

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

NOTIICATION

No. Acad/138.

Date :4th June, 2014

Τo,

The Principal of all the affiliated Science Colleges of Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Subject:- Direction No. 2 of 2014.

Sir/Madam,

I am forwarding herewith a copy of the Direction No. 2 of 2014 issued by the Hon'ble Vice-Chancellor under Section 14(8) of Maharashtra Universities Act, 1994 **'Direction governing examination leading to the Bachelor of Science (Information Technology) (Three Years Degree Course – Semester Pattern)**" and Examination Scheme to be implemented from Academic Session 2014-2015.

You are requested to kindly bring it to the notice of all teachers and students of your college.

Thanking you,

Yours faithfully,

Sd/-

(Dr. A.V. Gomashe)

Registrar,

Rashtrasant Tukadoji Maharaj

Nagpur University, Nagpur.

Encl: As above.

Copy for information and necessary action along with the Direction and Scheme as mentioned above to :-

- 1. The Dean, Faculty of Science, Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
- 2. The Chairman, Board of Studies in Computer Science, Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur.
- 3. The Controller of Examinations, Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
- 4. The Director, B.C.U.D., Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
- 5. The Deputy Registrar (Examinations) Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur.
- 6. The Deputy Registrar (Coll. Sec.) Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
- 7. The Asstt. Registrar (Prof. Exam.), Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
- 8. The Asstt. Registrar (Conf.), Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur.
- 9. The Asstt. Registrar (Exams & Enqury.), Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
- 10. The Asstt. Registrar University's Sub-Centre at Gadchiroli, R.T.M. Nagpur University, Nagpur.
- 11. The Officer-in-Charge, Publication Section, R.T.M. Nagpur University, Nagpur.
- 12. The Asstt. Registrar, Ordinance Section, R.T.M. Nagpur University, Nagpur
- 13. The P. A. to the Hon'ble Vice-Chancellor, R.T.M. Nagpur University, Nagpur
- 14. The P. A. to the Hon'ble Pro-Vice-Chancellor, R.T.M. Nagpur University, Nagpur
- 15. The P. A. to the Registar, R.T.M. Nagpur University, Nagpur
- 16. Mrs. Veena Prakashe, Information Scientist, R.T.M. Nagpur University, Nagpur

Sd/-

(Puran Meshram)

Deputy Registrar(Acad.)

Rashtrasant Tukadoji Maharaj

Nagpur University, Nagpur.

RASHTRASANT TUKDOJI MAHARAJ

NAGPUR UNIVERSITY,

NAGPUR

FACULTY OF SCIENCE

BOARD OF STUDIES IN COMPUTER SCIENCE

SYLLABUS FOR

Bachelor of Science (Information Technology) [B.Sc. (IT)] Three Years (SIX SEMESTERS) DEGREE COURSE

(FROM SESSION 2014-15)



RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

FACULTY OF SCIENCE

DIRECTION NO. 2 OF 2014

DIRECTION GOVERNING THE EXAMINATION LEADING TO THE DEGREE OF BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)

(THREE YEARS DEGREE COURSE – SEMESTER PATTERN)

(Issued under Section 14(8) of the Maharashtra Universities Act, 1994)

Whereas, Maharashtra Universities Act No. XXXV has come into force with effect from 22nd July, 1994 and further amended by Maharashtra Universities (Amendment and Continuance)Act, 2003, hereinafter referred as 'Act' has come into force from 8th August 2003.

AND

Whereas, the University Grants Commission, New Delhi vide letter No.D.O.No.F 1-2/2008/(XI Plan), dated.31 Jan.2008 regarding new initiatives under the XIth Plan – Academic Reforms in the University has suggested for improving quality of higher education and to initiate the Academic Reforms at the earliest.

AND

Whereas, the Board of Studies in all the Science subjects in their meeting held during 28/06/2013 prepared the syllabi and scheme of examination for the B.Sc. (I T) degree course and recommended for starting of the semester pattern in Faculty of Science from the academic session 2014-15,

AND

Whereas, the recommendations of various Board of Studies in the faculty of Science regarding Up-gradation and Revision of various syllabi and introduction and implementation of Semester Pattern Examination System at under graduate level was considered by the faculty of Science in its meeting held on 9/07/2013 and constituted a Committee to decide the policy decision regarding semester pattern examination system.

AND

Whereas, the Dean, Faculty of Science has consented to the syllabi and the scheme of examination for the award of B.Sc. (I T) degree in Faculty of Science,

AND

Whereas, the faculty of Science in its meeting held on 9/07/2013 vide item No. 35, has considered, accepted and recommended to Academic Council, the policy decision regarding introduction of Semester pattern and the draft syllabi of B.Sc. (I T) Semester-I & VI along with draft direction and other details.

AND

Whereas, the new scheme of examination as per semester pattern is to be implemented from the Academic Session 2014-15 for B.Sc. (I T) First Year & onwards which is to be regulated by this direction and as such

there is no direction issued and in existence and framing of an Ordinance for the above examination is a time consuming process.

2

AND

Whereas, the admission of students in the semester pattern at B.Sc. (I T) First Year are to be made in the Academic Session 2014-15.

Now, therefore, I, Anoop Kumar, Vice Chancellor of Rashtrasant Tukadoji Maharaj Nagpur University, in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act., 1994, do hereby direct as under:

1. This Direction may be called, "Examination leading to the Degree of BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY) (Three Year Degree Course-Semester Pattern).

- 2. This direction shall come into force with effect from the date of its issuance.
- 3. (i) The following shall be the examination leading to the Degree of BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY) in the faculty of Science namely:
 - a. The B.Sc. (IT) Semester-I Examination;
 - b. The B.Sc. (I T) Semester-II Examination;
 - c. The B.Sc. (IT) Semester-III Examination;
 - d. The B.Sc. (IT) Semester-IV Examination;
 - e. The B.Sc. (IT) Semester-V Examination; and
 - f. The B.Sc. (I T) Semester-VI Examination.

(ii) The period of Academic Session shall be such, as may be notified by the University.

4. The theory examination of Semester-I, II, III, IV, V and VI shall be conducted by the University and shall be held separately at the end of each semester at such places and dates as may be decided by the University and shall be held as per the schedule given in Table 1.

		Table 1	
Sr. No	Name of the Examination	Main Examination	Supplementary Examination
1	Semester I, III and V	Winter	Summer
2	Semester II, IV, and VI	Summer	Winter

5. Subject to compliance with the provisions of this Direction and of other Ordinances in-force from time to time, the following persons shall be eligible for admission to the examinations:-

(a) A student who has prosecuted a regular course of study for not less than one academic year prior to that examination;

(b) A teacher in an Educational Institution eligible under the provisions of Ordinance No. 18, and

(c) A women candidate who has not pursued a regular course of study.

Provided that in the case of the persons eligible under clauses (b) and (c), an applicant to the examination shall have attended a full course of laboratory instructions in a College in the subject in which laboratory work is prescribed. The candidate shall submit a Certificate to that effect signed by the Principal of the college.

6. Eligibility of every applicant for admission to B.Sc. (IT) Semester course shall:-

A)In case of the B.Sc. (I T) Semester I examination:-

The candidate should have passed the 12th Standard Examination of the Maharashtra State Board of Secondary and Higher Secondary Education with English and other Modern Indian Languages together with

mathematics or an examination recognized as equivalent thereto in such subjects and with such standards of attainments as may be prescribed.

Provided that students passing the 12th Standard Examination of the Maharashtra State Board of Secondary and Higher Secondary Education and offering Vocational Stream with mathematics shall be eligible for admission to the B.Sc. (I T) Semester I course.

B) In case of the B.Sc. (I T) Semester II, III, IV, V and VI Examinations:- The student should have attended a minimum of 90 days in the respective semester and passed the previous semester examination as per the rules of ATKT as mentioned in Para 7 of this direction.

7) The ATKT rules for admission for the B.Sc. (I T) Course (**Theory and Practical as separate passing head and on calculation fraction, if any, shall be ignored**) shall be as given in the following Table- 2. **Table 2**

Admission to Semester	The student should have attended the Session / term satisfactorily	Candidates should have passed at least one half of the passing heads of the following examinations (Theory and Practical as separate passing head and on calculation fraction, if any, shall be ignored)
1	2	3
B.Sc. (I T) Semester I	Semester I and admitted As per para 6 of this Direction	
B.Sc. (I T) Semester II	Semester II	
B.Sc. (I T) Semester III	Semester III	One half of the total head prescribed for Sem I and Sem II examination
B.Sc. (I T) Semester IV	Semester IV	
B.Sc. (IT) Semester V	Semester V	 a) Passed Sem I & II examination and b) One half of the total head prescribed for Sem III & IV examination
B.Sc. (IT) Semester VI	Semester VI	

8. a) Without prejudice to the other provisions of Ordinance No. 6 relating to the Examinations in General, the provisions of Paragraph 5, 8, 10 and 31 of the said ordinance shall apply to every candidate.

b)The students admitted to this Degree course shall be governed by the general Ordinances / Directions of the University which are applicable to all the regular or ex-students. These Ordinances includes complete as well as relevant provision of Ordinance No. 1, 2, 6, 7-A, 9, 10, 19, 109, Ordinance No. 30 of 2006, (amended Ordinance No. 4 of 2006), Direction 9 of 2008, Direction 5 of 2004 wherever applicable accordingly AND Direction / Ordinance of ATKT as well as reassessment / provisional admission as issued from time to time.

9. The fee for each Semester examination shall be as prescribed by the University from time to time.

10. Every examinee for the B.Sc. (I T) Semester I & II examination shall be examined in:

i)Compulsory English

ii)Any one of the following Languages

Marathi, Hindi, Urdu, Supplementary English, Gujarati, Bengali, Telugu, Sanskrit, French, German, Russian, Persian, Arabic, Pali and Prakrit or Latin

iii) six papers and three practicals at respective semester.

11. The Scope of the subjects of all semesters of B.Sc. (I T) examination shall be as indicated in the respective syllabi in force from time to time. The medium of instruction and examination shall be English, except for the courses in Languages.

12. The maximum marks allotted to each subject and the minimum marks which an examinee must obtain in order to pass the examination shall be as per the Appendix A appended to this Direction.

13. The practical examination of all semesters shall be conducted at the end of each semester as indicated in Table 3 given below.

Table 3

S. No			
	Name of the Examination	Main Examination	Supplementary Examination
1			
	Semester I, III and V	Winter	Summer
2			
	Semester II, IV, and VI	Summer	Winter

14. The scheme of awarding internal marks shall be as per Appendix- **B** appended with this Direction.

15. Successful examinees at the B.Sc. (I T) Sem-VI Examination who obtained not less than 60% marks (aggregate of Sem-I, II, III, IV, V & VI Examinations taken together, excluding Languages) shall be placed in First Division, those obtaining less than 60% but not less than 45% in Second Division, and all other successful examinees in the Third Division.

Explanation :

Division at the B.Sc. (I T) Examination shall be declared on the basis of the marks obtained only in the Subjects other than languages at the Sem-I, II, III, IV, V & VI Examinations taken together.

16. There shall be no classification of successful examinees at the Sem-I to Sem-V Examinations.

17. An examinee successful in the minimum period prescribed for the examination, obtaining not less than 75% of the maximum marks prescribed in the subject shall be declared to have passed the examination with Distinction in that subject.

Explanation :

(1) Distinction shall be awarded only in the Science Subjects.

(2) Distinction at the B.Sc. (I T) Examination shall be awarded on the basis of the marks obtained at the B.Sc. (I T) Semester - I, II, III, IV, V and Semester VI Examination taken together.

(3) Distinction shall not be awarded to an examinee availing of the provision of the exemptions and compartments at any of the examination.

18. Provisions of Ordinance No 7-A relating to the Condonation of Deficiency of Marks for passing an examination and compartment as amended up-to-date vide ordinance No. 45 of 1983 shall apply to the examinations under this Direction.

19. As soon as possible after the examinations, the Board of Examinations shall publish a list of successful examinees at the B.Sc. (I T) Sem-I & II; B.Sc. (I T) Sem-III & IV and B.Sc. (I T) Sem-V & VI Examinations. Such list at the B.Sc. (I T) Semester VI Examination shall be arranged in three Divisions. The names of the examinees passing the examination as a whole in the minimum prescribed period and obtaining the prescribed number of places in First or Second Division shall be arranged in Order of Merit as provided in the Examinations in General Ordinance No. 6. While preparing the Merit list for the B.Sc. (I T) Examination the marks secured by the candidate in the compulsory languages at their Semester I & II Examination will be taken into consideration in addition to the marks secured by them in their optional subjects.

