MASTER OF COMPUTER APPLICATIONS

(MCA)

ASSIGNMENTS
Year, 2014-15

(4th Semester)

(MCS-041, MCS-042, MCS-043, MCS-044, MCSL-045)
&
Problem definitions for MCS-044 July, 2014 & January, 2015

SCHOOL OF COMPUTER AND INFORMATION SCIENCES
INDIRA GANDHI NATIONAL OPEN UNIVERSITY
MAIDAN GARHI, NEW DELHI – 110 068

CONTENTS

Course Code	:	**MCS-041**
Course Title	:	**Operating Systems**
Assignment Number	:	**MCA(4)/041/Assign/2014-15**
Maximum Marks	:	**100**
Weightage	:	**25%**
Last Dates for Submission	:	**15ᵗʰ October, 2014 (For July 2014 Session)**
		15ᵗʰ April, 2015 (For January 2015 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: On a disk with 1000 cylinders, numbers 0 to 999, compute the number of tracks the disk arm must move to satisfy all the requests in the disk queue. Assume the last request serviced was at track 345 and head is moving to track 0. The queue in FIFO order contains requests for the following tracks: 123, 874,692, 475, 105, 376. Perform the computation for the following disk scheduling algorithms: *(10 Marks)*

(a) FIFO (b) SSTF (c) SCAN (d) LOOK

Question 2: Consider the following set of processes, with the length of the CPU burst time given in milliseconds.

Process	Burst time	Priority
P1	8	3
P2	3	1
P3	4	4
P4	7	2
P5	6	5

The processes are assumed to have arrived in the order   *(15 Marks)*
P1, P2, P3, P4 and P5 all at time 0.

a) Draw four 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=2) scheduling.

b) What is the turnaround time of each process for each of the scheduling algorithm in (a)?

c) What is the waiting time of each process for each of the scheduling algorithm in (a)?

d) Which of the schedules in (a) results in minimal average waiting time (overall processes)?

Question 3: Consider the following page-reference string: *(15 Marks)*

1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.

How many page faults would occur for the following replacement algorithms, assuming three frames? Remember all frames are initially empty.

a. FIFO replacement b. LRU replacement c. Optimal

Mention the merits and demerits of each of the above algorithms.

Question 4: Android has continued upgrading since it was first launched a few years ago and utilizes a special name each time it releases a new version of the platform. The latest version is Android 4.4.2. Mention its features and also compare this with the earlier versions namely Gingerbread, Ice Cream Sandwich and Jelly Bean. *(15 Marks)*

Question 5: Write a program in C to implement Banker's Algorithm to avoid Deadlock. Also explain the code briefly. *(10 Marks)*

Question 6: *a)* What is the cause of thrashing? How does the system detect thrashing? Once it detects thrashing, what can the system do to eliminate this problem? *(5 Marks)*

b) Explain in detail how semaphores and monitors are used to solve the Dining-Philosopher problem. *(10 Marks)*

Course Code	:	MCS-042
Course Title	:	**Data Communication and Computer Network**
Assignment Number	:	**MCA (4)/042/Assign/2014-15**
Maximum Marks	:	**100**
Weightage	:	**25%**
Last Dates for Submission	:	**15th October, 2014 (For July 2014 Session)**
		15th April, 2015 (For January 2015 Session)

This assignment has nine 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. Derive expressions for throughput in Aloha and slotted Aloha protocols. Show the vulnerability period of Aloha and also load vs. through graph for Aloha and slotted Aloha. *(10 marks)*

Q.2. Explain functioning of the following protocols with the help of a diagram. 3 bit sequence numbers are used. *(10 marks)*

- Go back N

- Selective Repeat

How these two protocols are different from **stop** and **wait** protocols?

