Ref. No. DOEACC/CCU/TECH/74/06-V

2nd August, 2010

N O T I C E

DOEACC Society is pleased to announce the IVth revision of DOEACC 'B' Level Syllabus effective for teaching with effect from January 2011. The outline of the IVth revised syllabus of 'B' Level course is enclosed at Annexure. The detailed IVth revised syllabus of 'B' level is available at the website of DOEACC Society at http://www/doeacc.edu.in

The First examinations based on the IVth revised syllabus for 'B' Level shall be held in July, 2011. Candidates undergoing training/examinations as per the existing syllabus (IIIrd revision) shall be provided two chances to complete the course as per the IIIrd revised syllabus. With effect from July 2011, examinations based on existing syllabus (IIIrd revision) and IVth revised syllabus shall be held concurrently for two examinations (July 2011 and January 2012 examinations). Thereafter, from July 2012, the examinations based on the existing syllabus (IIIrd revision) shall be discontinued and examinations shall be held only as per the fourth revised syllabus for 'B' Level.

Candidates who would be unable to complete the course as per the IIIrd revised syllabus, shall have to compulsorily appear in the IVth revised syllabus from July 2012 examinations based on the parity table given in the IVth revised syllabus. Candidates also have the option to shift from the existing syllabus (IIIrd revision) to the IVth revised syllabus immediately, based on the parity table.

Enquiries regarding any issues relating to the implementation of the revised syllabus should be addressed to Shri G. Bhaskar, at the email address revision@doeacc.edu.in.

Joint Chief Controller (Examination)

Contents

List of Elective Subjects:

1. ABOUT THE REVISED SYLLABUS

The third revised version of DOEACC syllabus came into effect in July 2003 examinations. Since then many advancements have taken place in the field of Information Technology. Consequently it has become necessary to revise the syllabus.

This document presents the fourth revised version of DOEACC B level syllabus which becomes effective for teaching w.e.f. January 2011. This 'B' Level syllabus is designed to facilitate students in the development of concept based approach for problem solving using IT as a tool. The self learning approach is built into the syllabus, thereby training the candidates to update themselves on the changing technologies in their area of work. The 'B' Level syllabus has been designed to produce Programmers, Web Administrators, faculty/ Trainer, Web Content Developers and trouble shooters etc., equipped with latest knowledge and skills.

2. DOEACC SOCIETY

DOEACC Society is an Autonomous Scientific Society of the Department of Information Technology, Ministry of Communications & Information technology, Govt. of India. The Society is registered under the Societies Registration Act, 1860. DOEACC Society is the only professional examination body in India, which accredits institutes / organizations for conducting particular course, specializing in the non-formal sector of IT education.

The office of the Society is situated at Electronics Niketan, 6, CGO Complex, New Delhi – 110 003 and number of counseling centres are situated in important cities in the country.

DOEACC is envisioned to be a premier knowledge institution pursuing human resource development activities in areas of Information Technology, Electronics and Communication Technology (IECT).

DOEACC's holistic quality policy entails offering its courses through painstakingly screened accredited institutes to ensure seriousness at both the institute and individual level. The Society has its twelve Centers at 20 locations namely Agartala, Aizawl, Aurangabad, Calicut (with Southern Regional Office at Pudukkottai), Gorakhpur(with Eastern Regional Office at Patna), Imphal, Kohima/Chuchuyimlang, Kolkata, Srinagar/Jammu, Shillong, Tezpur/Guwahati, Chandigarh (Branches – New Delhi, Shimla, Lucknow). Three more DOEACC Centres are being set up at Gangtok, Itanagar and Chennai. These Centres provide quality education & training programmes in Information, Electronic Design and related technologies/areas on long term and short term basis.

3. DOEACC SCHEME

DOEACC is a joint Scheme of the Department of information Technology (erstwhile Department of Electronics), Ministry of Communications & Information Technology, Govt. of India and All India Council for Technical Education (AICTE).

Objective of the Scheme

The objective of the Scheme is to generate qualified manpower in the area of Information Technology (IT) at the national level, by utilizing the facilities and infrastructure available with the institutions/organizations in the non-formal sector.

The Society is managed and administered by a Governing Council which consists of eminent academicians and professionals from IT industry. Minister of

Communications & Information Technology, Govt. of India, is the Chairman, Governing Council of the Society. The Executive Director is the Chief Executive Officer of the Society and manages day to day affairs of the Society. Manifold functions of the DOEACC Scheme are:

a) Accreditation
b) Registration and
c) Examination

4. DOEACC 'B' LEVEL COURSE

Objective of the 'B' Level Course

The objective of 'B' Level is to develop capability to analyse, develop and manage software project. The course has been designed to give the students sound background in computing, business functions and mathematics relevant to information technology. During the course, a student will learn Computer Programming Languages, Compilers, Software packages, database systems, Network Management & Information Security etc.

The career options available to DOEACC 'B' level qualifiers are:

- System Analyst
- Software Engineer
- Training faculty
- R & D Scientist
- EDP Manager

DOEACC 'B' Level Course consists of 25 theory modules (22 compulsory modules and 3 elective module), four Practicals and three Projects(out of which one will be a comprehensive project). The minimum duration of the course is three years. The structure of 'B' Level syllabus is indicated below :

DOEACC 'B' LEVEL COURSE STRUCTURE

The structure of the 'B' Level course is:

Module	Title
Bridge Course	
B0-R4	Basic Mathematics
(Required for students who have not studied Mathematics up to class 12)	
Semester I	
B1.1-R4	IT Tools and Business Systems
B1.2-R4	Internet Technology and Web Design
B1.3-R4	Programming and Problem Solving through C
B1.4-R4	Computer System Architecture
B1.5-R4	Structured System Analysis & Design
Semester II	
B2.1-R4	Data Structure through C++
B2.2-R4	Introduction to DBMS
B2.3-R4	Basics of OS, Unix & Shell Programming
B2.4-R4	Data Communication and Network Technologies
B2.5-R4	**Elective (Any one from the following to be chosen)**

B2.5.1-R4	Introduction to Object Oriented Programming through JAVA
B2.5.2-R4	Software Testing and Quality Management
PJ-1-R4	Project I

Semester III

B3.1-R4	Management Fundamentals & Information System
B3.2-R4	Discrete Structure
B3.3-R4	Software Engineering & CASE Tools
B3.4-R4	Operating Systems
B3.5-R4	Visual Programming

Semester IV

B4.1-R4	Computer-based Statistical & Numerical Methods
B4.2-R4	Professional & Business Communication
B4.3-R4	Object Oriented DBMS
B4.4-R4	Computer Graphics & Multimedia
B4.5-R4	Internet Technology and Web Services

Semester V

B5.1-R4	Software Project Management
B5.2-R4	Automata Theory & Compiler Design
B5.3-R4	Network Management & Information Security
Elective	**(Any two from the following to be chosen)**
BE1-R4	Embedded Systems
BE2-R4	Artificial Intelligence & Neural Networks
BE3-R4	E-Business
BE4-R4	System Modeling and Computer Simulation
BE5-R4	Parallel Computing
BE6-R4	Data Warehouse and Data Mining
BE7-R4**	Software Testing and Quality Management
BE8-R4	Digital Image Processing
BE9-R4	Accounting & Financial Management System
BE10-R4	Applied Operations Research
BE11-R4	Wireless & Mobile Communication
BE12-R4	Information Storage & Management
PJ-2-R4	Mini project / Seminar

Semester-VI

PJ-3-R4	PROJECT-III

** (Compulsory for students who have not done in Semester II of B Level / A Level)

5. PRACTICAL

All 'B' Level Candidate under the revised syllabi (Revision 4) shall have to qualify the Practical Examination, in addition to qualifying the theory examinations as well as the Project Work.

The students have to devote half of the total time allotted to each module for the practical session. Practical assignments have been worked out for each theory paper. At 'B' Level, there are four Practical Examinations.

The Practical-1 examination will be based on the syllabi of

B1.1-R4	IT Tools and Business Systems
B1.2-R4	Internet Technology and Web Design
B1.3-R4	Programming and Problem Solving through C
B1.4-R4	Computer System Architecture

Practical -2 examination will be based on the syllabi of

B1.5-R4	Structured System Analysis & Design
B2.1-R4	Data Structure through C++
B2.2-R4	Introduction to DBMS
B2.3-R4	Basics of OS, Unix & Shell Programming
B2.4-R4	Data Communication and Network Technologies
B2.5-R4	**Elective (Any one from the following to be chosen)**
B2.5.1-R4	Introduction to Object Oriented Programming through JAVA
B2.5.2-R4	Software Testing and Quality Management

Practical 3 examination will be based on the syllabi of

B3.3-R4	Software Engineering & CASE Tools
B3.4-R4	Operating Systems
B3.5-R4	Visual Programming

Practical - 4 examination will be based on the syllabi of

B4.3-R4	Object Oriented DBMS
B4.4-R4	Computer Graphics & Multimedia
B4.5-R4	Internet Technology and Web Services

6. PROJECT

DOEACC curriculum has a project as an important component of 'B' Level course. There are three projects at 'B' Level. The Project is carried out by the student under guidance and support of faculty and management of the respective institute.

It is felt that such a project provides an opportunity to the student to apply his/her knowledge and skills to real life problems (including oral and written communication skills), and as such the project should be given utmost importance and priority both by the students as well as institution faculty / management in respect of its identification, planning and implementation.

Objective of the Project

The aim of the project is to give the students an integrated experience in solving a real life problem by applying knowledge and skills gained on completion of theory papers in a course at a given Level. It provides an occasion for students to develop written and communication skills; Project also helps the students to realize the importance of resource and time management, ownership of task towards deliverables, innovation and efficiency in task management apart from presentation skills. It also provides a good opportunity for students to build, enhance and sustain

high levels of professional conduct and performance and evolves a problem solver frame of mind in student. It is also felt that taking up the project by a student prepares him for a job in industry and elsewhere.

6.1 B Level First project (PJ -1-R4)

Every candidate should do a project individually and no grouping is allowed. The project will be carried out under the guidance of the institute, if he/she is through the institute conducting an accredited course. The direct candidate will do the project in an organization where he/she is working. In that case, he/she will carry out the project under the guidance of experts/professionals from his organization.

Who could be a Supervisor / Guide

A guide for 'B' Level should be a person with DOEACC 'B' level / MCA / B.Tech / equivalent / higher qualification and adequate experience (minimum 3 years) in the area in which the student has chosen the Project. In the case of a candidate from an accredited institute, the institute concerned will render all help including the nomination of the Supervisor.

Time of Submission of First 'B' Level Project

'B' Level student can submit the project only after clearing 5 papers from the first two semesters and appearing in remaining papers of these two semesters in the next examinations.

Credits

The first Project would be approximately 350 man-hours and carries a total of 100 marks (80% for the project evaluation and 20% for the viva-voce).

Some important notes while preparing the project proposal

The following suggested guidelines may be followed in preparing the Final Project Report:

Good quality white executive bond paper A4 size should be used for typing and duplication. Care should be taken to avoid smudging while duplicating the copies.
Page Specification: (Written paper and source code)

Left margin	3.0 cms
Right margin	3.0 cms
Top margin	2.7 cms
Bottom margin	2.7 cms

Page numbers – All text pages as well as Program source code listing should be numbered at the bottom center of the pages.

Submission of Project Report to DOEACC

The student will submit his/her project report in the prescribed format along with requisite fee. The Project Report should include:

- One hard copy of the Project Report.
- Soft copy of Project on CD
- The Project Report may be about 50 pages (excluding coding).

6.2 Mini Project /Seminar (PJ- 2-R4)

Objective

DOEACC curriculum has a mini project as an important component of 'B' Level course. With the rapid technological advances in the field of computer, all the researches and studies carried out on various subjects around the world may not be available in the course curriculum. This is where the seminars or such mini projects are of great importance. Seminars are capable of keeping the students updated with the technologies. B level students are expected to take part in various seminars on latest topics. Through conducting or attending the seminars, they can make others understand what is their idea is all about. Seminars on the subject topics would always help them to understand the subject more effectively. This would give them a chance to collect more information about the topic they are provided with. The result is that they would learn the subject well.

Time of submission

The Project is carried out by the student under guidance and support of faculty and management of the respective Institute / Organization. This project or seminar will be based on the syllabi B5.1-R4, B5.2-R4, B5.3-R4, BE1-R4 to BE12-R4 modules of the 'B' Level course. The project completion certificate has to be submitted after appearing for all the modules of semester V of DOEACC 'B' level examination.

Credits

This mini Project/ seminar would be approximately 350 man-hours and carries a total of 100 marks. The marks and a certificate of conducting mini project/ seminar should be submitted in the prescribed format by the head of the institute running the accredited course or the organization of which the candidate is an employee.

Proforma of the mini Project Completion Certificate is given below;

Proforma of the Mini Project Completion Certificate

This is to certify that the Project work done or seminar (----------Title) attended at _____ by Mr./Ms._____
(DOEACC Registration No._____) in partial fulfillment of DOEACC 'B' Level Examination has been found satisfactory and the total marks obtained by the candidate is _____.

This report has not been submitted for any other examination and does not form part of any other course undergone by the candidate.

It is further certifies that he / she has appeared in all the five modules of semester V of DOEACC 'B' Level examination.

Signature

Name:
(By head of the institution with PROV No. /FULL No.) or by
Head of the Organization / Division
Name of the Organization:
Address:

6.3 B level Final Project (PJ-3-R4)

At this academic level, the project is of some great significance in the testing of a candidate's virtuosity in Information Technology and judges his or her ability to independently take charge of Project/System development.

The final Project may be started after the candidate has completed at least first 15 papers and has appeared in the remaining papers of the 4th semester of /B' level course. All 'B' level candidates are required to get the synopsis of the project and the brief bio-data of the supervisor/Guide approved from the Society. The synopsis should clearly mention the scope of the project. The project is to be taken up only after obtaining the approval of the Society.

Eligibility

The candidate could be from an institute conducting the accredited course or may be a direct candidate. The project is to be selected by the student reflecting knowledge gained by the him/her during the course of study. The subject will be chosen by the student duly approved by a supervisor/Guide.

Supervisor/Guide

A supervisor/Guide should be a person of eminence in the area in which the student has chosen the project. In the case of a candidate from an institute conducting the accredited course, all help including the nomination of the supervisor./guide will be rendered by the institute concerned. In the case of a direct candidate, the candidate should ensure that the facilities are available in the organization (where the project is taken up) and also the same are extended to them.

The guide of 'B' level Final project would be a person having MCA / B.Tech / M.Sc (comp.Sc) / M.Tech (Comp.Sci) / 'C' level with 5 years of experience in the field of Information Technology.

Topic of the Project

Should enable bringing out the topics learnt and should be related to applications in the Industry/field in real life.

Methodology

Candidate should undertake a project work involving use of software engineering methodologies, tools and techniques.

Format

Candidate should see the format in the Student project Guide at Doeacc website.

Credits

Project would be of approximately 450 man-hours and so credited by the Supervisor/Guide and will be presented in the form in conformance with the format given in the Student guide. The project will also include a viva-voce examination. Project carries a total of 300 marks. 80% of the marks are earmarked for the project evaluation and 20% for the viva-voce.

To qualify for a pass, a candidate must obtain at least 50% in each of project evaluation and viva-voice. Exact location of the viva-voce will be intimated by the examiner designated.

Time for submission

Project may be submitted by direct candidates when they have appeared for the last papers in the 5th semester and by students from institutes in 6th semester. The hard copy of the project is required to be submitted along with the following:

- Soft copy of Project on CD
- Project fee as applicable at the time of submission vide demand draft in favour of DOEACC Society payable at any nationalized bank in New Delhi.

Authenticity

Should be an original work, of real life value and not copied from existing material from any source and a certificate to the effect will be provided with the Project duly countersigned by the supervisor/Guide.

7. CREDIT SCHEME FOR DOEACC 'B' LEVEL COURSE

Introduction

A credit system based on the AICTE norms has been introduced for indicating the efforts required to pass a specific level of course under the DOEACC Scheme. Award of credit to a student will facilitate measurement/comparison of study hours including Theory Lectures, Tutorials and Practical Assignments put in a given mudule/paper/subject under the Scheme with similar course in IT in India and abroad. This will also facilitate other Universities/Apex Accrediting bodies to consider academic and professional equivalence of DOEACC courses. This will also help students/organizations to transfer credits from DOEACC to other academic bodies and vice-versa for ensuring continuing education. Following table gives the no. of hours of Lectures/Tutorials and Practicals per week to be attended and the credits earned by the student:-

Calculation of Credits

Code No.	Modules/ Subject Name	No. of Hrs. per week L*	T/P**	No. of Credits+	
B0-R4	Basic Mathematics				
B1.1-R4	IT Tools and Business System	3	3	5	
B1.2-R4	Internet Technology and Web Design	3	3	5	
B1.3-R4	Programming and Problem Solving Through 'C' Language	3	3	5	
B1.4-R4	Computer System Architecture	3	3	5	
B1.5-R4	Structured System Analysis and Design	3	3	5	
					25
B2.1-R4	Data Structures through 'C++'	3	3	5	
B2.2-R4	Introduction to Database Management System	3	3	5	
B2.3-R4	Basics of Os, Unix and Shell Programming	3	3	5	
B2.4-R4	Data Communication and Network Technologies	3	3	5	
B2.5-R4	**Elective-I (One out of the following two subjects to be chosen)**				

B2.5.1-R4	Introduction to Object-Oriented Programming through Java	3	3	5
B2.5.2-R4	Software Testing and Quality Management	3	3	5
				25
PJ1-R4	Project - I			5
				5
B3.1-R4	Management Fundamentals & Information Systems	3	3	5
B3.2-R4	Discrete Structures	3	3	5
B3.3-R4	Software Engineering and CASE Tools	3	3	5
B3.4-R4	Operating Systems	3	3	5
B3.5-R4	Visual Programming	3	3	5
				25
B4.1-R4	Computer based Statistical & Numerical Methods	3	3	5
B4.2-R4	Professional & Business Communication	3	3	5
B4.3-R4	Object Oriented Database Management Systems	3	3	5
B4.4-R4	Computer Graphics & Multimedia	3	3	5
B4.5-R4	Internet Technology and Web Services	3	3	5
				25
B5.1-R4	Software Project Management	3	3	5
B5.2-R4	Automata Theory & Compiler Design	3	3	5
B5.3-R4	Network Management & Information Security	3	3	5
B5.4-R4	**Elective –II (Two out of the following**			
B5.5-R4	**Elective - III Twelve subjects to be chosen)**			
BE1-R4	Embedded Systems	3	3	5
BE2-R4	Artificial Intelligence & Neural Networks	3	3	5
BE3-R4	E-Business	3	3	5
BE4-R4	System Modeling & Computer Simulation	3	3	5
BE5-R4	Parallel Computing	3	3	5
BE6-R4	Data Warehouse and Data Mining	3	3	5
BE7-R4	Software Testing and Quality Management	3	3	5
BE8-R4	Digital Image Processing	3	3	5
BE9-R4	Accounting & Financial Management System	3	3	5
BE10-R4	Applied Operations Research	3	3	5
BE11-R4	Wireless & Mobile Communication	3	3	5
BE12-R4	Information Storage & Management	3	3	5
				25
PJ-2	Mini Project/Seminar			5
				5

PJ-3	Project – II		34
			34

Total Credit (for 25 papers) **169**

*L : No. of Lecture hours per week
**T/P : No. of Tutorial/Practical hours per week

+Credits = L + (T+P)/2

Notes

1. One hour of lecture is equated to One credit and two hours of tutorial / practicals are similarly equated to a credit, every week for a semester consisting of 20 weeks.
2. Total No. of credits earned in a module is calculated using AICTE FORMULA (as applicable to Under Graduate Courses in IT namely
   C=L + (T+P)/2 where L, T and P indicate no. of hours per week for Lectures, Tutorials and Practical.
3. The credit scheme was implemented from July, 2003 examinations.
4. Fractions in Credits have been rounded to nearest integer.

8. EXAMINATION PATTERN

The theory examination for each module under the fourth revised syllabus would be for duration of three hours and the total marks for each subject would be 100. Four Practical examinations of three hours duration and 100 marks each have been introduced. The first examination with the revised syllabus will be held in July 2011, for which teaching will commence in January, 2011.

Dates for the various activities connected with examinations will be announced on DOEACC website, well in advance of the examinations.

Pass percentage

To qualify for a pass in a module, a candidate must have obtained at least 50% in each theory and practical examination each. The marks will be translated into grades, while communicating results to the candidates. The gradation structure is as below:-

Pass percentage	Grade
Failed (<50)	F
50%-54%	D
55%-64%	C
65%-74%	B
75%-84%	A
85% and over	S

Award of Certificates

Successful candidates in ‘B’ Level would be eligible for a certificate which is recognized as equivalent to MCA for the purpose of employment under Central Government by Government of India vide Ministry of Human Resources

Development, Govt. of India's notification no. F.2/697–TS.IIIa dated 26th September,2000.

9. Registration

Registration is a pre-requisite for appearing in DOEACC examinations. A candidate can register at only one Level at a time to appear for the examination. Registration is only for candidates and not for institutes. Registration forms are available from the DOEACC Society free of cost and also can be downloaded from the website. The eligibility criteria for registration at 'B' Level is as follows:

Students from institutes conducting accredited courses:

Level 'A'/ Government recognised PPDCA / Government recognised PGDCA / Government recognised polytechnic engineering diploma/Graduate, followed in each case, by an accredited 'B' Level course (First two semesters are exempted for those who pass 'A' Level in full. Candidates having Government recognised PPDCA / Government recognised PGDCA will also be eligible for exemption of some subjects depending on the courses they had undergone, on a case-by-case basis).

Direct Applicants

Level 'A' / Government recognised PPDCA / Government recognised PGDCA, followed in each case, by two years relevant experience. (First two semesters are exempted for those who pass 'A' level in full. Candidates having Government recognised PPDCA / Government recognised PGDCA will also be eligible for exemption of some subjects depending on the courses, they had undergone, on a case by case basis).

or

Graduate/Government recognised polytechnic engineering diploma, followed in each case by three years relevant experience. Relevant experience connotes job experience in IT, including teaching in a recognised institution as a faculty member excludes coaching.

Registration is open throughout the year, however cut off dates are specified for submitting registration applications for each examinations for the convenience of processing and allotting Registration Numbers.

Level	**Cut off Dates**	
	January Exams	July Exams
B Level	Preceding 31st July	Preceding 31st January

Accredited Institutes are allowed to submit the Registration Application Form of their candidates one month beyond the cut off dates.

9.1 Auto-upgradation:

The candidates successfully completing all papers (Theory as well as Practical) of a particular Level in a particular Examination and wish to appear in the next Examination for immediate higher Level are exempted from the above cut off dates. Such candidates can fill up examinations Form and Registration Forms for higher Levels subject to following conditions:-

a) Registration fee is not mixed / combined with Examination fee and is paid through a separate Demand Draft.
b) The facility is available to the candidates appearing through Accredited Institutes and not for direct applicants. However the facility is available to a candidate who might have completed lower level as a direct candidate and wishing to appear for immediate higher level through Accredited Institutes.
c) The facility is also not available to the candidates those who might be appearing through Accredited examination but have cleared lower level prior to the preceding exam (e.g. if a candidate has passed 'A' Level Exam in Jan, 2011 he would be eligible for this facility in case he wishes to appear for 'B' Level Examinations in July, 2011 through Accredited Institute. If, however, he had passed 'B' Level prior to Jan., 2011 Exams, this facility would not be available to him).
d) This facility would also not be available to the candidate opting for Level jumping (e.g. from 'O' to 'B' or 'A' to 'C' Levels).

Once registered at a particular level, the registration is valid for twelve consecutive examinations for 'B' Level, reckoned from the specific examination as indicated in the Registration allocation letter issued to the candidates.

Registration, by itself, does not entitle a candidate to appear for an examination at the Level concerned, unless all conditions, stipulated in the examination application form, and in any other notification, relevant to the examination are fulfilled by the candidate.

9.2 Re-registration:

Candidates who are not able to clear the level within the validity period of initial registration, are allowed to re-register for once, at the same level for another full term i.e. 6 years to clear the left over papers by submitting filled in Registration application and full Registration fee within one year of the expiry of the validity period of existing 'B' level Registration.

10. PRACTICAL EXAMINATION SCHEME

No of Practical Examination : Four
Duration of each Examination :Three hour duration including viva-voce
Max. marks in each Examination : 100=80 (Practical) + 20 (Viva)

Grading : Students will be awarded grades in practical examinations based on the marks scored by them in the practical and viva voce. Every candidate has to pass in both Theory and Practical examinations.

Date(s) :**Date(s) will be announced on the DOEACC website.**

The examinations will be conducted by the Society in reputed institutions for all candidates.

The institutes are obliged to facilitate the conduct of Practical examinations and arrange infrastructure, faculty for the conduct of practical examination. The institutes are not allowed to charge any fee from the candidates, for the practical examination.

11. HARDWARE REQUIREMENT FOR 'B' LEVEL COURSE

11.1 Computer configuration recommended

Processor	:	1 GHz or higher
RAM	:	128 MB or higher
HDD	:	40 GB or higher
Monitor	:	SVGA
Mouse	:	Windows compatible
Keyboard	:	Standard
NIC	:	Standard
Micro controllers	:	Standard
Micro processor	:	Standard
Optical Drive	:	Standard
Speaker, Mic, Webcam	:	Standard

11.2 Printer

Laser printer / Inkjet Printer	:	Standard
Dot matrix printer	:	Standard
OHP /LCD Projector	:	Standard
MODEM, DIAL UP/DSL	:	Standard
SCANNER	:	Standard

Sufficient number of Computers / nodes in Client server configuration mode satisfying the criteria of accreditation.

11.3 Networking

NIC	:	Standard
RJ-45 Connector	:	Standard
Punching Tool	:	Standard
Crimping Tools	:	Standard
UTP/STP/Coaxial Fiber Optic Cables and their connectors	:	Standard
8/16 port Hub/Switch	:	Standard
Wi-H Router	:	Standard

12. SOFTWARE REQUIREMENT FOR 'B' LEVEL COURSE

Operating system	:	Linux / Windows / 2000/xp/vista
NOS	:	Linux / Unix / Windows NT/Novell Netware
SW Packages	:	Star Office / MS Office, Internet Explorer, Internet Explorer / Web Publishing Tool, JDK / Oracle J Developer2, AUTOCAD/CorelDraw / MS Visio, Microsoft Visual Studio .Net.,Oracle / SQL Server. Standard Multimedia Tools,CASE Tool,Win Runner/Load Runner, RASMOL, BLAST,Fasta,WorkBench and NCBI Software Tools(Entrez) etc.Network Simulation Software,Project Management tools/software, Firewall, Network Traffic Analysis Tools, RTOS, Software Testing Tools, MATLAB / Mathmatica (with relevant tool boxes),Software
Antivirus Software	:	Standard
Compilers	:	C & C++ Compiler, Java MPI,PVM and OpenMP

Parity Table between Revision II (w.e.f July 1999) and Revision III (w.e.f July 2003) and Rev IV (w.e.f January 2011) of DOEACC 'B' Level Syllabus

Code	Revision II	Code	Revision III	Code	Revision IV
B1.1	Personal Computer Software	B1.1-R3	IT Tools and Applications	B1.1-R4	IT Tools and Business System
B1.2.1	Business Systems	B1.2-R3	Business Systems	B1.1-R4	IT Tools and Business System
B1.2.2	ERP Fundamentals		No Equivalence		No Equivalence
B1.3	I Computer Organization and System Software	B1.4-R3	Computer Organization	B1.4-R4	Computer System Architecture
B1.4	Programming and Problem Solving through 'C' language	B1.3-R3	Programming and Problem Solving through 'C' Language	B1.3-R4	Programming and Problem Solving through 'C' Language
B1.5	System Analysis, Design and MIS	B1.5-R3	Structured System Analysis & Design	B1.5-R4	Structured System Analysis & Design
B2.1	Data Structure through "C" Language	B2.1-R3	Data Structure through "C" Language	B2.1-R4	Data Structure through C++
B2.2	Introduction to Database Management	B2.2-R3	Introduction to Database Management	B2.2-R4	Introduction to Database Management System
B2.3	Computer Graphics	B2.5.3-R3	Computer Graphics		No Equivalence
B2.4	Data Communication and Network	B2.4-R3	Data Communication and Network	B2.4-R4	Data Communication and Network Technologies
B2.5.1	Unix and Shell Programming	B.2.3-R3	Basics of OS, Unix & Shell Programming	B2.3-R4	Basics of OS, Unix & Shell Programming
B2.5.2	Introduction to Object Oriented Programming and C++ / Visual C++	B2.51-R3	Introduction to Object Oriented Programming and C++	B2.5.1-R4	Introduction to Object Oriented Programming through Java
B2.5.3	Programming in Java	B2.5.2-R3	Introduction to Object Oriented Programming through Java	B2.5.1-R4	Introduction to Object Oriented Programming through Java
B2.5.4	Introduction to Object Oriented programming and Visual Basic	B2.5.2-R3	No Equivalence		No Equivalence
B3.1	Principles of Management	B3.1-R3	Management Fundamentals And Information System	B3.1-R4	Management Fundamentals And Information System
B3.2	Computer based Numerical and Statistical techniques	B4.1-R3	Computer based Numerical and Statistical Techniques	B4.1-R4	Computer based Statistical and Numerical Methods
B3.3	Computer Graphics & Multimedia	B4.4-R3	Computer Graphics & Multimedia	B4.4-R4	Computer Graphics & Multimedia
B3.4	Operating Systems	B3.4-R3	Operating Systems	B3.4-R4	Operating Systems
B3.5	Discrete Structure	B4.2-R3	Discrete Structures	B3.2-R4	Discrete Structures
B4.1	Accountancy & Financial management	BE9-R3	Accountancy & Financial Management	BE9-R4	Accounting & Financial Management System
B4.2	Data & Computer Communication	B3.5-R3	Networking & Mobile Communication	BE11-R4	Wireless & Mobile Communication
B4.3	Artificial Intelligence & Applications	BE2-R3	Artificial Intelligence & Application	BE2-R4	Artificial Intelligence and Neural Networks
B4.4	Software Engineering & CASE Tools	B3.3-R3	Software Engineering & CASE Tools	B3.3-R4	Software Engineering & CASE Tools
B4.5	Windows Programming		No equivalence		No Equivalence
B5.1	Operations Research	BE10-R3	Applied Operations Research	BE10-R4	Applied Operations Research

B5.2	Advanced Database Management	B5.2-R3	Object Oriented Database Management System	B4.3-R4	Object Oriented Database Management System
BE1	Advanced UNIX Programming		No Equivalence		No Equivalence
BE2	Object Oriented Technology		No Equivalence		No Equivalence
BE3	Compiler Design		No Equivalence		
BE4	Modelling and Simulation	BE4-R3	Principles of Modelling and Simulation	BE4-R4	System Modeling and Computer Simulation
BE5	Parallel Architecture and Parallel Computing	BE5-R3	Parallel Architecture & Computing	BE5-R4	Parallel Computing
BE6	Software Project Management	BE6-R4	Software Project Management	B5.1-R4	Software Project Management
	No Equivalence	B3.2-R3	Basic Mathematics		No Equivalence
	No Equivalence	B4.3-R3	Software Testing & Quality Management	BE7-R4	Software Testing & Quality Management
	No Equivalence	B4.5-R3	Internet Technologies and Tools	B4.5-R4	Internet Technology and Web Services
	No Equivalence	B5.3-R3	Network Management & Information Security	B5.3-R4	Network Management & Information Security
	No Equivalence	BE1-R3	Embedded Systems	BE1-R4	Embedded Systems
	No Equivalence	BE3-R3	E-Business	BE3-R4	E-Business
	No Equivalence	BE7-R3	Applied Bi-informatics		No equivalence
	No Equivalence	BE8-R3	Digital Image Processing	BE8-R4	Digital Image Processing
	No Equivalence	B5.1-R3	Professional and Business Communication	B4.2-R4	Professional and Business Communications
	No Equivalence		No Equivalence	B3.5-R4	Visual Programming
	No Equivalence		No Equivalence	B5.2-R4	Automata Theory & Compiler Design
	No Equivalence		No Equivalence	BE6-R4	Data Warehouse and Data Mining
	No Equivalence		No Equivalence	BE12-R4	Information Storage & Management

1. Candidates who have already cleared B3.2-R3 Basic Mathematics in Revision III do not need to pass the Bridge Course, B0-R4:Basic Mathematics.
2. The above table shows the equivalence between the modules of old syllabus (Revision II & III) and the new syllabus (Revision IV).
3. Candidates would not be allowed to appear in the equivalent papers of the Revision IV (new syllabi), if they have already passed the relevant papers in earlier revision.
4. Candidates would have to pass a total of 25 papers and 4 practical and 3 projects in order to qualify 'B' Level in Revision IV syllabus.
5. Candidates would not be allowed to appear for more than two elective papers as per the Revision IV from B3.1-R4 onwards, which means that if a candidate has already passed at least two electives as per the earlier revisions or Revision IV or both, He/she cannot opt for any further elective paper as per Revision IV.
6. Candidates who have already cleared the Elective paper (B2.5.2 R4)-'Software Testing & Quality Management', would not be allowed to obtain exemption against the Elective paper (BE7-R4)- 'Software Testing & Quality Management' in B level.
7. Cases where unclear papers have either become elective or have no equivalence in Revision IV and the candidate has already cleared his/her quota of elective papers, the candidate must replace the papers with equal number of introduced compulsory papers in Revision IV, i.e. papers which have no equivalence in earlier Revisions.

B0–R4: BASIC MATHEMATICS

Objective of the Course

The aim of this course is to make students aware about mathematics skills which are necessary for understanding essential topics in computer science. The course is framed in such a way that the students get exposure to basic topics in mathematics that would prepare the students to learn the advance level courses in the domain of computer science such as discrete structure, computer graphics, computer and communication networks, simulation, operations research etc.

The courses provide introduction to complex analysis, differential & integral calculus, analytic geometry, vectors and matrices.

Outline of Course

S. No.	Topic	Minimum number of hours
1.	Complex numbers	04
2.	Matrices & determinants	08
3.	Differential Calculus	12
4.	Integral Calculus	10
5.	Sequences & Series	08
6.	Differential equation	04
7.	Analytic geometry	09
8.	Vectors	05

Lectures	**=**	**60**
Practical/Tutorials	**=**	**60**
Total	**=**	**120**

Detailed Syllabus

1. Complex Numbers **04 Hours.**

Representation of complex numbers in polar form, vector form, exponential form, properties of arguments & modulus. Graphical representatives of complex numbers, De – Moiver's theorem, roots of complex numbers, solution of complex equations.

2. Matrices & Determinants **08 Hours.**

Notion of matrices, triangular, diagonal, identity matrices, transpose of a matrix, symmetric and skew - symmetric matrices, orthogonal matrices, Hermitian and skew Hermitian matrices consistent and inconsistent system of linear equations, Cramer's rule, Gauss elimination method, rank of a matrix, inverse of a square matrix. Determinants, properties of determinants, Eigenvalues & eigenvectors of a matrix, characteristic roots and characteristic vectors of a matrix.

3. Differential Calculus **12 Hours.**

Functions and their graph. Domain & ranges of functions. Real numbers, exponential & logarithmic functions.

Limits & continuity of functions. Hospital's rule.

4. Differential Calculus

Derivative as slopes and rate of change, techniques of differentiation, chain rule, Mean Value theorem. Maxima & minima, asymptotes.

5. Integral Calculus **10 Hours.**

Integration by substitution, parts, partial fractions. Definite integral. Area between two curves, volume, lengths of plane curves, area of surface of revolution.

6. Sequences & Series **08 Hours.**

Limits of sequences & series. Sandwich theorem. Ratio test, comparison test, integral test. Alternating series, Taylor & Mclaurin's series.

7. Differential Equations **04 Hours.**

First order differential equations and applications. Second order linear homogeneous differential equation.

8. Analytic Geometry **09 Hours.**

Polar coordinates, tangent lines and arc length for parametric and polar curves, conic sections, conic section in polar coordinates, rotation of axes: second degree equations.

9. Vectors **05 Hours.**

Vectors, dot & cross product of vectors, projections parametric equations of lines, planes in 3 -space.

RECOMMENDED BOOKS

MAIN READING

1. H Anton, I. Bivens, S. Davis, "Calculus", John Wiley and Sons.
2. E. Kreysig, "Advanced Engineering Mathematics", 8th Edition. Wiley, 2002, McGraw Hill
3. G.B. Thomas, Jr. R.L. Finney, "Calculus and Analytic Geometry", Pearson Education Asia, Ninth Edition, 2002

SUPPLEMENTARY READING

1. S.T.Tan, Applied "Calculus" , Kent Publishing Company.

B0–R4: BASIC MATHEMATICS

Model Question Paper

Note:

1. Answer question 1 and any four questions from 2 to 6.
2. Parts of the same question shoul be answered together and in the same sequence**.**

Time allotted: 3 hours **Total Marks :100**

1.

(a) Express the complex numbers $\frac{2+3i}{1+i}$ in the form a + ib. **(2)**

(b) Let $A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 \\ 0 & 1 \end{bmatrix}$.
Find whether the identity $A^2 - B^2 = (A + B)(A - B)$ is true or not. If not, then give reasons. **(3)**

(c) If $A = \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$. Then find the eigenvalues and associated eigenvectors of A. **(4)**

(d) Evaluate
$$\lim_{x \to 5} \frac{x2 - 3x - 10}{x2 - 10x + 25.}$$ **(3)**

(e) Evaluate
$$\int \frac{d\,x}{1+e^x}$$ **(2)**

(f) Find the area under the curve $x^2 + 1$ over the interval [0, 3]. **(3)**

(g) Show that the series $\sum_{k=1}^{\infty} \frac{k}{k+1}$ diverges. **(3)**

(h) Test the convergence of the series $\sum_{k=1}^{\infty} \frac{k}{2^k}$. **(3)**

(i) Solve the differential equation **(2)**
$$\frac{dy}{dx} = \frac{1}{4} y(2 - y)$$

(j) Find the entremum values of the function $f(x) = \frac{\log x}{x}$. **(3)**

2.

(a) Find all the solutions of $x^3 - 1 = 0$ **(4)**

(b) Express $\frac{(\cos\phi - i\sin\phi)^3}{(\cos\phi + i\sin\phi)^5}$ in the form a+ib where a and b are real numbers **(4)**

(c) Find whether the following pair of vectors is orthogonal or not (i.)x = (2, -4), y = (4,2) (ii.) x = (0, 2), y = (-3, 3) **(3)**

(d) Find the equation of a line which passes through the point (4, 3) in the direction of the vector (-2, 6) **(3)**

(f) Show that the matrix $\begin{bmatrix} 1/3 & 2/3 & 2/4 \\ 2/3 & 1/3 & -2/3 \\ -2/3 & 2\text{-}3 & -1/3 \end{bmatrix}$ is orthogonal. **(4)**

3.

(a) Solve the following system, if possible using Cramer's rule

$$x - 3y + 4z = 3$$
$$2x - 5y + 7z = 6$$
$$3x - 8y + 11z = 11$$

(4)

(b.) Find the inverse of the matrix

$$\begin{bmatrix} 2 & -1 & 3 \\ 1 & 3 & -1 \\ 3 & 2 & 1 \end{bmatrix}$$

(4)

(c) Prove that

$$\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix} = \begin{vmatrix} 2bc - a2 & c2 & b2 \\ c2 & 2ca - b2 & a2 \\ b2 & a2 & 2ab - c2 \end{vmatrix}$$

(4)

(d) Draw the graph of $y = 4 - |x - 2|$ **(4)**

(e) Find $\frac{dy}{dx}$ for the function $x^{2/3} + y^{2/3} = a^{2/3}$ **(2)**

4.

(a) Show that the function $\frac{(x+1)^2}{x+3}$ has a maximum value $\frac{2}{27}$ and a minimum value 0. **(3)**

(9)

(b) Evaluate

(i) $\int x^2 \log x \, dx$

(ii) $\int \frac{1}{\sqrt{x+a} + \sqrt{x}} \, dx$

(iii) $\int \frac{dx}{x\left[(\log x)^5 - 5\log x + 6\right.}$.

(c) Find the area of the region bonded by the curvey = x^2, the x – axis and the lines x = 2 and x = 3 **(4)**

(d) Evaluate $\int_{-3}^{3} |x| \, dx$ **(2)**

.

5.

(a) test the convergence of the following series

(i) $\sum_{k=1}^{\infty} \left(\frac{1}{5k} - \frac{1}{k(k+1)} \right)$

(ii) $\sum_{k=1}^{\infty} \frac{4k2 - 2k + 6}{8k7 + k - 8}$ **(6)**

(b) Using Leibnitz test, show that the following alternating series in convergent

(4)

$1 - 1/2 + 1/3 - 1/4 + 1/5 + \ldots\ldots\ldots\ldots$

(c) Find the Maclaurin's series for $e^{x.}$ **(4)**

(d) Find the binomial series for $\frac{1}{\sqrt{1+x}}$ **(4)**

6.

(a) Express the matrix $A = \begin{bmatrix} 4 & 2 & -1 \\ 3 & 5 & 7 \\ 1 & -2 & 1 \end{bmatrix}$
as the sum of a symmetry and a skew symmetric matrix. **(4)**

(b) Draw the graph of $r^2 = 4\cos 2\theta$ in polar form . **(4)**

(c) Find the slope of the tangent line to the circle $r = 4\cos\theta$ at the point where $\theta = \pi / 4$

(4)

(d) Find the equation of the parabola that is symmetric about the y – axis, has its vertex at the origin and passes through the point (5, 2).

(3)

(e) Draw the graph of the ellipse

$$\frac{x^2}{9} + \frac{y^2}{16} = 1$$

(3)

7.

(a) Solve the initial value problem

$$\frac{xdy}{dx} - y = x , \quad y(1) = 2.$$

(4)

(b) Find the a curve in the xy – plane that passes through (0, 3) and whose tangent line at a point (x, y) has slope $2x / y^2$

(4)

(c) Find the general solution of $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 6y = 0$.

(5)

(d) According to United Nations data, the world population in 1998 was approximately 5.9 million and growing at a rate of about 1.33% per year. Assuming an exponential growth model, estimate the world population at the beginning of the year 2023.

(5)

B1.1-R4: IT TOOLS AND BUSINESS SYSTEM

Objective of the Course

The goal of this course is to present overview of IT tools used in day to day use of computers and data base operations. The Course has been designed to provide knowledge on various hardware and software components of computer, operating system, various packages used for different applications, data base concepts & operations and various issues related to IT and application of IT.

At the end of the course the students will be able to:-

- Acquire the foundation level knowledge required to understand computer and its operations.
- Understand the hardware and software components of the computer.
- Understand the basic concept of operating system and get knowledge about various different operating systems.
- Understand to use the packages of word processing, spread sheet and presentation in detail.
- Understand various data base concepts and operations.
- Understand the issues related to IT and IT applications.

Outline of Course

S. No.	Topic	Minimum number of hours
1.	Computer Appreciation	04
2.	Computer Organization	06
3.	Operating System	13
4.	Word Processing	06
5.	Spreadsheet Package	09
6.	Presentation Package	05
7.	Data Base Operations	13
8.	Information Technology and Society	04
	Lectures = 60	
	Practical/Tutorials = 60	
	Total = 120	

Detailed Syllabus

1. Computer Appreciation **04Hrs.**

Characteristics of Computers, Input, Output, Storage units, CPU, Computer System, Binary number system, Binary to Decimal Conversion, Decimal to Binary Conversion, ASCII Code, Unicode.

2. Computer Organization **06 Hrs.**

Central Processing Unit - Processor Speed, Cache, Memory, RAM, ROM, Booting, Memory- Secondary Storage Devices: Floppy and Hard Disks, Optical Disks CD-ROM, DVD, Mass Storage Devices: USB thumb drive. Managing disk Partitions, File System

Input Devices - Keyboard, Mouse, joystick, Scanner, web cam, Output Devices- Monitors, Printers – Dot matrix, inkjet, laser, Multimedia- What is Multimedia, Text, Graphics, Animation, Audio, Images, Video; Multimedia Application in Education, Entertainment, Marketing. Names of common multimedia file formats**,** Computer Software- Relationship between Hardware and Software; System Software, Application Software, Compiler, names of some high level languages, free domain software.

3. Operating System 13 Hrs.

Microsoft Windows- An overview of different versions of Windows, Basic Windows elements, File management through Windows. Using essential accessories: System tools – Disk cleanup, Disk defragmenter, Entertainment, Games, Calculator, Imaging – Fax, Notepad, Paint, WordPad. Command Prompt- Directory navigation, path setting, creating and using batch files. Drives, files, directories, directory structure. Application Management: Installing, uninstalling, Running applications. Linux- An overview of Linux, Basic Linux elements: System Features, Software Features, File Structure, File handling in Linux: H/W, S/W requirements, Preliminary steps before installation, specifics on Hard drive repartitioning and booting a Linux system.

4. Word Processing 06 Hrs.

Word processing concepts: saving, closing, Opening an existing document, Selecting text, Editing text, Finding and replacing text, printing documents, Creating and Printing Merged Documents, Character and Paragraph Formatting, Page Design and Layout.
Editing and Profiling Tools: Checking and correcting spellings. Handling Graphics, Creating Tables and Charts, Document Templates and Wizards.

5. Spreadsheet Package 09 Hrs.

Spreadsheet Concepts, Creating, Saving and Editing a Workbook, Inserting, Deleting Work Sheets, entering data in a cell / formula Copying and Moving from selected cells, handling operators in Formulae, Functions: Mathematical, Logical, statistical, text, financial, Date and Time functions, Using Function Wizard.
Formatting a Worksheet: Formatting Cells – changing data alignment, changing date, number, character or currency format, changing font, adding borders and colors, Printing worksheets, Charts and Graphs – Creating, Previewing, Modifying Charts.
Integrating word processor, spread sheets, web pages.

6. Presentation Package 05 Hrs.

Creating, Opening and Saving Presentations, Creating the Look of Your Presentation, Working in Different Views, Working with Slides, Adding and Formatting Text, Formatting Paragraphs, Checking Spelling and Correcting Typing Mistakes, Making Notes Pages and Handouts, Drawing and Working with Objects, Adding Clip Art and other pictures, Designing Slide Shows, Running and Controlling a Slide Show, Printing Presentations.

7. Data Base Operations 13 Hrs.

Data Manipulation-Concept: Database, Relational Database, Integrity. Operations: Creating, dropping, manipulating table structure. Manipulation of Data: Query, Data Entry Form, Reports.

8. Information Technology and Society 04 Hrs.

Indian IT Act, Intellectual Property Rights – issues. Application of information Technology in Railways, Airlines, Banking, Insurance, Inventory Control, Financial systems, Hotel management, Education, Video games, Telephone exchanges, Mobile phones, Information kiosks, special effects in Movies.

RECOMMENDED BOOKS

MAIN READING

2. P.K. Sinha and P. Sinha, " Foundations of Computing" , BPB Publication, 2008.
3. Sagman S, "MS Office for Windows XP", Pearson Education, 2007.
4. ITL Educational Society, "Introduction to IT", Pearson Education, 2009.
5. Miller M, "Absolute Beginners Guide to Computer Basics", Pearson Education, 2009.

SUPPLEMENTARY READING

2. Turban, Mclean and Wetherbe, "Information Technology and Management" John Wiely & Sons**.**
3. Mansfield Ron, "Working in Microsoft Office", 2008, Tata McGraw-Hill
4. Balagurusamy E, "Fundamentals of Computers", 2009, Tata McGraw-Hill
5. Mavis Beacon, "All-in-one MS Office" CD based views for self learning, BPB Publication, 2008
6. Perry G, "MS Office 2007", Pearson Education, 2008.
7. D'Suoza & D'souza, "Learn Computer Step by Step", Pearson Education, 2006.
8. Kulkarni, "IT Strategy for Business", Oxford University Press

Refer: Open Office/ MS Office Environment for practice.

B1.1-R4 IT TOOLS AND BUSINESS SYSTEM

Model Question Paper

NOTE:

1. There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.

2. **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book.

3. Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**.

TOTAL TIME: **3 HOURS** **TOTAL MARKS: 100**
(PART ONE - 40; PART TWO - 60)

PART ONE
(Answer ALL Questions; each question carries ONE mark)

1. Each question below gives a multiple choices of answers. Choose the most appropriate one.

1.1 Which type of software provides additional functionality to your operating system?
- a) System software
- b) Operating system software
- c) Utility software
- d) Application software

1.2 Which of the following detects the presence or absence of a mark in a predetermined place?
- a) Pointing stick
- b) Bar code reader
- c) Optical mark reader
- d) Trackball

1.3 To create a capital letter, you must use which special key simultaneously with the letter key?
- a) Enter
- b) Esc
- c) Tab
- d) Shift

1.4 What type of software would you need to create an invitation to your birthday party?
- a) Spreadsheet
- b) Database
- c) Word processing
- d) Desktop publishing

1.5 In a word processing program, word wrap refers to:

a) Typing that extends beyond the right margin then automatically continues onto the next line.
b) Finishing a document.
c) Words that are unacceptable.
d) Words with too little space between them.

1.6 A space near the top of the spreadsheet where the formulas or other information in the active cell can be viewed is called the:
a) address label
b) title bar
c) entry bar
d) active cell

1.7 What is the binary number for the decimal number 217 ?
a) 11011001
b) 11101001
c) 10110101
d) 11000001

1.8 Which of the following translates a program written in a high-level language into machine code?
a) an assembler
b) a compiler
c) an operating system
d) an editor

1.9 Of the following components of a computer, which one performs computations?
a) output device
b) arithmetic/logic unit
c) control unit
d) memory unit

2. Each statement below is either TRUE or FALSE. Identify and mark them accordingly in the answer book.

2.1 The speed of a cpu is measured by the amount of time it takes to execute one machine cycle.
2.2 You can embed sounds, video clips, and animations into your word-processed document.
2.3 ROM doesn't lose data when you switch the computer off.
2.4 Operating systems are software systems that help make it more convenient to use computers and manage the transitions between multiple jobs.
2.5 In a computer, data is represented electronically by pulses of electricity.
2.6 The computer uses decimal number system for all computations
2.7 Hexadecimal number system is a compact representation of the binary number system.
2.8 The ASCII code for upper case and lower case alphabets is the same.
2.9 Microsoft Windows is a word processing system.
2.10 Computer memory is usually organized in bytes.

3. Match words and phrases in column X with the nearest in meaning in column Y.

	X	**Y**
3.1	software	a) transforming data into information
3.2	instructions	b) data that has been organized or presented in a

		meaningful fashion
3.3	operating system	c)any part of the computer that you can physically touch
3.4	processing	d)a set of computer programs that enables hardware to perform different tasks
3.5	information	e)the most common type of system software, it controls the way in which the computer system functions
3.6	data	f)the main circuit board in the system unit
3.7	Memory	g) the representation of a fact or idea (unprocessed information)
3.8	system software	h)holds instructions or data that the CPU processes
3.9	storage	i)processed data or information
3.10	motherboard	j)data or information that can be accessed again
		k)the set of programs that enables computer hardware devices and application software to work together
		l)steps and tasks necessary to process data into usable information

4. Fill in the blanks in 4.1 to 4.10 below, by choosing appropriate words and phrases given in the list below:

(a) Read	(b) magneto-optical	(c) Attachment	(d) Thesaurus	(e) backup
(f) Operating system	(g) Microprocessor	(h) Netiquette	(i) Assembler	(j) algorithm

4.1 A storage device that uses a combination of magnetic and optical (laser) technologies is a _____ storage device.

4.2 A(n) _____ is the CPU of a computer.

4.3 A(n) _____ is a program that converts an assembly language program to a machine language program.

4.4 The operation that takes data out of a specific memory location is the _____ operation.

4.5 _____ is an electronic document such as a Word file that is sent along with an email message

4.6 _____is a part of your Word Processor that will give you a list of antonyms or synonyms for chosen words

4.7 A _____ is a copy of one or more files created as an alternate in case the original data is lost or becomes unusable.

4.8 _____ involves respecting others' privacy and not doing anything online that will annoy or frustrate other people.

4.9 _____is the software that communicates with computer hardware on the most basic level.

4.10 An _____ is a set of instructions, sometimes called a procedure or a function, that is used to perform a certain task on a computer.

PART TWO
(Answer ANY FOUR questions)

5.

a. Differentiate between (i) Control Unit and Arithmetic Logic Unit (ALU) (ii) Volatile Storage and Non volatile Storage (iii) System Software and Application Software (iv) Impact and non impact printer

b. What are the components of Central Processing Unit? What are their functions?

(8+7)

6.

a. What are the principal functions of an Operating System? What is a multitasking operating system
b. Give the differences between compiler and interpreter?
c. As working with Linux OS all files and directories have security permissions; what are those and how chmod command helps in operating all those permissions?

(5+5+5)

7.

a. What is a template and what are the advantages and disadvantages of using one?
b. What is mail merge? Explain the steps to mail merge two documents using MS-WORD?
c. What is the role of "Control Panel" in Windows?

(5+5+5)

8.

a. What are the main functions of Database Management System (DBMS)? How will you differentiate it from File Management System?
b. Why is data validation necessary? What are the different types of data validation checks that are kept in a programme?
c. Define the meaning of Data Structures.

(5+5+5)

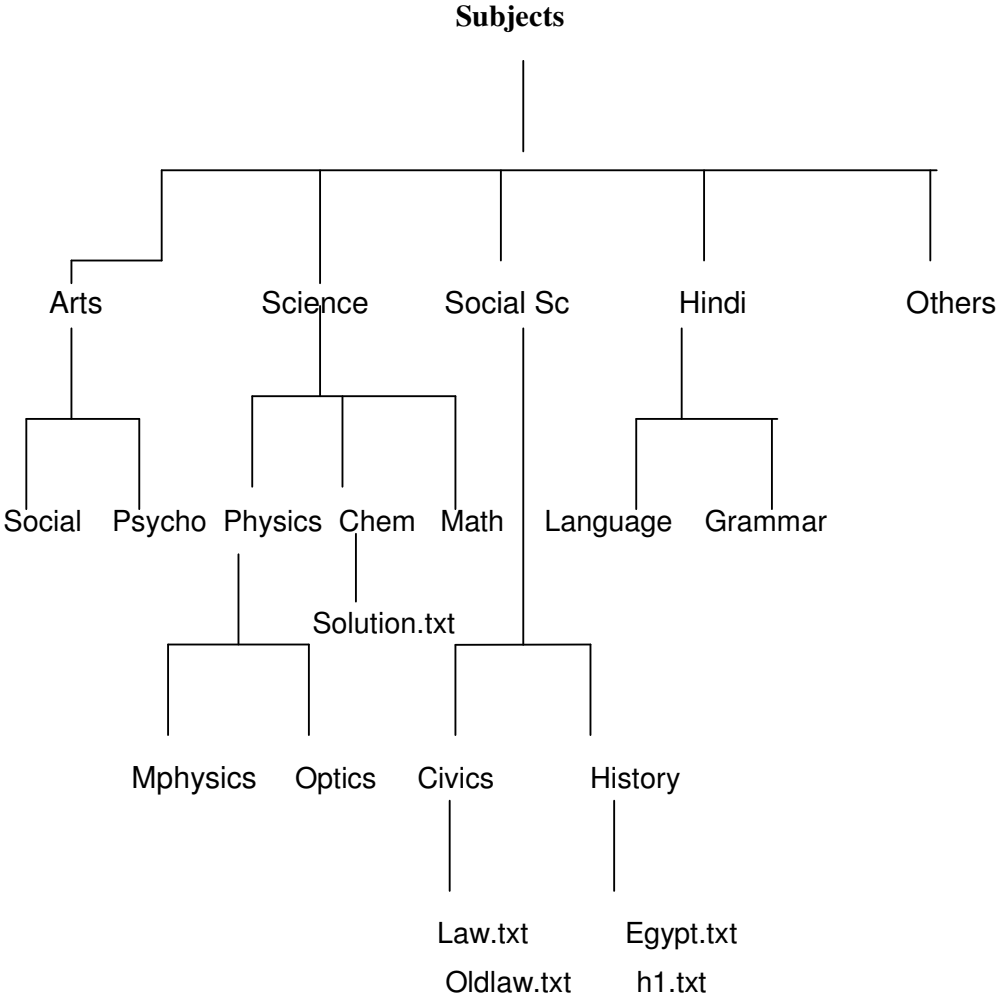
9.

a. Explain about Animating Text and Objects on the Slides of your Presentation.
b. What is the difference between relative and absolute references?
c. What is the purpose of Presentation Software in edutainment? Explain the features provided by Power Point softwares of embedding video and animations.

(5+5+5)

Assignment 1.

In a library, librarian has to maintain various books. He has made various categories according to the subject. The tree structure for the various directories are shown below



Create the above structure using DOS Commands.

Using the above tree structure do the following

(a) Imagine you are in psycho directory and from this location copy all files of Civics directory to the Others directory.

(b) List all the files of civics directory using the same location.

(c) Copy all the directories and subdirectories of SocialSc to others.

Assignment 2.

Imagine you are in the 'others' directory. From this location give the DOS commands for the following

(a) Display all the files of civics directory
(b) Delete the files from the mphysics physics
(c) Display all the files, which have extension of 'txt' under the 'math' directory.
(d) Copy the directory 'optics' under the 'mphysics' directory.

Assignment 3.

Create the following folders under the specified locations using windows.

a) D1 on desktop
b) R1 on the c: i.e. root
c) D2 on desktop
d) R2 on the c:

Do the following:

(i) Create a folder D1-1 under the D1 folder
(ii) Create a folder D2-1 under the D2 folder
(iii) Copy this D2-1 folder and paste it under R1 folder.
(iv) Delete the folder D2-1 from R1 folder
(v) Create the folder R1-1 under R1 folder
(vi) Copy R1-1 folder under the R2 folder
(vii) Rename folder R1-1 under R2 folder as 'subfolder of R2'
(viii) From the c: copy all files to folder R2
(ix) Delete all the files from the folder R2
(x) Recover all the deleted files

Assignment 4.

Do the following

(i) Interchange the functions of left and right mouse buttons.
(ii) Change the wallpaper of your computer and set it to a paint brush file made by you.
(iii) Change the screen saver of your computer and change it to 'marquee' , set your name as the text and wait time should be 2 minutes.

Assignment 5.

Do the following settings

a) Display pointer trails
b) Change the normal pointer of a mouse to another pointer
c) Set the date advanced by 2 months
d) Reset the system date & time
e) Set the system time late by 2 hrs: 40 minutes.

Assignment 6.

Create a document in Word on a topic of your choice. Format the document with various fonts (minimum 12, maximum 15) and margins (minimum 2, maximum 4). The document should include

a) A bulleted or numbered list

b) A table containing name, address, basic pay, department as column heading
c) A picture of lion using clip art gallery
d) An example of word art
e) A header with student name & date
f) A footer with pagination

Assignment 7.

Create a document with the text given below and save it as **First.Doc**

A Read only Memory is a memory unit that performs the read operation only, it does not have a write capability. This implies that binary information stored in a ROM is made permanent during the hardware production of the unit and cannot be altered by writing different words into it. Whereas a RAM is a general-purpose device whose contents can be altered during the computational process, a ROM is restricted to reading words that are permanently stored with in the unit. The binary information to be stored, specified by the designer, is then embedded in the unit to form the required interconnection pattern.

Do the following

a) Count the occurrences of the word “ROM” in the above document.
b) Replace ROM with Read Only Memory in the entire document
c) Underline the text Read Only Memory
d) Make an auto correct entry for ROM and it should be replaced by Read Only Memory

Assignment 8.

Use first.doc to perform the following operations

a) Make the first line of document bold
b) Make the second line italic
c) Underline the third line
d) Align the fourth line to center
e) Make the font color of first line as red
f) Change the font style of fifth line to Arial
g) Change the second line to 18 points
h) Insert the date & time at the start of document

Assignment 9.

Use the document earlier saved and perform the page setting as follows

Top Margin	1.3”
Bottom margin	1.4”
Left margin	1.30”
Right margin	1.30”
Gutter margin	1.2”

Header	0.7”
Footer	0.7”
Paper size	executive
Orientation	landscape

Assignment 10.

Insert a table. The table should have 5 columns. The auto behavior should be ‘Fixed column width’. The following report has to be created in the table.

. No.	**ame**	**sic Pay**	**esignation**	**epartment**
	ahul Roy	000/-	D	arketing
	tu Garg	000/-	D	les
	hit	00/-	anager	les
	kesh	00/-	enior Manager	R

(a) Heading should have a font size of 18, color should be blue and font should be bold.
(b) The data should have a font size of 12, color should be Red and font should be italic
(c) Insert a new row between 3 & 4 and type the data and reorder the sr. no column.

Assignment 11.

Create a table in word as shown below

ll No	ame	arks in Physics	arks in Chemistry	tal Marks
	tu			
	hit			
	nit			
	kesh			
	ti			
	arima			

Do the following

(a) In the total marks column, entries should be calculated using formulas and it is the sum of marks in physics and marks in chemistry.
(b) Insert a new row at the end of the table and also find grand total using formula.
(c) Sort the table based on total marks
(d) The date and heading should be center aligned
(e) Heading should be in bold and underlined

Assignment 12.

Below is given a letter and some addresses, this letter is to be sent to all these addresses, so use mail merge option to do so

Addresses are:

1) Amit
   H No 424 sector 8D
   Chandigarh

2) Rohit
   H No 444, Sector 125C
   Chandigarh

3) Jyoti
   H NO 550, Sector 16A
   Chandigarh

The Letter is

To
<<Name>>
<<Address>>
Dear <<Name>>

You are called for an interview on the <<Date>>at 9:00 A.M with your original documents

Yours Sincerely
ABC Limited
Phase –7
Mohali

Assignment 13.

Make a template for the bio-data with the following format

Bio-Data

Name	:
Father's Name	:
Date of Birth	:

Age :

Address :

Educational Qualification

No	ualification	oard	ercentage

Work Experience:

Assignment 14.

Make a document with the following

1. It should have 3 pages
2. It should have bookmarks named book1, book2, and book3 for the respective pages.
3. Using go to command go to the
   i) Page no 2
   j) Bookmark named book3
4. Insert one page break on page 2 to make total no. of pages 4.
5. Insert page number at each page

Assignment 15.

(i) Make an auto correct entry so that

a) Teh is replaced by The
b) Nmae is replaced by Name
c) Abouta is replaced by About a

(ii) Define a Macro 'Decorate' which makes the text bold, Red in color and italic, font size 14. Assign a shortcut key Alt + Z to this macro.

Assignment 16.

Type the following data in excel worksheet and save it as first.xls

3				
1				
4				
3				

1				
6				
2				
4				
2				
1				
0				
7				
9				
4				
8				

Do the following

(a) Highlight column A and copy it to column C
(b) Sort the data in column C in ascending order
(c) What is the lowest number in the list (use a function)
(d) Copy the data in column A to column E and sort it in descending order
(e) What is the highest number in the list (use a function)
(f) How many numbers in this list are bigger than 500 (use a database function)
(g) How many numbers in column A are between 520 and 540 inclusive (use a database function)

Assignment 17.

Type the following data in excel worksheet and save it as second.xls.

A	B	C	D
People per physician	Life Expectancy		
X	Y	X * Y	
370	70.5		
6166	53.5		
684	65		
449	76.5		
643	70		
1551	71		
616	60.5		
403	51.5		

Do the following

(a) Complete column C for finding product x * y
(b) Find sum of x column at the end of data
(c) Find sum of y column at the end of data
(d) Find sum of x * y column at the end of data
(e) Find sum of x^2
(f) Find sum of y^2

Assignment 18.

Enter the following data and save it in grade .xls

Name	Marks1	Marks2	Marks3	Total	Percentage	Grade
Amit	80	70	80			
Renu	70	60	90			
Rajeev	60	50	80			
Manish	50	30	90			
Sanjeev	40	40	80			
Anita	70	70	90			

Do the following

(a) Compute the total marks and percentage of each student by entering appropriate formula.
(b) Compute the grades based on following criteria
If percentage >= 90 then grade = A
If percentage >= 80 and <90 then grade = B
If percentage >= 70 and <80 then grade = C
If percentage >= 60 and <70 then grade = D
If percentage < 60 then grade = E

Assignment 19.

Using grade.xls to perform the following formatting operations

(a) Draw a border around the worksheet
(b) Change the font size of heading to 14 points and underline it and hide column c
(c) Increase the width of column A to 15 characters
(d) Right Align the values in column B, C, F

Assignment 20.

A university maintains a year wise result for four courses and then generates an average report as given below

Sr no.	Year	Course1	Course2	Course3	Course4	Average
1	2002	356	300	300	400	
2	2003	200	400	200	450	
3	2004	256	500	400	600	

4	2005	400	600	500	550	
5	2006	456	450	550	450	
6	Total					

(a) Complete the report to calculate the course wise average in row 6
(b) Provide formula to calculate year wise average in column G
(c) Generate a column chart to compare data

Assignment 21.

A person wants to start a business and he has four schemes to invest money according to profit and years. Find out which scheme is the most profitable.

Investment Amount	Percentage for Profit	No of years
20000	10%	6 years
40000	20%	5 years
14000	30%	4 years
12000	15%	5 years

Assignment 22.

A company records the details of total sales (in Rs.) sector wise and month wise in the following format

	Jan	Feb	March	April
Sector 30	12000	17000	14000	15000
Sector 22	14000	18000	15000	16000
Sector 23	15000	19000	16000	17000
Sector 15	16000	12000	17000	18000

(a) Enter the data in a worksheet and save it as sector.xls
(b) Using appropriate formula, calculate total sale for each sector
(c) Create a 3-D column chart to show sector wise data for all four months
(d) Create a 3-D pie chart to show sales in Jan in all sectors

Assignment 23.

Type the following data and save it in employee.xls

Name	Department	Designation	Salary	Address
Anju	TRG	MD	100000	CHD
Amit	TRG	AD	200000	MOHALI
Renu	BILL	MD	300000	CHD

Anita	BILL	AD	20000	MOHALI
Shivani	S/W	MD	10000	CHD

Do the following

(a) Count the total no. of employees department wise
(b) List the name of employees whose designation is 'MD'
(c) List the name and department of employees whose address is Chandigarh
(d) List the name of employees whose salary is greater than 5000
(e) List the Address of employees whose department is 'TRG'

Assignment 24.

Using above sheet do the following

(a) Count the total no. of employees who have salary greater than 10000
(b) Count the total no. of employees who are 'MD'
(c) Find the maximum salary department wise
(d) Find the minimum salary designation wise
(e) Count the employees for each designation for each department

Assignment 25.

Create a table with the following field names in MS-Access

Name of field	**Data type**
Book_name	Varchar
Purchase_date	Date
Price	Numeric
Author_name	Varchar

Do the following

a) Enter 5 records in the table using forms
b) Display list of books in alphabetical order using reports
c) Display list of books in ascending order of price

B1.2-R4: INTERNET TECHNOLOGY AND WEB DESIGN

Objective of the Course

The aim of this course is to provide you the conceptual and technological developments in the field of Internet and web designing with the emphasis on comprehensive knowledge of Internet, its applications and the TCP/IP protocols widely deployed to provide Internet connective worldwide. The World Wide Web with its widespread usefulness has become an integral part of the Internet. Therefore, this course also puts emphasis on basic concepts of web design.

At the end of the course the students will be able to: -

- Review the current topics in Web & Internet technologies.
- Describe the basic concepts for network implementation.
- Learn the basic working scheme of the Internet and World Wide Web.
- Understand fundamental tools and technologies for web design.
- Comprehend the technologies for Hypertext Mark-up Language (HTML).
- Specify design rules in constructing web pages and sites.
- Effectively deal with programming issues relating to VB Script, JavaScript, Java, ASP, Front Page and Flash.
- Figure out the various security hazards on the Internet and need of security measures.

Outline of Course

S. No.	Topic	Minimum number of hours
1.	Introduction to Internet	02
2.	TCP/IP – Internet Technology and Protocol	03
3.	Internet Connectivity	03
4.	Internet Network	04
5.	Services on Internet (Definition and Functions)	04
6.	Electronic Mail	07
7.	Current Trends on Internet	03
8.	Web Publishing and Browsing	10
9.	HTML Programming Basics	12
10.	Interactivity Tools	08
11.	Internet Security Management Concepts, Information Privacy and Copyright Issues	04

Lectures	**=**	**60**
Practical/tutorials	**=**	**60**
Total	**=**	**120**

Detailed Syllabus

1. Introduction to Internet **02 Hrs.**

Internet, Growth of Internet, Owners of the Internet, Anatomy of Internet, ARPANET and Internet history of the World Wide Web, basic Internet Terminology, Net etiquette.

Internet Applications – Commerce on the Internet, Governance on the Internet, Impact of Internet on Society – Crime on/through the Internet.

2. TCP/IP – Internet Technology and Protocol **03 Hrs.**

Packet switching technology, Internet Protocols: TCP/IP, Router, Internet Addressing Scheme: Machine Addressing (IP address), E-mail Addresses, Resources Addresses

3. Internet Connectivity **03 Hrs.**

Connectivity types: level one, level two and level three connectivity, Setting up a connection: hardware requirement, selection of a modem, software requirement, modem configuration, Internet accounts by ISP: Telephone line options, Protocol options, Service options, Telephone line options – Dialup connections through the telephone system, dedicated connections through the telephone system, ISDN, Protocol options – Shell, SLIP, PPP, Service options – E-mail, WWW, News Firewall etc.

4. Internet Network **04 Hrs.**

Network definition, Common terminologies: LAN, WAN, Node, Host, Workstation, bandwidth, Interoperability, Network administrator, network security, Network Components: Severs, Clients, Communication Media, Types of network: Peer to Peer, Clients Server, Addressing in Internet: DNS, Domain Name and their organization, understanding the Internet Protocol Address. Network topologies: Bust, star and ring, Ethernet, FDDI, ATM and Intranet.

5. Services on Internet (Definition and Functions) **04 Hrs.**

E-mail, WWW, Telnet, FTP, IRC and Search Engine

6. Electronic Mail **07 Hrs.**

Email Networks and Servers, Email protocols –SMTP, POP3, IMAp4, MIME6, Structure of an Email – Email Address, Email Header, Body and Attachments, Email Clients: Netscape mail Clients, Outlook Express, Web based E-mail. Email encryption- Address Book, Signature File.

7. Current Trends on Internet **03 Hrs.**

Languages, Internet Phone, Internet Video, collaborative computing, e-commerce.

8. Web Publishing and Browsing **10 Hrs.**

Overview, SGML, Web hosting, HTML. CGL, Documents Interchange Standards, Components of Web Publishing, Document management, Web Page Design Consideration and Principles, **Search and Meta Search Engines**, WWW, Browser, HTTP, Publishing Tools

9. HTML Programming Basics **12 Hrs.**

HTML page structure, HTML Text, HTML links, HTML document tables, HTML Frames, HTML Images, multimedia

10. Interactivity Tools **08 Hrs.**

ASP, VB Script, JAVA Script, JAVA and Front Page, Flash

11. Internet Security Management Concepts, Information Privacy and Copyright Issues **04 Hrs.**

Overview of Internet Security, Firewalls, Internet Security, Management Concepts and Information Privacy and Copyright Issues, basics of asymmetric cryptosystems.

RECOMMENDED BOOKS

MAIN READING

1. Greenlaw R and Hepp E "Fundamentals of Internet and www" 2nd EL, Tata McGrawHill,2007.
2. Ivan Bayross, "HTML, DHTML, JavaScript, Perl CGI", 3rd Edition, BPB Publications.
3. D. Comer, "The Internet Book", Pearson Education, 2009.

SUPPLEMENTARY READING

1. M. L. Young,"The Complete reference to Internet", Tata McGraw Hill, 2007.
2. Godbole AS & Kahate A, "Web Technologies", Tata McGrawHill,2008.
3. Jackson, "Web Technologies", Pearson Education, 2008.
4. B. Patel & Lal B. Barik, " Internet & Web Technology ", Acme Learning Publishers.
5. Leon and Leon, "Internet for Everyone", Vikas Publishing House.

B1.2-R4: INTERNET TECHNOLOGY AND WEB DESIGN

Model Question Paper

NOTE:

1. There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.

2. **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book.

3. Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**.

TOTAL TIME: 3 HOURS **TOTAL MARKS: 100**
(PART ONE: 40; PART TWO: 60)

PART ONE
(Answer all the questions; each question carries ONE mark)

1. Each question below gives a multiple choices of answers. Choose the most appropriate one.

1.1. Which type of network is most likely confined to a building or a campus
- a) Local area
- b) Metropolitan area
- c) Wide area
- d) Departmental

1.2. Which programming language always makes platforms-independent application
- a) Java
- b) Visual basic
- c) C++
- d) C

1.3. Which best describes support over serial line communication under the TCP/IP Protocol .
- a) SLIP
- b) PPP
- c) Both A,B
- d) None

1.4. If a group of network computers connect to a central hub the network has what type of Physical Topology
- a) Ring
- b) Star
- c) Bus
- d) None

1.5. If a group of computer connected to a central concentrator the network has what type of logical topology?
- a) Ring.

b) Sart
c) Bus
d) INone

1.6. The transport layer protocol is
a) ALP
b) PPX
c) TCP
d) None

1.7. The UDP is part of the which protocol suite
a) TCP/IP
b) IPX/SPX
c) Apple Talk
d) NetBEUI

1.8. JDK (Java Development Kit) include .
a) Java
b) Javac
c) JDB
d) All

1.9. Buffer over flow attacks means
a) Collect and relay some data
b) Get full system access
c) Play and display advertisement
d) Slow down system

1.10. A firewall can be
a) A Hardware
b) A Software
c) Both software and Hardware
d) Network Engine

2. Each statement below is either TRUE or FALSE. Identify and mark them accordingly in the answer book.

2.1. The Word Wide Web is a very large set of interlinked hypertext documents accessed viahe Internet.
2.2. World Wide Web is synonymous with Internet.
2.3. Packet switching is a network communications method that does not groups all Transmitted data, irrespective of content, type, or structure into suitably-sized blocks, called packets
2.4. The ARPANET computer network made a large contribution to the development of the e-mail.
2.5. SMTP is the push protocol that can not pull information from a remote server on demand.
2.6. Disaster recovery is the recovery of documents in case of destruction from fires, floods earthquake etc.
2.7. Streams can not controlled the flow of data from one source to another
2.8. The TCP/IP is slower then NetBEUI
2.9. A user level access is less secure then share level access
2.10. The ability of the new object to implement the base functionality of the parent object in new way is called inheritance

3. Match words and phrases in column X with the nearest in meaning in column Y.

X	Y
3.1 server would constantly send new data to the client through the initial connection, that remains open	a) Spoofing
3.2 A kind of forgery, mail assume to be send from know person but actually they are not	b) SGML
3.3 It is an application-layer Internet standard protocol used by local e-mail clients to retrieve e-mail from a remote server over a TCP/IP connection	c) Drug trafficking
3.4 It is an ISO Standard metalanguage in which one can define markup languages for documents ..	d) Web server push
3.5 The ability of a system or product to work with other system or product without much efforts	e) Web designing
3.6 Encoding data to make them unintelligible to unauthorized persons	f) Thread
3.7 use of Internet to sell their illegal substances through encrypted e-mail and other Internet Technology	g) Interoperability
3.8 Skill of designing hypertext presentation of Content delivered to end user	h) Class Diagram
3.9 It can be divided into linear and non linear technique categories	i) Scope
3.10 A single path of execution that is a sub process of the main process	j) POP3
	k) Encryption
	l) Multimedia
	m) nesting

4. Fill in the blanks in 4.1 to 4.10 below, by choosing appropriate words and phrases given in the list below :

(a) Cache	(b) URL	(c) Cyberterrorism	(d) metadata, integration
(e) IMAP4	(f) enterprise data modeling outer jain	(gHeader,Body	(h) CASCADE
(i) Interleaved main memory	(j) Virtual memory	(k) bus	(l) website
(m) Applet			

4.1. Viewing a Web page on the World Wide Web normally begins by typing the _____ of the page into a Web browser.

4.2. Web page data may need not to be re-obtained from the source Web server. Almost all Web browsers _____ the recently obtained data on the local hard disk

4.3. The internet e-mail message consist of two major section that are _____ and _____

4.4. _____ is one of the two most prevalent protocol for e-mail retrieval.