20. No Person shall be admitted to B.Sc. (I T) Sem-I, II, III, IV, V and VI Examinations, if he/she has already passed the corresponding or an equivalent examination of any other Statutory University.

21. Successful examinees at the B.Sc. (I T) Sem I, II, III, IV, and V Examinations shall be entitled to receive a **Certificate** signed by the **Registrar** and successful examinees at the end of B.Sc. (I T) Sem VI examination shall, on payment of prescribed fees, receive a Degree in the prescribed format, signed by the Vice-Chancellor.

22. The provisions of direction no. 3 of 2007 for the award of grace marks for passing an examination, securing higher grade in subject(s) as updated from time to time shall apply to the examination under this direction.

23. Absorption Scheme:

- a) While switching over to semester pattern, the failure students of annual pattern will be given three chances to clear the examination.
- b) The candidates who have cleared first year annual pattern examination in the subject shall get admission to third semester directly by matchable scheme. However, candidates who are allowed to keep term will not be eligible for admission to third semester unless they clear all the papers and practicals of first year annual pattern examination.
- c) The candidates who have cleared second year annual pattern examination in the subject shall get admission to fifth semester directly by matchable scheme. However, candidates who are allowed to keep term will not be eligible for admission to fifth semester unless they clear all the papers and practicals of second year annual pattern examination.
- d) The unsuccessful students of old course (Yearly pattern) shall be permitted to appear for higher class as per the new course (Semester Pattern) examination of the BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY) programme (Semester Pattern) provided that they submit a certificate from the Head of the Department/Principal of the College stating that they have satisfactorily undergone a course of study in all the subjects of the new course.
- e) The absorption scheme of the BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY) programme (Semester Pattern) will be effective till the introduction of new syllabus with the new absorption scheme.
- f) For other Statutory University candidates with similar yearly pattern program point No. 23 'a', 'b' and 'c' shall be applicable.
- g) For other Statutory University candidates with Semester pattern BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY) program the Candidates shall be admitted to next higher semester provided that he/she shall have cleared previous semester and a R.T.M. Nagpur University Committee constituted form time to time for the purpose shall scrutinize and clear the case on the basis of subject and syllabus contents of his / her previous semester exam of the other Statutory University.

Sd/-(Anoop Kumar)

Nagpur

Date : 16.5.2014.

Vice-Chancellor

Appendix - B:

Guidelines for Internal Assessment, Theory paper pattern and Practical

1. Each semester shall comprise of minimum 90 teaching days.

2. Each semester will comprise

a. six theory papers – 50 Marks each

b. internal assessment for each paper - 10 Marks each.

c. three practicals -30 marks each

3. In addition to the above, Semester I and II will have

a. One compulsory English paper of 60 marks with 15 marks internal assessment, Total 75 marks.

b. One second language paper (Marathi, Hindi, Urdu, Supplementary English, Gujarati, Bengali, Telugu, Sanskrit, French, German, Russian, Persian, Arabic, Pali and Prakrit or Latin) of 60 Marks with 15 marks internal assessment, Total 75 marks.

Internal Assessment:

4. The internal assessment shall be done by the College at least 15 days prior to the final examination of each semester. The Marks shall be sent to the University immediately after the Assessment in the prescribed format.

5. Guidelines for Internal Assessment are appended herewith.

a) The internal assessment marks assigned to each theory paper as mentioned in Appendix - A shall be awarded on the basis of assignments like class test, attendance, project assignments, seminar, study tour, industrial visits, visit to educational institutions and research organizations, field work, group discussions or any other innovative practice / activity.

b) There shall be one / two assignments (as described above) per Theory paper.

c) There shall be no separate / extra allotment of work load to the teacher concerned. He/ She shall conduct the Internal assessment activity during the regular teaching days / periods as a part of regular teaching activity.d) The concerned teacher / department / college shall have to keep the record of all the above activities until six months after the declaration of the results of that semester.

e) At the beginning of each semester, every teacher shall inform his / her students unambiguously the method he / she proposes to adopt and the scheme of marking for internal assessment.

f) Teacher shall announce the schedule of activity for internal assessment in advance in consultation with HOD / principal.

g) Final submission of internal marks to the University shall be before the commencement of the University Theory examinations.

Theory Papers:

6. All Theory papers shall be divided into four units.

7. The theory question papers shall be of 3 hours duration and comprise of 5 questions with equal weightage to all units.

8. The pattern of question papers is appended herewith.

Each theory paper will be of 50 marks each. All questions are compulsory and will carry equal marks. Question paper for any theory paper will comprise of five questions of 10 marks each. Question No. 1 to 4 will be from four units each with an internal choice. The questions can be asked in the form of long answer type for 10 marks.

Question No. 5 shall be compulsory with three questions / notes of very short answer type from each of the four units having 1 mark each. The student shall have an option of answering any 10 questions out of the 12 questions.

Practical:

9. Practical exam shall be of 4 hours duration.

10. The Practical Record of every student shall carry a certificate as shown below, duly signed by the teacherin-charge and the Head of the Department.

11. If the student fails to submit his / her certified Practical Record duly signed by the Teacher-In-Charge and the Head of the Department, he / she shall not be allowed to appear for the Practical Examination and no Marks shall be allotted to the student.

12. The certificate template shall be as follows:

CERTIFICATE

Name of the college / institution	
Name of the Department:	

This is to certify that this Practical Record contains the bonafide record of the Practical work of Shri / Kumari /

Shrimati	of	Semester
during the academic year	The candidate has satisfactorily	completed the experiments
prescribed by Rashtrasant Tukdoji Maharaj	Nagpur University for the subject	t

Dated ___/ ___/ ____

Signature of the teacher who taught the examinee

1._____ 2.____

Head of the Department

Appendix-A Teaching & Examination Scheme Bachelor of Science (Information Technology) [B.Sc. (IT)] Three Year (SIX SEMESTER) DEGREE COURSE B.Sc. (IT) Part I (Semester I)

C. No	Domono	Title of Deper	Taaab	ing C	ahama			1	Gromi	notion	Cahan			
SI.INO.	Fapers	The of Paper	Teach	ing S	cheme		т	1		nation	Schen		1	
				1	r		1	heory	1	r	ŀ	ractica	ul 👘	
			lh+Tu Periods)	r (Periods)	otal periods	Duration Hours	Aax Marks Th. Papers	Aax. Marks IA	otal	Ain Passing Aarks	Duration Hours	Aax Marks Practical	Ain Passing Aarks	Total (Th,Pr,AI)
			E O	ц	F		A H	~	F	~ ~ ~	Ц	ЧЧ	~ ~	
1.	-	English	4+1	-	4+1	3	60	15	75	30	-	-		75
2.	-	Marathi/Hindi/Ur du/Gujarati/ Sanskrit / Suppl. English	3	-	3	3	60	15	75	30	-	-		75
3.	Paper-I	Fundamentals of Information Technology	3	-	3	3	50	10	60	24	-	-	-	60
4.	Paper-II	Programming Methodology in 'C'	3	-	3	3	50	10	60	24	-	-	-	60
5.	Paper-III	System Analysis And Design	3	-	3	3	50	10	60	24	-	-	-	60
6.	Paper-IV	Web Technologies	3	-	3	3	50	10	60	24	-	-	-	60
7.	Paper-V	Multimedia Application Development	3	-	3	3	50	10	60	24	-	-	-	60
8.	Paper-VI	Applied Mathematics-I	3	-	3	3	50	10	60	24	-	-	-	60
9.	Pactical-I	Practical I – based on paper I & paper II		6	6	-	-	-	-	-	4	30	12	30
10.	Pactical-II	Practical II – based on paper III & paper IV		6	6	-	-	-	-	-	4	30	12	30
11.	Pactical-III	Practical III – based on paper V & paper VI		6	6	-	-	-	-	-	4	30	12	30

Note:

1. Th = Theory; Pr = Practical; Tu = Tutorial; IA = Internal Assessment.

2. Minimum marks for passing will be 40% of the total marks allotted to that paper / practical.

3. Candidate has to pass theory papers and practical separately.

- The strength of Batch of Practical and Tutorial for Under Graduates classes shall be 16 with an additional; of 10% with the permission of Hon'ble Vice-Chancellor.
- Details of Course of Languages shall be as per B.Sc. I

Teaching & Examination Scheme Bachelor of Science (Information Technology) [B.Sc. (IT)] Three Year (SIX SEMESTER) DEGREE COURSE B.Sc. (IT) Part I (Semester II)

Sr.No.	Papers	Title of Paper	Teach	ing So	cheme			I	Examii	nation	Schen	ne		
							Т	heory			Р	Practica	1	
			Th+Tu (Periods)	Pr (Periods)	Total periods	Duration Hours	Max Marks Th. Papers	Max. Marks IA	Total	Min Passing Marks	Duration Hours	Max Marks Practical	Min Passing Marks	Total (Th,Pr,AI)
1.	-	English	4+1	-	4+1	3	60	15	75	30	-	-		75
2.	-	Marathi/Hindi/Ur du, Gujarati, Sanskrit / Suppl. English	3	-	3	3	60	15	75	30	-	-		75
3.	Paper-I	Fundamentals of Digital Electronics	3	-	3	3	50	10	60	24	-	-	-	60
4.	Paper-II	Object Oriented Programming using 'C++'	3	-	3	3	50	10	60	24	-	-	-	60
5.	Paper-III	Operating Systems	3	-	3	3	50	10	60	24	-	-	-	60
6.	Paper-IV	Web Programming	3	-	3	3	50	10	60	24	-	-	-	60
7.	Paper-V	Database Management System	3	-	3	3	50	10	60	24	-	-	-	60
8.	Paper-VI	Applied Mathematics-II	3	-	3	3	50	10	60	24	-	-	-	60
9.	Pactical-I	Practical I – based on paper I & paper II		6	6	-	-	-	-	-	4	30	12	30
10.	Pactical-II	Practical II – based on paper III & paper IV		6	6	-	-	-	-	-	4	30	12	30
11.	Pactical-III	Practical III – based on paper V & paper VI		6	6	-	-	-	-	-	4	30	12	30

Note:

1. Th = Theory; Pr = Practical; Tu = Tutorial; IA = Internal Assessment.

2. Minimum marks for passing will be 40% of the total marks allotted to that paper / practical.

3. Candidate has to pass theory papers and practical separately.

- The strength of Batch of Practical and Tutorial for Under Graduates classes shall be 16 with an additional; of 10% with the permission of Hon'ble Vice-Chancellor.
- Details of Course of Languages shall be as per B.Sc. I

Teaching & Examination Scheme Bachelor of Science (Information Technology) [B.Sc. (IT)] Three Year (SIX SEMESTER) DEGREE COURSE B.Sc. (IT) Part II (Semester III)

Sr.No.	Papers	Title of Paper	Teach	ing So	cheme			I	Examii	nation	Schem	ne		
	1	1		0			Т	heory			Р	ractica	1	
			Th+Tu (Periods)	Pr (Periods)	Total periods	Duration Hours	Max Marks Th. Papers	Max. Marks IA	Total	Min Passing Marks	Duration Hours	Max Marks Practical	Min Passing Marks	Total (Th,Pr,AI)
1.	Paper-I	Microprocessor & ALP	3	-	3	3	50	10	60	24	-	-	-	60
2.	Paper-II	Data Structures	3	-	3	3	50	10	60	24	-	-	-	60
3.	Paper-III	Data Communication & Network - I	3	-	3	3	50	10	60	24	-	-	-	60
4.	Paper-IV	Linux Operating System	3	-	3	3	50	10	60	24	-	-	-	60
5.	Paper-V	E-Commerce	3	-	3	3	50	10	60	24	-	-	-	60
6.	Paper-VI	Statistical Methods	3	-	3	3	50	10	60	24	-	-	-	60
7.	Pactical-I	Practical I – based on paper I & paper II		6	6	-	-	-	-	-	4	30	12	30
8.	Pactical-II	Practical II – based on paper III & paper IV		6	6	-	-	-	-	-	4	30	12	30
9.	Pactical-III	Practical III – based on paper V & paper VI		6	6	-	-	-	-	-	4	30	12	30

