MASTER OF COMPUTER APPLICATIONS

(MCA)

MCA/ASSIGN/IV/YEAR/2013

ASSIGNMENTS
Year, 2013-14

(4th Semester)

(MCS-041, MCS-042, MCS-043, MCS-044, MCSL-045)
&
Problem definitions for MCS-044 July, 2013 & January, 2014

SCHOOL OF COMPUTER AND INFORMATION SCIENCES
INDIRA GANDHI NATIONAL OPEN UNIVERSITY
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Course Code	**:**	**MCS-041**
Course Title	**:**	**Operating Systems**
Assignment Number	**:**	**MCA(4)/041/Assign/13**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**15th October, 2013 (For July 2013 Session)** **15th April, 2014 (For January 2014 Session)**

This assignment has five questions carrying 80 marks. Answer all questions. Rest 20 marks are for viva-voce. You may use illustrations and diagrams to enhance the explanations. Please go through the guidelines regarding assignments given in the Programme Guide.

Question 1: **(15 Marks)**

Consider the following set of processes, with the length of the CPU-burst time given in milliseconds:

Process	Burst Time	Priority
P1	**10**	**3**
P2	**3**	**1**
P3	**4**	**3**
P4	**5**	**4**
P5	**6**	**2**

The processes are assumed to have arrived in the order P1, P2, P3, P4, and P5, all at the same time.

a. Draw Gantt charts illustrating the execution of these processes using FCFS, SJF, a non-preemptive priority (a smaller priority number implies a higher priority), and Round Robin(quantum = 1) scheduling.
b. What is the turn around time of each process for each of the scheduling algorithms in ***part a***?
c. What is the waiting time of each process for each of the scheduling algorithms in ***part a***?
d. Explain the evaluation of each algorithm.

Question 2: **(15 Marks)**

The Sleeping-Barber Problem:

A barbershop consists of a waiting room with n chairs, and the barber room containing the barber chair. If there are no customers to be served, the barber goes to sleep. If a customer enters the barbershop and all chairs are occupied, then the customer leaves the shop. If the barber is busy, but chairs are available, then the customer sits in one of the free chairs. If the barber is asleep, the customer wakes up the barber.

Write an interactive program in C / C++ to synchronize/coordinate the barber and the customers.

Question 3: **(10 Marks)**

Study and implement the Lamport's Bakery Algorithm for Interprocess synchronization using C/C++ programming language.

Question 4: **(20 Marks)**

Ubuntu is an Operating System based on the Debian Linux Distribution and distributed as free and open source software, using its own desktop environment. Discuss in detail the features, process scheduling, file handling and protection & protection mechanism in it.

Question 5: **(20 Marks)**

Discuss in detail the Process management, Memory management, I/O management, File management and Security and Protection in WINDOWS 8 Operating System.

Course Code	**:**	**MCS-042**
Course Title	**:**	**Data Communication and Computer Network**
Assignment Number	**:**	**MCA (4)/042/Assign/13**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**15th October, 2013 (For July 2013 Session)** **15th April, 2014 (For January 2014 Session)**

This assignment has eight questions. Answer all questions. Rest 20 marks are for viva-voce. You may use illustration and diagrams to enhance the explanations. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation.

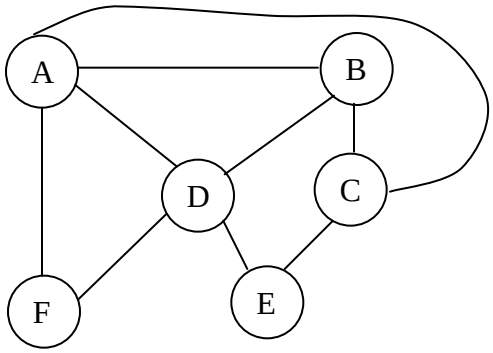
Q. 1 (i) Construct the Hamming Code for the bit sequence **(5 marks)**
10011010

(ii) If a binary signal is sent over 3 MHZ and whose signal to noise ratio is 30 db, what is the maximum achievable channel capacity? **(5 marks)**

Q.2 (i) Compare byte stuffing and bit stuffing. Also bit stuff the following data frame **(5 marks)**
11000010010001111000

(ii) Explain the hidden station and exposed station problem with illustrations. **(5 marks)**

Q.3 (i) Consider the following network. Apply Dijkshtra's shortest path algorithm to find the shortest path from node A to all the remaining nodes. **(10 marks)**



Also write pseudocode of the algorithm.