4.5. _____ is act of terrorism committed through the use of cyberspace or computer

4.6. _____ and _____. are the part of the document management

4.7. _____ collection of information about a particular topic or subject

4.8. A class that has no direct instances, but whose descendants may have direct instances is called a _____ _____.

4.9. Java communicate with the web page through a special tag called _____.
4.10. In _____ topology all device connect to a common shared cable.

PART TWO
(Answer any FOUR questions)

5.

a. What was the various firewall technique. (6)
b. What is interoperability and how product or system achieve interoperability.
c. Explain the advantages of Peer to Peer (P2P) network?

(6+5+4)

6.

a. What is the difference between SLIP and PPP ?
b. Explain the difference between router, repeater and bridge
c. Explain FDDI.

(6+5+4)

7.

a. What are the various network topologies explain with example.
b. What is Net etiquette?

(10+5)

8.

a. What do you understand with e-commerce explain with example (8)
b. Define document management

(8+7)

9.

a. Explain Web template system
b. What is world wide web ? what is the contribution of java to the world wide web.
c. What is token? List the various type of tokens supported by the java.

(4+6+5)

Assignment – 1.

Internet Surfing

a) Open the website of Yahoo! with the help of Internet Explorer or Netscape Browser
b) Check the properties of your browser.
c) Change the Home Page of your browser.
d) Check the History and clear the history.
e) Create a Bookmark.

Assignment – 2

Email

a) Create your email account on any of the familiar email services like hotmail, yahoo, rediffmail etc.
b) Compose and send an email to a friend.
c) Get the email addresses of five of your classmates. Add them to the address book of your email program. Send them each an email.
d) Receive an email from a friend.
e) Attach a document to the email.
f) Retrieve an attachment from an email received.

Assignment – 3

Search Engines

a) Open the search engines google and search for 'Doeacc'
b) Check the Advanced Search Options of Google.
c) Open the search engines Yahoo and search for 'Indian Railway'

Assignment – 4

Web Chart and Usenet

a) Start Netscape and select Communicator, Messenger from the menu. Try various ways of driving Usenet News via Netscape Messenger. Look at some serious news group and set-up chat session.
b) Open Windows Messenger and create a chat session with your friend

Assignment – 5

Web Page Development -HTML

Create a basic web page using Netscape Composer. The topic of the web page is up to you (within acceptable use).

- Create a web page containing information about you, your family and friends.

  Enter a suitable title for your page. Add some sub-titles for different sections of your text. For example, you could have a subheading for where you live, your family, your interests etc.

- Format the text of your web page in different Font, Alignment styles. Move the cursor to a sub-title and set it to Heading2.

  Experiment with the different heading styles to see what each one does .Which of these styles do you think is useful? Which are less useful? Why?

  Experiment with the font size, color, style (bold, italic, underline, etc.) and alignment (left, center, right or indented.

- See the HTML that is generated by Browser by selecting View Page source.

- Add a picture to your web page. You have scanned in, or one taken with a digital camera. Alternatively, you can use a picture from another web page. Remember that if you put pictures that you did not take on your web page, you must check for copyright permission first.

- Experiment with different sizes of picture and different locations within your web page. Also, experiment with different alignment and text wrappings. One minor problem with Netscape Composer is that it does not give proper WYSIWYG for pictures with text wrap. You will have to save your page and view it in the browser to see exactly what the layout will be.

- Your HTML documents should have the following characteristics: -

  a) Use of paragraphs.
  b) Use of 1 or more levels of section headers.
  c) Use of highlighting (bold, italics, etc.)
  d) Use of lists.
  e) Use of internal links (to other parts of your document) commonly used for a document table of contents.
  f) Use of links to graphic images and alternate text, in case the image could not be found or is not loaded (alternatively).

By using the above items one should be able to create his/her own home page.

Assignment – 6

Create a document with two links to an external document. The first link should lead to the beginning of the external document. The second link should lead to a particular section in the external document.

In the external document specify a link that will lead to a particular section within it.

Text Content:

Welcome to our homepage
This page has links to the website of ABC Lever Inc.

For further information click on any of the following:

- About ABC Lever Inc.
- Contact Information

Content of Linked pages is

Contact us

ABC Lever Inc. is a conglomerate that has interests ranging from bodycare products to toilet soaps.

A couple of years ago we entered the frozen
Food industry through mergers and
Acquisitions.
Last year we started our plant to manufacture salt and this year it is wheat flour.
Our current turnover is about Rs. 7500 cr and by the next decade we are looking at a target of 15000 cr.

Contact Us

You can contact us at the following address:-

ABC Lever Inc.
101 Maker Chambers III,
Nariman Point,
Mumbai-21
Tel. 2102011

You can also email us at
customersservices@abclever.com

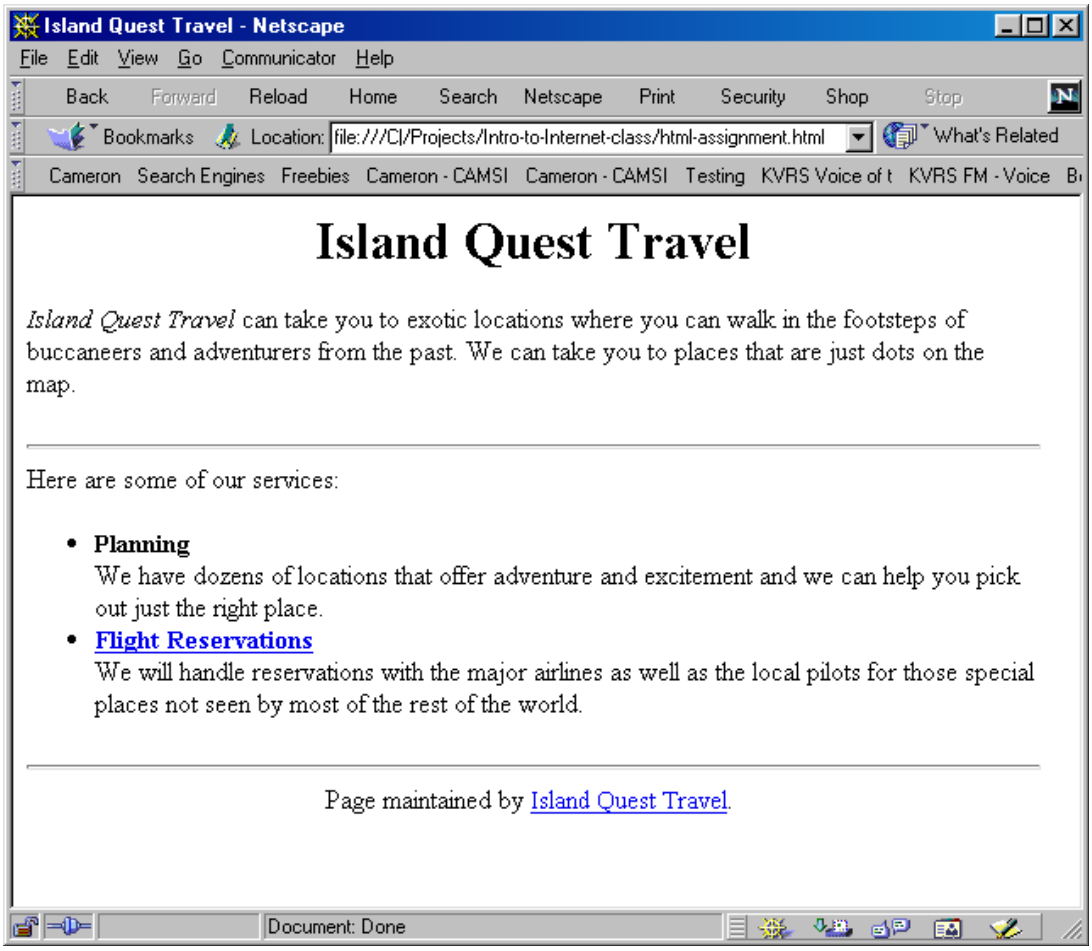
Assignment – 7

Prepare a "resume.html" that might include such information as:

a) distinguishing marks
b) special interests
c) work history
d) education and training
e) job objective
f) relevant skills and experience

Assignment – 8

Create the following HTML page



The keywords for the page are travel, recreation, and flight reservations.
The description for the page is
Island Quest Travel can help you make reservations for an exotic island vacation.
The words “Flight Reservations” links to a file called reservations.html.
The words “Island Quest Travel” are an email link to quest@travel.com

Assignment – 9

Design the form using HTML tags.

Employment Exchange

First Name :
Second Name :
Father's Name :
Date of Birth :
Sex Code : M F
Qualification : High School

Stream Science

Percentage Marks :

Nationality :

Religion :

Category : SC

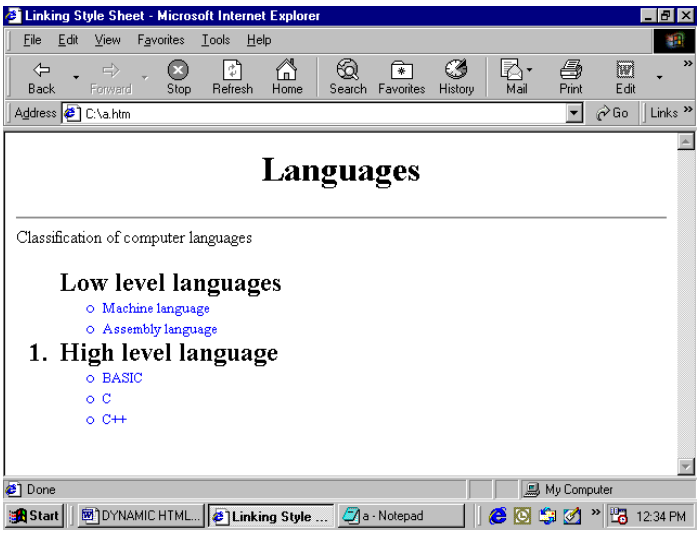
Mailing Address :

Permanent Address :

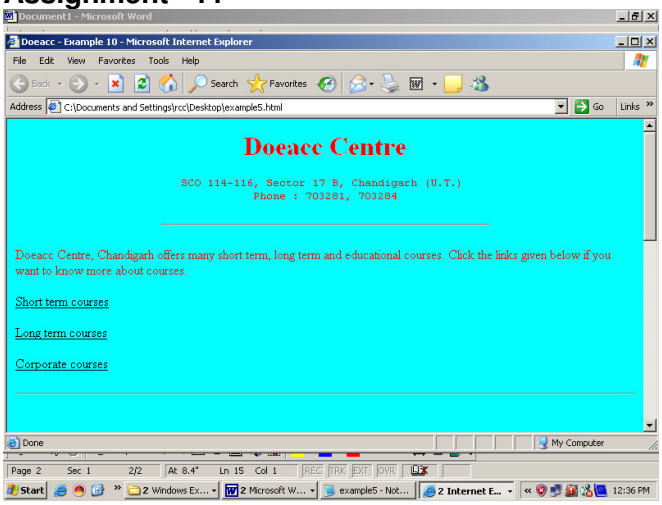
OK CLEAR

Assignment –10

Design the following web page using HTML Tags:



Assignment –11



Design the above webpage in which the links for courses should be in the same page with the following details:

Short term Courses.
Doeacc Center offers following short-term courses

a) Use of Personal Computer
b) 'C' Language
c) 'C++" Language
d) Visual Basic
e) Oracle/Dev. 2000
f) AutoCAD
g) Internet and Web Designing

Long term courses

Doeacc Center offers following long-term courses

a) O' Level
b) A' Level
c) B' Level
d) C' Level

Corporate courses

Doeacc Center offers following corporate courses

a) Use of Personal Computer
b) Courses according to their requirement

Assignment – 12

a) Make a table with your friend's details in it.
b) Column One, your friends names
c) Column Two, Address of your friends
d) Column Three, Mobile No of your friends
e) Column Four, Birth-Date of your friends

Assignment – 13

a) Create a 4x3 table
b) Within each table, place 12 images of Indian Tourist Spots, in each box
c) Each image link to the corresponding site of Tourist Spot
d) Each Image must be at least 100x100 in size

Assignment – 14

- Create a page with two frames
- The left frame of page contains the list of names & Images of the Indian National Hero's..
- On the left frame when you click on name or image, the details will be shown on the right frame.

Assignment – 15

create a job application form

- Create an area called section one and place text boxes that receives details -
  a) Name
  b) Age
  c) Gender
  d) High School
  e) Qualifications

- Create an area called section two and place text boxes that receives details -
  a) Previous Employment
  b) References
  c) Qualification

- At the end place a submit button

Assignment – 16

a) Take the picture of the motherboard
b) Place an image map on each item that is pointed out on the picture
c) Have them link to some information that you know about them.
d) There should be some sort of navigation or a back button on each page

Web Page Development – DHTML

Assignment – 17

Create a style in the <head> section
a) Change the lists size to h4
b) Change the links size to h2
c) Both should also have different colors

Assignment – 18

Create a style in the <head> section
a) Create a list of each persons first name in the class
b) Have each name have a different color and or size
c) your name must be the biggest

Web Page Development - VbScript

Assignment – 19

Write VbScript code for displaying an alert dialog box with OK button, welcoming a user with a message "Welcome To my Web Site". As soon as the OK button is clicked, an image is displayed in the web browser.

Assignment – 20

Create a VbScript file that contains

a) a textbox to accept a string and a button.
b) When user clicks the button the script checks whether that string is palindrome or not

Web Page Development – JavaScript

Assignment – 21

Validate the form in assignment -9 . The following validation checks are required:

a) First name, second name should not be left empty
b) Percentage marks should be numeric
c) Mailing address must contain @ symbol in it.

Assignment – 22

Create a an HTML document containing JavaScript code that

a) Has a button called check out
b) when this button is clicked on , it summons two windows
c) Window 1: Have a question that tells user to input value of the item
d) Window 2: Have a question that requests the user to input the amount of sales tax

Have a sentence that displays the cost of the item, the sales tax, and your final price.

Assignment – 23

Create a document that reads and stores cookies containing a user name and number of times , he or she has visited your website . Whenever the user visits the site, the system displays the cookies in alert dialogue box, increments the counter cookie by 1 and then resets the counter's expiration date to one year from the current date.

Assignment – 24

Create an HTML document that calculates the square feet of carpet required to carpet a room . Include three text boxes ; Create one text box for width of room and another for length of the room in linear feet . Also create a text box for the cost per square feet of carpeting. When you calculate the cost, add 25% to the total number of square feet to account for the closets and other features of the room. Display the total cost *in an alert* dialogue box.

Assignment – 25

Create a an HTML document with JavaScript code that

a) Has three textboxes and a button
b) The details to be accepted using textboxes are principal, rate of interest, and duration in years.
c) When user clicks the Ok button a message box appears showing the simple interest of principal amount

B1.3-R4: PROGRAMMING AND PROBLEM SOLVING THROUGH 'C' LANGUAGE

Objective of the Course

The objectives of this course are to make the student understand programming language, programming, concepts of Loops, reading a set of Data, stepwise refinement, Functions, Control structure, Arrays. After completion of this course the student is expected to analyze the real life problem and write a program in 'C' language to solve the problem. The main emphasis of the course will be on problem solving aspect i.e. developing proper algorithms.

- After completion of the course the student will be able to
- Develop efficient algorithms for solving a problem.
- Use the various constructs of a programming language viz. conditional, iteration and recursion.
- Implement the algorithms in "C" language.
- Use simple data structures like arrays, stacks and linked list in solving problems.
- Handling File in "C".

Outline of Course

S. No.	Topic	Minimum number of hours
1.	Introduction to Programming	04
2.	Algorithms for Problem Solving	10
3.	Introduction to 'C' Language	04
4.	Conditional Statements and Loops	07
5.	Arrays	06
6.	Functions	06
7.	Storage Classes	03
8.	Structures and Unions	06
9.	Pointers	06
10.	Self Referential Structures and Linked Lists	04
11.	File Processing	04

Lectures	**=**	**60**
Practical/tutorials	**=**	**60**
Total	**=**	**120**

Detailed Syllabus

1. Introduction to Programming **04 Hrs.**

The Basic Model of Computation, Algorithms, Flow-charts, Programming Languages, Compilation, Linking and Loading, Testing and Debugging, Documentation

2. Algorithms for Problem Solving **10 Hrs.**

Exchanging values of two variables, summation of a set of numbers, Decimal Base to Binary Base conversion, Reversing digits of an integer, GCD (Greatest Common Division) of two numbers, Test whether a number is prime, Organize numbers in ascending order, Find square root of a number, factorial computation, Fibonacci sequence, Evaluate 'sin x' as sum of a series, Reverse order of elements of an array, Find

largest number in an array, Print elements of upper triangular matrix, multiplication of two matrices, Evaluate a Polynomial

3. Introduction to 'C' Language 04 Hrs.

Character set, Variables and Identifiers, Built-in Data Types, Variable Definition, Arithmetic operators and Expressions, Constants and Literals, Simple assignment statement, Basic input/output statement, Simple 'C' programs.

4. Conditional Statements and Loops 07 Hrs.

Decision making within a program, Conditions, Relational Operators, Logical Connectives, if statement, if-else statement, Loops: while loop, do while, for loop, Nested loops, Infinite loops, Switch statement, structured Programming .

5. Arrays 06 Hrs.

One dimensional arrays: Array manipulation; Searching, Insertion, Deletion of an element from an array; Finding the largest/smallest element in an array; Two dimensional arrays, Addition/Multiplication of two matrices, Transpose of a square matrix; Null terminated strings as array of characters, Standard library string functions

6. Functions 06 Hrs.

Top-down approach of problem solving, Modular programming and functions, Standard Library of C functions, Prototype of a function: Formal parameter list, Return Type, Function call, Block structure, Passing arguments to a Function: call by reference, call by value, Recursive Functions, arrays as function arguments.

7. Storage Classes 03 Hrs.

Scope and extent, Storage Classes in a single source file: auto, extern and static, register, Storage Classes in a multiple source files: extern and static

8. Structures and Unions 06 Hrs.

Structure variables, initialization, structure assignment, nested structure, structures and functions, structures and arrays: arrays of structures, structures containing arrays, unions

9. Pointers 06 Hrs.

Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, Arrays and Pointers, pointer arrays, pointers and structures, dynamic memory allocation.

10. Self Referential Structures and Linked Lists 04 Hrs.

Creation of a singly connected linked list, Traversing a linked list, Insertion into a linked list, Deletion from a linked list

11. File Processing 04 Hrs.

Concept of Files, File opening in various modes and closing of a file, Reading from a file, Writing onto a file

RECOMMENDED BOOKS
MAIN READING

1. Byron S Gottfried "Programming with C" Second edition, Tata McGrawhill, 2007 (Paper back)

2. R.G. Dromey, “How to solve it by Computer”, Pearson Education, 2008.
3. Kanetkar Y, “Let us C”, BPB Publications, 2007.
4. Hanly J R & Koffman E.B, “Problem Solving and Programm design in C”, Pearson Education, 2009.

SUPPLEMENTARY READING

1. E. Balagurusamy, “Programming with ANSI-C”, Fourth Edition,2008, Tata McGraw Hill.
2. Venugopal K. R and Prasad S. R, “Mastering ‘C’”, Third Edition, 2008, Tata McGraw Hill.
3. B.W. Kernighan & D. M. Ritchie, “The C Programming Language”, Second Edition, 2001, Pearson Education
4. ISRD Group, “Programming and Problem Solving Using C”, Tata McGraw Hill,2008.
5. Pradip Dey , Manas Ghosh, “Programming in C”, Oxford University Press, 2007.

B1.3-R4: PROGRAMMING AND PROBLEM SOLVING THROUGH 'C' LANGUAGE

Model Question Paper

NOTE:

1. There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.

2. **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book.

3. Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**.

TOTAL TIME: 3 HOURS **TOTAL MARKS: 100**
(PART ONE - 40; PART TWO - 60)

PART ONE
(Answer ALL Questions; each question carries ONE mark)

1. Each question below gives a multiple choices of answers. Choose the most appropriate one.

1.1 The programming Language C happens to be

a) An Assembly Level Language.
b) A High Level Language with some Assembly Level Language Features.
c) A Programming Language used only to write System Software.
d) A Programming Language used for developing Application Packages only.

1.2 The C declaration int I_a; implies

a) The variable I_a is a signed Binary Integer .
b) The variable I_a is an Unsigned Decimal Integer.
c) The variable I_a is an signed Hexadecimal Integer.
d) The variable I_a is a signed Integer that can be expressed in any Base.

1.3 The C statement printf ("The Value =%x",62); will print

a) The Value= 62
b) The Value = O62
c) The Value= OX 3C
d) The Value= 3C

1.4 In the following C declaration

```
  float F_C = 12.5;
 void   VF_A (int);
int  main();    { /* begin main */
          float F_B;  F_C = 13.5;
     ……
      return (0); }/* end main */
```

a) The Variable F_C is GLOBAL to both the functions main () as well as VF_A.
b) The Variable F_C is LOCAL to the function main();
c) The Variable F_C is LOCAL to the function VF_A.
d) The Variable F_C is EXTERNAL.

1.5 Consider the following C Program .

```
# define  S 10+2

#include <stdio.h>

 int main()
                    { /* begin main */
                          int  Result  = S + S ;

                        printf ("\n\n Result = %d\n\n", Result ); /* Output Line #2 */

                         return (0);
                     } /* end main*/
```

The Output generated by the above C Program will be

a) Result = 10
b) Result = 12
c) Result = 24
d) Result = 20

1.6 What will be the Output generated by the following C Program ?

```
#include <stdio.h>
 int main()
                    { /* begin main */

                        int I_C ; float F_D , F_E;

                        I_C = 5/2 ; F_D = 5/2 ; F_E = 5/2.0;

                        printf ("\n I_C = %d  F_D =%f  F_E = %f \n\n", I_C,F_D,F_E);

                         return (0);

                     } /* end main*/
```

a) I_C= 1 F D = 2.0 F_E = 2.5
b) I_C= 2 F D = 2.0 F_E = 2.5
c) I_C= 2 F D = 2.5 F_E = 2.0
d) I_C= 2 F D = 2.5 F_E = 2.5

1.7 In C Functions the actual expressions / parameters are passed on to Formal parameters using the method of :

a) Call by reference.
b) Call by Value Result.
c) Call by Value.
d) Call by Name.

1.8 Consider the following C program segment :

```
typedef  struct  Point
                { float  F_x;
float  F_y;
}Point_T;
typedef  struct  Circle
{ float  F_Radius;
  Point_T  R_Center;
}  Circle_T;
int  main();
{  //  begin  main
Point_T  R_Point;  Circle_T  R_Circle;
/*  Circle  Manipulation  Statements  */
return(0);
}  //  end  main
```

To manipulate a circle which of the following set of assignment statements will have to be used ?

a) R_Circle.F_Radius = 10.2; R_Circle.R_Center.F_x = 2.0 ;
R_Center.F_y=3.0;
b) R_Circle.F_Radius = 10; R_Circle..F_x = 2.0 ; R_Circle.F_y=3.0;
c) R_Circle.F_Radius = 10.2; R_Circle.R_Center.F_x = 2.0 ;
d) R_Circle.R_Center.F_y=3.0;
e) R_Circle.F_Radius = 10.2; R_Circle.F_x = 2.0 ; R_Circle.F_y=3.0;

1.9 In the following C Declaration

```
#define CUI_Size 10
  typedef int AI_1D_01_T [CUI_Size];

int main()
    {/* begin main */
        AI_1D_01_T  AI_1D_A;
```

The variable AI_1D_A represents

a) An array of Integers of any size.
b) An array of Integers having minimum 10 integers.
c) An array of Integers having Maximum 10 Integers.
d) None of the above.

1.10 Consider the following C Code

```
#include  <stdio.h>
#include  <stdlib.h>
int  main  ()
       {/*begin  main */
             int  I_X=6; int  *PI_Y;
PI_Y  =  (int*)  malloc  (sizeof (int));
*PI_Y  =  I_X;
printf(" *PI_Y  =%d",*PI_Y);
*PI_Y  =  7;
printf  (" I_X  =  %d",I_X);
return(0);
```

```
} // end main
```

Which, among the following will it produce as output ?

a) *PI_Y = 7 I_X = 6
b) *PI_Y = 6 I_X = 7
c) *PI_Y = 7 I_X = 6
d) *PI_Y = 6 I_X = 6

2. Each statement below is either TRUE or FALSE. Identify and mark them accordingly in the answer book

2.1 In C %x format can be used for Inputting signed Octal Integers (FALSE).
2.2 A Pointer variable content will be the Address of the variable it points to. (TRUE).
2.3 In C , a SINGLE scanf () can be used to read in the values of any number of pre-declared variables (TRUE).
2.4 Arrays in C are always stored in Column Major fashion (FALSE).
2.5 ! operator is a BINARY Operator in C. (FALSE).
2.6 Recursive functions provide an elegant way of representing recurrences (TRUE).
2.7 Array represents a homogeneous Data Structure (TRUE).
2.8 A structure cannot be a member of an Union in C (FALSE).
2.9 In C *p++ increments the content of the location pointed to by p (TRUE).
2.10 A C Function can return a whole structure as it's value (TRUE).

3. Match words and phrases in column X with the nearest in meaning in column Y.

X		Y	
3.1	Premature exit from within a C Loop	a)	1 Byte.
3.2	Character variable will have a size of	b)	Indentation is essential
3.3	A C Function that do not return a value will be having	c)	Call by Reference.
3.4	A string in C is terminated by	d)	To open a file for writing after discarding it's previous content
3.5	To understand the Blocks of C	e)	An Integer type
3.6	Multiway branching in C can be implemented	f)	A void type
3.7	All variables declared inside a function	g)	Are Local to that function
3.8	A Pointer Parameter in a C Function simulates	h)	Opening a file in Read mode , retaining the previous content
3.9	A Linked List represents	i)	A white space character.
3.10	In C fopen "w" mode is used	j)	4 Bytes
		k)	A '\0' Charcter
		l)	A dynamic Data Structure
		m)	Using switch – case statement
		n)	Can be achieved by break statement

6. Fill in the blanks in 4.1 to 4.10 below, by choosing appropriate words and phrases given in the list below:

(a) Dividing	(b) One or ZERO	(c) CPU Register	(d) extern
(e) Optional	(f) Randomly	(g) At least once	(h At run time

(i) Linked List	(j) An Array	(k) Fields	

4.1 The Operator I_Value >> 2 is equivalent to _____ I_Value by 4 .
4.2 The Declaration reg int IReg_C will allocate a _____ for the variable IReg_C.
4.3 On executing f = ! (K >10) f will have a value _____
4.4 The individual Elements of any Array can be accessed _____
4.5 The else portion of an if else statement in c is _____
4.6 In C the body of do-while loop will be executed _____
4.7 Any variable starting with _____ in the declaration will be treated as an External variable

4.8 In C a polynomial of the form 100 M 34 – 20M + 10 can be efficiently represented by a _____
4.9 The Components of a Records are termed as _____
4.10 In C any dynamic data structure is created _____ .

PART TWO
(Answer ANY FOUR questions)

5. Consider the following C program Outline that DOES NOT USE any Structured Data Type like ARRAY or STRUCTURE or POINTER whatsoever ANYWHERE :

```
#include <stdio.h>
#include <math.h>

/* NO OTHER LIBRARY CAN BE USED*/

#define CI_Max 9999
#define CI_Min -9999
/* NO OTHER USER DEFINED CONSTANTS, DATA TYPES OR
GLOBALS CAN BE USED*/
/* User Defined Function Prototypes. NO OTHER FUNCTIONS are used */
void VF_Read_Int ( int, int, int*); /* READS and Returns an Integer through
it's pointer parameter provided it lies between a specific range passed as
the other two parameters . If the value read in within the happens to be
OUTSIDE this range, it will continue to loop & print the message Input
OUT of range ,

Give Again and wait for a proper value to be inputted by the user. */

int IF_Test_Prime (int) ; /* Used to Test MOST EFFICIENTLY whether the
Integer passed as it's only parameter happens to be Prime or Not. It
Returns 1 if the passed Integer is prime returns 0 if it is Non Prime. In
each case , it prints an appropriate message within it */

int main ()
{//begin main int I_Value;
/* You May Employ other Simple Variables */ VF_Read_Int (CI_Max,
CI_Min, &I_Value);
/* Reads in an Integer Value within a Specified Range */
VF_Print_NON_Prime_Factors (I_Value);
/* Displays all the NON Prime Factors of the value I_Value*/
return(0);
```

}//end main

a. Frame the body of the function

VF_Read_Int

. The Function heading is as illustrated below :

void VF_Read_Int (int I_High, int I_Low, int *PI_X)
/* READS and Returns an Integer through it's pointer parameter provided it lies between a specific range passed as the other two parameters . If the value read in within the happens to be OUTSIDE this range, it will continue to loop print the message {\bf Input OUT of range , Give Again and wait for a proper value to be inputted by the user. NO OTHER PARAMETER CAN BE USED. */

b. Frame the body of the function

IF_Test_Prime
. The Function heading is as illustrated below :

int IF_Test_Prime (int I_Num) /* Used to Test MOST EFFICIENTLY whether the Integer passed as it's only parameter happens to be prime or Not. It Returns 1 if the passed Integer is prime returns 0 if it is Non Prime. In each case , it prints an appropriate message within it */

(6+9)

6. Consider two integer data files F1 and F2 having following features.

a. Number of data values (key) in each file is unknown and the files may be of different sizes.
b. The values / Integer Keys in both the files F1 & F2 are Sorted in Descending Order.
c. Same data (key) can appear more than once in F1 or F2.
d. F1 and F2 may share common data values i.e. same key item may appear both the files .

Write a C function to merge the two files F1 and F2 to form a third file F3 having the following features.

-Elements in F3 are sorted in ascending order.
- Duplicate entries are not permitted (i. e. ,No element appears more than once).

(15)

7. The following operations are defined on a sorted Doubly linked list of Integers L where elements are arranged in Descending order from left.

INSERT (L,X) : Insert the integer X in the list L if X is not present.

DELETE (L,X) : Delete the integer X from the list L (if it exists).

SHOW-MID (L) : Print the n/2 th element of the list from left where n is the Number of elements in the current list and we use integer Division where 5/2 = 2

Frame C functions to implement each of the above functions INSERT (L,X) , DELETE (L,X) and SHOW_MID(L)

(6+6+3)

8.

a. In 2 (two) dimensions, a point can be described by its two coordinates namely X & Y both of which can be real numbers. A line can be described in the following manner :

(i) The co-ordinates of its two end points (X1, Y1) & (X2, Y2)
(ii) Its gradient 'm' & intersection 'c' (in the form Y = mx + c)
(iii) The length of the line is also stored along with.

Specify appropriate data types to store a point as well as a line in C.

(1+2)

b. Write a C function Point_to_Line (P1, P2) that will accept as parameters the coordinates of two points P1 & P2 and return a line that has the aforesaid 2 points as its end points.

(5)

c. A quadrilateral can be described by a sequence of 4(four) lines such that one end point of one line happens to be the starting point of the next line. Specify a suitable data structure in C to represent a quadrilateral.

(2)

d. Write a C function that will accept a quadrilateral as a parameter and classify it whether it is a
[2+2+3=7]
A Square.
A Rhombus.
A Rectangle.

in each case it computes the perimeter as well.

(2+2+3)

9.

a. Write a single Recursive C function to generate the n th Fibonacci number Fib(n) (n being a +ve non zero integer) . You cannot use any array, global variables and/or additional parameters/functions. Trace out the Call & Return sequences along with return values clearly by a schematic diagram when your function Fib(n) is invoked from main() with n = 6. Also mention the TOTAL no. of times any Fib(n) is called for each value of n for invoking Fib(6) from main(), e.g. Fib(2) is called a total of 4 times etc.

(2+5+2)

b. What will be the value of A(1, 3) if A(m, n) happens to be defined in the following manner? Specify each computation step in detail .

$A(0, n) = n + 1$ for $n \geq 0$
$A(m, 0) = A(m - 1, 1)$ for $m > 0$
$A(m, n) = A(m - 1, A(m, n - 1))$ for $m, n > 0$

(6)

B1.3-R4: PROGRAMMING AND PROBLEM SOLVING THROUGH 'C' LANGUAGE

Assignment 1.

Write a program to find sum of all prime numbers between 100 and 500.

Assignment 2.

Write a program to obtain sum of the first 10 terms of the following series for any positive integer value of X :

$X + X^3/3! + X^5/5! ! + X^7/7! + \ldots$

Assignment 3.

Write a program to reverse the digits of a given number. For example, the number 9876 should be returned as 6789.

Assignment 4.

Write a program to compute the wages of a daily laborer as per the following rules :-

Hours Worked	Rate Applicable
Upto first 8 hrs	Rs 50/-
For next 4 hrs	Rs 10/- per hr extra
For next 4 hrs	Rs 20/- per hr extra
For next 4 hrs	Rs 25/- per hr extra
For rest	Rs 40/- per hr extra

Accept the name of the laborer and no. of hours worked. Calculate and display the wages. The program should run for N number of laborers as specified by the user.

Assignment 5.

Write a program to input 20 arbitrary numbers in one-dimensional array. Calculate Frequency of each number. Print the number and its frequency in a tabular form.

Assignment 6.

Define 2 dimensional array a (3,3), b(3,3),sum(3,3),diff(3,3),mult(3,3). Store 9 arbitrary numbers in a(3,3) and 9 arbitrary numbers in b(3,3). Do the following:

a) Calculate sum of a(3,3) and b(3,3) and store in sum(3,3) where sum(i,j)=a(i,j)+b(i,j)
b) Calculate difference of a(3,3) and b(3,3) and store in diff(3,3) where diff(i,j)=a(i,j)-b(i,j)
c) Calculate product of two arrays a(3,3) and b(3,3) and store in mult(3,3) where mult(i,j)= summation of a(i,k)*b(k,j) over k where k=1 to 3.

Print the result in a tabular form

Assignment 7.

Write a function, str_search(char* s1,char* s2, int n) , that takes two strings and an integer, as arguments and returns a pointer to the n^{th} occurrence of 1^{st} string s1 in 2^{nd} string s2, or NULL if it is not present.

Assignment 8.

Write a C function to remove duplicates from an ordered array. For example, if input array contains 10,10,10,30,40,40,50,80,80,100 then output should be 10,30,40,50,80,100.

Assignment 9.

Apply recursive call to do the following:

(i) Input 'n'(1-200). Calculate sum of 'n' numbers.

(ii) Input 'n'(1-20). Calculate product of 'n' numbers.

(iii) Input 'n'(2-20). Print 'n' number of Fibonacci numbers. In Fibonacci sequence the sum of two successive terms gives the third term. The following are few terms of Fibonacci sequence :-

1 1 2 3 5 8 13 ……

Assignment 10.

Write a program which will arrange the positive and negative numbers in a one-dimensional array in such a way that all positive numbers should come first and then all the negative numbers will come without changing original sequence of the numbers.

Example:

Original array contains: 10,-15,1,3,-2,0,-2,-3,2,-9

Modified array: 10,1,3,0,2,-15,-2,-2,-3,-9

Assignment 11.

Write a menu driven program to maintain a Telephone Directory having following file structure:

1. Name : Character type : Length =20 characters.
2. Address : Character type : Length =40 characters.
3. Phone: Character type : Length =12 characters.

Menu

1. Add record(s)
2. Display record(s)
3. Search record(s)
4. Modify record(s)
5. Delete record(s)
6. Backup copy of File
7. Exit

Type your choice= 1,2,3,4,5,6,7— ->

Assignment 12.

Write a program to extract words form any text file and store in another file. Sort the words in alphabetical order and store them in the same file. Read the sorted file and print the frequency of each word.

Assignment 13.

Write a program to remove all occurrences of word “the” and “The” from an input string. For example

Input : The Dhillon Theatre is now the Fun Republic.
Output : Dhillon atre is now Fun Republic.

Assignment 14.

Write a program to display the Following pattern called Floyed’s Triangle.

```
1
2  3
4  5     6
7  8     9     10
      11    12    13    14    15
```

Assignment 15.

Write a program that accepts an input integer ‘n’ in the range 3-9 inclusive, and display the following pattern on a cleared screen.

Sample input for n=3
Sample output

```
    3
   3 2 3
  3 2 1 2 3
   3 2 3
    3
```

Sample input for n=4
Sample output

```
     4
    4 3 4
   4 3 2 3 4
  4 3 2 1 2 3 4
 4 3 2 3 4
    4 3 4
     4
```

Assignment 16.

Write a program to count the vowels in free text given as standard input. Read text one character at a time until you encounter end-of-data. Then print out the number of occurrences of each of these vowels.

Assignment 17.

Write a program to copy one file to another such that every word is reversed before being written to the target file. Assume the maximum size of each word is 10 characters and each word is separated either by new line(s), tab(s) or space(s). For example, if source file contains “I am an Indian”, the target file should contain “I ma na naidnI”.

Assignment 18.

Define a structure for an Employee having EmployeeName, EmployeeCode, BasicPay, DearnessAllowance, HRA, PF, GrossPay, NetPay Take an array of 10 Employees. Write ‘C’ functions to :-

a) Accept data for EmployeeName, EmployeeCode, BasicPay for all the employees.
b) Compute :-
    a. DearnessAllowance = 50% of BasicPay
    b. HRA = 20% of BasicPay + DearnessAllowance
    c. PF = 12% of BasicPay + DearnessAllowance
    d. GrossPay = BasicPay + DearnessAllowance + HRA
    e. NetPay = GrossPay – PF
c) Display the name of employee who has highest GrossPay.
d) Compute and display average net pay.
e) Display list of all employees in the alphabetical order of employee name.

Assignment 19.

Write a program to convert a given decimal number to its binary equivalent and vice versa.

Assignment 20.

Input any positive integer number (n<=9999999). Convert the number into words.

Assignment 21.

a) Define a structure of a node of a linked list having an integer data member x.
b) Use the above structure in (a) and write the functions for the following parts;

i) a function which takes a pointer to the head of linked list, which is in ascending order and an integer, x to be inserted in the linked list, as arguments. The node must be inserted in such a way that the linked list remains in ascending order after insertion.

ii) a function which takes a pointer to the head of a linked list and an integer, x to be removed from the linked list, as arguments. If x is not found in the linked list, then it should display an appropriate message.

Assignment 22.

Write a program to replace ‘a’ with ‘b’, ‘b’ with ‘c’,….,’z’ with ‘a’ and similarly for ‘A’ with ‘B’,’B’ with ‘C’, …., ‘Z’ with ‘A’ in a file. The other characters should remain unchanged.

Assignment 23.

Write a function char* stuff(char* s1,char* s2,int sp, int rp) to stuff string s2 in string s1 at position sp, replacing rp number of characters (rp may be zero).

Assignment 24.

Write a program to display the content of a Text file which means it will behave like TYPE command of MSDOS. Suppose the name of your program file: FILETYPE.C and FILETYPE.EXE and the name of the source file is MYFILE.TXT. The following command should work: C: \PROGRAM> FILETYPE MYFILE.TXT

Assignment 25.

Write a program to input name, address and telephone number of ‘n’ persons (n<=20). Sort according to the name as a primary key and address as the secondary key. Print the sorted telephone directory.

B1.4-R4: COMPUTER SYSTEM ARCHITECTURE

Objective of the Course

Objective of the course is to familiarize students about hardware design including logic design, basic structure and behavior of the various functional modules of the computer and how they interact to provide the processing needs of the user. This subject mainly focuses on the computer hardware and system software. It aims to describe the following aspects—

- Building blocks of the computer
- Computer Design
- Assembly Language Programming

Outline of Course

S. No.	Topic	Minimum number of hours
1.	Digital Components	10
2.	Data Representation	04
3.	Register Transfer & Micro Operations	04
4.	Basic Computer Organization	04
5.	Central Processing Unit	08
6.	Computer Arithmetic	06
7.	Input-Output Organization	08
8.	Memory Organization	08
9.	Assembly Language Programming	08

Lectures	**=**	**60**
Practical/tutorials	**=**	**60**
Total	**=**	**120**

Detailed Syllabus

1. Digital Components **10 Hrs.**

Overview of computer organization: Logic gates, Adders, Flip-flops (as 1 bit memory device), Encoders, Decoders, Multiplexers, Registers, Shift Registers, Counters, RAM, ROM

2. Data Representation **04 Hrs.**

Number system, Hexadecimal numbers, ASCII code, Two's complement, addition, subtraction, overflow, Floating point representation

3. Register Transfer & Micro Operations **04 Hrs.**

Bus and memory transfers, Three state Bus Buffers, Binary ADDER, Binary Incrementer, Arithmetic circuit, Logic and Shift Micro-operations, ALU

4. Basic Computer Organization **04 Hrs.**

Instruction codes, Direct and indirect address, Timing and Control Signal generation, Instruction Cycle, Memory Reference Instructions, Input Output instructions.

.

5. Central Processing Unit **08 Hrs.**

General Register Organization, Memory Stack, One address and two address Instructions, Data transfer, arithmetic, logical and shift instructions, Software and hardware interrupts (only brief introduction), Arithmetic and Instruction Pipelines.

6. Computer Arithmetic **06 Hrs.**

Addition and Subtraction with signed magnitude data, Multiplication Algorithms Hardware Algorithm and Booth Algorithm, Division Algorithm

7. Input-Output Organization **08 Hrs.**

Asynchronous Data transfer - Handshaking, Asynchronous Serial Transfer, Interrupt Initiated I/O, DMA transfer, Interfacing Peripherals with CPU (Introduction), Keyboard, Mouse, Printer, Scanner, Network card, Introduction to Pipelining and Linear Pipeline processor

8. Memory Organization **08 Hrs.**

ROM, RAM, Hard Disk, CD-ROM, Cache Memory - Direct mapping scheme, Virtual Memory concept, Cache memory working principles

9. Assembly Language Programming **08 hrs.**

Assembly Language of Intel 8086, Simple examples based on arithmetic and character operations.

Note: For assembly language programming Turbo Assembler may be used.

RECOMMENDED BOOKS

MAIN READING

1. Carter Nicholas, “Computer Architecture”, Schaun outline Sevies , Tata McGraw-Hill, 2008.
2. M. Morris Mano, “Computer System Architecture”, Pearson Education, 2008.
3. Peter Abel and N. Nizamuddin, “IBM PC Assembly Language and Programming”, Pearson Education, 2009.

SUPPLEMENTARY READING

1. J.P. Hayes, “Computer Architecture & Organization”, Tata McGraw Hill
2. Michael J. Flynn, “Computer Architecture: Pipelined and Parallel Processor Design”, Narosa Publishing House, 2002.

B1.4-R4 : COMPUTER SYSTEM ARCHITECTURE

Model Question Paper

Note:

1. There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.

2. **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book.

3. Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**.

TOTAL TIME: 3 HOURS **TOTAL MARKS: 100**

(PART ONE – 40; PART TWO – 60)

PART ONE
(Answer ALL Questions; each question carries ONE mark)

1. Each question below gives a multiple choices of answers. Choose the most appropriate one.

1.1 The Toggle flip-flop can be constructed using JK flip-flop by connecting
   a) Toggle input to J and inverted form of Toggle input to K
   b) The Toggle input to J
   c) Inverted form of Toggle input to K
   d) None of these

1.2 One bit Full adder can be designed using
   a) Two half adder and one OR gate
   b) Two Half adder
   c) One EX-OR and two NAND gates
   d) None of these

1.3 In most of the digital computers, arithmetic operation of multiply is implemented with
   a) Sequence of add micro-operations only
   b) Sequence of shift micro-operations only
   c) Sequence of add and shift micro-operations
   d) None of these

1.4 The most common type flip-flop to synchronize the state change during clock pulse transition is
   a) JK flip-flop
   b) Edge triggered flip-flop
   c) SR flip-flop
   d) None of these

1.5 Two references to memory to fetch an operand are needed in
   a) Indirect address instructions

b) Direct address instructions
c) Immediate instructions
d) None of these

1.6 Implied Accumulator (AC) register for all data manipulation is used in
a) Two-address instruction
b) Zero-address instruction
c) One-address instruction
d) None of these

1.7 Program Counter register holds
a) The instruction to be executed next
b) The address of next instruction to be executed
c) The count of the programs running in the system
d) None of these

1.8 DMA controller transfers one data word at a time in
a) Cycle stealing
b) Burst transfer
c) Synchronous transfer
d) None of these

1.9 Cache memory is used to keep
a) Very frequently used data in organization
b) Keep image of main memory
c) Compensate for the speed differential between main memory access time and processor logic
d) None of these

1.10 Segment register CS contains 1F00h and IP contains 0300h, the absolute address of the instruction 1F00:0300 is
a) 1F300h
b) 2200h
c) 1F30h
d) None of these

2. Each statement below either TRUE or FALSE. Identify and mark them accordingly in the answer book

2.1 A 4 to 1 multiplexer can be designed with the help of four AND gates and one OR gate.
2.2 Hardware procedure for programming ROM or PROM is irreversible.
2.3 Addition of two opposite signed numbers may cause overflow.
2.4 Three-state gates do not perform all conventional logic such as AND or NAND.
2.5 An n-bit binary adder requires (n-1) full adder.
2.6 Address in instruction may contain the address of the address of the operand.
2.7 The conversion from infix notation to reverse Polish notation must take into consideration the operational hierarchy adopted for infix notation.
2.8 In asynchronous data transfer between two independent units require that control signals be transmitted between communicating units to indicate the time at which data is being transmitted.
2.9 ROM is also random access memory.
2.10 An assembly program may have maximum size of 256KB.

3. Match words and phrases in column X with the nearest in meaning in column Y.

3.1	Using flip-flop with complementing capabilities	a.	Counter circuit
3.2	Single processor register	b.	Accumulator
3.3	Carry into sign bit and carry out of sign bit	c.	Overflow
3.4	Data in operand	d.	Immediate addressing
3.5	Control signal accompanying each data item	e.	Handshaking
3.6	Mechanism for translating program generated addresses into correct main memory locations	f.	Virtual memory
3.7	Addition of three bits (two significant bits and a previous carry)	g.	Full adder
3.8	Rules for interpreting or modifying the address field of instruction before operand is actually referenced	h.	Addressing modes
3.9	Rate at which serial information is transmitted	i.	Baud rate
3.10	Holding high 16 bits of the product in multiplication operation of assembly language	j.	DX
		k.	BX
		l.	Half adder
		m.	Strobe
		n.	Direct addressing
		o.	Undefined

4. Fill in the blanks in 4.1 to 4.10 below, by choosing appropriate words and phrases given in list below

(a)	ROM	(b)	Multiplex	(c)	Normalized
(d)	Indirect	(e)	Micro-programmed	(f)	One
(g)	Hardwired	(h)	Multiply	(i)	Pipelining
(j)	CX	(k)	RAM	(l)	Counter
(m)	Immediate	(n)	Macro-programmed	(o)	Add
(p)	DX				

4.1 ---------- does not need a read-control line.

4.2 ---------- is a combinatorial circuit, which receives binary information for one of 2^n input data lines and directs it to a single output line.

4.3 A floating point number is said to be ---------- if the most significant digit of the mantissa is non-zero.

4.4 One bit of instruction code can be used to distinguish between direct addressing and ---------- addressing.

4.5 A control unit which utilizes a ROM to store binary control information is called a ---------- control unit.

4.6 The computer needs only ---------- common hardware circuit to handle addition of signed and unsigned number.

4.7 In ---------- organization the control logic is implemented with gates, flip-flop, decoders and other digital circuits.

4.8 Booth algorithm gives a procedure to ---------- binary integers in signed – 2's complement representation.

4.9 ---------- is a technique of decomposing a sequential process into sub-operations, with each sub-process being executed in a special dedicated segment which operates concurrently with all other segments.

4.10 ---------- register acts as counter for repeating and looping the assembly instructions.

PART TWO
(Answer ALL questions)

5.

a. Simplify the following Boolean functions by means sum-of-product form of a three variable map. Draw the logic diagram with
   i. AND – OR gates
   ii. NAND gates

   $F(A, B,C) = \sum (0, 2, 4, 5, 6)$

b. Explain how JK Flip-flop can be realized from RS flip-flap?

c. How many 128 x 8 memory chips are needed to provide a memory capacity of 4096 x 16 ?

(9 + 3 + 3)

6.

a. Draw and explain a 4 bit adder-subtractor circuit.

b. Explain direct and indirect address instructions and immediate instructions with suitable examples.

c. Explain the basic computer instruction format. When do you call the set of instructions to be complete? Why are set of instructions for basic computer, which is complete, is not efficient?

(4 + 6 + 5)

7.

a. What are differences between zero-address, one-address and two-address instructions? Explain these through examples.

b. What is Booth algorithm? Explain it through flow chart along with an example.

c. What is asynchronous data transfer? What are strobe pulse method and handshaking method of asynchronous data transfer? Explain them.

(6 + 5 + 5)

8.

a. What is virtual memory? How is it implemented?

b. An address space is specified by 24 bits and corresponding memory space by 16 bits.
   i. How many words are there in the address space?
   ii. How many words are there in the memory space?
   iii. If page consists of 2k words, how many pages and blocks are there in the system?

c. For what purpose the segment registers are used and how many are there In Intel 8086? How are effective address is calculated in Intel 8086 assembly language?

d. Write an assembly language program to find the least and greatest number among the given twenty numbers (consecutively stored as words) at location **NUM** and put the results at **LEAST** and **GREATEST** locations (defined as words).

(3 + 4 + 3 + 5)

B1.4-R4: COMPUTER SYSTEM ARCHITECTURE

Assignment 1.

Design an AND gate and an EX-OR gate using NAND gates.

Assignment 2.

Solve the following K-Map for the given equation:

$$F(a,b,c,d) = \sum(0,1,4,5,7,9,10,11,14,15)$$

And draw the equivalent digital circuit diagram for the same.

Assignment 3.

Solve the following K-Map for the given equation:

$$F(p,q,r,s) = \prod(0,1,3,5,7,9,11,13,15)$$

And draw the equivalent digital circuit diagram for the same.

Assignment 4.

Prove the following Boolean algebra identities:

a) (A+B).(A+C)=A+B.C
b) A+A.B=A
c) (A+B'+A.B)(A+B')(A'.B)=0
d) A+A'.B=A+B

Assignment 5.

Given the Boolean function

F= p.q.r + p'.q' + q'.r + p.r

a) Simplify the Boolean expression using K-Maps.
b) Draw the logic diagram using the given Boolean expression.
c) List the truth table of the function.

Assignment 6.

Given the Boolean function

F= a'.b' + a'.d.c' + b.c.d'

a) List the truth table of the function.
b) Draw the logic diagram using the given Boolean expression.
c) Simplify the Boolean expression using Boolean Algebra Identities.
d) Draw the logic diagram using the simplified Boolean expression and compare with part 3.
e) Check whether the truth table of part 2 and of part 3 is identical.

Assignment 7.

Represent the decimal number 1849 in

a) BCD,
b) Excess-3 code,
c) 5421 code,
d) as a binary number,
e) equivalent Grey code of binary number.

Assignment 8.

A majority function is generated in a combinational circuit the output is equal to 1 if the input variables have 2 or more consecutive 1's appearing together, the output is 0 otherwise. Design the equivalent combinational circuit.

Assignment 9.

Design a combinational circuit with three inputs P, Q, R and three outputs a, b, c. When the input is 0 or 1 in decimal the binary output is one greater than the input. When the input is 6 or 7 in decimal, the binary output is one less than the input. Otherwise the binary output is zero.

Assignment 10.

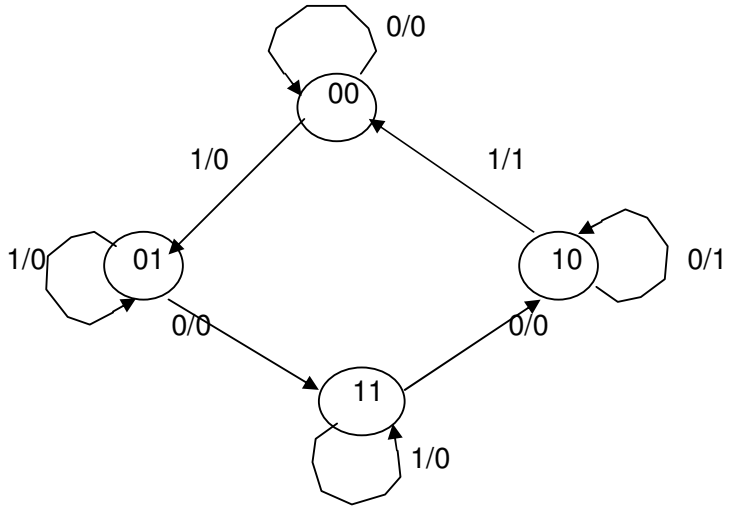
A circuit has four inputs and two outputs. One of the outputs is high when the majority inputs are high. The second is high only when all inputs are of same type. Design the combinational circuit.

Assignment 11.

Draw the state diagram and tabulate the state table for a sequential circuit with two flip-flops and one external input x. When x=1, the state of the flip-flops does not change. When x=0 the state sequence is 00,11,10 01, 00 and repeat.

Assignment 12.

For the given state diagram given in the figure



Draw the clocked sequential circuit using 2 T-Flip flops.

Assignment 13.

Construct a 6-to-64-line decoder with two 5-to-32-line decoders with enable and one 1-to-2-line decoder.

Assignment 14.

How many address line and data lines would be required for the memories of the following capacities:

a) 16K×8
b) 256K×16
c) 128M×16
d) 32G×32
e) 128G×8

Where K refers to Kilobyte, M refers to MegaByte and G refers to GigaByte.

Assignment 15.

How many 256×16 memory chips are needed to provide a memory capacity of 8192×16?

Assignment 16.

A computer needs 2048 bytes of RAM and 2048 bytes of ROM. The RAM and ROM chips to be used are specified in the problem. The RAM chip size is 256×8 and the ROM chip size is 2048×8. List the memory address map and indicate what size decoders are needed.

Assignment 17.

Perform the arithmetic operations arithmetic operations below with binary numbers using signed 2's complement representation wherever required. Use eight bits to accommodate each number together with its sign.

a) (+12) + (+56)
b) (-35) + (- 49)
c) (-85) – (+71)
d) (-109) + (-11)

Assignment 18.

Let Q be a register of eight bits having an initial value of Q=11011101, determine the sequence of binary values in Q after a arithmetic logical shift-left, followed by a circular shift-right, followed by a arithmetic logical shift-right and circular shift-left.

Assignment 19.

Divide $(448)_{10}$ with $(17)_{10}$ using the division algorithm.

Assignment 20.

Multiply $(-5)_{10}$ with $(-19)_{10}$ using the Booth's multiplication algorithm.

Assignment 21.

Write a program in assembly language that will reverse an array of N words.

Assignment 22.

Write a program in Assembly language that will accept hexadecimal input of numbers and display the equivalent hexadecimal number entered in the output.

Assignment 23.

Prompt the user to enter a line of text. On the next line, display the capital letter entered that comes first alphabetically and the one that comes last. If no capital letters are enterd display message, “No Capital Letters”. The result should look like this on the screen:

```
Type a line of text:
THE QUICK BROWN FOX JUMPED
First capital=B
Last Capital=X
```

Write a program in Assembly language to perform the above-mentioned task.

Assignment 24.

Write a program in Assembly language that will read a character from the keyboard and display the character in the next line.

Assignment 25.

Write a program in assembly language that will count the number of vowels and consonants in the string that has been entered.

B1.5-R4: STRUCTURED SYSTEM ANALYSIS AND DESIGN

Objective of the Course

The Objective of the course is to provide the necessary skills, learning and exposure in developing an information system. The student should be able to develop an understanding of the general principles and purpose of systems analysis and design; apply key techniques from a standard methodology. He should have knowledge of information systems and be able to prepare the physical design of an information system.

The course focuses on the following aspects of Information System Development:

- Study, Analysis and Design of a System
- Documenting and evaluating the system
- Data Modeling
- Developing Information Management System for an Organization
- Implementing, Testing and Security Aspects

Outline of Course

S. No.	Topic	Minimum number of hours
1.	Introduction	03
2.	System Development Cycle	03
3.	System Planning	06
4.	Modular and Structured Design	02
5.	System Design and Modeling	14
6.	Input/Output and Interface Design	07
7.	System Implementation and Maintenance	03
8.	Computer System Security	02
9.	OO Analysis/Design	12
10.	Introduction to Management Information System	08

Lectures	**=**	**60**
Practical/tutorials	**=**	**60**
Total	**=**	**120**

Detailed Syllabus

1. Introduction **03 Hrs.**

System Definition and concepts: General Theory systems, Manual and automated systems, Real-life Business Sub-Systems. System Environments and Boundaries, Real-time and distributed systems, Basic principles of successful systems, Approach to system development: Structured System Analysis and Design, Prototype, Joint Application Development, Role and Need of Systems Analyst. Qualifications and responsibilities, System Analysis as a Profession.

2. System Development Cycle **03 Hrs.**

Introduction to Systems, Development Life Cycle (SDLC). Various phases of SDLC: Study Analysis, Design, Development, Implementation, Maintenance; Documentation:

Principles of Systems Documentation, Types of documentation and their importance, Enforcing documentation discipline in an organization

3. System Planning **06 Hrs.**

Data and fact gathering techniques: Interviews, Group Communication -Questionnaires; Assessing Project Feasibility: Technical, Operational, Economic, Cost Benefits Analysis, Schedule, Legal and contractual, Political. Modern Methods for determining system requirements: Joint Application, Development Program, Prototyping, Business Process Re-engineering. System Selection Plan and Proposal

4. Modular and Structured Design **02 Hrs.**

Module specifications, Top-down and bottom-up design. Module coupling and cohesion. Structure Charts.

5. System Design and Modeling **14 Hrs.**

Process Modeling, Logical and physical design, Conceptual Data Modeling: Entity /Relationship Analysis, Entity-Relationship Modeling, ERDs and DFDs, Concepts of Normalization. Process Description: Structured English, Decision Tree, Table; Documentation: Data Dictionary, Recording Data Descriptions.

6. Input/Output and Interface Design **07 Hrs.**

Classification of forms, Input/output forms design. User-interface design, Graphical interfaces. Standards and guidelines for GUI design, Designing Physical Files and Databases: Designing Fields, Designing Physical Records, Designing Physical Files, Designing Databases, Introduction to CASE Tools; Features, Advantages and Limitations of CASE Tools, Awareness about some commercial CASE Tools.

7. System Implementation and Maintenance **03 Hrs.**

Planning considerations, Conversion methods, procedures and controls, System acceptance criteria, System Evaluation and Performance, Testing and Validation. Preparing, User Manual, Maintenance Activities and Issues.

8. Computer System Security **02 Hrs.**

Security aspects of a Computer System; Control Measures; Disaster Recovery and Contingency Planning, Prevention of Computer Virus & Malicious Applications.

9. OO Analysis / Design **12 Hrs.**

OO Development Life Cycle and Modeling. Static and dynamic modeling. Comparison of OO and Module-oriented Approach. Modeling using UML ; The UML diagrams; the process of Object modeling

10. Introduction to Management Information System (MIS) **08 Hrs.**

Meaning and role of MIS, Systems approach to MIS. Types of information systems : Transaction Processing System, Management Information System, Decision Support System, Expert System Case Studies (Illustrative) : MIS for Accounting and Finance Function,

MIS for Marketing System.

RECOMMENDED BOOKS

MAIN READING

1. Hoffer J. A, George J.F, Valacich J.S, and Panigrahi P.K “Modern Systems Analysis and Design”, Pearson Education, 2007.

2. A. Dennis and B. H. Wixom, “Systems Analysis and Design”, John Wiley & Sons, Inc.

SUPPLEMENTARY READING

1. Whitten J. L, Bentley L. D, “Systems Analysis and Design Methods”, Tata McGraw-Hill, 2008.
2. Kendall & Kendall, “Systems Analysis and Design”, Seventh Edition, Pearson Education.

B1.5-R4: STRUCTURED SYSTEM ANALYSIS AND DESIGN

Model Question Paper

NOTE:

1. There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.

2. **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book.

3. Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**.

TOTAL TIME: 3 HOURS **TOTAL MARKS: 100**
(PART ONE: 40; PART TWO: 60)

PART ONE
(Answer all the questions; each question carries ONE mark)

1. Each question below gives a multiple choices of answers. Choose the most appropriate one.

1.1 A starting point in the hardware design phase of a system design project is
- A. The determination of size and capacity requirements for the hardware
- B. Preparation of a purchase contract
- C. Calling quotations from hardware vendors
- D. Benchmarking

1.2 Software maintenance includes

- A. Bug fixing
- B. Setting preventive maintenance policy for the servers and clients in the computer network
- C. Simulation of proposed changes in organizational strategy
- D. Feasibility study

1.3 The role of an integrated CASE tool in a systems analysis and design project is
- A. To provide automatic help in case of legal cases when there is a dispute between developer and user
- B. To serve as a less expensive substitute for spreadsheet during the negotiation process
- C. To provide an environment that automates key tasks throughout the entire development process
- D. To serve as a sophisticated text editor

1.4 In the processing of a data dictionary, cross reference checking means
- A. Linking of documents through hypertext, in case the system deals with document imaging
- B. Ensuring that there is no inconsistency between the way a reference is quoted in a text file, and the reference is listed in a reference file

C. Determination of where data are used in the system, i.e., which processes use a given data item, which data items are unused.
D. Verifying whether the latest updates are reflected in different components of a system

1.5 Cost of error correction is least at
A. Requirement Analysis stage
B. Design stage
C. Development stage
D. Implementation stage

1.6 A sequential access file is not a file
A. In which the last record is retrieved in the same time as the first record
B. In which a record cannot be accessed unless its predecessor records are accessed
C. Usually stored on magnetic tape
D. In which to insert a record, a new copy of the file is created

1.7 The difference between menu interface and question-answer dialogue is
A. In the former, the user fills in a form, whereas in the latter, the user
B. In the former, the user uses a light pen, whereas in the uses a mouse
C. The former is popular in restaurant computers whereas the latter is popular in a police department
D. In the former, the user has to choose from a given list of options, and in the latter the user has to answer questions put by the computer

1.8 The primary difference between program testing and system testing is
A. Program testing is more comprehensive than system testing
B. System testing focuses on testing the interfaces between programs, whereas program testing focuses on individual programs
C. System testing is concerned with testing all aspects of a system including job designs and reward system designs
D. Programmers have no involvement in system testing, whereas designers are involved in program testing

1.9 Which of the following is not a major design consideration for a system?
A. Response time required
B. Frequency of record updates
C. Availability of technically qualified personnel to carry out design and development
D. Data integrity constraints

1.10 The largest percentage of the total life cycle cost of software is
A. Design costs
B. Maintenance costs
C. Coding costs
D. Testing costs

2. Each statement below is either TRUE or FALSE. Identify and mark them accordingly in the answer book.

2.1 A data dictionary is a structured repository of data about data.
2.2 HIPO diagrams are used to develop packages.

2.3 Computer system security involves only virus protection.
2.4 Validation errors are detected by check digits.
2.5 VTOC shows a hierarchy of documents.
2.6 ERD reflects the business requirements of a proposed system.
2.7 Aliases are included in Data Dictionaries.
2.8 During the Design phase of the SDLC, input design is governed by the volume and frequency of data.
2.9 A Database Administrator is the one who designs the database for an application.
2.10 A Gantt chart represents activity or job schedules in the form of bar graphs.

3. Match words and phrases in column X with the closest related meaning/word(s)/phrase(S) in column Y.

	X		**Y**
3.1	Smart Card	A.	Record occurrences
3.2	Knowledge Base	B.	Hardware selection
3.3	Alpha Test	C.	Verification
3.4	Validation	D.	Certificate
3.5	CASE	E.	SASD tool
3.6	Action Statement	F.	Expert System
3.7	Sizing	G.	Updating prelude
3.8	Tuples	H.	Communications
3.9	Benchmark	I.	Programming
3.10	Topology	J.	Transaction Processing

4. Each statement below has BLANK space to fit one of the word(s) or phrase(s) in the list below. Enter your choice in the answer sheet, following instructions there in.

(a)	Balancing	(b)	Outsourcing	(c)	Unit
(d)	Incremental Commitment	(e)	Recurring	(f)	Relationship
(g)	One-time	(h)	Level-1 Diagram	(i)	Database
(j)	Transposition Document	(k)	Context Diagram	(l)	System
(m)	Turn around Document	(n)	icon	(o)	Graph
(p)	Equality				

4.1 A shared collection of logically related data designed to meet the information needs of multiple users in an organization is a _____.
4.2 _____ is a strategy in Systems Analysis and Design in which the project is reviewed after each phase and continuation of the project is rejustified in each of these reviews.
4.3 A _____ cost results from the ongoing evolution and use of a system.
4.4 _____ provides an overview of an organizational system.
4.5 The conservation of inputs and outputs to a DFD process when that process is decomposed to a lower level is called _____.
4.6 _____ is an association between the instances of one or more entity types that is of interest to the organization.
4.7 The practice of turning over responsibility of some to all of an organization's information systems applications and operations to an outside firm is called _____.
4.8 _____ provides information that is delivered to an external customer as an

output that can be returned to provide new information as an input to an information system.

4.9 _____ is a graphical picture that represents specific functions within a system.

4.10 In _____ testing each module is tested alone in an attempt to discover any errors in its code.

PART TWO
(Answer any FOUR questions)

5.

a. What are the differences between system analysis and system design? Justify your answer with examples. What is the role of system analyst in system analysis and design?

b. What is Software Development Life Cycle (SDLC)? Describe various phases of SDLC. Briefly Explain various types of documentation involved in each phase of SDLC.

(7+8)

6.

a. What is UML? Why it is called unified modeling? List and explain various diagrams involved in modeling using UML, which shows behavioral aspects of the system.

b. Describe pros and cones of interview and questionnaires technique for requirement gathering.

c. What is a structure chart? How is it related with cohesion and coupling?

(7+4+4)

7.

a. Develop a decision tree that describes the decisions, a school attendance officer must make in fulfillment her responsibilities.

The officer spends a part of each day looking for truant students. If the officer comes upon a student who is truant, she transports the youth to the school's attendance office. The student is held at office while the attendance officer attempts to contact the parents or guardians. If the officer is able to reach the parents or guardians, the student is released into custody and a date is set for a formal review of the student's attendance record. If the officer is unable to reach the parents or guardians, the student is detained in the attendance office until the end of the school day and then released.

The system is dependent upon having up-to-date attendance records, as well as the current telephone numbers (home and work) for parents or guardians.
Whenever possible, the attendance officer will attempt to visit a truant student's parent or guardians and inform them of the problem.

However, if the officer has a large number of truancies to investigate, she sends a formal letter to the parents or guardians whom she has been unable to reach by phone or in person. The letter informs them of their child's truancy and requests that they call or come to see the truant officer.

b. A recruitment procedure in an organization is as follows:
An advertisement is issued giving essential qualifications for the specific post, the last date for receipt of application and the fee to be enclosed with the application. A clerk in the registrar's office checks the received applications to the concerned department. The department checks the application in detail and decides the applicants to be admitted, those to be put in the waiting list and those to be rejected. Appropriate letters are sent to the registrar's office, which intimates the applicant. Give physical and logical DFDs corresponding to the above problem.

(8+7)

8.

a. What is a CASE tool? Explain about any commercial CASE tool with its features and limitations.
b. What is the Conversion of system? Why is it required? How conversion takes place in an organization for system implementation?
c. Explain different types of threats that a computer system can have and explain various control measures for those threats.

(5+5+5)

9.

a. What is the significance of Usecase diagram in UML? At which phase of System Development it is drawn? Explain steps for preparing Usecase diagram with example.
b. Describe Object Oriented Development Life Cycle.
c. What is Object Oriented Modeling? Differentiate between Static and Dynamic Modeling.

(7+4+4)

Assignment-1

The City College has a large library consisting of books of different categories. Few are listed below:

A. Fiction	B. Biography	C. Economics D. Mathematics
E. Sports	F. Management	G. Computers and Communication
H. Taxation	I. Law	J. Travel

Students and teachers borrow the library books. The students can take at time two books on subjects related to studies and one book from general interest.
The teachers can take at time three books on subjects related to studies and two books from general interest. The college decides to provide an online facility to inquire on the availability of books in the library. Entering any of the following can search the books available in the library:

1. By Author index (Entering first two alphabets)
2. By title index (Entering first two alphabets of the title of the book)
3. By Subject index (Entering the name of the subject)

The database of the above application will be on the DBMS.
You are required to specify:

(a) The various files required to be specified and the layout and contents of the files.
(b) Design screen layouts for the above query. What are the checks and controls that you would like to incorporate in the system to ensure that erroneous input gets tapped as soon as it is typed.

Assignment 2.

Activities of a school Office during admission time are as follows
Applications are received from students and they are checked for eligibility for admission. Eligible candidates are called for an admission test. The teachers set the question papers for the test. The candidates take up the test. The teachers evaluate the test papers.

Based on the marks obtained by the candidate in the test and other criteria specified by the school, the teachers prepare a provisional admission list. The candidates in the admission list are called for an interview. Normally, this list contains about 10% more than the number of seats available in the school.

An interview panel is constituted to interview the candidates. Taking into account the performance of the candidates in the interview, the panel prepares a selection list. This selection list is sent to the principal for approval.

The candidates who figure in the approved selection list are intimated about their admission. Such candidates pay their admission and other school fees and get admitted. Proper receipts are issued for the payment of the fees. Such admitted candidates are assigned roll numbers and sections. Section wise attendance registers are prepared. The application forms of these admitted students are kept in a separate file.
Prepare the DFD representing these activities. Also give the data dictionary entries.

Assignment 3.

A company stores all the purchase orders placed by it on its vendors in a purchase order

file (POFILE). When it receives delivery of goods against a purchase order the details are entered in a file called RECDPOFILE (assume that partial deliveries do not exist, and that a purchase order corresponds to only one product). When an invoice is received from a vendor it is stored in the INVCEFILE. At the end of each day, a program retrieves each invoice in the INVCEFILE, checks it for the following:

(a) Whether the purchase order number mentioned in the invoice exists in the POFILE

(b) Whether the purchase order mentioned in the invoice has a corresponding entry in the RECDPOFILE.

In case a mistake is indicated in either of the above checks, a corresponding message is printed for the vendor, for later mailing; if the invoice is valid according to both the tests, then payment of invoice is authorized, and the invoice is entered in PAYFILE and a cheque is printed.

3.1 Draw a DFD for the above system

3.2 Explain the file design in detail for the above system

Assignment 4.

The office of Department of Computer Science organizes and handles seminars / workshops.

When a person wants to register for a seminar, he / she sends a request.
The office clerk notes the person's name, address, telephone number and organization name on a registration form. Copy of the form is placed in the master file, an acknowledgement letter prepared and sent to the registrant.
Another copy is sent to the billing clerk who creates an invoice record for the registrant in another central file and sends a copy of the invoice to the registrant.
One month before the seminar, the clerk prepares name tags and seminar material for each participant.
The registrants are expected to pay in advance of the seminar.
When a cheque comes in, the clerk verifies the registration against the registration record and enters the information that the payment has been received.
In case registrants do not sent the advance payments, their names are listed on a separate sheet. This defaulter sheet is given to the seminar coordinator who takes the appropriate action, which may be:

1. a person is allowed to attend the seminar, if he agrees to make the payment on the first day before the seminar starts , or
2. brings in a sanction letter from the head of the organization.

All registration records are maintained in a master file and used as a mailing list on an ongoing basis.
DESIGN A DFD FOR THE ABOVE REGISTRATION PROCEDURE FOR THE SEMINAR.

Assignment 5.

Below are some statements about order processing in an organization? You are required to construct an ER diagram from these statements.

Assignment 6.

"In many organizations, raw material inventory consumes a major portion of the assets of the business. Management of inventory is therefore an important computer application. An integrated inventory system includes an inventory subsystem,

a purchase subsystem, receiving subsystem. An inventory master file is usually maintained which is updated by all the subsystems. This file is also used to create a number of outputs for each of the subsystems."

(a) Identify some major data elements for the inventory master file.
(b) Identify which data elements are being updated by which subsystems.
(c) Identify some of the important o/p generated by each of the subsystems.

Assignment 7.

Design a system for the Warehouse Inventory System and illustrate the solution with a Structure Chart that will take in customer orders, select the item from inventory, and generate a packing slip and ***invoice.***

INPUTS:

a) Customer Order from the Sales Department.
b) Shipments of Finished Goods to be put in Inventory.

OUTPUTS:

a) Plant Order for more Finished Goods.
b) Shipments of Finished Goods to the Customer.
c) Invoice and Packing Slip for items shipped to Customer.
d) Notice to Sales that items are Back Ordered.

The warehouse maintains the MASTER FILE that contains the quantities of all items in inventory. The warehouse ships all items ordered and send out invoices. If the order quantity is greater than quantity in inventory, nothing is shipped. The whole quantity is "back ordered." A Back Order notice is sent to the Sales Department and the customer by way of the Sales Department. Also a Plant Order for that item at the requested quantity is sent to the plant. No other tracking of back orders is done. If the order quantity is less than or equal to the quantity in inventory, then the items are shipped and the quantity in inventory is reduced for the items shipped. A check is then made to see if the amount left in inventory is below the minimum on-hand quantity controlled by the Sales Department. If so, the automatic reorder quantity that is dictated by the Sales Department is used to generate a Plant Order for that item so that the inventory can be replenished. The Customer Order contains all necessary information: Items, Quantities, Customer -Information (Name, Billing-Address, and Shipping-Address).

Assignment 8.

Design a structured chart using following information:

Calling module :
Calculate student grade
Called module:
Get student's academic information
Get valid grade
Find out errors
Check for probation Period
Check for director's list
Include the required input and output couples, showing the direction and meaning.
In the same chart show check for probation as a calling module and factor a called module EVALUATE APPRAISAL. Show input and output couples.

Assignment 9.