Note:

1. Th = Theory; Pr = Practical; Tu = Tutorial; IA = Internal Assessment.

2. Minimum marks for passing will be 40% of the total marks allotted to that paper / practical.

3. Candidate has to pass theory papers and practical separately.

Grand Total of Semester III: 450

Teaching & Examination Scheme Bachelor of Science (Information Technology) [B.Sc. (IT)] Three Year (SIX SEMESTER) DEGREE COURSE B.Sc. (IT) Part II (Semester IV)

Sr.No.	Papers	Title of Paper	Teach	ing So	cheme		*	F	Examii	nation	Schem	ne		
							Т	heory			Р	ractica	1	
			Th+Tu (Periods)	Pr (Periods)	Total periods	Duration Hours	Max Marks Th. Papers	Max. Marks IA	Total	Min Passing Marks	Duration Hours	Max Marks Practical	Min Passing Marks	Total (Th,Pr,AI)
1.	Paper-I	Software Engineering	3	-	3	3	50	10	60	24	-	-	-	60
2.	Paper-II	Java Programming	3	-	3	3	50	10	60	24	-	-	-	60
3.	Paper-III	Data Communication & Network - II	3	-	3	3	50	10	60	24	-	-	-	60
4.	Paper-IV	Oracle	3	-	3	3	50	10	60	24	-	-	-	60
5.	Paper-V	Compiler Construction	3	-	3	3	50	10	60	24	-	-	-	60
6.	Paper-VI	Numerical Methods	3	-	3	3	50	10	60	24	-	-	-	60
7.	Pactical-I	Practical I – based on paper I & paper II		6	6	-	-	-	-	-	4	30	12	30
8.	Pactical-II	Practical II – based on paper III & paper IV		6	6	-	-	-	-	-	4	30	12	30
9.	Pactical-III	Practical III – based on paper V & paper VI		6	6	-	-	-	-	-	4	30	12	30

Note:

1. Th = Theory; Pr = Practical; Tu = Tutorial; IA = Internal Assessment.

2. Minimum marks for passing will be 40% of the total marks allotted to that paper / practical.

3. Candidate has to pass theory papers and practical separately.

Grand Total of Semester IV: 450

Teaching & Examination Scheme Bachelor of Science (Information Technology) [B.Sc. (IT)] Three Year (SIX SEMESTER) DEGREE COURSE B.Sc. (IT) Final (Semester V)

Sr.No.	Papers	Title of Paper	Teach	ing Sc	cheme			E	Examir	nation	Schem	ne		
							Т	heory			Р	ractica	1	
			Th+Tu (Periods)	Pr (Periods)	Total periods	Duration Hours	Max Marks Th. Papers	Max. Marks IA	Total	Min Passing Marks	Duration Hours	Max Marks Practical	Min Passing Marks	Total (Th,Pr,AI)
1.	Paper-I	Software Project Management	3	-	3	3	50	10	60	24	-	-	-	60
2.	Paper-II	Dot Net Framework and C#	3	-	3	3	50	10	60	24	-	-	-	60
3.	Paper-III	Network Security	3	-	3	3	50	10	60	24	-	-	-	60
4.	Paper-IV	Data Warehousing	3	-	3	3	50	10	60	24	-	-	-	60
5.	Paper-V	VB Programming	3	-	3	3	50	10	60	24	-	-	-	60
6.	Paper-VI	Graph Theory	3	-	3	3	50	10	60	24	-	-	-	60
7.	Pactical-I	Practical I – based on paper I & paper II		6	6	-	-	-	-	-	4	30	12	30
8.	Pactical-II	Practical II – based on paper III & paper IV		6	6	-	-	-	-	-	4	30	12	30
9.	Pactical-III	Practical III – based on paper V & paper VI		6	6	-	-	-	-	-	4	30	12	30

Note:

1. Th = Theory; Pr = Practical; Tu = Tutorial; IA = Internal Assessment.

2. Minimum marks for passing will be 40% of the total marks allotted to that paper / practical.

3. Candidate has to pass theory papers and practical separately.

Grand Total of Semester V: 450

Teaching & Examination Scheme Bachelor of Science (Information Technology) [B.Sc. (IT)] Three Year (SIX SEMESTER) DEGREE COURSE B.Sc. (IT) Final (Semester VI)

The of Paper	Teach	ing So	cneme			1 1	2xamir	nation	Schem	ne		
					(1)							
					1	heory	1		P	ractica	.1	
	Th+Tu (Periods)	Pr (Periods)	Total periods	Duration Hours	Max Marks Th. Papers	Max. Marks IA	Total	Min Passing Marks	Duration Hours	Max Marks Practical	Min Passing Marks	Total (Th,Pr,AI)
Enterprise Resource Planning	3	-	3	3	50	10	60	24	-	-	-	60
Advanced Java Programming	3	-	3	3	50	10	60	24	-	-	-	60
Cloud Computing	3	-	3	3	50	10	60	24	-	-	-	60
Data Mining	3	-	3	3	50	10	60	24	-	-	-	60
Animation Techniques	3	-	3	3	50	10	60	24	-	-	-	60
Operation Research	3	-	3	3	50	10	60	24	-	-	-	60
Practical I – based on paper I & paper II		6	6	-	-	-	-	-	4	30	12	30
Practical II – based on paper III & paper IV		6	6	-	-	-	-	-	4	30	12	30
Practical III – based on paper V & paper VI		6	6	-	-	-	-	-	4	30	12	30
	Enterprise Resource Planning Advanced Java Programming Cloud Computing Data Mining Data Mining Animation Techniques Operation Research Practical I – based on paper I & paper II Practical II – based on paper III & paper IV Practical III – based on paper V & paper VI	Enterprise Resource Planning3Advanced Java Programming3Advanced Java Programming3Cloud Computing Data Mining3Data Mining3Operation Research3Practical I – based on paper I & paper II3Practical II – based on paper V & paper VI4	Image: Problem in the systemImage: Problem in the systemImage: Problem in the systemImage: Problem in the systemEnterprise Resource Planning3-Advanced Java Programming3-Advanced Java Programming3-Cloud Computing Data Mining3-Data Mining Techniques3-Operation Research3-Practical I – based on paper I & paper II6Practical II – based on paper V & paper VI6	Image: Problem in the second constraint of the second c	Image: Problem of the second	Image: Problem of the systemSystem <t< td=""><td>Image: Problem Image: Problem Hard HardImage: Problem Problem HardImage: Problem Problem HardImage: Problem Problem HardImage: Problem Problem HardImage: Problem Problem HardImage: Problem Problem HardImage: Problem Problem HardImage: Problem Problem HardImage: Problem Problem HardImage: Problem Problem HardImage: Problem Problem HardImage: Problem Problem Hard</br></br></br></br></br></br></br></br></br></br></br></br></br></br></br></br></br></td></t<> <td>Image: constraint of the symmetry is a symmetry in the second on paper II$(sp)_{i1ad}$$(sp)_{i1ad$</td> <td>Image: Second constraints <th< td=""><td>I_{L} I_{L} I_{L}</td><td>$\begin{array}{c c c c c c c c c c c c c c c c c c c$</td><td>$\begin{array}{c c c c c c c c c c c c c c c c c c c$</td></th<></td>	Image: Problem Image: Problem Hard HardImage: Problem Problem HardImage: Problem Problem 	Image: constraint of the symmetry is a symmetry in the second on paper II $(sp)_{i1ad}$ $(sp)_{i1ad$	Image: Second constraints Second constraints <th< td=""><td>I_{L} I_{L} I_{L}</td><td>$\begin{array}{c c c c c c c c c c c c c c c c c c c$</td><td>$\begin{array}{c c c c c c c c c c c c c c c c c c c$</td></th<>	I_{L}	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c c c c c c c c c c c c c c c c c c $

Note:

1. Th = Theory; Pr = Practical; Tu = Tutorial; IA = Internal Assessment.

2. Minimum marks for passing will be 40% of the total marks allotted to that paper / practical.

3. Candidate has to pass theory papers and practical separately.

Grand Total of Semester VI: 450.

The valuation scheme of practical examination will be as under.

Record	- 06
Viva	- 06
Writing	- 09
Execution	- 09
TOTAL	- 30

B. Sc. (IT) Part I Semester-I Paper I Fundamentals of Information Technology

UNIT - I :

Basic Components of Digital Computers: Block Diagram. **CPU:** Functions of Each Unit: Primary Memory, ALU and CU, Instruction format. **Bus**: Data, Control and Address Bus **Number Systems:** Binary, Octal, Decimal, HexaDecimal, Their Conversions, Binary Arithmetic. ASCII, BCD, EBCDIC.

Language Evolution : Generation of Languages : Machine, Assembly, High Level Languages. Characteristics of Good Language **Translators :** Compiler, Interpreter and Assembler. Source and Object Program.

UNIT - II :

Memory: Static & dynamic, RAM, ROM, PROM, EPROM, EEPROM, flash and Cache. **Storage Devices**: Hard Disk, Zip Disk and Optical Disk. Pen Drive, Blue Ray

UNIT - III :

Input Devices: Keyboard, Mouse, Light Pen, Touch Screen, Voice Input, MICR, OCR, OMR, Barcode Reader and Flatbed Scanner.

Output Devices: VDU, Printers: Dot Matrix, Laser and Inkjet.

Plotters: Drum, Flat-Bed and Inkjet.

UNIT - IV :

Network: Network terminology, Topologies : Linear, Circular, Tree and Mesh. Types of Networks: LAN, WAN, MAN. Repeaters, Bridge, Routers, Brouters and Gateway. Modem for Communication between pc's, wi-fi network, Introduction of Bluetooth and Infrared devices. Network protocols. Architecture : Peer-to-Peer, Client/Server.

Reference Books:

1. Information technology concepts by Dr. Madhulika Jain, Shashank & Satish Jain, [BPB Publication, New Delhi.]

2. Fundamentals of Information Technology By Alexis And Mathews Leon

[Leon Press, Chennai & Vikas Publishing House Pvt Ltd, New Delhi]

B. Sc. (IT) Part I Semester-I Paper II Programming Methodology in C

UNIT-I:

Programming Structure : Sequence, Selection, Iteration and Modular. **Problem Solving techniques**: Development Tools: Algorithm, Flowcharts and Pseudo code (Definition and its characteristics) **Developing Algorithm and Drawing flowcharts**

UNIT-II:

C Character set, Tokens, Identifier, Keywords, Variables, Data types, Qualifiers. Operators and Expressions: Arithmetic, Relational, Logical, Bit-Wise, Increment, Decrement, Conditional and Special operators. typedef, Type Conversion, Constants, Declaring Symbolic Constants, Character Strings, Enumerated Data Types, Operator Precedence and Associativity. Library functions. : Maths, string handling Functions. Control Structure: Compound Statement, Selection Statement: if, if-else, Nested if, switch. Iteration statement: for, while, do..while, Nested loops, Jump statement: break, continue, goto. (Special emphasis on problem solving)

UNIT-III:

Arrays: Need, Types: Single and Two Dimensional Array. **Strings**: Strings Manipulation, Arrays of Strings, Evaluation order **Function**: Function Components, Return Data type, Parameter Passing, Return by Reference, Default Arguments, Recursive Functions, Arrays with Functions, Storage Classes. (Special emphasis on problem Solving)

UNIT-IV:

Structure: Declaration, Definition, Accessing structure members, Initialization, Nesting of Structures. **Union**: Unions, Differences between Structure and Union **Pointer:** Introduction, Address Operator (&), Pointer variables, Void pointers, Pointer Arithmetic, Pointers to Pointers.

File handling: Hierarchy of File Stream Classes, Opening & closing a file, Testing for errors, File Modes, File pointers and their manipulations, Sequential Access, Random Access, Command Line arguments.

- 1. The Art of programming through flowcharts & algorithm by Anil B. Chaudhari Firewall Media, Laxmi publication, New Publication.
- 2. Programming in C by E. Balagurusamy TMH Publications.
- 3. C Programming Kernighen Ritche
- 4. Programming with C Y. Kanetkar.
- 5. C Programming Holzner, PHI Publication.
- 6. Programming in C Ravichandran.

