MASTER OF COMPUTER APPLICATIONS (MCA)

ASSIGNMENTS

(July - 2015 & January - 2016)

MCS-041, MCS-042, MCS-043, MCSP-044, MCSL-045

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THE PEOPLE'S
UNIVERSITY

SCHOOL OF COMPUTER AND INFORMATION SCIENCES
INDIRA GANDHI NATIONAL OPEN UNIVERSITY
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CONTENTS

Important Notes

1. Submit your assignments to the Coordinator of your Study Centre on or before the due date.

2. Assignment submission before due dates is compulsory to become eligible for appearing in corresponding Term End Examinations. For further details, please refer to MCA Programme Guide.

3. To become eligible for appearing the Term End Practical Examination for the lab courses, it is essential to fulfill the minimum attendance requirements as well as submission of assignments (on or before the due date). For further details, please refer to the MCA Programme Guide.

4. The viva voce is compulsory for the assignments. For any course, if a student submitted the assignment and not attended the viva-voce, then the assignment is treated as not successfully completed and would be marked as ZERO.

Course Code	:	MCS-041
Course Title	:	Operating Systems
Assignment Number	:	MCA(IV)/041/Assignment/15-16
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	15th October, 2015 (For July 2015 Session)
		15th April, 2016 (For January 2016 Session)

This assignment has four questions. Answer all questions. Each question is of 20 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.

1. Consider the following jobs: *(15 Marks)*

Job #	Arrival time	Run time
A	0	6
B	2	4
C	3	5
D	5	4

(a) Using the **SJF** method, compute the completion times of the above jobs, average turn around time and average waiting time.

(b) Using the **SRTF** (Shortest Remaining Time first) method, compute the completion times of the above jobs, the average turn around time and the average waiting time. Note that SRTF is SJF with preemption. (Hint: Completion time - arrival time = turnaround time).

(c) Using the Round Robin method (with Quantum = 2), compute the completion times of the above jobs and the average waiting time.

2. (a) Banker's Algorithm is a deadlock avoidance algorithm that *(15 Marks)* checks for safe or unsafe state of a System after allocating resources to a process. When a new process enters into system, it must declare maximum no. of instances of each resource that it may need. After requesting operating system run banker's algorithm to check whether after allocating requested resources, system goes into deadlock state or not. If yes, then it will deny the request of resources made by process else it allocates resources to that process. No. of requested resources (instances of each resource) may not exceed no. of available resources in operating system and when a process completes it must release all the requested and already allocated resources.

    For implementing Banker's algorithm we should have pre-knowledge about 3 things:

    (i) How many instances of each resource a process could request. (Max)

(ii) How many instances of each resource is already allocated to that process(Allocated)

(iii)How many instances of each resource is already available(Available).

We can calculate need of each process from above information:
Need = Max - Allocated.

If Need <= Available then request will be accepted otherwise it is denied and it will check for next process in waiting queue.

A system is in Safe state if its all processes finish its execution or unsafe if any process is unable to acquire its all requested resources.

Write an interactive C program for implementing the Banker's Algorithm.

(b) Consider the following page-reference string: *(10 Marks)*

1, 2, 3, 2, 1, 7, 3, 4, 6, 2, 2, 2, 3, 1, 6, 3, 2, 1, 2, 4, 3

How many page faults would occur for following replacement algorithms assuming one, two, three, four, five, six or seven frames? Remember that all frames are initially empty, so your first unique pages will all cost one fault each.

   (i)   LRU replacement.
   (ii)   FIFO replacement.
   (iii)   Optimal replacement

3.   (a) The Linux kernel does not allow paging out kernel memory. What effect does this restriction have on kernel design? What are two advantages and two disadvantages of this design decision? *(10 Marks)*

     (b) The Windows 2000 VM manager uses a two-stage process to allocate memory. Identify several ways in which this approach is beneficial. *(10 Marks)*

4.   Discuss in detail the Process management, Memory management, I/O management, File management and Security & Protection in WINDOWS 8.1 Operating System. *(20 Marks)*

Course Code	:	MCS-042	
Course Title	:	Data Communication and Computer Network	
Assignment Number	:	MCA(IV)/042/Assignment/15-16	
Maximum Marks	:	100	
Weightage	:	25%	
Last Dates for Submission	:	15th October, 2015 (For July 2015 Session)	
		15th April, 2016 (For January 2016 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.