Design a structured chart using following information:

Calling Module:

Calculate Word Counting

Called Module:

Get Sorted Word List
Count Number of Different Words
Output Count

Include the required input and output couples, showing the direction and meaning. Also factorise the 'Get Sorted Word List' as calling module and 'get word list' and 'sort' as called modules which further can be factorised. Show also the input & output couples.

Assignment 10.

In a ABC Limited company, if the invoice paid is <5000, then no discount is offered. If the payment is made within 10 days and the payment is above 5000 but less than 10,000 , 2% discount is given. If the payment is made within 10 days and it is above 10,000, 3% discount is given. Otherwise no discount is given. Construct the limited entry decision table .

Assignment 11.

The candidate is to be allotted the department, given the conditions

a) If a male secures maximum marks in mathematics, allot Engineering department.
b) if a female secures maximum marks in biology, she is allotted medical department.
c) If a candidate secures maximum marks in English, allot English department.
d) If a candidate secures less than 180 marks in aggregate, he/she is rejected.
e) Rest all cases are allotted psychology department.

Based on above conditions draw a Extended Entry decision table.

Assignment 12.

If a candidate is sharp and disciplined, take him as trainee systems analyst.

a) If a candidate is only sharp, take him as trainee programmer
b) If a candidate is only disciplined, take him as Trainee console operator.
c) If a candidate is neither sharp nor disciplined, reject him.

Based on above conditions draw a decision tree & decision table .

Assignment 13.

Draw a mixed entry decision table for calculating income tax according to the following conditions:

Income Slab	**Rate**
Upto Rs. 18,000	Nil
Greater than Rs.18000 but less than 25000	25%
Greater than Rs.25000 but less than 50000	30%
Greater than Rs.50000 but less than 1,00,000	40%
Above Rs. 1,00,000	50%

Assignment 14.

Given is a data file of School Education Board for compilation of result of middle standard examination. Draw a decision table to compute the result of candidates. The pass formula is:

a) Candidate is to be declared 'PASS' if he gets 40 or more than 40 marks in all three subjects.
b) Candidate is to be declared 'FAIL' if he gets less than 40 marks in TWO OR MORE SUBJECTS.
c) Result is to be declared 'REAPPEAR', if the candidate secures less than 40 marks in one subject and 40 or more than 40 marks in other two subjects.

Assignment 15.

Given a file whose record consists of following attributes:
Roll No.
Name
Sex code 'M' for males
'F' for females
Marks in English
Marks in Biology
Marks in Maths
The scheme for selection and allotment of departments is as follows:

a) Reject the candidate, if aggregate marks are less than 180.
b) Allot 'ENGINEERING ' department if the candidate has maximum marks in maths and sex code is 'M'.
c) Allot 'MEDICAL' department if candidate has maximum marks in biology and sex code is 'F'.
d) Allot 'ENGLISH' department if candidate has maximum marks in English.
e) Allot 'PSYCHOLOGY 'department to all other selected candidates.

Use limited entry decision tree to do the final selection.

Assignment 16.

In Accounts Receivable systems printing of the monthly account statement is the main feature. Because of the frequency of accounts receivable invoices, customers generally expect certain information to be included on the statement. Name, address and account number details are essential as are the previous and current account balances.
A common form lists the date, type, and amount of each transaction in the main part of the invoice. Depending on the particular account, there may be none, one, or many transactions. (Statements are always sent to customers who have a balance outstanding, even if there are no transactions for the current month).

Some systems also charge interest on the previous month's unpaid balance. Interest charged for the current month is listed separately in a special place on the statement form.

At the end of the calendar year, a separate line is often added to inform the customer of the amount of interest paid during the year because Customers want to see this information as a means of knowing how much they paid in interest, and this is also required for reporting their taxes to the Internal Revenue department. To capture a customer's attention, merchants often include a special message on the bottom of the statement form. The message may be up to , 120 characters and can be used to promote special sales, provide consumer service telephone numbers, etc. Its use is, however, optional.

a. Develop the data structure(s) needed to accommodate accounts receivable statement preparation as described above.
b. Indicate which data items are mandatory and which are optional.

Assignment 17.

The sales staff of a Jewellery shop is divided into commissioned salesman and salaried salesman. A commissioned sales man receives 10% commission on every sale greater than or equal to Rs.10, 000.00; receives 5% commission on every sale greater than or equal to Rs.1, 000.00 and less than Rs. 10, 000.00 and receives 2% commission on every sale less than Rs.1, 000.00. A salaried salesperson receives a Rs.700.00 bonus for cumulative sales greater than or equal to Rs.10, 000.00; receives a Rs.50.00 bonus for cumulative sales greater than or equal to Rs.1, 000.00 and less than Rs.1, 000.00, and receives no bonus for sales less than Rs. 1, 000.00

From the above description, develop a class diagram for the system.

Assignment 18.

Prepare a limited entry decision table for the following case:
A wholesaler has three commodities to sell and has three types of customers. Discount

is given as per the following procedure:

a) For VIP'S orders, 10% discount is given irrespective of the value of the order.
b) For orders more than Rs. 50,000/- agent gets a discount of 15% and the retailer gets a discount of 10%.
c) For orders of Rs. 20,000/- or more up to Rs. 50,000/- agent gets a discount of 12% and the retailer gets a discount of 8%.
d) For orders of the value less than Rs. 20,000 agent gets 8% and retailer gets 5% discount.

The above rules do not apply to the furniture items where in a flat rate of 10% discount is admissible to all customers irrespective of the value of the order.

Assignment 19.

Identify the possible actions to be taken for the decision or policy for constructing decision table:

a) Pay no interest
b) Pay 5.75% quarterly interest on entire amount
c) Pay 6% quarterly interest on entire amount
d) Pay 6% monthly interest on amount up to Rs.25000
e) Pay 6.55% monthly interest on amount between Rs.25000 and Rs.50000
f) Pay 7.0% monthly interest on amount over Rs.50000

Assignment 20.

Simplify the following decision table:

	Rules										
1	2	3	4	5	6	7	8	9	10	11	12
C1											
N	Y	N	Y	N	Y	N	Y	N	Y	N	Y
C2											
N	N	Y	Y	N	Y	Y	N	N	Y	Y	
C3											
A	A	A	A	B	B	B	B	C	C	C	C
A1											
		X				X				X	
A2											
X				X				X			
A3											
	X				X						
A4											
			X				X		X		X

Were you able to combine rules 3 and 7 in above problem? Why?

Assignment 21.

Prepare a decision tree that defines the following course grading scheme: A student may receive a final course grade of S,A, B, C or F. In deriving the student's final course grade, the instructor first determines an initial grade for the first test of student. The initial course grade is determined in the following manner.

a) A student who has scored a total of not less than 90 percent on the first test , quiz, class performance and received a score not less than 75 percent in the final test will receive an initial grade of 'S' for the course.
b) A student who has scored a total less than 90 percent but greater than 80 percent on first test quiz, class performance and received a score not less than 70 percent in final test will receive an initial grade of 'A' for the course.
c) A student who has scored a total less than 80 percent but greater than 70 percent in the first test, quiz, class performance and received a score not less than 65 percent in the final test will receive an initial grade of 'B' for the course.
d) A student who has scored a total less than 70 percent but greater than 60 percent on the first test, quiz, class performance and received a score not less than 55 percent in the final test will receive an initial grade of 'C' for the course.
e) A student who has scored a total less than 60 percent in the first test, quiz and class performance will receive an initial and final grade of F for the course.

Once the instructor has determined the initial course grade for the student, the final course grade will be evaluated. The student's final course grade will be the same as his or her initial course grade if no more than four class periods during the semester were missed; otherwise, the student's final course grade will be one letter grade lower than his or her initial course grade (for example, an A will become a B).

Are there any conditions for which there was no course of action specified for the instructor to take? If so, what would you do to rectify the problem? Can your decision tree be simplified? If so, simplify it

Assignment 22.

Given the following use case, develop a class diagram by first developing a scenario diagram and then reducing it to a class diagram.

a) A customer arrives at an investment consultant and makes an initial enquiry about their investment requirements.
b) The consultant records and files the requirements.
c) The consultant checks the product files.
d) The consultant proposes a number of financial products to the customer for selection.
e) The customer then either selects one of the products.
f) The consultant records the decision in the requirements file.

Alternatives
The customer or proposes a variation to one of the alternatives.
The consultant to amend one of the alternatives uses the variation

Assignment 23.

For the following problem of car hire system:
Draw a use case model showing any relationships between the use cases.

USE CASE 1 - DOING RESERVATIONS

a) A customer contacts a reservation officer about a car rental.
b) The customer quotes the start and end dates needed, the preferred vehicle, and the pickup office.
c) The reservation officer looks up a prices file and quotes a price.
d) The customer agrees to the price.
e) The vehicle availability file is checked to see if an appropriate vehicle is available for the required time at the required office.
f) If the requested vehicle is available at the nominated pickup office, then it is reserved for the customer. An entry is made in the vehicle availability registering the reservation.
g) The reservation officer issues the customer with a rental number. A rental agreement is then created on the rental file, including the rental number, the rental period, the vehicle type and the pickup office.

Exceptions

An appropriate vehicle is not available at the pickup office. The customer is offered an alternative vehicle.

The customer does not agree to a price and asks for an alternate vehicle and/or period.

USE CASE 2 – AVAILABILITY SYSTEM

a) A vehicle availability file is checked to see if a vehicle of a given type is available at the requested pickup office for a requested rental period. There is a record for each vehicle, which includes the times, when a vehicle is available and when it is rented.
b) If it is, then the vehicle is reserved for the requested period.

Exception

If a reservation cannot be made because of lack of vehicles a problem report is issued to be used in planning vehicle levels.

USE CASE 3 - INITIATING RENTAL

a) A customer arrives at a pickup office and quotes a rental number to the rental officer.
b) The rental file is checked to the customer's rental number.
c) If so then the rental agreement is retrieved and discussed with customer.
d) If the customer accepts, then a set of rental agreement is printed.
e) The customer signs the agreement and lodges a credit card number.
f) The rental officer requests the customer to select one of a number of insurance options. Following the selection an insurance policy is filled out and attached to the signed agreement.

Exception

A customer does not have a prior reservation. In that case a vehicle availability check is made. If a vehicle is available, the customer is offered the vehicle and a price is quoted. If the customer accepts then a rental is initiated.

If the kind of reserved vehicle is not available to a customer with a prior reservation (because of a late return) then an alternate proposal is made to the customer.

Assignment 24.

Admission procedure in a University is as follows:
An advertisement is issued giving essential qualifications for the course, the last date for receipt of application, and the fee to be enclosed with the application. A clerk in the Registrar's office checks the received applications to see if mark sheet and fee are enclosed and sends valid applications to the concerned academic department. The department checks the application in detail and decides the applicants to be admitted, those to be put in the waiting list, and those rejected. Appropriate letters are sent to the Registrar's office, which intimates the applicant. Give physical and logical DFDs corresponding to the above problem.

Assignment 25.

A magazine is published monthly and is sent by post to its subscribers. Two months before the expiry of subscription, a reminder is sent to the subscribers. If subscription is not received within a month, another reminder is sent. If renewal subscription is not received up to two weeks before the expiry of the subscription, the subscriber's name is removed from the mailing list and the subscriber informed. Obtain logical DFDs for this problem.

Assignment 26.

Obtain a physical DFD for a simple payroll system described below.
A list of employees with their basic pay is sent to a clerk. He calculates the gross pay using standard allowances, which are known for each pay slab. Deduction statements such as loan repayment, subscription to association, EPF, Library security etc. is also sent to another clerk who matches these slips with the slips of gross pay and calculates net pay. This slip is used by a third clerk to write out pay cheques for each employee and sent to respective employees. The total pay bills paid are also computed.

Assignment 27.

Draw the context diagram, level 1 and level 2 diagrams for modelling the processing of an ATM.

B2.1-R4: DATA STRUCTURE THROUGH 'C++'

Objective of the Course

The objective of the course is to introduce the fundamentals of Data Structures, Abstract concepts and how these concepts are useful in problem solving.

After completion of this course student will be able to -

- To Understand and the concepts of object oriented language such as c++
- Analyze step by step and develop algorithms to solve real world problems.
- Implementing various data structures viz. Stacks, Queues, Linked Lists, Trees and Graphs.
- Understanding various searching & sorting techniques.

Outline of Course

S. No.	Topic	Minimum number of hours
1.	Analysis of Algorithm	10
2.	Basics of C++, Elementary Data Structures : Arrays, linked lists	18
3.	Abstract Data types Stacks and Queues	05
4.	Trees	12
5.	Searching, sorting and Complexity	10
6.	Graphs	05

Lectures	**=**	**60**
Practical/tutorials	**=**	**60**
Total	**=**	**120**

Detailed Syllabus

1. Analysis of Algorithm **10 Hrs.**

Introduction to Algorithm Design and Data Structures: Design and analysis of algorithm: Algorithm definition, comparison of algorithms. Top down and bottom up approaches to Algorithm design. Analysis of Algorithm; Frequency count, Complexity measures in terms of time and space. Structured approach to programming.

2. Basics of C++, Elementary Data Structures : Arrays, linked lists **18 Hrs.**

Basics of C++: Structure of a program Variables. Data Types. Constants Operators, Basic Input/Output**,** Control Structure , Functions, Compound Data Types**:** Arrays, Pointers, Dynamic Memory **,** Object Oriented Programming :Classes**,** Encapsulation, Abstraction, inheritance**,** Polymorphism, Representation of arrays: single and multidimensional arrays. Address calculation using column and row major ordering. Various operations on Arrays, Vectors. Application of arrays: Matrix multiplication, Sparse polynomial representation and addition, Stacks and Queues : Representation of stacks and queues using arrays and linked-list. Circular queues, Priority Queue and D-Queue. Applications of stacks: Conversion from infix to postfix and prefix expressions, Evaluation of postfix expression using stacks. Pointers: Definition, Pointer Arithmetic, Array of pointers, Arrays in terms of pointers. Linked list: Singly linked list; operations on list, Linked stacks and queues. Polynomial representation and manipulation using linked

lists. Circular linked lists, Doubly linked lists. Generalized list structure. Sparse Matrix representation using generalized list structure, stacks, queues.

3. Abstract Data types Stacks and Queues **05 Hrs.**

Definition of ADT, Stack ADT (array implementation), FIFO queue ADT (array implementation)

4. Trees **12 Hrs.**

Binary tree traversal methods : Preorder, In-order, Post-ordered traversal. Recursive Algorithms for above mentioned Traversal methods. Representation of trees and its applications : Binary tree representation of a general tree. Conversion of forest into tree. Threaded binary trees. Binary search tree. : Height balanced (AVL) tree, B-trees.

5. Searching, Sorting and Complexity **10 Hrs.**

Selection sort, Insertion sort, Bubble sort, Quick sort, merge sort , Heap sort, Radix sort and their complexity, Searching: Sequential search, Binary Search, Binary Search Tree, ASVL trees, B trees, Searching , sorting and complexity, Searching : Sequential and binary searches, Indexed search, Hashing Schemes. Sorting : Insertion, selection, bubble, Quick, merge, radix, Shell, Heap sort, comparison of time complexity.

6. Graphs **05 Hrs.**

Graph representation : Adjacency matrix, Adjacency lists, Traversal schemes : Depth first search, Breadth first search.

Spanning tree : Definition, Minimal spanning tree algorithms. Shortest Path algorithms (Prime's and Kruskal 's).

RECOMMENDED BOOKS

MAIN READING

1. Hubbard John. R, "Schaum's outline of Data Structures with C++", Tata McGraw-Hill, 2007.
2. Langsam Y,.Augenstein M.J and Tanenbaum A. M, "Data Structures Using C and C++",
   Second Edition, Pearson Education, 2007.
3. Kruse R, Tonodo C.L. and Leung B, "Data Structures and Program Design in C", Pearson Education, 2007.

SUPPLEMENTARY READING

1. Horowitz E, Sahni S and Mehta D, "Fundamentals of Data Structures in C++," Galgotia Publiction, 2009.
2. Weiss M A, "Data Structures and Algorithm Analysis in C++", Pearson Education, 2007.
3. Litvin G, "Programmking with C++ and Data Structures", Vikas Publishing House.

B2.1-R4: DATA STRUCTURE THROUGH C++

NOTE:

1. There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.

2. **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book.

3. Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**.

TOTAL TIME: 3 HOURS **TOTAL MARKS: 100**
(PART ONE – 40; PART TWO – 60)

PART ONE
(Answer ALL Questions; each question carries ONE mark)

1. Each question below gives a multiple choice of answers. Choose the most appropriate one and enter in the "tear-off" answer sheet attached to the question paper, following the instructions therein.

1.1 The equivalent prefix expression corresponding to (A + B) – (C + D * E) / F * G is
- a) - + A B * / + C DE * F G
- b) / - + AB * + C * D E F G
- c) - / + A B * + C D E * F G
- d) - + A B * / + C * D E F G

1.2 The address of a[2][3][4] is_____ where a[3][4][5] is stored in row major order with base address 1050. Assume element size is 4 bytes and the index values start from 0.
- a 1200
- b) 1286
- c 1100
- d) 1186

1.3 The number of nodes in a strict binary tree with n leaves is
- a) 2n - 1
- b) 2n
- c) 2n +1
- d) 2n +2

1.4 The best case of insertion sort is
- a when the data is randomly ordered.
- b) when the data is sorted in reverse order of what is required
- c) when the data is sorted in the same order as what is required
- d) none of the above

1.5 Building new classes from existing classes is
- a) encapsulation
- b) polymorphism

c) inheritance
d) data hiding

1.6 What is the following function doing?

```
int mystery(int temp, int a[], int i) {
        if (i < 0)
                return temp;
        else    {
                if ( temp < a[i])
                        temp = a[i];
                return mystery(temp, a, i - 1);
        }
}
```

a) finding the position of the minimum element in the array passed to it as an argument
b) finding the position of the maximum element in the array passed to it as an argument
c) finding the minimum value in the array passed to it as an argument
d) finding the maximum value in the array passed to it as an argument

1.7 A right in-threaded binary tree has
a) right links having NULL replaced by a special link to the predecessor of the node in inorder traversal
b) right links having NULL replaced by a special link to the successor of the node in inorder traversal
c) left links having NULL replaced by a special link to the predecessor of the node in inorder traversal
d) left links having NULL replaced by a special link to the successor of the node in inorder traversal

1.8 In _____ , a mathematical function is used to determine the location of a record.

a) AVL tree
b) Stack
c) Hashing
d) Adjacency matrix

1.9 Which of the following is not an application of stacks?
a) matrix multiplication
b) implementing function calls
c) conversion of an expression from infix to postfix form
d) determining whether the parentheses in an expression are balanced or not

1.10 Postorder traversal of a tree consists of three steps:
1. Visit the root
2. Traverse left subtree in postorder
3. Traverse right subtree in postorder

The correct sequence of steps is
a) 1 2 3
b) 1 3 2
c) 2 3 1
d) 3 2 1

2. Each statement below is either TRUE or FALSE. Identify and mark them accordingly in the answer book

2.1 Preorder traversal of a tree is the mirror image of its postorder traversal.
2.2 Strict FIFO order is followed in priority queue.
2.3 In selection sort, once the shortest element found in i^{th} iteration is placed at a particular position, it does not change its position after that.
2.4 Given a function prototype as *void fn(char **ptr, int n)* and a variable *char a[10]*, a call to the function can be *fn(&a[3], 10)*.
2.5 Linked list can be implemented using arrays also.
2.6 B-trees have all the leaves at the same level.
2.7 On subtracting two pointers, we get the number of bytes between the two addresses being pointed to by the pointers.
2.8 A graph without cycles is also known as a tree.
2.9 Linear search can be applied on sorted data.
2.10 Queues are used to evaluate prefix expressions.

3. Match words and phrases in column X with the nearest in meaning in column Y.

	X		Y
3.1	Inorder traversal of binary search tree	A.	Bubble sort
3.2	Sparse matrix	B.	Prim's algorithm
3.3	*new* operator	C.	$O(n^3)$
3.4	Shortest path	D.	Non-linear data structure
3.5	Compound data type	E.	Ordered list
3.6	Matrix multiplication complexity	F.	Mostly non zero entries
3.7	Recursion	G.	Dynamic memory allocation
3.8	Linked Lists	H.	Hashing
3.9	Consecutive elements comparison	I.	Integer
3.10	Open addressing	J.	Dijkstra's algorithm
		K.	$O(n^2)$
		L.	Linear data structure
		M.	Defining new data type
		N.	Polymorphism
		O.	Mostly zero entries
		P.	Divide and conquer strategy
		Q.	Heap sort
		R.	Array

4. Fill in the blanks in 4.1 to 4.10 below, by choosing appropriate words and phrases given in the list below:

(a)	Hash tables	(b)	int *p[10];	(c)	Depth
(d)	Complete binary tree	(e)	$O(n^2)$	(f)	n + 1
(g)	Binary search tree	(h)	Adjacency lists	(i)	Data
(j)	Stacks	(k)	n – 1	(l)	Objects
(m)	Radix	(n)	AVL tree	(o)	Index
(p)	Heap sort	(q)	Shell sort	(r)	O(n lgn)
(s)	Breadth	(t)	n	(u)	int (*p)[10];
(v)	General tree	(w)	Bubble sort	(x)	Quicksort

4.1 Another name for height balanced tree is_____ .
4.2 Mergesort has_____ complexity.
4.3 Graphs can be represented using_____ .

4.4 _____ represents an array of pointers.
4.5 Preorder traversal of a tree is a type of _____ first search.
4.6 A tree with n vertices has _____ edges.
4.7 _____ are instances of classes.
4.8 Indexed sequential search requires _____ file to be in sorted order.
4.9 _____ uses the concept of increments to sort data.
4.10 A _____ is a tree with the maximum number of nodes for a given depth.

PART TWO
(Answer any FOUR questions)

5.

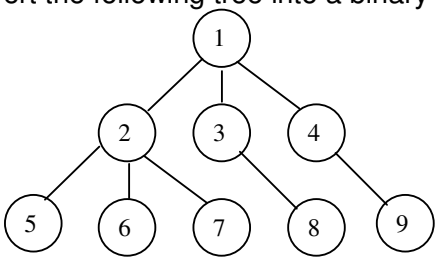
a. Create a class TwoDim which contains x and y coordinates as int. Define the default constructor, parameterized constructor and void print() to print the co-ordinates. Now reuse this class in ThreeDim adding a new dimension as z of type int. Define the constructors for the derived class and override the method void print() in the subclass. Write main() to show runtime polymorphism.

b. Apply binary search algorithm to search for 90, in the following list of numbers:
12, 25, 33, 37, 48, 50, 53, 57, 86, 92
Show the outcome after each iteration.

(9+6)

6.

a. Convert the following tree into a binary tree



b. Create a binary search tree for the following sequence:
Tina, Manik, Nupur, Utsav, Neha, Alka, Sehej, Monika, Geetu, Uday

c. What do you understand by space and time complexity? Calculate the space and time complexity of linear search method.

(3+5+7)

7.

a. Write a C++ program to create a doubly linked circular list L, with a header node. The data values of nodes are of character type. The nodes are to be inserted in the list in such a way that the nodes are in ascending order of their data values. In addition to this, it should be possible to delete a node with the given data value from the list.

b. Evaluate the following prefix expression:
**A+BC-+CBA
Assume A = 1, B = 2 and C = 3

(12+3)

8.

a. What is an ADT? Briefly explain the various components of an ADT.

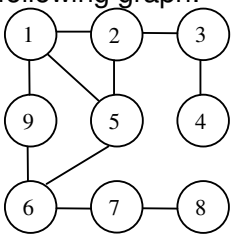
b. Apply heapsort on the following unsorted list of keys
8, 20, 9, 4, 15, 10, 7
Show intermediate the steps.

(6+9)

9.

a. Draw a B-tree for the following data: 23, 65, 37, 60, 48, 91, 15, 75, 86 and 58. Suppose that the search field values are inserted in the given order in a B-tree of order p = 3; show how the tree will expand and what will the final tree look like?

b. Consider the following graph:



Give the implementation of the graph as an adjacency matrix. Also write the depth-first and breadth-first traversals of the graph.

(9+6)

B2.1-R4: DATA STRUCTURE THROUGH C++

Assignment 1.

Write a program that reads ten numbers from the user. These ten numbers represent the scores that a student has received in a class. Your program should create a nicely formatted report that displays all ten scores as well as the total score and average score that the student received.

Assignment 2.

Write a C++ program that reads ten numbers from the user. After reading all ten numbers, compute the sum of the odd-positioned numbers, multiply all of the even-positioned numbers together, and add these two numbers together. That is, you should add the first, third, fifth, seventh, and ninth numbers. You will then multiply the second, fourth, sixth, eighth, and tenth numbers. The sum of these two numbers is your final result.

Assignment 3.

The library circulation system will keep track of every book as well as library cardholders. Each time a book is checked out or returned, the system must keep track of it. Books can be added to the library's collection and also removed. Due dates for books should be tracked, as well as notices sent out for materials that are more than a week overdue. Fines for overdue materials should be calculated, and a record kept of the amount owed by each cardholder.

Design appropriate classes that keep records of book(book no, book name, author name), cardholders(member no, member name, age, address, city) and issue_return(book no, member no, date of issue , date of return, fine). Write appropriate functions

a) for keeping records of books,videos and audios in the library.
b) for checking out or returning of book
c) for adding or removing of books in the library
d) for keeping track of fine due if the book is returned after due date

Assignment 4.

a) Write a program that can be used as a database of student's information for a department. The program should be able to dynamically allocate or deallocate storage for the student's records using linked lists. The database should have the following fields: the first and last names, a course code, and a grade for a student.

The program should display the following menu:
Welcome to the database menu!
Press 1 to insert a new record
Press 2 to delete a record
Press 3 to search the database (by last name)
Press 4 to print a range in the database
Press 9 to quit

b) Write a program for merging two sorted linked lists to form a third sorted linked list.

Assignment 5.

Implement a sparse matrix in which any or most of the entries are zero. Because allocating memory space for all entries of the matrix will be wasteful we intend to allocate memory space only for nonzero entries.

(a) Represent a sparse matrix as a doubly linked circular or any other data structure which you think is useful.
(b) Write a program to perform the following operations:
(i) Read in inputs for the entries of a sparse matrix and form a suitable data structure.
(ii) Addition of two sparse matrices
(iii) Subtraction of two sparse matrices
(iv) Multiplication of two sparse matrices
(v) Deletion of a sparse matrix
(vi) Print sparse matrix (in matrix form)
Hint : Each entry of a sparse matrix can be viewed as a structure of the form

Row-index	Column-index	Value
Left pointer	Up pointer	

Row index points to the next row (i.e. down). Column-index points to the next column (i.e. right).Value points to the information of data type added. Left pointer points to the element towards the next left element. Right pointer points to the element towards the next up element.

Assignment 6.

There are three circular disks having a hole in the center and placed on a peg and there are two empty pegs. The three disks are of different sizes. It is now required to transfer the three disks (named A, B, and C : C is smallest) from the source peg P1 to the target peg P2 using a standby peg P3 such that

(i) only one disk can be moved at a time and
(ii) no disk can be kept on top of a disk with smaller diameter.
Build a system that gives the solution for the above problem.
[Hint: Assume that there are three stacks for three pegs SP1, SP2, and SP3.
Transferring a disk
from one peg to other involves ADD and DELETE operations of stacks]

Assignment 7.

Given a linked list of integers sorted from smallest (at the head end) to largest, and a pointer to a single node containing an integer, make appropriate function that insert the node in the linked list so that it remains sorted.

Assignment 8.

Implement a data structure that supports the following operations: insert, findMin, findMax, deleteMin, deleteMax, isEmpty, makeEmpty. You must use the following algorithm: maintain a sorted array. Insert new items into the correct position in the array, sliding elements over one position to the right, as needed. findMin and findMax, and deleteMax are trivial. For deleteMin remove the item in position 0, and slide over all the other items one position to the left.

Assignment 9.

Companies and people often buy and sells stocks. Often they buy the same stock for different prices at different times. Say a person owns 1000 shares a certain stock (such

as Checkpoint), she may have bought the stock in amounts of 100 shares over 10 different times with 10 different prices.

In this assignment, you will be using a stack for Lifo accounting. You should use an array based implementation for your stack based implementation or a linked list for implementing your stack. Your stack should have records with the following fields:
The name of the stock (a string or int)
The number of shares of a stock (an int)
The purchase price (can be a decimal)

You can assume that the first element of the structure is the security bought first, the second was bought second, etc.

Create a program that should have the user able to enter information about various stocks, the amount of shares, and the price. The user can then enter a query about a certain stock and the cost according to the Lifo accounting methods for a certain number of shares.

The following could be your menu:

Press 1 to enter a new stock.
Press 2 to find the Lifo price for a stock.

If 1 is pressed, the user needs to enter the stock symbol, and the number of shares, and the price.
If 2 is pressed, the user needs to enter the stock symbol being queried and the number of shares in question.

Assignment 10.

Companies and people often buy and sells stocks. Often they buy the same stock for different prices at different times. Say a person owns 1000 shares a certain stock (such as Checkpoint), she may have bought the stock in amounts of 100 shares over 10 different times with 10 different prices.

In this assignment, you will be using a queue for storing data for Fifo accounting You should use an array based implementation for your queue based implementation or a linked list for implementing your queue.

Your queue should have records with the following fields:
The name of the stock (a string or int)
The number of shares of a stock (an int)
The purchase price (can be a decimal)

You can assume that the first element of the structure is the security bought first, the second was bought second, etc.
Create a program that should have the user able to enter information about various stocks, the amount of shares, and the price. The user can then enter a query about a certain stock and the cost according to the Fifo accounting methods for a certain number of shares.

The following could be your menu:

Press 1 to enter a new stock
Press 2 to find the Lifo and Fifo price for a stock.

If 1 is pressed, the user needs to enter the stock symbol, and the number of shares, and the price.

If 2 is pressed, the user needs to enter the stock symbol being queried and the number of shares in question.

Assignment 11.

A deque is a data structure consisting of a list of items, on which the following operations are possible:

a) push x : Insert x on the front end of the deque.
b) pop : Remove the front item from the deque and return it.
c) inject x : Insert x on the rear end of the deque.
d) eject : Remove the rear item from the deque and return it.

Describe routines to support the deque that take constant number of steps for each operation. You may use array-based or pointer-based implementation.

Assignment 12.

A Matrix is a rectangular arrangement of values where each element is specified as

A={a[i,j] }m*n

a[i,j] is element at i-th row and j-th column.

m is the number of rows, n is the number of columns.

Assume we have multiplication of two matrices as

$$\begin{bmatrix} 1 & 1 & 4 \\ 2 & 3 & 2 \\ 3 & 2 & 1 \end{bmatrix} * \begin{bmatrix} 2 & 3 & 4 \\ 2 & 1 & 2 \\ 3 & 1 & 1 \end{bmatrix} = \begin{bmatrix} 16 & 8 & 10 \\ 16 & 11 & 16 \\ 13 & 12 & 17 \end{bmatrix}$$

Write a program for Multiplication of two matrices using OOP concept?

Assignment 13.

A polynomial(quadratic) is as

ax^2 + bx + c where a,b,c are constants and x is a variable

Here's a table of names for polynomials and their sources:

degree	name	shape	dimension
1	linear	line	(1)
2	quadratic	square	(2)
3	cubic	cube	(3)
4	quartic	-	4
5	quintic	-	5

a) Write a program for implementing a polynomial of degree 2?

b) Write a program for adding and subtract two polynomials(Using Linked List)

Assignment 14.

Consider a database of student's information for a department . The program should be able to dynamically allocate or deallocate storage for the student's records. The database should have the following fields:

the first and last names, a course code, and a grade for a student

Create a C++ function to search a particular student's information from the database using

a) linear search and
b) binary search

Assignment 15.

Consider a database of patient's information for a hospital. The program should be able to allocate and deallocate storage memory for the patient's records. The database should have the following information field:

the first and last names, patient id, address , related disease , date of admission

Devise an appropriate C++ class and circular queue using arrays to implement the following functions

a) creation of circular queue,
b) accessing the element from the circular queue, and
c) searching element from the circular queue.

Assignment 16.

Create a Phone Book Data Store class. The requirements for this class are given below:

-Create 2 String arrays for storing names and numbers, respectively.

-Create class member variables for the capacity of the storage and the number of entries in use.

-Use the constructor to initialize the arrays to a size specified by a parameter.

-On this class, create and implement the following 4 methods:

o storeNumber( ) should take two parameters, the name and the phone number to store; it will not return any value. It will iterate through the store, find the next open space, and store the name and number.

o retrieveNumber( ) should take one parameter, the name, and return one parameter, the number. It will iterate through the storeuntil it matches the name, and then return the number.

o replaceNumber( ) should take two parameters, the name and the phone number to store; it will not return any value. It will iterate through the store until it matches the name, and then replace the number.

o getAllNamesAndNumbers( ) does not take any parameters. It will return a list of all of the names and numbers stored in the store.

-Use the PhoneBookDataStore.main( ) method to test the data structure. Create an instance that stores 5 numbers.

Finally, create an instance of PhoneBookDataStore as a member of your PhoneBook class, and implement the user interface (e.g. prompting) using circular linked list to

(a) collect names and phone numbers from the user and store them in the data store and
(b) print out a list of names and numbers.

Assignment 17.

a) Infix, Postfix and Prefix notations are three different but equivalent ways of writing expressions.

Infix notation: X + Y

Operators are written in-between their operands. This is the usual way we write expressions. An expression such as A * (B + C) / D is usually taken to mean something like: "First add B and C together, then multiply the result by A, then divide by D to give the final answer."

Postfix notation (also known as "Reverse Polish notation"): X Y +

Operators are written after their operands. The infix expression given above is equivalent to A B C + * D /

Prefix notation (also known as "Polish notation"): + X Y

Operators are written before their operands. The expressions given above are equivalent to / * A + B C D

Write a program in C++ to convert an expression into a) prefix and b) postfix expression?

b) Write a C++ program for the evaluation of postfix expression using Stack?

Assignment 18.

Implement a class of your own: a priority queue for a hospital emergency room, for example, where it needs to schedule patients according to priority. A patient with a more critical problem will pre-empt others even if they have been waiting longer. This is a priority queue, where elements are prioritized relative to each other and when asked to dequeue one, it is the highest priority element in the queue that is removed.

Write necessary functions on a priority queue as

a) create a empty queue,
b) whenever a more critical patient come, the system will preempt the queue and add patient in the queue depending on its priority,
c) access all patients information from the queue?

Assignment 19.

Parsing a file is when you read a file to collect information from the file.
In this assignment, you will parse a file, and put all of the words in a BST. You will use the BST to collect data about the number of times a word was found in the file. You should make no assumptions about which letters are in the middle (like M). The first word you encounter will be the root. If the next word is greater, put it to the right. If it is less, put it to the left. It is possible that the tree you make will be very very sparse (think what happens when the first word is zylberstein). Assume all words in the file are lower case (you can covert them easily anyway). I would recommend using the string library (it makes comparisons much better).

Devise appropriate functions for

a) creating a BST,
b) adding any word,
c) deleting any word,
d) modification of any word, and
e) searching any word in a BST.

Assignment 20.

Build a Binary Search tree by adding the following items into an empty Binary Search Tree, in order:

a) J, T, E, G, F, B, A, R, O, P, U, M, N, K, L, H, D, S, C, Q, I

Write the functions for the tree in each of the following orders:

a) Pre-order first traversal
b) In-order first traversal
c) In-order first traversal

Assignment 21.

There are different sorting techniques used for arranging the values present in the list.

Suppose we have a list of names of persons as

a)“Rajan”, “Rohit”, “Aman”, “Jinny”, “Sanjay”, “Bhatachariya”

Write C++ programs arrange these names using:

a) Bubble Sort,
b) Selection Sort,
c) Insertion Sort,
d) Quicksort,
e) Heap Sort
f) Merge Sort
ii) Differentiate between sorting Arrays vs sorting Linked Lists?

Assignment 22.

A bank needs to maintain records of its customers. It is decided to create a database using B-Tree or any other data structure which you think is useful. The order is based on the key and the Social Security number of each Customer. Each record contains the following information.

Name
Social Security Number
Street Address
City
State
Pin code
Date of Birth
Marital Status
Account Number
Account Type (Fixed, Saving, etc.)

A DBMS needs to be designed to provide menu driven facility to its users. The facilities are :

I. Insert the record for a new customer
F. Find and display the record for a customer specified by name or by social security number
U. Update the record
D. Delete the record of a customer from the database.

Assignment 23.

A balanced binary search tree where the height of the two subtrees(children) of a node differs by at most one is known as AVL tree. Insert 2 ,9 ,4 ,1, 7, 10, 3, 6, 5, 8 one by one into an initially empty AVL tree. Show the AVL tree after each insertion.

Write a C++ program for creating AVL tree-with insertion, deletion of data values into it?

Assignment 24

Kruskal’s algorithm is an algorithm for computing a minimum spanning tree. It maintains a set of partial minimum spanning trees, and repeatedly adds the shortest edge in the graph whose vertices are in different partial minimum spanning trees.

Write a C++ program for implementing Kruskal’s algorithm for a graph shown in Figure 1?

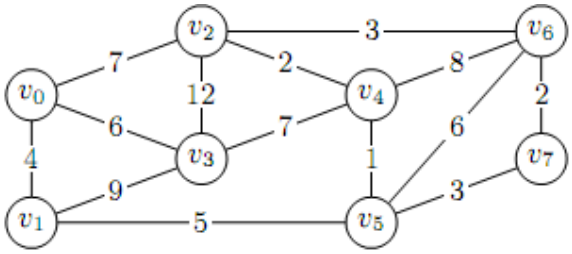


Figure 1: Undirected Graph

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Assignment 25.

In Prim's algorithm,we compute a minimum spanning tree by beginning with any vertex as the current tree. At each step add a least edge between any vertex not in the tree and any vertex in the tree. Continue until all vertices have been added.

Write a C++ program for implementing Prim's algorithm for a graph shown in Figure1?

Assignment 26.

Depth First Search is any search algorithm that considers outgoing edges (children) of a vertex before any of the vertex's siblings, that is, outgoing edges of the vertex's predecessor in the search. Extremes are searched first. This is typically implemented with a stack. Also known as DFS. Write a program in C++ to find the DFS of the graph shown in Figure 2?

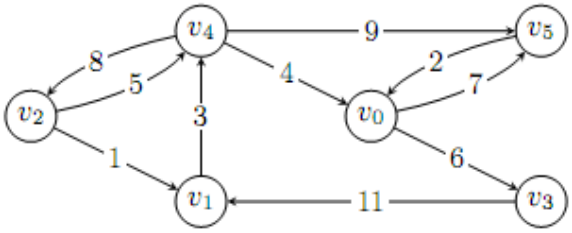


Figure 2: Directed Graph

Assignment 27.

Breadth First Search is any search algorithm that considers neighbours of a vertex, that is, outgoing edges of the vertex's predecessor in the search, before any outgoing edges of the vertex. Extremes are searched last. This is typically implemented with a queue. Also Known as BFS. Write a program in C++ to find the BFS of the graph shown in Figure 2?

B2.2-R4: INTRODUCTION TO DATABASE MANAGEMENT SYSTEM

Objective of the Course

This course will allow students to develop background knowledge as well as core expertise in Database Management Systems. The students will learn Database concept, Data Structure, Data Models, various approaches to Database design, strengths of relational model, Normalization.

At the end of the course the student will be able to

- Understand Database design and normalisation techniques.
- Use Standard Query Language and its various versions.
- Understand Importance of backup and recovery techniques.
- Develop Database system to handle the real world problem.

Outline of Course

S. No.	Topic	Minimum number of hours
1.	An Overview of Database Management System	04
2.	An Architecture of the Database System	04
3.	Relational Database Management System	08
4.	Normalization	08
5.	Relational Algebra and Relational Calculus	08
6.	The SQL Language	12
7.	Backup and Recovery	02
8.	Security	02
9.	Integrity	02
10.	Design and Development of Database Applications	10

Lectures	**=**	**60**
Practical/tutorials	**=**	**60**
Total	**=**	**120**

Detailed Syllabus

1. An Overview of the Database Management System **04 Hrs.**

What is database?, Why database?, database system, database management system (DBMS), advantages of DBMS.

2. An Architecture of the Database system **04 Hrs.**

Three levels of architecture, mappings, role of database administrator(DBA), E-R model, three approaches of DBMS- relational, hierarchical and network.

3. Relational Database Management System (RDBMS) **08 Hrs.**

Introduction, RDBMS terminology, relational model, base tables, keys.

4. Normalization **08 Hrs.**

Normal forms, Boyce-Codd Normal form, higher normal forms.

5. Relational Algebra and Relational Calculus **08 Hrs.**

Relational operators, tuple calculus, well formed formulae.

6. The SQL Language **12 Hrs.**
Introduction , Characteristics of SQL, data definition, data manipulation, SQL commands, SQL operators, Queries, aggregate functions.

7. Backup and Recovery **02 Hrs.**
Transaction recovery, system recovery, SQL support

8. Security **02 Hrs.**
General considerations, controls, audit trail, data encryption, SQL support.

9. Integrity **02 Hrs.**
General considerations ,integrity rules, SQL support.

10. Design and Development of Database Applications **10 Hrs.**
Database applications using some standard RDBMS.

RECOMMENDED BOOKS

MAIN READING

1. Silberschatz A, Korth H.F and Sudarshan S, "Database System Concepts", Fifth Edition, Tata McGraw-Hill, 2006.
2. C.J.Date, " An introduction to Database Systems", Pearson Education, 2007.
3. R. Elmasri, S. B Navathe, " Fundamentals of Database System", Pearson Education, 2007.
4. Desai C. Bipin, "An Introduction to Database Systems", Galgotia Publication, 2009.

SUPPLEMENTARY READING

1. Leon A and Leon M, "Fundamentals of DBMS", Vijay Nicole & Tata McGraw-Hill, 2007.
2. Gill P.S, "DBMS", I.K. International, 2008.
3. Singh S.K, "Database Systems: Concepts, Design & Applications", Pearson Education, 2008.
4. Leon A and Leon M, "Database Management Systems", Vikas Publishing House.

B2.2-R4: INTRODUCTION TO DATABASE MANAGEMENT SYSTEM

Model Question Paper

NOTE:

1. There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.

2. **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book.

3. Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**.

TOTAL TIME: 3 HOURS **TOTAL MARKS: 100**
(PART ONE: 40; PART TWO: 60)

PART ONE
(Answer all the questions; each question carries ONE mark)

1. Each question below gives a multiple choices of answers. Choose the most appropriate one.

1.1. One of the following is a valid record -based data models
- e) Object-oriented model
- f) Relational model
- g) Entity-relationship model
- h) None of the above

1.2. Which of the following is not a valid unary operation in the relational algebra?
- e) select
- f) min
- g) project
- h) rename

1.3. An abstraction concept for building composite objects from their component object is called
- e) Specialization
- f) Normalization
- g) Generalization
- h) Aggregation

1.4. The expression (RUS)-((R-S)U(S-R)) is equivalent to
- e) R □□S
- f) R □□S
- g) □□(condition) (RxS)
- h) □(RxS)

1.5. To represent many to many relationship between two entity types A and B in a relational model
- e) put identifying attribute(s) of A in the relation representing B.
- f) put identifying attribute(s) of B in the relation representing A.

g) create a new relation to represent the relationship.
h) It can not be represented.

1.6. If a relation A has m attributes and relation B has n attributes and A divide by B is possible then A divide by B has
e) m*n attributes
f) m-n attributes
g) n-m attributes
h) m / n attributes

1.7. Which of the following cannot enhance database system throughput?
e) Database system throughput can be enhanced by locking the smallest sized objects possible
f) Database system throughput can be enhanced by reducing the time that transaction that hold locks
g) Database system throughput can be enhanced by reducing the hot spots (frequently accessed and modified database objects)
h) Increasing the main memory capacity can enhance database system throughput.

1.8. Object based data models are used in describing the abstraction of the following level(5).
e) Only physical
f) Conceptual and view
g) Physical and conceptual
h) None of the above

1.9. Assume transaction A holds a shared lock R. If transaction B also requests for a shared lock on R.
e) it will result in a deadlock situation
f) it will immediately be granted
g) it will immediately be rejected
h) it will be granted as soon as it is release by A

1.10. In which of the following situations would one have to use an outer join in order to obtain the desired results?
e) A report is desired that lists all customers who placed an order.
f) A report is desired that lists all customers and the total of their orders.
g) A report is desired that lists all customers, the total of their orders during the most recent month, and includes customers who did not place an order during the month (their total will be zero).
h) There is never a situation that requires only an outer join.

2. Each statement below is either TRUE or FALSE. Identify and mark them accordingly in the answer book.

a. In a hierarchical database, modeling of many to many relations in achieved by record replication.
b. Two–phase locking protocols ensures freedom from deadlock.
c. A constraint is a rule in a database system that can be violated by users.
d. Integrity constraint guard against accidental damage to the database.
e. The recovery manager is responsible for implementing a particular strategy for concurring control.
f. Specialization is the reverse of generalization.

g. Domain relational calculus restricted to safe domain expressions is equivalent in expressive power to the basic relational algebra.

2.8 The process of check pointing reduces the amount of work done by DBMS during the restarting process.

2.9 A view is a table whose rows are computed as needed.

2.10 If GROUP BY is omitted in a SELECT command; entire table is taken as a group.

4. Match words and phrases in column X with the nearest in meaning in column Y.

X	Y
3.1 Operation that create a new instance of a class is called a(n)	n) Unary
3.2 Shows the static structure of an object-oriented model	o) constructor operation
3.3 A set of values that may be assigned to an attribute.	p) DDL
3.4 A system used in transaction-oriented applications that involve real-time processing of transactions.	q) Online Transaction Processing
3.5 Relationship occurs between two instances of a single entity type	r) DISTINCT
3.6 Encoding data to make them unintelligible to unauthorized persons.	s) Domain
3.7 A logical representation of the data for an organization	t) Data recovery
3.8 Data Dictionary	u) Class Diagram
3.9 Shadow paging	v) entity-relationship model
3.10 Eliminate duplicate rows from the query result set.	w) DML
	x) Encryption
	y) Deadlock
	z) Cardinality

5. Fill in the blanks in 4.1 to 4.10 below, by choosing appropriate words and phrases given in the list below :

(a) Encapsulation	(b) Class	(c) Structured Query Language	(d) entity
(e) Candidate key	(f) enterprise data modeling outer jain	(g) abstract class	(h) CASCADE
(i) Interleaved main memory	(j) Virtual memory	(k) conceptual schema	(l) client
(m) null			

a. _____ is a tool even non-programmers can use to access information from a database.

b. The first step in database development, in which the scope and general contents of databases are specified, is called _____.

c. The _____ tier concentrates on managing the user-system interface as well as localized data.

d. When creating tables using the CREATE TABLE statement, NOT NULL constrains an attribute from being assigned a(n) _____ value.

e. An attribute or combination of attributes that uniquely identifies a row in a relation is called a(n) _____ _____.

f. _____ is the technique of hiding the internal implementation details of an object from

its external view.

g. A class that has no direct instances, but whose descendants may have direct instances is called a(n) _____ _____.
h. Using an _____ _____ produces this information: rows that do not have matching values in common columns are also included in the result table.
i. The ON UPDATE _____ option allows changes to a parent table to pass onto a child table or tables.
j. Transforming data in blocks from the main memory to the cache memory enables an _____unit to operate at its maximum speed.

PART TWO
(Answer any FOUR questions)

5.

a. Construct an ER diagram (including important attributes) for a car insurance database that includes data about Customer (Car owner), Cars, accident, drivers involved in accidents and injured drivers and/or passengers. Note that any customer can insure many cars, each car may have different drivers at different times and accidents typically involved one or more cars.
b. Explain the advantages and disadvantages of Database Processing?

(10+5)

6.

a. Explain the purpose and scope of Database security and explain the following in terms of providing security for a database: authorization, views, backup and recovery, Integrity, encryption and RAID technology.
b. Consistency and reliability aspects of transaction are due to the ACIDity properties of transaction. Discuss each of these properties and how they relate to the concurrency control and recovery mechanisms? Give examples to illustrate your answer.

(8+7)

7.

a. Explain the difference between external, internal and conceptual schemas. How these different layers are related to the concepts of logical and physical and physical data independence.
b. What is a time stamp? How do time stamp based protocols for concurrency control differ from locking based protocols?

(7+8)

8.

a. Consider the following Relation Schema. An employee can work in more than one department:
   Emp (E-id, E_name, Salary)
   Dept (d_id, d_name, manager_id, floor_number)
   Write the following queries in SQL:
   I. Print the name of all employees, who work on the 10th floor and earn salary less than Rs.50,000.
   II. Print the names of the departments that employee Santa work in.
   III. Print the names of all managers who manage three or more departments on the same floor.
   IV. Print the names of all employees who work on floors where Jane Donald works.
   V. Give every employee who works in the toys dept. at 10% raise in the salary.

b. Explain 3rd normal form with suitable example.
c. In what way dynamic SQL is different from embedded SQL?

(5+5+5)

9.

a. Explain the Codd rules regarding null values and database description.
b. Explain the three levels ANSI/SPARC database architecture with its significance.
c. Explain with examples, how primary key and foreign key concepts is useful in relational data model?

(6+6+3)

B2.2-R4: INTRODUCTION TO DATABASE MANAGEMENT SYSTEM

Assignment 1.

The following tables form part of a database held in a relational DBMS:
Hotel (Hotel_No , Name, Address)
Room (Room_No, Hotel_No, Type, Price)
Booking (Hotel_No, Guest_No, Date_From, Date_To, Room_No)
Guest (Guest_No, Name, Address)
where Hotel contains hotel details and Hotel_No is the primary key. Room contains room details for each hotel and (Hotel_No, Room_No) forms the primary key.
Booking contains details of the bookings and the primary key comprises (Hotel_No, Guest_No, Date From) and Guest contains guest details and Guest_No is the primary key.

Write the SQL statements for the following:

a) List full details of all hotels in Mumbai.
b) List the names and addresses of all guests in New Delhi, alphabetically ordered by name.
c) List all double or family rooms with a price below Rs.800 per day, in ascending order of price.
d) List the bookings for which no date to has been specified.
e) What is the total daily revenue from all the double rooms?
f) How many different guests have made bookings for August, 2006?
g) List the price and type of all rooms at the hotel Land Mark.
h) What is the total income from bookings for the hotel Manor today

Assignment 2.

Create an E R diagram and relational schema to hold information about the situation in many institutions affiliated to some University, many teachers of different disciplines are teaching to many students enrolled in many courses offered by the university to the students through the institutions. Use concept of keys, aggregation, generalisation, cardinality etc. in a proper way.
Say the schema of respective entities is:

Teacher(T#, Tname, Tqual, Tsubject, Tcourse, Prog)
Student(Roll#., Sname, Sage, Saddress, Scourse.Prog , Smarks)
Teaches(T#, Roll# , Scourse, Prog ,University)

Assignment 3.

Performa following queries in SQL using the above schema:

a) Find details of Teachers who taught DBMS.
b) Find details of students who did MCA from PB University.
c) Find courses taught by T# 5078.
d) Find address of students whose marks are less than 50.

Assignment 4.

Consider the following requirements for a construction company that uses database system to keep track of its projects, workers and material requirements of various projects.

The projects for the company are of two kinds: (i) Turn key projects and (ii) Others.

All the projects have a life cycle (Please note that the turn key projects have a maintenance phase in addition.) and workers are allotted as per the phase of the project. Each project has its own plan of completion that is drawn at the start of the project. The worker and material requirement of project is calculated at the start of the project.

The store manages the materials. One of the major constraints for the store is that it requires 15 days to acquire a product. Thus, the inventory should fulfil the requirements of the next 15 days.

The store also keeps track of the issue of materials and return of defective materials to various projects.

The company keeps the information of all the clients including the information about the projects that are being maintained by the company (turn key projects).

Draw an ER diagram for the above company. Specify key attributes and constraints of each entity type and of each relationship type. Note any unspecified requirements and make appropriate assumptions to make the specification complete. Also, design the normalised tables with required integrity and security constraints.

Assignment 5.

Assume that a Consumer item lease Company which leases various household items to its clients for their use for a specific period of time, maintains the following tables:

Clients (clientID, name, address, contact Phone)
Itemlist (itemID, itemName, itemCost, purchase Date)
Leaselist (clientID, transactionNO, itemID, startDate, returnDate, amountTObeCharged)

Note: A client may lease an item many times. Amount to be charged is calculated as per a fixed rate multiplied by number of days item is leased. All items have unique itemID. However, two or more items may have same name.

Create the tables having appropriate referential integrity constraints. Make and state assumptions, if any.

Write and run the following SQL queries on the tables:

a) Find all the client names that have not got any item leased during the last month and no leased item is pending with them.
b) Find the list of all the items that were leased or returned last month.
c) Find the names of all those clients who have given the business to the company in the decreasing order of total amount paid by a client.
d) List the client's details and the items leased to them at present.
e) Find the client who has been leased at least two items.

Assignment 6.

Produce an E-R diagram, which documents the entities and relationships involved in the staff management and pay-roll for the employees working in a super market. Create a

relational schema to hold information. Identify the tables, perform normalization to the tables and fully implement the code with necessary validations using MS-Access / FOXPRO / DBASE or any other similar package. Provide necessary documentation and coding for the project.
Note: Assumptions can be made wherever necessary

Assignment 7.

The NBA (NDHU Basketball Association) is in dire need of a database in order to keep track of the activities in their league.

The entities in the database are

People (with attributes **id**, **name** and **age**),
Teams (with attributes **team name** and **manager**), and
Courts (with attributes **court id**, **address** and **capacity**).

Furthermore, people are specialised into **Referees** and **Players**.

Referees have the extra attribute **level** and
Players have the extra attribute **height**.
Players play in **teams**, and **teams** and **referees** participate in a game that takes place in a court on a certain date.

This league is quite violent and very often players are fouled out by referees. This causes bad relationships between teams and referees and some teams disqualify some referees from refereeing their games.

Some way of recording each game is also required. This will need to store the home and away teams scores.

No player plays for more than one team. Only one game is played on one court on any one day.

a) Produce a set of normalised entities to 1NF. *Add attributes as you think they are required.*
b) Create an ER diagram that models the relationships in the system.

Assignment 8.

Normalization of the CAR_SALE Table.
The purpose of this exercise is for you to demonstrate your ability to take a database schema and convert it up through the Third Normal Form. Upon completion of this exercise you will have:

a) Listed the functional dependencies for a database schema
b) Explained why a specific schema is not in Second or Third Normal Form
c) Normalized a given schema into the Third Normal Form

The below scenario has been created to help you determine the table structures required for each of the subsequent normalized tables.

Scenario
You are given the database schema for a car sales database as follows:

Table Name: CAR_SALE

ColumnName Car_num Date_sold Salesman Commission_percent Discount_amt

KeyType Primary Primary
Assuming that a car can be sold by multiple salesmen and, therefore, the attributes of ar_num and Salesman {Car_num, Salesman} taken together are the primary key for the relation. In addition, you are told that the date the car sells determines the discount amount and that each salesman has a unique commission rate.

Directions
To complete exercise one, you should do the following:
a) Read and complete each of the three steps identified under exercise two
b) Create a response for each step listed under exercise two
c) Create your response using MS Word
d) When appropriate, use the table feature within Word to create your tables.
e) Save the document as identified in the "Labs" section of the roadmap and upload the file in the course communication space drop-box.

Step 1
List the functional dependencies in the relation CAR_SALE. Based on the given primary key, decide if the dependency is
a) completely dependent on the primary key (primary keydependency),

b) partially dependent on the primary key (partial key dependency), or

c)dependent on a non-key column (transitive dependency) for each of the Functional Dependencies you list.

Step 2
Explain why the relation CAR_SALE is not in 2NF or 3NF
Step 3
Normalize the relation CAR_SALE into 3NF. Show your results by providing the resulting table schemas.

Assignment 9.

Exam Administration

Consider the following relation that keeps track of the exams taken by students at a University department:

Exam(studID, studName, courseID, courseTitle, acadYear,
examSession, mark, degreeCourse)

Suppose the following functional dependencies hold on the relation:

studID -> studName, degreeCourse
courseID -> courseTitle
studID, courseID, acadYear, examSession -> mark
studID, courseID -> acadYear, examSession

a) Decompose the relation in smaller relations such that

– each of the smaller relations is in BNCF with respect to the projection of the original dependencies;
– the decomposition is a loss less join decomposition.

b) Is your decomposition dependency preserving? If your answer is “yes”, argue why. If your answer is “no”, show which dependencies have been lost.

Assignment 10.

Wholesale Dealer
Consider the following relation that keeps track of the sales of a wholesale dealer in trousers:

TrousersSold(customerID, customerName, model, size, day, numberSold, price)
Suppose the following functional dependencies hold on the relation:

customerID -> customerName
customerID, model, size, day -> numberSold
model, size -> price
model, price -> size

a) Decompose the relation in smaller relations such that
– each of the smaller relations is in BNCF with respect to the projection of the original dependencies;
– the decomposition is a lossles join decomposition.

b) Is your decomposition dependency preserving? If your answer is “yes”, argue why. If your answer is “no”, show which dependencies have been lost.

Assignment 11.

Manufacturing
Consider the following relation that keeps track of the orders placed by a manufacturing company:

Orders(orderDate, deliveryDate, supplier, partID, material, price).

Suppose the following functional dependencies hold on the relation:

orderDate, supplier -> deliveryDate
partID, supplier, orderDate -> price
partID -> material
material -> supplier.

a) Decompose the relation in smaller relations such that
– each of the smaller relations is in BNCF with respect to the projection of the original dependencies;
– the decomposition is a lossless join decomposition.

b) Is your decomposition dependency preserving? If your answer is “yes”, argue why. If your answer is “no”, show which dependencies have been lost.

Note Solve the assignments from 12 to 20 through Select as well as through relational

algebra.

Database Schema for the exercise:

Professor **(ssn** , profname, status, salary)
Course(**crscode** ,crsname,credits)
Taught(**crscode,semester**,ssn)

Assumptions:

a) Each course has only one instructor in each semester.
b) All professors have different salaries.
c) All professors have different names
d) All courses have different names
e) Status can take value from "full","associate" , and "assistant".

Assignment 12.

Return those professors who have taught "csc6710" but never "csc7710"

Assignment 13.

Return those professors who have taught "csc6710" and "csc7710" in same semester.

Assignment 14.

Return those professors who have taught "csc6710 " or "csc7710" but not both.

Assignment 15.

Return that course which have never been taught.

Assignment 16.

Return that courses that have been taught atleast in two semester.

Assignment 17.

Return the names of all professors who have ever taught "csc7710".

Assignment 18.

Change all credits to 4 for those courses that are taught in semester "f2006:.

Assignment 19.

Return the professor who earns second highest salary.

Assignment 20.

Delete those professors who have never taught.

Assignment 21.

a)Create a tables Employee with following columns :

Employee

Emp _ no integer NOTNULL
Emp_fname char(20) NOTNULL
Emp_lname char(20) not null
Dept_no char(4) null

b)Create a table Department with following columns:

Department Table

Dept_no char(4) not null
Dept_name char(25) not null
Location char(30) null

c)Create a table project with following columns:

Project table:

Project_no char(4) notnull
Project_name char(15) not null
Budget float null

d)Create a table works_on with the following columns:

Works_on table

Emp_no integer notnull
Project_no char(4) notnull
Job char(15) null

Assignment 22.

a) Using INSERT statement enter the following data in the Employee table:

Emp_no	Emp_fname	Emp_lname	Dept_no
25348	Mathew	Smith	D3
10102	Ann	Jones	D3
18316	John	Barrimore	D1
29356	James	James	D2
9031	Elke	Hansel	D2
2581	Elsa	Bertoni	D2
28559	Sybill	Moser	D1

b) Using INSERT statement enter the following data in the Department table:

Dept_no	Dept_name	Location
D1	Research	Dallas
D2	Accounting	Seattle
D3	Marketing	Dallas

c) Using INSERT statement enter the following data in the Project table:

Project_no	Project_name	Budget
P1	Apollo	120000
P2	Gemini	95000
P3	Mercury	185600

d) Using INSERT statement enter the following data in the works_on table

Emp_no	Project_no	Job
10102	P1	Analyst
10102	P3	Manager
25348	P2	Clerk
18316	P2	Null
29346	P2	Null
2581	P3	Analyst
9031	P1	Manager
28559	P1	Null
28599	P2	Clerk
9031	P3	Clerk
29346	P1	Clerk

Assignment 23.

a) See the records of all the tables with SELECT command.
b) List the Employee number of all the clerks.
c) Get the employee numbers for all employees who have a leading job (Analyst or Manager) in project P1.
d) Get the employee number and first name of all employees whose first name starts with A.
e) Find the employee details having Maximum salary.

Assignment 24.

a) Find the employee details having second highest salary.
b) Insert the data of a new employee called Jullia Long , whose employee number is 11111. Her department no is not known yet.
c) Change the name of the department of the employee James .The new department name is Sales.
d) Find the employee number for all employees who are clerks or works in Department D3.
e) Create a table Sample and get all the record from employee table with select statement.

Assignment 25.

a) Alter table sample , add new column Telephone_no char(12) null.
b) Drop the Column Telephone_no from Sample table.
c) Get the list of all the employee except the employees having emp_no either 10102 or 9031.
d) List the name of the project whose budget lies between 95000 to 12000.
e) Get the names of all the employees whose first name contains the letter “a” as the second character.
f) Get Full details of all the employees whose departments are located in Dallas.
g) Get all jobs of the employees.
h) List the project numbers for all the projects employing less than four persons.

B2.3-R4 : BASICS OF OS, UNIX AND SHELL PROGRAMMING

Objective of the Course

The objective of the course is to make students aware of the functioning of a multi-user operating system. This course will serve as a foundation course for the higher level course in Unix. The students are expected to learn the commands while doing practical and emphasis should be given to those switches/options and flags, which are most frequently used in real life.

After completion of the course students will be able to:

- Understand Operating System concepts.
- Use System calls and memory management.
- Use Unix commands and editors.
- Carry out Unix File management and shell programming in Unix.
- Do Network configuration and security management in Unix.

Outline of Course

S. No.	Topic	Minimum number of hours
1.	Operating System Concepts	04
2.	Linux Ideas and History	01
3.	Linux Usage Basics	02
4.	Running Commands and Getting help	02
5.	Browsing the File System	04
6.	The X-Window System	04
7.	Users, Groups and Permissions	03
8.	Advanced Topics in Users, Groups and Permissions	03
9.	The Linux file system in-depth	06
10.	vim: An advanced text editor	03
11.	Standard I/O and Pipes	02
12.	Using the bash shell	03
13.	Configuring the Bash Shell	04
14.	Text Processing Tools	03
15.	Shell Programming	06
16.	Investigating and Managing Process	04
17.	Finding and Processing Files	02
18.	Basic System Configuration Tools	04

Lectures	**=**	**60**
Practical/tutorials	**=**	**60**
Total	**=**	**120**

Detailed Syllabus

1. Operating System Concepts **04 Hrs.**

Overview of OS. System Calls, Process Management, Memory Management, Disk and filesystems, Networking, Security, Graphical User Interface, Device Drivers.

2. Linux Ideas and History **01 Hrs.**

What is Open Source? , Linux Origins, Red Hat Distributions, Linux Principles

3. Linux Usage and Basics **02 Hrs.**

Logging in to a Linux System, Switching between virtual consoles and the graphical environment, Elements of the X Window System, Starting the X server, Changing your password, The root user, Changing identities, Editing text files.

4. Running Commands and Getting Help **02 Hrs.**

Running Commands, Some Simple commands, Getting Help, The whatis command, The –help Option, Reading Usage Summaries, The man command, Navigating man pages, The info command, Navigating info pages, Extended Documentation, Red Hat Documentation.

5. Browsing the File System **04 Hrs.**

Linux File Hierarchy Concepts, Some Important Directories, Current Working Directory, File and Directory Names, Absolute and Relative Pathnames, Changing Directories, Listing Directory Contents, Copying Files and Directories, Copying Files and Directories: The Destination, Moving and Renaming Files and Directories, Creating and Removing Files, Creating and Removing Directories, Using Nautilus, Determining File Content.

6. The X-Window System **04 Hrs.**

XOrg: The X11 Server, XOrg Server Design, XOrg Server Configuration, XOrg Modularity, Server and Client Relationship, XOrg in runlevel 3, XOrg in runlevel 5, Configuration Utilities, Remote X Sessions.

7. Users, Groups and Permissions **03 Hrs.**

Users, Groups, Linux File Security, Permission Precedence, Permission Types, Examining Permissions, Interpreting Permissions, Changing File Ownership, Changing Permissions – Symbolic Method, Changing Permissions – Numeric Method, Changing Permissions – Nautilus

8. Advanced Topics in Users, Groups and Permissions **03 Hrs.**

User and Group ID Numbers, /etc/passwd, /etc/shadow and /etc/group files, User Management tools, System Users and and Groups, Monitoring Logins, Default Permissions, Special Permissions for Executables, Special Permissions for Directories.

9. The Linux File System In-depth **06 Hrs.**

Partitions and Filesystems, Inodes, Directories, Inodes and Directories, cp and inodes, mv and inodes, rm and inodes, Hard Links, Symbolic (or soft) Links, The Seven Fundamental Filetypes, Checking Free Space, Removable Media, Mounting CDs and DVDs, Mounting USB Media, Mounting Floppy Disks, Archiving Files and Compressing Archives, Creating, Listing and Extracting File Archives, Creating File Archives: Other Tools.

10. vim: An Advanced Text Editor **03 Hrs.**

Introducing vim, vim: A Modal Editor, vim basics, Opening a file in vim, Modifying a file, Saving a file and exiting vim, Using Command Mode, Moving around, Search and Replace, Manipulating Text, Undoing changes, Visual Mode, Using multiple “windows”, Configuring vi and vim, Learning more.

11. Standard I/O and Pipes **02 Hrs.**

Standard Input and Output, Redirecting Output to a File, Redirecting STDOUT to a Program(Piping), Combining Output and Errors, Redirecting to Multiple Targets (tee), Redirecting STDIN from a file, Sending Multiple Lines to STDIN.

12. Using the Bash Shell **03 Hrs.**

Bash Introduction, Bash Heritage and Features, Command Line Shortcuts, History Tricks, Command Line Expansion, Command Editing Tricks, gnome-terminal

13. Configuring the Bash Shell **04 Hrs.**

Bash Variables, Environment variables, The TERM Environment variable, The PATH Environment variable, Some common variables, Aliases, How bash expands a Command Line, Preventing Expansion, Login vs non-login shells, Bash startup tasks: profile, Bash startup tasks: bashrc, Bash exit tasks

14. Text Processing Tools **03 Hrs.**

Tools for Extracting Text, Viewing File Contents, Viewing File Excerpts, Extracting Text by Keyword, Extracting Text by column, Tools for analyzing text, Gathering text statistics, Sorting Text, Eliminating Duplicate Lines, Comparing Files, Duplicating File Changes, Spell Checking with aspell, Tools for manipulating Text, sed, Special Characters for Complex Searches.

15. Shell Programming **06 Hrs.**

Scripting Basics, Creating Shell Scripts, Generating Output, Handling Input, Exit Status, Control Structures, Conditional Execution, File Tests, String Tests, for and sequences, continue and break, Using positional parameters, handling parameters with Spaces, Scripting at the command line, Shell Script debugging.

16. Investigating and Managing Process **04 Hrs.**

What is a Process? Listing Processes, Finding Processes, Signals, Sending Signals to Processes, Scheduling Priority, Altering Scheduling Priority, Interactive Process management tools, Job Control, Scheduling a Process to execute later, Crontab File format.

17. Finding and Processing Files **02 Hrs.**

Locate, Locate Examples, find, Basic find Examples, find and Logical Operators, find and Permissions, find and Numeric Criteria, find and Access Times, Executing commands with find, find Execution Examples, The GNOME Search Tool.

18. Basic System Configuration Tools **04 Hrs.**

TCP/IP Network Configuration, Managing Ethernet Connections, Graphical Network Configuration, Network Configuration Files, Printing in Linux, Setting the System's Date and Time, Managing Services.

RECOMMENDED BOOKS

MAIN READING

1. Maurice J. Bach, “Design of the Unix Operating System”, Pearson Education,2008.
2. Sumitabha Das, “Unix : Concepts and Applications”, Tata McGraw-Hill , 2008.
3. ISRD Group, “Basics of OS, UNIX and SHELL Programming” , Tata McGraw-Hill,2006.
4. Sarwar, Koretsky, and Sarwar, “Unix , The Text Book”, Pearson Education, 2007.

SUPPLEMENTARY READING

1. Stephen Prata “Advanced Unix -A programmer’s Guide”., BPB Publication, 2008.
2. Kochan S & Wood P, “Unix Shell Programming”, Pearson Education, 2008.
3. Stevens W R, Rago S.A, “Advanced Programming in Unix Environment”, Pearson Education, 2008.

B2.3-R4: BASICS OF OS, UNIX AND SHELL PROGRAMMING

Model Question Paper

NOTE:

1. There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.

2. **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book.

3. Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**.

TOTAL TIME: 3 HOURS **TOTAL MARKS: 100**
(PART ONE-40; PART TWO-60)

PART ONE
(Answer ALL Questions; each question carries ONE mark)

a) **Each question below gives a multiple choices of answers. Choose the most appropriate one.**

1.1 Which one of the following is used to start X server?
- a) startwindow
- b) startx
- c) startxserver
- d) startgui

1.2 Which one of the following lets you know short description of command?
- a) show
- b) descriptor
- c) whatis
- d) none of the above

1.3 Which one of following is used to redirect output to a file while still redirecting to another program?
- a) >
- b) >>
- c) 2>
- d) tee

1.4 What command gives space usage per file system?
- a) df
- b) du
- c) ls
- d) chkdisk

1.5 Linux allows the use of more than one command in one line by specifying the following symbol among the commands:
- a) ;
- b) :

c) ,
d) >

1.6 To copy entire directory structure, we need to use
a) cp –s olddir newdir
b) cp –d olddir newdir
c) cp –e olddir newdir
d) cp –r olddir newdir

1.7 Which one of the following is used to send signal to process?
a) sig
b) kill
c) switch
d) None of the above

1.8 Vim is text editor in Linux. Which one is used to redo last undone change in file?
a) <shift><ctrl>r
b) r
c) <ctrl>r
d) <ctrl><del>r

1.9 Which one of the following suspends a foreground process?
a) <ctrl>s
b) <ctrl>r
c) <ctrl>z
d) <ctrl>x

1.10 File tests are used to test variety of conditions that relate to files on the system. Which one of the following returns true if file is symbolic link?
a) –d <File>
b) –e <File>
c) –s <File>
d) –h <File>

2. Each statement below is either TRUE or FALSE. Identify and mark them accordingly in the answer book.

2.1 Locate searches file in to current directory by traversing current directory.
2.2 Ctrl + F1 is used to switch from virtual console to graphical environment.
2.3 Nice alters process scheduling priority.
2.4 During opening a files using vim editor, multiple files can be supplied to vim in command line.
2.5 User's name and password are stored in /etc/passwd directory.
2.6 su command is used to change user.
2.7 PATH is an environment variable
2.8 In file system of Linux **.**(dot) refers to parent Directory.
2.9 In vi text editor, 5b takes the cursor 5 words backward to the beginning of the word in ex mode.
2.10 Unique command removes all duplicate lines from file.

3. Match words and phrases in column X with the nearest in meaning in column Y.

X **Y**

3.1	Detail documentation of command	a)	path
3.2	Directory of all users are located	b)	PS1
3.3	Displays absolute path of current directory	c)	help
3.4	The process who doesn't have parent	d)	diff
3.5	User's password stored in encrypted form	e)	/etc/passwd
3.6	File executed when exiting a login shell	f)	/etc/.bash_logout
3.7	Used to compare two files for differences	g)	man
3.8	Displays process information.	h)	init
3.9	Used to compress files and directories	i)	Gzip
3.10	Local Variable	j)	/home
		k)	~/.bash_logout
		l)	pwd
		m)	ps
		n)	/etc/shadow

4. Fill in the blanks in 4.1 to 4.10 below, by choosing appropriate words and phrases given in the list below:

(a)	telnet	(b)	ls -l	(c)	time
(d)	groups	(e)	/etc/startup	(f)	join
(g)	passwd	(h)	login	(i)	touch
(j)	umask	(k)	In-core inode	(l)	changerootpwd
(m)	/etc/profile	(n)	Dir -per	(o)	head
(p)	paste	(q)	PCB	(r)	at

4.1 _____command is used to change password of root user.
4.2 _____ can be used to change the default access permission of file.
4.3 The _____ command provides output from the beginning of the concerned file.
4.4 _____is used to combines files.
4.5 The command _____can change access time of a file
4.6 _____command is used to see file permissions in current directory.
4.7 Remote login to a machine can be done via _____ command.
4.8 The _____ command provides the facility to schedule a job at a specific time.
4.9 Path of the system wide startup script is _____.
4.10 _____ gives groups you belong to.

PART TWO
(Answer any FOUR questions)

5.

a. What is open source? What are the principles of Linux?
b. List out command line expansion. Using suitable example, explain working of each command line expansion.

(6 + 9)

6.

a. Write a shell script which takes marks of five subjects as input, finds out the percentage and prints grade of exam. For example

Input:

Enter marks of subject:

Subject1	70
Subject2	80
Subject3	80
Subject4	65
Subject5	75

Output:

Grade: Distinction

b. What are the advantages of having distinct disk partition?
c. What are various commands available in Linux for taking backups? Explain important options of each utility.

(6 + 4 + 5)

7.

a. Linux provides prompt ($ or #) to execute commands. How does shell expand commands which are typed on prompt?
b. How overwriting and appending can be performed in Linux? Using suitable example, explain how standard error can be redirected?
c. List and explain fundamental file types in Linux. How file type can be obtained?

(5 + 3 + 7)

8.

a. Write a shell script which finds out whether entered number is prime or not.
   Input:
   Enter Number: 5
   Output:
   Prime Number
b. What do the following commands in "vi" specify? How are they used?
   i) map
   ii)? pat
   iii) set
   iv) ab
c. How does the "login:"prompt appear?

(5 + 5 + 5)

9.

a. Which command is used to change permission associated to File/Directories? List and explain methods to change permission of File/Directories.
b. What is hard link and soft link? How it can be created?
c. What are the special permissions for executables and directories? What are uses of special permission?

(5 + 5 + 5)

B2.3-R4 : BASICS OF OS, UNIX AND SHELL PROGRAMMING

Assignment 1.

Try the following command sequence and write its output:
cd ; pwd ;ls -al ; cd . ;pwd (where did that get you?) ; cd .. ;pwd ; ls -al ; cd .. ; pwd;ls -al ;cd .. ;pwd (what happens now) ;cd /etc ;ls -al | more ;cat passwd ;cd – ;pwd.

Assignment 2.

a) Explore the filesystem tree using cd, ls, pwd and cat. Look in /bin, /usr/bin, /sbin, /tmp and /boot. What do you see?
b) Explore /dev. Can you identify what devices are available? Which are character-oriented and which are block-oriented? Can you identify your tty (terminal) device (typing who am i might help); who is the owner of your tty (use ls -l)?
c) Explore /proc. Display the contents of the files interrupts, devices, cpuinfo, meminfo and uptime using cat. Can you see why we say /proc is a pseudo-filesystem which allows access to kernel data structures?