B. Sc. (IT) Part I Semester-I Paper III System Analysis and Design

UNIT - I :

Introduction : System, Subsystems, Components of Computerized Information System, Systems Analysts, SDLC, Prototyping. **Feasibility Study and Analysis:** Identifying Problems, Organizing Feasibility Analysis: Economic, Financial, Organizational and Technological. Feasibility Decision, Choice of a solution. **Data Collection:** Interviews, Brain Storming, Questionnaires, Document Search, Observation.

UNIT - II :

Structured tools and techniques of Data analysis : Structured English, Process Charts, SOP, Decision Tables and Decision Trees, Data Flow Diagram, Data Dictionary.

(Special emphasis on problem solving)

System Design : Input design: Input Validation, Human factor Consideration, Messages, System Tolerance. Output design: Categories of output, Design Principles, Control of Output. Forms: Principles of Form Design, Ways to ensure Quality Forms.

Codes: Types, Physical Representation of Codes, Principle of Code Design.

UNIT - III :

Implementation: Training, Operational Training and Related Activities, Planning to Implement Change, Change Strategies.

Testing: Preparation for Testing, Test Execution: Levels of Testing, Component, Function, Subsystem, System, Test Evaluation, Acceptance.

Conversion: Cold Turkey, Parallel, Pilot, Modular and Sequential Methods. Conversion Period Length. **System Evaluation.**

UNIT - IV :

Project Planning, Metrics for Project Size Estimation, Project Estimation Techniques, **Scheduling:** Work Breakdown Structure, Activity Networks and CPM, Gantt Charts, PERT Charts, Project Monitoring and Control. Risk Management, Software Configuration Management: Necessity, Configuring Management Activities

Software Reliability and Quality Management: Software Reliability, Software Quality, ISO 9000. Software Maintenance: Characteristics of Software Maintenance, Maintenance Process Models, Estimation of Maintenance Cost.

Software Reuse: What can be reused, Why no reuse so far, Basic Issues.

- 1. Information Systems Analysis, Design and Implementation By K. M. Hussain Donna Hussain [Tata McGraw-Hill Publishing Company Ltd, New Delhi]
- 2. Fundamentals of Software Engineering by Rajib Mall [PHI Publication]
- 3. Workbook on Systems Analysis & Design by V. Garg [PHI Publication]
- 4. System Analysis and Design- Don Yeates, shiebls, Helmy (M).
- 5. System Analysis & Design Edward TMH
- 6. System Analysis and Design Satzinger, Robert Jackson and Stephen Burd, Thomson Learning
- 7. Introduction to Systems Analysis Design, Igor Hawryszkiewycz, PHI

B. Sc. (IT) Part I Semester-I Paper IV Web Technologies

UNIT I

Introduction to Internet, Requirement for connecting to internet, Basic internet term, Introduction to World Wide Web (WWW), Evaluation of world wide web, basic features of www, web browsers, web server. **Internet Security:** Secure Transaction, Privacy issues, computer crimes and its type. **Security Issues:** Security threats like damage to data, loss of data and unauthorized use of data. **Security Procedure:** Firewall, Encryption, Password, Access Control List, Digital Certificate.

UNIT – II

Introduction to HTML, Features of HTML, Advantage and Disadvantage of HTML, Basic structure of HTML documents. **Creating web pages with HTML Tags :** <HTML>, <HEAD>, <TITLE>, <BODY>,Heading tags, Paragraph tags, Alignment, Font tag and its attributes, line break, Pre-formatted text tag, list element (Unordered lists, ordered list, Definition list, Marquee tags and its attribute. **Character formatting tags:** Logical verses physical style, logical and physical tags. Changing the colors of the fonts. **Linking :**Relative pathnames verses absolute pathnames, URLs, Linking within a web page, linking to a different web page, linking to external web page, linking to an image by image, linking to document located in different directory, types of URLs .

UNIT – III

Images: IMG element and its attributes, Images as a Hyperlink, Image map, Image Formats, Frames. **Tables:** TABLE element and its attributes, Creating simple tables, Row element, Data element, Spanning rows and columns. **Form designs**: Form Controls, Text controls, password fields, radio buttons, checkboxes, reset and submit buttons, select element, option, Image and textarea. **Embedding Multimedia:** Introduction, Embedding Multimedia, Inserting sound/audio formats, video file formats. DHTML: using DHTML in internet explorer, heading and horizontal line, hidden message, the message at the center of the page, moving boxes, changeable box.

UNIT – IV

Cascading Style Sheets (CSS): advantage of CSS, Disadvantage of CSS, Defining a Style, Inline style sheet, Embedded Style sheet, External style sheets. **Style sheet Properties:** Font, color, background, creating group, text, Box properties, span tag.

Scripting Language: JAVA SCRIPT – Introduction, Advantages, Disadvantages, Working of JavaScript, Structure of JavaScript program, Variable, Data types, Operators & Expression, Decision Making- if—else, switch, loops(for, for...in, while, do...while), break & continue, , Arrays

BOOKS:

- 1. Complete HTML by BPB
- 2. HTML 4 Unleashed (SAMS)
- 1. Dynamic HTML by O'RELLY (SPD)
- 2. Java Script Programming for the absolute beginner by Harris (PHI)

B. Sc. (IT) Part I Semester-I Paper V Multimedia Application Development

Unit I

Fundamental concepts in Text and Image: Multimedia and hypermedia, world wide web, overview of multimedia software tools. Graphics and image data representation graphics/image data types, file formats, Color in image and video: color science, color models in images, color models in video.

Unit II

Fundamental concepts in video and digital audio: Types of video signals, analog video, digital video, digitization of sound, MIDI, quantization and transmission of audio.

Unit III

ActionScript Features. **Object-Oriented** Action Script I: ActionScript, Datatypes Type Checking, Classes, Authoring ActionScript Class. and an 2.0 Action Script II: Inheritance, Authoring an ActionScript Subclass, Interfaces, Packages, Exceptions.

Unit IV

Application Development: Application Frame work, Using Components with ActionScript MovieClip Subclasses.

Multimedia data compression: Lossless compression algorithm: Run-Length Coding, Variable Length Coding, Dictionary Based Coding, Arithmetic Coding, Lossless Image Compression, Lossy compression algorithm: Quantization, Transform Coding, Wavelet-Based Coding. Embedded Zerotree of Wavelet **Coefficients Set Partitioning** in Hierarchical Trees (SPIHT).

Text Books:

- 1. Fundamentals of Multimedia by Ze-Nian Li and Mark S. Drew PHI/Pearson Education.
- 2. Essentials Action Script 2.0, Colin Moock, SPD O, REILLY

B. Sc. (IT) Part I Semester-I Paper VI Applied Mathematics-I

UNIT-I:

Propositional Calculus:

Connectives, Negation, conjunction, Disjunction, statement formulas and truth tables, conditional and Bi-conditional, well formed formulas, Tautologies, Equivalence of formulas, duality law, Tautologies implications, Functionally complete set of, other connectives,

UNIT-II:

Disjunctive normal forms, connective normal forms, Principal disjunctive normal form, Principal conjunctive normal form.

UNIT-III:

Predicate Calculus:

The theory of Inference for statement Calculus, validity using truth tables, Rules of inference, consistency of premises and indirect method of Proof

UNIT-IV:

The statement function, variables and quantifier, Predicate formulas, Free and Bound variables, The universe of Discourse, Theory of inference for predicate calculus.

- 1. Discrete Mathematical Structures with applications to computer Science By J,P.Tremblay & R. Manohar, (TMH)
- 2. Discrete Mathematical Structures by Kolman Busby and Ross (pearson)
- 3. Discrete Mathematics By Norman Biggs. (Oxford).
- 4. Logic and Discrete Mathematics : Grassmann, Tremblay (Pearson)
- 5. Introduction to Automata Theory, Languages, and computation :Hopcroft, Motwani and Ullman(Pearson)
- 6. An introduction to the theory of computer science, languages and machines : Sudkamp
- 7. Kenneth H Rosen Discrite Mathematics & it's Applications TMH

B. Sc. (IT) Part I Semester-II Paper I Fundamentals of Digital Electronics

Unit – I

Data and Information: Features of Digital Systems, Number Systems: Decimal, Binary, Octal, Hexadecimal & their inter conversions, Representation of Data: Signed Magnitude, one's complement & two's complement, Binary Arithmetic, Fixed point representation and Floating point representation of numbers.

Codes: BCD, XS-3, Gray code, hamming code, alphanumeric codes (ASCII, EBCDIC, UNICODE), Error detecting and error correcting codes.

Unit- II

Boolean Algebra: Basic gates (AND, OR, NOT gates), Universal gates (NAND and NOR gates), other gates (XOR, XNOR gates). Boolean identities, De Morgan Laws. Karnaugh maps: SOP and POS forms, Quine McClusky method.

Unit –III

Combinational Circuits: Half adder, full adder, code converters, combinational circuit design, Multiplexers and demultiplexers, encoders, decoders, Combinational design using mux and demux. Sequential Circuit Design: Flip flops (RS, Clocked RS, D, JK, JK Master Slave, T, Counters, Shift registers and their types, Counters: Synchronous and Asynchronous counters.

Unit- IV

Computers: Basic Organization, Memory: ROM, RAM, PROM, EPROM, EEPROM, Secondary Memory: Hard Disk & optical Disk, Cache Memory, I/O devices

Books:

- 1. Modern Digital Electronics by R. P. Jain, 3rd Edition, McGraw Hill
- 2. Digital Design and Computer Organisation by Dr. N. S. Gill and J. B. Dixit, University Science Press

B. Sc. (IT) Part I Semester-II Paper II Object Oriented Programming Using 'C++'

UNIT - I:

Object Oriented Methodology: Elements of Object Oriented programming, Objects, Classes, OOPs features. **Classes & Objects:** Specifying a Class, Creating Objects, Accessing Class members, Defining member function, Outside Member Functions as inline, Accessing Member Functions within the class, Static data member, Access Specifiers: Private, Protected and Public Members.

UNIT - II :

CONSTRUCTORS & DESTRUCTORS: Introduction, Parameterized Constructors, Constructor Overloading, Constructors with Default Arguments, Copy Constructor, Destructor, Order of Construction and Destruction, Static data members with Constructor and Destructors. **OPERATOR OVERLOADING:** Definition, Overloadable Operators, Unary Operator Overloading, Unary & Binary overloading, Rules for Operators Overloading.

UNIT - III :

DYNAMIC OBJECTS: Pointers to Objects, Creating and Deleting Dynamic Objects: New and Delete operators, Array of Objects, Array of Pointers to Objects, Pointers to Object Members, this Pointer. **INHERITANCE**: Defining, Abstract classes, Single, Multilevel, Multiple, Hierarchical, Hybrid Inheritance, Constructor and Destructor in Derived Classes.

UNIT - IV :

VIRTUAL FUNCTIONS: Need for Virtual Functions, definition, Pure Virtual Functions, Abstract Classes, Rules for Virtual Functions. **EXCEPTION HANDLING:** Exception Handling Model, List of Exceptions, Handling Uncaught Exceptions, Fault Tolerant Design Techniques, Memory Allocation Failure Exception, Rules for Handling Exception Successfully.

- 1. Mastering C++ by K R Venugopal Tata McGraw-Hill, New Delhi.
- 2. The C++ Programming Language –Bjarne Stroustrup
- 3. Programming with C++ Ravichandran
- 4. Programming with C++ Robert Lafore
- 5. Object Oriented Programming with C++ by E. Balagurusamy, McGraw Hill

B. Sc. (IT) Part I Semester-II Paper III Operating System

UNIT - I:

Structure of Operating System, Operating System functions, Characteristics of Modern OS. **Process Management**: Process states, Creation, Termination, Operations on Process, Concurrent process, Processes Threads, Multithreading, Micro Kernels **CPU Scheduling**: Schedulers, Scheduling Methodology, CPU Scheduling Algorithm: FCFS, SJF, RR, Priority Scheduling.

UNIT – II:

Performance comparison : Deterministic Modeling , Queuing analysis, Simulators. **Deadlock and Starvation:** Resource Allocation Graph, Conditions for Dead Lock, Dead Lock Prevention, Dead Lock Detection, Recovery from Deadlock.

UNIT - III:

Memory Management: Logical Vs. Physical Address Space, Swapping, Memory Management Requirement, Dynamic Loading and Dynamic Linking, Memory Allocation Method: Single Partition allocation, Multiple Partitions, Compaction, paging, segmentation, Segmentation with paging. Protection.