Q.4 (i) Explain Backoff algorithm in CSMA/CD. **(5 marks)**

(ii) What are the reasons for having a minimum length frame is Ethernet? **(5 marks)**

Q.5 (i) How does TCP's congestion control mechanism work? Explain through an illustration. **(5 marks)**

(ii) Describe Silly window problem. How it can be avoided? **(5 marks)**

Q.6 Explain Ethernet frame format. **(10 marks)**

Q.7 (i) Why is traffic shaping needed? **(5 marks)**

(ii) Assume two prime numbers are p = 13 and q =11. Calculate the public and private key for RSA algorithm. **(5 marks)**

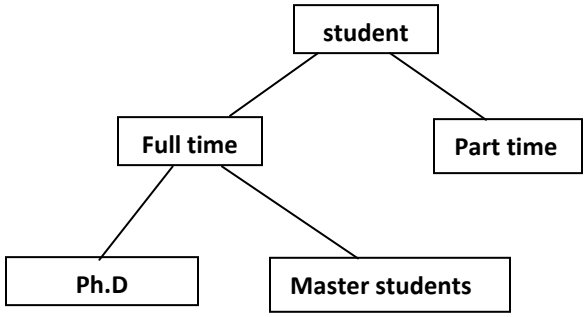
Q.8 (i) How does BGP work? How does it solve the count to infinity problem? **(5 marks)**

(ii) Find CRC for the data polynomial $X^9 + X^7 + X^5 + X^3 + X^2 + 1$ with generator polynomial $X^3 + X + 1$. **(5 marks)**

Course Code	**:**	**MCS-043**
Course Title	**:**	**Advanced Database Management Systems**
Assignment Number	**:**	**MCA (4)/043/Assign/13**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**15th October, 2013 (For July 2013 Session)** **15th April, 2014 (For January 2014 Session)**

This assignment has eight questions, which carries 80 marks. Answer all the questions. Rest 20 marks are for viva-voce. You may use illustrations and diagrams to enhance explanations. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation. Answer to each part of the question should be confined to about 300 words.

Q.1 Create an object oriented database for the following UML diagram. **(10 marks)**
Make assumptions about your attributes and functions.



How is object oriented database different from RDBMS? Explain.

Q.2 Given the relation schema: **(5 marks)**

(i) Enroll (S#, C#, Section)
Teacher (Prof, C#, Section)
Advisor (Prof, S#) Prof. is a thesis advisor of S#
GRADES (S#, C#, Grade, Year)
Student (S#, Sname)

C# represents course code
S# represents students code

Write queries expressed in relational algebra.

(a) List all students taking at least one course that their advisor teaches.
(b) List those professors who teach more than one section of the course.

(ii) How are assertions different from views? Explain assertions and views with the help of examples. **(5 marks)**

Q.3 (i) What are semantic database? Explain the process of searching the knowledge in any semantic database with the help of a block diagram. **(5 marks)**

(ii) With the help of an example, explain the implementation of Cursors and Triggers. **(5 marks)**

Q.4 (i) What is multivalued dependency? Explain through an example how is 4NF related to multivalued dependency. **(5 marks)**

(ii) Differentiate between clustering and classification approach to data-mining. **(5 marks)**

Q.5 (i) What is semi structured data? Explain with an example. What is the difference between a well formed XML document and a valid XML document? **(5 marks)**

(ii) Define multimedia databases and challenges in designing them. **(5 marks)**

Q.6 Create an ER diagram and relational scheme (at least four) to hold information about the following: **(10 marks)**
Many teachers of different disciplines are imparting education to various students, enrolled in different courses offered by the university through an institution. The institution is affiliated to number of universities.

Q.7 With the help of a block diagram describe the phase of query Processing. How do we optimize a query under consideration? Does query optimization contribute to the measurement of query cost? Support your answer with suitable explanation. **(10 marks)**

Q.8 (i) What are the different types of index implementation available in POSTgre SQL? Explain each one of them. **(5 marks)**

(ii) What is a Join Dependency? Explain with an example. **(5 marks)**

Course Code	**:**	**MCS-044**
Course Title	**:**	**Mini Project**
Assignment Number	**:**	**MCA (4)/044/Assign/13**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**15th October, 2013 (For July 2013 Session)** **15th April, 2014 (For January 2014 Session)**

There are five questions in this assignment carrying 80 marks. Rest 20 marks are for viva-voce. You may use illustrations and diagrams to enhance the explanations. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation. Assumptions made if any, should be stated.