Q.3. A bit stream 101010101101 transmitted using standard CRC method. The generator polynomial is x^4+1. Show the actual bit string transmitted. Suppose the fourth bit from the left is inverted during transmission. Show that this error is detected at the receiver's end. *(10 marks)*

Q.4. Sketch the Manchester and differentiate Manchester encodings for the bit stream: 100111010101 *(5 marks)*

Q.5. Explain the Ethernet frame format. Why there is a requirement of maximum and minimum Ethernet frame length? *(10 marks)*

Q.6. How is OSPF implemented in IP network? Illustrate. *(10 marks)*

Q.7. Consider the following network with the indicated link cost. *(15 marks)* Use Dijkstra's and Bellman's shortest path algorithm to find the shortest path from source node *A* to all other nodes.
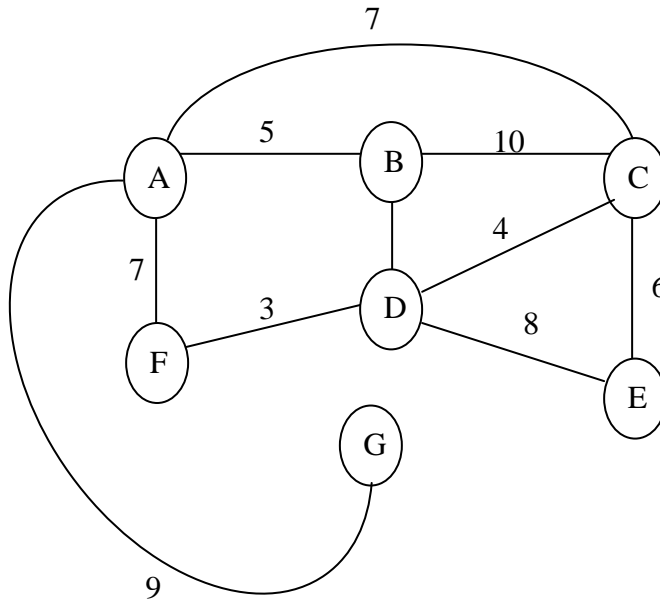
Q.8. What are the benefits of using digital certificate? *(5 marks)*

Q.9. How does TCP 3-way handshake mechanism handle the *(5 marks)* following:

(i) Delayed arrived and SYN packets

(ii) Delayed ACK Packet

Course Code	:	**MCS-043**
Course Title	:	**Advanced Database Management Systems**
Assignment Number	:	**MCA (4)/043/Assign/2014-15**
Maximum Marks	:	**100**
Weightage	:	**25%**
Last Dates for Submission	:	**15th October, 2014 (For July 2014 Session)**
		15th April, 2015 (For January 2015 Session)

This assignment has seven 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. Construct an E-R diagram and the corresponding relational database for a University/ College's office. The office contains data about each class, including the instructor, the enrolment, the time and room number of the class. For each student the number of subjects and the class is recorded. Document all assumptions that you make about the mapping constraints. *(10 marks)*

Q.2. Consider the following relation scheme: *(5 marks)*

students (S#,Sname)

Courage (C#, c name, Tname)

Studies (S#, C#)

Write the relational algebra queries and SQL queries for the following:

1) List students who are not studying in Course No. C2

2) Get the student details of those students who are studying in both courses, with course number, C4 and course no. C6

Q.3. List and explain the two integrity rules of relational model with the help of a suitable example for each. *(5 marks)*

Q.4. Define Hash join and explain the process and cost calculation of Hash join with the help of an example**.** *(10 marks)*

Q.5. *i)* List the feature of semantic database *(20 marks)*

ii) Explain clustering in data mining

iii) Explain the characteristics of mobile database. Also give an application of mobile database.

iv) How is audit trail done in database? How are they related to

database security?

Q.6. *i)* How does OLAP support query processing in dataware house. *(10 marks)*

ii) Differentiate between embedded SQL and dynamic SQL. Give an example of embedded SQL.

Q.7. Explain the following with the help of an example: *(20 marks)*

i) Application of Datagrid

ii) XML and HTML

iii) Data-marts

iv) Security classes

v) Concurrently control

vi) Deductive database

vii) Significance of creating data dictionary in database

viii) Datagrid

ix) Query optimization

x) Heterogeneous database.