UNIT - IV:

I/O Management: I/O hardware, I/O Buffering, Disk I/O, Raid, Disk Cache. **File Management**: File Management system, File Accessing Methods, File Directories, File Allocation Methods, File Space Management, Disk Space Management, Record blocking. **Protection Mechanisms**: Cryptography, Digital Signature, User Authentication.

- 1. Operating Systems by P. Balakrishna Prasad [Scitech Publication]
- 2. Operating System Concept : Silbershaz (Addision Education)
- 3. Operating Systems H.M. Deitel Addision Wesley.
- 4. Operating Systems- John J. Donoven.
- 5. Operating System : A.S.Godbole (TMH)
- 6. Modern Operating Systems : Tenenenbaum (Pearson Education)
- 7. Operating System : Peterson.

B. Sc. (IT) Part I Semester-II Paper IV Web Programming

Unit I

Internet, Internet users and working, Information on Internet, Requirements for connecting to Internet, Basic Internet Terms, Introduction to world wide web, Evaluation of world wide web, basic features, web browsers, popular web browsers, web servers, HTTP, URL, Search Engines, Search Engines categories, how to use Search Engines, Searching criterion, Introduction to browsers, Working with e-mail, Parts of e-mail text, working with messages.

Unit II

Java Script -Introduction, values and variables, operators, loops and various statements in java script, Date object, Math object, string object, window events, working with forms, document object, screen object, navigator object, images and animation, java script objects

Declaration, definition, and referencing. Identifiers scope rules. Recursion. Arrays; declaration, allocation & accessing, sorting of arrays, JavaScript objects : Math, String, Date, Number and Boolean.

Documents, forms, Statements, Functions, Objects in Java scripts, events and event handling, arrays, FORMS, Buttons, Checkboxes, Text fields and text areas.

Unit-III

Introduction to active server pages (ASP) : working of ASP, setup, ASP objects, file system object, session tracking & cookies. Accessing databases using ASP.

XML: Introduction, Document type definition, XML Schemas, Document Object model, Presenting XML, Using XML Processors: DOM and SAX

Unit IV

XML displaying an XML Document, Data interchange with an XML Document, advantages of integrating ASP & XML. Introduction to Java Server Pages (JSP): scripting standard actions, Directives. Custom tag libraries. JSP & XML case study: advantages of integrating JSP & XML.

References:

- 1. Deitel, Deitel & Nieto, Internet and Worldwide Web how to Program, Pearson Education
- 2. Techmedia : The Complete Java Script
- 3. Eddy et. al. : "Teach Yourself Active Server Pages" (IDG)
- 4. R Bangia, Second edition Internet and web design, firewall media
- 5. R Bangia Multimedia and Wed technology
- 6. Internet and web designing, Macmillan
- 7. Ivan Bayross Web Enabled Commercial Application Development Using HTML, DHTML, JS, Perl
- 8. Kathhleen Kalata, Internmet Programming with VBScript and Java Script. Thomson Publication
- 9. Robert W. Sebesta, Programming the World Wide Web Pearson
- 10. Pekowsky : "Java Server Pages" (Pearson Education)

B. Sc. (IT) Part I Semester-II Paper V Database Management System

UNIT-I:

DBMS: Definition: Databases, DBMS, Problems with traditional file processing system, Objectives of the database systems, Three level architectures of DBMS, Component of DBMS, Database Administrator, Database Users, Data model, Different types of data models, Concepts of Hierarchical, Network Models.

UNIT-II:

E-R Models : Basic Concepts, Entity, Attributes, Relation Ship, Mapping, Keys, Weak and Strong Entity Set, Problems on E-R Diagrams, Extended E-R Features: Specialization, Generalization, Aggregation, Problems on Reduction of an E-R Schema to Tables, Tabular representation of Strong, Weak entity Sets and Relationship Sets.

UNIT-III:

Relational Model: Structure, Relational Algebra, Fundamental Operations, Set –Intersection, Natural Join, Division and Assignment Operation. Extended Relational Algebra Operations, Aggregate Functions.

UNIT-IV:

Functional Dependency: Functional Dependency, Fully Functional Dependency, Partial Dependency, Transitive Dependency, Multi Valued Dependency. Normalization, Normal Forms (1NF, 2NF, 3NF, BCNF, 4NF, 5NF). Problems on Normal forms.

- 1. Data Base System Concepts By A SilbersChatz By Henry Korth And S.Sudarshan [Mcgraw-Hill ltd. New Delhi] 3rd Edition.
- 2. Introduction to Data Base Management by NAVEEN PRAKASH [Tata McGrawHill ltd.]
- 3. Bipin C. Desai, An Introduction to Database Systems, Galgotia Publications.
- 4. Raghu Ramakrishnan & Johannes Gerhrke, "Data Base Management Systems", Mc Graw Hill International Edition, 2000
- 5. Muzumdar, Introduction to Database Management Systems. TMH

B. Sc. (IT) Part I Semester-II Paper VI Applied Mathematics-II

UNIT - I :

Set Theory: Set, Subsets operations on set, Venn diagram, algebra on sets, Cartesian product of sets, Binary relations, Properties of binary relation, Relation matrix and the graph of relation, Partial order relations, Equivalence relations, Equivalence Classes, Composition of relations.

UNIT - II :

Functions - definition, types of function, Invertible functions composition of functions.

Counting - Permutation, Combinations, The pigeonhole principle, recurrence relation, Mathematical Induction.

UNIT - III :

Algebraic Structures Semi groups & groups: Binary operations, Semi groups, isomorphism and Homomorphism, Product and Quotient of semi groups, Groups, subgroups, products and Quotient of groups.

Lattices: - Lattice concepts, isomorphic Lattices, Properties of lattices, Finite Boolean algebras.

UNIT - IV :

Graph Theory: Basic concepts, types of graphs, Representation of graph in memory, Euler path and circuits, Hamiltonian Path and circuits.

Trees:- Basic concepts, Libeled trees, Undirected trees.

- 1. Discrete Mathematical Structures with applications to computer Science By J,P.Tremblay & R. Manohar, (TMH)
- 2. Discrete Mathematical Structures by Kolman Busby and Ross (pearson)
- 3. Discrete Mathematics By Norman Biggs. (Oxford).
- 4. Logic and Discrete Mathematics : Grassmann, Tremblay (Pearson)
- 5. Introduction to Automata Theory, Languages, and computation :Hopcroft, Motwani and Ullman(Pearson)
- 6. An introduction to the theory of computer science, languages and machines : Sudkamp
- 7. Kenneth H Rosen Discrite Mathematics & it's Applications TMH

B. Sc. (IT) Part II Semester -III Paper I Microprocessor and ALP

UNIT-I

An over view of 8085, Architecture of 8086 Microprocessor. Special functions of General purpose registers. 8086 flag register and function of 8086 Flags. Addressing modes of 8086. Instruction set of 8086. Assembler directives, simple programs, procedures, and macros.

Assembly language programs involving logical, Branch & Call instructions, sorting, evaluation of arithmetic expressions, string manipulation.

UNIT-II

Pin diagram of 8086-Minimum mode and maximum mode of operation. Timing diagram. Memory interfacing to 8086 (Static RAM & EPROM). Need for DMA. DMA data transfer Method. Interfacing with 8237/8257.

8255 PPI – various modes of operation and interfacing to 8086. Interfacing Keyboard, Displays, 8279 Stepper Motor and actuators. D/A and A/D converter interfacing.

UNIT-III

Interrupt structure of 8086. Vector interrupt table. Interrupt service routines. Introduction to DOS and BIOS interrupts. 8259 PIC Architecture and interfacing cascading of interrupt controller and its importance.

Serial data transfer schemes. Asynchronous and Synchronous data transfer schemes. 8251 USART architecture and interfacing. TTL to RS 232C and RS232C to TTL conversion. Sample program of serial data transfer. Introduction to High-speed serial communications standards, USB.

UNIT-IV

Advanced Micro Processors - Introduction to 80286, Salient Features of 80386, Real and Protected Mode Segmentation & Paging, Salient Features of Pentium, Branch Prediction, Overview of RISC Processors.

TEXT BOOKS :

1. Advanced microprocessor and Peripherals - A.K.Ray and K.M.Bhurchandi, TMH, 2000.

2. Micro Controllers – Deshmukh, Tata McGraw Hill Edition.

B. Sc. (IT) Part II Semester -III Paper II Data Structures

UNIT - I :

LINKED LIST : Linked List, Representation of Single, Double, Header, Circular Single and Double Linked list, All possible operations on Single and Double linked List using Dynamic representation, Polynomial Representation and its Manipulation.

UNIT - II :

STACKS : Stacks terminology, Representation of Stacks in Memory, Operation on Stacks, Polish Notations, Translation of infix to postfix & prefix expression, Infix to Postfix Conversion, Evaluation of Postfix Expression, Recursion, Problems on Recursion, Quick Sort and Tower of Hanoi Problem.

UNIT - III :

QUEUE : Representation of Queues in Memory, Circular Queue. Dequeue and Priority Queue. Operations of above Structure using Array and Linked Representation.

SORTING AND SEARCHING: Selection Sort, Insertion Sort, Merge Sort, Efficiency of Sorting Methods, Big-O Notations.

Hash Tables, Hashing Technique, Collision Resolution Technique.

UNIT - IV :

TREES : Basic Terminologies, Representation of Binary Trees in Memory, Traversing of Binary tree, Binary Search Tree, Operation on Binary Search Tree, Heap Tree, Operation on Heap Tree, Heap Sort Method

GRAPHS : Basic Terminologies, Definition and Representation of Graphs in Memory: Linked List and Matrix Representation. Traversing graphs : BSF, DFS Method.

- 1. Classical Data Structures : D. Samanta. PHI, New Delhi.
- 2. DATA STRUCTURE : LIPSCTUZ SCHUM OUTLINE SERIES
- 3. Data structure Using C++ : Y. Kanetkar
- 4. Data Structures Using C++: Tennenbaum
- 5. Data structures by Tremblay Sorenson
- 6. Data structures by Bhagat singh Naps

B. Sc. (IT) Part II Semester -III Paper III Data Communication & Network-I

Unit-I:-

Introduction to data communications and Networking:- Introduction, history, data communication and network architecture, protocols and standards, standards organization, layered network architecture, open systems interconnection, data communications circuits, serial and parallel data transmission, circuit arrangements and data communication networks, alternate protocol suite. Signal, Noise, Modulation and Demodulation:- Introduction, signal analysis, Electrical Noise and Signal to Noise ratio, analog modulation systems, Information capacity, bits, Bit rate, Baud and Mary Encoding, digital modulation.

Unit –II:

Transmission Media:- Introduction , Metallic cable Metallic transmission lines, transverse electromagnetic waves, characteristics , transmission line classifications, M.T line types, M.T. line equivalent circuit , Wave propagation on metallic transmission lines , metallic transmission line losses. Optical fiber Transmission media:- Introduction, Advantages and Disadvantages of optical fiber cables , Electromagnetic spectrum , O.F. Communication system block diagram, Optical fiber Construction , the physics of light, velocity of propagation, propagation of light through an Optical fiber cable, Optical fiber modes and classifications , O.F. Comparison , losses in optical fiber cables, light sources, light detectors , lasers Digital transmission:- Introduction, Pulse modulation, pulse code modulation, dynamic range, Signal Voltage-to-quantization Noise Voltage Ratio, Linear Versus Nonlinear PCM Codes, Companding, PCM Line Speed, Delta Modulation PCM & Differential PCM.

Unit –III

Wireless Communication Systems:- Introduction, Electromagnetic Polarization, Rays & Wavefronts, Electromagnetic Radiation, Spherical wavefronts & the Inverse Square law, Wave Attenuation & Absorption, Optical Properties of Radio Waves, Terrestrial Propagation of Electromagnetic Waves, Skip Distance, free-Space Pathloss, Microwave Communication Systems, Satellite Communication Systems. Data Communication Codes, Error Control & data Formats:- Introduction, Data Communication Character Codes, Barcodes, Error Control, Error Detection, Error Correction, Character Synchronization. Data Communication Hardware, Data Communications Circuit, Line Control Unit, serial Interfaces.