Background and Project Specifications:

Most of the Banks are using online Computer based System for their operations. Assume that you are asked by a new Bank to design and implement a web-based system for basic banking operations like opening an account, withdrawal of money through cash or cheque only, deposition of money, money transfer from one account to another and calculation of account interests for two different kind of customers – customers having savings account and customers having fixed deposit amount. An account should have a minimum balance and rate of interest. A person holding the savings account can only perform 50 transactions in a month. The bank also needs to implement the process of closure of an account. You may study such manual system at any Bank. Perform the following tasks for the Bank.

Question 1: **(10 Marks)**

Which Systems Development Life Cycle (SDLC) will you propose for the specification given above? Justify you selection by evaluating suitability of at least two SDLCs.

Question 2: **(10 Marks)**

What would be major costs of installing the system? What are going to be the benefits in terms of finance? Perform a cost-benefit analysis for the proposed software. List the major tasks and milestones of the Project and make a project schedule. You schedule must include both GANTT and PERT charts. Explain the two charts drawn by you.

Question 3: **(10+15 Marks)**

Study the system and create a software requirement specification. You must identify either the processes or objects while analyzing. During the analysis give consideration to possible input and output of the processes. After identifying the requirements, create Analysis Models. You may either use the classical approach and draw Entity relationship model and data flow diagrams (DFD's) up to level 2-3; or you may take object oriented analysis approach and create class diagram, use case diagram, use cases, etc.

Question 4: **(15+10 Marks)**

Think of system architecture and then perform data design. You must perform normalization on tables up to 3rd normal form. The table design must include Primary and Foreign keys and constrains. Create the systems flow chart or detailed process design and state transition diagrams. Also design the user input screens and output report formats

Question 5: **(10 Marks)**

Design various unit test cases for different testing techniques/strategies.

Course Code	**:**	**MCSL-045**
Course Title	**:**	**UNIX and DBMS LAB**
Assignment Number	**:**	**MCA (4)/L045/Assign/13**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**31st October, 2013 (For July 2013 Session)** **30th April, 2014 (For January 2014 Session)**

The assignment has two parts A and B. Answer all the questions. Each part is for 20 marks. UNIX and DBMS lab record carries 40 Marks. Rest 20 marks are for viva voce. You may use illustrations and diagrams to enhance the explanations. Please go through the guidelines regarding assignments given in the MCA Programme Guide for the format of presentation. If any assumptions made, please state them.

PART-I: MCS-041

Question 1: **(5 Marks)**

Write the UNIX commands for the following:

(a) Use the *more* command, and a *pipe* to send the contents of your *.profile* and *.shrc* files to the screen.

(b) How could you use head and tail in a pipeline to display lines 25 through 75 of a *file*?

(c) To search the */etc/passwd* file for the lines containing any input string given by the user.

(d) To see the lines in /*etc/passwd* that begins with the character "a".

(e) List all the files in the */tmp* directory owned by the user root.

(f) To see a complete listing of all the processes currently scheduled.

(g) Use the *ps* command, and the *grep* command, in a pipeline to find all the processes owned by you.

(h) To force termination of a job whose *process ID* is given.

(i) Sort the */etc/passwd* file, place the results in a file called foo, and trap any errors in a file called *err* with the command.

(j) To sort a file called *foo*, and place the results in a file called *bar*.

(k) To check if a file is a zipped file.

(l) To list down file/folders lists sorted, alphabetically.

(m) To view all processes running including user and system processes.

(n) To produce list of all files in the current directory without headers, but in three columns.

(o) To find out the number of times the character "?" occurs in a file.

Question 2:

(a) Write a shell program to count no. of other vowels in a given text file by the user. **(5 Marks)**

(b) Write a shell program to find second largest number among the 5 numbers given. **(5 Marks)**

(c) Write a shell program to take 2 strings as input, concatenate them and display the length of the resultant string. **(5 Marks)**

PART-II: MCS-043

Question 1: **(7 Marks)**

(a) Create an appropriate database using Oracle to manage an Authorized Car Service Centre. Perform Normalization to the normalised tables till the required levels.