1. (a) Calculate channel capacity by applying Shannon's theorem for the following parameters. *(5 Marks)*
       Bandwidth (w) = 3100 Hz
       Signal to noise ratio (s/w) = 30 db

   (b) Suppose a computer A sends a message to a computer D via LAN 1, Router 1 and LAN 2. Explain the processes involved and contents of the packets and frames at network layer and data link layer for each hop interface. Assume the logical and physical address on your own. *(5 Marks)*

2. (a) Given a 10 bit sequence 1001001111 and a divisor of 1011, find the CRC. *(5 Marks)*

   (b) How does the sampling rate affect the transmitted digital signal? *(3 Marks)*

   (c) What is the difference between bit rate and baud rate? *(2 Marks)*

3. (a) Explain the concept of bit stuffing. How it is different from character stuffing. If the bit string 01111011111111101111111101110 is bit staffed, what is the output string? *(4 Marks)*

   (b) Assume a data stream is made of 101011100. Encode this stream using the following encoding scheme: *(3 Marks)*
       (i) Manchester
       (ii) Differential Manchester Encoding
       (iii) R Z

   (c) Construct the Hamming code for the bit sequence 10011010. *(3 Marks)*

4. (a) What are the advantages of fragmentation of frames in IEEE802.11. Discuss. *(4 Marks)*

   (b) Explain stop and wait ARQ. What can be the problem with this protocol? *(3 Marks)*

   (c) Why is sliding window protocol useful in satellite links? *(3 Marks)*

5. Consider the following network, with the indicated link cost. Use Dijkstra's algorithm to find the shortest paths from source node A to all other nodes. *(10 Marks)*
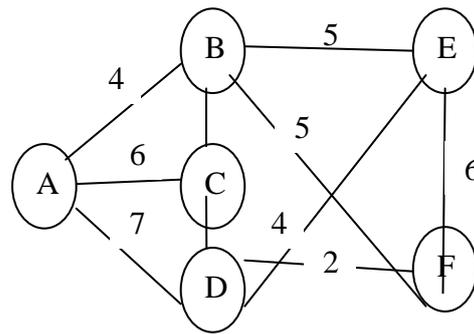
6. (a) How does BGP work? How does it solve the count to infinity problem? *(5 Marks)*

   (b) Explain the leaky bucket algorithm. *(5 Marks)*

7. (a) Explain how does Nagle's algorithm reduce the wastage of bandwidth. *(5 Marks)*

   (b) Explain TCP's congestion control mechanism through an illustration. *(5 Marks)*

8. (a) What is the utility of digital certificate? How are these digital signatures created? *(5 Marks)*

   (b) Explain Diffie Hellman algorithm with the help of an example. *(5 Marks)*

Course Code	:	MCS-043
Course Title	:	Advanced Database Management Systems
Assignment Number	:	MCA(IV)/043/Assignment/15-16
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	15th October, 2015 (For July 2015 Session)
		15th April, 2016 (For January 2016 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.

1. (a) Design a gennalization and specialization hierarchy for an automobile sales company. The company sells motorcycles, passenger cars, vans and trucks. Justify your placement of attributes at different hierarchy. *(5 Marks)*

   (b) Write SQL statements for the following: *(5 Marks)*

   (i) Grant select on student table to a student Shyam
   (ii) Revoke insert, update and delete permission on department table for user Mohan.

2. (a) Explain the followings in the context of XML. *(4 Marks)*

   (i) XML Tags
   (ii) Document type

   (b) Create an XML schema for list of their MCA students and their marks of 5th semester course. *(6 Marks)*

3. (a) Explain the role of checkpoints in log based recovery with the help of an example. *(5 Marks)*

   (b) Define a trigger check-key that does not allow duplicate values in attributes employee no. in employee table. *(5 Marks)*

4. (a) How is clustering and segmentation related to data mining? Explain partitioning clustering algorithms. *(6 Marks)*

   (b) What are data marts? What is the significance of creating them? *(4 Marks)*

5. (a) How will you enforce referential integrity constraints in Oracle? Explain with the help of one example. *(5 Marks)*