Assignment 3.

a) Convert the decimal number 192 to octal and hexadecimal using bc command.
b) Run ps , the script command and run ps again . What is its output. Explain.
c) Write a command to create following directory structure in one command: DOEACC→ALEVEL→AL55…
d) Create above Directory Structure with permission 777.?

Assignment 4.

a) Run the following command and explain its output
(i) cd ../.. (ii)mkdir ../bin (iii)rmdir .. (iv)ls ..
b) Write a command to remove entire directory structure DOEACC/ALEVEL/AL55 in one command?
c) Run the command tty and note the device name of your terminal. Now run cp /etc/passwd to device name of your terminal. Explain its output.

Assignment 5.

a) How does the command mv bar1 bar2 behave , where both bar1 and bar2 are directories, when (i) bar2 exists and (ii)bar2 does not exist
b) Write a command to display lines common to a.txt and b.txt?
c) Write a command to display lines unique to a.txt?
d) Run script command and then issue dir,ls,pwd commands and then run exit. What is its output?

Assignment 6.

a) Write a command to compare two text files.
b) Write a command to copy a file with permission 444.Copy it again and explain your observation.

Assignment 7.

a) Use chmod –w . and then try to create and remove a file in the current directory. What is its output.
b) Run the commands (i) ls –ld . and (ii) ls –l .. Explain its output.

Assignment 8.

Using vi editor write commands to do the following

a) Combine five lines into a single line.
b) Search a pattern printf and then repeat the search in opposite direction.
c) How will you insert /* at the beginning and */ at the end?

Assignment 9.

Using vi editor

a) Write a command to copy line number 1,10 after line number 25.
b) Write a command to move line number 1,10 after line number 25.
c) Write a command to copy next 10 lines to a.txt.

Assignment 10.

Using vi editor

a) Write a command to undo last action.
b) Write a command to create abbreviation LU as Linux Unix.
c) Write a command to map ctrl+K to display manual of vi editor.

Assignment 11.

a) Write a command to convert contents of a file a.txt to upper case
b) Write sequence of commands to convert 1st line of a file a.txt to upper case
c) Write a command to display name of a file in your current directory whose size is maximum.

Assignment 12.

a) Write a command to change modification time of a file without modifying the file.
b) Write a command to display name of a file in your current directory whose size is maximum.

Assignment 13.

a) We have a file emp.mast which consists of detail of employees in an organization
(Fields are
emp_id,emp_name,dept_name,basic_salary,designation,dob).Write a command to display name of employee who is not director.
b) Write a command to display name and basic of each employee.

Assignment 14.

a) Using at command submit a job at 7 pm.
b) Using batch command submit a job at 7 pm..
c) Delete a job from at queue.
d) Display the listing of jobs in at queue.
e) Write a command to kill a job.

Assignment 15.

a) Write a command to display those lines in emp.mast in which 'Training' is present.
b) Write a command to display names of employees in Training Department.
c) Write a command to display number of blank records in a file.

Assignment 16.

a) Write a command to display contents of a file emp.mast in sorted order on emp_id field.
b) Write a command to display contents of a file emp.mast in sorted order on basic_salary field.
c) Write a command to display name of the youngest employee .
d) Write a command to create backup of current directory.

Assignment 17.

a) Write a Shell script to display factorial of a number. Number cannot be blank.
b) Write a Shell script to send mail to all users on your System
c) Write a Shell script to find sum of prime numbers between 2 and 200.

Assignment 18.

b) Write a Shell script to display sum of digits and number of digits in a number. Number cannot be blank.
c) Write a Shell script /command to display contents of a file in reverse order.
d) Write a Shell script to display sum of prime factors of a number.

Assignment 19.

a) Write a shell script to create a data entry screen for the file emp.mast created in assignment no-13.
b) Write a shell script to modify records on the basis of emp_id .Emp_id should be entered by user or command line argument can be used.
c) Write a shell script to insert and delete a record from emp.mast file.[Apply all validations]

Assignment 20.

a) Write a shell script to generate salary slip of employees (emp_id wise) in file emp.mast by using following formula : Net Salary=Basic+DA+HRA+CCA-EPF.
b) Write a shell script to check spelling in a file and replace misspelled word.

Assignment 21.
Write a script that compares two directories bar1 and bar2 and copies all files in bar1 to bar2, which are not present in bar2.

Assignment 22.

Write a script that checks each minute and reports on who logs in and who logs out.

Assignment 23.

Write a script which converts 1st character of each line in a file to uppercase.

Assignment 24.

a) Write a shell function size() which lists only the total size of the files supplied as arguments.
b) Use the above function to display size of all files in a directory. Directory Name should be supplied at command line.

Assignment 25.

Write a shell script to add , modify and delete users without using system administration command.

B2.4-R4: DATA COMMUNICATION AND NETWORK TECHNOLOGIES

Objective of the Course

This course will allow students to develop background knowledge as well as core expertise in data communication and networking (DCN) technologies, which is one of the fastest growing industries in today's world. It forms an integral part of the modern Information and Communications Technology (ICT) in any organizations. Starting from intranet/extranet in small offices to the World Wide Web, principles of DCN play an important role in designing any modern telecom infrastructure.

A major ramification of the fantastic growth of telecommunications and networking is a dramatic increase in the number of professions, where an understanding of DCN is essential for success. Today, students wanting to understand the concepts and mechanisms underlying DCN infrastructures come from a variety of academic and professional backgrounds. Hence, to be useful, a course on DCN infrastructures must be accessible to students without technical backgrounds while still providing technical material comprehensive enough to challenge more experienced readers. This course is designed with this new mix of students in mind.

The course, being the first one on telecommunication and networking in the DOEACC hierarchy, starts from the very basics of communication technology and goes up to the Internet, spanning all the five layers of TCP/IP model. The students will be exposed to communication principles, different types of media, modulation techniques, multiplexing, switched networks, the Internet, TCP/IP suite, network security, mobile wireless communication, fibre-optic communications and the state-of-art networking applications**.**

At the end of the course the students would know:

- Evolution of data communication and networking paradigms
- Principles of data communication, channel characteristics, signaling, modulation and encoding, and multiplexing (SONET/SDH)
- Various transmission media, their comparative study, fibre optics and wireless media
- Categories and topologies of networks (LAN and WAN)
- Layered architecture (OSI and TCP/IP) and protocol suites
- Channel error detection and correction, MAC protocols, Ethernet and WLAN
- Details of IP operations in the INTERNET and associated routing principles
- Operations of TCP/UDP, FTP, HTTP, SMTP, SNMP, etc.
- Strategies for securing network applications in enterprises
- Emerging technologies, such as WDM mesh, mobile telephony etc

Outline of Course

S. No.	Topic	Minimum number of hours
1.	Data Communications	06
2.	Communication Network Fundamentals	08
3.	Media Access Control	06
4.	Networking Components	06
5.	Link Control and MAC Protocols	05
6.	Local Area Networks (LAN)	05
7.	Wide Area Networks (WAN)	08

8.	Application Protocols	08
9.	Wireless Networks	03
10.	Security and Management	05

Lectures	**=**	**60**
Practical/tutorials	**=**	**60**
Total	**=**	**120**

Detailed Syllabus

1. Data Communications **06 Hrs.**

Introduction, Communication Systems, Signal and data, Transmission modes, Synchronous and asynchronous transmission, Circuits, channels and multichanneling, Signaling, Encoding and decoding, Error detection and Recovery, Flow control, Sliding Window, Congestion Management, Multiplexing [FDM, TDM, CDM, WDM] and Spreading [DS. FH], Concept of Modulation, Baseband versus Broadband; Pulse Code Modulation (PCM), Shift Keying [ASK, FSK, PSK, QPSK, DPSK]; Encoding techniques and CODEC; Classification of Modems, Standards and Protocols, Protocols used by Modem to Transfer files, Establishing a Connection (Internet connectivity); Digital Subscriber Loop (DSL)

2. Communication Network Fundamentals **08 Hrs.**

Introduction, Switching techniques: Circuit Switching, Packet switching, Datagram, Virtual circuit and Permanent Virtual Circuit, Connectionless and connection oriented communication, Message switching, Cell switching (ATM); Telephone network signaling Network topologies, Layering the communication process, Open Systems Interconnection (OSI) model, Data encapsulation; Protocols, services and layering, PDU/SDU; TCP/IP suite, Hour-glass model, Internet Architecture and Protocol overview.

3. Media Access Control **06 Hrs.**

Introduction, Access Techniques (STDM, FDMA, TDMA, Spread Spectrum techniques and CDMA, DSSS, FHSS); Media Access Control: Aloha and Slotted Aloha, Media Access Control Address, Polling, CSMA, CSMA/CA, CSMA/CD and Reservation Aloha, Digital hierarchies [SONET/SDH]

4. Network Components **06 Hrs.**

Introduction, LAN Hardware, LAN Operating Systems, Transmission Media: Guided Media (Twisted pair, Co-axial cable, Optical fiber); Unguided Media (Radio, VHF, microwave, satellite, Infrared); Fiber Optics Communication Components (Source, Channel Detector.

.

5. Link Control and MAC Protocols **05 Hrs.**

Framing, Error Detection and Correction; Window-based Flow Control; Logical Link Control, HDLC Protocol, Point-to-Point Protocol (PPP), X.25 CCITT standard for packet data transmission; Media access control, Random Access Techniques, Scheduling Mechanisms.

6. Local Area Network (LAN) **05 Hrs.**

LAN topologies and protocols; IEEE 802 Standard; Ethernet (Standard, Fast, Gigabit), Token Ring, FDDI, Wireless LANs (802.11x);

Connecting LANs: Repeaters, Bridges, Switches, Routers; Virtual LANs

7. Wide Area Network (WAN) **08 Hrs.**

Network Layer Addressing and Routing concepts (Forwarding Function, Filtering Function); Routing Methods (Static and dynamic routing, Distributed routing, Hierarchical Routing); Distance Vector Protocol, Link State protocol, Open Shortest Path First (OSPF);

Internet Protocol (IP): Addressing & Routing; Internet Control Message Protocol, (ICMP), Address Resolution Protocol (ARP), Dynamic Host Control Protocol (DHCP), Network Address Translation (NAT), IPv6, Mobile IP

Process-to-Process delivery in Transport Layer: User Datagram Protocol (UDP), Transmission Control Protocol (TCP), congestion control

8. Application Protocols **08 Hrs.**

Client/Server Model, Network File System (NFS), Remote Login: Telnet; File Transfer Protocol (FTP), Trivial File Transfer Protocol (TFTP); E-mail system: Simple Mail Transfer Protocol (SMTP), Post Office Protocol (POP); World Wide Web (WWW), Domain Name System (DNS), DNS servers; Hyper Text system: Hyper Text Transfer Protocol (HTTP), Hyper Text markup Language (HTML)

9. Wireless Networks **03 Hrs.**

Radio Communications, Cellular Radio, Mobile Telephony (GSM & CDMA), Satellite Networks (VSAT), Mobile Adhoc Networks (MANET).

10. Security and Management **05 Hrs.**

Cryptography, IPsec, SSL/TLS, PGP, secure HTTP, proxy, firewall, VPN; Simple Network Management Protocol (SNMP), Network policies.

RECOMMENDED BOOKS

MAIN READING

1. Behrouz A Forouzan, “Data Communication and Networking”, Tata McGraw-Hill, 2008
2. William Stallings, “Data and Computer Communications”, Pearson Education, 2008.
3. Rajneesh Agrawal and Bharat Bhushan Tiwari, “Data Communication and Computer Networks”, Vikas Publishing house Ltd. , 2005.
4. Tomasi Wayne, “Introduction to Data Communications and Networking”, Pearson Education, 2007.

SUPPLEMENTARY READING

1. A. S. Tanenbaum, “Computer Networks”, Fourth Edition, Pearson Education.
2. A. Leon-Gracia and I. Widjaja, “Communication Networks”, Tata McGraw Hill, 2004.
3. K. Pahlavan and P. Krishnamurthy, “Principles of Wireless Networks”, EEE/ Prentice Hall of India, 2003.

B2.4-R4: DATA COMMUNICATION AND NETWORK TECHNOLOGIES

Model Question Paper

NOTE:

1. There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.

2. **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book.

3. Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**.

TOTAL TIME: 3 HOURS **TOTAL MARKS: 100**
(PART ONE - 40; PART TWO - 60)

PART ONE
(Answer ALL Questions; each question carries ONE mark)

1. Each question below gives a multiple choices of answers. Choose the most appropriate one.

1.1 The physical layer most popularly used in wired LANs nowadays uses

a) UTP cables
b) STP cables
c) Coaxial cables
d) Radio Frequency

1.2 Seamless networking refers to

a) A complete end-to-end digital network.
b) Use of a single platform for end-to-end communication where geographical distance between communicating entities is hidden to the end user.
c) Use of a single platform for end-to-end communication where geographical distance between communication entities is visible to the end user.
d) Use of a single platform to transmit data, audio and video.

1.3 Router operates in

a) Data Link Layer
b) Network Layer
c) Transport Layer
d) All of the above

1.4 Flow control in OSI model is done by

a) Data link layer
b) Network layer
c) Transport layer
d) Both data link and transport layer

1.5 Which of the following keeps track of the individual units of data (called packets) that a message is divided into for efficient routing through the Internet.

a) Address Resolution Protocol (ARP)
b) Internet Protocol (IP)
c) Hypertext Transfer Protocol (HTTP)
d) Transmission Control Protocol/Internet Protocol (TCP/IP)

1.6 A brute force attack against an encryption system:

a) is known as RC4
b) is also known as 3DES
c) tries to gain access by trying every possible key
d) always uses the Rijndael algorithm

1.7 In FDDI, data normally travels on

a) Primary ring
b) Secondary ring
c) Both rings
d) Neither ring

1.8 In Cellular Mobile Communication handoff means

a) to disturb the signal
b) to disturb the antenna
c) to switch to a new channel when call is in progress
d) to switch off the MTSO

1.9 The _____ sublayer is responsible for the operation of the CSMA/CD access method and framing.

a) LLC
b) MII
c) MAC
d) None of the above

1.10 Light is confined within the core of a simple optical fiber by _____.

a) refraction
b) total internal reflection at the outer edge of the cladding
c) total internal reflection at the core cladding boundary
d) reflection from the fiber's plastic coating

2. Each statement below is either TRUE or FALSE. Identify and mark them accordingly in the answer book

2.1. Executable files can be transmitted using SMTP.
2.2. RSA is a secret key encryption algorithm.
2.3. IPv6 uses 16 bit addresses.
2.4. The remote controls of TVs, VCRs and Stereo use Radio waves.
2.5. Ethernet uses variables sized packets to transmit data.
2.6. TCP/IP is the protocol suite for Internet.
2.7. Encryption and decryption are the functions of the presentation layer.
2.8. Coaxial cable provides data rates over 10 Mbps and frequencies upto 400 MHz.
2.9. Synchronous transmission is known as start/stop transmission.
2.10. UTP Category 3 can be used in Fast Ethernet networks.

3. Match words and phrases in column X with the nearest in meaning in column Y.

	X	Y
3.1	Release of message contents and traffic analysis	a) Attenuation
3.2	Provides a wireless link between a LAN hub and a mobile data terminal equipped with an antenna	b) Active attacks
3.3	Gradual weakening of a signal over distance	c) nomadic access
3.4	Go-back-N ARQ	d) Trunks
3.5	Branches between exchanges	e) Passive attacks:.
3.6	Connect dissimilar networks.	f) SONET
3.7	Phase modulation	g) TFTP
3.8	Fiber Optics technology for transmitting high-speed data	h) sliding-window flow control
3.9	File transfer protocol	i) angle modulation
3.10	Division of network into smaller networks	j) router
		k) SNMP
		l) Spectrum
		m) Subnetting

4. Fill in the blanks in 4.1 to 4.10 below, by choosing appropriate words and phrases given in the list below:

(a) CDMA	(b) PDU	(c) FTP	(d) Isotropic antenna
(e) Full-duplex operation	(f) Baud rate	(g) Bandwidth	(h) ICMP
(i) FTAM	(j) Direct Sequence Spread Spectrum	(k) Manchester	(l) FIFO queueing
(m) Weighted fair queuing			

4.1. _____takes into account the amount of traffic through each queue and gives busier queues more capacity without completely shutting out less busy queues.
4.2. Standard Ethernet (10-Mbps) uses _____ encoding.
4.3. With_____, a station can transmit and receive simultaneously
4.4. An_____ is a point in space that radiates power in all directions equally.
4.5. With _____, each bit in the original signal is represented by multiple bits in the transmitted signal, using a spreading code.
4.6. _____ allows multiple users to transmit over the same wireless channel using spread spectrum.
4.7. A _____ is the combination of data from the next higher communications layer and control information.
4.8. _____ is the difference between highest and lowest frequencies of a composite signal.
4.9. _____ is a reporting protocol for the IP addressing.
4.10. The _____ protocol is used to transfer , accessand manage files.

PART TWO
(Answer ANY FOUR questions)

5.

a. What is meant by simplex, half duplex and full duplex communication system? Give representative examples of each.

b. What is the purpose of cladding in an optical fiber? Discuss its density with respect to the core.
c. Define forwarding function. Explain its significance with the help of suitable example.

(5+5+5)

6.

a. Compare the IEEE standards 802.2, 802.3, 802.4, 802.5 and 802.6 briefly.
b. Explain the difference between pure ALOHA and slotted ALOHA and draw diagrams for them.
c. What is high speed LANs? Describe briefly the various types of High-speed LANs used in computer communication networking.

(5+5+5)

7.

a. What advantages does TCP have over UDP? What are the features, which make TCP a reliable protocol?
b. What is static routing? How does it differ from dynamic routing? Discuss the problem of count to infinity associated with distance vector routing technique.

(7+8)

8.

a. Compare and contrast three key long distance communication technologies, namely X.25, frame relay and ATM.
b. Why is it important for protocols configured on the top of Ethernet to have a length field in their header, indicating how long the message is? Discuss what kinds of problems arise when two computers on the same Ethernet share the same MAC (hardware) address.
c. Routers, bridges and repeaters are used to connect differing networks. Under what circumstances would each of these technologies be used?

(6+5+4)

9. Write short notes on any three:

a. SNMP
b. VPN
c. SONET
d. Novell Netware

(5+5+5)

B2.4-R4: DATA COMMUNICATION AND NETWORK TECHNOLOGIES

Assignment 1.

What is the load on simple ALOHA system in packet/sec, with a data rate of 9600 bps, packet size of 804 bits and G=0.75
{Where G is total rate of data presented to network for transmission or simply offered load}

Assignment 2.

Explain the steps involved in computing the checksum for a given message frame:
Data Polynomial D(x) = 10011101010101100000
Generator polynomial G(x) =$x^4 + x^3 + 1$

Find the complete frame bit pattern for data given above.
[Hint : FCS will be 0101]

Assignment 3.

Explain the steps involved in computing the checksum for a given message frame
Data Polynomial D(x) = 11001010101
Generator polynomial G(x) =$x^4 + x^3 + x + 1$

Assignment 4.

A 1-km-long, 10-Mbps CSMA/CD LAN (not 802.3) has a propagation speed of 200 m/µsec. Repeaters are not allowed in this system. Data frames are 256 bits long, including 32 bits of header, checksum, and other overhead. The first bit slot after a successful transmission is reserved for the receiver to capture the channel in order to send a 32-bit acknowledgement frame. What is the effective data rate, excluding overhead, assuming that there are no collisions?

Assignment 5.

Calculate the baud rate for given bit rate and type of modulation
a) 2000 bps, 4-PSK
b) 4000 bps, 8-PSK
c) 4000 bps, 4-QAM

Assignment 6.

Calculate the bit rate for given baud rate and type of modulation
a) 2000 baud, ASK
b) 1000 baud, 8 PSK
c) 1000 baud, 16 QAM

Assignment 7.

How many amplitude levels are there for each of the following methods
a) unipolar
b) NRZ-L
c) NRZ-I
d) Manchester

Assignment 8.

Show the signal diagram (time domain graph) using following methods, for the data stream

1 0 0 1 0 1 1 0

a) RZ
b) NRZ-L
c) NRZ-I
d) Differential Manchester

Assignment 9.

Show the signal diagram (time domain graph) using following methods, for the data stream

1 1 0 1 0 0 0 1 1 0

a) QAM
b) 4-PSK
c) PSK
d) Bipolar AMI

Assignment 10.

What is the maximum data rate, for a typical telephone line with a signal-to-noise ratio of 30dB and an audio bandwidth of 3kHz?

Assignment 11.

A line has signal-to-noise ratio of 1000 and a bandwidth of 4000 kHz. What is the maximum data rate supported by this line?

Assignment 12.

A digital signal has a bit rate of 2000 bps. What is duration of each bit (bit interval)?

Assignment 13.

What is the minimum interval that retransmit timer can be set at, given the channel transmission capability of 20kb/s and propagation delay of 2ms.

Assignment 14.

Explain why channel efficiency of message switching is greater than circuit switching?

Assignment 15.

Configure the PC with first useable class C private IP address and subnet mask.

Assignment 16.

Write a program to simulate slotted controlled ALOHA. Each station should monitor the channel load and increment its value of α by X percent whenever $G < 1$ and decrement it by the same amount if $G > 1$. Assume negligible propagation delay. Examine how value of X affects system performance.

Assignment 17.

Write a program to simulate routing using flooding. Each packet should contain a counter that is decremented on each hop. When the counter gets to zero, the packet is discarded. Time is discrete, with each line handling one packet per time interval. Make three versions of the program:

a) all lines are flooded
b) all lines except the input line are flooded
c) only (statically chosen) best *k* lines flooded.
Compare flooding with deterministic routing (k=1) in terms of delay bandwidth used.

Assignment 18.

A channel has a bit rate of 4 kbps and a propagation delay of 40msec. For what range of frame sizes does stop-and-wait give an efficiency of at least 60%?

Assignment 19.

Identify the OSI layer in which the following protocols work:
NFS, ICMP, NAT, PPP, X.25, SMTP, SSL, SONET

Assignment 20.

Give the port number on which the following protocols work.
TFTP, FTP, SMTP, DNS, DHCP, ICMP.

Assignment 21.

Decrypt the following message which was encrypted using shifted alphabet cipher

$f(a) = (a + 4) \mod 26$

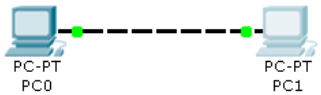
X L M W T V S F P I Q K E Z I Q I E L I E H E G L I

Assignment 22.

Write a program to break monoalphabetic substitution ciphers consisting of English prose (uppercase letters only). The program should compute single letter, digram, trigram frequencies of ciphertext, make guesses about which letter is which, and see if they lead to reasonable plaintext digrams and trigrams. The program should output the plaintext.

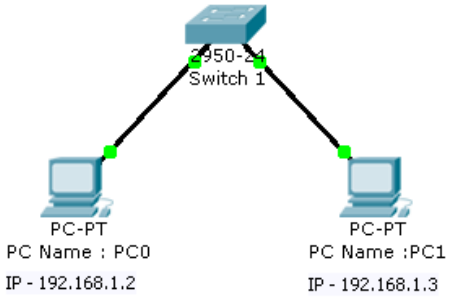
Assignment 23.

Configure the topology (given below) to establish a peer-to-peer network.



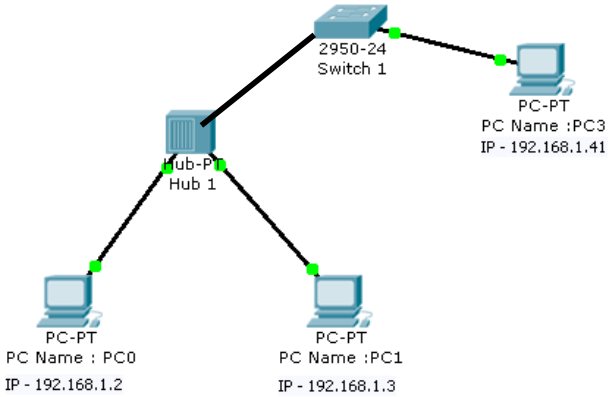
Assignment 24.

Configure the topology (given below) to establish a switch-based network. After configuring the IP address and suitable subnet mask, ping PC1 to PC0



Assignment 25.

Configure the topology (given below) to establish a network. After configuring the IP address and suitable subnet mask, ping PC1 to PC3



B25.1-R4: INTRODUCTION TO OBJECT ORIENTED PROGRAMMING THROUGH JAVA.

Objective of the Course

The course is designed to impart knowledge and develop skills required to solve real world problems using object oriented approach, Java Language constructs and Unified Modelling Language. This course covers the subject in 3 sections, viz, Introductions to Object Oriented Programming, Introduction to Java Programming Language, Introduction to UML.

After the completion of the course the student is expected to understand:

- Basics of Object Oriented Programming.
- Various Object Oriented programming concepts - Abstraction, Objects and Classes, Inheritance, Polymorphism.
- Basic data structures in Java, Objects and Classes , Super Class, sub-class, Interfaces, Inner classes.
- GUI programming using AWT/Swing.
- Deploying Java Applications.
- Accessing Databases in Java.
- What is unified Modeling Language and Why is it used.
- Using Class, Interface, Interaction, State and Activity, Physical diagrams in modeling software.

Outline of Course

S. No.	Topic	Minimum number of hours
1.	Introduction to Object Oriented Programming	14
2.	Introduction to Java programming Language.	32
3.	Introduction to UML.	14

Lectures	**=**	**60**
Practical/tutorials	**=**	**60**
Total	**=**	**120**

Detailed Syllabus

1. Introduction to Object Oriented Programming **14 Hrs.**

1) Thinking Object-Oriented **(1 Hr.)**
- Why Is OOP Popular? A New Paradigm, A Way of Viewing the World.
- Why Is OOP Popular? A New Paradigm, A Way of Viewing the World.

2) Abstraction **(1 Hr.)**
- Layers of Abstraction, Other Forms of Abstraction.

3) Classes and Methods **(1 Hr.)**
- Encapsulation, Class Definitions, Methods.

4) Messages, Instances, and Initialization **(2 Hrs.)**

- Message-Passing Syntax, Statically and Dynamically Typed Languages, Accessing the Receiver from Within a Method, Object Creation, Pointers and Memory Allocation, Constructors{Constant Values}, Destructors and Finalizers.

5) Inheritance and Substitution **(3 Hrs.)**

- An Intuitive Description of Inheritance, Inheritance in Various Languages, [Subclass, Subtype, and Substitution], Overriding and Virtual Methods, Interfaces and Abstract Classes, Forms of Inheritance, The Benefits of Inheritance, The Costs of Inheritance. Examples (Language independent)

6) Static and Dynamic Behavior **(1 Hr.)**

- Static versus Dynamic Typing, Static and Dynamic Classes, Static versus Dynamic Method Binding.

7) Multiple Inheritance **(1 Hr.)**

- Inheritance as Categorization, Problems Arising from Multiple Inheritance, Inner Classes.

8) Polymorphism and Software Reuse **(1 Hr.)**

- Polymorphism in Programming Languages, Mechanisms for Software Reuse, Efficiency and Polymorphism, Will Widespread Software Reuse Become Reality?

9) Overloading and Overriding **(3 Hrs.)**

- Type Signatures and Scopes, Overloading Based on Scopes, Overloading Based on Type Signatures, Redefinition, Notating Overriding, Replacement versus Refinement, Deferred Methods, Overriding versus Shadowing, Covariance and Contra variance.

2) Introduction to Java Programming Language 32 Hrs.

1) An Introduction to Java **(1 Hr.)**

- Java as a Programming Platform, The Java "White Paper" Buzzwords, Java and the Internet, A Short History of Java, Common Misconceptions About Java.

2) The Java Programming Environment **(1 Hr.)**

- Installing the Java Development Kit, Choosing a Development Environment, Using the Command-Line Tools, Using an Integrated Development Environment, Compiling and Running Programs from a Text Editor, Running a Graphical Application, Building and Running Applets.

3) Fundamental Programming Structures in Java **(2 Hrs.)**

- A Simple Java Program, Comments, Data Types, Variables, Operators, Strings, Input and Output, Control Flow, Big Numbers, Arrays.

4) Objects and Classes **(2 Hrs.)**

- Introduction to Object-Oriented Programming, Using Predefined Classes, Defining Your Own Classes, Static Fields and Methods, Method Parameters, Object Construction, Packages, Documentation Comments, Class Design Hints.

5) Inheritance **(2 Hrs.)**

- Classes, Superclasses, and Subclasses, Object: The Cosmic Superclass, Generic ArrayLists, Object Wrappers and Autoboxing, Reflection, Enumeration Classes, Design Hints for Inheritance.

6) Interfaces and Inner Classes **(2 Hrs.)**

- Interfaces, Object Cloning, Interfaces and Callbacks, Inner Classes, Proxies.

7) Introduction to GUI **(2 Hrs.)**

- AWT Architecture, Light-Weight vs Heavy-Weight, AWT Event Model, AWT Event Hierarchy & Event Handling, Using Top-Levels, components and containers, Introduction to Layouts, Focus Architecture.

8) Graphics Programming **(4 Hrs.)**

- Java2D Rendering Model, Strokes & Fills, Geometries, Fonts and Text Layout, Transformations, Display and manipulation of Images and offscreen buffers, Using Color, Printing through Java, Doing More with Images using Image IO, Hardware Acceleration and Active Rendering techniques.

9) User Interface Components with Swing **(4 Hrs.)**

- The Model-View-Controller Design Pattern, Introduction to Layout Management, Text Input, Choice Components, Menus, Sophisticated Layout Management, Dialog Boxes.

10) Deploying Applets and Applications **(2 Hrs.)**

- Applet Basics, The Applet HTML Tags and Attributes, Multimedia, The Applet Context, JAR Files, Application Packaging, Java Web Start, Storage of Application Preferences.

11) Exceptions and Debugging **(2 Hrs.)**

- Dealing with Errors, Catching Exceptions, Tips for Using Exceptions, Logging, Using Assertions, Debugging Techniques, Using a Debugger.

12) Streams and Files **(3 Hrs.)**

- The Complete Stream Zoo, ZIP File Streams, Use of Streams, Object Streams, File Management, New I/O, Regular Expressions.

13) Database Programming **(5 Hrs.)**

- The Design of JDBC, The Structured Query Language, JDBC Installation, Basic JDBC Programming Concepts, Query Execution, Scrollable and Updatable Result Sets, Metadata, Row Sets, Transactions, Advanced Connection Management, Introduction to LDAP.

3) Introduction to UML **14 Hrs.**

1) Introduction, An outline Development Process and Use cases **(2 Hrs.)**

- What Is the UML?, How We Got Here, Notations and Meta-Models, Why Do Analysis and Design?, Overview of the Process, Inception,

Elaboration, Planning the Construction Phase, Construction, Transition, When to Use Iterative Development, Use Case Diagrams, Business and System Use Cases, When to Use Cases.

2) Class Diagrams and Advance Concepts **(4 Hrs.)**

- Perspectives, Associations, Attributes, Operations, Generalization, Constraint Rules, When to Use Class Diagrams, Stereotypes, Object Diagram, Class Scope Operations and Attributes, Multiple and Dynamic Classification, Aggregation and Composition, Derived Associations and Attributes, Interfaces and Abstract Classes, Reference Objects and Value Objects, Collections for Multivalued Association Ends, Frozen, Classification and Generalization, Qualified Associations, Association Class, Parameterized Class, Visibility.

3) Interaction Diagrams, Packages and Collaborations **(1 Hr.)**

- Sequence Diagrams, Collaboration Diagrams, Comparing Sequence and Collaboration Diagrams, When to Use Interaction Diagrams, Packages, Collaborations, When to Use Package Diagrams and Collaborations.

4) State and Activity Diagrams **(1 Hr.)**

- Concurrent State Diagrams, When to Use State Diagrams, Decomposing an Activity, Dynamic Concurrency, Swimlanes, When to Use Activity Diagrams.

5) Physical Diagrams **(1 Hr.)**

- Deployment Diagrams, Component Diagrams, Combining Component and Deployment Diagrams, When to Use Physical Diagrams.

6) Case Studies **(5 Hrs.)**

RECOMMENDED BOOKS

MAIN READING

1. Timothy Budo, "An Introduction to Object-Oriented Programming with Java", Pearson Education, 2009.
2. Martin Fowler,"UML Distilled: A Brief Guide to the Standard Object Modeling Language", 3rd Edition, Pearson Education, 2009.

SUPPLEMENTARY READING

1. H. Schildt, "The Complete Reference -Java2", Tata McGraw-Hill, 2008.
2. P. J Dietel and H. M Dietel, "Java How to Program", 7th Edition, Pearson Education, 2008.
3. Grady Booch, James Rumbaugh, Ivar Jacobson, "Unified Modeling Language User Guide", 2nd Edition, Pearson Education, 2009.
4. Wu C Thomas, "Introduction to Object Oriented Programming with Java", 4th Edition, Tata McGraw-Hill, 2008.
5. Balaguruswamy E, "Programming with Java", Tata McGraw-Hill, 2007.
6. Muthu C, "Essentials of Java Programming", 2008, Tata McGraw-Hill, 2007.
7. Bhave M.P, Patekar S.A, "Programming with Java", Pearson Education , 2009.
8. Khurana Rohit , "Object Oriented Programming with C++", Vikas Publishing House.

B25.1-R4: INTRODUCTION TO OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Model Question Paper

NOTE:

1. There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.

2. **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book.

3. Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**.

TOTAL TIME: 3 HOURS **TOTAL MARKS: 100**
(PART ONE-40; PART TWO-60)

PART ONE
(Answer ALL Questions; each question carries ONE mark)

1. Each question below gives a multiple choices of answers. Choose the most appropriate one.

1.1. A type of use case relationship that adds new behavior or actions is a(n):
e) generalized relationship
f) extend relationship
g) recursive relationship
h) abstract relationship

1.2. The technique of hiding internal implementation details of an object best describes:
a) incorporation
b) polymorphism
c) encapsulation
d) generalization.

1.3. Activity diagrams can be used to show
a) how objects are activated
b) how all the users can interact
c) multithread processing
d) how use cases fit together to achieve business level process

1.4. Which of the following show the static structure of data and operations those act on the data?
a) use cases
b) class diagram
c) state diagram
d) sequence diagram

1.5. class ExceptionTest{
public static void main(String sz[]){

```
                try{
                        int iA = 0;
                        int iB = 50 / iA;
                }
                catch(Exception e){
                        System.out.print("I am always here");
                }
                catch(ArithmeticException e){
                        System.out.print("Am I on Output ever???...");
                }
        }
}
```

What will be the output for the code above?

a) I am always here.Am I on Output ever???...
b) Error
c) I am always here.
d) Am I on Output ever???...

1.6. Which Exception is thrown by the read( ) method of InputStream class?

a) Exception
b) FileNotFoundException
c) ReadException
d) IOException

1.7. Which of the statement below does not correctly defines the difference between JDBC and ODBC ?

a) ODBC can be directly used with Java because it uses a C interface
b) ODBC makes uses of pointers which has been totally removed from JAVA
c) ODBC is from Microsoft while JDBC is from java applications
d) ODBC requires manual installation of the ODBC driver manager and driver on all client machines. While for JDBC drivers are written in Java and JDBC code is automatically installable, secure and portable on all platforms.

1.8. Given the following code

```
import java.awt.*;
public class SetF extends Frame{
public static void main(String argv[]){
 SetF s=new SetF();
 s.setSize(300,200);
 s.setVisible(true);
 }
}
```

How could you set the frame surface color to pink?

a) s.setBackground(Color.pink);
b) s.setColor(PINK);
c) s.Background(pink);
d) s.color=Color.pink

1.9. Which of the following applet tag is legal to embed an applet class named Test into a webpage?

a) <applet param = Test.class width = 200 height = 200> < /applet >
b) <applet code = Test.class width = 200 height = 200 > < /applet >
c) <applet class = Test width = 200 height = 200>< /applet >
d) <applet> code = Test.class width = 200 height = 200 < /applet >

1.10. State diagrams are being drawn to
   a) show how objects move between classes
   b) find missing use cases
   c) show how an object responds to messages
   d) show how classes change state over time

2. Each statement below is either TRUE or FALSE. Identify and mark them accordingly in the answer book.

2.11 A concrete class or an abstract class can only be a parent class.
2.12 Extension is applied to subclass while restriction is applied to superclass.
2.13 Traversing an association is an operation that yields related objects.
2.14 Computing the derived object may change the state of the object.
2.15 The % (modulo) operator can be used with floating point operands.
2.16 A *static* method can be invoked by simply using the name of the method alone.
2.17 Objects are passed to a method by use of call-by-value.
2.18 Abstract class can be a final class.
2.19 Interface can Inherit one or more Interfaces.
2.20 Font[] getAllFonts( ) returns an array of Font objects for all selected fonts.

3. Match words and phrases in column X with the nearest in meaning in column Y.

	X		**Y**
3.1	Abstraction	a)	Can be done using Object.Method(Information)prototype.
3.2	Encapsulation	b)	a-part-of relationship
3.3	Message Passing	c)	Action
3.4	Runtime Polymorphism	d)	isa relationship
3.5	destructor	e)	This information provides us the direction of inheritance
3.6	Aggregation	f)	This information will guide us in designing classes
3.7	Actors	g)	Normal objects
3.8	Association	h)	Functions are automatically called when derived class object gets destroyed
3.9	Generalization	i)	Dynamic Binding
3.10	Event	j)	Is a way to provide transparent access to Essential Details
		k)	Explicit objects
		l)	Can be related to Data Hiding in programming.

4. Fill in the blanks in 4.1 to 4.10 below, by choosing appropriate words and phrases given in the list below:

(a)	event	(b)	data store	(c)	object-Code
(d)	state	(e)	integer	(f)	deployment
(g)	default	(h)	polymorphism	(i)	boolean
(j)	public	(k)	link	(l)	finalize ()
(m)	association	(n)	byte-Code	(o)	object class

4.11 In dynamic model _____ represent interval of time.
4.12 A (n) _____ describe a group of links with common semantics and are inherently bidirectional.

4.13 UML _____ diagram shows where components of distributed system are located.
4.14 _____ is a passive object within a data flow diagram that stores data for later access.
4.15 _____ is the cosmic super class.
4.16 Java compiler produces an intermediate code which is known as _____.
4.17 _____method in java is same as destructor method in c++.
4.18 _____ means the ability that one thing can take several different forms.
4.19 _____ is the data type returned by all relational operators.
4.20 _____ is the default access specifier for class members in Java.

PART TWO
(Answer any FOUR questions)

5.

a. Mention in brief four aspects of Object Oriented Design and Programming.
b. Encapsulation "protects" the abstractions. Justify the statement.
c. How can encapsulation and polymorphism improve reusability?
d. What are the challenges in designing with inheritance (single/multiple both)?
e. What is UML? What it is not? What is the importance of UML?

(4+4+4+3+3)

6.

a. A more flexible way to do it is to write a wrapper JDBC Driver that is an intermediary between the client application and database. Explain how to write a wrapper JDBC **Driver** class.
b. Explain the significant language features of java.
c. Which are the Similarities and Differences between java and C++?

(10+4+4)

7.

a. Write a short note on java access specifiers with examples.
b. Packages and interfaces form a very important concept in Java. Which are the advantages and disadvantages of package and interface?
c. The Java 2D™ API provides two-dimensional graphics, text, and imaging capabilities for Java™ programs through extensions to the Abstract Windowing Toolkit (AWT). List the capabilities of Java 2D™ API.
d. The Pattern class defines an alternate compile method that accepts a set of flags affecting the way the pattern is matched. Explain any four flags of Pattern class.

(4+6+4+4)

8.

a. The Java language supports special "doc comments". Explain Java Documentation Comment Syntax.
b. Various commands are available in Java Development Kit those can be used to enhance java programming. How various options of *javac* command can be used in java programming?
c. Differentiate between Frozen v/s Read only object, Fork and Join and give example of the same.
d. What are the uses of multiple classification and dynamic classification? How it differs from classification and generalization?

(4+4+5+5)

9.

a. What does state chart diagram document?
b. Explain Aggregation & Composition with suitable example.
c. How to reduce interface of a package?
d. What do you mean by node? How do you represent it? In which diagram this concept is there?
e. What is the role of a template?

(5+4+4+3+2)

Assignment 1.

Write a program that can create a concordance (A concordance lists every word that occurs in the document, and for each word it gives the line number of every line in the document where the word occurs).The document should be read from an input file, and the concordance data should be written to an output file. The names of the input file and output file should be specified as command line arguments when the program is run.

Assignment 2.

Open a text file so that you can read the file one line at a time. Read each line as a String and place that String object into a LinkedList. Print all of the lines in the LinkedList in reverse order.

Assignment 3.

Write a Java Program to create three new types of exceptions. Write a class with a method that throws all three. In main( ), call the method but only use a single catch clause that will catch all three types of exceptions.

Assignment 4.

Design a Calculator using Java Applet/Swing. The display should have all the digit buttons along with buttons for operations +,-,*, / and =. There is a designated panel to show the current results. If a digit button is clicked, the number is displayed on the panel. If an operator button is clicked the operation is to be performed. The calculator can operate in two modes.

a. When, the operator buttons are pressed the intermediate results should be displayed.
b. The operations can take in any number of arguments and the final result is displayed only when the = button is pressed.

Assignment 5.

Write an applet with a JTextArea where the user can enter some text. The applet should have a button. When the user clicks on the button, the applet should count the number of lines in the user's input, the number of words in the user's input, and the number of

characters in the user's input. This information should be displayed on three labels in the applet.

Assignment 6.

Write a Java Program to create three interfaces, each with two methods. Inherit a new interface from the three, adding a new method. Create a class by implementing the new interface and also inheriting from a concrete class. Now write four methods, each of which takes one of the four interfaces as an argument. In main( ), create an object of your class and pass it to each of the methods.

Assignment 7.

Create an image from an Array of Color-Indexed Pixel Values in the byte buffer. A 16-color index color model is used to represent the pixel colors.

Assignment 8.

Write a Java Program to find all the strings that match a given Regular Expression in one or more files or other sources.

Assignment 9.

Write a little applet that lets the user draw polygons. As the user clicks a sequence of points, count them and store their x- and y-coordinates in two arrays. These points will be the vertices of the polygon. Also, draw a line between each consecutive pair of points to give the user some visual feedback. When the user clicks near the starting point, draw the complete polygon. Draw it with a red interior and a black border. The user should then be able to start drawing a new polygon. When the user shift-clicks on the applet, clear it.

Assignment 10.

Write a Java Program to read from or write to a particular location in a file, such as an indexed file.

Assignment 11.

Assume that a bank maintains two kinds of accounts for customers, one called as savings account and the other as current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed.

Create a class **account** that stores customer name, account number and type of account. From this derive the classes “cur_acct” and “sav_acct” to make them more specific to their requirements. Include necessary functions in order to achieve the following tasks:

a) Accept deposit from a customer and update the balance.
b) Display the balance.
c) Compute and deposit interest.
d) Permit withdrawal and update the balance.
e) Check for the minimum balance, impose penalty, necessary, and update the balance.

Assignment 12.

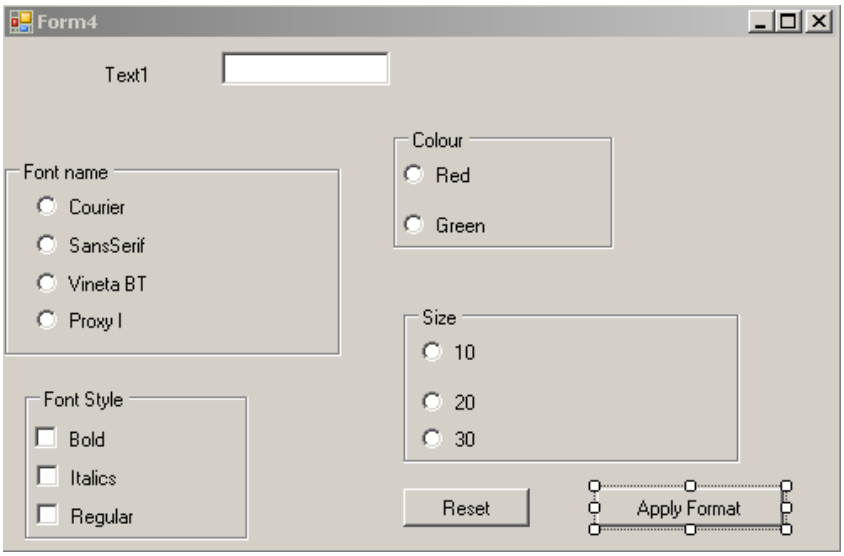
A hospital wants to create a database regarding its indoor patients. The information to stores include

a) Name of the patient
b) Date pf admission
c) Disease
d) Date of discharge

Create a base class to store the above information. The base class should include functions to enter information and display a list of all the patients in the database. Create a derived class to store the age of the patients. Write a code to list the information about all the pediatric patients (less than 12 years in age).

Assignment 13.

Create the following form using java applet/Swing and the text in textbox should be formatted as per the selections:



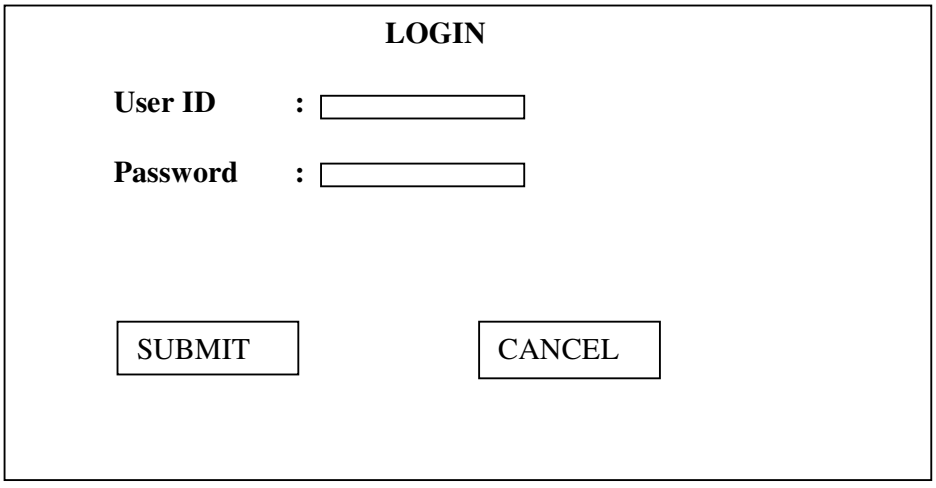
Assignment 14.

Create table with the following structure:

Userid	Character	10
Password	Character	10

Primary Key-Userid

Now design a login form(connected to database using jdbc) and show a welcome message if userid and password combination is correct, otherwise display an error message.



Assignment 15.

The Indian Airlines has launched a fast transportation service, using their supersonic passenger airplanes. You are hired by the Indian Airlines for maintaining their database. It contains only a single table, called Route, which holds all pairs of cities with a directed

connection, the distance between them, and the type of aircraft used for that trip. An example table is given below:

omCity	oCity	stance (km)	rplane
handigarh	delhi	5	300
umbai	oa	5	200
umbai	une	3	100
…	…	…	…

Your program should assume that the table already exists in the database and contains data. The structure of the command line to run your program is as follows:

Java IA Supersonic < queryType > < queryVariable > [toTable]

Your program should ask the user for login and password, and connect right after to the database, based on the given information.

< queryType > is one of the following:

a) **toCity**:output all services that go to the city specified in **<queryVariable >**

b) **fromCity:**output all services that go from the city specified in **<queryVariable >**

c) **airplane:** output all services that use airplane specified in **<queryVariable >**

[toTable] is an optional parameter – the user may dump the query result to toTable by stating 'toTable' as an argument, or not specify a 3rd argument at all. In the latter case, the output should be inserted to a table called **IA Result**. In case that it does not exist, **IA Result** should be created by the program, with the same columns as Route. Otherwise, the existing data should be deleted, and the query result should be inserted.

Assignment 16.

Create an application that creates a ball which bounces with the help of thread in Graphics.

Assignment 17.

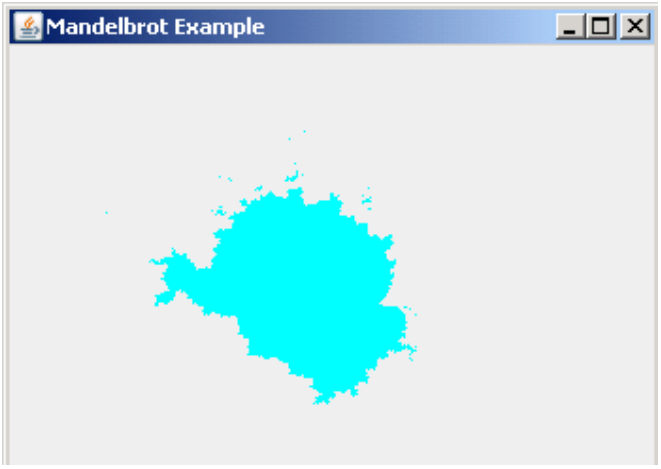
Create a layout prototype of Ms-Paint in Java swing using menus and layout management. You can also add functionality to some of the menu item/toolbar items.

Assignment 18.

Write a program using inheritance that should be able to draw a circle, Ellipse, square, rectangle, parallelogram and a rhombus when relevant dimensions are read in e.g. a circle can be drawn when the centre and the radius is read in, and ellipse can be drawn when the major and minor axis lengths along with the centre is given, a rectangle can be drawn with two sides given and so on.

Assignment 19.

Write a java program to draw a Mandelbrot, which is a collection of points in the plane whose boundary forms a fractal.



Assignment 20.

Draw use case diagram for the parking ticket payment system .The information for the system is given below:

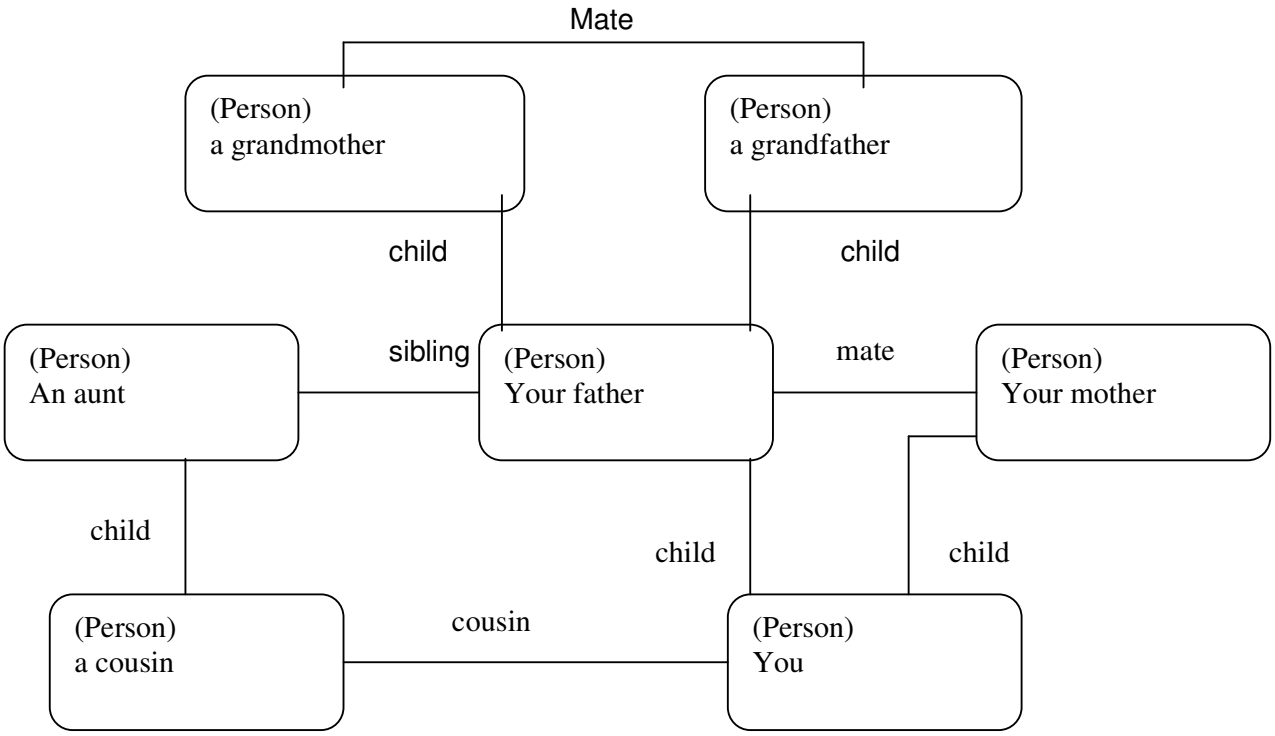
a) Patrol Officer enters ticket information. (ticket status = unpaid)
b) Ticket Holder views her ticket by ticket number. (ticket status = unpaid)
c) Ticket Holder pays for ticket by entering her credit card information. (ticket status = in process)
d) Office Staff views all tickets whose status is “in process” to retrieve payment credit card information for each ticket. (ticket status = in process)
e) Office Staff does credit card payment transactions manually. (ticket status = in process)
f) Office Staff change ticket status for each successful payment. (ticket status = paid)

Assignment 21.

The following is a partial taxonomy of rotating electrical machines. Electrical machines may be categorized for analysis purposes into alternating current (ac) or direct current (dc). Some machines run on ac, some on dc, and some will run on either. An ac machine may be synchronous or induction. A few examples of electrical machines include large synchronous motors, small induction motors, universal motors, and permanent magnet motors. Most motors found in the homes are usually induction machines or universal motors. Universal motors are typically used in where high speed is needed such as in blenders or vacuum cleaners. They will run on either "AC" or "DC". Permanent magnet motors are frequently used in toys and will work only on dc.
Prepare an object diagram showing how the categories and the machines just described relate to one another. Use multiple inheritance where it is appropriate to do so.

Assignment 22.

Prepare a class diagram from the instance diagram in the following figure:



Assignment 23.

The direction control for some of the first toy electric trains was accomplished by interrupting the power to the train. Prepare state diagrams for the headlight and wheels of the train, corresponding to the following scenario:

Power is off, train is not moving.
Power is turned on, train moves forward and train headlight shines.
Power in turned off, train stops and headlight goes out.
Power is turned on, headlight shines and train does not move.
Power is turned off, headlight goes out.
Power is turned on, train runs backward with its headlight shining.
Power is turned off, train stops and headlight goes out.
Power is turned on, headlight shines and train does not move.
Power is turned off, headlight goes out.
Power is turned on, train runs forward with its headlight shining.

Assignment 24.

A simple digital watch has a display and two buttons to set it, the “A” button and the “B” button. The watch has two modes of operation, display time and set time. In the display time mode, hours and minutes are displayed, separated by a flashing colon. The set time mode has two sub-modes, set hours and set minutes. The “A” button is used to select modes. Each time it is pressed, the mode advances in the sequence: display, set hours, set minutes, display, etc. Within the sub-modes, the “B” button is used to advance the hours or minutes once each time it is pressed. Buttons must be released before they can generate another event. Prepare a state diagram of the watch.

Assignment 25.

Some combined bath-showers have two faucets and a lever for controlling the flow of the water. The lever controls whether the water flows from the showerhead or directly into the tub. When the water is first turned on, it flows directly into the tub. When the lever is pulled, a valve closes and latches, diverting the flow of water to the showerhead. To switch from shower to bath with the water running, one must push the lever. Shutting off the water releases the lever so that the next time the water is turned on, it flows directly into the tub. Write a scenario for a shower that is interrupted by a telephone call.

B25.2-R4: SOFTWARE TESTING AND QUALITY MANAGEMENT

Objective of the Course

This objective of the course is to make students aware about the importance of the software testing during software development. The course covered to be in line with the development tools and languages taught in this level. The course will prepare the student for software testing and debugging. It will further laid the foundation for advanced courses in Software quality assurances.

Outline of Course

S. No.	Topic	Minimum number of hours
1.	Introduction	02
2.	Importance of Software Testing	04
3.	Testing Techniques and Strategy	10
4.	Verification and Validation	06
5.	Building Test Cases and Plans	20
6.	Quality Assurance and Standards	10
7.	Debugging Technique and Tools	04
8.	External Source of Errors	04

Lectures	**=**	**60**
Practical/tutorials	**=**	**60**
Total	**=**	**120**

Detailed Syllabus

1. Introduction **02 Hrs.**

Software program and its objective, Software development techniques, top-down verses bottom-up approach, modular and structures programming. A brief introduction about object oriented approach.

2. Importance of Software Testing **04 Hrs.**

Software testing and its importance, software development life cycle verses software testing life cycle, Deliverables, version and error control

3. Testing Techniques and Strategy **10 Hrs.**

Unit testing, Integration testing, System testing, Acceptance testing
White-Box testing: Flow Graph notation, Cyclomatic Complexity, Graph matrices, control structure and loop testing.
Black-Box testing: Equivalence partitioning, Boundary Value Analysis, Orthogonal Array testing.

4. Verification and Validation **06 Hrs.**

Requirement verification, Coding standards, Walk through, Formal Inspection, Design validation and verification, Function test, Design metrics, correctness proof and its requirement.

5. Building Test Cases and Plans **20 Hrs.**

Format of test cases, Du, dc and other data paths, Test data selection, branch coverage, statement coverage, pre-condition and post-condition, Test schedule and check pointing, suitable exercises for creating test cases for each type of techniques mentioned in para 3.

6. Quality Assurance and Standards **10 Hrs.** Basic software quality parameters and its metrics, Software Configuration Change and types of errors, Quality management models: ISO, SPICE, IEEE, CMM

7. Debugging Technique and Tools **04 Hrs.**
Integrated development environment, debugging, tracing, data inspection, exception errors, code and data redundancy, unreachable code.

8. External Source of Errors **04 Hrs.**
Main memory, conflicting dll and unknown interface as source of error and their rectification.

Note: Any open-source Software Tools may be utilized, such as "winrunner".

RECOMMENDED BOOKS

MAIN READING

1. Desikan S, Ramesh G, "Software Testing", Pearson Education, 2008.
2. Tamres L, "Introducing Software Testing", Pearson Education, 2007.
3. Dustin E, "Effective Software Testing", Pearson Education, 2007.
4. Mathur A.P, "Fundamentals of Software Testing", Pearson Education, 2008.

SUPPLEMENTARY READING

1. Brian Marick, "The Craft of Software Testing", Pearson Education, 2008.
2. Rajani & Oak, "Software Testing : Methodology, Tools and Processes" Tata McGraw-Hill, 2007.
3. R. Pressman, "Software Engineering", 6th Edition, Tata McGraw-Hill.

B25.2-R4: SOFTWARE TESTING AND QUALITY MANAGEMENT

Model Question Paper

NOTE:

1. There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.

2. **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book.

3. Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**.

TOTAL TIME: 3 Hours **TOTAL MARKS: 100**
(PART ONE -40; PART TWO-60)

PART ONE
(Answer ALL Questions; each question carries ONE mark)

1. Each question below gives a multiple choices of answers. Chose the most appropriate one.

1.1 Verification is:
a) Checking that we are building the right system
b) Checking that we are building the system right
c) Performed by an independent test team
d) Making sure that it is what the user really wants

1.2 A regression test:
a) Will always be automated
b) Will help ensure unchanged areas of the software have not been affected
c) Will help ensure changed areas of the software have not been affected
d) Can only be run during user acceptance testing

1.3 Which of the following could be a reason for a failure
1) Testing fault
2) Software fault
3) Design fault
4) Environment Fault
5) Documentation Fault

a) 2 is a valid reason; 1,3,4 & 5 are not
b) 1,2,3,4 are valid reasons; 5 is not
c) 1,2,3 are valid reasons; 4 & 5 are not
d) All of them are valid reasons for failure

1.4 Test is prioritized so that:
a) you shorten the time required for testing
b) You do the best testing in the time available
c) You do more effective testing
d) You find more faults

1.5 Which of the following is not a static testing technique
a) Error guessing
b) Walkthrough
c) Data flow analysis
d) Inspections

1.6 During which test activity could faults be found most cost effectively?
a) Execution
b) Design
c) Planning
d) Check Exit criteria completion

1.7 The purpose of requirement phase is
a) To freeze requirements
b) To understand user needs
c) To define the scope of testing
d) All of the above

1.8 The process starting with the terminal modules is called -
a) Top-down integration
b) Bottom-up integration
c) None of the above
d) Module integration

1.9 The inputs for developing a test plan are taken from
a) Project plan
b) Business plan
c) Support plan
d) None of the above

1.10 Inspections can find all the following except
a) Variables not defined in the code
b) Spelling and grammar faults in the documents
c) Requirements that have been omitted from the design documents
d) How much of the code has been covered

2. Each statement below is either TRUE or False. Identify and mark them accordingly in the answer book.

2.1 In information technology, we often build products requirements/specifications which although documented not true quality needs of our customers.
2.2 Our products must be corrected so that they will eventually meet our customers' true quality needs.
2.3 Can produce products at our convenience and at any cost
2.4 Quality is not an attribute of product
2.5 Quality is not a binary state
2.6 Quality need not be defined in quantitative terms in order to be measurable.
2.7 Quality can be controlled only if it is measured.
2.8 Non conformance must be detected as early as possible measured.
2.9 High defect prone products and processes are identified testing the product after all processes are over.
2.10 0% of all defects are attributable to incorrect ineffective processes.

3. Match words and phrases in column X with the nearest in meaning in column Y

	X	Y
3.1	A process of selecting test cases/data by identifying the boundaries that separate valid and invalid conditions	a) Quality Assurance
3.2	It is based upon graphical representation of the program process	b) Software Configuration
3.3	The input domain of the system is partitioned into classes of representative values, so that the no of test cases can be limited to one-per-class, which represents the minimum no. of test cases that must be executed.	c) CMM-Managed
3.4	A planned and systematic set of activities necessary to provide adequate confidence that requirements are properly established and products or services conform to specified requirements	d) Data flow modeling
3.5	Foundation for continuing improvement and optimization of process	e) Boundary value Analysis
3.6	The nodes represent the data objects. The links represent the transformations that occur to translate one data object to another.	f) Equivalence testing
3.7	Computer programs (source code and executables), documentation (technical and user), data (internal and external to programs)	g) Unit Testing
3.8	Brainstorming meeting, whose goal is to identify the problem, propose elements of a solution, negotiate different approaches, and specify a preliminary set of solution requirements	h) Black Box
3.9	Iis the process of testing each software component individually using stubs and/or drivers.	i) Control Flow Analysis
3.10	A technique in which the input domain is divided into classes of equivalent data items	j) Facilitated application specification technique (FAST).

4. Fill in the blanks in 4.1 to 4.10 below, by choosing appropriate words and phrases given in the list below:

(a) Quality control	(b) Design,	(c) Management cycle	(d14
(e) Customer	(f) Acceptable quality level	(g) Test tools	(h) implementation and test
(i) White box	(j) optimising process		

4.1 For quality to happen, there must be well-defined standards and procedures which are followed
4.2 Quality means fit for use. This is _____view.
4.3 The no of principles in Dr. W. Edwards Deming's quality principles is _____.
4.4 The other name PDCA referred to is _____.
4.5 With the_____, the data is available to justify the application of technology to various critical tasks, and numerical evidence is available on the effectiveness with which the process has been applied to any given product
4.6 If changes are not controlled, then orderly _____ is impossible and

no quality plan can be effective.

4.7 AQL stands for_____.

4.8 Is a vehicle for performing a test process_____.

4.9 The process by which product quality is compared with applicable standards; and the action taken when nonconformance is detected is called _____.

4.10 cyclomatic Complexity method is one of the method of _____Testing.

PART TWO
(Answer ANY FOUR questions)

5.

a. How does software differ from the artifacts produced by other engineering disciplines?
b. How do software process metrics differ from software project metrics?
c. What is meant by the term software reliability?

(5+5+5)

6.

a. What are the names of the five levels of the SEI Capability Maturity Model? In your own words, briefly describe each.
b. Describe the change control process for a modern software development project.

(10+5)

7.

a. System Testing
b. What is equivalence partitioning as it applies to software testing?
c. Boundary Value Analysis
d. Black box vs. white box testing
e. Acceptance Testing

(3+3+3+3+3)

8.

a. What are the key differences between validation testing goals and acceptance testing goals?
b. A computer system is required that will support the following small garage business.

Customers bring their cars to the garage for servicing and repair. The attendant must check the car in, record details about the owner and the car, along with any specific customer requests. The workshop manager inspects each car and creates a job specification for it. He then schedules the job and assigns a mechanic to complete the specified tasks. During this process, if any new problems are discovered a new job specification is created by the workshop manager before carrying out the work. When the job is finished the mechanic completes a report detailing the time spent, work done and materials used. This information is used by the attendant to create an invoice for the customer when they come to collect their car.

Represent the system described above as a use-case diagram

(5+10)

9.

a. What is the difference between testing Techniques and tools? Give examples.

Quality control activities are focused on identifying defects in the actual products produced; however your boss wants you to identify and define processes that would prevent defects. How would you explain to him to distinguish between QA and QC responsibilities?

b. Describe the process used in the UML (unified modeling language) approach to object-oriented design.

(10+5)

Assignment 1.

A program reads three integer values, representing the lengths of the sides if the triangle. The program prints whether the triangle is scalene, isosceles or equilateral. Develop a set of test cases that would test the program adequately.

Assignment 2.

Derive a flow graph for the above program and apply basis path testing to develop test cases that will guarantee the execution of all the statements. Execute the cases and show the results.

Assignment 3.

Given the following procedure

```
        PROCEDURE AVERAGE
        Interface Returns avg, input, valid
        Interface accepts value, min, max

    int value [100];
    int avg; input, valid, min, max, sum, i

    i = 1;
    input = valid = 0;
    sum = 0
    Do WHILE value [i]  <> - 999 and input <100
    Input = input + 1
    If value [I]>= min and value [I] <=max
    THEN valid = valid + 1
            Sum = sum + value [I]
    ELSE
            SKIP
    END IF
     i = i + 1;
    END DO
    IF Valid > 0
    THEN avg = sum/valid
```

```
        ELSE
            Avg = -999
        END IF
        END AVERAGE
```

a) Draw a flow graph for the above given algorithm.
b) Determine the cyclomatic complexity by applying
   i) Number of regions
   ii) Edges and nodes
   iii) Predicate nodes
c) Determine a basis set of linearly independent paths.

Assignment 4.

Prepare the test cases corresponding to each independent path identified in Q3.

Assignment 5.

Draw a Graph Matrix corresponding to algorithm given in Q3 & compute the cyclomatic complexity. Prepare the test cases of the given algorithm to test the conditions using CONDITION TESTING.

Assignment 6.

Write a program in any programming language to accept a number and generate a table. Draw a flow graph and design various test cases for testing all possible paths.

Assignment 7.

Write a program in a programming language, specified by the examiner, to accept a 10 numbers & sort them in the order accepted at run time. Make a flow graph and design test cases for the condition testing. Also mention the expected results.

Assignment 8.

You are to prepare a Test Plan. What are the various test factors to be analyzed that correspond to Project Risks?

Assignment 9.

A university's web site allows students to enroll online bio-data. The form contains following fields:

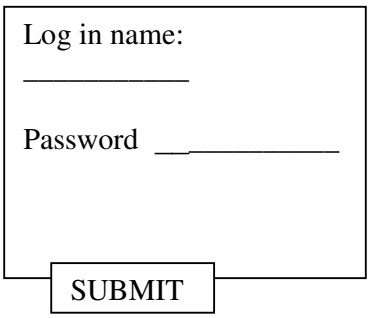
i. Name of the student
ii. Father's name
iii. Address
iv. City
v. State
vi. Pin code
vii. Sex
viii. Date of Birth
ix. Academic Qualifications

a. Exam Passed
b. University/Board
c. Marks obtained
d. Division
e. Max Marks

Design the validation checks for the given fields.

Assignment 10.

Assume there is functionality to log-in through the screen given below:



Write a set of black box test cases to test the functionality of the given screen.

Assignment 11.

Prepare a checklist to review the Requirements and Design

Assignment 12

.

Write a program to find the sum of the matrices. Write all the test cases so as to verify the correctness of the logic.

Assignment 13.

Write the code for binary and linear search. Find the cyclomatic complexity of the two by drawing the flow graph.

Assignment 14.

Prepare a list of checks to test date, numeric and alpha fields in any data entry screen.

Assignment 15.

Create du and dc graph for the following program:

```
scanf(x,y);
        if (y < 0)
                pow = pow – y;
        else
                pow = y;

        z = 1.0;
while(pow != 0)
```

```
{
        z = z * x;
        pow = pow – 1;
}
if (y < 0)
        z = 1.0/z;
printf(z);
```

Assignment 16.

Create the flow graph of the above Q15 and compute the cyclomatic complexity.

Assignment 17.

Prepare the list of test cases for q16

Assignment 18.

Write a program to compute the factorial of a number and create du and dc graph for the same.

Assignment 19.

Create the graph matrix of the Q18 and compute the cyclomatic complexity.

Assignment 20.

Prepare the list of test cases for q19

Assignment 21.

Write a program to create fibonacci series and and create du and dc graph for the same.

Assignment 22.

Create the flow graph of Q21 and compute the cyclomatic complexity.

Assignment 23.

Prepare the list of test cases for q22

Assignment 24.

Prepare a checklist to test the Graphical User Interface of Windows based application.

Assignment 25.

Prepare a comprehensive checklist to test a WEB Site

B3.1-R4 : MANAGEMENT FUNDAMENTALS AND INFORMATION SYSTEM

Objective of the course:

This paper is concerned with the strategic importance of Management concepts and its processes in an business organization. This course provides a broad review of the field of Information system development, integration and managing security of such information systems in the modern business environment. It recognizes that many organizations employ information Technology (IT) Professionals, they have a key role to play in as the information provider that adds significant value to the ever-increasing volume of data processed for management decision making. At the end of the course, candidates should be able to:

- Develop an understanding of general management and information system concepts and practices.
- To understand the technological environment of the contemporary organization and to apply a systematic approach to the use of information technology in organisations.
- Appraise the technological environment in order to support the practical aspects of information development, integration, usage and understand security holes and its security controls to prevent information from various frauds.
- To gain application ability of necessary controls and standards in computerized Information system.

Outline of course

S.No	Topic	Minimum No. of Hours
1.	The Process Of Management	10
2.	Information System Concepts	05
3.	Functional and Other Information Systems	10
4.	Enterprise Systems	05
5.	System Development Process	10
6.	Information System Security	05
7.	Information Systems Control Techniques	10
8.	Case studies	05

Lecture	**60**
Tutorials	**60**
Total	**120**

DETAILED SYLLABUS

1. **THE PROCESS OF MANAGEMENT** **(10) hrs**

Functions Of Management Business Organization ,Levels of Management, the classical organizational theory, the Behavioral Approach, the Management Science Approach **:**
Planning- Mission, Vision and goal setting; and SWOT Analysis; **Organizing** -Types of Organizational Structures, Power, Authority, Delegation, Centralization and Decentralization, Formal and informal organizations , Functions and Design of an organization; **Leading** - Motivation, Theories of Motivation; **Controlling:** Control Process. Relevance of Computer applications in different functional areas of Management.

2. INFORMATION SYSTEM CONCEPTS **(5) hrs**

Definition of system, Types of systems: Physical and Abstract Systems, Deterministic and Probabilistic systems, Open and Closed systems. Need of an efficient information system., Major types of systems in organizations on the basis of organizational levels.

3. FUNCTIONAL AND OTHER INFORMATION SYSTEMS (10) hrs

Finance and Accounting Information systems- order processing, Inventory control Accounts receivable system Accounts Payable System, Payroll System, General ledger, Billing System, Purchase system. Marketing and Sales, Manufacturing and Productions , and Human Resources Information Systems. OAS, TPS, MIS,DSS, GDSS EIS, and ES.

4. ENTERPRISE SYSTEMS (5) hrs

Redesigning the organization with information systems, BPR, Enterprise System Architecture : Integration of business functions. ERP: Meaning Characteristics, Benefits, Limitations, Risks in ERP implementations. Supply Chain Management(SCM) Customer Relationship Management (CRM). E-Business

5. **SYSTEM DEVELOPMENT PROCESS (10) hrs**

Introduction to SDLC/Basics of SDLC; Requirements analysis and systems design techniques**;** Strategic considerations :-Acquisition decisions and approaches**;** Software evaluation and selection/development ;Alternate development methodologies- RAD, Prototype etc; Hardware evaluation and selection; Systems operations and organization of systems resources; Systems documentation and operation manuals; User procedures, training and end user computing; System testing, assessment, conversion and start-up; Hardware contracts and software licenses System implementation; Post-implementation review; System maintenance; System safeguards.

6. INFORMATION SYSTEM SECURITY (5) hrs

System Vulnerability, Computer frauds , computer abuse , preventing computer frauds , Ensuring System Quality , Information Security – Need, Contents of information security plan , Principles of information security ,Best approach to implement information security

7. INFORMATION SYSTEMS CONTROL TECHNIQUES (10) hrs

Introduction, General Controls-Operating System controls, Data Management Controls, Organizational Structure Controls, System Development Controls, System Maintenance Controls, Computer Centre Security Controls, Internet and Intranet Controls, PC controls.
Application Controls: Input controls, Processing controls, Output controls, Storage Controls.

Case studies (5) hrs

RECOMMENDED BOOKS

MAIN READING

1. K. C. Laudon and J. P. Laudon, “Management Information Systems: Organization and Technology”, 11th Edition, Prentice Hall India, New Delhi.
2. Sushila Madan, “Management Fundamentals and Information Systems” Taxman Publishing New Delhi.

SUPPLEMENTARY READING

i. Harold Koontz and Heinz Weihrich, “Essentials of Management”, VIIIth Edition Tata McGraw-Hill Publishing New Delhi
ii. Management Principles and Practice By Dr, C.B. Gupta Published by Scholar Tech Press Edition 2009 New Delhi.
iii. W. S. Jawadekar, “Management Information System”, IV th edition Tata McGraw-Hill Publishing New Delhi.

B3.1-R4: MANAGEMENT FUNDAMENTALS AND INFORMATION SYSTEMS

Model Question Paper

NOTE:

1. **Answer question number 1 and any four from 2 to 7.**
2. **Parts of the same question must be answered in sequence and together.**

Time Allotted: 3 Hours **Total Marks: 100**

Ques. 1

(a) What is the significance of motivation in an organization ? (5 marks)
(b) Explain the various skills that managers at different levels of management should possess. (5 marks)
(c) Explain the effects of applying computer technology to MIS. (5 marks)
(d) What are the characteristics of information required for strategic planning? (5 marks)

Ques. 2

(a) What is the importance of planning in an organization? (5 marks)
(b) What are the differences between programmed and non- programmed decisions? (5 marks)
(c) Define and distinguish between Line, Staff and Functional relationships. (5 marks)
(d) What are the various principles of delegation of authority? (5 marks)

Ques 3.