(b) Perform following queries using SQL: **(8 Marks)**

(i) Describe the structure of all the tables created by you.

(ii) List the name of the new spare parts issued and used for various models of the cars on a particular day along with their product-code.

(iii) Find the no. of cars and their details of repairs done in any specific months' time.

(iv) Display the details of the car service centre like the service centre name, address etc..

(v) Display the list of all pending services.

(vi) Display the details of all the service engineers belonged to that service centre.

(vii) Display the list of employees, their designations, employee id and department in which they are working.

(viii) Display the facilities the centre have.

(c) Write appropriate triggers, exceptions and functions for the above car service centre management system database schema and describe them briefly. **(5 marks)**

MCS 044: Mini Project, Problem Definitions for July, 2013 & January, 2014

Important Notes
1. Viva-voce worth 20 Marks is compulsory for each course. 2. Please follow the MCS-044 guidelines for solving, presentation format and submission of the Mini Project.

INTRODUCTION

The mini project is designed to help you develop practical ability and knowledge about practical tools/techniques in order to solve real life problems related to the industry, academic institutions and computer science research. The course Mini Project is one that involves practical work for understanding and solving problems in the field of computing. In this booklet the list of the problem definitions for the July, 2013 and Jan, 2014 sessions are given. Every year, the list of problem definitions will change. Please do not attempt the problems given in the booklet (MCS-044, Block-1) received by you along with your course material.

PROBLEM DEFINITIONS

We have divided different projects into four broad areas / categories of computer science as given below, so that you can select any one of these categories for your Mini project.

- Application development
- Networking project
- System software
- Website development.

An initial list of project definition will be given below in the following sections. However, student can elaborate the project definitions after discussing it with the project counsellor.

Students should **select one project from the given categories only** as per their interest, experience and knowledge in that area. Students should evaluate themselves and then should choose the project. Students may propose modifications/suggestions in the given project specification and finalize it in consultation with the MCS-044 counsellor.

APPLICATION DEVELOPMENT PROJECTS

Here we focus on investigating new ideas in application development through different projects. A set of possible project name and their details will be presented, however, students are encouraged to be creative and develop their own ideas in the given project descriptions.

1) Project Name: Bus Information System

Description

A Bus Company has about 50 Buses. These Buses service 10 different routes, each route has only one stopover. For example, two routes may be Delhi-Noida-Meerut and Delhi-Indirapuram-Meerut. All the bus routes start from the same city Delhi, however, they may have same or different stopover and destination city. (You may assume that no two routes are identical.) There are about 15 cities covered by the Bus company. Each Bus route includes information about the distance between various cities and time taken between two cities by that route. For example, for the route Delhi-Noida-Meerut, the distance and time taken between Delhi-Noida and Noida-Meerut will be recorded. The Buses return using the reverse route after a stop time of 1 hr at the destination. The Buses depart for one route after every 6 hours with the first bus starting at 5 a.m.

Use suitable data structure to create this system. Your system should be such that it should try to answer the following queries:

- Given a source – destination (can be a stopover also) by a customer, the software should give the route number of the path that takes the shortest time from the source to destination. Please note that there may be some source-destination pairs that may not be connected directly or indirectly.
- The time at which next bus from a source be available for a given source-destination pair.
- List all the routes for a given source-destination pairs.
- List all the routes and return routes

You may add more queries and more functionality into the system.

2) Project Name: Complete Contact Book

Description

Contact information is an essential component of any digital device that is involved in communication between more than two people. Assume that a Contact database stores all the possible addresses relating to a person including number of addresses (like office, home, permanent), different phones (residence, mobiles, office phones, etc.), fax number, e-mail addresses, website address, internet call addresses, etc.

The names of the person, designation and company name should also be included in this data. Each person may be part of one or more groups. Design either an object oriented or relational database system for the requirements above. In addition, you must design and implement an interface to query the address book on name or part of name, telephone number, group lists, etc. You should also design and implement interface to create new contact, editing and deleting contact information.