   (b) Create an object- oriented database using ODL for the following schema. Make suitable assumptions about attributes. *(5 Marks)*

6.   (a) How does an OLAP support query processing in dataware house?   *(4 Marks)*

      (b) What do you understand by query processing and query optimization? What are query trees and query graphs? Explain with an example of your choice.   *(6 Marks)*

7.   (a) Explain MVD (multi valued dependency) and join dependency with the help of an example for each.   *(5 Marks)*

      (b) How audit trails is done in database? How are they related to database security?   *(5 Marks)*

8.   (a) How does oracle manage database security?   *(4 Marks)*

      (b) The organization called XYZ Pvt. Ltd. Company undertakes several kinds of projects. Each employee can move on one or more projects. Each project is undertaken on the request of a client. A client can request for several projects. Each project has only one client. A project can use a number of items from different manufacturers and an item may be used by several projects.   *(6 Marks)*

      Before the delivery of items to a client, it is tested by a testing group in the organization.

      Draw E-R diagram and convert it into a relational schema.

      Also identity primary key in each relation.

Course Code	:	MCSP-044
Course Title	:	Mini Project
Assignment Number	:	MCA(IV)/P-044/Assignment/15-16
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	15th October, 2015 (For July 2015 Session)
		15th April, 2016 (For January 2016 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 book shop buys and sells books. It buys books from book suppliers in Bulk (minimum order is of 10 copies of books). On receiving the order of books from the suppliers the book shop gives a unique ID to every book that it gets in the store (please note that copies of a book have same ISBN number but different ID). The book shop sells the books to the customers. A customer can order the book either online by selecting various titles and number of copies, or on a counter. An order may include many books. A customer must register before placing the order. The order can be delivered at the address of the customer. The customers are ranked as per the amount of previous orders with the book store. Even special discount of 5% is offered to customers who have made a total purchase of INR 5000 or more with the book shop in the past 2 years. The book shop also analyses the data in such a way that purchase of books from suppliers are initiated well in time.

You may study similar type of requirements relating to a book shop offering online services and perform the following tasks:

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)*

2. What would be major costs of the system? What may be the financial benefits of installing such a system? 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. *(10 Marks)*

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 (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. *(10 + 15 Marks)*

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 system flow chart or detailed process design and state transition diagrams. Also design the user input screens and output report formats. *(15 + 10 Marks)*

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(IV)/L-045/Assignment/15-16
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	31st October, 2015 (For July 2015 Session)
		30th April, 2016 (For January 2016 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

1.   Write the UNIX commands for the following: *(5 Marks)*

  (a) To connect to a remote machine to download or upload files.
  (b) To print a file using standard print command
  (c) To set an environment variable
  (d) To change the command prompt from **$** to *.
  (e) To grant the permissions of **r w x** to the *user* and **read only** permission to the *group* and *others* for all the files in a current directory.
  (f) To set date and time.
  (g) To list all the files in the current directory whose file names starts with *a*.
  (h) To displays the first 5 lines of any text file.
  (i) To split a file *splittest*, which is containing 10 lines into 5 lines each which are directed to two various files.
 (j) To remove files starting with alphabet *c* from your directory.

2.   (a) Write a shell program to count no. of characters, vowels,   *(5 Marks)*
          special symbols and blank spaces in a given file provided by
          the user as input and individually display the count.

       (b) Write a shell script to check whether the year given as input   *(5 Marks)*
          is a leap year or not.

       (c) Write a shell script to add two matrices A and B of size 3 *x* 2   *(5 Marks)*
          matrix.

PART-II: MCS-043

1.   (a) Create an appropriate database using Oracle for a MCA   *(10 Marks)*
Assignments Management system at Study Centres for all the
5 semesters. It should cater to the assignment submissions for
all the courses, allotment of assignments to academic
counsellors for evaluation, marks entry and display. Perform
Normalization till the required levels.

     (b) Perform following queries using SQL: *(5 Marks)*

        (i)   Find the total no. of assignments received for the MCA
first semester courses.

        (ii)   Display the details of academic counsellor evaluating the
assignments for more than one course.

        (iii) Display the list of student who have passed in all the first
semester assignemnts.