Unit – IV

Network Topologies & Connectivity Devices:- Introduction, Transmission Formats, Topologies, Collision & Broadcast Domains, Connectivity Devices, Standard Connectivity Device Logic Symbols Local Area Networks:- Introduction, IEEE Project 802, Access Control Methodologies, Medium access Control, LAN Data Link Layer, Logic Link Control Sublayer, MAC Sublayer, Ethernet.

References:

- 1. Godbole Data Communication and Networking .- (TMH)
- 2. P.C. Gupta Data Communications and Computer Networks, PHI, New Delhi 2006
- 3. Comer Internetworking with TCP/IP Vol-1, PHI Publication.
- 4. Wayne Tomasi Introduction to Data Communications & Networking (Pearson Education)
- 5. Kenneth C. Mansfield, Jr; James L.Antonakos An Introduction to Computer Networking (Pearson Education)
- 6. W. Stallings Data and Computer Communications, 7th Edn., Pearson Edn./ PHI, New Delhi,
- 7. Forouzan Data Communication and Networks, Tata McGraw Hill.
- 8. Tanenbum Computer Networks, 3ed edition, PHI Publication.

B. Sc. (IT) Part II Semester -III

Paper IV Linux Operating System

UNIT - I :

Logging In and Logging Out, Anatomy of Linux OS, Directory Structure, /usr Directory, File Types: User datafiles, System data files, Executable files. Naming files and directories, Spawning Processes. **Shell:** Creating User Account, Shell Program, bash shell, Changing shell prompt. **Commands:** Basic Syntax for a command, Exploring the Home Directory, ls, mkdir, rmdir, stat, cat, rm, mv, cp

UNIT - II :

Editor: Vi editor. **Hooking up Hardware Devices:** Formatting a Floppy Disk, Gathering important system information. Backing Up and restoring the File **System:** Simple Backup, gzip, gunzip, tar. **Printing files:** Print Spool directory, Sending files to Printer.

UNIT - III :

Sharing Files with other Users: Maintaining User Accounts, Changing Password, Creating Group Accounts, Granting Access to files, Changing File Ownership, Protecting Files, Making a File Read-Only. Working with Processes: Types of processes, ps Command, Creating process, killing process, free command and top utility.

UNIT - IV :

Managing Disk Space: df, du commands, Creating Additional Free Disk Space, Locating Unused Files, Setting System Clock. Communication Utilities: who, who am i, finger, mesg, write, wall, talk, Creating a message of the day. X Window System, Graphical User Interfaces: KDE and GNOME Desktop Environment.

- 1. SAMS Teach Yourself Linux by Craig and Coletta Witherspoon [Techmedia]
- 2. LINUX complete reference by Richard Peterson

B. Sc. (IT) Part II Semester -III Paper V E-Commerce

UNIT - I :

Introduction to e-Commerce, Scope of electronic commerce, definition, e-Commerce and Trade Cycle, e- Markets, Internet e-Commerce in perspective. Value chain, Supply chain, Porters value chain model, Inter organizational value chains.

UNIT - II :

Business strategy in electronic age: Competitive advantages, Strategy, Porters model, First Movers advantages, Advantages using e-Commerce. Introduction to business strategy, Strategic implications of IT, Technology, Business environment, Business capability, Existing business strategy, Strategy formulation and implementation planning, e-Commerce implementation, e-Commerce evaluation.

UNIT - III :

Business to Business e-Commerce: Inter organizational transactions, The credit transaction trade cycle, A variety of transaction, Pens and things, Electronics Market, Usage of e-Market, Advantages and disadvantages of e-Market, Future of e-Market, EDI, introduction, EDI and Business.

UNIT - IV :

Business to Consumer Electronic Commerce: Consumer trade transaction, Internet e-Commerce, e-Shop, Other e-Commerce technologies, Advantages and disadvantages of comsumer e-Commerce. Elements of e-Commerce: elements, e-Visibility, e-Shop, Online payments, Internet e-Commerce security.

Reference Books:

01. E-Commerce, Strategy, Technologies and Applications By: David Whiteley Tata McGraw-Hill Edition.

B. Sc. (IT) Part II Semester -III Paper VI Statistical Methods

UNIT-I:

Introduction - Definition of Statistics, Importance and scope of Statistics, Limitations of statistics, Distrust of Statistics. Statistical Data Collection - Primary and Secondary data, Methods of Collecting Primary data, Sources and Secondary Data, Census and Sample Investigation. Presentation of statistical Data - Classification, Tabulation, Frequency Distribution, Diagrams and Graphs. Frequency Distributions and

UNIT-II:

Measures of Central Tendency - Frequency Distribution, Continuous Frequency Distribution, Graphic Representation of a Frequency Distribution Average or Measures of Central Tendency or Measures of Locations, Requisites for an ideal Measure of Central Tendency Arithmetic: Mean Median, Mode, Geometric Mean and Harmonic Mean, Weighted Average, Relationship amongst different Averages.

UNIT-III:

Measures of Dispersion, Skewness and Kurtosis - Meaning and Significance of Dispersion, Methods of Measuring Dispersion - Range, Quartile, Mean Deviation, Standard Deviation, Coefficient of Skewness, Kurtosis, Coefficient of Dispersion, Coefficient of Variation.

UNIT-IV:

Correlation and Regression - Definition of Correlation, . Scatter Diagram, Karl Pearson Coefficient of Correlation, Limits for Correlation Coefficient, Definition of Regression, Lines of Regression, Regression Curves, Regression coefficients, properties of Regression coefficients, Correlation Analysis vs. Regression Analysis.

- 1.S Sastry Introduction to Numerical Analysis
- 2.Y. Rajaraman, Computer Oriented Numerical Methods Prentice Hall Publication
- 3. Gupta and Kapoor Fundamental of Mathematical Statistics
- 4.Brian Flowers Introduction to Numerical Methods in C++ By. (Oxford)
- 5.E. Balaguruswamy, Numerical Methods Tata McGraw Hill Publication
- 6.Srimanta Pal Numerical Methods (Oxford)
- 7.K Sankara Rao Numerical Methods for Scientists & Engineers [PIII].
- 8. Manish Goyal Computer Based Numerical And Statistical Techniques (Laxmi)

B. Sc. (IT) Part II Semester -IV Paper I Software Engineering

Unit I

Introduction to Software Engineering : The evolving role of software, Changing Nature of Software, Software myths.

A Generic view of process : Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models.

Unit II

Process models : The waterfall model, Incremental process models, Evolutionary process models, The Unified process. **Software Requirements :** Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document.

Unit III

Requirements engineering process : Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

System models : Context Models, Behavioral models, Data models, Object models, structured methods.

Unit IV

Design Engineering : Design process and Design quality, Design concepts, the design model.

BOOKS:

- 1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition.McGrawHill International Edition.
- 2. Software Engineering- Sommerville, 7th edition, Pearson education.
- 3. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers
- 4. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiely.
- 5. Systems Analysis and Design- Shely Cashman Rosenblatt, Thomson Publications.
- 6. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.

B. Sc. (IT) Part II Semester -IV Paper II Java Programming

UNIT - I :

Introduction to Java: -History of Java, features of Java, getting started with Java. **Java programs**:-Introduction of Application & Applets. **Variables**: -Variable naming, variable initialization, assign values, Rules of variables, Scope of variable. **Operators**: -Arithmetic, Assignment, Unary, Comparison, Shift, Bit-Wise, Logical, Conditional, New, Special, Relational. Data types:-Integers, Char, String, Float etc. Typecasting: **Tokens**: -Java tokens Order of precedence of operators Streams: - Input and output.

UNIT - II :

Creating a class & subclass: -Declaring a class, Naming class, Rules to assign Class & Subclass, Creating a new object, Class of an object. **Data members:** -Declaring data member, Naming variables, using class members. **Methods:** -Using data members, Invoke a method, passing arguments to a method, calling method. **Access Specifier & Modifiers:** -Public, Private, Protected, Static & Final. **Overloading:** -Method overloading, Constructor overloading. **Java class library:** - Different types of classes. **Decision making & loops:**-If-then-else, Switch,? : operator, While-loop, do-while loop, for. **Array:** -Creating an array, one-dimensional array, two-dimensional array. **String:** -String array, string methods. **Inheritance:** -Single & multiple inheritances **Interfaces:** -Defining interfaces, extending interfaces, implementing interfaces.

UNIT - III :

Packages: -Java API packages, creating packages, accessing packages, adding a class to packages. **Import statement:** - Introduction & implementation of import statement. **Applets:**-Introduction to Applets & Application, how applets application are different creating An applet. Applets life cycle, designing a web page, creating an executable applet, running the applet, applet tags, passing a parameter to applet, HTML tag, Converting applet to application. **Threads:**-Overview of threads, single & multiple threads, lift cycle of threads, stopping & blocking threads, working with threads, priority to thread, synchronization. **Exceptions & Errors:**-Introduction, types of error, exception, syntax of exception, handling techniques, exception for Debugging.

UNIT - IV :

Event: -Event driven programming, handling an (AWT) events. **Graphic class:**-Introduction, the graphic classes, drawing & filling of lines, rectangle, circle & ellipse, arcs, polygons, text & fonts, creating a font class, font objects, text, coloring object. **Streams:**-Introduction, Abstract stream classes, file input & output. **AWI Applications:** -Creating a GUI using AWT toolkit, using component class, frames. **Components & Control:** -Textfield, textarea class, label, button, choice, list, checkbox, class, and combo. **Menus:** -Creating a popup menus. **Image:** - Type of image, Properties of an image, Displaying an image. **Layouts:** -Using Window Listener interface, Different types of Layout, Layout manager, Flow manager, Grid manager. **Container:** -Different types of container (Frame, Dialog, Panel)

- 1. Programming with Java a primer II edition:-E Balaguruswamy(Tata McGraw-Hill)
- 2. Java Programming (For absolute beginners) Russell PHI
- 3. Black Book on Java
- 4. Java-Complete References

B. Sc. (IT) Part II Semester -IV Paper III Data Communication & Network-II

Unit-I

Communication Architecture, Protocols & Architecture: Protocols, The Layers Approach, OSI Model, TCP/IP protocol suite, System Network Architecture.

Internetworking: Principles of Internetworking, Bridges, Routers, Repeaters, Gateways, Connection Oriented Internetworking, Connectionless Internetworking, Connectionless Internetworking, Router-level protocol.

Unit II

Transport Protocols- Transport services, Protocol Mechanism, Network services, ISO Transport Standards, TCP, UDP, TCP and UDP Packet format, Lightweight Transport Protocol.

Unit III

Session Services & Protocols- Session Characteristics, OSI Session Services, Definition, OSI Session Protocol definition. DNS, FTP, HTTP.

Unit IV

Digital Network, ISDN & Broadband ISDN : Overview of ISDN, Architecture and Interfaces of ISDN, Transmission structure, User Access, ISDN protocols, Broadband ISDN(B-ISDN).

Books

- 1. William Stalling, Data and Computer Communication, PHI Publication.
- 2. Forouzan, Data Communication and Networks, Tata McGraw Hill.
- 3. Godbole, Data Communication and Network, TMH
- 4. Tanenbum, Computer Networks , ,PHI Publication.
- 5. Comer Internetworking with TCP/IP Vol-1, PHI Publication
- 6. Data and Computer Communication by William Stalling, PHI Publication.
- 7. Data Communication and Network by Forouzan, Tata McGraw Hill.

B. Sc. (IT) Part II Semester -IV Paper IV Oracle

Unit I

Introduction to Oracle - Relational database management system (RDBMS), Codd's Rules for RDBMS, Oracle as multiuser system, Logging and Logging out of Oracle, Database Administrator (DBA) and its Role, Creation of user and Password.

Introduction to Structured Query language (SQL) – History and standardization of SQL, benefits of SQL, elements of SQL, Languages, Database objects, Reserve words, Keywords.

Data types – Char, Varchar, Date, Number, Long, Raw and Long raw.

Unit II

SQL Command – DDL command, DML command, DRL command, Aggregate function, Clauses, Set operator, Predicates, Join, Sub queries, Views. Simple reports commands.

PL/SQL - Introduction to PL/SQL, Advantages of PL/SQL, PL/SQL block structure, Character Set, Literals, PL/SQL data type, Variables, Control and loop statements, Loops and Labels.

Unit III

Cursor – PL/SQL Cursor, Explicit Cursors, Implicit Cursors. **Exception Management** - User defined, predefined exceptions, subprograms and packages - procedures, functions, package specification, body, calling sub programs, advantages of packages, cursers in packages.