NETWORKING PROJECTS

We will focus on investigating new ideas in networking research through different networking projects. A set of possible project topics which will be presented, however, students are encouraged to be creative and develop their own ideas in the given project descriptions.

1) Project Name: Peer to Peer Networks – implementing shared file system with support for search.

Description

This project is aimed at helping you demonstrate the use of shared file system that may be used in peer-to-peer networks. It is suggested that you may create a distributed file system that may use a centralized directory but have replicated file storage. The query for a file may be created at any participating computer and should be answered by the centralized directory. The additional complexity here is due to availability of replica – which of the replica must be selected to answer the query? You may define your own technique for this purpose. You may simulate the network or use object oriented programming language like Java to demonstrate the system.

2) Project Name: Storing secured information on a remote node

Description

This project is aimed at helping you to demonstrate the use of cryptography while transfer of information from a source to a destination. The information that is to be sent across must be encrypted using any stated algorithm. You must write the code of this algorithm yourself. The information may be stored at remote note in decrypted form. However, whenever the information is requested at any node, it should be sent in encrypted form. You may simulate the network or use object oriented programming language like Java to demonstrate the system.

SYSTEM SOFTWARE DEVELOPMENT PROJECTS

Here we will focus on investigating new ideas in application development through different projects. A set of possible projects and their details will be presented however, students, are encouraged to be creative and develop their own ideas in the given project descriptions.

1) Project Name: Concurrency and Synchronization Manager of a shared file

Description

The purpose of this system software is to create a structured shared file. The file can be considered to be a cluster of information. For example, it may include student information and all the results of the students in different subjects. The file is to be used by a number of users at the same time. Allowable operations on the file by different users are:

- Create new data record
- Reading data
- Updating data

While creating and updating data only one user can operate on the entire file, whereas, many users may read data from the file concurrently. In addition, to all the above, design and implement two coordinating processes *Insert transactional data* (for example, insert marks) and *printing completed transactions* (for example, print result). The *Insert transactional data* process may be created as a batch process and should signal the *printing completed transactions* process on its completion. You must use an object oriented programming language for implementing this project.

2) Project Name: A simple editor

Description

In this project you are expected to create a simple GUI editor. The editor should have features for creating, editing, viewing and printing of files. It should also have feature for finding and replacing text in the file. The editor should support Hindi fonts (if possible). The editor must support GUI. You must use an object oriented programming language for implementing this project.

WEB DEVELOPMENT PROJECTS

Here, we will focus on investigating new ideas in application development through different projects. A set of possible project name and their details will be presented, however, students are encouraged to be creative and develop their own ideas in the given project descriptions.

1) Project Name: Online Assignment Result Monitoring System

Description

Develop an Online assignment result monitoring system that provides all the facilities related to assignment evaluation at a study centre of a University like IGNOU. The student submits the assignment at the study centre, the related data (enrolment number and subject code) is entered into the system at the study centre. The system verifies from the available data, if student is eligible to submit that assignment. If everything is in order the receipt of submission is issued to the student. Once assignments are submitted, they are sent to evaluators (about 20 assignments of a subject to an assignment evaluator). The evaluators evaluate and conduct the viva-voce of the students and are given access rights to enter the marks of the students. They, however, cannot change the marks of the students. Any change of marks can be made on the request of evaluator and study centre by the Regional office. The student can view the status of his/her assignment evaluation but not his/her marks till assignment results are officially declared by the University. Study centre can use this system to create the bills of the evaluators and also monitoring reports such as time taken by an evaluator to evaluate the assignments given to her/him. The regional centre uses this system to create the consolidated results and get it declared by the University.

2) Project Name: Online Art Gallery

Description

An art gallery exhibits the works of many artists. Each artist is given a specified space on the online webpage. The artists are charged for the space allotted to them on daily basis. The charges vary in different months. Jan to April and August to December the charges are Rs 200 per day per exhibit, from May to July charges are Rs 300 per day per exhibit. Each exhibit has a name and style of painting. The exhibits can be bought by the online customers who need to register with the art gallery. On receiving the full payment, the painting is sent to the customer. The system keeps track of the status of delivery of the painting to the customer. This status can also be seen by the customer. The gallery also stores the information about the visitors of the gallery who need not register with the art gallery website. For visitors only email id of the visitor is asked. Every month a complete information of business through online site is created for the artists as well as for the site promoters.