        (iv) Display the list of all the students who scored more than
90% in MCS-011.

        (v)   Display the total no. of assignments received in the
current session for the MCSL-045 course.

     (c) Write appropriate triggers, exceptions and functions for the   *(5 Marks)*
above said system database schema and describe them briefly.
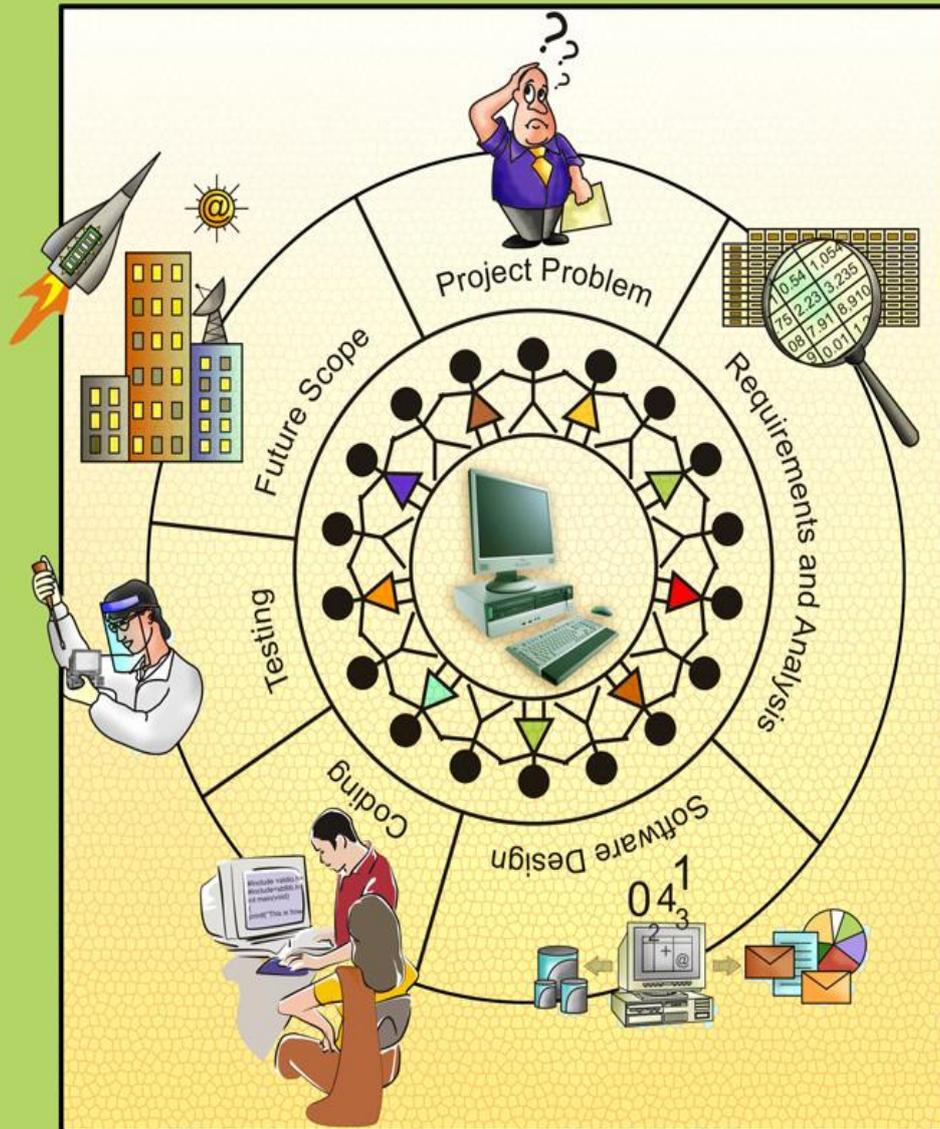
Problem Definitions for July 2015 & January 2016

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 2015 or Jan 2016 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, 2015 and Jan, 2016 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: Budget Control System

Description

A company creates its Budget under various Heads such as Employee Salary, Purchase of Goods, Meeting Expenses, Infrastructure Costs etc. All the expenses are to be recorded in a database system. Salaries have various components such as date of payment, Basic Salary, Dearness Allowance, House rent allowance, and deductions such as provident fund, and Income Tax deduction at source. Purchase of Goods requires details of items which have been purchased, date of purchase, price, etc. For the meetings the company stores the date of meetings, meeting agenda, members present in the meeting, honorarium payment to members etc. Infrastructure costs may include rents if the infrastructure is rented or maintenance or depreciation changes, if any and likewise.