(a) Why information systems are required? (5 marks)

(b) What are the inputs and outputs of MIS and what processing is performed in MIS? (5 marks)
(c) Describe the comparison between MIS and DSS. (5 marks)
(d) What are the advantages of an expert system? (5 marks)

Ques 4.

(a) What is the purpose of preliminary investigation? (5 marks)
(b) Explain the various steps involved in system analysis. (5 marks)
(c) "The final step of system implementation is its evaluation". What functions are being served by system evaluation ? (5 marks)
(d) Explain the advantages and disadvantages of using prototyping approach of system development (5 marks)

Ques. 5

(a) What are the major factors to be considered in designing user inputs? (5 marks)
(b) Write a short note on system manual. (5 marks)
(c) Explain the advantages of pre-written application software package. (5 marks)
(d) Compare and contrast between direct conversion and parallel conversion. (5 marks)

Ques. 6

(a) What are the benefits of ERP systems? (5 marks)
(b) Briefly describe the various financial decisions. (5 marks)
(c) What are the characteristics of computer frauds? (5 marks)
(d) Explain private key and public key encryption. (5 marks)

Ques. 7

(a) What is firewall? What are the objectives of firewall? (5 marks)

(b) What are the various risks involved in ERP implementation? (5 marks)

(c) What is information security? What are the objectives and contents of information system security plan? (5marks)

(d) Explain the factors upon which " make or buy" decision of an application software depends. (5 marks)

B3.1-R4: MANAGEMENT FUNDAMENTALS AND INFORMATION SYSTEMS
(Assignments)

Assignment 1. Case study on the Process Of Management and give the answer of following questions.

1. Describe the different levels of management and explain the information required at these different levels.
2. Describe the various types of Organisation Structure.
3. Describe the relationship between planning and controlling and the importance of controlling.
4. Describe the importance of motivation and the theories of motivation.

Assignment 2. Case study on Information System Concepts and give the answer of following questions.

1. Discuss why information systems are required.

Assignment 3. . Case study on Functional and Other Information Systems and give the answer of following questions.

1. What is the Decision Support System? How it helps to take decisions?
2. What are the factors on which information requirements depend?
3. What are the Expert Systems? Discuss the application areas of Expert Systems.

Assignment 4. . Case study on Enterprise Systems and give the answer of following questions.

1. Describe the importance of ERP in current business system and list out the various risk involved in implementing ERP.
2. Describe Scope of SCM.
3. Explain trends in CRM and challenges faced.

Assignment 5. . Case study on System Development Process and give the answer of following questions.

1. Describe the different stages of System Development Life Cycle.
2. Describe the different conversion strategies during System Implementation.
3. Describe the criteria for software selection.

Assignment 6. . Case study on Information System Security and give the answer of following questions.

1. What are the objectives of information security policy?
2. Why should business take computer frauds seriously?

Assignment 7. Case study on Information System Control Techniques and give the answer of following questions.

1. Describe General Controls. How do they differ from Application Controls?
2. What are the objectives of Storage Controls? Explain any two Storage Controls.

Assignment 8. Case study on system maintenance of a Project and give the answer of following questions

1. What are the Duties and responsibilities of the following people in a project

    i. Data entry supervisor,
    ii. File librarian
    iii. Control group
    iv. Operations management

v. Role of Security administrator
vi. Role of Quality Assurance group
vii. Role of System Analyst
viii. Role of application Programmer
ix. LAN administrator
x. Help desk administration

B3.2 – R4: Discrete Structure

Objective of the course

Discrete structure is a course which plays important role in the development of computer science and data networking. It teaches the students how to work with discrete structures, which are the abstract mathematical structures used to represent discrete objects and relationship between these objects. These structures include sets, permutations, relations, graphs, trees and finite state machines. Mathematics logic and Boolean algebra will help the students in the understanding of Digital system designs.

Certain classes of problems are solved by the specification of an algorithm. After an algorithm has described, a computer program can be constructed implementing it. In the portion of Analysis of algorithm ,verification of the functioning of an algorithm, time required to perform it, are all covered. The topics on number theory has application in cryptography combinatorics.Recurrence relation has utility in Analysis of Computer algorithms. To understand LAN, WAN knowledge of graph theory is required. A depth and comprehensive study of discrete structure helps the students to understand the advancements of computer science.

Outline of course

S. No.	Topic	Minimum number of hours
1.	Sets theory and functions	6
2.	Mathematical logic	8
3.	Boolean Algebra	5
4.	Number Theory	5
5.	Algebraic Methods	6
6.	Combination	9
7.	Graph Theory	9
8.	Analysis of Algorithms	5
9.	First state machines & languages	7

Lectures = 60
Tutorials = 60
Total = 120

DETAILED SYALLABUS

1. **Set Theory & Functions** **(6) hrs**

Sets, Subsets, Relations and their properties. Representing relations, Equivalence relation, partial orderings, maximal & minimal elements of a poset ,functions , inverse functions. Composition of functions and recursive functions.

2. **Mathematical logic** (8) hrs

Logic operators, proposition equivalence involving tautologies contradiction , predicate & quantifiers, computer representations of sets.

3. **Boolean Algebra** **(5) hrs**

Partitions of a set lattices and algebraic systems, Boolean functions and Boolean expressions, propositional Calculus, gates and switching circuits, Karnaugh map.

4. **Number Theory** **(5) hrs**

The Principal of induction, Euclidean algorithms the greatest common divisor, equivalence relation, Fibonacci numbers.

5. **Algebraic Methods** **(6) hrs**

Groups, order of a group element, cosets , Lagrange's theorem, permutations, representation of groups by permutation.

6. Combinations **(9) hrs**

Basics of counting, the Pigeonhole principle, permutation and combination, Discrete Probability generating functions, recurrence rotation, Divide and conquer relation, Inclusion and exclusion with applications.

7. **Graph Theory** **(9) hrs**

Multigraph and weighted graphs, paths & circuits, Eulerian paths nd circuits, the traveling salesman problem, planer graphs, trees, spanning trees, cut sets, minimum spanning tree.

8. **Analysis of Algorithms** **(5) hrs**

Algorithms and programs, efficiency of algorithms. Big 'O' notation, comparison of algorithm, sorting algorithm.

9. Finite start machines and languages **(7) hrs**

Languages and grammars, finite state of machines with output and without, Language recognition, turting machines.

Recommended Books
Main Reading

1. Kenneth N. Rosen, "Discrete Mathematics and its applications, Tata McGraw Hill.
2. C.L. Liu, "Elements of Discrete mathematics Tata McGraw Hill.
3. Norman L. Biggs " Discrete Mathematics Oxford University Press"
4. Trembling, J.P. & Manohar P, " Discrete mathematical structure with applications, Tata McGraw Hill.
5. Vinay Kumar, Discrete Mathematics, BPB, India, 2002

Supplementary Readings

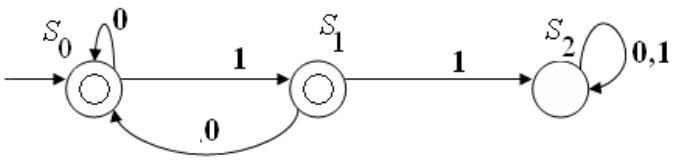
1. John Truss, " Discrete mathematics for computer scientists, Addison – Wesley
2. M. Lipson and Lipshutz, "Discrete Mathematics, Schaum's Outline series.
3. M.O. Albertson and P. Hutchinson, "Discrete Mathematics with Algorithm, "John Wiley and sons.

B3.2 – R4: Discrete Structure
Model Question paper

Attempt question 1 and any four of the remaining six questions.
Question 1 is of 28 marks and the rest are of 18 marks each.

Q.1

(a) How many different words can be formed out of the letters of the word VARANASI?
(b) If R is a relation "Less Than" from A = {1,2,3,4} to B = {1,3,5} then find RoR^{-1}.
(c) A graph G has 21 Edges, 3 vertices of degree 4 and other vertices are of degree 3. Find the number of vertices in G.
(d) What kind of strings does the following automaton reject?



(e) Find the binomial generating function for the sequence 1, 2, 3, ….
(f) Define cyclic group and give an example of such group.
(g) Show that (D_{30}, |) is a lattice. D_{30} is set of all positive integers that divides 30 and | is relation of divides i.e. x | y implies that x divides y.

[4x7]

Q.2

(a) Write the negation of each of the following in good English sentence.

I. Jack did not eat fat, but he did eat broccoli.
II. The weather is bad and I will not go to work.
III. Mary lost her lamb or the wolf ate the lamb.
IV. I will not win the game or I will not enter the contest.

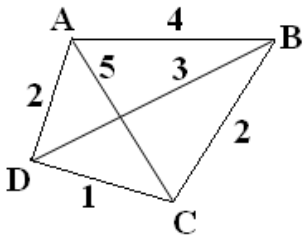
(b) **Simplify the logical expression**

$$\overline{X}\,\overline{Y} + \overline{X}\,Z + Y\,Z + \overline{Y}\,Z\,\overline{W}\,.$$

[8,10]

Q.3

(a) For the given graph, find the minimal spanning tree using Prim's algorithm.



(b) Show that is R_1 and R_2 are equivalence relations on A, then $R_1 \cap R_2$ is an equivalence relation.

[9,9]

Q.4

(a) 20 members of a bowling league wear shirts numbered consecutively from 1 to 20. When any three of these members are chosen to be a team, the league proposes to use the sum of their shirt numbers as the code number for the team. Show that if any eight of the 20 are selected, then from these eight one may form at least two different teams having the same code number.

(b) In a group of athletic teams in a certain institute, 21 are in the basketball team, 26 in the hockey team, 29 in the foot ball team. If 14 play hockey and basketball, 12 play foot ball and basket ball, 15 play hockey and foot ball, 8 play all the three games.

(i) How many players are there in all?

(ii) How many play only football?

[8,10]

Q.5

(a) Prove that for every pair of elements x and y in A (using algebraic method).

(i) (x + y)' = x' * y'

(ii) (x * y)' = x' + y'

(b) Prove that $(p \leftrightarrow q) \leftrightarrow r = p \leftrightarrow (q \leftrightarrow r)$

(c) Prove that the Boolean expression $A + AB + A\overline{B}$ is independent of B.

[8,6,4]

Q.6

(a) Let (G, *) be a group then for any two elements a and b of (G, *) prove that $(a * b)^{-1} = b^{-1} * a^{-1}$.

(b) Solve the recurrence equation $a_n = 5a_{n-1} + 7n; \quad a_1 = 5$

(c) Prove that V(G) ≤ E(G) ≤ Deg (G) in an undirected graph G.

[6,6,6]

Q.7

(a) Draw a finite state machine for the language that contains string on {0,1} such that number of 0's is even and number of 1's is a multiple of 3.

(b) Define permutation group. Show that every cycle can be written as product of transposition.

[8,10]

B3.2-R4 : Discrete Mathematical Structure
Assignment

1. Define a multi set. What is a cardinality of a set? Illustrate your answer with an example. How many binary relation can be defined on A if |A| = n?
2. When a set is called well ordered set? Show that (P(S), $\subseteq$) is a finite boolean algebra, where S = {1, 2, 3} and $\subseteq$ is a relation defined on P(S) as 'set containment'.
3. Define normal subgroup. is (I+, +) a group ?
4. Let M = (S, I, $\Im$, s_0, T) be a finite state machine. Let R be a relation defined on S such that for any two states: s_i, $s_j \in S$, $s_i R s_j$ iff s_i and s_j are w-compatible. Show that R is an equivalence relation.
5. Determine the binomial generating function for the sequence a, where the general term of the sequence is given as

$$a_k = \sum_{k=1}^{n-1} \frac{1}{k(n-k)} \quad for \quad n \geq 2$$

6. Prove the following using mathematical induction

$$(666...upto\ n\ digits)^2 + (888...upto\ n\ digits) = (444...upto\ 2n\ digits)$$

7. Find the discrete numeric function for the generating function $(1+x)^5$.
8. Solve the recurrence relation $a_n = a_{n-1} + a_{n-2}$; for $n \geq 2$; given that $a_1 = a_2 = 1$.
9. Twenty cards numbered 1 through 20 are placed face down on a table. Cards are selected one at a time and turned over until 10 cards have been selected. If the two cards add up to 21, the player loses. Is it possible to win the game?
10. Find the number of ways of selecting three numbers x, y and z from 1 to 300 (both inclusive) such that x + y + z is divisible by 3.
11. Draw a finite state machine that can accept any string from {a, b}* that contains 2n a's and 3m b's where both m and n are non-negative integers.
12. Construct a phrase structure grammar G for the language
$$L = \{a^m b^n \mid m, n \geq 1, m \neq n\}$$
13. Simplify the following FSM.

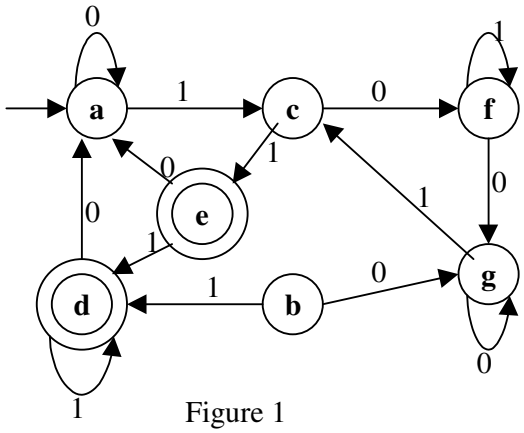
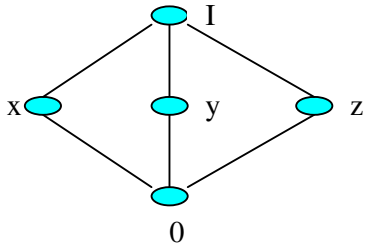


Figure 1

14. A lattice is said to be modular if, for all a, b and c, $a \leq c \Rightarrow a \vee (b \wedge c) = (a \vee b) \wedge c$. Show that a distributive lattice is modular. Further show that the lattice shown in the following Hasse diagram is a non-distributive lattice and is modular.

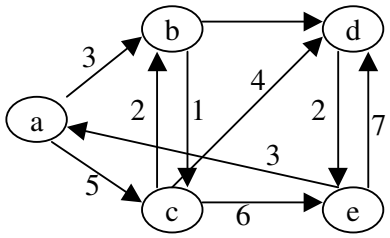


15. Show that if L_1 and L_2 are two distributive lattices, then $L = L_1 \times L_2$ is also distributive, where partial order in L is the product of partial orders in L_1 and L_2.

14. Given a complete regular bipartite graph of 100 vertices, what will be its chromatic number? What is the cardinal number of the set E of this graph?

15. What is a planar Graph? Show that Kn (n < 5) is a planar graph.

16. Calculate all pairs shortest path in the following graph.



17. Reduce the following Boolean expressions, defined over the two-valued Boolean algebra, to Conjunctive Normal Form and Disjunctive Normal Form.

$$f(w, x, y, z) = (w \wedge x \wedge y') \vee (w \wedge x' \wedge z) \vee (x \wedge y' \wedge z')$$

18. Simplify the following boolean expression

$$w\,(x + y\,(z + x') + y') + w'x'y'z'$$

19. Let L is a distributive lattice. Show that if there exists an a with

$$a \wedge x = a \wedge y \text{ and } a \vee x = a \vee y$$

then x = y.

B3.3-R4: SOFTWARE ENGINEERING & CASE TOOLS

Objective of the Course

In this course, students will study the various topics relevant to development of modern quality software system. Analysis, Design and development of software is an extremely important course and every software developer is required to be well conversant with the principles, theory and practical aspects of writing efficient and high quality programs. This course is a graduate-level software engineering course. We will explore a basic knowledge of software engineering principles, advanced specification and design. This course covers various topics that every computer science student needs to know and practice to ensure quality software development.

Outline of Course

S.No.	Topic	Minimum No. of Hours
1.	Software Engineering Fundamentals	05
2.	Software Requirements Analysis & Specification	10
3.	Software Design	05
4.	CASE Tools	04
5.	Coding and Testing	06
6.	User Interface Design	03
7.	Configuration Management	04
8.	Software Maintenance	06
9.	Software Quality and Metrics	05
10.	Object-Oriented Software Engineering	06
11.	Advance Software Engineering Topics	06

Lectures	=	60
Practicals/Tutorials	=	60
Total	=	120

Detailed Syllabus

1. **Software Engineering Fundamentals** **5 Hrs.**

Definition of software product and process, Software Characteristics, Components, Applications, Layered Technologies, Processes and Product, Methods and Tools, Generic View of Software Engineering, Software Crisis, Software development paradigms, Techniques of Process Modeling, Software Process and lifecycle models: Build & Fix Model, Waterfall Model, Prototyping Model, Iterative Enhancement Model, Evolutionary Development Model and Spiral Model, Incremental, and Concurrent Development Model.

2. **Software Requirements Analysis & Specification** **10 Hrs.**

System specification, Software requirements specification (SRS) standards, Formal specification methods, Specification tools, Requirements validation and management. Problem Recognition, Evaluation and Synthesis, Modeling, Specifications and Review Techniques. Analysis Modeling: Difference between Data and Information, ER Diagram, Dataflow Model, Control Flow Model, Control and Process Specification, Data Dictionary.

3. **Software Design** **5 Hrs.**

Software architecture, Modular design - cohesion and coupling, Process-oriented design, Process and Optimization, Data-oriented design, User-interface design, Real-time software design, Architectural Designing, Interface Design, Procedural Design, Object Oriented Design.

4. **CASE Tools** **4 Hrs.**

Computer-aided software engineering, Introduction to CASE, Building Blocks of CASE, Relevance of CASE tools, High-end and low-end CASE tools, automated support for data dictionaries, DFD, ER diagrams, Integrated Case Environment, CASE workbenches.

5. **Coding and Testing** **6 Hrs.**

Choice of Programming languages, Coding standards, Introduction to Testing Process, Functional & Structural Testing, Testing Activities like Unit, Integration & System Testing, Testing tools and workbenches.

6. **User Interface Design** **3 Hrs**.

Concepts of Ui, Interface Design Model, Internal and External Design, Evaluation, Interaction and Information Display.

7. **Configuration Management** **4 Hrs.**

Concepts in Configuration Management, The Configuration Management Process: Planning and Setting up Configuration Management, Perform Configuration Control, Status Monitoring and Audits.

8. **Software Maintenance** **6 Hrs.**

What is software maintenance, Maintenance Process & Models, Reverse Engineering, Software re-engineering, Configuration Management issues and concept, Configuration planning & techniques, Software versions and change control process, Documentation.

9. **Software Quality and Metrics** **5 Hrs.**

SQA-Software Quality Assurance, Debugging and reliability analysis, Program complexity analysis, Software quality and metrics, Quality Control, Approaches to SQA, Reliability, ISO9000 and 9001, CMM Levels and SIX sigma.

10. **Object-Oriented Software Engineering** **6 Hrs.**

OO Concepts and Approach, OO Analysis, Domain Analysis, OOA Process and Object Models, OO Design, System Design process and Models, UML and diagrams,

11. **Advance Software Engineering Topics** **6 Hrs.**

Clean room approach and strategy, Functional specification and design, Component-based software engineering process, Reusability and Metrics, Reengineering Essentials, Software Agents.

RECOMMENDED BOOKS:
MAIN READING

1. R. Pressman, "Software Engineering", 7th Edition, 2002, McGraw-Hill.
2. W.S. Jawadekar, Software Engineering – A Primer, TMH-2008

SUPPLEMENTARY REDING

1. Shari Ptleeger, “Software Engineering”, 2001, Pearson Education.
2. Stephen Schach, Software Engineering, TMH, 2007
3. Sommerville I., Software Engineering, Addision-Wesley

B3.3-R4: SOFTWARE ENGINEERING & CASE TOOLS
Model Question Paper

NOTE:

1. **Answer question 1 and any FOUR questions from 2 to 7.**
2. **Parts of the same question should be answered together and in the same sequence.**

TOTAL TIME: 3 HOURS **TOTAL MARKS: 100**

1.

b) Why should a requirement engineer avoid making any design decision during requirement analysis?

c) Why the Spiral life cycle model is considered to be a meta model? Differentiate between throw away and evolutionary prototype process model.

d) Differentiate between functional and non functional requirements of a software? What are non-functional requirements for software?

d) How structure partitioning can help to make software more maintainable?

e) Explain in brief: "Software Characteristics". Mention some of the myths exists in the various stake holder's mind about the software.

f) Why SRS document also known as black box specification of a system?

g) Project requirements continually change, but change can be easily accommodated if software is flexible. Justify in brief.

(7x4)

2.

a) What are the major phases of the entire life of the software? Specify the percentage of efforts required on each phase. Which phase requires the maximum efforts?

b) How do you evaluate user interface? List the desirable characteristics that a good user interface should possess.

e) Why is it so difficult to gear a clear understanding of, what the customer wants? Which document needs to be prepared for contracting between customer and developer? What it contains?

(7+5+6)

3.

a) Identify the types of defects that you would able to detect during the following: Code walk through and code Inspection. Give difference between code walk through and code inspection.

b) Discuss the merits and demerits of ISO 9001 and SEI CMM Certification.

c) What is the meaning of FTR (Formal Technical Review)? What are the guidelines to review software product? List and explain various activity involve in Software audit.

(6+4+8)

4.

a) What do you mean by measure, measurement and metric? How they are related to each other? What is difference between Product and Process Quality metrics?

b) Develop an E-R diagram and prepare data dictionary for the following system.

"Library Management System".

c) What are the different kinds of project resources? Explain in brief.

(7+8+3)

5.

a) Draw the DFD for the following system.
"A simple invoicing system for a small business".

b) Suppose an organization assessed at level 3 of SEI CMM, what can you infer about the current quality practices at the organization? What does this organization has to do reach SEI CMM level 4?

c) What is the meaning of Data Collection? Which factors are important for Data collection?

(7+7+4)

6.

a) What is the method of estimating software quality? What is to be done in subcontracting and quality auditing?

b) What is the meaning of software maintenance? What are the different types of maintenance that are software product might need. Why is such maintenance required?

c) Explain the integration testing process. Why is the mixed integration testing approach preferred by many testing engineers?

(7+7+4)

7.

a) Discuss the relationship between the concept of information hiding as an attribute of effective modularity and the concept of module independence. Why is it good idea to keep the scope of effect of a module within its scope of control?

b) Differentiate between software reengineering and reverse engineering.

c) Describe technique for tracking and controlling of Software Quality. How we can do effective contract management?

(7+7+4)

B3.3-R4: SOFTWARE ENGINEERING & CASE TOOLS

Assignment 1. Find out the appropriate model for the below applications.

- A Well-understood data processing application.
- A new software product that would connect computers through satellite communication. Assume that your team has no previous experience in developing satellite communication software.
- A software product that would function as the controller of a telephone switching system.
- New library automation software that would link various libraries in the city.
- Extremely large software that would provide, monitors, and control cellular communication among its subscribers using a set of revolving satellites.
- New text editor.
- A compiler for a new language.
- An object-oriented software development effort.
- The graphical user interface part of a large software product.

Assignment 2. Prepare Software project management planning (SPMP) document as per below format using Turbo Project for Library Automation System.

- Introduction
  1. Objectives
  2. Major Functions
  3. Performance Issues
  4. Management and Technical Constraints
- Project Estimates
  1. Historical Data Used
  2. Estimation Techniques Used
  3. Effort, Resource, Cost, and Project Duration Estimates
- Schedule
  1. Work Breakdown Structure
  2. Gantt Chart Representation
- Project Resources
  1. People
  2. Hardware and Software
  3. Special Resources
- Staff Organization

1. Team Structure
2. Management Reporting

- Risk Management Plan
  1. Risk Analysis
  2. Risk Identification
  3. Risk Estimation
  4. Risk Abatement Procedures
- Project Tracking and Control Plan
- Miscellaneous Plans
  1. Quality Assurance Plan
  2. Configuration Management Plan
  3. System Testing Plan
  4. Delivery, Installation and Maintenance Plan

Assignment 3. CASE STUDY: Study of different Software Cost Estimation models.

- Calculate the cost of Library Automation system by COCOMO

Assignment 4. Design Software Requirement Specification (SRS) document for the Library Automation System.

Assignment 5. Draw the following diagram for the library automation system

- Structure chart, Physical DFD, User Interface (I/O) Designing, Component level Design.

Assignment 6. Draw the User's View diagram for the library automation system using Object Oriented approach by Enterprise Architecture Tool.

- Use case Diagram

Assignment 7. Draw the Behavioral View diagram for the library automation system using Object Oriented approach by Enterprise Architecture Tool.

- Sequence Diagram
- Collaboration Diagram
- State-chart Diagram
- Activity Diagram

Assignment 8. Draw the Structural View diagram for the library automation system using Object Oriented approach by Enterprise Architecture Tool.

- Class Diagram
- Object Diagram

Assignment 9. Draw the Implementation View diagram for the library automation system using Object Oriented approach by Enterprise Architecture Tool.

- Component Diagram

Assignment 10. Draw the Environmental View diagram for the library automation system using Object Oriented approach by Enterprise Architecture Tool.

- Deployment Diagram

Assignment 11. CASE STUDY: Various Testing Tools.

Assignment 12. Design Test Cases for Library automation system's functionality

Assignment 13. Prepare technical white paper on any one topic as given below.

- ISO, CMM, Six-Sigma standards, Agile Process Model, Clean room Software Engineering, Cost Benefit Analysis Method (CBAM), Re-engineering, Software security, Automated software testing, Web Engineering, Computer Aided Software Engineering

B3.4-R4: OPERATING SYSTEMS

Objective of the Course

This course is covering all the fundamental operating systems concepts such as processes, interprocess communication, input/output, virtual memory, file systems, and security. The students are expected to learn these principles through UNIX/Linux/Windows 2000/XP/NT/Vista like operating systems.

The course outline is about the concepts, structure and mechanism of operating systems. Its purpose is to present, as clearly and completely as possible, the nature and characteristics of modern-day operating systems. It examines the operating systems that run in multiprocessing environments and covers distributed computing in the context of open system interconnection (OSI) standards and protocols.

The intent of this course is to provide a thorough discussion of the fundamentals of operating system design and to relate these to contemporary design issues and to current directions in the development of operating systems.

Outline of Course

S.No.	Topic	Minimum No. of Hours
1.	Overview	08
2.	Process Management	10
3.	Storage Management	10
4.	I/O Systems	08
5.	Distributed Systems	10
6.	Protection & Security	08
7.	Case Studies	06

Lectures	**=**	**60**
Practicals/Tutorials/Assignments	**=**	**60**
Total	**=**	**120**

Detailed Syllabus

1. Overview **8 Hrs.**

Introduction: Operating Systems, Multi programmed Batched system, Time storing systems, Parallel and Distributed Systems, Real Time Systems, Computer System Structures : I/O structure, Storage Structure , Storage Hierarchy, Hardware, Protection, General System Architecture.

Services: User Interface Services, Graphics and Multimedia Services, Messaging and Collaboration, Network basics, Web Services

Operating System Structures: System components, Operating System Service, System Calls, System programs, System Structure, System Design and Implementation, System Generation, Virtual Machines and Hypervisor

2. Process Management **10 Hrs.**

Processes : Process Concept, Process Scheduling, Operation on Processes, Cooperating Proceses, Interprocess Communication, Symmetric vs. asymmetric multiprocessing, Background Process.

CPU Scheduling : Scheduling Criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real Time Scheduling, Algorithm Evaluation, Thread Scheduling, System Jobs.

Process Synchronization : The Critical Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors.

Deadlocks: Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Deletion, Recovery from Deadlock, Combined Approach to Deadlock Handling.

3. Storage Management **10 Hrs.**

Memory Management: Logical versus Physical Address Space, Swapping, Contiguous Allocation, paging, Segmentation, Segmentation with paging.

Virtual Memory: Demand Paging, Performance of Demand Paging, Page Replacement Algorithms, Thrashing, Demand Segmentation.

File System Interface: Access Methods, Directory Structure, Protection, Consistency Semantics, Partitions, Simple Volumes, Shadow Volumes, Virtual Disks, Bitlocker.

File System Implementation: File System Structure, Allocation Methods, Free Space Management, Directory Implementation, Efficiency and Performance, Recovery.

4. I/O Systems **9 Hrs.**

I /O Systems : I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Requests to Hardware Operations, Performance, Synchronous I/O and Asynchronous I/O, File Caching.

Secondary-Storage Structure : Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Reliability, Stable Storage Implementation.

Tertiary-Storage Structure : Tertiary-Storage Devices, Operating-System Jobs, Performance Issues

File System: File System Formats (CDFS, FAT, NTFS, exFAT etc), Kernel Mode and User Mode Driver Framework

5. Distributed Systems **9 Hrs.**

Network Structures : Topology, Network Types, Communication, Design Strategies.

Distributed System Structures : Network Operating Systems, Distributed Operating Systems, Remote Services, Robustness, Design Issues

Distributed File Systems : Naming and Transparency, Remote File Access, Stateful versus Stateless Service, File Replication.

Distributed Coordination : Event Ordering, Mutual Exclusion, Atomicity, Concurrency Control, Deadlock Handling, Election Algorithms, Reaching Agreement

6. Protection & Security **8 Hrs.**

Protection : Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights.

Security : The Security Problem, Authentication, One-Time Passwords, Program Threats, System Threats, Threat Monitoring, Encryption, Computer-Security Classifications, Common Criteria, VPN, Protocol security, Access Checks (ACL, DACLs), Auditing, Policy Management, User Account Controls (UAC).

7. Case Studies **6 Hrs.**

The Unix System, The Linux System, Windows Server.

RECOMMENDED BOOKS
MAIN READING

1. Silberschatz Galvin, "Operating System Concepts", 1999, Addison-Wesley Longman.
2. Andrew S. Tanenbaum, Albert S. Woodhull, "Operating Systems : Design & Implementation", 2002, Pearson Education Asia.
3. Mark E. Russinovich and David A. Solomon , "Windows Internals 5th Edition" ,June 2009 :
   Microsoft Press

SUPPLEMENTARY READING

1. D.M.Dhamdhere, "Operating Systems : A Concept Based Approach", 2002, Tata McGraw Hill Publishing Company.
2. A.S. Godbole, " Operating Systems", Tata McGraw Hill, 2002
3. Stephen G. Kochan , Patrick Wood , " UNIX Shell Programming" SAMS Publishing 2007, Third Edition ,Pearson Education
4. Richard L.Petersen, " LINUX:The Complete Reference " fifth edition, Tata McGraw Hill,2006
5. Kate Wrightson , Joe Merlino ," Introduction To UNIX", McGrawHill Irwin ,2003

Note : For All modules explanation must carry case study of either UNIX family or Windows family or both and the last module then can be covered with features of the case study studied throughout.

B3.4-R4 : OPERATING SYSTEMS

NOTE:
1. Answer question 1 and any FOUR questions from 2 to 7.
2. Parts of the same question should be answered together and in the same sequence.

Time: 3 Hours **Total Marks: 100**

1.
(a) How can one distinguish between Processes, Threads and Jobs ?
(b) What is a software interrupt?
(c) What is a virtual memory space? How is it different from a physical memory space?
(d) Distinguish between Partitions, Volumes and Multi-Partition Volumes..
(e) What does Process Virtualization do? What security threat does it address ?
(f) Briefly discuss one of the ways of implementing memory protection using special hardware support.
(g) Differentiate between Symmetric and Asymmetric multiprocessing.

(7 x 4)

2.
(a) Describe in brief, the different attributes associated with any file in a typical computer system along with the relevance/usefulness of each of these attributes.

(b) What is Hypervisor? Define the two types of Hypervisor. Give Examples of each type.

(c) How does Bitlocker ensure OS integrity and encrypt files in the hard drive.

(6+8+4)

3. Assume that a producer is producing non zero integers £ 1000 and putting them in a circular buffer of size 100, while the consumer is consuming the non zero integers contained in that circular buffer at its own speed. Using counting and binary emaphores, write the outline of the producer process and the consumer process.

(18)

4.

(a) Explain the basic differences between a security/protection policy and protection mechanism as existing in any contemporary computer system.

(b) Explain the Application level filtering feature of Windows firewall .

(c) What is a password? Why is it used? Describe the various types of password validation techniques as used in any computer system.

(4+6+8)

5. Consider a hypothetical computer system having the following CPU scheduling features.

It has got 3 (three) priority levels 1, 2 & 3 with 1 being the highest and 3 being the lowest. It supports a multilevel preemptive scheduling policy having the features mentioned below:

Priority level	Allotted Time Quantum (in units)	% CPU time allotted
1	10	50%
2	15	30%
3	20	20%

Context switching time among jobs/processes having same priority = 2 units.

Context switching time from one priority level to another = 5 units.

Dispatcher execution time = 5 units (fixed).

Time Quantum allotted/job excludes the time taken by the dispatcher as well as the context switching time.

Jobs/Processes are serviced in a Round Robin fashion.

Before servicing the very first job, one needs to execute the dispatcher and perform a context switch i.e., no job can possess a zero waiting time.

If any job finishes well within its allotted time quantum the remaining part of that time quantum is not allotted to any other job rather a context switch takes place.

For the previously mentioned computer system having the aforesaid scheduling policy,the following job mix / processes is required to be serviced.

Process/Job	**Service time (in units)**	**Priority**	**Arrival time (in units)**
P_0	20	2	0
P_1	15	1	5
P_2	25	2	8
P_3	30	3	10
P_4	12	1	15
P_5	40	3	20
P_6	18	2	22
P_7	24	1	30

(a) Specify the queue status at each priority level.
(b) Specify the Gantt chart for the given job mix.
(c) From the Gantt chart compute the turnaround time as well as waiting time for each process. **(5+10+3)**

6. Consider the following specifications about the physical and virtual spaces as existing in a computer system.

- Physical space = 64 K words out of which 16K is occupied by the resident operating system. Remaining portion is available to accommodate user processes.
- Physical space is divided into 2K word size frames.
- Virtual space for user 1 = 256K words.
- Virtual space for user 2 = 512K words.
- Both the users share a common 8K word Library, which is required at all time By both the users.

(a) Specify the address layout of the following, clearly highlighting each field:

i. Virtual address of user 1.
ii. Virtual address for user 2.
iii. Address of library.
iv. Physical Address.

(b) How many Page Map Table (PMT) entries will be needed for user 1, user 2 & Library? Clearly justify your answer.

(c) Specify in detail a typical PMT entry assuming the following features of each page.

- Each page has got an associated modify bit which helps to identify whether the corresponding frame has been written into and hence needed to be written back to the virtual space during any page replacement.
- A use bit indicating whether the page has been accessed recently.
- Access permission bits signifying the following modes of access.
  i. READ
  ii. WRITE
  iii. EXECUTE

(d) Assuming that the library needs to be present at all time in memory and the system has a TLB Cache that can contain maximum 16 entries, how many user pages can be referred from TLB? Justify your answer.

(8+2+5+3)

7.

(a) State the necessary conditions for a deadlock to occur with examples.

(b) Explain the Kernel Structure in UNIX. Discuss with examples the Directory entry attributes and Inode table Attributes in detail.

(c) Consider the following process and resource map.

- The system has got 4 (four) concurrently non-shareable and reusable resources with following unit allocation/resource.

Resource	Units
R_0	8
R_1	5
R_2	9
R_3	7

- There are 5 (five) processes in the system P_0… P_4 having the following maximum resource requirements.

Process	R_0	R_1	R_2	R_3
P_0	3	2	1	4
P_1	0	2	5	2
P_2	5	1	0	5
P_3	1	5	3	0
P_4	3	0	3	3

Applying Banker's algorithm, show that

i) The following is a safe Allocation State

Process	R_0	R_1	R_2	R_3
P_0	2	0	1	1
P_1	0	1	2	1
P_2	4	0	0	3
P_3	0	2	1	0
P_4	1	0	3	0

ii) The following is an unsafe Allocation State

Process	R_0	R_1	R_2	R_3
P_0	2	0	1	1
P_1	0	1	2	1
P_2	4	0	0	1
P_3	1	2	1	0
P_4	1	0	3	0

(5+5+8)

B3.4-R4: OPERATING SYSTEMS

Assignment 1. Try the following command sequence and write its output:

a) General Commands :- man , logname ,uname ,who ,who am i ,tty , date,cal ,echo
b) Directory Commands :- mkdir , cd , cd .. , pwd , rmdir
c) File Commands :- touch , cat , rm ,cp ,mv , ln , ls , chmod , umask , wc
d) Filter Commands :- head , tail , cut ,paste , sort ,uniq , tr ,cmp , comm , grep
e) Disk Commands :- du , df
f) Mathematical Commands :- bc , expr ,factor

Assignment 2.

a) why unix commands can be divided into internal and external commands?
b) How to know a process is a zombie or orphan process?
c) How can we obtain just day from date command.
d) What is the significance of " tee " commands?
e) How to find the version details of unix?

Assignment 3.

d) Explore the filesystem tree using cd, ls, pwd and cat. Look in /bin, /usr/bin, /tmp /etc. What do you see?
e) Explore /dev. Can you identify what devices are available? Which are character-oriented and which are block-oriented? Can you identify your tty (terminal) device (typing who am i might help); who is the owner of your tty (use ls -l)?
f) Explore /proc. Display the contents of the files interrupts, devices, cpuinfo, meminfo and uptime using cat. Can you see why we say /proc is a pseudo-filesystem which allows access to kernel data structures?

Assignment 4.

e) Convert the decimal number 192 to octal and hexadecimal using bc command.
f) Run ps , the script command and run ps again . What is its output. Explain.
g) Write a command to create following directory structure in one command:
DOEACC→ALEVEL→AL55…
h) Create above Directory Structure with permission 777.?

Assignment 5.

a) Write a command to delete a non-empty directory.
b) What output will this command sequence produce ?
who | grep –c "^$LOGNAME"
c) What is the difference between pipe (|) and tee command, explain with example.

Assignment 6. Using vi editor write commands to do the following

d) Block Copy
e) Block Move
f) Block Delete

Assignment 7. Using vi editor

d) Two consecutive lines are combined into one .Which vi command is used to do so?
e) Write a command to move line number 1,10 after line number 25.
f) In the middle of a file being typed you want to import the output of who command. How would you do so?

Assignment 8. Using vi editor

d) Write a command to undo last action.
e) What is the purpose of .exrc file?
f) Write a command to create abbreviation LU as Linux Unix.

Assignment 9.
Write a shell script
a) To copy source file to destination file using CP Command
b) To copy source file to destination file without using CP Command
c) To append file f1 at the end of file f2.
d) To concate content of two files.

Assignment 10.
Write a shell script that
a) Works as a calculator.
b) Takes a number and Checks it is a prime or not.
c) Finds factorial of the given number.
d) Finds reverse of a given number.
e) Finds the given No is Armstrong or Not.
f) Generates Fibonacci series

Assignment 11.
a) Write a shell script to wish "good morning", "good afternoon" and "good night" as per the current system time.
b) Write a Shell script to send mail to all users on your System
c) Write a shell script to check validity of the user

Assignment 12.
a) Write a shell script that changes directory as specified by the user
b) Write a shell script to find out no. of vowels from the file.
c) Write a shell script to find out the biggest number from the given three numbers. Numbers are supplied as command line argument. Print error message if sufficient arguments are not supplied.
d) Write a shell script for checking file have write(w) read(r) and execute permission or not. And also that file exists or not`

Assignment 13.
c) We have a file emp.mast which consists of detail of employees in an organization (Fields are emp_id,emp_name,dept_name,basic_salary,designation,dob).Write a command to display name of employee who is not director.
d) Write a command to display name and basic of each employee.

Assignment 14.
f) Using at command submit a job at 7 pm.
g) Using batch command submit a job at 7 pm..
h) Delete a job from at queue.
i) Display the listing of jobs in at queue.
j) Write a command to kill a job.

Assignment 15.
e) Write a command to display contents of a file emp.mast in sorted order on emp_id field.
f) Write a command to display contents of a file emp.mast in sorted order on basic_salary field.
c)Write a command to display name of the youngest employee .
d) Write a command to create backup of current directory.

Assignment 16.
a) Write a shell script to generate salary slip of employees (emp_id wise) in file emp.mast by using following formula :
Net salary=Basic+DA+HRA+CCA-EPF.
b) Get student information of students and store them in a file. The students' information contains roll no., name and marks of students. Write a shell script to print name of top five students.

B3.5-R4: Visual Programming

Objective of the Course

- To make the students to understand the visual programming language concepts applied to a business environment including: form design, common form tool controls, input-process-output model, arithmetic operations and assignment statements, predefined object methods & functions, decision structures, looping structures, list controls, array and table processing, sub procedures and user-defined functions, and database programming. Implement application design specifications with a visual object-oriented, event-driven programming language.

Outline of the Course

S.No	*Topic*	*Minimum No. of Hours*
1.	Introduction to .NET	04
2.	VB .NET	05
3.	Console Applications	05
4.	Introduction to Windows Forms	05
5.	Introduction to ADO.NET	05
6.	Windows Forms and Controls in detail	04
7.	Data Types and Base Class Libraries	05
8.	Object Oriented Programming with VB.NET	08
9.	Visual Inheritance	02
10.	Mastering Windows Forms	02
11.	ASP .NET	08
12.	Themes and Master Pages	03
13.	Managing State	04

Lectures	**=**	**60**
Practicals	**=**	**60**
Total	**=**	**120**

Detailed Syllabus

1 Introduction to .NET

.NET framework, MSIL, CLR, CLS, Name spaces, Assemblies The Common Language Implementation | Assemblies | Metadata and Intermediate Language | Garbage Collection | Versioning and Side-by-Side Execution | The End to DLL Hell | Managed Execution | COM InterOp

2 VB .NET

Language Features | Creating .NET Projects | NameSpaces | Data Structure and Language Highlights | Classes and Inheritance | Structured Error Handling | Exploring the Base Class Library | Compatibility with VB6 | The .NET Type System | Threads | C#

3 Console Applications

When to use Console Applications | Generating Console Output | Processing Console Input

4 Introduction to Windows Forms

Benefits of Windows Forms | Windows Forms compared to the classic VB 'Ruby' Forms mode | .NET Events | Visual Inheritance | Code-free re-sizing | Using ActiveX Controls

5 Introduction to ADO.NET

Benefits of ADO.NET | ADO.NET compared to classic ADO | DataSets | Managed Providers | Data Binding, DataSets and XML | Typed DataSets

6 Windows Forms and Controls in detail

The Windows Forms Model |Creating Windows Forms |Windows Forms Properties and Events |Windows Form Controls |Resizing | Menus | Dialogs | ToolTips

7 Data Types and Base Class Libraries

Understanding .NET Data Types | Exploring Assemblies and Namespaces | String Manipulation | Files and I/O | Collections | The Microsoft.VisualBasic Namespace

8 Object Oriented Programming with VB.NET

Creating Classes in VB.NET | Overloading | Constructors | Inheritance | Controlling scope and visibility | Dispose and Finalization | Debugging and Error Handling

9 Visual Inheritance

Apply Inheritance techniques to Forms | Creating Base Forms | Programming Derived Forms

10 Mastering Windows Forms

Printing | Handling Multiple Events | GDI+ | Creating Windows Forms Controls

11 ASP .NET

Introduction to ASP.NET, Working with Controls, Using Rich Server Controls Accessing Data, Overview of ADO.NET | Connecting to Data | Executing Commands | Working with Data | Choosing an ADO.NET Provider | Configuration Overview | Using the Web Site Administration Tool | Programming Configuration Files | Encrypting Configuration Sections

12. Themes and Master Pages

Creating a Consistent Web Site | ASP.NET 2.0 Themes | Master Pages Displaying Data with the GridView Control

13. ManagingState

Preserving State in Web Applications | Page-Level State | Using Cookies to Preserve State | ASP.NET Session State | Storing Objects in Session State | Configuring Session State | Setting Up an Out-of-Process State Server | Storing Session State in SQL Server | Using Cookieless Session IDs | Application State Using the DataList and Repeater Controls | Overview of List-Bound Controls |Creating a Repeater Control | Creating a DataList Control

Recommended Books:

1. Bradley, Julie C. and Anita C. Millspaugh. PROGRAMMING VISUAL BASIC 2008 Edition 7th Edition, Boston, MA: McGraw-Hill/Irwin,
2. Professional VB. NET 3.0, Wrox publication by Bill, Billy, Tim, Kent and Bill Sheldon.
3. ASP .NET complete reference, publication Tata McHill.
4. Introducing Microsoft Visual Basic 2005 for Developers, Microsoft Publications
5. Professional ASP.NET 2.0 , Wrox Publication

Web Reference:

www.msdn.microsoft.com

Model Question Paper
B3.5-R4 VISUAL PROGRAMMING

NOTE:

1. Answer question 1 and any FOUR questions from 2 to 7.

2. Parts of the same question should be answered together and in the same sequence.

Time: 3 Hours **Total Marks: 100**

a) Explain the difference between Array and Array List.
b) Explain the architecture of .NET and the Framework of .NET.
c) Explain Operator Overloading by giving Proper Example.
d) Explain Exception handling in VB.NET.
e) Define Namespace. Give types of namespace with example.
f) Give the difference between Out and Ref Parameter.
g) Define terms: CLR and CLS

(7x4)

Q.2

a) Explain Visual Inheritance in VB.NET with example.
b) How the below methods of sqlCommand class are differ from each other.
- ExecuteNonQuery()
- ExecuteReader()
- ExecuteScalar()

c) Explain events and delegates with example.

(6+6+6)

Q.3

a) Explain Managed and Unmanaged Code in the .NET context with Example.
b) Explain Split and Join String function in VB.NET with program code.

(9+9)

Q.4

a) List out the steps to create a master page and the use of the master page.
b) Explain the page execution of the ASP.Net and also explain which are the main events of page are occurred when page is requested.

(9+9)

Q.5

a) Differentiate web server and HTML control in brief and list various navigation controls in asp.net.
b) Write a menu driven program that behaves like calculator. Take three arguments from user Two numbers and one operator and display proper result. Use command line Arguments. Define exception called ExWrongInput to handle invalid input, also handle zero division exception
c) Explain Function Overloading & Overriding.

(6+9+3)

Q.6

a) What is the difference between a sealed, interface and abstract class?
b) Differentiate cookies, Sessions and application objects of Asp.net.
c) What is the use of the DataRelation class? Can I use DataRelation class with DataTable?

(7+6+5)

Q.7

a) Explain Terms: .NET code Synchronization, Multithreading
b) How Regular Expression is handled in .NET? Explain with code example.
c) What is Virtual Function? Give syntax of declaring of virtual function in VB .Net.
d) What is the significance of DataSet Class? Explain how to populate a DataSet using a DataAdapter.

(4+4+6+4)

Practical Assignment List

Sr. no.	Practical	Week no.
PART-1 .NET Framework 2.0 and Visual Studio 2005		
1	Study of .NET framework with comparison of various framework versions.	**1**
2	Study of .NET Architecture with 1) Run time environment (CLR) 2) CSC 3) Garbage Collection 4) Common Type System (CTS)	**1**
3	Introduction to IDE Visual Studio 2005 and Explain about new features of 2005 compares to Visual Studio 2003	**2**
4	Study of language features and comparison of VB.NET and C#.	**3**
PART-2. Visual Studio 2005 C#		
5	Write a program for Arithmetic Calculator using Console Application in C# & VB.	**3**
PART-3. Visual Studio 2005 Object Oriented Programming		
6	Write a Program for explaining use of Overloading and Overriding, constructor and Destructor in Class with using methods and properties in VB.	**4**
7	Write a program for explaining events and Delegates in VB.	**5**
PART-4. Windows Forms VB.NET 2.0		
8	Implement Windows Form based application using controls like menus, dialog and tool tip etc.	**6**
9	Implement Master Form with Windows application.	**7**
10	Implement concepts of Inheritance, visual inheritance and Interface in windows application.	**8**
11	Implement printing of GDI+ with windows application.	**8**
PART-5. ADO.NET 2.0		
12	Study of comparison between ADO and ADO.NET.	**9**
13	Use Dataset, Data Reader, XML Reader & Data Sources (SQL, Object & XML) with Any Windows or Web Application.	**9**
14	Use Data Controls like Data List, Grid View, Detail View, Repeater and List Bound Control	**10**
PART-6. ASP.NET 2.0		
15	Implement web application using ASP.NET with web control.	**11**
16	Write a code for web application to provide input validations using Input Valuators.	**12**
17	Create a Web application that illustrates the use of themes and master pages with Site-Map.	**13**
18	Create a Web Application in ASP.NET using various CSS.	**13**
19	Implement the concept of state management in a web application.	**14**
20	Implement code in ASP.NET that creates and consumes Web service.	**15**
21	Study of ASP.NET administration and configuration tool.	**16**

Guidelines for Practical List:

Here Considering all aims if we can use these as a features of any application, we can get implemented two projects or two small applications (Windows Application and Web Application) by incorporating all practical of respective stream. We would follow VB.NET as programming language. For ASP.NET use of VB script is preferable. Please go through the operating manner describe below in next page

Any Application Development is developed in three layers

1) User Interface – Windows Forms and Windows Form Controls, Master Forms
   Web Controls with Skins, Master Pages, Themes, Skins etc.
2) Business Logic – Using Constructors, Events, Inheritance and required etc.
   & for Web Application State Management
3) Database – ADO.NET with Data Controls and Reports Generation

This can accomplish a 75% work for a Windows/Web Application.
Remaining work is testing and validating the Input, which is also included in the practical list. Polishing the application will remain only. Here we can ask them to work for past analyzed project also.

Example-1:

.Assume that a bank maintains two kinds of accounts for customers, one called as 'savings account' and the other as 'current account'. The savings account provides compound interest and withdraws as facilities but no chequebook facility .The current account provides chequebook facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed.
Create an abstract class 'Account' that stores customers name, account number and type of account. From this derive classes' cur_acct and sav_acct to make them more specific to their requirements. Include necessary member functions in order to achieve the following tasks.

a) Accept deposit from a customer and update the balance
b) Display the balance
c) Compute & deposit interest
d) Permit withdrawal and update the balance
e) Check for the minimum balance, impose penalty necessary and update the balance.

(Use Constructors, Properties, method overloading)

Generate various reports for the organization , there is a namespace bit.edu and under that namespace there are three namespace such as Admin, Account, and Computer. Under the admin namespace there is a class called CollegeReports and interface called Report and CollegeReports class implements the Report interface and Account class implements also Report interface in account name space and ComputerReports class also implements Report interface

Example-2

For Data Types, Expressions, Control Structures, Modifiers Exception Handling

We can give some application description as below.

A Program, it behaves like calculator. Take three arguments from user, two numbers and one operator and display proper result. Use command line Arguments. Define exception called ExWrongInput to handle invalid input, also handle DivideByZeroException and catch other necessary application exceptions.

B4.1 – R4: Computer Based Numerical and Statistical techniques

Objective of the courses

There is a vast amount of data being generated in all the fields of human activity. In order to use this data, one needs to organize and analyze it. The analysis of data is a scientific endeavor which needs knowledge of numerical techniques, probability and statistical methods. The numerical techniques offer computational frameworks to solve real-life problems. Probability theory provides a rational framework to deal with uncertainty which is ubiquitous. Further, probability theory also provides a foundational basis for statistical techniques.

This course attempts to familiarize students with much needed concepts from numerical analysis, probability and statistics. A good grounding of these concepts is essential for better understanding of topics such as Mobile Communications, Performance Modeling of Computer Networks, Soft Computing, Pattern Recognition, Image Processing, Data Mining.

Outline of the course

S. No.	Topic	Minimum number of hours
I	**NUMERICAL TECHNIQUES**	**20**
1.	Errors in Numerical Calculations	02
2.	Algebraic and Transcendental Equations	04
3.	System of Linear Equations	05
4.	Interpolation	04
5.	Numerical Differentiation & Integration	05
II	**STATISTICAL TECHNIQUES**	**40**
1.	Probability, Conditional Probability and independence	10
2	Random Variables (RVs) and Expectation	08
3.	Some Important Distributions	08
4.	Statistical Inference	08
5.	Regression	06
	lectures =	60
	Practical / tutorials =	60
	Total =	120

Detailed Syllabus

NUMERICAL TECHNIQUES

1. **Errors in Numerical Calculations**

Errors and their Computation, A general error formula, Error in Series Approximation

2. **Algebraic and Transcendental Equations**

Bisection Method, Iteration Method, Newton – Raphson Method

3. **System of linear Equations**

Solution of Linear Systems – Direct Method: Matrix Inversion Method, Gaussian Elimination Method, Method of Factorization, Iterative Method: Gauss-Siedal Method.

4. **Interpolation**

Finite differences, Newton Interpolation Formula, Lagrange's Interpolation Formula.

5. **Numerical differentiation & Integration**

Numerical differentiation: Maximum and Minimum values of tabulated function, Numerical Integration: Trapezoidal rule, Simpson's rule for numerical integration.

II STATISTICAL TECHNIQUES

1. Probability, Conditional Probability and independence

Motivation, Probability Models, Probability Axioms, Sample space having equally likely outcomes, Conditional Probability, Bayes' formula, Independent events

2. Random Variables (RVs) and Expectation

Introduction, Discrete RV, Distribution Function, Probability Mass function, Bernoulli and Binomial RVs, Continuous RVs, Probability Density Function, Uniform RVs, Moments and Expectation, Jointly distributed RVs, Independent RVs, Covariance and correlation, Expectation of Sum of RVs, Markov and Chebyshev inequalities.

3. Some Important Distributions

Discrete Distributions: Binomial, Poisson, Geometric;
Continuous Distributions: Uniform, Exponential, Normal and Gamma; Moments of these distributions, Central Limit Theorem and its applications.

4. **Statistical Inference**

Parameter Estimation: Random Sample, Statistic, Estimator, Unbiased, Method of moments, Maximum likelihood estimation; Confidence Intervals: sampling from Normal Population, Distribution of the sample mean, Population variance is unknown; sampling from Bernoulli Distribution,
Hypothesis Testing: Null Hypothesis, Alternative Hypothesis, tests on population mean, Hypothesis concerning two means, Goodness of Fit (Chi-Square test),

5. Regression

Introduction, Least squares regression curve, Square of mean prediction error, Least squares curve fitting, Coefficient of determination.

Note: Students should use any statistical Software like Excel, SPSS and MATLAB etc. while doing lab-work. They should develop programs using C/C++ for implementation of numerical and statistical procedures.

RECOMMENDED BOOKS:
Main Readings

1. Sastry, S.S, "Introductory Methods of Numerical Analysis", 4th ed. PHI, 2007.
2. Ross, S.M, "A First Course in Probability", 6th ed. Pearson, 2006.
3. Trivedi, K.S., "Probability & Statistics with Reliability, Queuing, and Computer Science Applications", PHI, 2008.

Supplementary Reading

1. Ross, S.M, "Probabilty and Statistics for engineers and Scientists", 4th ed., Elsevier.
2. Pal, S, "Numerical Methods- Principles, Analyses and Algorithms", Oxford University Press, 2009.

B4.1 – R4: Computer Based Numerical and Statistical techniques
Model Question Paper

NOTE:

1. **Answer question 1 and any four questions from 2 to 7.**
2. **parts of the same question must be answered in sequence and together.**

TOTAL TIME: 3 Hours **TOTAL MARKS: 100**

Q1. (a.) Find the relative error in q = x / y where x = 4.536 and y = 1.32, both x and y being correct to the digits given.

(b.) Of 300 business students, 100 are currently enrolled in accounting and 80 are currently enrolled in business statistics. These enrollment figures include 30 students who are in fact enrolled in both courses. What is the probability that a randomly chosen student will be in either accounting or business statistics.

(c.) Find a real root of the equation

$$x^3 + x^2 - 1 = 0$$

on the interval [0,1] with an accuracy of 10^{-3}.

(d.) The probability density of the continuous random variable x is given by

$$f(x) = \begin{cases} 1/5, \text{ for } 2<x< 7 \\ 0, \text{ elsewhere} \end{cases}$$

Find P (3 < x < 5) and V(X).

(e.) Determine the value of k for which the function given by

f (x, y) = kxy, for x = 1, 2, 3 y = 1, 2, 3

can serve as a joint probability distribution function.

(f.) Of the people who enter a large shopping mall, it has been found that 70% will make at least one purchase. For a sample of n = 50 individuals, what is the probability that at least 40 percent make one or more purchases each.

(g)For a particular brand of TV picture tube, the mean operating life of the tube is μ = 9,000 hr. with a standard deviation of σ = 500 hr. Determine the expected value and standard error of the sampling distribution of the mean given a sample size of n = 25

(h) A Computer system has six I/O channels and the system personnel are reasonably certain that the load on the channels is balanced. If X is the random variable denoting the index of the channel to which a given I/O operation is directed, then its pmf is assumed to be,

$p_X(i) = p_i = 1/6, \quad i = 0, 1, \ldots, 5.$

Out of n = 150 I/O operations observed, the numbers of operations directed to various channels were,

$n_0 = 22, \quad n_1 = 23, \quad n_2 = 29, \quad n_3 = 31, \quad n_4 = 26, \quad n_5 = 19,$

For testing the hypothesis that the load on the channels is balanced, compute χ^2.

Q.2.(a) Solve the equations by the factorization method.

$$2x + 3y + z = 9$$
$$x + 2y + 3z = 6$$

$3x + y + 2z = 8$

(b.) Given that f(0) = 1, f(1) = 3, f(3) = 55, find the unique polynomial of degree 2 or less which fits the given data? Find the bound on the error.

(c.) From the following table, find dy/dx at x = 0.1:

x	0.0	0.1	0.2	0.3	0.4
y	1.000	0.998	0.990	0.978	0.960.

Q3(a.) A box of fuses contains 20 fuses of which five are defective. If three of the fuses are selected at random and removed from the box in succession without replacement, what is the probability that all the three are defective?

(b.) Find the distribution function of the total number of heads obtained in four tosses of a balanced coin.

(c.) State the central limit theorem. Also outline its importance.

4 (a.) The joint probability density function given by

$$f(x, y) = \begin{cases} 4xy & \text{for } 0 < x < 1, \ 0 < y < 1. \\ 0 & \text{elsewhere} \end{cases}$$

Find the marginal densities of X and Y and the conditional density of X given Y = y

(b.) If the random variables X, Y and Z have the means $\mu_x = 2$, $\mu_y = -3$ and $\mu_z = 4$, the variances $\sigma_x^2 = 1$, $\sigma_y^2 = 5$ and $\sigma_z^2 = 2$ and the covariances, Cov(X,Y) = -2, Cov(Y,Z) = -1, Cov(Y, Z) = 1, find the mean and the variance of $W = 3X - Y + 2Z$.

Q5. (a.) If 2% of the books found at a certain bindery have defective bindings, using the Poisson approximation to the binomial distribution, determine the probability that five of 400 books bound by this bindery will have defective bindings.

(b.) If the joint density of X_1 and X_2 is given by

$$f(x_1, x_2) = \begin{cases} 6e^{-3x_1 - 2x_2} & \text{for } x_1>0, \ x_2>0 \\ 0 & \end{cases}$$

Find the probability density of

$$Y=X_1 + X_2.$$

Q6. (a.) An oil company claims that less then 20% of all car owners have not tried its gasoline. Test the claim at the 0.01 level of significance if a random check reveals that 22 of 200 car owners have not tried the oil company's gasoline.

(b.) The mean life of a sample of 10 electric light bulbs was found to be 1,456 hours with standard deviation of 423 hours. A second sample of 17 bulbs chosen from a different batch showed a mean life of 1,280 hours with standard deviation of 398 hours. Is there a significant difference between the means of the two batches?

(c.) In partially destroyed laboratory record of an analysis of correlation data, the following results only are legible variance of X = 9
Regression equations 8 X -10Y + 66 = 0, 40X-18Y = 214.
What are (i.) the mean values of X and Y; (ii.) the correlation coefficient between X and Y and (iii.) the standard deviation of Y.

Q7(a.) The variables X and Y are connected by the equation a X +bY + c = 0. Show that the correlation between them is -1 if the sign of a and b are all alike and +1if they are different.

(b.) Let $X_1, X_2, \ldots, X_n$ be a random sample from a distribution with mean μ and variance σ^2. The sample variance is defined by

$$S^2 = \frac{1}{n} \sum_{i=1}^{n} (X_i - \bar{X})^2 ,$$

Show that $E[S^2] \neq \sigma^2$.

(c.) A programs average working set size was found to be $\mu_0 = 50$ pages with a variance of $\sigma^2 = 900$ pages^2. A reorganization of the programs address space was suspected to have improved its locality and hence decreased its average working set size. In order to judge the locality-improvement procedure, test the hypothesis:

$H_0: \mu = \mu_0$, versus $H_1: \mu < \mu_0$.

B4.1-R4 Computer Based Numerical and Statistical Techniques

Practical Assignments

Sr.No.	Write computer programs (Using C/C++) for
1	Cramer's Rule / Quadratic Equation
2	Bisection Method
3	False Position Method & Secant Method
4	Newton-Raphson Method
5	Newton's Forward Difference & Newton's Backward Difference Method
6	Lagrange's Interpolation Method
7	Curve fitting,
8	Gauss Elimination Method
9	Gauss Jacobi Method & Gauss Seidel Method
10	Trapezoidal, Simpson's 1/3 & 3/8 rule
11	Numerical differentiation using Newton's Interpolation
12	Euler's Method, 4^{th} Order Runge Kutta Method,
13	Milne's Predictor-Corrector Method
14	Summarizing datasets (Histogram, Sample mean, Mode, Median, Variance, Skewness and Kurtosis)
15	Recursive computation of sample mean and sample variance
16	Plot of pmf of sum of n i.i.d. random variables to illustrate central limit theorem.

B4.2-R4: PROFESSIONAL AND BUSINESS COMMUNICATION

Objective of the Course

This objective of this paper is to equip the student with Professional and Business Communication Skills so as to enable him to effectively communicate and present technical reports/presentations. The course covers various forms of communications and processes, art of listening, building interpersonal networks, group and team communications, interview and presentation skills.

Outline of Course

S. No.	Topic	Minimum number of hours
1.	Introduction	02
2.	Forms of Technical Communication	05
3.	Communication Process	12
4.	The Art of Listening	05
5.	Interpersonal Network	05
6.	Communication in Groups and Teams	08
7.	Resumes and Interviews	02
8.	Making Presentation	05
9.	Technology in Communication	08
10.	Internet Collaborative Tools	08
	Lectures	**= 60**
	CaseStudy/seminars/ Presentations	**= 60**
	Total	**= 120**

Detailed Syllabus

1. Introduction **02 Hrs.**

What is Communication? Why Communication is Key to Success in today's Business? Goals of Communication; Effective Communication; Communication Competence

2. Forms of Technical Communication **05 Hrs.**

Technical Reports; Forms, Memos, Letters and emails; Graphics; Reports; White Papers;

3. Communication Processes **12 Hrs.**

Oral Communication Techniques; Speaking in Public; Negotiating Skills; facilitator and Participant skills in meetings; Proper Business Writing; Email Etiquettes; Reading and Comprehension skills.

4. The Art of Listening **05 Hrs.**

Benefits of Effective Listening; Hearing versus Listening; A Model of Listening; Gender Differences and Listening; Assessing Differences and Listening, Improving Your Listening Skills; How to talk so that Others will Listen; Body language.

.

5. Interpersonal Work **05 Hrs.**

Defining Interpersonal Communication; The Impact of Conversations on Relationships; Formal and Informal Communication; Vertical versus Horizontal Organizations; Communication Styles; Communication Climate; Job Productivity and Satisfaction at Work Place; Building Interpersonal Skills in the Workplace, Ettiquets

6. Communication in Groups and Teams **08 Hrs.**

The Elements of Successful Group Communication; Types of Small Groups Operating in an Organization; Demographic Variables that affect Group Life; The Group Decision Making Process; Tools for Effective Problem Solving; Performing Effectively in Teams; managing Meeting mania; How to Stand out at Someone else's Meeting, probing skills, Voice Characteristics in Articulate Speaking, Tone, Pitch, Rate of Speech and Volume

7. Resumes and Interviews 02 Hrs.

Introduction to Resumes; Cover Letters; The Employment Interview; Surviving the Group Employment Interview; The Informational interview; Mock Interviews, The Performance Appraisal Interview.

8. Making Presentations 05 Hrs.

Facets of Professional Presentations; Understanding Your Audience and the Speaking Occasion; Managing Time; Establishing Your Presentation Goals; Selecting the Best Format for your Presentation.

Brainstorming; Developing Logical Sequences for Your Messages; Supporting Ideas; Generating Appeals and gathering evidence; Setting and Achieving your Image Goals; Optimizing; your PERC-Quotient, Being spontaneous – Capturing and holding your audience's attention

09. Technology in Communication 08 Hrs.

Communication Technology Today; Mobile Communication, Use of electronic gadgets (mobile phone, iphone, ipod, e-books,etc) and etiquettes, Changing Role of Communication Technology in the Workplace; Communication Competence and Life-Long Learning; Human Technology and the Virtual Office;

10. Internet Collaborative Tools 08 Hrs

Internet Tools of Networking, modern Software Tools for business communication; Web 2.0 Tools;; Innovation and Techno-Life in the next decade. Legal Issues *&* ***Electronic Business Communications***

RECOMMENDED BOOKS

MAIN READING

1 Kitty Locker and Stephan K.Kaczmarek, "Business Communication", 3rd Edition, Tata McGraw-Hill, 2007.
2 Andrea Rutherford, "Basic Communication Skills for Technology", Pearson Education.
3 Meenakshi, Raman and S.Sharma, "Technical Communication" (OUP), 2009.

SUPPLEMENTARY READING

1 J. Penrose et., "Advanced Business Communication", Thomson Asia Ltd., 2002..
2 Internet Usage must be encouraged to learn the latest

B4.2-R4: PROFESSIONAL AND BUSINESS COMMUNICATION

Model Question Paper

NOTE:

1. **Answer question 1 and any four questions from 2 to 7.**
2. **parts of the same question must be answered in sequence and together.**

TOTAL TIME: 3 Hours **TOTAL MARKS: 100**

1. **(7 x 4)**

a) What are pre-interview preparations to be done?
b) How to create effective resumes?
c) Enumerate features of a good web site.
d) Bring out the importance of ON-Line Help systems.
e) Give salient etiquette of electronic communication – emailing and chatting
f) Web 2.0 Tools and their relevance in social networking.
g) How has PC become the most powerful tool of communication for the modern business?

2. **(8+5+5)**

a) Describe the various communication styles. Illustrate by examples.
b) What steps would you follow to improve your communication?
c) How can you communicate clearly and effectively? Highlight the use of body language.

3. **(8+5+5)**

a) What are the basic writing skills? Give illustrations.
b) Discuss the basic guidelines for writing effective business letters.
c) How to write reports and structure memos? Write a sample of each.

4. **(5+5+4+4)**

a) List the guidelines for improving the listening skills?
b) Bring out reasons as to why it is important to practice effective listening techniques.
c) What are the do's & don'ts of listening?
d) How to make others to listen you?

5. **(5+5+4+4)**

a) How to plan for a presentation? Enumerate the features of a good presentation.
b) How to organize a persuasive presentation?
c) List the steps to analyze the audience before and during the presentation?
d) How to handle questions effectively?

6. **(8+5+5)**

a) Discuss how one can be a good team player? Assume you are a team leader, what strategies would you adopt to help your team work together more effectively and efficiently?
b) How to conduct a negotiation? How to establish your terms of agreement?
c) Discuss the essence of communication technology in your workplace.

7. **(5+5+4+4)**

a) What steps to follow to create first impressions and impact?
b) How to understand the supervisor Styles?
c) How to manage physical culture?
d) How to avoid clashes during group discussion?

8. **18**

Write an email to a customer apologizing for the delay in the shipment of a product and requesting an additional period of two weeks for delivery.

B4.2-R4: PROFESSIONAL AND BUSINESS COMMUNICATION

Assignments

1. (a) What are the basic writing skills? Support your answer by illustrations.
   (b) Bring out reasons as to why it is important to be good listener.
   (c) How can one an effcective team performer?
   (d) List some of the good negotiating skills.
   (e) What are the most common kinds of persuasive messages?
2. Enumerate the role of humour in oral communication. What kind of humour is appropriate in business context.
3. State the differences between individual behavior and group behavior, and its implications for group related communication.
4. You have completed your doctorate in Computer Science. Prepare your resume highlighting your academic achievements and suitability for a teaching job.
5. Enumerate the features of a good power-point presentation. Give reasons for the effectiveness of power-point slides.
6. Internet has transformed the entire business communication field. How?
7. How has the modern communication technologies affected the job productivity and satisfaction? Give examples in support of your answer.
8. Explain the concept of virtual office. Is it a boon or curse? Justify.
9. Explain the common rules that should be kept in mind to achieve success in job search.
10. List the essential etiquettes which need be observed when corresponding via emails.
11. List the common Web 2.0 tools for social interaction. How has these tools contributed to make this world a 'flat world'?
12. Discuss the role of ethics in electronic business communications and dealings.

13. CASE STUDY

    The Technical Writing Department of IIS Vision Pvt (Ltd.) needs new computer equipment. Currently, the department has outdated H/W and application S/W, with hardly any graphical capabilities. There is a great need of color printers and scanners. Video camera will also of great support for technical work. Due to these constraints, company's manuals, pamphlets and course material are not being liked/appreciated by the customers. Moreover, IIS Vision has no web-site for product advertisement and/or company recognition on the internet. All this has led to a decline in profits.

    As technical Writing Department Manager, you have consulted with your group members to set the situation right. As a team, you have decided the company needs to purchase the following H/W and S/W:

    - Five new PCs
    - Two laser prnters
    - MS-office
    - Graphics S/W
    - Scanner
    - Video camera

Draft a technical proposal to CEO of IIS Vision, giving justification for the purchase and installation of the equipment. Invent the required details.

B4.3-R4 : OBJECT ORIENTED DATABSE MANAGEMENT SYSTEMS

Objective of the Course

The Database Technology and Object Oriented Technology have joined together to form Object Oriented Database Technology.

The Object Oriented Database Management Systems, which have now become the order of the day, incorporate the Object Oriented features into Database Management.

This course initially dwells deep into Object Oriented Technology and subsequently surveys the database management features, which are to be integrated into Object Oriented Technology to evolve into Object Oriented Database Systems. Also the practical exposure for OO support provided by popular packages like Oracle, DB2, etc for OODB is included in this course.

Outline of Course

S No	Topic Name	Minimum no of Hours
1	Overview of object oriented concepts	05
2	Object oriented programming	05
3	Object oriented Data Model	05
4	Object orientation in Query Languages	12
5	Object oriented Database systems	15
6	Information Integration	15
7	Object database standards	03
	Lectures	60
	Practicals/tutorials	60
	Total	120

Detailed Syllabus

1. Overview of Object Oriented Concepts **5 Hrs.**

Need for Object Oriented Programming : Procedural Languages, The Object Oriented Approach, Advantages of Object Oriented Programming. Characteristics of Object Oriented Languages : Objects, Classes, Inheritance, Reusability, New Data Types, Polymorphism and Over Loading.

2. Object Oriented Programming **5 Hrs.**

An overview of C++ Programming/Smalltalk/Java, Loops and Decisions, Structures and Functions, Objects and Classes, Arrays and Pointers, Inheritance, Virtual Functions.

3.Object oriented Data Model: **5 Hrs.**

OO Relationships, Relationship integrity, ER Diagramming models for OO Relationships - different notations (Coad/Yurdan notation, Shlaer/Meelor notation, OMT notation, UML notation and Booch Notation), Integrating Objects into a Relational Database.

4.Object orientation in Query Languages: **12 Hrs.**

Introduction to Object Definition Language (ODL) – Class declarations, attributes in ODL,, Relationships in ODL, Inverse relationships, Multiplicity of relationships, methods and types in ODL.

Additional ODL concepts: Multi-way relationships in ODL, sub- classes in ODL, multiple Inheritance in ODL, extents, declaring keys in ODL. From ODL to Relational Designs , Object relational model – from relations to object relations, Nested relations, references, OO vs object relational, from ODL

design to OR designs.

Introduction to OQL – features of OQL, additional forms of OQL expressions, object Assignment and creation in OQL, user defined types in SQL, operations on objet-relational data, Ordering relationships on UDTs

5.Object Oriented Database Systems (including Object Relational Database Systems) 15 Hrs.

Relational vs Object Oriented Database Systems : Semantic Database Systems, Object Hierarchies - Generalization, Specialization, Aggregation, E-R model, RM/T, SDM, SAM, Daplex, IFO.

The architecture of Object Oriented Databases, Query Languages for OO Databases, Gemstone/O2/Orion/Objectstone, Object Relational Database Management System (ORDBMS) - Oracle 8i, 9i, DB2.

Overview of object database systems: ORDBMS implementation and challenges, database design for an ORDBMS, OODBMS – ODMG data model and ODL, comparison of RDBMS, OODBMS and ORDBMS.

6.Information Integration : 15 Hrs.

Semi- structured data: Motivation for the semi-structured data model, semi-structured data representation, Information integration Vs semi-structured data.

XML and its data model: semantic tags, well formed XML, document type definitions, using a DTD, attribute lists.

Modes of Information integration, wrappers in mediator based systems, capability based optimization in Mediators, Online analytical processing, data cubes, materialized views .

7.Object Database standards 3 Hrs

Basics of OODBMS terminology, understanding of types, inheritance, representing logical Relationships, basic interface and class structure, declaring attributes, specifying relationships, Adding operator signatures and the complete schema.

RECOMMENDED BOOKS

MAIN READING

1. Jan L Harrington : Object oriented Database Design clearly explained , Morgan Kaufman publishers, academic press , 2000. (chapters – 3, 4, 5 , 6,7,8,9,10)
2. Ramakrishnan and Gehrke: Database Management Systems – Third edition – International edition, Mc-graw Hill, 2003. (chapter 23 only)
3. H Garcia –Molina , J D Ullman and J Widom: Database Systems The complete book , Pearson Education, 2004. (chapter 4 and 9 only)

SUPPLEMENTARY READING

1. R. Cattel, “Object Data management”, (1993), Addison-Wesely.
2. W. Kim, “Modern Database Systems”, (1995), ACM Press, Addison-Wesely.
3. CSR Prabhu, “Object Oriented Databases Systems : Approaches and Architectures” (1999),Prentice Hall of India.

Resource Website :

1. www.omg.org
2. http://www.service-architecture.com/object-oriented-database/index.html

B4.3-R4 : OBJECT ORIENTED DATABSE MANAGEMENT SYSTEMS

Model Question Paper

NOTE :

1. Answer question 1 and any FOUR questions from 2 to 7.
2. Parts of the same question should be answered together and in the same sequence.

Time: 3 Hours **Total Marks: 100**

1. Answer whether you agree with the following statements by marking them either TRUE or FALSE. Justify your answer in each case.
   a) Aggregation relationship between classes is transitive.
   b) Objects when passed as arguments to a method in C++ are always passed by reference.
   c) C++ classes can be considered as abstract data types (ADTs).
   d) A class hierarchy described the “has a “ relationship among the classes.
   e) Is it possible to use object embedding (i.e., composite objects) to realize the features of inheritance?
   f) Class diagrams developed using Booch’s methodology can serve as the functional specification of a system.
   g) Deep class hierarchies are signs of an object-oriented design done well.