Course Code   :   **MCS-044**
Course Title   :   **Mini Project**
Assignment Number   :   **MCA (4)/044/Assign/2014-15**
Maximum Marks   :   **100**
Weightage   :   **25%**
Last Dates for Submission : **15th October, 2014 (For July 2014 Session)**
                              15th April, 2015 (For January 2015 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 Program Guide for the format of presentation. Assumptions made if any, should be stated.

Background and Project Specifications:

A School is using a School Information System (SIS) to maintain fee and attendance records of its students. When a student takes admission in the school, s/he is allotted a unique admission number. The basic student information that is stored in the SIS includes name, parent name, address, phone number of guardian, email ID of guardian and health record. The school charges fee from its students every quarter (3 months). The fee includes components like tuition fee, activity fee, material fee and bus fee. Any student who does not pay the advance fee by a due date is charged late fee for a period of 15 days. After that a fee defaulter list is created and reported to the principal. Some students of the school may be given waiver of tuition fee on account of scholarship. The school maintains the records of the last 20 years. The attendance of each candidate is recorded every day. A student whose attendance falls below 60% in a month is issued a warning letter. Both the attendance and fee records of every student is loaded on the website having controlled access. The principal can see all the records, class teachers can see the records of all the students of their class, and parents of a student can view record of their ward.

You may study such system at any School. Perform the following tasks for the School.

Question 1:	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.	*(10 Marks)*
Question 2:	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. Your schedule must include both GANTT and PERT charts. Explain the two charts drawn by you.	*(10 Marks)*

Question 3: 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 diagram and data flow diagrams (DFDs) up to level 2-3; or you may take object oriented analysis approach and create class diagram, use case diagram, use cases, etc. *(10+15 Marks)*

Question 4: Design the system architecture and the database as per the needs of the system. 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. *(15+10 Marks)*

Question 5: Design various unit test cases for different testing techniques/strategies. *(10 Marks)*

Course Code	:	MCSL-045
Course Title	:	UNIX and DBMS LAB
Assignment Number	:	MCA (4)/L045/Assign/2014-15
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	31st October, 2014 (For July 2014 Session)
		30th April, 2015 (For January 2015 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:** Write the UNIX commands for the following: *(7 Marks)*

   a) Use the ***cat*** command, and display all the .txt files in the current directory on the screen at one go.

   b) To copy dir1 into dir2 including subdirectries.

   c) To start any web browser from the command prompt.

   d) To search for a certain pattern in the files existing in the current directory

   e) To list lines that do not include ***and*** in a text file.

   f) To compress all .dat files in the current directory.

   g) To decompress all the .dat files compressed in (f).

   h) To pause a process.

   i) To kill a process.

   j) To send a set of files to the line printer.

   k) To list all the files in the present working directory including the hidden files.

   l) To show all the files in the subdirectories of a directory.

   m) To get help on any UNIX command.

   n) To display any file one screen at a time.

Question 2:   a) Write a shell script program to perform all Arithmetic Operations using Command line arguments. *(4 Marks)*

b) Write a shell script program to search whether element is present in the list or not and also display its position in the list. *(5 Marks)*

c) Write a shell program to illustrate the *case* statement. *(4 Marks)*

PART-II: MCS-043

Question 1: *a)* Create an appropriate database using Oracle to manage a IGNOU Study Centre (SC). Perform Normalization to the normalised tables till the required levels. *(7 Marks)*

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

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

(ii) Identify the key constraints and list them.

(iii) List the details of your study centre like SC Code, RC Code, Address, Programmes activated, No. of Approved Academic Counsellors etc.

(iv) List the names of the academic counsellor, his/her educational qualifications, experience and course(s) they counsel for computer programmes (CIT/BCA/MCA).

(v) List the name of the Programme Incharge / Study Centre Coordinator along with his/her details.

(vi) List the total no. of students in your study centre (programme wise) who took new admission for the recent session.

