# MASTER OF COMPUTER APPLICATIONS (MCA)

**MCA/ASSIGN/SEMESTER-IV**

**ASSIGNMENTS**

**(July - 2019 & January - 2020)**

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


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

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**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.8

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| **Course Code** | **:** | **MCS-041** |
| **Course Title** | **:** | **Operating Systems** |
| **Assignment Number** | **:** | **MCA(IV)/041/Assignment/2019-20** |
| **Maximum Marks** | **:** | **100** |
| **Weightage** | **:** | **25%** |
| **Last Date of Submission** | **:** | **15th October, 2019 (for July, 2019 session)**<br>**15th April, 2020(for January, 2019 session)** |

**This assignment has six questions, which carries 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 for the format of presentation.**

**Q1.** **Assume you have the following jobs to execute with one processor:**

| Process | Processing Time | Arrival Time |
|---|---|---|
| P1 | 15 | 00 |
| P2 | 10 | 05 |
| P3 | 07 | 10 |
| P4 | 16 | 12 |
| P5 | 04 | 13 |

Calculate the turnaround time, waiting time, average turnaround time, average waiting time, throughput and processor utilization for the above given set of processes that arrive ***at a given arrive time*** shown in the table, with the length of processing time given in milliseconds using FCFS, SJF, RR (with quantum 2) and SRTN scheduling algorithms. Also draw their corresponding Gantt charts. **(20 Marks**)

**Q2**. Using C programming, write a semaphore based solution to Dining Philosopher's problem and explain the program. **(10 Marks)**

**Q3.** (a) Discuss how fragmentations manifest itself in each of the following types of virtual storage system. **(9 Marks)**

i) Segmentation
ii) Paging
iii) Combined segmentation and paging

(b) Compare direct file with indexed sequential file organization. **(6 marks)**

**Q4.** (a) Explain take-grant model for operating system security with an example. Also explain the mechanisms of security in WIN 2000 operating system? **(5 Marks)**

(b) Explain Bell and La-Padula Model for security and protection. Why is security a critical issue in a distributed OS environment? **(5 Marks)**

**Q5.** Write and explain an algorithm used for ordering of events in a distributed environment. Implement the algorithm with an example and explain? **(10 Marks)**

**Q6.** Discuss in detail the Process management, Memory management, I/O management, File management and Security and Protection for the following Operating Systems:

**(15 Marks)**

(a) WINDOWS 10 (b) ANDROID Version 9.0 (PIE)

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| **Course Code** | **:** | **MCS-042** |
| **Course Title** | **:** | **Data Communication and Computer Network** |
| **Assignment Number** | **:** | **MCA(IV)/042/Assignment/2019-20** |
| **Maximum Marks** | **:** | **100** |
| **Weightage** | **:** | **25%** |
| **Last Date of Submission** | **:** | **15th October, 2019 (for July, 2019 session)** |
| | **:** | **15th April, 2020(for January, 2020 session)** |

**Answer all the questions in the assignment which carry 80 marks in total. 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.**

**Q1.** (a) What is the need of modulating a signal? Will it be a right approach to send the information as the signal itself? **(4 Marks)**

(b) Explain techniques used in digital to analog modulation with the help of diagram **(5 Marks)**

**Q2.** (a) Discuss the different approaches to circuit switching? Why it is suitable for voice Transmission? What are its limitations? **(5 Marks)**

(b) How does multistage switching overcome these limitations? **(3 Marks)**

**Q3.** A bit string 011100111110001110 needs to be transmitted at the data link layer. What is the string actually transmitted after bit stuffing? **(2 Marks)**

**Q4.** (a) Define checksum and write the algorithm for computing the checksum? **(5 Marks)**

**Q5.** Define flow error control and piggybacking concepts. Show the operation of Stop & Wait ARQ with the help of an illustration. Also illustrate the outcome of Stop & Wait ARQ in the following scenarios. **(6 Marks)**

(i) When ACK is lost
(ii) When Frame is lost
(iii) When ACK timeout occurs

**Q6.** (a) How does MACAW work? Show diagrammatically. What are the added features in MACAW compared to MACA ? **(5 Marks)**

(b) What are the advantages of frame fragmentation in wireless network? Explain. **(4 Marks)**