   (7 X 4)

2. Consider the following Automobile Spare Parts Shop Automation Software (AAS), which is required by a retail automobile spare parts shop to automate various book keeping activities associated with its business.

   - The retail shop deals with a large variety of automobile spare parts procured from various manufacturers. The shop owner maintains different partsin wall mounted and numbered racks. At the end of each day, the shop owner would request the computer to generate indents for the items, which are out of stock. The computer should print out the parts description, the quantity required and the address of the vendor supplying the part. The shop owner would have to simply put these printouts into envelops and courier them to the address printed.
   - Whenever new supplies arrive, the shop owner should be able to update the inventory.
   - Whenever any sale occurs, the shop owner would enter the code number of the parts and the corresponding quantities sold. AAS should print out the cash receipt, maintain the cashbook and adjust the inventory.
   - The computer should also generate the revenue for any specified day and Month,when queried by the owner.

Perform the following. (You can make suitable assumptions regarding the details of various features of AAS software but you must clearly write down the assumptions you make).

a) For implementing the AAS software identify the classes and their inter-relationships and represent them using the notations of the Booch methodology.

b) Write the class declarations and the method prototypes arrived part (a) of this question in C++ syntax.

(10+8)

3.

a) What is the difference between static and dynamic service invocation mechanisms in CORBA? Comments on the advantages and disadvantages of each.

b) What is the role of OMG (Object Management Group) in forming standards in object-oriented technology? What are some of its contributions in this direction?

c) What is the role of IDL in CORBA-based application development? Write an IDL interface for a simple calendar, which can set the date and time of an appointment, change the date and time of an appointment, delete an appointment, and query appointments for a given day.

(6 + 6 + 6)

4.

a) What is the difference b/w method overloading and method overriding ? Give an example to explain your answer.

b) Write C++ code for the following description of the class/subclasses :

Define an abstract base class "GeomShape" that has the following:

- Data members for the (x,y) co-ordinate position.
- A constructor for initializing GeomShapes
- A virtual method MoveShape()
- A virtual method PrintShape() to output an object

Derive subclasses "GeomLine", "GeomCricle" and "GeomTriangle", from "GeomShape", and implement "MoveShape()" and "PrintShape()" methods for each of the subclasses. You may assume appropriate data-members for each of the subclasses. You should use appropriate access controls in "GeomShape".

c) Make appropriate changes/additions to the above code to create several shapes of different types and to print them so that your code can be compiled and runusing a C++ compiler. Identify abstraction, encapsulations and polymorphism from your code.

(6 + 8 + 4)

5. What are the limitations of the Relational Model ? What is the motivation and advantages for semantic database models and object oriented database models in comparison with the relational model ? What are the object / entry type hierarchies and explain their characteristics. (18)

6.What are the main features of the various semantic database models and their relative comparison of features ? (18)

7.What are the comparative features of various prominent OODBMS products ? Distinguish the capabilities of OODBMS & ORDBMS products with examples.

(18)

B4.3-R4 OODBMS

Practical Assignments

1. Prepare object diagram showing at least 10 relationships among the following object classes. Include association, aggregation and generalization. Object classes are School, playground, principal, school board, classroom, book, student, teacher, cafeteria, rest room, computer, desk, chair, ruler, door, swing

2. Prepare object diagram showing at least 10 relationships among the following object classes. Include association, aggregation and generalization. Object classes File System, File, Directory, File Name, and ASCII file, Executable File, Directory File, Disk, Drive, Track, and Sector

3. Draw the Class Diagram for Phone Call.

4. Draw the Scenario of Vending Machine.

5. Draw the State Diagram for Phone Call.

6. Draw the Event Trace for phone call.

7. Draw the State Diagram to withdraw cash from ATM Machine.

8. Draw the Data Flow Diagram for Cash withdrawn, Cash Deposit in Bank ATM.

9. Design and Create cube by identifying measures and dimensions for Star Schema, Snowflake schema.
10. Design and Create cube by identifying measures and dimensions for Design storage for cube using storage mode MOLAP, ROLAP and HOLAP.
11. Process cube and Browse Cube data
    a. By replacing a dimension in the grid, filtering and drilldown using cube browser.
    b. Browse dimension data and view dimension members, member properties, member property values.
    c. Create calculated member using arithmetic operators and member property of dimension member.

Create and use Excel Pivot Table report based on data cube

B4.4 – R4 : COMPUTER GRAPHICS AND MULTIMEDIA SYSTEMS

Objective of the course

This course aims to impart fundamental concepts of computer graphics and multimedia so that students are able to understand:

- The basic concept of computer graphics
- Algorithms to draw various graphics primitives
- 2D –3D transformations
- Multimedia concepts and various I/O technologies

and to enable the students to develop their creativity.

Outline of the Course

S.No	*Topic*	*Minimum No. of Hours*
1.	Graphics Hardware – Primitives	5
2.	Basic Mathematical Concepts for Computer Graphics	7
3.	Graphics Operations –Clipping, Filling	10
4.	Object Representation	10
5.	Transformation 2D – 3D & Projections	14
6.	Multimedia Systems	14

Lectures	**=**	**60**
Practicals/Tutorials	**=**	**60**
Total	**=**	**120**

Detailed Syllabus

1. Graphics Hardware – Primitives

Display devices – Refresh Cathode Ray Tube, Raster Scan Display, Plasma Display, Liquid Crystal Display, Plotters, Printers
Input Devices – Keyboard, Trackball, Joystick, Mouse, Light Pen, Tablet and Digitizing Camera.

2. Basic Mathematical concepts for Computer Graphics

Matrices and Determinants. Operations related to Matrices and Determinants.
Vectors : Definition , Vectors and Co-ordinate System
Drawing algorithms – DDA algorithm, Breshenham's Line algorithm, Breshenham's Circle generation algorithm.

3. Graphics Operations

Clipping – Point Clipping, Line Clipping, Polygon Clipping. Sutherland-Cohen line clipping algorithm. Midpoint Sub-division algorithm.

Filling – Flood fill algorithm, Boundary fill algorithm and scan-line polygon fill algorithm.

4. Object Representation

Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-spline curve. Bezier and B-Spline surfaces. Basic illumination models, shading algorithms
.

5. Transformation 2D – 3D & Projections

2D Geometrical transformation -translation, scaling, rotation, reflection and shear transformation matrix representation and homogenous co-ordinates, composite transformations, transformation between co-ordinates.

3D Geometrical transformation – Representation of points, 3D scaling, shearing, rotation, reflection, translation, multiple transformation, rotation about and axis parallel to a co-ordinate axis.

Projections : Parallel, Perspective and Isometric. Viewpoints

6. Multimedia Systems

Multimedia Terms, Hardware, Hardware peripherals, Basic tools in multimedia, Multimedia Building Blocks -Media Forms, elements, Sound, Image, Animation, Video, MPEG,JPEG,Graphic file formats, Multimedia Applications.

RECOMMENDED BOOKS

MAIN READING

1. David F. Rogers and J. Alan Adams "Mathematical Elements for Computer Graphics" (Paperback) McGraw-Hill Science/Engineering/Math; 2nd edition (Pub Date: JUL-02)
2. Schaum's Outline of "Theory and Problems of Computer Graphics" (Paperback) by Zhigang Xiang & Roy A. Plastock McGraw-Hill; 2nd edition (September 8, 2000)
3. Prabhat K Andleigh and Kiran Thakrar, "Multimedia Systems and Design", PHI, 2003
4. Mark J. Bunzel and Sandra K. Morris "Multimedia Application Development" Mcgraw-Hill Osborne Media; 2nd edition (September 1993)

SUPPLEMENTARY BOOKS

1. Donald Hearn and M. Pauline Baker, "Computer Graphics C Version", (Papaerback) 3rd Edition Prentice Hall (2002)
2. Rogers, "Procedural Elements of Computer Graphics", McGraw Hill Pub ,1997
3. Judith Jeffcoate, "Multimedia in practice technology and Applications", Prentice Hall PTR; 1 edition (February 8, 1995)
4. Bing J. Sheu and Mohammed Ismail "Multimedia Technology for Applications" Wiley-IEEE Press (June 22, 1998)

B4.4 – R4 : COMPUTER GRAPHICS AND MULTIMEDIA SYSTEMS

Model Question Paper

NOTE :

1. Answer question **1** and any **FOUR** questions from **2** to **7**.
2. Parts of the same question should be answered together and in the same sequence.

Time : 3 Hours **Total Marks: 100**

1.

a). Explain the two basic techniques for producing color displays with a CRT.
b). What steps are required to fill a region using the boundary-fill algorithm method?
c). Show that sum of the squares of the direction cosines of a line is equal to one.
d). What are the transformation commands?
e). What does scaling mean? Give an example
f). What is a hidden surface? Why should it be removed?
g). Write short notes on 3D- Graphics packages used in Animation.

7x4

2.

a). Explain with diagram how video controllers in a raster scan devices perform refresh operation.
b). Find the inverse of the matrix $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$

c). Given the vectors A=I+2J and B=2I-3J, find (i) the length (ii) the dot product and (iii) the angle θ between the vectors.

d). Find the equation of a circle passing through the three points $P_1(1,2)$, $P_2(3,0)$ and $P_3(0,-4)$. **(8,3,4,3)**

3.

a). Derive Bresenham circle algorithm with radius.

b). Draw a flowchart illustrating the logic for the Sutherland-Hodgman polygon clipping algorithm. **(9,9)**

4.

a). Clip the line with endpoints (0, 60) and (60, 120) against a window with lower left corner and upper right corners (10, 10) and (110, 110) using midpoint subdivision method.
b). Briefly describe clipping a polygon against a rectangular window
c). Write a short note on Flood fill with illustration. **(9,5,4)**

5.

a). Explain the Bezier technique for generating curves with examples.
b). Write short notes on matrix representation and homogenous coordinates
c). Derive the transformation matrix, which reflects a point about an arbitrary line. Hence reflect (5,2) about the line y = x + 1.

(9,4,5)

6.

a). What is a Sound Card? Explain its working and principle.
b). Describe any two multimedia file formats.
c). What extra hardware or equipment is required to produce digital sound and video?

(9,5,4)

7. Write short notes on the followings.

a). Positioning feedback techniques
b). Rotation in 3 – Dimensional Transformation
c). Back face removal

(6 x 3)

B4.4 – R4 : COMPUTER GRAPHICS AND MULTIMEDIA SYSTEMS

PRACTICAL LIST

Pre-requisite knowledge: Familiarity Graphics programming in C

Computer Graphics:

1. Implement DDA Line drawing algorithm for line drawing.
2. Implement Bresenham's Line drawing algorithm for slope < 1 as well as slope >1.
3. Implement Bresenham's Circle drawing algorithm.
4. Implement Cohen-Sutherland Line clipping algorithm for 2D.
5. Implement Midpoint Sub-division clipping algorithm for 2D.
6. Implement Boundary fill algorithm for polygon filling.
7. Implement Flood fill algorithm for polygon filling.
8. Generate the Bezier curve.
9. In 2D, draw a Square (Edge: 100 pixels) on the left top corner of the screen. Move it to the centre of the screen. Convert it into rectangle such that Horizontal edge =2×Vertical edge.
10. Implement 2D general pivot-point rotation and shear for a square.

B 4.5-R4: Internet Technology and Web Services

Objective of the Course

The objective of this course is to provide insight into the technologies and applications used in Internet and web. This is an advanced course and the students are expected to be familiar with basics of computer communications, Internet and World Wide Web. Contemporary technologies and protocols need to be studied in depth with a purpose to understand their purpose, specifications and implementation. Exposure to students will also be provided through practical and tutorial exercises. Aim of this is to make students enable to become network system administrators.

The leading objectives of this course is to provide

- Review of the Internet, its architecture and related Infrastructure including servers, network components and its applications
- Comprehensive understanding about how internetworking is accomplished using major Internet protocols
- An introduction to the World Wide Web services
- Familiarization with scripting languages and their importance in development of web applications
- Underline concepts relating to web service protocols
- Learning of relevant concepts for development of multicast and multimedia networks
- Key issues relating to information security
- Need of Quality of service with regard to IP network and data protection

Outline of Course

SN	Topic	Minimum Hours
1.	Review of Internet, Infrastructure and Architecture	04
2.	Internetworking and major Internet protocols	09
3.	World Wide Web	05
4.	Scripting Languages	09
5.	Open Source Initiative, Applications and Utilities	04
6.	Web Service Protocols	08
7.	Multicast and Multimedia	08
8.	Security issues	08
9.	IP Networks and Quality of Service	05
	Theory	**60**
	Practical	**60**
	Total	**120**

Detailed Syllabus

Hours

Review of Internet its architecture

1. TCP/IP architectural model: Evolution of Internet and its architecture; Internetworking; TCP/IP Protocol Stack; bridges, routers and gateways, Internet Protocol (IP), IP Addressing, IP Datagram;, Introduction to IPv6, Methods of Delivery - Unicast, Broadcast, Multicast and Anycast.

TCP/IP application protocols: Domain Name System (DNS), File Transfer Protocol (FTP), TELNET, Simple Mail Transfer Protocol (SMTP), Multipurpose Internet Mail Extensions (MIME), Simple Network Management Protocol (SNMP) and Hypertext Transfer Protocol (HTTP) **10**

2. Web essentials

Introduction to WWW, Client/Server architecture, 3-Tier and n-Tier architecture, web browsers, web servers **4**

3. Web technologies **10**

Common Gateway Interface (CGI), Server-Specific APIs, Servlets, Java Server Pages (JSP), SGML, Introduction to Hypertext Markup Language (HTML), Extensible Markup Language (XML), Active Server Pages (ASP)

4. Web programming:

Java its components and overview, JavaScript, Java in the World Wide Web, Java Security, Distributed Objects; Client-side Scripts, Server-side Scripts; ActiveX; Visual Basic Script; Perl and PHP Script; Web Graphics - GIF Format, JPEG Format; Web Audio/Video - MP3, AVI and Quicktime **12**

5. Web Services Protocols

Protocols: Simple Object Access Protocol (SOAP), Universal Description Discovery and Integration (UDDI) and Web Services Description Language (WSDL); UDDI Registry; Search for Web Services; Create Web Services **6**

6. Multicast and Multimedia

Multicasting, Internet Group Management Protocol (IGMP), Multicast Routing Protocols, Real-Time Protocols RTP and RTCP, Voice over IP, ITU-T Recommendation H.323

Multimedia and its application constraints on Internet; Audio and Video on the Internet; Standardized data formats for multimedia; Multimedia Compression: JPEG, MPEG; Streamed Data Transfer; Virtual Reality; Animation **6**

7. Open Source Initiative, Applications and Utilities

Open Source Initiatives, its importance and philosophy, Linux, Apache, MySQL and PHP/Perl (LAMP). Apache Server, MySQL **4**

8. Security issues

Proxy Servers; Firewalls; VPN; Data Handling and Forwarding; Data Storage; Errors in Identity; Web Services Security issues - Data Protection and Encryption, Authentication, Authorization, Non Repudiation and Signatures; types of security attacks and threats; Cookies; Passports and Web Tracking Work; Cryptography; Privacy and Digital Certificates **8**

BOOKS RECOMMENDED

Main Reading

1. Data Communications and Networking, , Behrouz A Forouzan, Tata McGraw Hill (11th Reprint 2008)
2. Web Technologies – A Computer Science Perspective, 2nd Edition Jeffrey C Jackson, Pearson Education (Reprint 2009)
3. Web Technologies – TCP/IP Architecure and Java Programming, 2nd Edition, Achyute S Godbole and Atul Kahate, Tata McGraw Hill
4. Eric Rosebrock & Others “Setting up LAMP: Getting Linux, Apache, MySQL and PHP Working Together”, Sybex, 2004

Supplementary Reading

1. Sandeep Chatterjee, James Webber, “ Developing Enterprise Web Services: An Architects Guide”, Prentice Hall, Nov 2003
2. Frank. P. Coyle, XML, Web Services And The Data Revolution, Pearson Education, 2002.
3. Ramesh Nagappan , Robert Skoczylas and Rima Patel Sriganesh, “ Developing Java Web Services”, Wiley Publishing Inc., 2004.
4. Derek Atkins et.al. “Internet Security Professional Reference”, Techmedia
5. Eric Newcomer, "Understanding Web Services: XML, WSDL, SOAP, and UDDI", Addison-Wesley Professional, 2002

B 4.5-R4: Internet Technology and Web Services
Practical List

Assignment 1. Create your home page in HTML. In that home page provide links to move toother pages like hobbies, educational info, personal info etc.

Assignment 2. Create html program to illustrate the use of frame and frameset tags of html.

Assignment 3. Using HTML controls create a student information form to collect student's information like name, address, phone, email, sex, birth date, hobbies etc. Use appropriate controls.

Assignment 4. Create page which demonstrates loops in java script.

Assignment 5. Create page which demonstrates the use of functions in java script

Assignment 6. Create page which demonstrates various events like mouse click, got focus, lost focus (blur), change etc.

Assignment 7. Using vbscript create various functions and sub routines to validate the data entered by user in form of program 2 (i.e. Student Information form).

Assignment 8. Create an ASP page to display time on server

Assignment 9. Create an ASP page to illustrate the use of buffer property of Response object

Assignment 10. Create an ASP page to illustrate the use of FORM collection of Request object.

Assignment 11. Create an ASP page to illustrate the use of QUERY STRING collection of request object

Assignment 12. Write an ASP page to print all Environment and Server variables.

Assignment 13. Create ASP/PHP pages to illustrate the use of cookies. (Create cookie in one page and read it in other page)

Assignment 14. Create an ASP/PHP page to show your session id.

Assignment 15. Illustrate the use of session object to maintain user's state information(ASP/PHP)

Assignment 16. Create a program to show the use of abandon and timeout methods of session object.(ASP/PHP)

Assignment 17. Create HIT counter for your ASP/PHP page using Application object

Assignment 18. Illustrate the concept of Global.asa file

Assignment 19. Illustrate the use of URLEncode and HTMLEncode methods of server object.

Consider following database for following program

Database: STUDENT.MDB
Table:
Login(username as text, password as text)
StudentMaster(id as number, name as text, age as number, phone as text, email as text)

Assignment 20. Create an HTML page for login and one asp page to validate the user.

Assignment 21. Create an HTML form to enter student information and one asp page to save information in database table

Assignment 22. Create an ASP/PHP page to display information of all students in tabular format.

Assignment 23. Create an ASP/PHP page to search, delete or modify particular student's information.

B4.5-R4: Internet Technology and Web Services

Model Questions

NOTE: The first question below is the compulsory. Answer any four questions from 2 to 7.

PART - I

1. Answer the following: (7x4)

(a) How can a Router be used as a Firewall?
(b) What is the purpose of the "Time to Live" field of the IP datagram?
(c) What is VPN and why is it needed?
(d) How essential is UDDI in the web services?
(e) What is streaming video and audio? Briefly explain them.
(f) What are the features of Java that make it ideal for web programming?
(g) What key components are required to run and develop PHP Web pages? Explain them briefly.

PART - II

2 (a) How does the three-way handshake work for creating a TCP connection? 6
(b) What is Internet? Describe the Architecture of Internet. Explain how a router works. 6
(c) Discuss, how the files can be copied across the network with FTP. What is the primary difference between FTP and HTTP? 6

3 (a) Describe the steps involved when a Web browser requests for and obtains a Web page from a Web server. 6
(b) What do you understand by Inter thread Communication? Explain it. 6
(c) Swing is part of the Java Foundation Classes (JFC). Explain the features that Swing and the Java Foundation Classes provide. 6

4 (a) What is the transport protocol used to call a webservice? Explain briefly the key elements used for this protocol message along with the syntax rules applied. 9
(b) What are the Web Services Description Language (WSDL) document types? How do they assist with publishing and finding WSDL service descriptions in a UDDI Registry? 9

5 (a) What is transport layer security? What are the threats from which it prevents an application to communicate across a network? 6
(b) What do you understand by the LAMP technology as Web development framework? What makes PHP more commonly used Server-side scripting language? 6
(c) How is the Internet Group Management Protocol (IGMP) used both by the client computer and the adjacent network switches to connect the client to a local multicast router? Explain the basic network architecture used to deliver a multicast service (like video) using IGMP. 6

6 Describe briefly the purpose and functioning of the following Internet Servers 6x3
(i) Remote Access Server
(ii) Domain Name Server
(iii) Proxy Server

7 (a) How and what kinds of errors can creep into XML data? How can they be eliminated? 6
(b) What is the output of the following JavaScript program? Explain why this output is produced? 6
(c) How does HTML provide presenting data in tabular form? Explain with a suitable example by writing codes for 3x3 table with automatically adjusted table column width to contain the maximum width item in any column and border width of 5 pixels and rule width of 1 pixels. (6)

B5.1-R4: SOFTWARE PROJECT MANAGEMENT

Objective of the Course

The course presents a new management framework uniquely suited to the complexities of modern software development.

The course provides a clear and provocative discussion of the economic, metrics and management strategies needed to plan and execute a software project successfully. This comprehensive course also covers all the qualitative and quantitative aspects of project management with a practical treatment of many engineering and managerial issues.

At the end of the course, students will gain a practical framework for systematically improving the planning and execution of any software project.

Outline of Course

S. No.	Topic	Minimum No. of Hours
1.	Review of software engineering concepts	04
2.	Software Process	04
3.	Introduction to Project Management	04
4.	Software Project Planning	08
5.	Project Economics	10
6.	Project Scheduling and Tracking Techniques	06
7.	Risk Analysis and Management	06
8.	Software Metrics and Project Management	08
9.	Project Control and Closure	04
10.	Project Management Issues with regard to New Technologies	06
	Lectures	60
	Practical /Tutorials	60
	Total	120

Detailed Syllabus

1. Review of software engineering concepts 4 Hrs.

Principles of software engineering, Features of good software, Quality Requirement in different Application Areas

2. Software Process 6 Hrs.

Software Process and Models, Tools and techniques of Process Modeling, Product and Process .

3. Introduction to Project Management 4 Hrs.

Definition of the project, Project specification and parameters, Principles of Project management, Project management life cycle

4. Software Project Planning 8 Hrs.

Project activities and Work Breakdown Structure (WBS), Criteria for completeness in the WBS, Activity Resource Requirements and Cost, Joint Project Planning Session, Project Management Plan

5. Project Economics 10 Hrs.

Project Costing, Empirical Project Estimation Techniques, Decomposition Techniques, Algorithmic methods, Automated Estimation Tools

6. Project Scheduling and Tracking Techniques 6 Hrs.

Why are projects delayed? Effort Estimation Techniques, Task Network and Scheduling Methods, Monitoring and Control Progress, Graphical Reporting Tools

7. Risk Analysis and Management 6 Hrs.

Risk Concepts and Identification, Risk Assessment and Control, Risk Components and Drivers, Risk Tracking and Monitoring, Risk Mitigation and Management

8. Software Metrics and Project Management 8 Hrs.

Measures, Metrics and Indicators, Process and project metrics, Statistical Metrics and Process Monitoring, Function-point and project management

9. Project Control and Closure 4 Hrs.

Defect Collection and Audit, Causal and Pareto Analysis, Project Closure Analysis

10. Project Management Issues with regard to New Technologies 6 Hrs.

Object-oriented Methodology, Web-based Projects, Embedded Systems

RECOMMENDED BOOKS

MAIN READING

1. John J. Rakos, “Software Project Management for Small to Medium Sized Projects”, 1998, Prentice Hall, ISBN: 0138261733.

2. Walker Royce, “Software Project Management: A Unified Framework”, 2001, Addison-Wesley Professional, ISBN-10: 0201309580, ISBN-13: 9780201309584.

3. Pankaj Jalote, “Software Project Management in Practice”, 2001, Addison-Wesley Professional, ISBN-10:0-201-73721-3, ISBN-13: 9780201737219.

Note 1 : This course should be supported extensively by Web-based and CASE Studies.
Note 2 : This course will be supported by a project management software package, such as MS-Project.

SUPPLEMENTARY READING

1. Roger S. Pressman, “Software Engineering: A Practitioner's Approach”, 7th Edition, , McGraw Hill, ISBN: 0073375977.

2. Ian Sommerville, “Software Engineering”, 8th Edition, Pearson Education, 2006.

3. A Guide to the Project Management Body of Knowledge (PMBOK® Guide) (4th Edition), 2008, Project Management Institute, ISBN-13: 97819306994580.

B5.1-R4 : SOFTWARE PROJECT MANAGEMENT

NOTE :

1. **Answer question 1 and any FOUR questions from 2 to 7.**
2. **Parts of the same questions should be answered together and in the same sequence.**

Time : 3 Hours **Total Marks : 100**

1 **Do as directed:** **(7*4)** **[28]**

a) State the meaning of a software quality and its quality attributes.
b) Describe the meaning of 'Payback analysis' in software projects?
c) State the meaning of productivity, process and software process.
d) Explain about defect density measures.
e) What is the distinction between a WBS and a Process Model?
f) Justify – "Non-critical project activities have time slacks"
g) Explain the kind of team structure for small, medium and large software projects.

2 **(a)** Describe the software processes as per IEEE standard. **[6]**

(b) Explain the different stages of a project management life cycle. **[6]**

(c) Describe the role of project management plan. **[6]**

3 **(a)** How can we estimate the cost of a software? Explain COCOMO model. **[8]**

(b) Explain the role of Work Breakdown Structure (WBS) in managing the project activities. **[6]**

(c) Explain Pareto 80/20 rule. **[4]**

4 **(a)** Describe the challenges of automated regression testing in Agile Environment **[9]**

(b) Describe the factors behind the delay in a software project. **[9]**

5 **(a)** Draw a control flow graph and calculate McCabe's Cyclomatic number for the following source code. **[6]**

```
0.  {
1.          a=1;
2.          while (a<b) {
3.                  c = a+1;
4.                  while (c<=a) {
5.                          if (X[a]<X[c])
6.                                  swap(X[a],X[c];
7.                          c=c+1; }
8.                  a=a+1;
9.  }
```

(b) Describe the various issues involved in managing software development. How can a risk in a software development be tackled? **[9]**

(c) Describe the meaning of defect, defect density and defect root cause. **[3]**

6 **(a)** Explain embedded systems with its advantages. **[7]**

(b) Explain principles of risk management. **[6]**

(c) Describe the role of a function point analysis in project management. How can we calculate function point? **[5]**

7 **(a)** Explain measures, metrics and indicators with suitable example. **[8]**

(b) Consider the following activities for a certain software projects: **[10]**

Activity no.	Activity name	Duration (days)	Immediate predecessor
1.	Requirement Specification	35	-
2.	Database Design	25	1
3.	GUI Design	30	1
4.	Coding	30	1
5.	Documentation	35	2
6.	Integration	25	3
7.	Testing	120	5,6

Do the following:

- Draw activity network representation of the project.
- Find earliest start (ES) time, earliest finish (EF) time, latest start (LS) time, latest finish (LF) time and slack time (ST) for each activity.
- Find the critical path.

* * *

B5.1-R4 Software Project Management

Practical Assignments

1. Study Software Project management basics concept. Define Case study project of any software system. With synopsis of it.
2. Study of Life cycle of a project using steps. Prepare rough project task list and plan for software project.
3. Case study for Roles played by the project Manager and various team members in Software project. Distribute the project work according to role of team members.
4. Software Time, Effort and Cost Estimation of given project using various methods.
5. Prepare Gantt chart (Task Entry) for project plan of software project with duration and create baseline and milestones.
6. Prepare PERT for project plan of software project with duration.
7. Prepare CPM for project plan of software project with duration.
8. Prepare list of resource in Software project task. Assigned resources to particular task. Enter respective entry in PERT, CPM and Gantt chart.
9. A Case Study on Risk management using given software project.
10. Track the project using recording actual duration or work done in each task of project. Enter data in Tracking Gantt chart wizard.
11. Generate various reports for all level of managers of Software Project for different milestone.
12. How Project fails: A Case Study on Common mistakes made during different phases of a project
13. Practical on Resource re-allocation & smoothing for resolving conflicts in Project schedule and resources.
14. Case study of various projects Management CASE tools and compare functionality with each other.

B5.2-R4: AUTOMATA THEORY AND COMPILER DESIGN

Objective of the course

This course aims to impart fundamental concepts of theory of automata and compiler construction so that students are able to:

- To study the basic concept of language and operation on it.
- To study the regular language and finite automata to recognize it.
- To study context free language and PDA to accept it.
- To understand, design and implement a lexical analyzer.
- To understand, design and implement a parser.
- To understand, design code generation schemes.
- To understand optimization of codes and runtime environment.

And to enable the students to develop their creativity.

Outline of the Course

S.No	*Topic*	*Minimum No. of Hours*
1.	Review Of Mathematical Theory	5
2.	Regular Languages And Finite Automata	6
3.	Context Free Grammar (CFG) and PDA	10
4.	Turing Machine (TM)	6
5.	Basics of Compiler & Lexical Analysis	5
6.	Syntax Analysis	10
7.	Syntax-Directed Translation	6
8.	Dynamic Memory Allocation & Memory Management	6
9.	Code Optimization And Code Generation	6

Lectures	**=**	**60**
Practicals/Tutorials	**=**	**60**
Total	**=**	**120**

Detailed Syllabus

1. Review Of Mathematical Theory

Sets, functions, logical statements, proofs, relations, languages, Mathematical induction, strong principle, Recursive definitions.

2. Regular Languages And Finite Automata

Regular expressions, regular languages, applications, Types of grammar: 0, 1, 2 and 3
Automata with output-Moore machine, Mealy machine, Finite automata, memory requirement in a recognizer, definition, union, intersection and complement of regular languages, Non Determinism Finite Automata, Conversion from NFA to FA, Kleene's Theorem, Minimization of Finite automata.

3. Context Free Grammar (CFG) and PDA

Definition, Unions Concatenations And Kleen's* of Context free language Regular grammar, Derivations and Languages, Relationship between derivation and derivation trees, ambiguity, Unambiguous cfg And Algebraic Expressions, Bacos Naur Form (BNF), Normal

Form – CNF, Deterministic PDA, Equivalence of CFG and PDA, Context free language (CFL), Pumping lemma for CFL.

4. Turing Machine (TM)

TM Definition, Model Of Computation And Church Turning Thesis, computing functions with TM, Combining TM, Variations Of TM, Non Deterministic TM, Universal TM, Recursively and Enumerable Languages, Context sensitive languages and Chomsky hierarchy.

5. Basics of Compiler and Lexical Analysis

A Simple Compiler Difference between interpreter, assembler and compiler. Overview and use of linker and loader , types of Compiler, Analysis of the Source Program, The Phases of a Compiler, The Grouping of Phases, Compiler-Construction Tools.

The Role of the Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, A Language for Specifying Lexical Analyzers, Design of a Lexical Analyzer Generator, Optimization of DFA-Based Pattern Matchers

6. Syntax Analysis

The Role of the Parser, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom-Up Parsing, Operator-Precedence Parsing, LR Parsers, Using Ambiguous Grammars, Parser Generators.

7. Syntax-Directed Translation

Syntax-Directed Definitions, Construction of Syntax Trees, Bottom-Up Evaluation of S-Attributed Definitions, L-Attributed Definitions, Top Down Translation, Analysis of Syntax-Directed Definitions , Type Systems, Specification of a Simple Type Checker, Equivalence of Type Expressions, Type Conversions.

8. Dynamic Memory Allocation & Memory Management

Source Language Issues, Storage Organization, Storage-Allocation Strategies, Access to Nonlocal Names, Parameter Passing, Symbol Tables, Language Facilities for Dynamic Storage Allocation, Dynamic Storage Allocation Techniques.

9. Code Optimization And Code generation

Intermediate Languages , The Principal Sources of Optimization, Optimization of Basic Blocks, Loops in Flow Graphs, Iterative Solution of Data-Flow Equations, Code-Improving Transformations, Data-Flow Analysis of Structured Flow Graphs, Efficient Data-Flow Algorithms, Symbolic Debugging of Optimized Code.

Issues in the Design of a Code Generator, The Target Machine, Run-Time Storage Management, A Simple Code Generator, Register Allocation and Assignment, The DAG Representation of Basic Blocks, Peephole Optimization, Generating Code from DAGs, Dynamic Programming Code-Generation Algorithm, Code-Generator Generators.

RECOMMENDED BOOKS

MAIN READING

1. John C. Martin “Introduction to Languages and Theory of Computation” TMH; Third Edition
2. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, “Compilers Principles, Techniques and Tools”, Pearson Education Asia

SUPPLEMENTARY BOOKS

1. Adesh K. Pandey “An introduction to automata theory and formal languages”, Publisher: S.K. Kataria & Sons.
2. Deniel I. Cohen , Joh Wiley & Sons, Inc “Introduction to computer theory”.
3. Allen I. Holub “Compiler Design in C”, Prentice Hall of India.
4. J.P. Bennet, “Introduction to Compiler Techniques”, Tata McGraw-Hill, Second Edition.

B5.2-R4: AUTOMATA THEORY AND COMPILER DESIGN
Model Question Paper

NOTE :

1. Answer question **1** and any **FOUR** questions from **2** to **7**.
2. Parts of the same question should be answered together and in the same sequence.

Time : 3 Hours **Total Marks: 100**

1.

a). Briefly describe the four main tasks of a lexical analyzer

b). Give a regular expression for the set of programming language floating point constants, where each such constant contains either a decimal point or an exponent part, *e.g.*, 123.45, 123e45, 1.23e45. The strings 123. and .45 are *not* floating point constants for the purposes of this question. Ignore the possibility of negative constants or negative exponents.

c). Give a context-free grammar for the set of nonempty strings of a's and b's that are palindromes, *i.e.*, that read the same forwards and backwards, *e.g.*, a, abba, bbababb.

d). Describe a typical data structure used to implement a symbol table, and justify two main features of the data structure.

e). What is the difference between top-down and bottom-up parsing?

f). What is operator grammar? Define operator precedence parsing.

g). Construct deterministic automaton for (0|1)*011

(7x4)

2.

a). Consider the following grammar $G=(T=\{m,n,q,\$\},NT=\{S,S0,A,B,C\},S0,P)$.
P :

(1) $S' \rightarrow S\$$
(2) $S \rightarrow AB$
(3) $A \rightarrow mA$
(4) $A \rightarrow nA$
(5) $A \rightarrow \varepsilon$
(6) $B \rightarrow qCn$
(7) $C \rightarrow Cm$
(8) $C \rightarrow m$

(a) Compute the FIRST and FOLLOW sets for the non-terminals in G

b). Draw a NFA-Λ for 010* + 0(01+10)* 11.

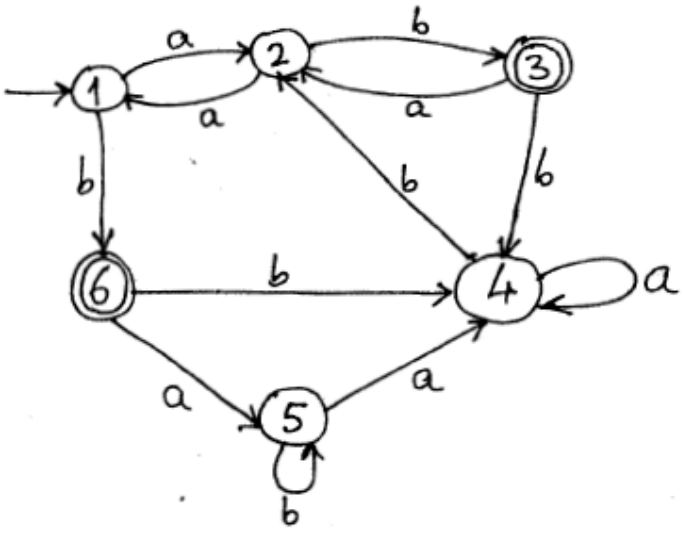
c). Write a short-note on Universal Turing machine

d). Briefly describe the two main tasks of a semantic analyzer.

(8,3,4,3)

3.

a). For the following FA, use the minimization algorithm to find a minimum-state FA recognizing the same language



b). Construct a syntax-directed translation scheme that translates arithmetic expression from infix notation into postfix notation in which an operator appears after its operands.give the annonated parse tree for the input 9-5*2. **(9 ,9)**

4.

a). Show that the following grammar is LR(1) but not LALR(1).
S -> Aa|bAc|Bc|bBa A -> d B -> d

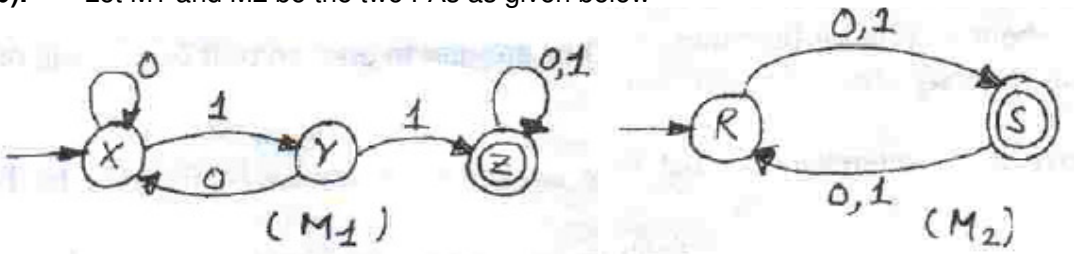
b). Explain code optimization technique in detail.

c). write a short note on Chomsky's hierarchy of grammars (type 0,1,2 and 3). Give salient comparative characteristics also. **(9,5,4)**

5.

a). Consider the following grammar:
E -> E+T|T T -> TF|F
F -> F*|a|b
Construct SLR Parsing table for it.

b). Let M1 and M2 be the two FAs as given below-



Draw FA recognizing (L2-L1) where L1 and L2 are the two language corresponding to M1 and M2 respectively.

c). write a short note on Register allocation and Assignments. **(9,4,5)**

6.

a). Give transition tables for Push Down Automata (PDA) recognizing the following language
L = The language of all non-palindromes over {a,b}.

b). write a short note on LEX and YACC.

c). write a short note on Primitive Recursive function and its examples.

(9,5,4)

10. Write short notes on the followings.

a). Advantages of LR parser.

b). NP Complete Problems.

c). Recursively Enumerable Languages.

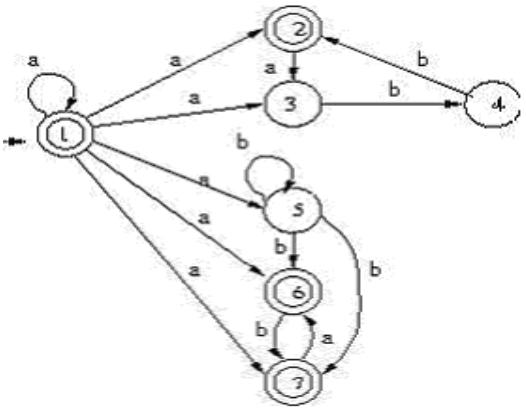
(6 x 3)

B5.2-R4: AUTOMATA THEORY AND COMPILER DESIGN

Assignment 1.
Implement a program which accepts all strings in which both number of 0's and 1's are even using C language

Assignment 2.

Convert following NFA to DFA.



Assignment 3.

Implement a program to implement simple lexical analyzer using C language.

Assignment 4.

Draw a DFA : 1(01+10)* + 0(11+10)*.

Assignment 5.

Implement a program for a predictive parser (grammar from the book).

Assignment 6.

Draw DFA for following:
(010+00)*(10)*
(0+10)*1*
(0+00+∧)(1+10+100)*

Assignment 7.

Implement RDP for a grammar.
E->TE'
E'->+TE' | **^**
T->FT'
T'->*FT' | **^**
F->(E) | id

Assignment 8.

Write a program to eliminate left recursion from a grammar.

Assignment 9.

Write a program to left factor a grammar.

Assignment 10.

Write a program that will find the FIRST SET of the grammar.

Assignment 11.

Write a program that will find the FOLLOW SET of the grammar.

Assignment 12.

Write a Lexical Analyzer using Lex or Flex utility of UNIX for following:

1. A lexer to print out all numbers from a given file. (Hint: By default lex reads from standard input).
2. A lexer to print out all HTML tags in a file.
3. A lexer which adds line numbers to the given file and display the same onto the standardoutput.
4. A lexer which attempt to extract only comments from a C program and display the same on standard output.
5. A lexer which replaces all the occurrence of "rama" with "RAMA" and "sita" with "SITA".
6. A lexer to do the word count functions of the wc command in UNIX. It prints the number of lines, words and characters in a file.
7. A lexer which classifies tokens as words, numbers or "other".
8. A lexer that changes all numbers to hexadecimal in input file while ignoring all others.
9. This lexer prints only words followed by punctuation. If the following sentence was the input from standard input:
   "I was here", they said.
   But were they? I cannot tell.
   It will print the words here, said, they, and tell. It will not print the punctuation; only the words.
10. **Implement lexical analyzer for C language program.**

Assignment 13.

Write a Parser using yacc or utility of UNIX for following:

1. **Write a Program for a simple desk calculator using YACC Specification and Also implements the code that checks semantic error from string**

B5.3-R4: Network Management & Information Security

Objective of Course

The objective of this course is to provide an overview of information security and network security and management. The course covers a broad range of security related concepts and issues that face industries today. The course will also examine the practical aspects of the issues involved in secure systems and networks and industry practices being adopted to protect information systems. Students will gain the knowledge, skills and abilities to incorporate good information security practice in any organization. 2

The following topics are addressed in this course: security requirements of information system assets, vulnerabilities, threats, risk management, authentication, access control, security policy models, network security, cryptography, digital signatures, network management, security protocols used in internet and e-commerce applications, technologies, applications and systems development and vulnerabilities assessment.

S.No	Topic	Minimum No. of Hours
1.	Introduction to Information Security	4
2.	Identification & Entity Authentication	4
3.	Security Policy Design and Risk Assessment	6
4.	Cryptography	6
5.	Public Key Infrastructure & Message Authentication	8
6.	Network Security	8
7.	Network Management	8
8.	Web Security & Application Security	6
9.	Firewalls	6
10.	Cyber Law	4

Lectures = 60
Practicals/Tutorials = 60
Total = 120

Detailed Syllabus

1. Introduction to Information Security **4 Hours**

Security Goal,Services
- Attributes of Information Security
  - Authentication, Confidentiality, Integrity, Availability, Non Repudiation, Access control
- Threats & Vulnerabilities
  - Security attacks,Unauthorized Access,Impersonation,Denial of Service
    - Malicious Software,
    - Viruses, Worms, Trojan, spyware
- Security Mechanisms

2. Identification & Entity Authentication **4 Hours**

- Definitions
- Types of authentication
- Password Authentication
- Password Vulnerabilities & Attacks
  - Brute Force & Dictionary Attacks
- Password Policy & Discipline

Alternate Approaches
Biometric authentication

3. Security Policy Design and Risk assessment 6 Hours

Definition: Security Policy, Best practices in security Policy
Formulate Security policy,
Issue in Security Policy Implementation
Risk Management
Risk analysis
Risk Assessment
Identification of assets
Identification of Threats to assets
Risk Calculation
Incident Handling
Preparation
Detection of an Incident
Responding to an Incident
Recovering from an Incident
Building an Incident Response Team

4. Cryptography 6 Hours

Cryptography Basics
Plain Text, Cipher Text, Encryption Algorithm, Decryption Algorithm
Requirements for Cryptography,Cryptanalysis and attacks
Conventional Symmetric Encryption Algorithms
Symmetric vs Asymmetric
Block and Stream ciphers
DES, Double and Triple DES
Stream Cipher: RC4 and RC5.
Cryptographic Modes

5. Public Key Infrastructure & Message Authentication 8 Hours

Public Key Cryptography Principles & Applications
Algorithms
RSA, Diffe-Hellman Key Exchange, DSS, Elliptic-curve
One way Hash Functions
Message Digest
MD5, SHA1
Digital Signatures
Public Key Infrastructure (PKI)
Digital Certificates
Certificate Authorities

6. Network Security 8 Hours

Overview of IPV4
OSI Model, Maximum Transfer Unit
IP, TCP, UDP, ICMP
ARP, RARP, DNS
Ping, Traceroute
Network Attacks
Buffer Overflow
IP Spoofing, TCP Session Hijacking, Sequence Guessing
Network Scanning
ICMP, TCP sweeps
Basic Port Scans

IPSEC

IPsec Overview, IP security architectureAuthentication Headers, ESP
Internet Key Exchange (IKE), Security Associations
Virtual Private Network: concepts, PPTP, L2TP

7. Network Management **8 hours**

Network Management Architecture & Applications
- Management Standards and Models

Network Management Functions – Configuration
- Configuration Management
- Configuration Database & Reports
- ASN.1

Network Management Functions
- Fault
  - Management
  - Identification and Isolation
- Security
  - Protecting Sensitive Information
  - Host and User Authentication

SNMP v1, SNMP, v3
- Structure of Management Information
- Std. Management Information Base
- Protocols

Network Management Accounting & Performance Functions
- Accounting Management
- Performance Management
- Network Usage, Metrics and Quotas

8. Web Security & Application Security **6 Hours**

Web security Consideration
Secured Socket Layer and Transport layer security
Secured Electronic Transaction
Secured Mail
Pretty Good Privacy (PGP), S/MIME

9. Firewalls **6 hours**

Firewall Design Principles
- Firewall Characteristics

Types of Firewalls
- Packet Filtering Router
- Stateful Inspection Firewall
- Application Level Gateway or Proxy
- Circuit level gateway
- Bastion Host

Firewall Configuration
- Screened Host Firewall System
- Screened Subnet Firewall System

10. Cyber Crime and Cyber law **4 hours**

Cyber crimes
- Crimes against the computer
- Crimes using a computer

Indian IT Act 2000

Objectives
Provisions
Offenses and grey areas

Recommended Reading

1. William Stallings, “Network Security Essentials”, First Indian Reprint, 2000, Pearson Education Asia
2. Gollmann, Dieter, “Computer Security”, First Edition, 1999, John Wiley & Sons Ltd.
3. Micki Krause, Harold F. Tipton, “Handbook of Information Security Management”, 1999, Auerbach Publications
4. K.Mandia, Chris Prosise, Matt Pepe, “Incident Response and Computer forensics”, 2nd edition, Tata Mc-grawhill
5. Simson Garfield, “Web Security, Privacy Commerce”, Second Edition, 2002, O’Reilly Publications
6. Dr. R.K.Tiwari,P.K.Sastri,K.V.Ravikumar, ”Computer Crime and Computer Forensics”, First Edition, 2002, Select Publishers
7. Behrouz A. Forouzan , Cryptography and Network Security,The McGraw-Hill Edition, 2007

Recommended Web Sites

1. www.mit.gov.in - For IT Act details
2. www.cert.org
3. www.securityfocus.com
4. www.cerias.purdue.edu
5. www.ietf.org
6. www.w3c.org
7. www.sans.org
8. www.genome.wi.mit.edu/WWW/faqs/www-security-faq-html

B5.2 – R4 NETWORK MANAGEMENT & INFORMATION SECURITY - I

1

a) Describe various attacks on communication across a network

b) List out types of attach on encrypted messages. Also explain how the average time required exhaustive key search affected by key size.

c) How does the anti replay service is implemented through AH Protocol?

d) How a hash function can be used to provide message authentication without using a key?

e) Discuss various fields in X.509 digital certificate. What is role of CA and RA while certificate creation process.

f) Briefly Explain the operational description of PGP

g) Explain the various criteria for evaluating the security policy defined for an organization.

(7X4)

2

a) What is ASN.1 with respect to network management function? What is the purpose of ASN.1? Explain with the help of an example.

b) Name the main component of the public key cryptosystem and formulate the security requirements. Discuss the use of the system for security and authencity.

c) Briefly explain Elliptic curve cryptography

(6+ 9+3)

3

a) Explain the Digital Signature Standard (DSS) approach to digital signatures

b) Perform the encryption and decryption of the plain text, M= 8,where recipients RSA public key are (n=77,e =17).

c) Give a detail description of single round of DES algorithm

(6+6+6)

4

a) What is the purpose of SNMP? An SNMP operation is performed using Protocol Data Unit (PDU), basically a word for packet. List all PDU used and explain each of them.

b) Discuss possible intrusion detection strategies. Clearly define two broad classes of strategies. What ate the advantages and shortcoming of the two strategies?

c) Security policy can generally be subdivided into many categories, depending on their audience and scope. Explain each category with suitable example.

(7+7+4)

5

a) Explain the major issues in Security Policy implementation in organization.

b) What is Role based access control? What are the advantages of using Role based access control over Mandatory access control (MAC) and Discretionary Access control (DAC)?

c) Explain how two users can exchange secret key with confidentiality and authentication using public key distribution

(3+8+7)

6

a) List all the participants in the Secured Electronic Transaction (SET) System.

Briefly explain the the sequence of events that are required for a SET.

b) Explain the implementation of Virtual Private Network

c) Consider the following identification protocol, Peggy given her name to victor. Victor tossed an unbiased coin. If the coin comes up heads, victor accepts Peggy otherwise he rejects. Compute the False rejection and Acceptance rates. Is the protocol practical?

(7+7+4)

7

a) Is there any difference between conventional crime and cyber crime? Cyber crime may be broadly classified in three groups. Explain each of them. What precautions one has to take to prevent cyber crime in the society?

b) What is a firewall? What is the difference between a Packet filter router and a stateful inspection Firewall

c) Discuss some grey areas of Indian IT act 2000.

(9+6+4)

BE5.2-R4 Network Management & Information Security

Practical Assignments

No.	Aim
Assignment 1	To implement Caesar cipher encryption-decryption.
Assignment 2.	To implement Monoalphabetic cipher encryption-decryption.
Assignment 3.	To implement Playfair cipher encryption-decryption.
Assignment 4.	To implement Polyalphabetic cipher encryption-decryption.
Assignment 5.	To implement columnar transposition cipher encryption-decryption
Assignment 6.	To implement Hill cipher encryption-decryption.
Assignment 7.	To implement Rail-Fence cipher encryption-decryption.
Assignment 8.	To implement diffie-hellman key exchange algorithm.
Assignment 9.	To implement RSA encryption-decryption.
Assignment 10.	To implement Triple DES encryption-decryption
Assignment 11.	Case study: Digital Signature
Assignment 12.	Case study: Java Security Features
Assignment 13.	Case study: Authentication in Kerberos security
Assignment 14.	Case study: Windows 2000 active directory

BE1-R4 EMBEDDED SYSTEMS
Detailed syllabus

OBJECTIVES:

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To explain programming concepts and embedded programming in C and C++.
- To explain real time operating systems, inter-task communication.

Outline of Course

S.No	Topic	Minimum No. of Hours
1.	Introduction To Embedded System	10
2.	Processor technology used in embedded system	10
3.	Real time operating system (RTOS)	10
4.	Programming embedded system	10
5.	Techniques of connectivity and networking.	6
6.	Interrupt service routines	7
7.	Embedded application development	7

Lectures = 60
Practicals/Tutorials = 60
Total = 120

Detailed Syllabus

1.Introduction To Embedded System 10

- Embedded System Overview
  1. Definition
  2. Characteristics of Embedded Computing Applications.
  3. Design Challenges.
- Design Process
  1. Requirement
  2. Specification
  3. Architecture Design.
  4. Designing Of Components
  5. System Integration.
- Computer Essentials
  1. Instruction Sets- CISC & RISC.
  2. Memory Types- RAM ROM, UVROM, EEPROM, DRAM, Flash Memory, Hybrid Types.
  3. Organizing Memory.
- Microprocessor And Microcontrollers
  1. Microprocessor
  2. Microcontrollers Family.

3. PIC Microcontrollers.

- Processor Technology

1.5.1 General Purpose Processor-Software.

1.5.2 Single Purpose Processor- Hardware.

1.5.3 Application Specific Processor.

1.6 Embedded System on Chip (SoC)

1.7 I/O Devices

1.7.1 Timers and Counters

1.7.1.1 Watchdog Timer.

1.7.2 Interrupt Controller.

1.7.3 DMA Controller.

1.7.4 ADC and DAC.

1.7.5 Infrared Devices.

1.7.6 UART.

1.7.7 Displays and Keyboards.

2. Processor technology used in embedded system **10**

2.1 Memory system architecture

2.1.1 Caches

2.1.2 Virtual memory.

2.1.3 Memory management unit and address translation.

2.2 I/O subsystem

2.2.1 Busy-wait I/O.

2.2.2 DMA.

2.2.3 Interrupt driven I/O.

2.3 16/32 bit embedded processor and microcontrollers

2.3.1 CISC & RISC- 8051, Motorola 68HC11, ARM, Atmel 905xx series.

2.3.2 DSP processors.

2.4. Processor performance enhancement

2.4.1 Pipelining.

2.4.2 Superscalar execution and VLIW architecture.

3. Real time operating system (RTOS) **10**

3.1 Basic features of OS.

3.2 Task and Task States.

3.3 Semaphores.

3.4 RTOS architecture.

3.5 RTOS task enrollment.

3.6 RTOS scheduling.

3.6.1 Handling of task scheduling and latency and deadlines as performance metrics.

3.6.2 Co-operative round robin scheduling.

3.6.3 Cyclic scheduling with time slicing.

3.6.4 Rate monotonic co-operative scheduling.

3.6.5 Pre-emptive scheduling model strategy by a scheduler.

3.6.6 Critical section service by pre-emptive scheduler.

3.6.7 Fixed (static) real time scheduling of tasks.

3.6.8 Hard real time scheduling.

3.7 RTOS kernel.

3.7.1 Polled loop system.

3.7.2 Co-routines.

3.7.3 Interrupt driven system.

3.7.4 Multi rate system.

3.8 Process and Threads.

3.9 Synchronization and Interprocess communication

3.9.1 Shared data problem.

3.9.2 Use of semaphores.

3.9.3 Priority inversion problem.

3.10 Comparison and study of RTOS

3.10.1 VX WORKS.

3.10.2 PSOS.

3.10.3 QNX.

3.11 Criteria for choosing RTOS.

4. **Programming embedded system** **10**

4.1 Programming languages.

4.1.1 desired language characteristics.

4.1.2 Introduction to object oriented programming.

4.1.3 Data typing -overloading and polymorphism.

4.1.4 Control.

4.1.5 Multitasking and task scheduling.

4.1.6 Timing specifications.

4.1.7 Run time exception handling.

4.2 Use of high level languages –C, OOPS, JAVA for embedded systems.

4.3 Programming and run time environment.

4.3.1 Compiling – 'C' program compiler and cross compilers.

4.3.2 Assembling.

4.3.3 Linking.

4.3.4 Debugging.

4.4 Program Validation and Testing.

5. Techniques of connectivity and networking. 6

5.1 Interfacing.

5.1.1 Memory interfacing.

5.1.2 I/O device interfacing.

5.1.2.1 Interfacing protocols.

5.1.2.1.1 GPIB.

5.1.2.1.2 FIREWIRE.

5.1.2.1.3 USB.

5.1.2.1.4 IrDA.

5.2 Infrared connectivity

5.2.1 IrDA and PIC microcontroller

5.3 Radio connectivity

5.3.1 Bluetooth.

5.3.2 Zigbee.

5.3.3 Zigbee and PIC microcontroller.

5.4 Controller area networks(CAN) and local area interconnect network(LIN).

5.4.1 CAN.

5.4.2 CAN and PIC microcontroller.

5.4.3 LIN.

5.4.4 LIN and PIC microcontroller.

5.5 Embedded System and Internet.

6. Interrupt service routines 7

6.1. Watch dog timer.

6.2. Flash memory basic toolset.

6.3 Hosts and Debugging.

6.4 Remote Debugging.

6.5 ROM emulator.

6.6 Logic Analyzer.

6.7. Caches.

6.8. Computer optimization.

6.9. Statistical profiling.

7. Embedded application development 7

7.1. Design methodologies

7.1.1 UML as design tool.

7.1.2 UML notations.

7.1.3 Requirement analysis and use case modeling.

7.1.4 Static modeling.

7.1.5 Object and class structuring.

7.1.6 Dynamic modeling.

7.2 Embedded Database Applications.

7.3 Voice over IP.

7.4 Mobile JAVA applications.

7.5 Design Examples-

- Telephone PBX.
- SET TOP box.
- ATM system.
- Washing machine.

Recommended Books:

Main book:-

1. fundamentals of embedded software where C and assembly meet by Daniel W. Lewis., PHI ,2002,
2. Embedded system design: a unified hardware/software introduction, Frank Vahid , Tony Givargis, Wiley publishers, 2003.

Supplementary book:-

1. Designing embedded system PIC microcontroller by Tim Wilmshurst, Newness.
2. Embedded system design, CMP book, USA 2002.

BE1- R4 : EMBEDDED SYSTEMS

Model Question Paper

Time : 3 Hrs. Maxmum Marks: 100

1. Explain the following in brief-
    1. Define system on chip (SOC) with an example.
    2. Give any two uses of VLSI designed circuits.
    3. Expand and explain GPIB.
    4. What are the characteristics of PIC microcontroller?
    5. Why do you need a cross compiler?
    6. What are the advantages of building ISR queues?
    7. Explain the objectives of Kernel.
    8. What are the uses of semaphores?
    9. What is the meaning of Task Service functions?
    10. What are the queue related functions?
    11. What is an embedded System?
    12. Describe micro controller.
    13. Explain Watch Dog Timer
    14. Explain Inter Task Communication (14*2=28).
2. a) Explain hardware timer and software timer.
   b) Explain why single-purpose processors (hardware) and general-purpose processors are essentially the same, and then describe how they differ in terms of design metrics.
   c) Briefly define each of the following: mask-programmed ROM, PROM, EPROM, EEPROM, flash EEPROM, RAM, SRAM, DRAM, PSRAM, and NVRAM. (6+6+6)
3. a) Describes the salient features of ARM family processors.
   b) How will you describe superscalar processing, pipelining, branch and data dependency penalties? Explain a three stage pipeline. (4 + 2 = 6)
   c) explain, by giving one example of each RISC and CISC processors. (6+6+6)
4. a) Differentiate Real Time Operating System and Typical Operating Systems.
   b) Explain a scheduler in which the RTOS inserts into a list the ready tasks for sequential execution in a cooperative round robin model.
   c) Explain the VX WORKS facilities in detail. (6+8+4)

5. a) . Show how to extend the number of ports on a 4-port 8051 to 8 by using extended parallel I/O. Using block diagrams for the 8051 and the extended parallel I/O device,

(i) Draw and label all interconnections and I/O ports. Clearly indicate the names and widths of all connections.

(ii) Give C code for a function that could be used to write to the extended ports.

b) Define the following terms-

i) linker.

ii) locator.

iii) debugger.

iv) exception.

c) Explain the concepts of OOPS and describe how it is beneficial in programming of embedded systems. (7+6+5)

6. a) Explain the difference between port-based I/O and bus-based I/O.

b) How does the USB protocol provide for a device attachment , configuration, reset, reconfiguration, and bandwidth sharing with other devices and device detachment .

c) Why does IrDA use a form of low level protocols, while Bluetooth employs security at the link level? (4+8+6)

7. a) What are the advantages of using multiple function calls in cyclic order in the main? Also write the advantages of building ISR queues? (4+3)

b) What are the 15 points strategy must be taken into account for designing the code for synchronization between the processes, ISRs, OS functions and tasks and for resource management? (7)

c) What is an emulator? What are the various components of an emulator? What are the advantages of ICE. (4)

8. a) Give a brief note on Exemplary Applications of each type of Embedded system..

b) i) What are the characteristics taken into consideration when interfacing a device and a port? (3)

(ii) What are the Sophisticated Interfacing features in Device Ports? (3)

c) Why is UML used? Explain the various relationships with UML notation. Also, enumerate the steps involved in modeling static and dynamic types. (7)

(5+6+7)

BE1-R4 Embedded System

Practical Assignments

1. LED interfacing with Microcontroller 89S51.

2. LCD interfacing with Microcontroller 89S51.

3. Keyboard interfacing with microcontroller 89S51.

4. Write C language codes in Keil IDE software.

5. Write C language codes in Keil IDE software.

6. Write C language codes in Keil IDE software.

7. Write C language codes in Keil IDE software.

8. a. To study directory structure of Fedora-Linux.
   b. To study basic commands of Linux.
   c. To study installation steps of Fedora-Linux.

9. Write and compile the C codes on Fedora-Linux. (At least 2 Application based C program which uses the structure, structure Pointer, pointer and link-list)

10. To study the PRAYOG board for ARM Processor.

BE2 – R4 Artificial Intelligence and Neural Networks

Objective of Course

The main objective of the course is to provide insight into the artificial intelligence, neural networks and applications. This course will enable students to bring together an identifiable core of ideas, techniques, and applications that characterize the emerging field of Artificial Intelligence.

The course serves to introduce students about this critically important technology to increase their understanding of its implications, to pique their curiosity about the remarkable developments that are taking place and helps to familiarize students with many faces of Artificial Intelligence and Neural Networks. An overview covering introductory concepts, knowledge acquisition, representation, problem solving, search and control Strategies, LISP & PROLOG program languages, natural language processing and neural networks along with basic models and their applications are considered.

With the new knowledge systems, students will be able to engage in intelligent activities such as tackling natural problems in a systematic way to provide effective and optimal solutions, and also conducting natural conversations with people and solving complex problems.

Course Description

This course briefly introduces the basic techniques of artificial intelligence: problem solving, heuristic search, knowledge representation, logic system and inference, and also covers some application techniques such as planning, probabilistic reasoning, and intelligent systems. Students should survey and design some practical artificial intelligence applications in any information system domain.

The course also introduces the concepts and theoretical groundwork about Artificial Neural Networks. The course topics include some of the neural network models, like perceptrons, feed forward networks, recurrent networks and self organization networks. Learning and training of different neural network paradigms is also included.

Outline of the Course

Unit 1:	Introduction to Artificial Intelligence (AI)	4 Hrs.
Unit 2:	Problem Solving, Search and Control Strategies	4 Hrs.
Unit 3:	Heuristic Search Techniques	5 Hrs.
Unit 4:	Knowledge Representation and Inference	9 Hrs.
Unit 5:	Knowledge Acquistion and Updation	5 Hrs.
Unit6:	Probabilistic Reasoning and Uncertainties	6 Hrs.
Unit 7:	AI Programming	8 Hrs.
Unit 8:	Natural Language Processing	4 Hrs.
Unit 9:	Artificial Neural Networks	5 Hrs.
Unit 10:	Neural Network Architectures	6 Hrs.
Unit 11:	Learning Paradigms in Artificial Neural Networks	4 Hrs.
	Total Lectures	60 Hrs.
	Practical/Tutorials	60 Hrs.
	Total	120 Hrs.

Detailed Syllabus

Unit 1: Introduction to Artificial Intelligence (AI)	**4 Hrs.**
Natural and Artificial Intelligence Definitions of AI Nature of AI Solutions Testing Intelligence AI Techniques Testing Intelligence - Turing Test - Chinese Room Test Data Pyramid, Computer Based Information Systems in the Pyramid AI Applications Areas - Mundane Tasks, formal Tasks and Expert Tasks	
Unit 2: Problem Solving, Search and Control Strategies	**4 Hrs.**
Problems and Problem Spaces Problem Characteristics Production Systems Control Strategies - Forward Chaining - Backward Chaining Exhaustive Searches and Blind Methods - Depth First Search - Breadth First Search	
Unit 3: Heuristic Search Techniques	**5 Hrs.**
Introduction and Characteristics of Weak Methods Heuristic Search Techniques Generate and Test Hill Climbing Branch and Bound technique Best First Search and A* Algorithm Problem Reduction AND / OR graphs AO* Algorithm Constraint Satisfaction Problems Means Ends Analysis	
Unit 4: Knowledge Representation and Inference	**9 Hrs.**
Knowledge Representation (KR) - Formal KR (First Order Predicate Logic) - Procedural KR (Rule, Semantic Nets ,Frames, Conceptual Dependency,Scripts, and Semantic Web), - KR Issues and Limitations	

Using Predicate logic -Syntax and Semantics for FOPL -Properties of Wff's -Conversion to clausal form -Horn's clauses -Unification -Resolution Principles -Deduction Rules -	
Unit 5: Knowledge Acquisition and Updation	**5**
Knowledge Based Systems (KBS) Architecture - Knowledge Base - Inference Engine - Explanation and Reasoning - Self Learning - User Interface Difficulties with KBS Development Process Knowledge Acquisition (KA) - Techniques - Role of Knowledge Engineer (KE) - Knowledge Sharing and Dealing with Multiple Experts - KA Issues and Limitations Knowledge Update - Update by KE - Update by Experts Self-Learning	
Unit 6: Probabilistic Reasoning and Uncertainties	**6 Hrs.**
Crisp and Fuzzy Logic Fuzzy Membership Functions Fuzzy Rule Based Systems Probability and Bayes' Theorem Certainty factors Dempster-Shafer theory Non Monotonic Reasoning and Truth Monitoring Systems	
Unit 7: AI Programming	**8 Hrs.**
Introduction to AI Languages like LISP, CLISP, PROLOG, Visual PROLOG, Artificial Intelligence Markup Language, Java Expert System Shell, etc. Introduction to PROLOG Programming - Anatomy of PROLOG Program - Clauses: Facts, Goal, Variable, Predicates and Rules - Unification and Backtracking - Lists and Recursion - Arithmetic and Comparison - Fail and Cut Predicates	

Unit 8: Natural Language Processing	**04 Hrs.**
Introduction to Natural Language Processing Syntactic Processing Semantic Analysis Parsing techniques Context –free grammar Recursive Transitions Nets, (RTN) Augmented Transition Nets (ATN) Case and Logic Grammars	
Unit 9: Artificial Neural Networks	**05 Hrs.**
Introduction to Neural Computing and Artificial Neural Network (ANN) Fundamental Concepts - Biological Neuron - Artificial Neuron, Activation Function and Output Functions - Introduction to ANN Architectures - Applications of ANN	
Unit 10: Neural Network Architectures	**06 Hrs.**
Hopfield Model, Parallel Relaxation Perceptron, Lineraly Separable Problems, and Fixed Increment Perceptron Learning Multi layer Perceptron, Non-Lineraly Separable Problems, and Back Propagation Learning Self Organizing Networks: Kohonens Networks Recurrent Networks	
Unit 11: Learning Paradigms in Artificial Neural Networks	**04 Hrs.**
Objectives of Learning Hebb's Rule Delta Rule Supervised Learning Unsupervised Learning	

Recommended books

Main Reading

1. Akerker and Sajja, Knowledge-Based Systems, Jones and Bartlett, MA, USA, 2009.
2. Clocksin and C.S. Melish, Programming in PROLOG, Narosa Publishing House, Reprint 2002.
3. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, Prentice Hall of India, 1990
4. Elaine Rich and Kevin Knight, Artificial Intelligence, Tata McGraw Hill Publishing Co. Pvt. Ltd., 1991.
5. Siman Haykin: Neural Networks, A comprehensive Foundation, Pearson Education, II edition, 2001.

Supplementary Reading

1. Jacek M. Zurada, Introduction to Artificial Neural systems, Jaico Publishing House, 1994.
2. Nils J. Nilsson, Principles of Artificial Intelligence, Narosa Publishing House, New Delhi, Reprint 2002.
3. Robert J Schalkoff, Artificial Neural networks, McGraw Hill, 1997.
4. Peter Jackson, Introduction to Expert Systems, Addison Wesley Publishing Company, 1998.

BE2 – R4 Artificial Intelligence and Neural Networks
Model Question Paper

Answer Any Five Full Questions. [20 marks each]

Q1 A Give your own definition of Artificial Intelligence (AI) and justify it with suitable examples. Classify AI applications into different categories and explain it with proper examples. **[10]**

B What is a production system? List all component of a production system with one line description of each. **[2.5]**

a. Describe characteristics of AI systems in one to two lines. What types of solutions are offered by AI? **[2.5]**

b. List techniques of testing AI systems. Explain any one in detail. **[2.5]**

c. Draw data pyramid ad show computer based information systems in it. Also give major difference between the AI systems and non-AI systems. **[2.5]**

Q2 A Explain Hill climbing technique for searching solution from the given solution space. Show working of the algorithm with sample data. What is the variation of the Hill climbing method called? **[10]**

B What do you mean by heuristic? Give an example of a heuristic function which can be utilized in AI based search. Explain role of the heuristic function in the search. **[10]**

Q3 A Explain planning using AI techniques by taking an example from the domain *Blocks Word.* **[10]**

B (i) Differentiate weak method and strong method of AI searching. Also give a major difference between *generate and test* and *random* search methods. **[5]**

(ii) Explain backward chaining control strategy with example. **[5]**

Q4 A Draw structure of a knowledge based system. Explain working of each component in brief. **[10]**

B (i) What are the difficulties associated with development of an intelligent systems? List a few. **[5]**

(ii) Explain process of knowledge acquisition in detail. **[5]**

Q5 A List components of a Script. Also write a script to visit to a dentist. **[5]**

B Translate the following knowledge base into the predicate logic:

(i) Jack and Jill are children.
(ii) Everyone loves either a Jack or a Jill.
(iii) Anyone who likes children has a friend.
(iv) Everyone has a friend.
(v) Anyone who has friend is healthy. **[5]**

C Explain anatomy and main components of a typical PROLOG program. Also consider the following facts and rules:

(i) A fast car is fun.
(ii) A big car is nice.
(iii) A little car is practical.
(iv) Bill likes a car if the car is fun. **[10]**

What is the deduction from the above facts and rules according to PROLOG

language?

Q6	**A**	Define the term *NLP*. Explain the various advantages achieved by utilization of it. Also list the problems and limitations of it.	**[10]**
	B	Briefly explain Bayesian method of probabilistic reasoning. Also discuss its limitations.	**[10]**
Q7	**A**	Explain Minimax search procedure with a neat illustration.	**[10]**
	B	Explain perceptron. Draw perceptron that simulates the logical functions AND and OR.	**[10]**
Q8	**A**	Differentiate Supervised and Unsupervised learning methods.	**[5]**
	B	Explain the following terms: (i) Activation Function (ii) Self Organizing Network (iii) Linearly Separable Problem (iv) Forward Pass and Backward Pass	**[5]**
	C	Explain back-propagation learning algorithm for multi layer perceptron.	**[10]**

BE2-R4: AI & Neural Networks

Practical Assignments

1. Write a Turbo Prolog program for your Family Tree.
2. Develop a medical diagnostic expert system. (Small model).
3. Enter the facts for the following predicates for a Turbo Prolog program

   likes (person, drink)
   enjoy (person, hobby)
   plays (person, instrument)
   And obtain answer to the queries at goal prompt for the following questions

   - Who likes wine?
   - Does anybody like wine?
   - Is true that nobody likes wine?
   - Who likes wine as well as enjoys playing cricket and piano.
   - Does anybody playing at least one instrument?
   - Who likes to play chess, drink coke but does not play any instrument.
   - Who share at least one hobby and at least one instrument?
   - Who are the person sharing common instruments but no hobbies are in Common?
4. Write programs for performing the following operations on List.
   a. print member of a list
   b. write list
   c. membership
   d. add item
   e. append list
   f. delete from a list
   g. finding last element
   h. finding nth element
   i. reversing a list
   j. merge list
   k. finding sub list
   l. find max from a list
   m. permutation
5. Write prolog program to solve tower of Hanoi problem using recursion.
6. Write following programs demonstrating Recursion concept.
   a. Print number from 1 to 10
   b. Reverse the number printed in (a)
   c. Find out sum of numbers printed in (a)
   d. Print the following pattern:
      1
      8
      27
      64
      125
   e. Find out factorial of a number
7. Write a program to implement generalized water jug problem: (having 2 Water Jugs of capacities 4 and 3 liters each and it is required to generate solution path leading to a water jug containing exact two liters of water)
8. Write a program to check whether a year is leap year or not.

9. Write a program to concatenate name and surname.
10. Write a program to generate Fibonacci series.
11. Create a database of students name, addresses, list of subjects and list of marks. Then for a given student calculate and display marks.
12. Write a program to check whether the number is less than 27 or not.
13. Write a program to display integer numbers from 1 to 100 on successive lines. However when a number is divisible by 3 or 7, display "Buzz 3" or Buzz 7" respectively next to the number.
14. Write a program to find out roots of quadratic equation.
15. Write a program to check the user name and password is valid or not.
    a. Give an opportunity to user to re-enter the password 'n' no. of times, on entering wrong password
    b. Give an opportunity to user to re-enter the password three times, on entering wrong password.
16. Write a program that demonstrates use of arithmetic operators (menu driven).
17. Write a program that prints inorder, preorder and postorder traversal of a tree.
18. Explain Compound Object, fail and cut. WAP to store knowledge regarding employees of a company and display a list of employees whose birth-date is in current month.

    Employee (emp_id, name, b_date, address)
19. Study of neural network and Design Neural Network for Character recognition of English Alphabets.

BE3 – R4 : E-BUSINESS

Objective of the Course

To acquaint the participants with the basic knowledge of introduction to electronic business and role of independent third parties, regulatory environment, EDI, electronic commerce and the internet, internet security standards, electronic commerce payment mechanism and e-commerce applications.
To gain an understanding of how information systems are devised and applied to create innovative business models among corporate and consumers.
To acquaint with the latest technology of electronic commerce such as web architecture, interoperable and secure information systems.
To develop elementary skills in developing an effective e-business solution architecture.

Outline of Course

S.No.	Topic	Minimum No. of Hours
1.	E-Business Models	05
2.	E-Business Architecture	05
3.	Planning On-line Business	10
4.	Internet Security and Firewall Systems	06
5.	E-Payment Systems	06
6.	Consumer oriented & Business Oriented E-commerce	08
7.	Security in E-commerce E-Markets	10
8.	Laws relating to on line transactions	05
9.	case studies	05

Lectures	=	60
Practicals/Tutorials	=	60
Total	=	120

Detailed Syllabus

1. **E-Business Models** **05 Hrs.**
E-business:-characteristics, Drivers, Advantages, limitations, Problems of E-commerce. Categories of E-commerce :-Business-to-Business, Business-to-Consumer , Consumer-to-Business, Consumer-to-Consumer Models and impact of electronic commerce on business models. SCM

2. **E-Business Architecture** **05 Hrs.**
Internet and WWW as enablers of electronic commerce, Internet Protocol suite, brief history of Web, Web system Architecture, URL, overview of HTTP & CGI, Applet/Servlet, Client Server Architecture.

3. **Planning On-line Business** **10 Hrs.**
Types of Business models-Pure business model and Brick and Click Model, Difference between Brick and Mortar and E-commerce; which model is successful, Launching business on Internet : The Life cycle approach- Business planning and Strategising phase, Infrastructure phase, Design phase, Marketing phase, Fulfillment phase, Maintenance and enhancement phase Feedback phase

4. **Internet Security and Firewall Systems** **06 Hrs.**
IPSec protocol, S-HTTP, Secure Socket Layer (SSL), IP Spoofing, Firewall Systems, Packet Filtering Firewall, Application Level Firewall, and Circuit level Firewall.

5. **E-Payment Systems** **06 Hrs.**
SET Protocols, E-Check, E-Cash, Micro Payment Systems, Smart Card, Electronic Fund Transfer. The payment gateways.