(vii) List the facilities available there at the Study centre.

(viii) List the details of the computer systems and other equipment at your SC.

c) Write appropriate triggers, exceptions and functions for the above Study Centre Management System database schema and describe them briefly. *(5 marks)*

MCS-044
MINI PROJECT
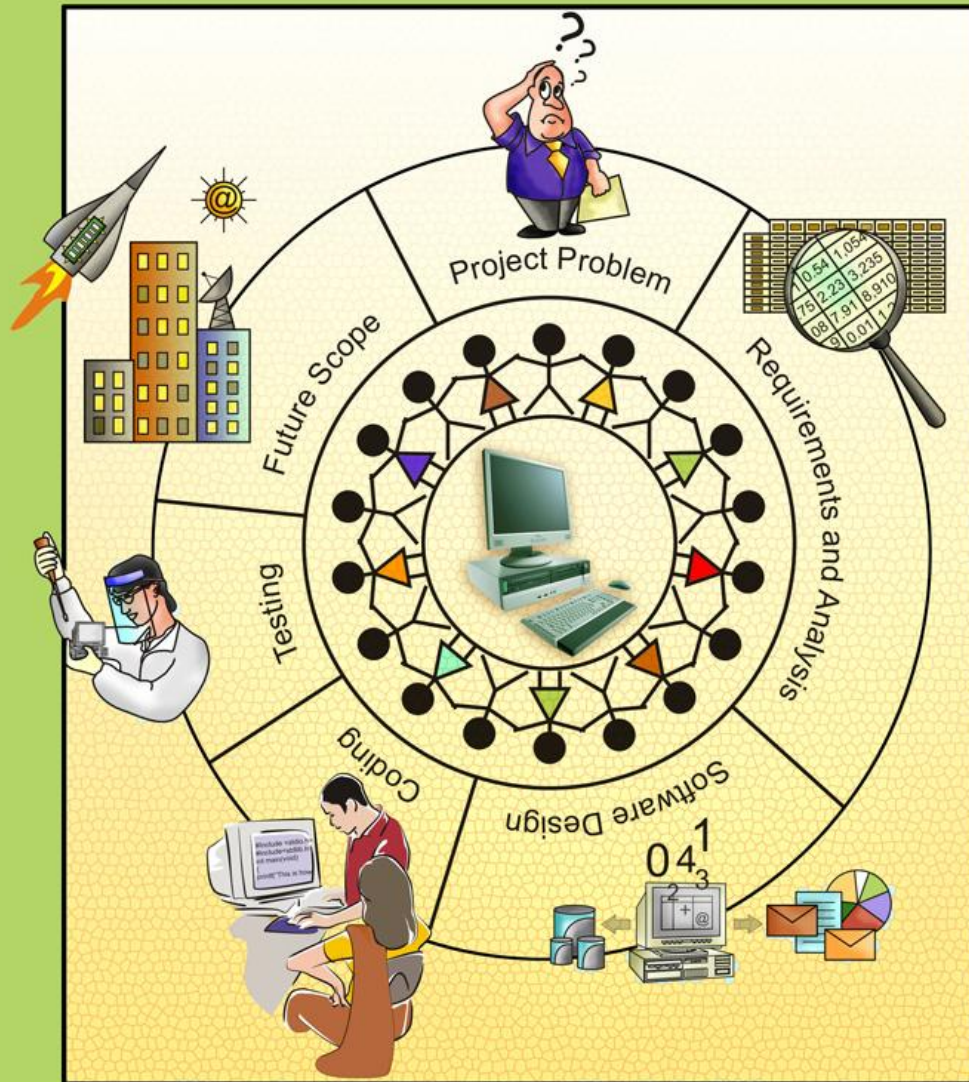
Problem Definitions for July, 2014 & Jan, 2015