Unit IV

Database Triggers & Built in Packages - Database triggers-syntax, parts, statement, body, restriction, types. **Built in packages** – DBMS standard. **DBMS OUTPUT -** Collection, member functions and procedures, PL/SQL table and records, declaration, referring, maintaining row count, insertions, deletions, nested tables, varying, arrays, initialization, declaration, varrays, member functions and procedures.

Books:-

- 1. ORACLE 9i PL/SQL PROGRAMMING, SCOTT URMAN, : ORACLE PRESS
- 2. ORACLE PL/SQL : PL/SQL IN 21 DAYS (TECHMEDIA) SAMS
- 3. ORACLE 9i THE COMPLETE REFERENCE
- 4. ORACLE : I.T. TODAY (ENCYCLOPEDIA)
- 5. Database System Using Oracle: A Simplified Guide to SQL & PL-SQL: Nilesh Shah, PHI Publication.
- 6. Database Management Systems (Complete practical approach) by Sharad Maheshwari & Ruchin Jain, Firewall media
- 7. Dr. P.S.Deshpande SQL & PL/SQL for Oracle 10g Black Book

B. Sc. (IT) Part II Semester -IV Paper V Compiler Construction

UNIT - I :

Compilers and translators, need, the structure of a compiler, Lexical Analysis, Syntax analysis, Intermediate code Generation, Optimization, Code Generation, Book keeping, Error Handling

UNIT - II :

High Level programming languages, Definitions of programming languages, The lexical and syntactic structure of a language, Data elements, structures, Operators, Assignment Statements, Data Environments, Parameter transmission, Storage management.

UNIT - III :

The role of the lexical analyzer, Approach to the design of lexical analyzer, Implementation of lexical analyzer, Context free grammars, Derivations and parse trees, Ambiguous grammar.

UNIT - IV :

Parsers, Shift-reduce parsing, Operator precedence parsing, Top-down parsing, predictive parsers, Symbol Table, Code Optimization: The principal source optimization, Loop optimization, The DAG representation of basic blocks, Code Generation : A machine model, a simple code generator, Register Allocation and assignment.

- 1. Principles of Compiler Design A.V. Aho, J. D.Ullman : Pearson Education.
- 2. Modern Compiler Design- Dick Grune, Henry E. Bal, Cariel T. H. Jacobs, Wiley dreamtech.
- 3. Engineering a Compiler-Cooper & Linda, Elsevier.
- 4. Compiler Construction, Louden, Thomson.

B. Sc. (IT) Part II Semester -IV Paper VI Numerical Methods

UNIT - I :

Roots of Non-Linear Equations : Algebraic equation, Polynomial equation, Transcendental equation, Iterative method, Starting & Stopping Iterative method, Bisection Method, False Position method, Newton Raphson Method: Secant Method, Determining all possible roots, Multiple roots of polynomial, Complex Roots using Muller's Method.

UNIT - II :

Solution to Linear Equations Existence of solution, Gauss Elimination Method, Gauss elimination with pivoting, Gauss Jordan Method, Round off errors and refinement, m Conditioned system, Matrix inversion method.

UNIT - III :

Linear interpolation, Lagrange Interpolation, Spline Interpolation, Interpolation with equidistant points, Least Square regression Fitting, Transcendental equations, Multiple linear regression, m conditioning in Least square

UNIT - IV :

Integration & Differentiation : Trapezoidal Rule, Simpson 1/3 Rule, Simpson 3/8 rule, Gaussian Integration, Solution to differential equation (using Runge-Kutta second and fourth order methods, Multistep method for differential equations (Milne-Simpson method, Adams-bashforth-

Reference Books:

1.S Sastry Introduction to Numerical Analysis

2.Y. Rajaraman, Computer Oriented Numerical Methods - Prentice Hall Publication

3. Gupta and Kapoor Fundamental of Mathematical Statistics

- 4.Brian Flowers Introduction to Numerical Methods in C++ By. (Oxford)
- 5.E. Balaguruswamy, Numerical Methods Tata McGraw Hill Publication
- 6.Srimanta Pal Numerical Methods (Oxford)

7.K Sankara Rao Numerical Methods for Scientists & Engineers [PIII].

8. Manish Goyal Computer Based Numerical And Statistical Techniques (Laxmi)

B. Sc. (IT) Final Semester -V Paper I Software Project Management

Unit I

Managing Software Project: Process & Project Management, Project Management and the CMM, Project Management at Infosys, Introduction to CMMI, PCMM, The Project Planning Infrastructure: The process data base, process capability Baseline, Process Assets and the Body of Knowledge System.

Unit II

Process Planning: The Information System Development Process, Requirement Analysis, Requirement Change Management, Effort Estimation & Scheduling: Estimation and Scheduling Concepts, Effort – Estimation, Scheduling.

Unit III

Quality Planning: Quality Concepts, Quantitative quality Management Planning, Defect Prevention Planning. Risk Management: Concepts of Risks and Risk Management, Risk Assessment, Risk Control.

Unit IV

Measurement and Planning: Concepts in measurement, Measurements, Project tracking. Project Management Plan: Team Management, Customer Communication and Issue Resolution, Structure of the Project Management Plan.

Text Book:

- 1. Pankaj Jalote Software Project Management in Practice, Pearson Education, New Delhi
- 2. B.Huges and M.Cotterell Software Project Management, 3/e, TMH, New Delhi
- 3. Pankaj Jalote CMM in Practice, Pearson Education, New Delhi
- 4. W. Humph Grey Managing the Software Process, Addition Wesley
- 5. R. T. Futrell, D. F. Shafer, L. I. Safer, "Quality Software Project Management", Pearson Education

B. Sc. (IT) Final Semester -V Paper II Dot Net Framework and C#

Unit-1

The .Net framework: Introduction, The Origin of .Net Technology, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL), Just-In –Time Compilation, Framework Base Classes.

Unit-II

C -Sharp Language (C#): Introduction, Data Types, Identifiers, Variables, Constants, Literals, Array and Strings, Object and Classes, Inheritance and Polymorphism, Operator Overloading, Interfaces, Delegates and Events. Type conversion.

Unit-III

C# Using Libraries: Namespace- System, Input-Output, Multi-Threading, Networking and sockets, Managing Console I/O Operations, Windows Forms, Error Handling.

Unit-IV

Advanced Features Using C#: Web Services, Window Services, Asp.net Web Form Controls, ADO.Net. Distributed Application in C#, Unsafe Mode, Graphical Device interface with C#. Net Assemblies and Attribute: .Net Assemblies features and structure, private and share assemblies, Built-In attribute and custom attribute. Introduction about generic.

Books:-

- 1. Wiley," Beginning Visual C# 2008", Wrox
- 2. Fergal Grimes," Microsoft .Net for Programmers". (SPI)
- 3. Balagurusamy," Programming with C#", (TMH)
- 4. Mark Michaelis, "Essential C# 3.0: For .NET Framework 3.5, 2/e, Pearson Education
- 5. Shibi Parikkar, "C# with .Net Frame Work", Firewall Media.

B. Sc. (IT) Final Semester -V Paper III Network Security

Unit I

Introduction, Security Concepts, Threats and Risks, Attacks – Passive and Active, Security Services, Confidentiality, Authentication, Non-Repudiation, Integrity, Access Control, Availability, Model for Internetwork Security, Internet Standards and RFCs Access Control Mechanisms ,Access Matrix, HRU, TAM, ACL and capabilities

Unit II

Access Control Models, Chinese Wall, Clark-Wilson, Bell-LaPadula, Non- Interference and Role Base Model. Cryptography, Secret Key and Public Key Cryptosystems, Symmetric Ciphers, Block Ciphers and Stream Ciphers, DES, IDEA and Key Escrow, RSA and ElGamal.

Unit III

Secure Hash and Key management, Digital Signature and Non-repudiation, cryptanalysis. Network Security, Objectives and Architectures, Internet Security Protocols, IP encapsulating Security Protocol, Network and Transport Layer Security.

Unit IV

Network Security Applications, Authentication Mechanisms: a) Passwords, b) Cryptographic authentication protocol, c) Smart Card, d) Biometrics,e) Digital Signatures and seals, f) Kerberos, g) X.509 LDAP Directory. Web Security : a) SSL Encryption b) TLS, SET, E-mail Security, PGPs / MIME, IP Security, Access and System Security , Intruders, Intrusion Detection and Prevention , Firewall a) Hardware Firewall b) Software Firewall c) Application Firewall d) Packet Filtering. e). Packet Analysis, Proxy Servers, Firewall setting in Proxy, ACL in Proxy

BOOKS

- 1. William Stallings, "Network Security Essentials", Prentice-Hall.
- 2. Edward Amoroso, "Fundamentals of Computer Security Technology", Prentice-Hall.

References :

- 1. 3 Dorothy E. Denning, "Cryptography and Data Security", Addison-Wesley.
- 2. 4 Peter J. Denning, "Computers under Attack", Addison-Wesley.
- 3. 5 Douglas R. Stinson, "Cryptography: Theory and Practice", CRC Press.
- 4. 6 D. Brent Chapman and Elizabeth D. Zwicky, "Building Internet Firewalls",
- 5. O'Reilly and Associates

B. Sc. (IT) Final Semester -V Paper IV Data Warehousing

Unit I

Introduction, Definition, Components, Warehousing databases, Users, Advantages, Features, Data Granularity, Information Flow Mechanism, Metadata, Classes of Data, Lifecycle of Data, Data Flow. Architecture of Data Warehouse, characteristics, Goals, Data Marts, Building Data Marts, Pushing and Pulling Data,

Unit II

Data Warehousing Schema, Dimensional Modeling, Star Schema, Snowflake Schema, Aggregate Tables, Fact Constellation Schema, Data Modeling, Dimensional Modeling: Dimension Table, Fact Tables, Fatless Fact Tables, Updates to Dimension Tables, other types of dimension table, Performance of Data Warehouse. ELT Process: Data Extraction, Data Transformation, Data Loading, Data Quality

Unit III

Data warehousing design Review, Developing data warehouse, Testing, Monitoring, Tuning, Feedback Loops. OLAP in Data warehouse: OLAP, ROLAP, HOLAP, Multidimensional Analysis, OLAP Functions, OLAP Application\s, OLAP Models, OLAP Considerations, Tools and Products, Data Design, Administration and Performance, OLAP Platforms

Unit IV

Building Data Warehouse: Problem Definition, Success Factors, Requirement Analysis, Planning, Design Stage, Building and Implementation of Data Marts, Building Data Warehousing, Backup and Recovery, quality Frameworks, Operating warehouse, Recipe for Successful Warehouse, Pitfalls, factor,

Text Books

- 1. Rema Thareja Data Warehousing Oxford University Press
- 2. Alex Berson, S. J. Smith, Data Warehousing, Data Mining & OLAP, TMH
- 3. George M Marakas, Modern Data Warehousing, Mining and Visualization, Pearson Education

B. Sc. (IT) Final Semester -V Paper V VB Programming

UNIT-I:

Working with Visual Basic Window Components: Menu Bar, Tool Bar, Project Explorer Window, Form Layout Window, properties Window, Toolbox, Code Editor Window Working with Forms: Properties, Events, Methods Working with Basic Controls:Label, CommandButton, TextBox, OptionButton, Frame, CheckBox, ListBox, ComboBox, Image, Scroll, Picture, Timer, DriveListBox, DirListBox, FileListBox and Shape Controls. Basic Programming Fundamentals: Variables, Data types, Constant, Conversion Function. Scope of Variable: Public, Private Static. Operators: Logical, Arithmetic, Concatenation, Comparison. Decision Structure: If.. Then, If..Then..Else, Select Case.. End Case. Loop Structure: Do..While, While.. Wend, For.. Next, With..EndWith. DoEvents()

UNIT-II:

Arrays: Dynamic Array, Preserve and Control arrays. **Procedure:** General procedure, General Methods for Passing Arguments to a Procedure, **Functions:** User-Interaction, String, Math, Date, Conversion Functions. **Modules:** Form, Standard.

UNIT-III:

Menus: Creating, Adding Menu Items, Creating Shortcut, Adding Separators Bars, Submenus, Code for Menus. Creating Popup Menu: System, Custom. **Database Handling:** Database Concepts, Creating and Accessing Database, Using Data Control. **Using DAO:** Creating Search Programs, Numeric Search and Complex Search Programs.