6. **Consumer oriented and Business Oriented E-commerce 8 Hrs.**
Virtual Organizations: working, Benefits, Limitation; E-services:-E-retailing; On-line service sector –banking, travel, stocktrading and investing, career, education, real estate, E-Auctions (C2C auctions, B2Bauctions), Reverse Auction, entertainment. E-Government Procurement (EGP),.E-business Models.

7. **Security in E-commerce 10 Hrs.**
Threats to E-commerce security, objectives of E-commerce security infrastructure, security controls, Encryption of Message using Cryptography, Data Encryption Standards, RSA, Public and private keys, Digital Signature, Digital Certificate. Certificate issuances, Certificate Authorities and Hierarchy

8. **Laws relating to on line transactions 05 Hrs.**
Intellectual Property-copyright, Patent, Trademark; Tort Law on Internet, Domain Name Disputes, Web Linking Disputes Product Liability Law, Encryption Laws, Legal disputes in B2C Internet based e-commerce

9. **Case studies 05 Hrs.**

RECOMMENDED BOOKS

Main Reading

1. Henery Chan, Raymond Lee, Tharam Dillon and E Chang, "E-Commerce: Fundamentals and Applications", January 2002, John Wiley & Sons.
2. Sushila Madan "E-Commerce" , 4th Edition, Mayur Paperbacks Publication New Delhi.

Supplementary Reading

1. S J Joseph, P T E- commerce: An Indian Perspective,3rd Edition, PHI

2. Kalakota and M Robinson, "E-Business Roadmap for Success", 2nd Edition, Dec 2000, Addison –Wesley Professional..

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BE3-R4: E-BUSINESS

Model Question Paper

Note: Question No. 1 is compulsory. Answer any FOUR questions from 2 to 6.

Time: 3 Hrs. **Maximum Marks: 100**

Q1. Give brief answer to the following questions:

a) Explain the concept virtual organization.

b) What is the difference between Applet and servlet? Give an example to explain it further.

c) Explain the concept of Domain name.

d) What is Smart card?

e) Explain the difference between Reverse auction and Forward auction.

f) Explain any two main functionalities of network firewall.

g) What is a certification authority? State its importance in e-commerce.

(4*7)

Q2

a) What key indicators suggest that E-commerce is here to stay? Explain. (6)

b) How a Website can be promoted? (6)

c) Write a short note on cookie. (6)

Q3

a) What is e-money? Differentiate between credit card and debit card.

b)Explain the advantages and disadvantages of online education from the point of university student. (9x2)

Q4. a) Explain how digital certificates help in verifying the identity of server by its clients. Explain various classes of digital certificates? Further explain the process of acquiring digital certificate. (10)

b) What are different threats to e-commerce security? (8)

Q5.a) Describe the working of virtual organizations. Also state its pitfalls. (8)

b) How is copyright law is different from patent law? (5)

c) Explain Web system architecture. (5)

Q6. a) Explain how web based marketing is different from traditional marketing. What are the various options available for marketing a product online? Explain each of them with an example. (8)

b) Explain the scope of business–to-business model . (5)

c) Briefly explain SSL handshake protocol. (5)

BE3-R4 : E-business

Practical Assignments

1. Explore the java classes related to digital certificates.
2. Create a digital certificate request using the software provided by a web server.
3. Case study on digital signature.
4. Design and implement Rc5 algorithm.
5. Design and implement RSA algorithm.
6. Case study on IP Security and IP spoofing.
7. Case study on paypal.
8. Case study on Google AdSense
9. Create banner using java applet
10. Create Java servlet which counting how many times the servlet is accessed.
11. Create java servlet to insert the values in the database table from the html form.
12. Case study on Service Oriented Architecture (SOA)
13. Case study on IT Act of India.
14. Case study on Internet Security.
15. Implement monoalphabetic cryptographic technique using java programming.

BE4-R4: System Modeling and Computer Simulation

Objective of the Course

Models of most real systems are highly complex and analytically intractable. However, their behavior can be understood by resorting to simulation techniques, primarily based on discrete event system simulation. This course is designed to help students acquire basic skills in simulation techniques for solving problems in a wide variety of areas like management science, business, industrial, service, and computer science. This course will also give a brief exposure to modeling frameworks. In order to pursue this course a basic understanding of computer science, mathematics, Numerical Techniques, Probability and statistics is required.

Outline of Course

S.No.	Topic	Minimum No. of Hours
1	System models and System studies	04
2	What is Simulation?	06
3	Continuous System Simulation	06
4	Concepts in Discrete-event Simulation	06
5	Queuing Models	08
6	Simulation Software	06
7	Random Numbers and Non-Uniform random variate generation	08
8	Analysis of Simulation Data	04
9	Verification and Validation of Simulation Models	04
10	Simulation of Computer Systems and Manufacturing Systems	08

Lecture	=	60
Practicals/Tutorials	=	60
Total	=	120

Detailed Syllabus

1. System models and System studies

Concept of a System, Deterministic and Stochastic Activities, Continuous and Discrete Systems, System Modeling, Types of Models, Principles used in Modeling, Corporate Model, System Design.

2. What is Simulation?

Technique of Simulation, The Monte-Carlo Method, Comparison of Simulation and Analytical Methods, Experimental nature of Simulation, Types of System Simulation, Numerical Computation Techniques for Continuous Models, Numerical Computation Techniques for Discrete Models, Distributed Lag Models, Cobweb Models.

3. **Continuous System Simulation**

Continuous System Models, Differential Equations & Applications, Feedback Systems, Simulation of an Autopilot, Interactive systems, Real Time Systems.

4. **Concepts in Discrete Event Simulation**

The Event Scheduling / Time Advance Algorithm, World Views, Manual Simulation

using Event Scheduling, List Processing: Lists-Basic properties and operations, Use of arrays for List Processing, Using Dynamic Allocation and Linked Lists.

5. **Queuing Models**

Characteristics of Queuing Systems, Arrival and Service Patterns, Queue Discipline, Long Run Measures of Performance of Queuing Systems, Time-Average Number in System, Server Utilization, Costs in Queuing Problems, Steady State behavior of Infinite Population Markovian Models, Multiserver Queue: M/M/C/∞/∞.

6. **Simulation software**

Comparison of Simulation Packages with Programming Languages, Classification of Simulation Software: General Purpose vs Application Oriented Simulation Packages, Desirable Software Features: General Capabilities, H/w and S/w Requirements, Animation and Dynamic Graphics, Statistical Capabilities, General Purpose Simulation Packages, Object Oriented Simulation, Examples of Application-oriented Simulation packages, Simulation in GPSS.

7.Random Number, Non-Uniform random variate Generation and Monte-Carlo Method

Linear Congruential Generators, Testing Random Number Generators: Empirical and Theoretical tests, Non-Uniform Random Variate Generator: Inverse Transform, Composition. Generating Continuous Random Variates: Uniform, Exponential, Gamma, and Normal. Generating Discrete Random Variates: Bernoulli, Binomial, Poisson.
Monte-Carlo Method: Evaluation of Integral-Hit or Miss Method.

8.Analysis of Simulation Data

Identifying the Distribution with Data, Types of Simulations with respect to Output Analysis, Stochastic nature of Output Data, Measures of Performance and their Estimation: Point Estimation, Confidence-Interval Estimation, Output Analysis for Terminating Simulations: Statistical Background, Confidence-Intervals with Specified Precision, Output Analysis for Steady State Simulations, Variance-Reduction Technique-Antithetic variates.

9. Verification and Validation of Simulation Models

Model Building- Verification and Validation, Verification of Simulation Models, Calibration and Validation of Models: Validation of Model Assumptions, Validating Input-output Transformations, Input-Output Validation

10. **System Simulation: Case Studies**
Manufacturing Systems:

Introduction, Objectives of Simulation in Manufacturing, Simulation Software for Manufacturing, Modeling System Randomness: Source of Randomness, Machine Downtime.
Computer Systems: Simulation Tools, Process Orientation, Event Orientation, High Level Computer System Simulation, CPU Simulation, Memory Simulation

RECOMMENDED BOOKS

MAIN READING

1. Banks, Jerry, Carson John S. II, Nelson Barry L. and Nicol David M., "Discrete Event System simulation", 4th Ed, Pearson Education, 2005.
2. Geoffrey Gordon, "System simulation", 3rd Edition, PHI, 2009.
3. Law.Averill.M: Simulation Modeling and Analysis", 4th Edition, Tata- McGraw Hill, 2008,.

BE4-R4: - System Modeling and Computer Simulation

Model Question Paper

Q.1 is Compulsory. Answer Any Four Questions From Q.2 to Q.7.

Time: 3 Hours **Max. Marks: 100**

Q-1

a) Name three principle entities, attributes and activities to be considered if you were to simulate operation of a cafeteria.

b) In the aircraft system, suppose the control surface angle y is made to be A times the error signal. The response of the aircraft to the control surface is found to be $I\ddot{\theta}_0 + D\dot{\theta}_0 = Ky$. Find the conditions under which the aircraft motion is oscillatory.

c) Draw a cobweb model for the following market:

D = 12.4 – 1.2 P
S = 8.0 – 0.6 P_{-1}
P_0 = 1.0

d) Is the following table realizable for a finite buffer state-independent M/M/1 system? Why or why not?

n	**0**	**1**	**2**	**3**	**>=4**
p(n)	**0.4**	**0.3**	**0.2**	**0.1**	**0.0**

e) Outline Hit or Miss Monte Carlo method to estimate **π** ? Can you provide an error estimate?

f) State the major goals of manufacturing-simulation models. What are the common measures of system performance?

g) Describe briefly the features which are to be considered when selecting simulation software.

h) Compare validation in simulation to the validation of theories in physical sciences.

Q-2

(a) Give inverse-transform algorithm for generating random numbers from

$$f(x) = \begin{cases} \frac{3x^2}{2}, & \text{for } -1 \le x \le 1 \\ 0, & \text{elsewhere} \end{cases}$$

(b) Suggest an algorithm to generate Binomially distributed random variates with parameters n and p.

(c) What is antithetic sampling? How is it used in simulation studies?

Q-3

a) There are many possible measures of performance for queuing systems. Discuss some measures that are commonly used in the mathematical study of Queuing systems.

b) For the single server queuing system, M/M/1, define L(t) to be the total number of customers in the system at time t and Q(t) denotes the number of customers in queue at time t.
i) Is it true that L(t) = Q(t) + 1? Why or why not?
ii) Make the plot of L(t) vs t.

(c) Consider a physician who schedules patients every 10 minutes and who spends S_i minutes with i^{th} patient, where,

$$S_i = \begin{cases} \textbf{9} \text{ minutes with probability 0.9,} \\ \textbf{12} \text{ minutes with probability 0.1,} \end{cases}$$

Compute $E[S_i]$ and $V[S_i]$. Find percentage of time in the long run the physician will be busy.

Q-4 **(a)** Bring out the importance of list processing in system simulation.

(b) Comment on the relative merits of manual vs computerized simulations.

(c) Outline various steps, which guide a model builder in thorough and sound simulation study.

Q-5

a) When analyzing simulation output data, a distinction is made between transient and steady state simulations. Distinguish between two types of simulations.

b) Consider a terminating simulation that runs over time interval [0,T] and results in observations $Y_1, Y_2, \ldots, Y_n$. How will you estimate

$$\Theta = E\left[\sum_{i=1}^{n} \frac{Y_i}{n} \right]$$

and confidence interval for a fixed number of replications.

Q-6 The purpose of model verification is to assure that the conceptual model is
(a) reflected accurately in the operational model. Outline suggestions that can be given for use in the verification process.
(b) As an aid in the validation process, a three-step approach has been widely discussed.
1. Build a model that has high face validity.
2. Validate model assumptions.
3. Compare the input-output transformations to corresponding input-output transformations for the real system.
Describe each step in detail.

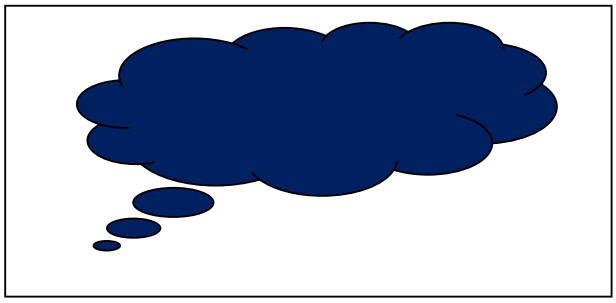
Q-7
(a) Consider a machine that operates continuously until a part jams; i.e., it is never starved or blocked. Suppose that a part has probability p of jamming, independently of all other parts. What is the probability distribution of the number of parts produced before the first jam and what is its mean?
(b) Consider a machine that "operates" 24 hours a day for 7 days a week. The uptimes $U_1, U_2, \ldots$ and downtimes $D_1, D_2, \ldots$ are available but not the corresponding busy times $B_1, B_2, \ldots$ Suppose, for simplicity, that an exponential distribution fits the U_is.

The average number of parts produced per-8 hour shift is known, as well as the average processing time for parts. Assuming that the exponential distribution is also a good model for the B_i's, what mean should be used for a machine-breakdown model based on busy time?

BE4-R4: System Modeling and Computer Simulation
List of Practical Assignments

1. Simulation of a major traffic intersection is to be conducted with the objective of improving the current traffic flow. Discuss problem formulation, setting-up of objectives and overall project plan, Model conceptualization and data collection.

2. Use Monte-Carlo method to estimate the size of the shaded area enclosed within the rectangular area of 1000 X 500 m^2.



3. A bank has one drive-in teller and room for one additional customer to wait. Customers arriving when the queue is full, park, and go inside the bank to transact business. The times between arrivals and service time distributions follow:

Time between arrivals (mins)	Probability	Service time (mins)	Probability
0	0.09	1	0.20
1	0.17	2	0.40
2	0.27	3	0.28
3	0.20	4	0.12
4	0.15		
5	0.12		

Simulate the operation of the drive-in teller for 10 new customers. The first of the 10 new customers arrives at a time determined at random. Start the simulation with one customer being served, leaving in queue. How many customers went into the bank to transact business?

4. A warehouse holds 1000 m3 of cartons. These cartons come in three sizes: Little-1(m^3), Medium-2 (m^3), and Large- 3 (m^3). The cartons arrive at the following rates: Little: every 10 +/- 10 minutes; Medium: every 15 minutes; and Large, every 8 +/- 8 minutes. If no cartons are removed, how long will it take to fill an empty warehouse?

5. Given the following distributions,

Normal(10,4),
Triangular (4,10,16)

Uniform (4,16)

Find the probability that 6 < X < 8 for each of the distributions.

6. Use the Linear-Congruential Method to generate sequence of random numbers with X_0 = 27, a = 17, c= 43, and m = 100. Generate the sequence of X_i and corresponding random numbers $R_i = X_i /m$. Are these random numbers uniformly distributed?

7. Draw a cobweb model for the following market:

   $D = 12.4 – 1.2\ P$
   $S = 8.0 – 0.6\ P_{-1}$
   $P_0 = 1.0$

8. A torsional pendulum consists of a bar suspended from a spring that winds and unwinds as the bar oscillates up and down. If x is the vertical displacement and θ is the angle the spring turns, the following differential equations describe the motion:

   $$a\ddot{x} + b x - c\theta = F(t)$$

   $$e\ddot{\theta} + f\theta - g x = G(t)$$

   Assume the system starts from rest with x and θ equal to zero. F(t) remains zero for all time and G(t) is 1 for t >= 0. Solve the equation for the following values:
   a = e = 1 , b = f = 40, c = g = 4.

9. The following data yield the arrival times and service times that each customer will require, for the first 13 customers at a single server system. Upon arrival, a customer either enters service if the server is free or joins the waiting line. When the server completes work on a customer, the next one in line (i.e. the one who has been waiting the longest) enters service.

   Arrival Times: 12 31 63 95 99 154 198 221 304 346 411 455 537
   Service Times: 40 32 55 48 18 50 47 18 28 54 40 72 12.

   a) Determine the departure times of these 13 customers.
   b) Repeat (a) when there are two servers and a customer can be served by either one.
   c) Repeat (a) under the new assumption that when the server completes a service, the next customer to enter service is the one who has been waiting the least time.

10. A mouse is trapped in a maze and desperately “wants out”. After spending between 1 and 3 minutes, uniformly distributed, of trying, there is 30 % chance that it will choose the right path. Otherwise, it will wander around aimlessly for between 2 and 3 mins, uniformly distributed, and eventually end up where it started only to try once again. The mouse can “try freedom” as many times as it pleases, but there is limit to everything. With so much energy expended in trying and retrying, the mouse is sure to die if it does not make it within a period that is normally distributed with a mean of 10 mins and a standard deviation of 2 mins. Write a simulation that will estimate the probability that the mouse will be free. For the purpose of estimating the probability, assume that 100 miles will be processed by the model.

BE5-R4: PARALLEL COMPUTING

Objective of the Course

This course is aimed at providing students with a deep knowledge of the techniques and tools needed to understand today's and tomorrow's high performance computers, and to efficiently program them.

Today's high performance computers range from expensive highly parallel shared/distributed memory platforms down to cheap local networks of standard workstations. But the problems associated with software development are the same on all architectures: the user needs to recast his or her algorithm or application in terms of parallel entities (tasks, processes, threads, or whatever) that will execute concurrently. Parallelism is difficult to detect in an automatic fashion because of data dependencies. In many cases, one needs to perform some form of algorithm restructuring to expose the parallelism. Finally, to realize the restructured algorithm in terms of software on a specific architecture may be quite complicated.

In this course we plan to cover and understand the nuts and bolts of developing parallel applications. For instance our study of Shared memory parallel architectures and programming with OpenMP and Ptheards, Distributed memory message-passing parallel architectures and programming, portable parallel message-passing programming using MPI. This will also include design and implementation of parallel numerical and non-numerical algorithms for scientific and engineering, and commercial applications. In addition we will study performance evaluation and benchmarking on today's high-performance computers.

At the end of the course the student will understand:

1. Basics of Parallel Computing
2. The impact of high-speed computation on current research, as well as the advancement of knowledge
3. Networking technology for support of high-speed computing
4. Taxonomy, models and architectural trends of parallel processing
5. General hardware (architecture) concepts, new technologies enabling the realization of such new concepts as well as details of commercially available systems
6. Performance measurement results on state-of-the-art systems

Outline of the course

S.No	Topic	Minimum no. of hours
1.	Parallel Computers-Introduction	06 Hrs
2.	Parallel Computer Architecture	10 Hrs
3.	System Interconnection and Gigabit Network	10 Hrs
4.	Parallel Programming	06 Hrs
5.	Performance Metrics and Benchmarks	10 Hrs
6.	Parallel Paradigms and Programming Models	10 Hrs
7.	Parallel Algorithms and Applications	08 Hrs
	Lectures	**60 Hrs**
	Practicals/Tutorials	**60 Hrs**
	Total	**120 Hrs**

Detailed Syllabus

1. **Parallel Computers-Introduction** **06 Hrs**
   The Demand of Computational Speed, Types of Parallel Computers, Architectural Features of Message passing Multicomputer, Networked Computers As a Multicomputer Platform, Potential for increased computational speed.

2. **Parallel Computer Architecture** **10 Hrs**
   A Taxonomy of Parallel Architectures, Control Mechanism, Address-space Organization, Interconnection Networks, Processors Granularity ;SIMD Architecture : Overview of SIMD Architecture, Design and Performance Issues; MIMD Architecture : Shared Memory Architecture, Uniform and Non-uniform Memory Access Multi Processors, Parallel Vector Processors (PVP), Symmetric Multiple Processors (SMP), CC-NUMA, NUMA and COMA Architectures ;Distributed Memory Architecture : Cluster Architecture - Design and other Issues MPP Architecture

3. **System Interconnection and Gigabit Network** **10 Hrs**
   Basics of Interconnection Network, Network Topologies and Properties, Buses, Corssbar, and Multistage switches, Gigabit Network Technologies, Comparision of Network Technologies

4. **Parallel Programming** **06 Hrs**
   Paradigms and Programmability : Algorithmic Paradigms, Programmability issues Parallel Programming Examples; Parallel Programming Models : Implicit Parallelism, Explicit Parallel Models, Other Parallel Programming Models ;Shared Memory Programming : The POSIX Threads (Pthreads) Model, The Open MP Standard ;Message-Passing Programming : The Message Passing Paradigm, Message Passing Interface (MPI), Parallel Virtual Machine (PVM);Data Parallel Programming : The Data Parallel Model, The Fortran 90 Approach, Other Data Parallel Approaches

5. **Performance Metrics and Benchmarks** **10 Hrs**
   Performance Metrics for Parallel Systems: Run Time, Speedup, Efficiency Cost.; Scalability and Speedup Analysis: Amdahl's Law: Fixed Problem Size, Gustafson's Law: Fixed Time, Sun and Ni's Law: Memory Bounding, Isoperformance Models; System and Application Benchmarks : Micro Benchmarks, Parallel Computing Benchmarks, Business and TPC Benchmarks, SPEC Benchmark Family ; Performance v/s Cost, Performance of parallel Computers, Performance of Parallel Programs

6. **Parallel Paradigms and Programming Models** **10 Hrs**
   Parallel Programming Models: Implicit Parallelism, Explicit Parallel Models, Other Parallel Programming Models; Shared Memory Programming: The POSIX Threads (Pthreads) Model, The Open MP Standard; Message-Passing Programming: The Message Passing Paradigm, Message Passing Interface (MPI), Parallel Virtual Machine (PVM); Data Parallel Programming: The Data Parallel Model, the FORTRAN 90 Approach, Other Data Parallel Approaches

7. **Parallel Algorithms and Applications** **08 Hrs**
   Sorting Algorithms, Searching Algorithms, Dynamic Programming, Matrix Multiplication, Dense Matrix Computations, Sparse Matrix Computations

MAIN READING:

1. Kai Hwang and Zhiwei Xu, “Scalable Parallel Computing”, 1997, McGraw Hill New York.

SUPPLEMENTARY READING:

1. Barry Wilkinson and Michael Allen, “Parallel Programming”, 1999, Pearson Education Asia.
2. Steven Brawer, “ Introduction to Parallel Programming”
3. M. Shasikumar, Dinesh shikhare and P. Ravi Prakash, “Introduction to Parallel Processing”.
4. V. Rajaraman and C. Siva Ram Murthy, “Parallel Computers-Architecture and Programming”

BE5-R4: PARALLEL COMPUTING
MODEL QUESTION PAPER

NOTE:

1. Answer question 1 and any FOUR questions from 2 to 7.
2. Parts of the same question should be answered together and in the same sequence.

TOTAL TIME: 3 HOURS **TOTAL MARKS: 100**

1.

a) What are the representatives of Micro and Macro Benchmark suites?
b) What there is need for sorting and searching parallel algorithm?
c) Which factors can affect the scalability of a parallel system?
d) What are the differences between SMP (Symmetric multi processor) and NUMA (Non-Uniform Multiple access)?
e) In parallel computing interconnection of computational devices play important roles. What are the basics network components?
f) What are parallel programming languages?
g) What are the fiber channel interconnection topologies?

(7 X 4)

2.

a) Write a short note on PVM.
b) What is dense matrix computation? How it differs from sparse metric computation?

(10 + 8)

3.

a) How is a networked computer providing platform form parallel computing?
b) Write a short note on networking topologies for interconnection network.
c) How are latency and bandwidth metrics asses the performance of interconnection network system architecture?

(3+10+5)

4.

a) What are the main features of Data-Parallel, Message-Passing and Shared-variable models?
b) How performance of the parallel computers can be measured?
c) What is implicit parallelism in Parallel Programming model? How it can be applied to increase performance of parallel computing?

(5+5 +8)

5.

a) POSIX Thread is parallel programming model? Explain the basic thread management primitives.
b) Write a short note on: Types of Parallel Computers.

(8+10)

6.

a) How to achieve load balancing in parallel computing?
b) What are the comparisons of three communication modes which exist in Message passing Models?
c) What are the potentials for increasing computational speed?

(3+7+8)

7.

a) Define the following basic terms for interconnection networks.
   1) Network Diameter
   2) Bisection Bandwidth

3) Crossbar Switches
4) Cell switches network

b) Using fixed problem size, explain how metrics can be used to analyze and predict the scalability of parallel computer-program?

c) In parallel computing, how one can derive performance v/s cost?

(8+6+4)

BE5-R4: PARALLEL COMPUTING

PRACTICAL ASSIGNMENTS

Assignment 1. Write a program which creates child process and prints its process Ids

Assignment 2. Shared Memory Programming - I

1) **Write a program to copy content of an array to another array using 2 processes**
2) **Write a program which performs Addition of 2 Arrays.**
3) **Write a program which performs Matrix Addition**

Write a program that finds factorial of a number

Assignment 3. Shared Memory Programming – II

1) **Write a program which performs Matrix Multiplication**

Write a program sum 1 To N using M process (Mutual Exclusion)

Assignment 4. Shared Memory Programming – III

1) **Write a program to sum an array of N elements using self-scheduling (Mutual Exclusion)**

Write a program to calculate Standard Deviation

Assignment 5. Shared Memory Programming – IV

1) **Write a program to calculate Standard Deviation (Barrier)**

Write a program to create histogram

Assignment 6. Thread-Based Implementation - I

1) **Write a program to create and join Thread**
2) **Write a program to sum an array of N elements using loop splitting**

Write a program to sum an array of N elements using self scheduling

Assignment 7. Thread-Based Implementation – II

1) **Write a program to illustrate producer Consumer Problem**

Write a program to calculate Standard Deviation

Assignment 8. Write programs which explain working of Expression Splitting

Assignment 9 Write a program to illustrate indirect scheduling.

Assignment 10 Write programs which explain working of Induction Variable

BE6-R4: DATA WAREHOUSEING AND DATA MINING

Objective of the Course

Data warehousing and data mining are the essential components of decision support systems for the modern day industry and business. These techniques enable the knowledge worker (analysis, manager, executive) to make better and faster decisions. The objective of this course is to introduce the student to various Data Warehousing and Data Mining concepts and Techniques. A database perspective has to be used throughout the course to introduce principles, algorithm, architecture , design and implementation of data mining and data warehousing techniques.

Outline of Course

S. No.	Topic	Minimum No. Of Hours
1	Introduction and Background	06
2	Data Warehousing and OLAP	11
3	Data Mining Primitives	05
4	Concept Description: Characterization and Comparison	06
5	Association Analysis	06
6	Classification and Predictions	08
7	*Cluster Analysis*	06
8	Mining Complex Types of Data	09
9	Application of Data Warehousing and Data Mining	03

Lecture = 60

Practices/Tutorials = 60

Totals = 120

Detailed Syllabus

1. Introduction and Background 6 hrs

An introduction to multidisciplinary filed of data mining, Discussion on the evolutionary path of database technology that has led to the need for data warehousing and data mining, different kind of data on which data mining applied, classification of data mining system, Major issues in Data miming, Stress on important of its application potential.

2. Data Warehousing and OLAP 11 hrs

Concepts of Data warehouse, deference between operational database system and data warehouse, Multidimensional Data Model: data cube, Stars – Snowflakes – Fact schemas for multidimensional database, measures, concept hierarchies, OLAP operation on multidimensional Data Model, Data Warehouse architecture, Types of OLAP servers, Life cycle of data warehouse implementation, Relationship between data warehouse and data mining.

3. Data Mining Primitives 5 hrs

Data Preprocessing including Data cleaning - Data integration - Data transformation, Discretization and concept Hierarchy generation, Definition and Specification of a

generic data miming task, Description of Data mining query language with few example queries.

4. Concept Description: Characterization and Comparison 6 hrs

Introduction to concept description, Data Generalization and Summarization based characterization: Attribute Oriented Induction (AOI) – Efficient implementation of AOI, Analytical Characterization, Mining class comparison: Discriminating between Different classes, Mining Descriptive Measures in Large database.

5. Association Analysis 6 hrs

Association rule mining, Mining Single Dimensional Boolean Association rule in truncation database, Mining multilevel association rule, Discussion on few association rule algorithm such as Apriori, frequent pattern growth, etc.., From Association rule to correlation analysis.

6. Classification and Predictions 8 hrs

Issues regarding classification and predication, Different classification methods including Decision tree induction – Bayesian Classification, Neural network technology, K- Nearest Neighbor Classifier- Case-based Reasoning - Fuzzy set theory - genetic algorithm, Prediction: Linear and Multiple Regression – Nonlinear Regression – Other Regression Models, Classifier Accuracy

7. Cluster Analysis 6 hrs

Types of data in cluster analysis, Partition based Clustering, Hierarchical Clustering, Density based Clustering, Grid based Clustering, Model based Clustering, Discussion on scalability of clustering algorithm, Outlier analysis, Parallel approaches to clustering

8. Mining Complex Types of Data 9 hrs

Data mining issues in object oriented databases, spatial databases and multimedia databases, time series databases, text databases, web mining: web usage mining – web content mining – web log attribute.

9. Application of Data Warehousing and Data Mining 3 hrs

Exploration of web sites on data warehousing and data mining application including bibliography databases, Corporate Houses and Research labs.

Use of data mining packages and data warehousing packages, e.g. SAS, IBM, excel miner tools.

MAIN READING

1. Data Mining: Concepts and Techniques, Second Edition (The Morgan Kaufmann Series in Data Management Systems) Jiawei Han and Micheline Kamber, ISBN-10: 1558609016 ISBN-13: 978-1558609013; 2005

SUPPLEMENTARY READING

1. Arun K Pujari, "Data Mining Techniques" ISBN; 8173713804; ISBN-13: 9788173713804;978-8173713804; Universities Press.
2. M. Jarke, M. Lenzerni, Y. Vassiliou, and P. Vassiladis, “Fundamentals of Data Warehouses, 1st edition"; Year of Publication: 1999 ISBN:3540653651 Springer-Verlag New York, Inc. Secaucus, NJ, USA.

3. Margaret Dunham, "Data mining: Introductory and Advanced Topics" ISBN-10: 0130888923

ISBN-13: 978-0130888921 Publisher: Prentice Hall; 1 edition (September 1, 2002).

BE6-R4: DATA WAREHOUSING AND DATA MINING
Model Question paper

NOTE:

1. **Answer question 1 and any FOUR questions from 2 to 7.**
2. **Parts of the same question should be answered together and in the same sequence.**

TOTAL TIME: 3 HOURS **TOTAL MARKS: 100**

1.

a) What is (are) the motivation(s) behind knowledge discovery in database (KDD)?
b) Give architecture of data warehouse. List out the components of data warehouse.
c) What are the disadvantages of query driven approach? How to overcome those?
d) Explain Data Discretization and Concept Hierarchy Generation.
e) Explain the difference between Star schema and Fact constellation schema in terms of their usage.
f) What do you men by noise? How to handle noisy data?
g) For what purpose Data Cube Aggregation and Dimensionality Reduction strategies are used.

(7x4)

2.

a) Suppose the data for analysis include the attribute age. The age values for data tuple are:
13,15,16,16,19,20,20,21,22,22,25,25,25,25,30,33,33,35,35,35,35,36,40,45,46,52,70.
   1. What are the mean, median and mode of the data.
   2. Find first quartile (Q1) and third quartile (Q3) of the data.
   3. Give the fine number summary of the data.

b) Suppose that a data warehouse consists of the three dimensions time, doctor and patient, and two measures count and charge
   1. Draw a schema diagram
   2. Give OLAP operations in order to list the total fee collected by each doctor in 2000?

c) Why fact constellation schema data warehouse model is not suitable for data marts? Which process model is suited for designing data marts?
d) How to calculate the measure value at a given point? Which kind of measures rank ( ) and median ( ) are?

(6+4+4+4)

3.

a) Which are the pattern interestingness criteria? Define support and confidence. For a company-X, min_sup is 10% and min_conf is 75%, while for another company-Y, min_sup is 20% and min_conf is 60%. For which of the two companies, the rule A→ B is more strong? Why?
b) For class characterization, what are the major differences between a data cube based implementation and a relational implementation such as AOI? Discuss which method is the efficient & under what conditioned?
c) What defines a data mining task?

(10+4+4)

4.

a) Why is scaling important for clustering? Give the methods/expressions used for scaling the following types of variables:
   - Interval-scaled Variables
   - Ordinal Variables
   - Binary Variables
   - Nominal Variables

b) "Market Basket Analysis is a kind of classification" is this correct? If yes, justify, if no correct the statement & give the reason.

c) Can a quantitative characterization rule and a quantitative discriminant rule be expressed together in the form of the rule? Justify.

d) When mining association rules, how can the data mining system tell which rules are likely to be interesting to the user?

(5+5+4+4)

5.

a) Differentiate between clustering and classification. What are the similarities? Can we replace/use one in place of another?

b) Briefly describe each type of CH with example.

c) Explain the algorithm for inducing a decision tree from training samples.

d) Where Attribute Relevance Analysis is used? How entropy based method is related to it? Explain in detail.

(5+3+3+7)

6.

a) Consider the following data.

	B	~B
A	200	45
~A	50	150

Find correlation between A and B.

b) Explain in detail with example 3-4-5 rule that is used to segment numeric data into natural intervals.

c) Where are supervised and unsupervised learning are used and what purpose do they serve? How to improve the accuracy of the classifiers?

(6+6+6)

7.

a) Compare Bayesian classifier with Decision Tree and Neural Networks.

b) Compare analytical characterization with relevance analysis and without relevance analysis.

c) What is backpropagation? How does backpropagation work? How is it possible to understand what the backpropagation network has learned?

(6+6+6)

BE6-R4 :Data Warehousing and Data Mining

Practical List

1. Suppose that a data warehouse consists of the three dimensions time, doctor and patient, and two measures count and charge
    1. Draw a schema diagram
    2. Give OLAP operations in order to list the total fee collected by each doctor in 2000?
2. Propose an algorithm in pseudo code for the following.
   The automatic generation of a concept hierarchy for numeric data based on the equidepth partitioning rule.
3. Following is the sorted data for price (in Rs.)
   40,80,150,210,210,240,250,280, 340.
   - Partition the above data into equidepth bins.
   - Smooth the data by bin means and bin boundaries.
4. Consider the following transaction database:

TID	Item List
1	1,2,5
2	2,4
3	2,3
4	1,2,4
5	1,3
6	2,3
7	1,3
8	1,2,3,5
9	1,2,4

   Find the frequent pattern using FP Growth algorithm.
5. Major (x, “science”) → Status (x, “undergraduate”). Total 5000 students are there. 56% of undergraduate at the university, Major in “Science”. 64% students are registered in undergraduate program and that 70% students are majoring in the “science”.
   Compute the utility and certainty
   Major (x, “Biology”) → Status (x, “undergraduate”) [7%, 80%]. Suppose 30% of the science students are majoring in biology. Then will you consider the above rule novel with respect to given rule.
6. Suppose that the data for analysis include the attribute age. The age values for the data tuple are:
   13,15,16,16,19,20,20,21,22,22,25,25,25,25,25,30,33,35,35,35,35,36,40,45,46,52,70.
    a. Use min-max normalization to transform the value 35 for age on to 0-1 range
    b. Use z-score normalization to transform value 35, where std. Deviation is 12.94 yrs.
    c. Use normalization by decimal scaling to transform value 35 for age.
7. Which are the pattern interestingness criteria. Define support and confidence. For a company-X, min_sup is 10% and min_conf is 75%, while for another company-Y, min_sup is 20% and min_conf is 60%. For which of the two companies, the rule A→ B is more strong? Why?

8. There are nine transactions in the database:

T100	I1,I2,I5
T200	I2,I4
T300	I2,I3
T400	I1,I2,I4
T500	I1,I3
T600	I2,I3
T700	I1,I3
T800	I1,I2,I3,I5
T900	I1,I2,I3

Generate candidate 3-itemset and frequent 3-itemset.

9. Suppose a Data Ware Warehouse consists of three dimensions:
- Time - Doctor - Patient and two measures
  - Count - Charge, where charge is the fee that a doctor charges a patient for a visit.

a) Draw a star schema diagram for above warehouse

What specific OLAP operations should be performed in order to list the total fees collected by each doctor in 2006?

10. Write an algorithm for k-nearest neighbour classification given k and n, the number of attributes describing each sample.

11. Suppose that the university course database for Delhi University includes the following attributes describing students:
Name, address, status (undergraduate/postgraduate), major and GPA.

- Propose a concept hierarchy for the attributes address, status, major and GPA. For each concept hierarchy, as proposed above, state the type of concept hierarchy.

12. Suppose that the following table is derived by AOI.

Class	Sales country	Count
	USA	180
Salesman	Others	120
	USA	20
Salesgirl	Others	80

Transform the table into a cross tab showing the associated t-weights and d-weights.

13. A database has four transactions. Let min_sup=60 and min_conf=80%.

TID	Date	Items_bought
T100	02/02/08	{A,B,C,E}
T200	07/02/08	{A,B,C,D,E}
T300	12/02/08	{A,B,D,K}
T400	23/02/08	{A,B,D}

Find all frequent itemset using FP Growth.

BE7-R4: SOFTWARE TESTING AND QUALITY MANAGEMENT

Objective of the Course

This objective of the course is to make students aware about the importance of the software testing during software development. The course covered to be in line with the development tools and languages taught in this level. The course will prepare the student for software testing and debugging. It will further laid the foundation for advanced courses in Software quality assurances.

Outline of Course

S. No.	Topic	Minimum number of hours
1.	Introduction	02
2.	Importance of Software Testing	04
3.	Testing Techniques and Strategy	10
4.	Verification and Validation	06
5.	Building Test Cases and Plans	20
6.	Quality Assurance and Standards	10
7.	Debugging Technique and Tools	04
8.	External Source of Errors	04

Lectures = 60
Practical/tutorials = 60
Total = 120

Detailed Syllabus

1. Introduction **02 Hrs.**

Software program and its objective, Software development techniques, top-down verses bottom-up approach, modular and structures programming. A brief introduction about object oriented approach.

2. Importance of Software Testing **04 Hrs.**

Software testing and its importance, software development life cycle verses software testing life cycle, Deliverables, version and error control

3. Testing Techniques and Strategy **10 Hrs.**

Unit testing, Integration testing, System testing, Acceptance testing

White-Box testing: Flow Graph notation, Cyclomatic Complexity, Graph matrices, control structure and loop testing.

Black-Box testing: Equivalence partitioning, Boundary Value Analysis, Orthogonal Array testing.

4. Verification and Validation **06 Hrs.**

Requirement verification, Coding standards, Walk through, Formal Inspection, Design validation and verification, Function test, Design metrics, correctness proof and its requirement.

5. Building Test Cases and Plans **20 Hrs.**

Format of test cases, Du, dc and other data paths, Test data selection, branch coverage, statement coverage, pre-condition and post-condition, Test schedule and check pointing, suitable exercises for creating test cases for each type of techniques mentioned in para 3.

6. Quality Assurance and Standards **10Hrs.**

Basic software quality parameters and its metrics, Software Configuration Change and types of errors, Quality management models: ISO, SPICE, IEEE, CMM

7. Debugging Technique and Tools **04 Hrs.**

Integrated development environment, debugging, tracing, data inspection, exception errors, code and data redundancy, unreachable code.

8. External Source of Errors **04 Hrs.**

Main memory, conflicting dll and unknown interface as source of error and their rectification.

Note: Any open-source Software Tools may be utilized, such as "winrunner".

RECOMMENDED BOOKS

MAIN READING

1. Desikan S, Ramesh G, "Software Testing", Pearson Education, 2008.
2. Tamres L, "Introducing Software Testing", Pearson Education, 2007.
3. Mathur A.P, "Fundamentals of Software Testing", Pearson Education, 2008.

SUPPLEMENTARY READING

1. Brian Marick, "The Craft of Software Testing", Pearson Education, 2008.
2. Rajani & Oak, "Software Testing : Methodology, Tools and Processes" Tata McGraw-Hill, 2007.
3. R. Pressman, "Software Engineering", 6th Edition, Tata McGraw-Hill.

BE7-R4: SOFTWARE TESTING AND QUALITY MANAGEMENT

Model Question Paper

NOTE:

1. There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.
2. **PART ONE** is objective type and **PART TWO** is descriptive type. Time allotted for **PART ONE** is one hour.
3. Maximum time allotted for **PART ONE** is **ONE HOUR** out of the maximum time of three hours for the entire paper.

TOTAL TIME: 3 Hours **TOTAL MARKS: 100**
(PART ONE -40; PART TWO-60)

PART ONE

(Answer ALL Questions; each question carries ONE mark)

3. Each question below gives a multiple choices of answers. Chose the most appropriate one.

3.1 Verification is:
a) Checking that we are building the right system
b) Checking that we are building the system right
c) Performed by an independent test team
d) Making sure that it is what the user really wants

3.2 A regression test:
a) Will always be automated
b) Will help ensure unchanged areas of the software have not been affected
c) Will help ensure changed areas of the software have not been affected
d) Can only be run during user acceptance testing

3.3 Which of the following could be a reason for a failure
1) Testing fault
2) Software fault
3) Design fault
4) Environment Fault
5) Documentation Fault

a) 2 is a valid reason; 1,3,4 & 5 are not
b) 1,2,3,4 are valid reasons; 5 is not
c) 1,2,3 are valid reasons; 4 & 5 are not
d) All of them are valid reasons for failure

3.4 Test is prioritized so that:
a) you shorten the time required for testing
b) You do the best testing in the time available
c) You do more effective testing
d) You find more faults

3.5 Which of the following is not a static testing technique
a) Error guessing
b) Walkthrough
c) Data flow analysis
d) Inspections

3.6 During which test activity could faults be found most cost effectively?
a) Execution
b) Design
c) Planning
d) Check Exit criteria completion

3.7 The purpose of requirement phase is
a) To freeze requirements
b) To understand user needs
c) To define the scope of testing
d) All of the above

3.8 The process starting with the terminal modules is called -
a) Top-down integration
b) Bottom-up integration
c) None of the above
d) Module integration

3.9 The inputs for developing a test plan are taken from
a) Project plan
b) Business plan
c) Support plan
d) None of the above

3.10 Inspections can find all the following except
a) Variables not defined in the code
b) Spelling and grammar faults in the documents
c) Requirements that have been omitted from the design documents
d) How much of the code has been covered

4. Each statement below is either TRUE or False. Identify and mark them accordingly in the answer book.

4.1 In information technology, we often build products requirements/specifications which although documented not true quality needs of our customers.
4.2 Our products must be corrected so that they will eventually meet our customers' true quality needs.
2.3 Can produce products at our convenience and at any cost
2.4 Quality is not an attribute of product
2.5 Quality is not a binary state
2.6 Quality need not be defined in quantitative terms in order to be measurable.
2.7 Quality can be controlled only if it is measured.
2.8 Non conformance must be detected as early as possible measured.
2.9 High defect prone products and processes are identified testing the product after all processes are over.
2.11 0% of all defects are attributable to incorrect ineffective processes.

3. Match words and phrases in column X with the nearest in meaning in column Y

	X	**Y**
3.1	A process of selecting test cases/data by identifying the boundaries that separate valid and invalid conditions	a) Quality Assurance
3.2	It is based upon graphical representation of the program process	b) Software Configuration
3.3	The input domain of the system is partitioned into classes of representative values, so that the no of test cases can be limited to one-per-class, which represents the minimum no. of test cases that must be executed.	c) CMM-Managed

3.4	A planned and systematic set of activities necessary to provide adequate confidence that requirements are properly established and products or services conform to specified requirements	d) Data flow modeling
3.5	Foundation for continuing improvement and optimization of process	e) Boundary value Analysis
3.6	The nodes represent the data objects. The links represent the transformations that occur to translate one data object to another.	f) Equivalence testing
3.7	Computer programs (source code and executables), documentation (technical and user), data (internal and external to programs)	g) Unit Testing
3.8	Brainstorming meeting, whose goal is to identify the problem, propose elements of a solution, negotiate different approaches, and specify a preliminary set of solution requirements	h) Black Box
3.9	lis the process of testing each software component individually using stubs and/or drivers.	i) Control Flow Analysis
3.10	A technique in which the input domain is divided into classes of equivalent data items	j) Facilitated application specification technique (FAST).

4. Fill in the blanks in 4.1 to 4.10 below, by choosing appropriate words and phrases given in the list below:

(a) Quality control	(b) Design,	(c) Management cycle	(d14
(e) Customer	(f) Acceptable quality level	(g) Test tools	(h) implementation and test
(i) White box	(j) optimising process		

4.11 For quality to happen, there must be well-defined standards and procedures which are followed
4.12 Quality means fit for use. This is _____view.
4.13 The no of principles in Dr. W. Edwards Deming's quality principles is _____.
4.14 The other name PDCA referred to is _____.
4.15 With the_____, the data is available to justify the application of technology to various critical tasks, and numerical evidence is available on the effectiveness with which the process has been applied to any given product
4.16 If changes are not controlled, then orderly _____ is impossible and no quality plan can be effective.
4.17 AQL stands for_____.
4.18 Is a vehicle for performing a test process_____.
4.19 The process by which product quality is compared with applicable standards; and the action taken when nonconformance is detected is called _____.
4.20 cyclomatic Complexity method is one of the method of _____Testing.

PART TWO
(Answer ANY FOUR questions)

5.

d. How does software differ from the artifacts produced by other engineering disciplines?
e. How do software process metrics differ from software project metrics?
f. What is meant by the term software reliability?

(5+5+5)

6.

f. What are the names of the five levels of the SEI Capability Maturity Model? In your own words, briefly describe each.

g. Describe the change control process for a modern software development project.

(10+5)

7.

b. System Testing

b. What is equivalence partitioning as it applies to software testing?

h. Boundary Value Analysis

i. Black box vs. white box testing

j. Acceptance Testing

(3+3+3+3+3)

8.

a. What are the key differences between validation testing goals and acceptance testing goals?

b. A computer system is required that will support the following small garage business.

Customers bring their cars to the garage for servicing and repair. The attendant must check the car in, record details about the owner and the car, along with any specific customer requests. The workshop manager inspects each car and creates a job specification for it. He then schedules the job and assigns a mechanic to complete the specified tasks. During this process, if any new problems are discovered a new job specification is created by the workshop manager before carrying out the work. When the job is finished the mechanic completes a report detailing the time spent, work done and materials used. This information is used by the attendant to create an invoice for the customer when they come to collect their car.

Represent the system described above as a use-case diagram

(5+10)

9.

b. What is the difference between testing Techniques and tools? Give examples.
Quality control activities are focused on identifying defects in the actual products produced; however your boss wants you to identify and define processes that would prevent defects. How would you explain to him to distinguish between QA and QC responsibilities?

b. Describe the process used in the UML (unified modeling language) approach to object-oriented design.

(10+5)

Assignment 1.

A program reads three integer values, representing the lengths of the sides if the triangle. The program prints whether the triangle is scalene, isosceles or equilateral. Develop a set of test cases that would test the program adequately.

Assignment 2.

Derive a flow graph for the above program and apply basis path testing to develop test cases that will guarantee the execution of all the statements. Execute the cases and show the results.

Assignment 3.

Given the following procedure

```
        PROCEDURE AVERAGE
        Interface Returns avg, input, valid
        Interface accepts value, min, max

int value [100];
int avg; input, valid, min, max, sum, i

i = 1;
input = valid = 0;
sum = 0
Do WHILE value [i]  <> - 999 and input <100
Input = input + 1
If value [I]>= min and value [I] <=max
THEN valid = valid + 1
        Sum = sum + value [I]
ELSE
        SKIP
END IF
 i = i + 1;
END DO
IF Valid > 0
THEN avg = sum/valid
ELSE
        Avg = -999
END IF
```

END AVERAGE

d) Draw a flow graph for the above given algorithm.
e) Determine the cyclomatic complexity by applying
   iv) Number of regions
   v) Edges and nodes
   vi) Predicate nodes
f) Determine a basis set of linearly independent paths.

Assignment 4.

Prepare the test cases corresponding to each independent path identified in Q3.

Assignment 5.

Draw a Graph Matrix corresponding to algorithm given in Q3 & compute the cyclomatic complexity. Prepare the test cases of the given algorithm to test the conditions using CONDITION TESTING.

Assignment 6.

Write a program in any programming language to accept a number and generate a table. Draw a flow graph and design various test cases for testing all possible paths.

Assignment 7.

Write a program in a programming language, specified by the examiner, to accept a 10 numbers & sort them in the order accepted at run time. Make a flow graph and design test cases for the condition testing. Also mention the expected results.

Assignment 8.

You are to prepare a Test Plan. What are the various test factors to be analyzed that correspond to Project Risks?

Assignment 9.

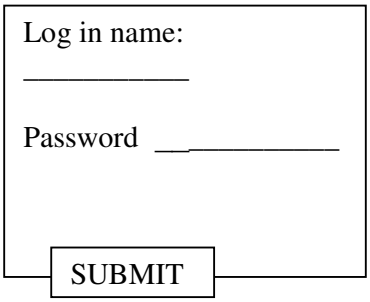
A university's web site allows students to enroll online bio-data. The form contains following fields:

x. Name of the student
xi. Father's name
xii. Address
xiii. City
xiv. State
xv. Pin code
xvi. Sex
xvii. Date of Birth
xviii. Academic Qualifications
   a. Exam Passed
   b. University/Board
   c. Marks obtained
   d. Division
   e. Max Marks

Design the validation checks for the given fields.

Assignment 10.

Assume there is functionality to log-in through the screen given below:



Write a set of black box test cases to test the functionality of the given screen.

Assignment 11.

Prepare a checklist to review the Requirements and Design

Assignment 12.

Write a program to find the sum of the matrices. Write all the test cases so as to verify the correctness of the logic.

Assignment 13.

Write the code for binary and linear search. Find the cyclomatic complexity of the two by drawing the flow graph.

Assignment 14.

Prepare a list of checks to test date, numeric and alpha fields in any data entry screen.

Assignment 15.

Create du and dc graph for the following program:

```
scanf(x,y);
        if (y < 0)
                pow = pow – y;
        else
                pow = y;

        z = 1.0;
while(pow != 0)
{
        z = z * x;
        pow = pow – 1;
```

```
}
if (y < 0)
        z = 1.0/z;
printf(z);
```

Assignment 16.

Create the flow graph of the above Q15 and compute the cyclomatic complexity.

Assignment 17.

Prepare the list of test cases for q16

Assignment 18.

Write a program to compute the factorial of a number and create du and dc graph for the same.

Assignment 19.

Create the graph matrix of the Q18 and compute the cyclomatic complexity.

Assignment 20.

Prepare the list of test cases for q19

Assignment 21.

Write a program to create fibonacci series and and create du and dc graph for the same.

Assignment 22.

Create the flow graph of Q21 and compute the cyclomatic complexity.

Assignment 23.

Prepare the list of test cases for q22

Assignment 24.

Prepare a checklist to test the Graphical User Interface of Windows based application.

Assignment 25.

Prepare a comprehensive checklist to test a WEB Site

BE8 – R4: Digital Image Processing

Objective of Course:

This course Explain why the ability to perform digital processing of radiographic images is a significant advantage. It Cover the basic theory and algorithms that are widely used in digital image processing and Expose students to current technologies and issues that are specific to image processing systems. It gives to students the fundamentals of digital image processing, covering some topics from the following list: inverse problems in imaging; image enhancement; edge detection; feature extraction; and geometric diffusion. Describe the general relationship between image contrast and pixel values.

Outline of Course

S. No	Topic	Minimum No of Hours
1.	Introduction	10
2.	Image Digitization	06
3.	Image Enhancement	14
4.	Image Restoration	10
5.	Image Compression	10
6.	Image registration and Multi-valued Image Processing	10

Lecture	**:**	**60**
Practical	**:**	**60**
Total	**:**	**120**

Detailed Syllabus

1. **Introduction** **10 Hrs**
   Introduction of Image Processing with its applications, Components of Image processing system, Image Formation model.
2. **Image Digitization** **06 Hrs**
   Image digitization process, Image representation schemes like, GIF, TIFF, BMP, JPEG, PNG
3. **Image Enhancement** **14 Hrs**
   Introduction of Image enhancement, Image enhancement techniques: Contrast intensification by Linear stretching, Non-Linear stretching, Exponential stretching, Noise cleaning or Smoothing by Image averaging, Special filters like Mean filter, Median Filter, Max filter, Mean filter and Image sharpening and Crispening
4. **Image Restoration** **10 Hrs**
   Minimum Mean-square Error restoration, Least-square error restoration, Restoration by Singular Value Decomposition, Restoration by Maximum Posterior Estimation, Restoration by Homomorphic Filtering
5. **Image Compression** **10 Hrs**
   Introduction, Error Criterion (Objective and Subjective), Stages of Image compression, Difference between Lossy Compression techniques and Loss less image compression techniques, Compression techniques like Huffman coding, Run Length Encoding, Lempel-Ziv-welch (LZW) coding, JPEG, Transform compression, Block Truncation compression.
6. **Image registration and Multi-valued Image Processing** **10 Hrs**
   Introduction of image registration, Geometric transformation, Plane to plane Transformation, Mapping, Stereo imaging, Multi-modal and Multi-spectral image processing, Pseudo and False coloring, Image fusion. Color Models like RGB, CMY, YIQ, YcbCr, HIS

Textbook:

1. Rafael C. Gonzalez & Richard E. Woods: Digital Image Processing, Addision-Wesley Publishing Company, 1993

References:

1. B. Chanda, D. Dutta Majumder: Digital Image Processing and Analysis, PHI, 2000.
2. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins: " Digital Image Processing using MATLAB", Pearsons Education Asia, 2004
3. Nick Afford: Digital Image Processing, Addison-Wesley Publishing Company, 2000.
4. Scott E Umbaugh : Computer Vision and Image Processing, PHI, 1998.

BE8 – R4: DIGITAL IMAGE PROCESSING

NOTE:

3. **Answer question 1 and any FOUR questions from 2 to 7.**
4. **Parts of the same question should be answered together and in the same sequence.**

TIME: 3 HOURS **TOTAL MARKS: 100**

Q.1

a) What is Bit Plane Slicing? What effects will be there is LSB details from the image is removed?
b) Compare Low pass filtering in spatial domain & frequency domain
c) Calculate memory required to store 1024x768, 8bit grayscale image and RGB image.
d) Derive Laplacian Mask for 4way & 8 way neighborhoods.
e) Explain brightness adaptation and discrimination.
f) How you can inverse the image using Discrete Fourier Transform. Give the steps.
g) Explain Image Enhancement by Arithmetic and Logic Operation

(7x4)

Q.2

a) Explain fundamental steps in Digital Image Processing.
b) Describe methods for image acquisition using single sensor, sensor strip and sensor array.
c) How smoothing can be done in frequency domain? how edge detection can be done in frequency domain?

(6+6+6)

Q.3

a) Explain Fidelity criteria.
b) Explain Adaptive mean filter for image restoration and compare with mean filter.
c) Describe Spatial resolution & Gray level-Resolution. Also show how image content are affected with change of both.

(6+6+6)

Q.4

a) Explain Un-sharp Masking & High Boost Filtering.
b) Compare RGB, CMYK and HIS color models.
c) How Histogram processing used for colored image? Explain with example.

(6+6+6)

Q.5

a) Explain Order Statistics Filters. Describe Median and Max filter.
b) Calculate D_4 distance, D_8 distance and D_m distance for pixels in square. Find the connected component for each if possible & give minimum path length. Set V={3}

3	3	3	2	1	2	2	5
4	3	4	5	3	2	2	2
2	3	2	3	1	3	3	1
1	4	3	3	2	4	3	4
2	1	2	2	1	2	1	3

(8+10)

Q.6

a) If source of image (data) is known, it is easy get detect redundancy for images. Justify the statement. Explain various types of redundancy related to image data

b) Generate Huffman code for Following set of data:

33	33	33	21	17	21	21	53
43	33	43	53	33	21	21	21
21	33	21	33	17	33	33	17
17	43	33	33	21	43	33	43
21	17	21	21	17	21	17	33

(8+10)

Q.7

a) Explain Basic Thresholding method to decide a threshold T. for images having Bi-modal histogram.

b) Explain homomorphic filtering process in frequency domain.

c) Explain simultaneous contrasts and Mach bands.

(6+6+6)

BE8-R4: Digital Image Processing

Practical List

Assignment 1. Introduction to MATLAB & Image processing Toolbox.

Assignment 2. Write a m-function for following image transforms for grayscale image.
(Input: Gray Scale Image)
i. Inverse Transform
ii. Power-law Transform
iii. Log Transform

Assignment 3. Write m-function for Histogram Equalization for grayscale image.
(Input: Gray Scale Image)

Assignment 4. Write m-function for Local Histogram Equalization.
(Input: Gray Scale Image)

Assignment 5. Write m-function for Histogram Specification for grayscale image.
(Input: 2 Gray Scale Images)

Assignment 6. Demonstrate the use of Smoothing and Sharpening using various Filters for Smoothing (Average(Mean) Filter, Weighted Filter, Median Filter, Gaussian Averaging Filter, Laplacian Filter for Sharpening (H-V and H-V-D))
(Input: Gray Scale Image)

Assignment 7. Perform the BIT PLANE SLICING for the gray scale image. Show the effect of removing the each bit plane from the image.
(Input: Gray Scale Image)

Assignment 8. Demonstrate the use of Filtering in Frequency Domain. Implement the function for the IDEAL, GAUSSIAN, and BUTTERWORTH (both High pass and Low pass) filters. Also compare and analyze results.
(Input: Gray Scale Image)

Assignment 9. Demonstrate the use of different filter applied for image restoration which is degraded by Raleigh, Gaussian, and Salt & Pepper Noise. Implement following filters:
i. Mean Filter
   a. Arithmetic Mean filter
   b. Geometric filter
   c. Harmonic Filter
   d. Contra Harmonic filter
ii. Order Statistics Filters
   d. Median filter
   e. Max & Min Filters
   f. Mid point Filter
(Input: Gray Scale Image)

5. Demonstrate use of Prewit , Sobel, Robert, Canny edge detector for Edge detection.
(Input: Gray Scale Image)
6. Implement Fourier Descriptor for shape detection and prepare CHAIN CODE for shape.
(Input: Binary Image with one Shape)
7. Demonstrate use of Morphological Operations (Dilate & Erosion).
(Input: Binary Image with one Shape)
8. Write a M-function for Color space Transformation. (RGB↔YUV↔CMYK)
(Input: Color Code)

Software Requirement: MATLAB 6.0

BE9-R4 : ACCOUNTANCY AND FINANCIAL MANAGEMENT

Objective of the Course

Managerial decision making has ever remained a crucial economic activity in accounting and financial management, for the nature and quality of decision is at the back of economic and financial prospect of the firm. Sound, intelligent and objective decisions depend to a larger degree upon the skills the managers hone within them, coupled with an efficient MIS. Accounting systems are an integral part of the MIS responsible for providing necessary, relevant and timely information to managers. Hence, the management of the organization along with its team of existing and prospective accountants must possess thorough understanding of the nature of accountancy. In view of this, the present course on accountancy and financial management is designed to equip the students with necessary skills, tools and techniques, which the accountants and the managers of tomorrow would use for appreciating the issues involved in system designing and using the accounting information for important managerial decisions.

The present course has broadly three segments-first, on financial accounting; second on cost accounting and third, on financial management. The first segment focuses on accounting provides a recordable language for business communication along with necessary financial information as crucial inputs for managerial decisions. As a system financial accounting aims at recording financial transactions of all types (*between a firm and the external world*)in various accounting books and then processes and transforms such transactions to provide for financial statements of the firm. Such financial statements are reflections on the financial health of a firm which must be an outcome of important managerial decisions. Cost accounting as a system process necessary information pertaining to the cost of inputs, which is not part of financial accounting but such information is certainly useful for a number of decisions to be made. The focus of this segment is to make the students appreciate how such a cost data is important for cost management and cost control Finance is one of the most important functional areas of management. This segment is designed keeping in mind that students must appreciate the issues involved in the management of corporate finance. It is expected that after the course each student must appreciate importance of financial management in the organizational context and understand further how sound financial management provides a strong lever to help the firm take-off for better and unprecedented prospects.

After the completion of the course, the following is expected from the students:

Appreciation of the objectives and importance of Accounting Information System in an organisation.
Perfect knowledge of how different transactions are recorded in various accounting books.
Understanding of how the records are processed to generate Profit and Loss Account, Balance Sheet, Funds Flow Statement and Cash Flow Statement.
Knowledge about analysis of the information obtained in the form of financial statements of a firm to determine its financial health and for taking certain decisions.
Appreciation of various cost concepts and relevance thereof in decision making.

Skills to process cost information so as to determine the cost of a product/service.

Using cost data for better cost management and control; and for taking intelligent decisions.

What are various financial decisions a finance manager has to take in a firm, what tools, techniques, information etc. one uses for decision making.
Appreciation and understanding of contemporary corporate finance related issues.

Outline of Course

S.No.	Topic	Minimum No. of Hours
1.	Financial Accounting: An Introduction	6
2	Preparation of Final Financial statements	10
3	Analysis of Financial Statements	06
4	Cost Accounting: An Introduction	03
5	Overheads	02
6	Cost Accumulation Systems	03
7	Variable and Absorption Costing	03
8	Cost-Volume-Profit Analysis	03
9	Budgeting	04
10	Financial Management: An Introduction	03
11	Time value of Money and Mathematics of Finance	03
12	Capital Budgeting Decisions	04
13	Cost of Capital and Sources of Finance	04
14	Capital Structure and Dividend Decisions	03
15	Working Capital Management	03

Lectures	=	60
Practical/Tutorials	=	60
Total	=	120

Detailed Syllabus

1. **Financial Accounting : Basic Accounting Concepts** **06 Hrs.**
Need for Accounting, Its relationship with other subjects. The Profession of Accounting. Meaning and nature of Accounting - Accounting as a language of the business and accounting as an information system. Accounting Process and the final output of the accounting system. Principles of accounting and double entry system, recording of transactions in journal. Recording transactions in cash-book (single column only), sales- book and purchase-book, posting of transactions into ledger and the preparation of trial balance. The Financial Accounting Framework, Accounting Policies. The Accounting Equation, Accounting Standards on Disclosure of Accounting Policies. The Nature of Income. The Accounting Period concept Interim Reports. Relation between income and Owners' Equity. Income: Not the Same as Increase in Cash. The Conservatism concept An Introduction to Accounting Standard on Valuation of Inventory. Revenue Recognition. The Realization Concept. The Matching Concept. Recognition of Expenses: Criteria for Expense Recognition, Expenses and Expenditures. The Consistency Concept. The Materiality Concept. The Income Statement: Revenues, Cost of Sales, Gross Margin, Expenses, Net Income. Relation between Balance Sheet and Income Statement, Accrual versus Cash-Basis Accounting. Net Profit or Loss Prior period items, extraordinary items

2. **Preparation of Final Financial statements** **10 Hrs.**
Process leading to preparation of financial statements. Preparation of Final Accounts - Profit and Loss Account and Balance Sheet (with simple adjustments), Preparation of Statements of Changes in Financial Statements-Funds Flow Statement and Cash Flow Statement

3. **Analysis of Financial Statements** **06 Hrs.**
Horizontal (Trend) Analysis and Vertical (Common-Size) Analysis, Ratio Analysis – Liquidity Ratios, Turnover Ratios, Profitability Ratios, Solvency Ratios and Market Ratios, Du Pont Analysis, Analysis of Statements of Changes in Financial Position - Funds Flow Statement and Cash Flow Statement

4. **Cost Accounting : Basic Concepts** **03 Hrs.**

Meaning, nature and importance of cost accounting system in an organization. Elements of costs and various cost concepts such as direct and indirect costs, fixed and variable costs, sunk cost, opportunity cost, out of pocket and imputed costs, preparation of cost sheet

5. **Overheads** **02 Hrs.**

Allocation, Apportionment and Absorption of Overheads

6. **Cost Accumulation Systems** **03 Hrs.**

Job costing system (simple treatment), process costing system (simple treatment)

7. **Variable and Absorption Costing** **03 Hrs.**

Estimation of profit under absorption costing system and under variable costing system (simple cases), Understanding and appreciating the differences in profits calculated under both the systems. Importance of variable costing for decision making.

8. **Cost-Volume-Profit Analysis** **03 Hrs.**

Understanding the nature of variable cost and fixed cost (total as well as per unit), contribution, P/V Ratio, Break-Even-Point, Assumptions of Cost-Volume-Profit Analysis and studying the relation between cost, volume and profit, Graphical Analysis of Break-Even-Point and Profit-Volume Relation, Use of Cost-Volume-Profit Analysis for Decision Making, Limitations of Cost-Volume-Profit Analysis

9. **Budgeting** **04 Hrs.**

Meaning, objectives and importance of budgeting in an organisation, Budget as a management control system. Different approaches to Budgets including. Preparation of cash budget, fixed and flexible budgets, zero-base budgeting

10. **Financial Management : Basic Concepts** **03 Hrs.**

Nature, objectives and scope, Financial decision-making and types of financial decisions, Role of a finance manager in a firm, Basic axioms of Financial Management, Risk-Return framework for financial decision - making. Corporate Finance.

11. **Time value of Money and Mathematics of Finance** **03 Hrs.**

Interest rates and term structure of interest rate. Time value of money and the opportunity cost of money, Present value and future value and interest rate and discount rate, Annuities and their types, Numerical related to the calculation of present values and future value

12. **Capital Budgeting Decisions** **04 Hrs.**

Nature and kinds of capital budgeting decisions, Techniques of evaluating capital budgeting decisions – discounted and non-discounted methods of investment appraisals such as payback period, accounting rate of return, NPV, IRR and profitability index

13. **Cost of Capital and Sources of Finance** **04 Hrs.**

Basic valuation model, concept of cost of capital - weighted average cost and marginal cost, cost of debt and cost of equity - simple cases, Various long - term sources of funds for a firm. New paradigm of institutional and packaged finance. Loan syndication and loan consortia.

14. **Capital Structure and Dividend Decisions** **03 Hrs.**

Concept of capital structure, financial leverage and capital structure, determinants of capital

structure. Dividend and its forms - cash dividend, right and bonus shares, and buy-back of shares. Determinants of dividend policy of a firm

15. **Working Capital Management** **03 Hrs.**

Basics of working capital management : Meaning of gross and net working capital, components of working capital, risk-return framework for working capital decisions. Determinants of working capital requirement, Sources of financing working capital requirement.

Recommended Reading

Main Reading

1. R.Narayanaswamy: Financial Accounting: A Managerial Perspective, PHI
2. MN Arora: Copst and Management Accounting, Vikas Publications
3. Prasanna Chandra, "Financial Mnagement : Theory and Practices, 5th Edition, 2001, Tata McGraw Hill.

Supplementary Reading

3. Robert N. Anthony and James s. Reece : Accounting Principles
4. S.N. Maheswerी : Advanced Accountancy
5. M.Y. Khan and P.K. Jain, "Management : Accounting", Second Edition, 1995 (Tata McGraw Hill Publishing Co. Ltd, New Delhi.
6. R.L. Gupta and M. Radhaswamy : Advanced Accountancy
7. Horngran, C.T., Foster G and Sales, S.M., "Cost Accounting: A Managerial Emphasis, 10th Edition, 2000, Prentice Hall of India.
8. Paresh Shah, Management Accounting, OUP
9. Ravi M. Kishore, Cost and Management Accounting, Taxmann
10. Pandey I.M., " Financial Manager, 7th Edition, 2002 Vikas Publishing Pvt.Ltd.
11. Ravi M. Kishore, Financial Management : Problems and Solutions, Taxmann

BE9- R4 : ACCOUNTANCY AND FINANCIAL MANAGEMENT

NOTE:

1. **Answer Question 1 any FOUR questions from 2 to 7.**
2. **Parts of the same question should be answered together and in the same sequence.**

1.

a) Explain the concepts of Historical Cost and Conservatism in financial accounting. What are the possible implications if a firm does not follow these concepts? (4)

b) Record the following transactions in journal, post them, and prepare a trial balance in the books of Falgun Private Limited: (6)

Sl. No.	Details of transactions
i	Promoters were issued 75,000 equity shares with a face value of Rs. 10 each at a premium of 20% in cash.
Ii	Plant and machinery were purchased against issue of 10% preference shares worth Rs. 2.00 lakhs. Transport charges of Rs. 25,000 were paid to bring the plant and machinery to the factory.
Iii	Purchase of Rs. 1.50 lakhs was made at 10% trade discount.
Iv	Bank account was opened with BOI by depositing Rs. 6.00 lakhs.
V	Credit sale of Rs. 1.80 lakhs was made on the terms "2/15, net 45" to M/s Patel Bros; the Party cleared 50% payment through cheque on the 12th day.
Vi	Salary of Rs. 35,000 & printing expenses for the same amount were paid by cheque.
vii	Purchase of Rs. 2.00 lakhs was made from Amrut by cheque.

c) Answer the following in about 100 words each:

i) Distinguish between Absorption Costing and Variable costing. (4)
ii) Distinguish between Job costing and Process Costing. (3)
iii) Explain the concept of Zero Base Budgeting. (4)
iv) Explain the difference between NPV and IRR (4)
v) Explain how weighted average cost of capital is computed. (3)

2. The summarized balance sheet of Sharad Co. Ltd. as on 31st March 2007 and 31st March 2008 is given below: **(18)**

Figures in Rs.

Liabilities	31-03-07	31-03-08	Assets	31-03-07	31-03-08
Eqity shares of Rs. 10 each	1,000,000	1,500,000	Goodwill	40,000	30,000
General Reserves	600,000	200,000	Fixed Assets	1,300,000	2,230,000
Profit & Loss A/c	100,000	120,000	Investments	150,000	120,000
10% Debentures	-	500,000	Stocks	100,000	150,000
Creditors	450,000	510,000	Debtors	550,000	350,000
Provision for Taxation	150,000	170,000	Cash & bank	120,000	90,000
			Preliminary expenses	40,000	30,000
TOTAL	2,300,000	3,000,000	TOTAL	2,300,000	3,000,000

The following additional information is also available:

(a) On 1-4-2007, bonus shares at one share for every two shares were issued by capitalizing General Reserve.
(b) Income Tax of Rs. 1,40,000 was paid during the year.

(c) Interim dividend of Rs. 90,000 was paid during the year.
(d) Depreciation of Rs. 50,000 was provided on Fixed Assets
(e) Investments costing Rs. 50,000 were sold at a profit of Rs. 10,000 and the profit was credited to profit and loss account.

Prepare a cash flow statement from the above information.

3. The summarised balance sheets of "Sarjon" Limited are given in the following table:

Figures in Rs.

LIABILITIES	31-12-05	31-12-06	ASSETS	31-12-05	31-12-06
Equity share capital	150,000	200,000	Fixed assets	350,000	350,000
General reserve	30,000	50,000	Debtors	50,000	60,000
Profit- loss a/c	20,000	25,000	Bills receivables	23,000	31,250
9% debentures	200,000	150,000	Stock	65,000	105,250
Creditors	75,000	95,000	Cash	12,000	3,500
Bills payables	15,000	20,000			
Bank O.D.	10,000	10,000			
Total	500,000	550,000	Total	500,000	550,000

Additional information

	2005	2006
Sales (20% cash sales)	450,000	540,000
Cost of sales	217,500	321,200
Administrative, selling and other financial expenses (Other than int.& tax at 35%)	32,500	25,300

Stock at 31-12-2004 was Rs. 35,000

From the above information calculate following ratios:

(9x2)

I. Current ratio
II. Acid test ratio
III. Cash ratio
IV. Gross Profit margin ratio
V. Operating profit
VI. Net profit ratio
VII. Stock turnover ratio
VIII. Debtor's ratio (days of the yr. 360)
IX. Rate of return on capital employed

4. Prepare a cash budget for three months ending 30th June 2005 from the information given below:

(18)

Figures in Rs.

Month	Sales	Materials	Wages	Overheads
Feb	14,000	9,600	3,000	1,700
Mar	15,000	9,000	3,000	1,500
Apr	16,000	9,200	3,200	2,000
May	17,000	10,000	3,600	2,200
Jun	18,000	10,400	4,000	2,300

- Credit terms are:
  Sales and debtors: 10% of sales are on cash, 50% of the credit sales are collected next month and the balance in the following month.
- Creditors:- Materials : 2 months
  Wages : ¼ month
  Overhead : ½ month
- Cash & bank balance on 1st April, 2005 is expected to be Rs. 6,000.
- Other relevant data are:
  I. Plant and machinery will be installed in February 2005 at a cost of Rs. 96,000. The monthly instalment of Rs. 2,000 is payable from April onwards.
  II. Dividend @ 5% on Preference share capital of Rs. 2,000,000 will be paid on 1st June.
  III. Advance to be received for sale of vehicles Rs. 9,000 in June.
  IV. Dividends from investments amounting to Rs. 1,000 are expected to be received in June.
  V. Income tax (advantage) to be paid in June is Rs. 2,000.

5. A company currently operating at 80% capacity has following particulars:

Figures in Rs.

Sales	6,400,000
Direct Material	2,000,000
Direct labour	800,000
Variable Overheads	400,000
Fixed Overheads	2,600.000

An export order has been received that would utilize half of the capacity of the factory. The order cannot be split, i.e. it has either to be taken in full and executed at 10% below the normal domestic prices or rejected totally.
The alternatives available to the management are:

I. Reject the order and continue with the domestic sales only (as at present), or
II. Accept the order, split capacity between overseas and domestic sales and turn away excess domestic demand, or
III. Increase capacity so as to accept the export order and maintain the present domestic sales by:
   - Buying the equipment that will increase capacity by 10%. This will result in an increase of Rs. 2,00,000 in fixed cost, and
   - Work overtime to meet balance of required capacity. In that case labour will be paid at one and a half times the normal wage rate

Prepare a comparative statement of profitability and suggest the best alternative. **(18)**

6.

a) The following data are obtained from the records of factory:

Figures in Rs.

Sales	100,000
Material consumed	40,000
Variable overheads	10,000
Labour charges	20,000
Fixed Overheads	18,000
Net Profit	12,000

Calculate:

I. The number of units by selling which the company will neither lose nor gain anything.
II. The sales needed to earn a profit of 20% on sales.

III. The extra units which should be sold to obtain the present profit if it is proposed to reduce the selling price by 20% and 25%.
IV. The selling price to be fixed to bring down its break-even point to 500 units under present conditions.

(2+2+4+2)

b) A company has the following capital structure *(Rs.Lakh)*

Equity capital 1, 00,000 shares of Rs. 10 each	10
Reserves and surplus (retained earnings)	08
12% debentures 5,000 numbers of Rs. 100 each	05
	23

i. If the company is paying dividend at 27%, calculate the cost of equity and weighted average of capital, based on book values.

(4)

ii. If the market value of equity shares is Rs, 15 each and if the debentures are quoted at Rs. 95 each, what is the weighted average cost of capital, based on market values.

(4)

Note. Tax rate both cases is 35%.

7. Toy limited has a new project for the manufacture of a computerised toy. The product is a novelty in the toy market. The company had already spent an amount of Rs. 720,000 in developing the product and is eager to place it in the market as quickly as possible. The company estimates a five-year market life for the product. The maximum number it can produce in any given year is limited to 36 lakhs units. The expected market scenario will support a sale equivalent of 20%, 50%, 100%, 100%, and 30% of the capacity in the 1st year, 2nd year, 3rd year, 4th year and 5th year respectively.