MCS 044: Mini Project, Problem Definitions for July, 2014 & Jan, 2015

Important Notes

1. **Viva-voce of this project is compulsory.**
2. **Please follow MCS-044 guidelines for process of solving project problem and for the presentation format for submission of mini project report.**
3. **Please do not attempt the problems given in the course material of MCS-044, Block -1 or any other old problems. You must attempt one of the problems given in this section, if you submit mini project during July 2014 or Jan 2015 session.**

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, 2014 and Jan, 2015 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: Course Material Distribution System

Description

A University like IGNOU, dispatches course material to its student after the admission of students is finalized. The material distribution system receives a batch file of admission data including name, address and courses to be dispatched for every student. Each course consists of 2-4 booklets, which are generally packed together before dispatch. Inventory of each booklet is kept separately, as they are printed separately. On receiving a batch of requests for dispatch, first it is verified if all the course material to be dispatched to a student is available. All those courses, for which all the booklets of course are available, are dispatched to the student. Rest of the data is moved to pending list of course wise dispatch. When a course is printed and is made available in the store, the dispatch is made first to the pending cases.

Use suitable data structure/database to create this system. Your system should be such that it should try to answer the following queries:
*   The status of materials in the store
*   The list of students to whom dispatch has been made.
*   The courses for which material dispatch is pending.
*   Possible prediction for printing for the future dispatches.

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

2)   Project Name: Client Coordination Management

Description

A diagnostic centre maintains good relations with its clients. A diagnostic centre maintains the list of its clients. The contact information about the client that is stored by the company includes name of the client, phone numbers (residence, mobiles, office etc.). A client may be part of a family. In such cases, the family is considered as a single client. The clients may be working in various organizations. Some of these organizations have rate contract with the diagnostic centre, whereas some organizations get fixed discounts. A client who has been regular (has got at least 10 tests done in a year) client gets a discount of 5%. Make a billing software for the diagnostic centre. Assume that the diagnostic centre only performs limited number of tests. Just name them as Blood Test, Urine Test, Kidney Function Test, Liver function test, and Blood cholesterol test. You may assume suitable rates for these tests. Use suitable data structure/database to create this system. Your system should be such that it should try to answer the following queries:
*   The number of tests that have been conducted last month. Which of these tests is most common.

- Making and printing the Bill as for a client.
- Company wise list of clients and the discounts given to them.
- Possible prediction for future expansion.

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

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: Implementation of Data transmission using TCP/IP Network**

This project is aimed at helping you demonstrate the use of implementation of Data packets over TCP/IP. You may create a client page on which two strings should be input by a user. You must check the validity of the strings. If both the strings are valid strings they should be passed using TCP/IP packet to the server. On the server both the strings should be checked for equality. The result of the operation is sent back to the client where it is to be displayed. You may simulate the network or use object oriented programming language like Java to demonstrate the system.

2) **Project Name: Sending a secure message over a network to a remote site**

Description

This project is aimed at helping you to demonstrate the use TCP/IP protocol to send a secure message to a destination. You can use any algorithm for encryption, but the algorithm must be implemented by you. At the receiving node, you should generate an acknowledgment of the received message to the originating node. This message may also be encrypted using the same algorithm. At both the ends the you must decrypt the messages. 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: Create calls for a simple file system**

Description

The purpose of this system software is to create a set of file system calls. A file can be considered to be a sequence of bytes. Some of the basic services that you need to create include file creation, file openANDread, file write and file close. Each

service should have suitable parameters. A file may be used by many users when it is being read, but it can be written to by only one program at a time. You must use an object oriented programming language for implementing this project.

2)   **Project Name: A simple command based editor**

   Description

   In this project you are expected to create a simple command interface based editor, somewhat on the line of Unix vi editor. The editor should have features for creating, opening, editing, printing and closing of files. It should also have feature for finding and replacing text in the file. 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 Report Management System of a Diagnostic Lab**

   Description

   A diagnostic lab has many patients. It conducts many blood and urine tests for its clients. Some of these tests may be CBC, Blood Glucose, KFT, LFT etc Each test has many parameters like Hemoglobin, WBC, etc. Each parameter has a standard allowed range. The clients client need to register on the web site giving name, age, address etc. A client when wants to get some test done s/he registers for those tests and make payment. Samples are collected from the clients home. The reports are put on the web site along with allowable reference ranges in a printable format.