UNIT-IV:

Using ADO Data Control, Data Link, ODBC Data Source name, Using Connection String, Creating Navigating buttons. Working with Advanced Data Controls : DataList Control, DataCombo Control, DataGrid Control and Msflexgrid Control. **Handling Errors** : Run Time, Trapping and Handling Error, ERR Object. Data Environment and Data Reports.

- 1. VISUAL BASIC to Advance by Soma Dasgupta [BPB Publication]
- 2. Evangelos Petroutsos, Mastering Visual Basic 6.0 BPB Publication.
- 3. VISUAL BASIC 6 COMPLETE REFRENCE (TMH PUB)
- 4. Visual Basic 6 Deitel & Deitel (Pearson Education)
- 5. Mastering VB 6.0 Black Book -Peter Norton-Techmedia.

B. Sc. (IT) Final Semester -V Paper VI Graph Theory

Unit 1 : Graphs and operations on graphs

Definition and elementary results, Types of graphs, Isomorphism, Matrix representation of graphs: Adjacency matrix and incidence matrix, Subgraphs and induced graphs, Complement of a graph, Self complementary graphs, Union, intersection of graphs, Ring sum of two graphs.

Unit 2 Connected Graphs

Definitions: walk, trail, tour, path and circuit, Definitions of connected, disconnected graphs, Dijkstra's shortest path algorithm, Connectivity: cut-vertex, vertex connectivity.

Unit 3 : Tree Graphs

Tree : Definition, Theorem : A tree with n vertices has n - 1 edges, Theorem : A connected graph G with n vertices and n - 1 edges is a tree, Theorem : A graph with n vertices is a tree if and only if it is circuit free and has n - 1 edges, Theorem : A graph G is a tree if and only if it is minimally connected, Center of a tree, Spanning tree: Definition and examples, Fundamental circuit and cut – set : Definition, Binary trees and elementary results, Kruskal's algorithm.

Unit 4 : Directed Graphs

Definition, types of directed graphs, Directed (rooted) trees, arborescence and Polish notation, Isomorphism of digraphs, Connectedness in digraphs, Euler digraph, Network and flows: Definition, examples, Maximal flow algorithm.

- 1. Elements of Discrete Mathematics by C.L. Liu
- 2. Discrete Mathematics by Olympia Nicodemi
- 3. Discrete Mathematical Structure for Computer Science by Alan Doer and K. Levasicur.
- 4. Discrete and Combinatorial Mathematics by R.M. Grassl
- 5. Discrete Mathematics by Kenneth Rosen, Tata McGraw Hill
- 6. Graph Theory with Applications to Computer Science and Engineering by
- 7. Narsing Deo, Prentice Hall, India.
- 8. A First Step in Graph Theory by Raghunathan, Nimkar and Solapurrkar
- 9. Discrete mathematics by S.R.Patil and others, NIRALI Prakashan.
- 10. Discrete mathematics by Bhopatkar, Nimbkar, Joglekar, VISION
- 11. Publication.
- 12. Discrete mathematics by Naik and Patil, PHADAKE Prakashan.

B. Sc. (IT) Final Semester -VI Paper I Enterprise Resource Planning

Unit I

INTRODUCTION Business needs and ERP, ERP as an overview, entries as an overview, Benefits of ERP, ERP and related technologies, ERP architecture, business process reengineering, data warehousing, data mining, on line analytical processing supply choice management.

Unit II

ERP: Client server architecture and ERP, ERP implementation life cycle, implementation m~hodologies, ER? implementation – The hidden cost, organizing implementations, vendors, consultants and users, contracts with vendors, consultants and employees, project management and monitoring. After ERP implementation.

Unit III

THE BUSINESS MODULE : Business models in an ER? package, finance, manufacturing human resource, plant maintenance, materials management, quality management sales and distribution.

Unit IV

Selection of ERP, SWOT analysis of various ER? products supply chain enabled ERP. ER? and Electronic Data Interchange (EDI) integration, ERP in manufacturing and non manufacturing industries.

BOOKS:

1. ERP Demystifled by Aleris Leon (TMH Pub.)

2. Enterprise Resource Planning by Parag Diwan and Sunil Sharma (Pentageon Pren.)

B. Sc. (IT) Final Semester -VI Paper II Advance Java Programming

Unit I

Core Java: Introduction, Operators, Data types, Variables, Arrays, Control Statements, Methods & Classes, Inheritance, Package and Interface, Applets

Java swing: Creating a swing Applet and Application, Programming using Panes, Pluggable Look and feel, Labels, Text fields, Buttons, Toggle Buttons, Checkboxes, Radio Buttons, View Ports, Scroll Panes, Scroll Bars, List, Combo Box, Progress bars, Menus and Toolbars, Layered Panes, Tabbed Panes, Split Panes, Layouts, Windows, Dialog Boxes, Inner frame.

Unit II

JDBC: The connectivity Model, JDBC/ODBC Bridge, Java.sql package, connectivity to remote database, navigating through multiple rows retrieved from a database.

Unit III

Java Beans: Application Builder tools, The bean developer kit(BDK), JAR files, Introduction, Developing a simple bean, using bound properties, The java Beans API, Session Beans, Entity Beans, Introduction to Enterprise Java Beans(EJB), Introduction to RMI(Remote Method Invocation): A simple client-server application using RMI.

Unit IV

Java Servlets: Servlet basic, Servlet API basic, Life cycle of a Servlet, Running Servlet, Debugging Servlet, Thread-safe Servlet, HTTP Redirects, Cookies, Introduction to Java server pages(JSP).

References:

- 1. Margaret Levine Young, "The Complete Reference Internet", TMH.
- 2. Naughton, Schidt, "The Complete Reference JAVA2", TMH.
- 3. Balagurusamy E., "Programming in Java", TMH.
- 4. Dustin R. Callway, "Inside Servlets", Addison Wesley.
- 5. Mark Wutica, "Java Enterprise Edition", QUE.
- 6. Setven Holzner, "Java2 Black Book", dreamtech.

B. Sc. (IT) Final Semester -VI Paper III Cloud Computing

Unit I

Introduction to Cloud Computing, The Evolution of Cloud Computing, Hardware Evolution, Internet Software Evolution, Server Virtualization, Web Services Deliver from the Cloud, Communication-asa-Service, Infrastructure-as-a-Service, Monitoring-as-aService, Platform-as-a-Service, Software-as-aService, Building Cloud Network

Unit II

Federation in the Cloud, Presence in the Cloud, Privacy and its Relation to Cloud-Based Information Systems, Security in the Cloud, Common Standards in the Cloud, End-User Access to the Cloud Computing

Unit III

Introduction, Advancing towards a Utility Model, Evolving IT infrastructure, Evolving Software Applications, Continuum of Utilities, Standards and Working Groups, Standards Bodies and Working Groups, Service Oriented Architecture, Business Process Execution Language, Interoperability Standards for Data Center Management, Utility Computing Technology, Virtualization, Hyper Threading, Blade Servers, Automated Provisioning, Policy Based Automation, Application Management, Evaluating Utility Management Technology, Virtual Test and development Environment, Data Center Challenges and Solutions, Automating the Data Center

Unit IV

Software Utility Application Architecture, Characteristics of an SaaS, Software Utility Applications, Cost Versus Value, Software Application Services Framework, Common Enablers, Conceptual view to Reality, Business Profits, - Implementing Database Systems for Multitenant Architecture

Books:

1. John W. Rittinghouse and james F. Ransome, "Cloud Computing Implementation, Management and Security", 2010, CRC Press, Taylor & Francis Group, Boca Raton London New York

2. Alfredo Mendoza, "Utility Computing Technologies, Standards, and Strategies", Artech House INC,

3. 2007. [Unit -11I to Unit V]

4. Bunker and Darren Thomson, "Delivering Utility Computing", 2006, John Wiley & Sons Ltd.

5. George Reese, "Cloud Application Architectures", O'reilly Publications, 2009.

B. Sc. (IT) Final Semester -VI Paper IV Data Mining

Unit I

Data Mining: Introduction, Definitions, KDD Vs Data Mining, DBMA Vs Data Mining, Data Mining Problems, Data Models, OLAP, User Perspectives, Issues, Challenges, Trends, Application Areas and Applications

Frequent Pattern Mining: Basic Problem Definition, Association Rule, Mining Association Rule, Applications, Variations, Interestingness, Methods of Discovering Association Rule, Priori Algorithm, Frequent Itemset Mining (FIM) Algorithm, Comparison of FIM Algorithm, Optimal FIM Algorithm, Incremental Mining, Conciseness of Results, Sequential Rule

Unit II

Classification, Definition, Applications, Evaluations of Classifiers, Issues, Classification Techniques, Optimal Classification Algorithm, Regression

Decision Tree, Tree Construction Principal, Best Split, Speliting Indices, Splitting Criteria, Decision Tree Construction Algorithm

Unit III

Clustering, Definition, Applications, Measurement of Simplicity, Evaluation of Clustering Algorithm, Classification of Clustering Algorithm, Partition Method, Hierarchical Method, Density Base Method, Grid Base Method, Outlier Detection,

Unit IV

Partition Discovery, Relational Data, Transactional Data, Distributed Data, Spatial Data, Data Stream, Time Series Data, Text and Web Data, Multidimensional Data

Books

- 1. Vikram Pudi, Data Mining Oxford University Press
- 2. Arun K Pujari Data Minig Technique, University Press (India) Private Limited
- 3. Alex Berson, S. J. Smith, Data Warehousing, Data Mining & OLAP, TMH

B. Sc. (IT) Final Semester -VI Paper V Animation Techniques

Unit I

What is mean by Animation, Why we need Animation, of Animation, Uses of Animation, Types of Animation, Principles of Animation, Some Techniques of Animation, Animation on the WEB, 3D Animation, Special Effects, Creating Animation.

Unit II

Creating Animation in Flash: Introduction to Flash Animation, Introduction to Flash, Working with the Timeline and Frame-based Animation, Working with the Timeline and Tween-based Animation, Understanding Layers, Actionscript.

Unit III

3D Animation & its Concepts, Types of 3D Animation, Skeleton & Kinetic 3D Animation – Texturing & Lighting of 3D Animation, 3D Camera Tracking, Applications & Software of 3D Animation.

Unit IV

Motion Caption, Formats, Methods, Usages, Expression, Motion Capture software's, Script Animation Usage – Different Language of Script Animation Among the Software. Concept Development, Story Developing, Audio & Video, Color Model, Device Independent Color Model, Gamma and Gamma Correction, Production Budgets, 3D Animated Movies.

TEXT BOOK:

- 1. Ranjan Parekh, PRINCIPLES OF MULTIMEDIA, TMH
- 2. Ashok Banerji, Ananda Mohan Ghosh, Multimedia Technologies, McGraw Hill Publication

B. Sc. (IT) Final Semester -VI Paper VI Operation Research

Unit 1

Overview of operations Research: OR models, OR Techniques

Linear Programming : Introduction, Graphical solution; Graphical sensitivity analysis, The standard form of linear programming problems, Basic feasible solutions, unrestricted variables, simplex algorithm , artificial variables, Big M and two phase method, Degeneracy, alternative optima, unbounded solutions, infeasible solutions.

Unit 2

Dual problems: Relation between primal and dual problems – Dual simplex method

Transportation model: starting solutions. North West corner Rule, lowest cost method, Vogels approximation method – Transportation algorithms – Assignment problem – Hungarian Method.

Unit 3

Network Models: Definitions, CPM and PERT, Their Algorithms Integer Programming : Branch and Bound Algorithms cutting plan algorithm.

Dynamic Programming: Recursive nature of dynamic programming, Forward and Backward Recursion.

Unit 4

Assignment Problem – Zero-One Programming Model for Assignment Problem, Types of Assignment Problem, Hungarian Method, Branch and Bound Technique for Assignment Problem.

Text Books:

- 1. Operation Research by Kanti Swarup, P. K. Gupta, Man Mohan [Sultan]
- 2. Operation Research by R. Panneerselvam [PHI]
- 3. Introduction to Operation Research by Billy E. Gillet [TMH]
- 4. Operation Research by Hira Gupta
- 5. Operation Research Problems and Solutions by Sharma J. K. [MacMillan]
- 6. Operation Research Theory and Application by Sharma J. K., [MacMillan]