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 income tax deduction of an employee in a financial year.
- The list of infrastructure that requires maintenance
- The Budget of the year and expenditure from that budget.
- The overall expenses occurred in honorarium in the meetings.

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

2) Project Name: In-patient Management

Description

A hospital has 200 beds. The patients are admitted in the hospital. Every in-patient is under the treatment of a senior consultant (doctor). The senior consultant prescribes medications, tests and recommends consultation with other doctors. The nursing staff services the in-patient as well as takes sample for various tests or sends the patients for various tests or calls the doctors for consultation. The test reports are made available to all the doctors. Thus, the system should keep records of patients, their medical history, treatment and tests. It should also keep track of doctors and nursing staff who are handling various medical processes.

This system can also inform about the status of various beds in the hospital. Use suitable data structure/database to create this system. Your system should be such that it should try to answer the following queries:

- Displays the discharge summary, listing all the test reports and prescriptions during the patient's stay in the hospital.
- List of admitted patients and their consulting doctors
- Possible prediction for future expansion of number of Beds or separation into specialised wards.
- List of all the staff of the hospital

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 secure data transmission using HTTPS for the purpose of login.**

   Description

   In this project you should try to demonstrate the use of implementation of Data packets over HTTPS. You may create a client page on which you should ask user name and password of a user. You must check the validity of these two strings, encrypt them and pass them using packets with suitable protocol to the server. At the server, decrypt them and check against already existing array containing approved user names and related password. The result of the operation is sent back to the client and displayed. You may simulate the network or use object oriented programming language like Java to demonstrate the system.

2) **Project Name: Service requests on Cloud**

   Description
   Cloud computing offers online access to computing resources and services to registered users. It has a pool of servers and software. You need to simulate data transfer from a client to a cloud server and its response back to the client. You may create your own service. Make suitable assumptions, wherever needed.

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 simple library utilities**

Description

Create utilities for merging of files as well as displaying the contents on the console, copying the content of one file into more than two files specified in the command line/dialog box, splitting the content of a file into 5 files and displaying the content of these split files on the console. You must use an object oriented programming language for implementing this project.

2) **Project Name: Implementation of Disk based Producer/Storage**

Description

A constant stream of data is being generated by a producer process. This data is to be stored in a disk block till it is full. Once the disk block is full, the producer process is suspended and storage process is activated. This storage process adds this block to a file and then creates a free block. This awakes the producer and storage process is suspended. You may use system calls, wherever needed. You should implement this project first using semaphore and then using a monitor. You may make suitable assumptions for the implementation. You may use any programming language for this implementation.

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 Appointment System**

Description

A hospital has large number of doctors with specified specialty. The Hospital allows new as well old patients to take appointment of the doctors. New patients first fill up an online registration form giving all the details of their illness, they are called for physical examination by the doctor on a specified date. After going through all the details, the doctor either confirms the registration of the patient or rejects it. All registered patients can book the appointments of the doctors. Doctors are available for consultation only on specific days. The appointments are booked for a time slot of 15 minutes on specific dates. Analyse the requirements in details and design & develop the online appointment system for the hospital.

2) **Project Name: Online Project Work Status**

Description

A software company maintains the details of work status of its projects using an online system. Company follows a standard waterfall model for development of every project and each step of this model is called a *task* by the company. Every

project is responsibility of a project lead, who makes a schedule of completion of each *task*. A team of 2 analysts or 2 design experts or 2 programmers or 2 testers are allotted to the project based on the present state of the project. Project lead has to make an online request for reserving the teams. A delayed project needs to be re-allotted the teams. The date of starting a task and the date of completion of a task is duly recorded by this application. In case the task is not yet completed the expected date of completion is recorded. A project team is located in a single location; however, project teams of different projects are dispersed on the client sites, therefore, this online system keeps track of allocation of teams to projects. It also keeps track of status of every project and future resource requirements.

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.