Investment in the project is expected to be completed in one year and will have the following major components:

	(Rs. Lakhs)
Land building and civil works	12.50
Machinery and equipment	87.50
Interest during construction	8.00

The cost structure of the toy is as given below:

- Materials Rs. 2.00
- Conversion cost excluding depreciation Rs. 1.00

Materials are required to be held in stock for I5 days at an average while finished goods may be held or up to 60 days. Production cycle is. 12 days. Credit expectancy of the market is 30 days, both on sales and purchases. It s the usual practice of the company to keep a cash-in hand reserve for 15 days' expenses not provided for specifically elsewhere in the working capital estimates.

Working capital requirement should be worked out on the above basis for the first year. The same level in terms of money will be maintained in the subsequent years, though the composition may change.

The following assumptions are made:

i. Project will be financed by a combination of equity and term loans in a ratio as close to 30:70 as practicable.
ii. Loans will carry an interest of 14% p.a.

iii. Loan disbursement will be uniform throughout the period of construction at a simple interest at the same rate as above.
iv. Selling price per unit will be Rs. 6.
v. One year moratorium on the principal will be available.
vi. Promotion expenses for the first three years will be Rs. 2.00 lakhs, Rs.1.00 lakh and Rs. 0.50 lakh respectively.
vii. Production is prorated every month equally.
viii. The factory operates one shift for 360 days in year.
ix. Ignore interest on overdraft.
x. Working capital requirement will not increase after the initial first year.

Calculate the following:

a) Initial working capital required. (4)
b) Total financial investment in the project and its financing. (4)
c) Profit before depreciation and interest charges for 5 years. (6)
d) Debt service coverage ratio. (4)

BE 9 -R4 : ACCOUNTANCY AND FINANCIAL MANAGEMENT
ASSIGNMENTS

Assignment 1. Case study on the Basic Accounting Concepts and give the answer of following questions:

1. What are the accounting principles,assumptions and concepts?
2. What is the difference between capital expenditure and revenue expenditure?
3. What is the accrual basis of accounting?
4. At what point are revenues considered to be earned?
5. What is the difference between net cash flow and net income?
6. Pass journal entries for the following:
   (a) Purchase of goods worth Rs.1000 at a discount of Rs.100.
   (b) Issue of shares at par having face value of Rs.10 for purchase of fixed assets worth Rs.10000.
   ©) Issue of shares at Rs.8 having face value of Rs.10 for purchase of fixed assets worth Rs.10000.
   (d) Issue of shares at Rs.12 having face value of Rs.10 for purchase of fixed assets worth Rs.12000
   (e) Paid Rs. 10000 to Mr X in full and final settlement of his dues worth Rs. 11000.
   (f) Withdrawn goods for personal use (sale price Rs.1500, cost Rs.1200).
   (g)Goods distributed to children in an orphanage (sale price Rs.1500, cost Rs.1300).
   (h) Goods stolen (sale price Rs.1500, cost Rs.1200).
   (i) Goods destroyed by fire (sale price Rs.1500, cost Rs.1200).
   (j) Goods used in furnishing the office (sale price Rs.1500, cost Rs.1200).
   (k) Recovered from Mr. K half the amount which was written off as bad. Rs.400 was written off as bad earlier.
   (l) Cheque received from X for Rs.1000 was dishonored by bank.
   (m) Received Rs.1000 as advance for goods ordered by S.

Assignment 2. Case study on preparation of Final Financial Statements and give the answer of following questions:

1. What is accrued income?
2. What does a balance sheet tell us?
3. Why isn't land depreciated?
4. Where is a contingent liability recorded?
5. What is the difference between a balance sheet and a trial balance?
6. What is an intangible asset?
7. What are accruals?
8. Where does revenue received in advance go on a balance sheet?
9. What is the difference between reserve and provision?
10. What are accrued expenses and when are they recorded?
11. What is the difference between bad debt and doubtful debt?
12. What is the difference between the Cash Flow and Funds Flow statements?
13. Why is the Cash Flow Statement identified as one of the financial statements

14. An extract of the trail balance as at 31 Dec. 2004 of the firm of William and Moraes is available. The partners share profit and losses in the proportion of 60% and 40% respectively with following further stipulations:

i. Each partner is entitled to be paid Rs. 2,000 p.m. by way of salary; and
ii. Interest at the rate of 15% will be charged on drawing other than salary.

Trial Balance as at 31.12.2004

	Dr. Rs.	**Cr.** Rs.
Capital Accouts:		
William	--	80,000
Moraes	--	80,000
Sundry Creditors	--	35,000
Fixed assets	1,82,000	--
Goodwill	20,000	--
Stock in trade(31.12.2004)	42,250	--
Sundry debtors	71,450	--
Cash in hand	13,000	--
Staff salary advance	3,000	--
Partners Salaries	48,000	--
Office expenses outstanding	--	1,000
Depreciation	18,000	--
Staff Salaries	20,000	--
Trading Account (Gross Profit)	--	2,40,000
Office expenses	18000	--
	4,36,000	4,36000

Utilise the following additional information you are required to prepare:

i. Profit and Loss Account for the year 2004.
ii. Balance sheet as at 31 December 2004; and
iii. Partners Capital Account

Additional Information:

a) A perusal of the payment voucher for January 2005 indicates payment of salaries of Rs.2,000 and office expense of Rs. 8,000, relating to the periods before 31.12.2004.

b) Partners have drawings in their accounts as follows:

Moraes:	on 1.1.2004	Rs 20,000
Williams:	on 1.5.2004	Rs 20,000

c) Rs 1,000out of staff salary advance is to be carried forward to 2005

Assignment 3. Case study on Analysis Of Financial Statements and give the answer of following questions:

1. What is the accounts receivable collection period?
2. What is the fixed asset turnover ratio?
3. What is the debt ratio?
4. What is the total asset turnover ratio?
5. What is the return on assets ratio?
6. What is the working capital turnover ratio?
7. What is the working capital ratio?
8. What is the days' sales in accounts receivable ratio?
9. What is a liquidity ratio?
10. What is the days' sales in inventory ratio?
11. What is the inventory turnover ratio?
12. What is the debt to equity ratio?
13. What is the accounts receivable turnover ratio?
14. What is the acid test ratio?
15. What is the current ratio?

16. Redraft the following Profit and Loss account and Balance Sheet and calculate the following ratios:

A) Gross profit ratio
B) Overall profitability ratio
C) Current ratio
D) Debt- Equity ratio
E) Stock turnover ratio
F) liquidity ratio

Profit and Loss Account

Particulars	**Rs.**	**Particulars**	**Rs.**
Opening stock of finished goods	1,00,000	sales	10,00,000
Opening stock of Raw materials	50,000	Closing Stock of Raw materials	1,50,000
Purchase of Raw materials	3,00,000	Closing Stock of Finished goods	1,00,000
Direct Wages	2,00,000		50,000
Manufacturing Expenses	1,00,000		
Administration Expenses	50,000		
Selling and distribution Expenses	50,000		
Loss on sale of plants	55,000		
Interest on debentures	10,000		
Net Profit	3,85,000		

	----------		**13,00,000**
	13,00,000		

BALANCE SHEET

Liabilities	**Rs.**	**Assets**	**Rs.**
Share Capital:		Fixed Assets	2,50,000
Equity Share Capital	1,00,000	Stock of Raw materials	1,50,000
Preference Share Capital	1,00,000	Stock of finished goods	1,00,000
Reserves	1,00,000	Sundry Debtors	1,00,000
Debentures	2,00,000	Bank balance	50,000
Sundry creditors	1,00,000		
Bills Payable	50,000		
	----------		----------
	6,50,000		6,50,000
	----------		----------

Assignment 4. Case study on Basic Concepts Of Cost Accounting and give the answer of following questions:
1. What are fixed costs?
2. What are variable costs?
3. What are direct costs?
4. What are indirect costs?

5. What are sunk costs?
6. What are indirect costs?
7. What are opportunity costs?
8. What are out-of-pocket costs?
9. What are imputed costs?

Assignment 5. Case study on Overheads and give the answer of following questions:
1 What are overheads?
2. How overheads are allocated, apportioned, and absorbed?

Assignment 6. Case study on Cost Accumulation Systems and give the answer of following questions:
1. Explain job-order costing and process costing techniques.
2. Differentiate between job-order costing and process costing techniques.
3. How costs are allocated under job-order costing and process costing techniques?

Assignment 7. Case study on Variable and Absorption Costing and give the answer of following questions:
1. Describe Variable(Marginal) Costing and Absorption Costing.
2. Differentiate between Variable(Marginal) Costing and Absorption Costing.
3. From the following data preoare statements of cost according to both Variable(Marginal) Costing and Absorption Costing:

	Product A	ProductB	ProductC
	Rs.	Rs.	Rs.
Sales	30,000	60,000	80,000
Direct Material	12,000	25,000	36,000
Direct Labour	8,000	10,000	14,000

Fixed Overheads	6,000	8,000	6,000
Variable Overheads	2,000	3,000	5,000
Fixed Administration overheads	1,000	2,000	2,000
Fixed selling overheads	2,000	2,000	3,000
Variable selling overheads	1,000	3,000	3,000

Assignment8. Case study on Cost-Volume- Profit Analysis and give the answer of following questions:

1. Describe the following terms:
   A) Fixed Cost
   B) Variable cost
   C) Contribution
   D) Profit/ Volume Ratio(P/V Ratio)
   E) Key Factor
   F) Break- Even Point

2. What are the assumptions underlying Cost-Volume- Profit Analysis?
3. Comment on the relative profitability of the following two products.

	Production cost/ unit	
Particulars	ProductA(Rs.)	Product B(Rs.)
Material	200	150
Wages	100	200
Fixed Overheads	350	100
Variable Overheads	150	200
Profit	200	350
Sale price per unit	1000	1000
Output per day	200 units	100 units

4. A company manufacturing machines has the capacity to produce 500 machines per annum. The variable cost of each machine is Rs.200 and the selling price of each machine is Rs.250. Fixed overheads are Rs.12000 per annum. Calculate the break-even-point for output and sales and show what profit would result if the output is 90% of the capacity.
5. What is marginal cost and how does it differs from total cost?
6. What happens to P/V ratio and Break-Even-point when:
   a) Unit selling price of product increases.
   b) Unit variable cost increases.
   c) Total fixed cost increases.
   d) Number of units sold increases.

7. What are the advantages and limitations of Break-Even-Charts?

Assignment9. Case study on Budgeting and give the answer of following questions:

1 Explain the meaning of budget. What are the advantages of budgetary control?
2. Differentiate between Fixed and Flexible budgeting.
3. Explain Zero Base Budgeting.
4. With the following information for a 60% activity, prepare a budget at 80% and 100% activity.
   Production at 60% activity- 6000units.
   Materials Rs.100 per unit
   Labour Rs.40 per unit
   Expenses Rs.10 per unit
   Factory expenses Rs.4,00,000 (40% Fixed)
   Administration expenses Rs.3,00,000 (60% Fixed)

Assignment10. Case study on Basic Concepts of Financial Management and give the answer of following questions:

1. Briefly describe the major types of Financial Management Decisions taken in a company.
2. Describe the relationship between Financial Accounting and Financial Management.

Assignment11. Case study on Time Value Of Money and Mathematics of Finance and give the answer of following questions:

1. What is the meaning of "present value of a future amount"? How are the present values and future values calculated?
2. Explain the discounting technique of adjusting for time value of money.
3. What is the minimum amount which a person should be ready to accept today from a debtor who otherwise has to pay a sum of Rs.5000 today, Rs. 6000, Rs.8000, Rs.9000, Rs. 10000 at the end of year 1,2,3,4 respectively from today. The rate of interest may be taken at 10%.
4. A firm purchases a machinery for Rs.8,00,000 by making a down payment of Rs. !,50,000 and remainder in equal installments of Rs. 1,50,000 for six years. What is the rate of interest to the firm?

Assignment 12. Case study on Capital Budgeting Decisions and give the answer of following questions:

1. What is capital budgeting decision? Why is it significant to a firm?
2. Describe the concept of discounted cash flows in making investment decisions and its superiority over the traditional methods of investment evaluation.
3. How is pay back period calculated? How is it helpful in determining IRR?
4. What is profitability index? Which is superior ranking criteria – PI or NPV?
5. Make a comparison between NPV and IRR methods.
6. How do you calculate the Accounting Rate Of Return? Explain the treatment of depreciation in calculating the net investment. What are the limitations of ARR?
7. A company is considering an investment proposal to install a new machinery. The project will cost Rs. 50,000. The new machine has a life expectancy of 5 years and no salvage value. The company tax rate is 40%. The firm uses straight line method of depreciation. The estimated profits before tax from the proposed investment are as follows:

Year	Profit(Rs.)
1	10,000
2	11,000
3	14,000
4	15,000
5	25,000

Compute the following:

A. Pay back period
B. Average rate of return
C. Internal rate of return
D. Net present value at 10% discount rate
E. Profitability index at 10% discount rate

8. A firm whose cost of capital is 10% is considering two mutually exclusive projects X and Y , the details of which are:

Year	Project X	Project Y
0	100000	100000
1	10000	50000
2	20000	40000
3	30000	20000
4	45000	10000
5	60000	10000

Compute the net present value at 10%, Profitability Index, and the Internal Rate of Return for the two projects.

Assignment 13.

Case study on Cost of Capital and Sources of Finance and give the answer of following questions:

1. Why debt is considered as the cheapest source of finance for a profit making company?
2. Explain the different approaches to the calculation of cost of equity. Are retained earnings cost free?
3. Is the cost of debt the same as the rate of interest?
4. Describe the various long-term sources of funds for a firm.
5. Calculate the cost of capital in each of the following cases:
   a) A company issues 10% non-redeemable preference shares at Rs. 105 (FV =100)
   b) The current market price of share is Rs. 90 and the expected dividend at the end of current year is Rs.4.5 with a growth rate of 8%.
   c) A company is considering raising of funds of about Rs.100 lacs by one of the two alternative methods, viz, 14% term loan from bank or 13% non-convertible debentures. The term loan would attract no major incidental cost. The debentures would have to be issued at a discount of 2.5% and involve cost of issue of Rs.1,00,000 Advice the company as to the better option based on the effective cost of capital in each case. Assume a tax rate of 50%.
6. What is loan syndication and loan consortia?

Assignment 14. Case study on Capital Structure and Dividend Decisions and give the answer of following questions:

1. What is the meaning of the term “capital structure”?
2. Explain the factors that are relevant in determining the capital structure.
3. Explain Financial Leverage.
4. Briefly explain the factors which influence the dividend policy of a company.

Assignment15. Case study on Working Capital Management and give the answer of following questions:

1. Explain the following terms:
   a) Working Capital
   b) Gross working capital
   c) Net working capital
2. Explain the factors that determine the working capital requirement.
3. Explain the effects of excessive working capital as well as of inadequate working capital.
4. What are the different sources of financing working capital requirement?

BE10-R4: APPLIED OPERATIONS RESEARCH

Objective of the Course

This course is designed so as to familiarize students with OR models and the quantitative techniques that are used to handle real life problems. The principal aim of the course is to get a practical orientation of the subject matter. Case studies have also been given due importance in the course. The recommended books give leads to many interesting case studies that require challenging and comprehensive analysis with substantial use of computer and easily available software packages in an interactive mode.

A significant portion of the syllabus has been devoted to conceptual development of important topics, such as linear and Integer programming and network analysis, which have wide applicability in many fields including computer sciences. Driven by the need to meet the challenges of decision making in a highly competitive environment, some important and relevant topics like game theory have been included.

Practical exercises and tutorials are suggested in the course besides providing exposure to practical OR models. These exercises are expected to equip students with necessary analytical skills and programming expertise to help face the challenges of the IT industry.

Outline of Course

S.No.	Topic	Minimum No. of Hours
1.	Introduction to Quantitative Techniques and OR Modeling	02
2.	Linear Programming	
	(a) Model formulation and Case Studies	03
	(b) Linear Programming Methodologies	08
	(c) Transportation and Assignment Problems	06
3.	Integer Programming	04
4.	Job Sequencing	04
5.	Network Analysis	07
6.	Project Scheduling by PERT / CPM	06
7.	Basic Queuing Theory	06
8.	Inventory Control	04
9.	Game Theory 06	
10.	Unconstrained Optimization: Steepest Descent Method	04

Lectures	=	60
Practical/Tutorials	=	60
Total	=	120

Detailed Syllabus

1. **Introduction to Quantitative Techniques and OR Modeling** **2Hrs**.

Defining the problem, acquiring the data, modeling a decision problem, different types of models, formulating mathematical model for decision problems, testing the model , developing its solution, analyzing the result; implementation of above concepts through simple examples or case studies.

2. **Linear Programming**

a) Model Formulation and Case Studies: **3 Hrs.**

Assumptions in linear programming, Formulation of linear programming models, Practical Case Studies. (Practical: Use of Microsoft or Lotus Spreadsheet use to formulate a case study is recommended). Graphical illustrations and understanding of special cases – no feasible solutions, no finite optimum solutions, multiple solutions, and degenerate solutions

b) Linear Programming Methodology: **8 Hrs.**

The geometry of linear programming problem, the algebra of Simplex method including the concepts of convex set, extreme points, basic feasible solutions, slack , surplus, artificial variables, computational aspects of the Simplex algorithm and the two phase method, numerical examples illustrating all types of cases, viz. infeasibility, unbounded problems, alternate optimal solution, etc. (Practical exercises, development or software for simplex method is recommended).

Duality theory in linear programming, dual formulation for all types of linear programming problems including equality inequality constraints, unrestricted variables, maximization and minimization in objective function; Economic Interpretation of duality, all duality theorems (without proofs) and their applications. (Tutorial on practical case studies and interpretation or duality in those cases)

c) Transportation problems and assignment problems: **6 Hrs.**

General models of the two problems as special linear programming problems, Basic feasible solution computation for TP problems by north-west rule, matrix minima method and Vogel's method, determining the optimal transportation schedule, the Hungarian method for AP problems with stress on finding their optimal solutions (Development or software for Hungarian method is recommended)

3. Integer Programming **4 Hrs**.

Integer Programming modeling and 0-1 programming modeling through examples, like, resource allocation, investment decision, fixed charge problem, traveling salesman problem etc.; Understanding the non-linearity in such problems, Branch and Bound algorithm with numerical examples (Practical: development or code for traveling salesman problem using the branch and bound and Hungarian methods is recommended)

4. Job Sequencing **4 Hrs.**

Sequencing models, Johnson's algorithm for processing n jobs -two machines and n-jobs three machines, Processing 2 jobs through n machines; graphical solution. (Tutorial on developing model for job sequencing with precedence constraints as an integer programming model)

5. Network Analysis **7 Hrs.**

Examples of Network Flow Problems, modeling of network flow problem as a linear programming problem, node-arc incidence matrix, the concept of spanning tree, min cut, max flow-min cut theorem and its relationship with linear programming duality; labeling algorithm for the max-flow problems, illustration through numerical examples.
Shortest-Path network problems, applications of shortest path problem, Dijkstra's Algorithm (It is suggested to formulate a practical model from logistics or transportation sector as a network problem and determine its solution).

6. Project Scheduling by PERT/CPM **6 Hrs.**

Project management: PERT, CPM; applications of PERT/ CPM, drawing PERT/CPM networks, critical path evaluation by network analysis and CPM method, determination of negative floats and negative slacks, probability of project completion, program evaluation and review technique. (Practical: Use of MS Project is recommended)

7. Basic Queuing Theory **6 Hrs.**

Basic elements of queuing systems through examples, exponential Distribution and Poisson distribution; Steady state measure of performance of a Queuing system, Single server single channel model (M/M/1), multi-channel queuing model (M/M/m).

(Practical: Development of software modules for simulating M/M/1 queue from manufacturing / communication field is recommended)

8. Inventory Control **4 Hrs.**

Introduction to Inventory control and applications, deterministic Models: the basic EOQ model, inventory models with non-zero lead time, EOQ problems with Discount rates and price breaks, EOQ with shortages, multi-item deterministic Inventory models

9. Game Theory **6 Hrs.**

Introduction to Game theoretic models, Zero-sum games; concepts of pure strategies and mixed strategies, law of dominance, graphical solution of 2xn or mx2 games; relationship between game problem and linear programming and linear programming duality, linear programming based solutions of game (Practical: suggested to develop a code for solving a zero sum matrix game through the Simplex algorithm of linear programming)

10. Unconstrained Optimization **4 Hrs.**

Introduction to nonlinear Unconstrained Optimization problems, steepest descent direction, steepest descent algorithm, geometrical interpretation, simple numerical examples

RECOMMENDED BOOKS

MAIN READING

1. Hamdy A Taha, "Operations Research: An Introduction", 8th edition (with CD ROM), 2002, Pearson Education, Inc
2. S. Chandra, Jayadeva, A. Mehra, "Numerical optimization with Applications", Narosa Publishing House, 2009

3. A. Ravindran, D. T. Phillips, J. J. Soleberg, “Operations Research: Principle and Practice”, Wiley, 1987.

SUPPLEMENTARY READING

1. P. C. Tulsian and V. Pandey, “Quantitative Techniques: Theory and Problems”, Pearson, 2002.
2. F. S. Hiller and G. J. Lieberman, “ Introduction to Operations Research, 7th edition, McGraw Hill, 2002.

REFERENCES

1.http://www.ms.ic.ac.uk/jeb/or/contents.html

2.http://www.bus.colorado.edu/faculty/lawrence/bap6100/schedule.ht

BE10-R4: APPLIED OPERATIONS RESEARCH
Model Question Paper

Time: 3 Hrs. **Maximum Marks: 100**

Note: First question below is compulsory. Answer any four questions from questions 2 to 7.

1.

a) Write dual of the following linear programming problem
Minimize $Z = 0.4x_1 + 0.5x_2$
Subject to

$$\begin{pmatrix} 0.3x_1+0.1x_2 \le 2.7 \\ 0.5x_1+0.1x_2 = 6 \\ 0.6x_1+0.4x_2 \ge 6 \\ x_1, x_2 \ge 0 \end{pmatrix}$$

b) Solve the assignment problem with the following cost table:

		Task			
		1	2	3	4
Assignee	A	8	6	5	7
	B	6	5	3	4
	C	7	8	4	6
	D	6	7	5	6

c) Construct the project network with the following activities and relationships.

Activity	Immediate Predecessors	Estimated Duration
A	-	2
B	-	3
C	A,B	2
D	A,B	2
E	D	3

d) Detail how the following conditional constraints can be formulated in an integer program: Either $3x_1 + 2x_2 \le 18$ or $x_1 + 4x_2 \le 8$

e) Suppose that the demand for a product is 30 units per month and the items are withdrawn at a constant rate. The setup cost each time a production run is undertaken to replenish inventory is Rs.15. The production cost is Re1 per item and holding cost is 0.30 per item per month. Assuming shortages are not allowed. Determine how often to make a production run and what size it should be. If shortages are allowed but cost Rs.3 per item per month, determine the frequency of production runs its size.

f) Check whether the following zero-sum game has a solution in pure strategies?

	Strategy	Player 2		
		1	2	3
Player 1	1	0	-2	2
	2	5	4	-3
	3	2	3	-4

g) Find the steepest descent direction to the function
$f(x, y, z) = 100 - x^2 - 2y^2 - z^2 - xy - xz$, at (2,1,-1).

(7 * 4 marks)

2. (i) Define a basic solution and basic feasible solution in a linear programming problem. Find all basic solutions of the following linear system of equations.

$x_1 + x_3 = 4$

$2x_2 + x_4 = 12$

(ii) Larry Edison is the director of the computer center for Buckly College. He now needs to schedule the staffing of the center. It is open from 8am until midnight. Larry has monitored the usages of the center at various times of the day, and determined that the following number of computer consultants is required.

Time of the day	Minimum number of consultants required to be on duty
8am to noon	4
Noon to 4pm	8
4pm to 8pm	10
8pm to midnight	6

Two types of computer consultants can be hired: full-time and part-time. The full-time consultants work for 8 consecutive hours in any of the following shifts: (8am to 4pm), (noon to 8pm) and evening 4pm to midnight. Full-time consultants are paid $14 per hour. Part-time consultants can be hired to work any of the four shifts mentioned above and are paid $12 per hour. An additional requirement is that during every time period, there must be at least two full time consultants on duty for every part time consultant on duty. Larry would like to determine how many full-time and how many part-time consultants should work each shift to meet the requirements at the minimal possible cost. Give a linear programming formulation for Larry's problem.

(iii) Six jobs need drilling first followed by tapering. Processing times on drill machine and the lathe which does tapering are given as follows:

M/c	J1	J2	J3	J4	J5	J6
Drill M(1)	4	7	3	12	11	9
Tap (M2)	11	7	10	8	10	13

Find a sequence that minimizes the make span.

(6 * 3 marks)

3.(i) Consider the following transportation tableau. Use MODI method to determine whether the solution shown (in bold) provides the minimal transportation cost. If it is not, find the minimal cost solution. Does the problem have an alternative solution? Find one, if it has so.

Destinations / Origin	D1	D2	D3	D4	Supply
O1	5 **25**	7	10 **50**	5	75
O2	6	5	8 **100**	2 **75**	175
O3	6 **100**	6	12	7	100
O4	8	5 **100**	14	4 **50**	150

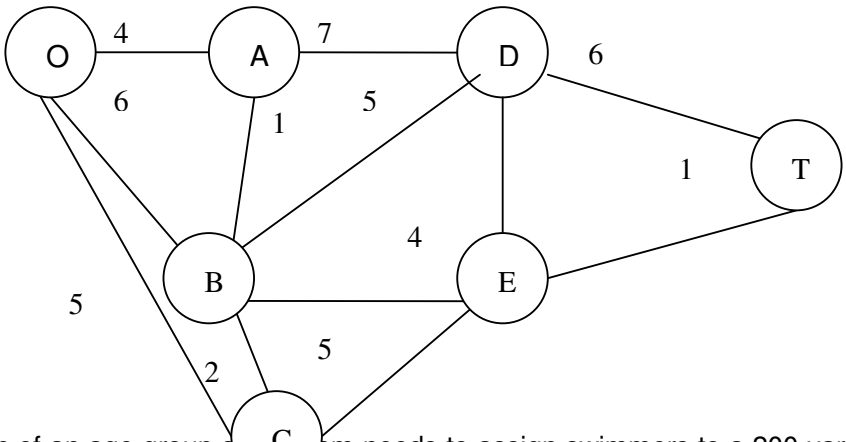
Demand	125	100	150	125	

(ii) Use the branch and bound method to solve the following integer programming problem

Maximize $z = 7x_1 + 9x_2$
Subject to $5x_1 + 7x_2 \leq 35$
$4x_1 + 9x_2 \leq 36$
$x_1, x_2 \geq 0$ and are integers

(2 * 9 marks)

4. (i) Find the shortest path between nodes O and T through the following network where the numbers along the arcs represent the actual distances between corresponding nodes.



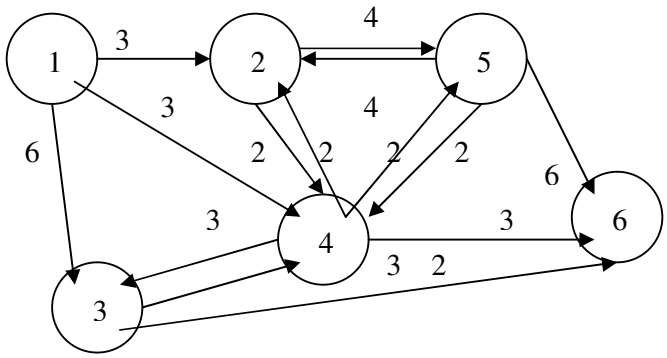
(ii) The coach of an age group swim team needs to assign swimmers to a 200 yard medley relay team to send to the Junior Olympics. Since most of his best swimmers should be assigned to each of the four strokes. The five fastest swimmers and the best times they have achieved in each of the strokes for 50 yards are

Stroke	Carl	Chris	David	Tony	Ken
Backstroke	37	32	33	37	35
Breaststroke	43	33	42	34	41
Butterfly	33	28	38	30	33
Freestyle	29	26	29	28	31

Find the optimal assignment of 4 swimmers to 4 strokes so that the total time of completing the relay gets minimized.

(2 * 9 marks)

5. (i) In a highway network the traffic flow capacities are as shown in the figure. What is the maximal flow in vehicles per hour through the system? How many vehicles per hour must travel over each road to obtain this maximal flow?



(ii) Starting from (2, -2) perform two complete iterations of the steepest descent method to minimize a function $f(x, y) = x^2 + xy + 2y^2$.

(2 * 9 marks)

6. (i) Use Linear Programming to solve the following zero-sum game.

Player 1	Player 2 Strategy		
Strategy	**1**	**2**	**3**
1	0	-2	2
2	5	4	-3
3	2	3	-4

(ii) The following table gives the activities of construction project and duration

Activity	1-2	1-3	2-3	2-4	3-4	4-5	
Duration (days)		20	25	10	12	6	10

Draw the network of the project. Find the critical path and minimum time of completion of the project.

(2 * 9 marks)

7. (i) Assume the following quantity discount schedule. If annual demand is 120 units, ordering costs are Rs.20 per order, and the annual holding cost rate is 25%, what order quantity would you recommend?

Order Size	Discount	Unit cost
0 to 49	0	30
50 to 99	5	28.50
11 or more	10	27.00

(ii) Customers arrive at a window with Poisson distribution with mean of 10 minutes and service time 6 minutes per customer. The space in front of window can accommodate only 3 persons including the serviced one. Find the probability that the arriving customer can go directly to the space in front of the window. How long the customer has to wait before getting the service?

(2 * 9 marks)

BE10-R4: Applied Operation Research

Practical List

The student is advice to write the computer programs of the following algorithms and implement them on some real life problems. This will enable them to appreciate and understand the theoretical aspects of the course.

1. Simplex Method with mixed constraints & solution of its dual
2. North West corner method in transportation problems
3. Least cost method
4. Vogel's approximation method
5. Finding float in a network
6. Replacement of machines w/o P.V.F.
7. Replacement of machines with P.V.F.
8. Replacement of machine 1 with machine 2
9. Shortest path algorithm in networks
10. Dijkastra's algorithm
11. Simulation of Inventory
12. Simulation of Queue
13. Any one model from Queuing theory
14. Steepest descent algorithm

BE11-R4: WIRELESS & MOBILE COMMUNICATION

Objective of course

The objective of this course is to provide an overview of wireless and mobile communication. The course covers a broad range of concepts, standard and issues related to wireless and mobile networks. The course will also examine the practical aspects of the issues involved in wireless and mobile communication and standard practices being adopted by the Communication Industry. Students will gain the knowledge, skills and abilities related to hardware, software, technologies, standards and applications used in wireless and mobile communication and their practices in any organization.

The following topics are addressed in this course: aspects of Wireless Communication Technology, Wireless communication types, Digital cellular system and standards, third generation mobile services, Wireless LAN, Broadband Wireless network, Bluetooth technology of communication, Wireless in local loop and operating system and application development for mobile devices.

Outline of Course

S.No.	Topic	Minimum No. of Hours
1.	Overview of Computer Networks	4
2.	Multiple Access Technologies for Wireless Communication	6
3.	Mobile Data Communication	10
4.	Personal Wireless Communication Systems	5
5.	Digital Cellular Systems and Standards (2 G)	10
6.	Third Generation Mobile Services (3 G)	6
7.	Wireless Local Area Networks (WLAN) : IEEE 802.11	8
8.	Broadband Wireless Network Standards for WLMAN (WiMax)	2
9.	Bluetooth Technology (WPAN):	2
10.	Wireless in Local Loop (WLL)	2
11.	Application Development and Operating Systems for Mobile Devices	5
	Lectures	**60**
	Practical/Tutorials	**60**
	Total	**120**

Detailed Syllabus

1. Overview of Computer Networks **4 Hrs.**

Network Classification, LAN, MAN, WAN etc. and internetworking.

2. Multiple Access Technologies for Wireless Communication **6 Hrs.**

FDMA, TDMA : Fixed TDM, Pure ALOHA and Slotted
ALOHA CDMA : Spread Spectrum Techniques

3. Mobile Data Communication **10 Hrs.**

Cellular Telephony, Radiopropagation : Small Scale Fading and Multipath Fading, Speech coding, Error Coding and Error Correction.

Mobility Management, Hand off Management : Soft Hand off and Hard Hand off, Switching and authentication, MTSO Interconnections.

Circuit Switched Data Services on Cellular Networks, Packet Switched Data Services on Cellular Networks.

4. Personal Wireless Communication Systems 5 Hrs.

Personal Communication Systems (PCS) Architecture, Cordless Telephony (CT2), Digital Enhanced Cordless Telecommunications (DECT), Personal Access Communication System (PACS), Personal Handy Phone System (PHS).

5. Digital Cellular Systems and Standards (2 G) 10 Hrs.

Global System for Mobile Communication (GMS) System Overview : GSM Architecture, European TDM, Digital Cellular Standard, GSM Protocol model, GSM mobility management, Short Message Service (SMS) security aspects.

Analog Mobile Phone Service (DAMPS) : IS-136 North American TDMA Standard. Code

Division Multiple Access (CDMA) : IS95 Digital Cellular Standard.

General Packet Radio Service (GPRS) : GPRS Architecture, GPRS Network, Interfaces and Procedures (2.5 G).

6. Third Generation Mobile Services (3 G) 6 Hrs.

UMTS and International Mobile Telecommunications (IMT-2000), W-C DMA and CDMA 2000, Quality of Service in 3 G.

7. Wireless Local Area Networks (WLAN) : IEEE 802.11 8 Hrs.

Components and working of WLAN, Transmission Media for WLAN : Radio Transmission, Infrared Transmission, (IrDA), Direct Sequence Spread Spectrum Technology (DSSS), Frequency Hopping Spread Spectrum technology (FHSS)

IEEE 802.11 standards and WLAN types : Ad-hoc WLAN, Infrastructure WLAN.

Protocols for WLAN : CSMA/CA, RTS/CTS, Hidden Terminal Problem, Wired Equivalent Privacy (WEP)

Products for WLAN: Access Points and WLAN (Wi -Fi) cards.

8. Broadband Wireless Network Standards for WLMAN (WiMax) 2 Hrs.

WiMax Model and Architecture, WiMax Protocols and 802.16 standards Protocols and

9. Bluetooth Technology (WPAN): 2 Hrs.

Introduction to Personal Area Networks (PAN): Features and Goals, Bluetooth Architecture,

IEEE 802.15 standards, Protocol Stack, Bluetooth products and security

10. Wireless in Local Loop (WLL) 2 Hrs.

WLL Architecture, WLL Technologies, WLL Products.

11. Application Development and Operating Systems for Mobile Devices 5 Hrs.

Introduction to Windows CE, Palm OS, Symbian O/S, Application development using Nokia Tool-Kit. Development tools for Java, J2ME, Embedded Java.

RECOMMENDED BOOKS
MAIN READING

1. Theodore S. Rappaport, "Wireless Communications: Principles and Practice", Second Edition, 2002, Pearson Education Asia.
2. Jochen Schiller, "Mobile Communication", 2000, Pearson Education Asia.
3. Rajesh & Balasubramanian "Computer Networks : Fundamentals and Application", 2002, Vikas Publishing House..
4. Hansmann, et. Al. "Principles of Mobile Computing", Springer-Verlag Publishers, 2003.

SUPPLEMENTARY READING

1. Raj Pandya, "Mobile and Personal Communication Systems and Services", Prentice Hall of India, 2001.
2. Yi-Bing Lin and Imrich Chlamatac, "Wireless and Mobile Network Architectures", John Wiley and Sons., 2001.
3. Dr. Kamilo Feher, "Wireless Digital Communication: Modulation and Spread Spectrum Applications", Prentice Hall of India, 2005.
4. Asoke Talukder, Roopa Yavagal, "Mobile Computing: Technology, Applications and Service Creation", TMH Publishing Co., 2005.

BE11-R4 Wireless & Mobile Communication

Practical Assignments

Assignment 1 Study the Wireless Application Protocol.

Assignment 2. Write a Program that shows the welcome greeting on a simulator screen. (Simulator can be Openwave/Nokia WAP toolkit / any online emulator)

Assignment3. Study of Nokia Mobile Browser (NMB), Nokia Mobile Internet Toolkit (NMIT) and Nokia Mobile Gateway Simulator tools

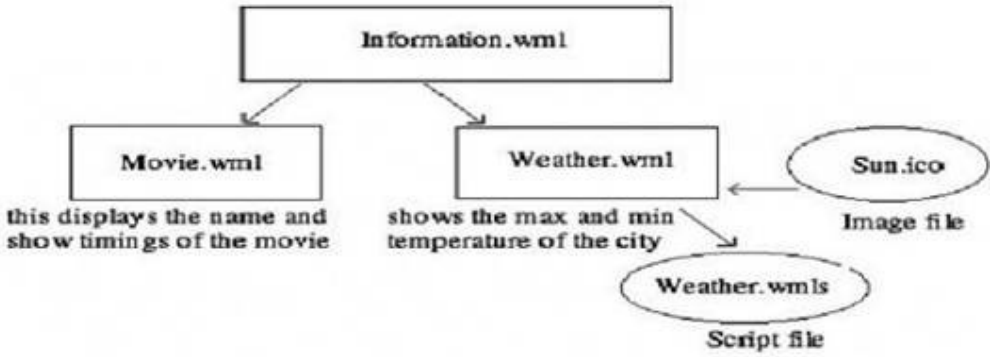
Assignment4. The Information Master Application

The Information Master application deals with providing information about movies and the weather to the client. It's made up of three WML files, one WMLS file and one graphic file. The script file has just one function for generating the random numbers for the display of maximum and minimum temperatures on the screen.

Application Structure

The case study discussed here contains the following files :

Information.wml
Movie.wml
Weather.wml
Weather.wmls
Sun.ico



The first three files are the WML application files; the fourth is the script file that will be used by Weather.wml file, Sun.ico is an image file used to display the image of sun on the browser screen by the Weather.wml code file.

Application Work Flow

The application opens a menu with two options: Movie and Weather, if the user clicks Movie, the Movie.wml file, which displays the name of movies and show timing, appears.

If the user clicks Weather, the Weather.wml file, which display the maximum and minimum temperatures of various cities on the screen, appears. The temperatures are generated by using Lang.rand() in the script file and by Weather.wml to display them on-screen.

Assignment 5. The Restaurant Application

This application starts with a menu from which the user can select different items to order from restaurant. After the user selects the items, the bill is generated accordingly.

Application Structure

The application is made up of file files:

ResScript.wmls – The scripting file

Restaurant.wml – The main menu file to select the category

South.wml – Link file to select items of the South India dishes category

Soft.wml – Link file to select items of Soft Drinks category

Snacks.wml – Link file to select items of Snacks category

Application Work Flow

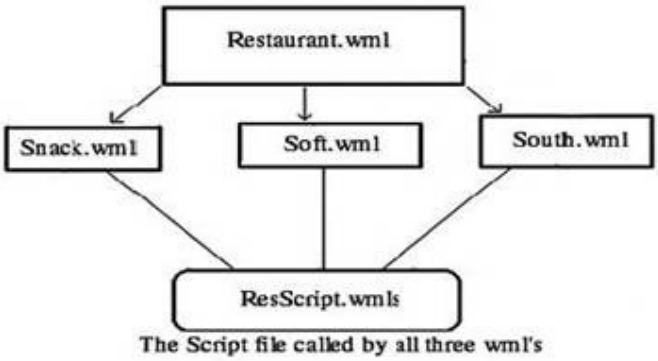
The main file is Restaurant.wml, which shows three items:

South Indian (South.wml)

Soft Drink (Soft.wml)

Snacks (Snacks.wml)

After you click a particular item, the system calls the corresponding WML file and shows the item related to that category.



The Script file called by all three wml's

Assignment 6. To do list:

- creation of child process with error handling capacity (spawn, throw, catch)
- once can use "fieldset" to group the similar elements
- should provide information regarding deck and its access control information (head)
- "link" option, "postfield" option for passing information to http server
- "receive" from child process
- "table" for tabular structure
- "timer" to perform some task after some period

Assignment 7. Write a program which displays the information in a formatted form.

Assignment 8. Write a program which displays the information in an aligned form with images.

Assignment 9. Write a program to create a screen saver.

Assignment 10. Introduction of WML script library and dialogs library and programs based on this.

Assignment 11 Programs using language Library.

Assignment 12. Programs using float library and string library.

Assignment 14. Programs using URL library and WML browser library.

Assignment 14. Programs on connectivity between database and WML scripts.

Assignment 15. Implement game using WML and WML script.

Assignment 16. Create small application with J2ME to display greetings.

Assignment 17. Create an application in J2ME to demonstrate sending and receiving SMS.

Assignment 18. Design small website using WML/WML Script.

Assignment 19. Do the **complete project** by the end of the semester. You can come up with your own ideas. some of the listings are done for your help (project is among 3-4 students)

- Select any game for mobile
- To update the stock values from the website. if the change is beyond certain limit, message should be flashed on the screen
- Location based service to be provided for the mobile user
- Sending SMS in group. Things will be controlled by the PC, address book

and other things will be maintained by PC. SMS sending will be done automatically.

- SMS Banking
- Tamper proof. If the mobile is not unlocked and still some person is tampering the keys of the instrument, then some kind of bad noise and bad pictures should start on its own. This is to disturb the person so that he/she stops playing with the mobile keys.

Note: The projects can be done using WML and WML Scripts. If some group students wish to do the project using .NET Compaq libraries or JAVA, they can go for it.

BE12 – R4: Information Storage & Management

1. Course Objectives

The elective module on Information Storage & Management provides detailed knowledge, practical training, and insight into the implementation and management of various storage technologies with a focus towards applying these technologies in an information lifecycle paradigm. This module focuses on the following key aspects:

- The evolution of storage and implementation models
- Storage devices principles including structure, host I/O processing, & core algorithms
- Storage classes (SAN, NAS. CAS), interconnection protocols, and management principles
- Storage network design principles
- Networked storage capabilities (Snaps, mirroring, virtualization)
- Backup, Business Continuity, and Disaster Recovery principles
- Storage implementation planning and analysis
- Tiered storage models using hybrid storage technologies

2. Pre-requisites to take the elective module on Information Storage & Management

At a minimum, a student should have successfully completed the following modules:

M3-R4 Programming & Problem Solving through 'C' language
A4-R4 Computer System Architecture
A6-R4 Data Structures through 'C++' Language
A9-R4 Data Communication & Computer Network Infrastructure
A8-R4 Operating Systems

3. Why the new elective in Information Storage & Management?

With the advent of internet & the increased use of computers, the volume of information being handled by individuals & organizations is increasing at a very fast pace. This has necessitated the use of large storage devices & the management thereof. The elective module on Information Storage & Management provides detailed knowledge, practical training, and insight into the implementation and management of various storage technologies with a focus towards applying these technologies in an information lifecycle paradigm.

4. Hardware Requirements

Processor:	Pentium III or higher
Memory:	256 MB or higher
Video card:	standard video
Minimum Display resolution:	1024 X 768
Free space in hard disk:	150 MB beyond base OS, other applications, and local files. (The simulator environment is a 50MB+ download)
CD/ROM drive:	not needed, unless installing from CD
Mouse:	Standard
Audio:	Sound Card/Speakers or headphones

5. Software Required

Minimum Browser:	IE 5.X
Supporting Software:	Java, JavaScript, Real Player, Shockwave/Flash: Java Run Time Environment (JRE) 5.0 or later
Operating System:	Windows 2000, XP, or later

6. Course Outline

S.No	Topic	Lecture (hours)	Tutorial/Practicals (Hours)
1	Introduction to Storage Technology	9	8
2	Storage Systems Architecture	8.5	10
3	Introduction to Network Storage	9.5	9
4	Introduction to Information Availability	5.5	6
5	Managing and Monitoring	4	4
6	Networked Storage Design – SAN	14.5	13
7	Networked Storage Design – NAS	10	10
Total (Hours)		**61**	**60**

7. Detailed Syllabus

Section 1 Introduction to Storage Technology (9 hours)

Data proliferation and the varying value of data with time & usage, Sources of data and states of data creation, Data center requirements and evolution to accommodate storage needs

Overview of basic storage management skills and activities, The five pillars of technology, Overview of storage infrastructure components, Evolution of storage, Information Lifecycle Management concept, Data categorization within an enterprise, Storage and Regulations

Section 2 Storage Systems Architecture (8.5 hours)

Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure- components, properties, performance, and specifications, Logical partitioning of disks, RAID & parity algorithms, hot sparing, Physical vs. logical disk organization, protection, and back end management, Array caching properties and algorithms, Front end connectivity and queuing properties, Front end to host storage provisioning, mapping, and operation, Interaction of file systems with storage, Storage system connectivity protocols

Section 3 Introduction to Networked Storage (9.5 hours)

JBOD, DAS, SAN, NAS, & CAS evolution, Direct Attached Storage (DAS) environments: elements, connectivity, & management

Storage Area Networks (SAN): elements & connectivity, Fibre Channel principales, standards, & network management principles, SAN management principles

Network Attached Storage (NAS): elements, connectivity options, connectivity protocols (NFS, CIFS, ftp), & management principles, IP SAN elements, standards (iSCSI, FCIP, iFCP), connectivity principles, security, and management principles,

Content Addressable Storage (CAS): elements, connectivity options, standards, and management principles, Hybrid Storage solutions overview including technologies like virtualization & appliances.

Section 4 Introduction to Information Availability (5.5 hours)
Business Continuity and Disaster Recovery Basics, Local business continuity techniques, Remote business continuity techniques, Disaster Recovery principles & techniques

Section 5 Managing & Monitoring (4 hours)
Management philosophies (holistic vs. system & component), Industry management standards (SNMP, SMI-S, CIM), Standard framework applications, Key management metrics (thresholds, availability, capacity, security, performance), Metric analysis methodologies & trend analysis, Reactive and pro-active management best practices, Provisioning & configuration change planning, Problem reporting, prioritization, and handling techniques, Management tools overview

Section 6 Network Storage Design - SAN (14.5 hours)
Basic SAN design criteria, Fibre Channel infrastructure design principles, Storage needs data collection: existing, growth capacity, performance requirements, data location, business continuity and disaster recovery needs, data center consolidation requirements, etc.

Requirements data & infrastructure analysis, Developing a SAN design plan with emphasis on the key design criteria: scalability, availability, performance, security, capacity, and manageability, SAN design components, infrastructure models, properties, and usage patterns

Studies and critiques of existing SAN design scenarios (partial mesh, full mesh, core/edge, & tiered designs), SAN management activities associated with design (configuration, discovery, zoning, LUN masking, login rights, etc.), Advance SAN management topics: SNMP configuration, policy management, task automation

Section 7 Network Storage Design - NAS (10 hours)
Basic NAS design criteria, Network infrastructure design principles, NAS unique technologies: Wide Area File Services (WAFS), and policy based hierarchical storage management (HSM), Storage needs data collection: existing, growth capacity, performance, requirements, data location, business continuity and disaster recovery needs, data center consolidation requirements,

NAS unique requirements: protocol usage, server consolidation needs, network traffic loading, global data access needs, WAN requirements, Requirements data & infrastructure analysis, Developing a NAS design plan with emphasis on the key design criteria: scalability, availability, performance, security, capacity, and manageability, NAS design components, infrastructure models, properties, and usage patterns

Studies and critiques of existing NAS design scenarios (local area, LAN core/edge, WAN core/edge, WAFS, & HSM, NAS management activities associated with design (protocol configuration, discovery, permissions mapping, data migration), Advance NAS management topics: SNMP configuration, policy management, task automation, VTLU setup, FTP setup, Windows server consolidation, LAN trunking, IP SAN considerations: client / LUN mapping, CHAPS authentication, driver interoperability, security considerations

8. Recommended Books

Main Reading

1. Marc Farley Osborne, “Building Storage Networks”, Tata McGraw Hill
2. Robert Spalding, “Storage Networks: The Complete Reference“, Tata Mcgraw Hill

Supplementary Reading

1. NIIT, “Introduction to Information Security Risk Management” , Prentice-Hall of India

9. Examination Pattern

- The theory examination for the module would be for three hours and the total marks for the subject would be 100. There can be one practical examination of 100 marks.
- Other homework, papers, and spot quizzes can be given by the individual instructor at their discretion.

10. Credit Scheme

Total Number of theory hours = 60
Total Number of Tutorials/Practicals hours = 60
L(No. of hours per week for Lectures) = 3
T/P(Number of hours per week for Tutorials/Practicals) = 3
Credits for the module = 5
Total number of credits has been calculated using the AICTE formula C= L+ (T+P)/2
where
L, T and P indicate the number of hours per week for lectures, Tutorials and Practicals

BE12-R4: Information Storage & Management
Model Question Paper

Duration: 3 hours Maximum Marks: 100 Marks

Questions 1 – 8 are compulsory. Choose any five questions from Questions 9 to 19.

1) a) What are the Five Pillars of Information Technology?
   b) For a financial institution, specifically for a bank, given examples of "active data", "inactive data", and "Aged Data" **(5 Marks)**

2) Describe and contrast the environmental, operational, and infrastructure in a data center that would tend to make you use of NAS instead of SAN or SAN instead of NAS? Outline what the impact of these considerations would be?
(5 Marks)

3) Outline 4 key factors in operation risk assessment when planning business continuity and how they impact the process of planning for business continuity?
(7 Marks)

4) You have purchased an intelligent disk subsystem for you data center. Pertinent facts about this purchase are:
   - This subsystem has 10 spindles which can be configured as RAID 0, up to 5 LUNs of RAID 1, or 2 LUNS of RAID 5.
   - Each spindle holds 150 GB of data formatted
   - The array has two connections to the SAN switch which can, on average, process 80 MB/sec.
   - The array has two individual processors which, on average, can process a sustained load of 70 MB/sec
   - Each storage process can read/write to LUNs assigned to it at native speed.
   - Each storage process can read/write to LUNs not assigned to it at ½ the sustained throughput
   - Each spindle in the array on average can sustain a load of 5 MB/sec
   - The array will be connected to 4 servers, each dual connected to the SAN switch.

   The data load and requirements:

Server name	Storage requirement	Sustained throughput
A	100 GB	20 MB/sec
B	500 GB	50 MB/sec
C	300 GB	10 MB/sec
D	700 GB	70 MB/sec

   Describe how you would configure the storage for this environment and why? Provide an estimate of the maximum through put you would expect from this array given the performance data provided and explain how you derived this estimate.
(10 Marks)

5) You are the storage administrator for a data center that currently has 700 GB of active storage on fibre channel, RAID 5 based storage. An additional 200 GB of old, archived data is kept on RAID 5, ATA based storage. Your new, active data increases at a rate of 2 GB/Day. 0.1 GB/day of archived data is restored to active status. 0.3 GB/day of active data can be migrated to archive status. Answer the following questions and explain how you reached your results:

   a) How much total Fibre Channel storage will you need in 1 year (365 days) from now?

b) How much total ATA storage will you need in 1 year (365 days) from now?

c) How much additional Fibre Channel storage will you need for the next year?

d) How much additional ATA storage will you need for the next year?

e) Can you eliminate any storage over the course of the next year? If so, state how much. If not, explain why not.

(10 Marks)

6) Explain, in brief terms, the difference between the different types of Networked Storage?

(5 Marks)

7) What factors govern disk I/O performance? Which are most significant?

(10 Marks)

8) Answer the following questions about business continuity concepts:
   a) What is the operational difference between a point in time copy and a clone?
   b) What is the common name for a point in time copy?
   c) Contrast and compare under what operational conditions would you use a point in time copy as compared to a clone?
   d) Explain the operational differences between a synchronous mirror and an asynchronous mirror.
   e) Under what operational conditions would you use a synchronous mirror?

(8 Marks)

9) An automated data characterization of an existing small data center shows the following general size information (all values in GB):

Server purpose	.doc	.xls	.ppt	.txt	.mp3 / .jpg	.pdf	.pst	other
Home directories	40	5	20	1	50	2	55	2
Source code	1	0	1	6	0	0	0	223
Database server	20	2	2	20	30	0	0	119
E-mail	4	3	8	1	5	1	435	4

Using the information from the table provide your best estimates (in GB) of:

a) How much data is picture or video based?
b) How much data is part of an active database?
c) How much data is file & print data?
d) Which data and how much data must be protected to ensure that active databases and e-mail is available?
e) What is the percentage of e-mail, active database, source code, and other data?

(8 Marks)

10) Explain the functional differences and benefits of the following disk seeking algorithms:
   - FIFO (first in, first out)
   - smallest I/O request first
   - largest I/O request first
   - shortest track distance first

   Which method is the best? Justify your answer. **(8 Marks)**

11) You manage a small data center in Mumbai with 20 servers and total storage of 5 TB of data in 2 individual storage arrays. A data characterization study shows:

- 40% of the data is mission critical databases with a change rate of 200 GB/day
- 20% of the data is email with a change rate of 10GB day.
- 10% of the data is file and print for user accounts with a change rate of 1 GB/day
- 30% of the data is test generated data with a change rate of 500 GB/day

Your data center is located on the first floor of a building located near the airport and is susceptible to occasional flooding during monsoon. You have sister facilities in Pune and Chennai. You have been tasked to develop an affordable disaster recovery plan that covers the most crucial activities for business operations. Assume no growth in data over the next year. What strategy would you recommend? In your answer be sure to specify:

- What DR situations would you plan for and why?
- Which site would you use as a DR site and why?
- What data would be included in the DR plan?
- What technologies would you use in building the DR plan?
- How would the DR process work?

(8 Marks)

12) You are planning to setup an asynchronous mirror between Bangalore and New York. Your analysis of the data and connectivity testing show:
    - A sustained throughput through the link of 400 Kbps.
    - You cannot commit more than 40% of the link capacity to the mirroring operation.
    - The data set to be mirrored is 200 GB.
    - The change rate of this data set is 5% per day.

    Answer the following:
    - What is the throughput that can be committed to mirroring?
    - How long will it take to silver the mirror over the existing link?
    - How much change data will be queued up during this silvering process?
    - What size would you recommend for each change set? Why?
    - How often would you ship change sets from the primary array to the mirror? Why?
    - How long could the mirror be broken before you would recommend re-silvering the mirror from scratch?

    (8 Marks)

13) You have a "hot" failover site setup between your primary campus in Bangalore and your backup site in Mysore (60km) using synchronous mirroring. Your workers are housed in a second site in Bangalore that connects to the primary data/server site via the network.

    What would be the key steps to execute a successful failover to the secondary site?

    What would be the key steps to fail back to the primary site?

    (8 Marks)

14) You have been tasked with setting up a high performance NAS file server. Environmental conditions you know include:
    - The NAS device will have 4 network interfaces, one per front end processing unit, and each interface will be attached to a different LAN
    - There are 2000 users spread evenly over the 4 local area networks
    - Each user is to receive 2 GB of space for use
    - The intelligent storage array has four independent fibre channel loops with each disk dual ported to independent loops
    - The disks purchased are 140 GB fibre channel disks; there are 10 disks per shelf in the array.
    - All the disks in the same shelf must be tied to the same two fibre channel loops
    - There can be no more than 10 shelves in the array
    - The user directories must be laid out on RAID 5 storage

    Understanding that the goal is to get the best I/O performance you can by maximizing the use of spindles and loops explain the following (use drawing as necessary):

How would you connect the disk shelves to the fibre channel loops?

How would you organize RAID groups on the shelves?

How would you allocate file systems to these LUNs?

(8 Marks)

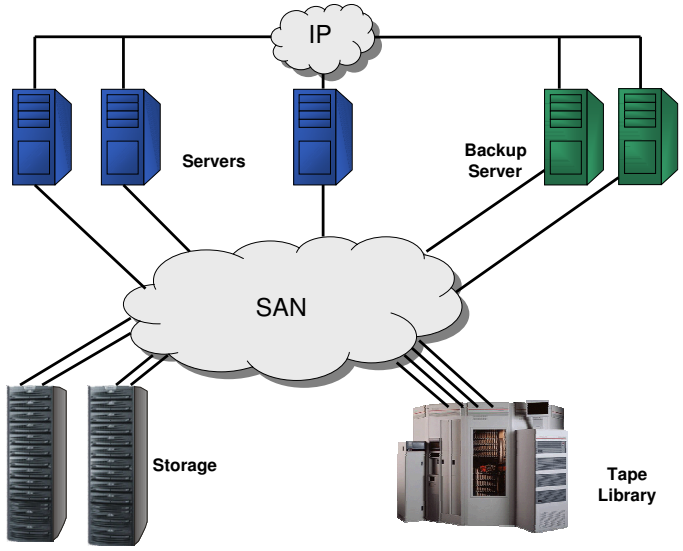
15) Describe the basic principles of how Content Addressable Storage works. Be certain to discuss how object tagging and data protection works with a CAS device.

(8 Marks

16) Contrast the behavioral difference between the protocols CIFS, NFS, and FTP. Be certain to discuss how these protocols operate and cover the impact that network disconnects have relative to each protocol. **(8 Marks)**

17) Outline the basic structure of the SMI-S and CIM standards. Which is used for what types of management operations? **(8 Marks)**

18) You are responsible for establishing a standard backup process for your data center. Your data center is arranged as follows.



Specifics are:

- There are 2 storage arrays each holding 2 TB of data to be backed up.
- The storage arrays have 2 connections to the SAN for load balancing, but can supply only 60 MB/sec of data on average.
- There are two dual CPUs backup servers. Each backup server can move 30 MB/sec to the tape library.
- The tape library has 4 tape drives each connected to the SAN via a separate fibre channel connection
- Each tape can write, using compression, up to 50 GB/tap at a sustained rate of 10 MB/sec.

Answer the following:

a) What components in this data center limit the total backup throughput?
b) What is the maximum data throughput that can be committed to tape?
c) How many tapes are required to make a full back up of all the data?
d) Assuming you can keep the backup running at maximum speed, how long will it take to put a full backup to tape in the library? (8 Marks)

19) Answer the following questions about IP storage:

a) Describe briefly the differences between iSCSI, FCIP, iFCP.
b) Explain how CHAPS authentication works for iSCSI
c) Describe the I/O flow in an IP SAN environment. (8 Marks)

BE12-R4: Information Storage & Management
Example Practical / Project Assignments

Sample Exercise 1
(Section 5, Lab 1, Monitoring Case Study, 3 hours)

You work for an enterprise with a main campus located in New Delhi with remote offices located in Hyderabad, Bangalore, and Mumbai. Each office remote location is connected to the main campus through ATM backbone using VPN tunneling with firewall security, and each remote office has its own firewall for WAN access. The main campus has 50 servers for various applications and 10 TB of storage platform supporting approximately 500 employees, remote office in Hyderabad has 30 servers and 8 TB of storage platform supporting 200 employees, remote office in Bangalore has 50 servers and 12 TB supporting 600 employees, and the remote office in Mumbai has 25 servers and 10 TB of storage platform supporting 300 employees. Keeping these requirements in mind, perform the following

1. Research and identify network monitoring tools available in market today best suited for your enterprise – 120 min
2. Design a monitoring infrastructure for these enterprise using SNMP protocol, for performance monitoring, CPU and memory monitoring, host performance, Channel and connectivity performance, Storage array performance, spindle contention, and trend analysis – 120 min
3. Redesign step 2 using TCP/IP – 60 min
4. Discuss and explain pros and cons for the design you recommended in step 2 and step 3, make sure that you consider cost of solution in your discussion – 50 min
5. If you are in a budget approving authority, which design will you pick to implement in your enterprise – 10 min

Sample Exercise 2
(Section 5, Lab 2, System Management Case Study, 3.5 hours)

You are responsible for provide IT related service to several large corporations in USA with an agreed upon SLA with mandates you to have 99.1% uptime, business continuity, and disaster recovery with no down time during a natural or man-made disaster.

i. How would you approach to show your customers that you are compliant with the terms in SLA – 30 min
ii. How can you achieve a cost effective management system for your customers -15 min
iii. How do you plan to deploy patches and updates to the machines with the enterprise – 15 min
iv. Conduct research to determine at least three off-the-shelf management system capable of solving issues on steps i, ii, and iii – 120 min
v. Select one of the management system from your research and discuss why you selected the tool – 30 min

Sample Exercise 3
(Section 4, Lab 3, Disaster Recovery Case Study, 3 hours)

You manage an enterprise for a software services company in Mumbai with 30 servers in a cluster configuration with 100 TB of storage platform, your company has a remote office in Chennai with 20 servers with 100 TB of storage platform, and you have a joint venture with another software company in Kashmir which has recently purchased 500 TB of storage platform, and currently only utilize 50TB of that storage platform. You have VPN connectivity with the Joint Venture partner in Kashmir and have permission to utilize their available storage platform for up to 400 TB.

Federal government of India has just notified the state officials that a typhoon is forming in the Arabian sea and it is projected to reach Mumbai as early as 72 hours or as late as 96 hours. You have connections within state government, and your connection informs you that according to the projections, Mumbai will have massive flooding and your office location will definitely be under water with no power for several days, you have no disaster recovery plan in place and business continuity is essential for your business. Take 60 minutes to develop a disaster recovery plan individually.

Your instructor will divide the class in several groups. Once you are in your group, discuss your plan with others, and formulate a disaster recovery plan based on best practices within the plans in the group, prepare to answer questions as why certain practice was chosen when you formulate a group plan- 60 minutes

You have 15 minutes to present your group plan to the class – 60 minutes

Sample Exercise 4
(Section 2, Lab 1, Seeking Algorithm Assignment, 6 hours)

This exercise will allow us to study the effects of several disk seeking algorithms. You will develop a software simulation program that will mimic the physical behavior of a disk drive under an I/O load. You will then vary the program by changing the disk seeking algorithm to study how performance changes based on the behavior of the algorithm. This exercise will be completed in 3 parts:

Part 1 Develop a program to simulate the behavior of a disk drive
Part 2 Develop procedures for different seeking algorithms that can be substituted into the simulation program
Part 3 Run the simulation with varying I/O loads against each seeking algorithm. Plot the resulting data to show how disk throughput varies based on I/O load and seek algorithm.

<u>Part 1</u>
The physical parameters of the disk under study are:

Number of writable platters	4
Number of cylinders / platter	512 (numbered 0 – 511)
Number of sectors / cylinder	8
Read time of a sector	8 msec
Disk RPM	5400
Head movement delay	20 usec / track
Avg. electrical switching delay per I/O	3 usec
Logical sector addresses	0 – 16383, logical sectors 0 – 4095 are on platter 0, 4096 – 8191 are on platter 1, and so on in sequential order.
Sector size	512 bytes / sector
Writable disk size	8 MB

An I/O into this simulation model will be a logical sector number (0 – 16383) and an I/O request size (0 – 64 sectors). The program must keep track of the disk head position relative to the physical cylinder and the last logical block number read at all times. Assume when the program begins that the heads are on cylinder 0 nearest to the spindle and at logical sector address 0.

For the purposes of this assignment assume that the disk is under constant load and that as soon as an I/O is completed another is queued to be processed with no delay. Also assume that for measurement a total of 10,000 I/O requests will be processed to determine the throughput. Note, make the number of I/O request to process be an input item to the program on each run. We will vary this later.

For the purposes of Part 1 assume that all I/O processing is FIFO (first in, first out). This means the I/O requests must be processed in the order they are received.

You program will use a random number generator of your design to get the logical sector number and I/O request size for each I/O. The program, using the current known state of the simulation environment from the preceding I/O request will calculate the time required to process the I/O. These processing times will be summed for each of the 10,000 I/O requests. When the simulation is complete it will report:

- Total time to service the 10,000 (or whatever) I/O requests (sec.)
- Average I/O request time (msec)
- Throughput of the disk for this I/O load (I/Os / sec.)

The average electrical switching delay should be added to each I/O request. You may assume that ½ of a rotational delay must be added for each track read from to satisfy the I/O request.

Part 2

Develop procedures for seeking algorithms to replace the FIFO seeking model and verify that the algorithm works properly with the base simulation program. The algorithms to implement are

First in, First out (FIFO).	This was done in Part 1
Minimum seek	Implement a logical I/O queue of 5 requests and immediately fill it with the first 5 I/O requests. Sort this queue so the next I/O request to process is the closest of the 5 to the current logical sector address. This list should be resorted with the addition of each I/O request. For each sorting algorithm add 2 usec to each I/O request to cover the sorting overhead.
Maximum seek	Using the same 5 request queue in the minimum seek algorithm order each I/O request so that the next I/O request to be processed is the furthermost logical sector address from the current logical sector address. Update this ordering with each new I/O request. Assume the same 2 usec time addition for each I/O request as you did for the minimum seek algorithm.
Large request size seek	Using the same 5 request queue from the minimum seek algorithm order the I/O requests so the largest I/O request gets processed next. Update this ordering with each new I/O request. Assume the same 2 usec time addition for each I/O request as you did for the minimum seek algorithm.
Small request size seek	Using the same 5 request queue from the minimum seek algorithm order the I/O requests so the smallest I/O

	request gets processed next. Update this ordering with each new I/O request. Assume the same 2 usec time addition for each I/O request as you did for the minimum seek algorithm.
MySeek Algorithm	Develop your own seek algorithm staying within the following parameters. The I/O queue must be 5 I/O requests. For each manipulation of the queue you must add 2 usec to the I/O processing time.

Part 3

Using the simulation and seek algorithms developed in Parts 1 & 2 run the simulations in the table below:

Seek Algorithm	**I/O requests**				
FIFO	100	500	1000	5000	10000
Minimum seek algorithm	100	500	1000	5000	10000
Maximum seek algorithm	100	500	1000	5000	10000
Large request size seek algorithm	100	500	1000	5000	10000
Smallest request size seek algorithm	100	500	1000	5000	10000
"My Seek" algorithm100	100	500	1000	5000	10000

Provide 2 graphs based on this data. The first should show disk throughput, by algorithm, as a function of number of I/O requests. The second graph should show average I/O request time, by algorithm, as a function of the number of I/O requests.

Sample Exercise 5
(Section 8, Lab 2, Unique File Key Study, 3 hours)

A basic principle of content addressable storage is concept of deriving a unique ID tag based on the contents of a data object and being able to retrieve the data object based on this id tag. In this exercise we will undertake the following:

- Develop software to build a unique key for files submitted to the store
- Store the files based on the key tag
- Develop a method for handling ID tag collisions
- Demonstrate file retrieval

Part 1 – unique file key procedure

Develop a procedure that will build a unique key for a file submitted to it for analysis. For this exercise we will assume that all our storage will consist of text files.

You are free to use any technique you like, but we recommend for simplicity you develop the key by summing together the individual bytes of a file into a 32 bit unsigned integer allowing the overflow to fall off. For example the text string "ABCD" would evaluate as:

Binary (16 bits)	decimal	character
0100 0001	41	A
0100 0010	42	B
0100 0011	43	C
0100 0100	44	D
0101 1010	170	N/A

This procedure will take any file presented to it and compute a unique key. This key (a 32 bit unsigned integer) will be returned from the procedure.

Part 2 – File repository & data store

Using the procedure from part 1, expand your program to accomplish the following tasks:

- Create a directory to serve as a file repository.
- Through a simple user interface query the user for a filename or pathname of a file to be added to the repository.
- Open the file specified and generate a unique key for the file using the procedure from part 1.
- Present the user with the key number (as an unsigned integer) along with the original file name.
- Copy the file to the file repository saving it under a filename which is the unique file key converted to a text string. For example, the filename of the example in part one would be "41".
- Store the file key and the original file name in an array or linked list catalogue for later usage.
- Ensure this user interface will allow the user to submit multiple files into the repository

Demonstrate that the program at this stage will place files into the repository correctly with the correct file key.

Part 3 – File retrieval

Expand the program from Part 2 to accomplish the following:

- Modify the user interface to support both file repository submission and retrieval.
- For file retrieval present the user with a list of the catalogue contents sorted by original filename.
- Allow the user to select the file for restoration using the position number in the list.
- When a file is selected for retrieval, use the file key to find and open the file in the repository.
- Ask the user where to place the file being retrieved (pathname) and copy the file to that directory giving it the original filename.
- Return the use to the main menu for additional file storage or retrieval operations.

Demonstrate that file retrieval works properly.

Part 4 – File Key Collisions

Expand the program from part 3 to handle situations where a file, due to its content, generates the same file key. For this exercise submitting the same original file twice to the repository or two individual files with the same content will generate this scenario.

Specifically expand the program to accomplish the following:

- When a file key is generated check the catalogue to see if it is a duplicate.
- Expand the catalogue to hold not only the file key and original file name but also add a sequence key.
- When a file is stored in the repository for the first time set its sequence key to the integer value 0.
- If a file key is duplicated determine what the last sequence number was and add one to the sequence number when this catalogue entry is made.
- Store the file in the repository using a filename that is based on the file key and sequence number. Using our example from part 1 the second file with that key would be named "41-1".

- Expand the file retrieval list to show the sequence number. Be sure to sort the retrieval list alphabetically by filename and sequence number.
- A file retrieval is copied to the destination directory. If the file already exists store the file by the original filename hyphenated with the sequence number.

Demonstrate that this final program version can store and retrieve file with duplicate file keys.

11. Example Subjective Questions and Answers

1) *Question*
   Describe environmental conditions that would tend to make you use NAS instead of SAN or SAN instead of NAS?

   Answer
   When making the evaluation of SAN over NAS or vice-versa I tend to look at the following aspects:

   - What are the performance requirements of the storage solution?
   - What is the storage model in use today?
   - What would be the infrastructure cost for any proposed change in storage solution?
   - What applications must be used in conjunction with this storage solution?
   - What is the training & background of the storage administration staff?
   - What is the management "style" of the storage administration staff?
   - What is the networking (IP & Fibre Channel) capability of the customer's environment?

   None of these aspects in and of itself would mandate a specific solution, but the alignment, or non-alignment of these aspect give guidance about what storage solution models are likely to be acceptable to the customer. Looking deeper:

   - If the storage solution will be under constant heavy I/O load or needs to meet specific response times requirements in a variable I/O load model then I would give preference to a SAN solution. In general the performance will be greater with less variability in I/O response times.
   - If the customer is already significantly invested in SAN infrastructure it is often the case that you can expand or leverage existing infrastructure saving costs. Likewise, customers having existing SANs will typically be over much of the initial training hurdle that SAN management typically entails. However, if the customer has no pre-existing SAN, nor preference to it then I would lean toward NAS. Most customers will have the necessary infrastructure (10 Mpbs / 100 Mbps / 1 Gbps networks) in place. Some will argue that NAS management is easier than SAN management, but given many of the concepts are the same it is not clear this is an advantage for NAS.
   - If the infrastructure change is small then proposing either SAN or NAS if probably fine depending on customer preference. However, if the customer does not have a SAN infrastructure and would need to make a significant investment then NAS is typically the cheaper cost option on a per-port basis. However, one must be care about the type of infrastructure. If the customer needs 1 Gbps network to sustain the load, but has only a 10 or 100 Mbps infrastructure the cost of new network cable and switches normalizes the cost quickly between the two options.
   - Applications are not created equal when looking at SAN and NAS storage. Most applications will work with both. Some applications do not tolerate variable network response times gracefully. Such applications are not good candidates for NAS. Some older database applications were susceptible to this. Likewise, many applications do not need the higher I/O throughput capabilities of SANs (file and print services come to mind). So unless there are other reasons, like increasing disk utilization, for moving to a SAN the additional cost may not be worth it.

- If the storage administration staff has no experience with SAN then starting with NAS can often be an easier transition. The storage management is more like what most administrators are familiar with from setting up and managing Windows based servers. However, experienced UNIX administrators who are familiar with logical disks, software RAID, etc. will not be daunted by SANs. The big thing is to identify any knowledge gaps and organize the training necessary to ensure storage administration happens correctly.
- Finally is the aspect of "style". Administrators who want to have direct control over every option at every level of the infrastructure tend to want and like SAN administration for they can interact at the lowest levels of the storage infrastructure. Administrators who are task oriented tend to like NAS administration better. In most NAS platforms you can work and administer at the lowest levels, but in general most NAS administration is task oriented vs. object oriented.

2) *Question*
What factors govern disk I/O performance? Which are most significant?

Answer
Disk performance is governed by many characteristics, some that even interact with others. In general the key factors, in order of performance contribution, break down into:

Seek time	In general, this is the time to move the head from one track on the platter to another track. However, the actual seek time can be influenced by the algorithms used in the disk firmware to order the seeks (trying to minimize seek time), the incoming I/O pattern, the command queue depth on the disk (impacts seek ordering), movement speed of the heads, the layout of sectors on a track, the physical diameter of the platter, and the inter-track gap on the platter surface.
Rotational delay	This is the time it takes for a specific sector on a track to pass beneath the read/write head. It is governed almost exclusively by the rotational speed of the disk, but can also be influenced by newer variable speed disks that will vary the rotational speed slightly based upon track positioning to allow more sectors on a track to increase overall capacity.
Electrical Delay	This is the time required by the disk firmware to read and analyze I/O requests plus the time necessary to perform any electrical switching to match up read/write head with the processing electronics and channel selection for multi-channel drives.

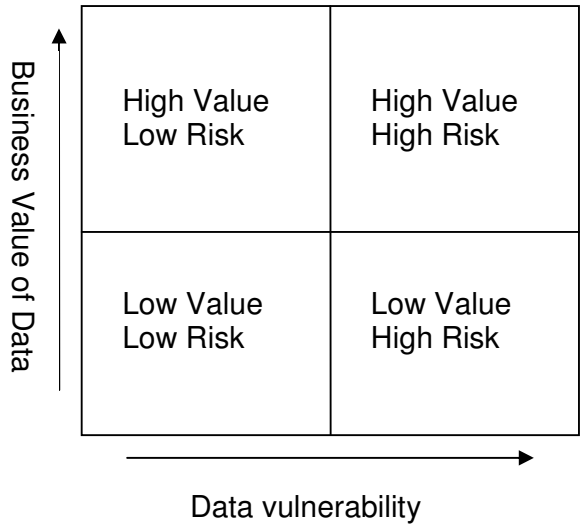
Of the parameters given seek time is the most dominate constituting usually over 60% of the overall performance.

3) *Question*
Outline 4 key factors in operation risk assessment when planning business continuity and how they impact the process of planning business continuity?

Answer
In planning business continuity I would pay attention to the following factors:
- What are the types of data in my business? What is the intrinsic value of each to my business?
- How does the business value of each data class vary over time? How does each data class drive my ability to earn revenue?
- How venerable is each class of data to damage or loss via man-made disaster, damaged equipment, weather disasters, planned operational down time, system overloading?
- What is the restoration time requirement for each class of data to be available before there is 5% revenue impact to my business, 25%, & 50%?

I would work through a process of completing the categorizations for each key areas above and sift the results. This results should yield, in general, a two dimensional table with the

business value (in terms of revenue impact) on one axis and the vulnerability of the data on the second axis. See the example below.



The data categories that map into the high value, high risk quadrant is the candidates to being planning for business continuity services. Data grouping in this quadrant have the greatest and most timely impact on business operations. They are ones that need the most reactive (in terms of failover / restore time) and the most solid processes for protection, backup, & restoration in the event of a data emergency. From this point the process is mostly determining what services levels are needed, the costs to implement those service levels and comparing the cost to implement against what can be afforded.