2)   **Project Name: Online counseling station booking**

   Description

   An Open University has five counseling stations. Each of these stations have facility for online counseling including camera, computer, web link etc. There are a number of users who wants to use these facilities. They need to use the online counseling station booking facility. A counseling session is of 1 hour duration and can be performed from 9 a.m. to 6 p.m.. One can book a counseling station for next 30 days only. One can book these stations if they have valid user name and password. A user is allowed to book a maximum of 20 sessions in the slot of next 30 days. A session can also be canceled, but it should be done at least one day in advance. User who cancels a session without prior information is debarred to book any further session, provided he takes the permission from the authorities again.

GUIDELINES

The MCS-044 block covers the majority of the guidelines regarding the formulation of the project proposal, formulation of the project report and the format to the followed for the project report. However the following are the detailed guidelines with respect to the counseling sessions and evaluation scheme.

Practical Counseling sessions

Students can discuss their topic with the counsellors at study centres and the counsellors will give suggestions on project specification at the study centre during the practical sessions. There are total 10 practical sessions, as given below:

Name of the Topic	No. of Practical Sessions (3 hrs each)
Project specification	1
Coding / Implementation	5
Testing	2
Documentation	2

Role of the Counsellor

The MCS-044 Mini-project counsellor is the person who motivates and helps students during the development of the project. The counsellor should take responsibility for guiding and approving different project processes, including Analysis, Design, Coding, Testing, and also the editing of project reports. Moreover, the main responsibilities of a counsellor are:

- Dedicating adequate time to the student for providing effective supervision and encouragement,
- Making sure that the student chooses a manageable project topic,
- Providing critical comments on the student's work and progress,
- Ensuring the student has access to necessary data,
- Encouraging the student to proceed in the intended direction and to agreed time limits, and
- Making sure that the project is the student's own work.

PROJECT SUBMISSION

Project Proposal

Project proposal should be presented to, reviewed by and agreed upon in consultation with the project counsellor to provide constructive feedback on the proposal and planned programme of the project work. **No need of any formal approval to be taken on any proforma**.

Project Report

The project report will contribute to the assessment and your marks. The format of this report will follow the format, guidelines and suggestions given in the block, but details should also be discussed with your counsellor. The final reports of students doing **the project in a group should not be identical. Each student should emphasise on his/her role and responsibilities in the project work.**

Submission of the Project Report

One copy of the original project report is to be submitted to the Study Centre concerned. A photocopy of the same project report must be retained by the student and should carry with him/her at the time of the viva voce.

EVALUATION SCHEME

MCS-044 course has three main evaluation components consisting of assignment (25 marks), project report (50 marks) and viva-voce (25marks). **A student is required to score 40% marks in each of these components separately for successful completion of the course.**

The project will be assessed by a written report and a combined presentation and viva voce (viva voce). To help the students we have given some guidelines about evaluation and assessment in the next section. If, the examiner finds that the project is lacking in any key areas then, the student will be asked to re-submit the project by selecting a new topic in the next session.

Resubmission of the project by the failed students

If the student fails in project report evaluation or viva-voce or in both, the students need to redo the entire process by selecting a new problem from the list of problems which will be updated every year.

Assignment/Continuous Evaluation

25% of total marks are allotted to assignment/continuous evaluation. The assignment questions are given in the MCA 4th semester assignment booklet.

If the student failed only in assignment component and successfully passed in project report evaluation and viva-voce, s/he needs to submit the fresh assignment of the current year, as is done in the normal courses.

Final Evaluation

The Term End Practical Examination of Mini Project will be conducted at the study centre concerned. 75% of total marks are evaluated in the final evaluation. Out of these 75 marks, 50 marks are allotted for the project report evaluation and 25 marks are allotted for viva voce.