**Q7.** How does a bridge operate in different LAN environments? What are the problems encountered in building a bridge between the various 802 LANs ? Discuss. **(5 Marks)**

**Q8.** Write Dijkstra and Bellman Fords shortest path routing algorithms and make a comparison between the two algorithms. **(6 Marks)**

**Q9.** (a) Discuss general principle of congestion control and the mechanisms used in congestion control in packet switched network . **(6 Marks)**

(b) Explain the implementation of token bucket traffic shaper with the help of a diagram? **(5 Marks)**

**Q10.** Explain with the help of an example and a diagram how the congestion controls algorithm (slow start algorithm) work at transport layer. **(5 Marks)**

**Q11.** (a) Define digital signature and explain its benefits. **(4 Marks)**

(b) What kind of a model is being used in India to provide public key infrastructure related services. (I.e. management of public keys). Elaborate. **(5 Marks)**

**Q12.** Discuss the implementation of Kerberos mechanism. **(5 Marks)**

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| **Course Code** | **:** | **MCS-043** |
| **Course Title** | **:** | **Advanced Database Management Systems** |
| **Assignment Number** | **:** | **MCA(IV)/043/Assignment/2019-20** |
| **Maximum Marks** | **:** | **100** |
| **Weightage** | **:** | **25%** |
| **Last Dates for Submission** | **:** | **15th October, 2019 (For July, 2019 session)**<br>**15th April, 2020 (For January, 2020 session)** |

**Answer all the questions in the assignment which carry 80 marks in total. 20 marks are for viva voce. You may use illustrations. Place go through the guidelines regarding assignments given in the Programme Guide for the format of presentation.**

**Q1.** Design a database for a university's examination division which conducts examination, issue hall tickets to the students for appearing for TEE. It also issue grade cards to the successful candidates. It maintains data about (a) Programs (b) Study center (SC) (c) Regional center (RC) (d) Students (e) courses within a program
The hall ticket should have student name, SC-code, RC code, Student id, Program code & course code and date of examination.
The grade card should have the following attributes Student id, Student name, program code, Course code and grade in each course.

(a) Draw the EER (extended ER) diagram for the above problem showing all entities, attributes and relationship. Also identify multivalued and derived attributes. **(5 Marks)**

(b) Draw the appropriate tables and relationship among the tables for the above diagram and normalize the tables up to 3NF. **(5 Marks)**

(c) Include generalization and aggregation features in the diagram and draw their tabular representations and explain. **(6 Marks)**

(d) Identify weak entity sets in the above diagram if any. Show how will you convert a weak entity set to a strong entity set? What is the need of such task? **(3 Marks)**

(e) Identify multivalued dependency in the above diagram if any. Justify. **(3 Marks)**

(f) Create an XML schema for the grade card to be issued by the division having details: student id, programme code, course id, grade, consumer name, assignments marks, TEE marks and grade. **(3 Marks)**

**Q2.** What is the fundamental difference between XML document and relational database? How is XML data stored in RDBMS? Explain. **(5 Marks)**

**Q3.** Write an algorithm that checks whether to the concurrent transactions are in deadlock or not? **(6 Marks)**

**Q4.** What are views? What is their significance in DBMS? How are views created in SQL? Explain the concept with the help of an example pertaining to the design of University's examination system (refer to Q1) **(6 Marks)**

**Q5.** Discuss the algorithm and the related cost of performing Selection operation. **(6 Marks)**

**Q6.** What is a timestamp? What is the use of timestamp protocols in distributed database? How does timestamp generation take place in distributed database? **(6 Marks)**

**Q7.** How are implementations of triggers in Oracle different from the standard implementations? **(5 Marks)**

**Q8.** Explain multiple granularities with the help of an example. How is **locking** done in such a case? **(6 Marks)**

**Q9.** What are the characteristics of multimedia & mobile databases? Explain the design challenges of these database? **(5 Marks)**

**Q10.** What is assertion rule mining? Write apriority algorithm for finding frequency item set. Discuss it with suitable examples. **(5 Marks)**

**Q11.** Draw a simple **Use case** and a **class diagram** for a university's examination system. **(5 Marks)**

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| **Course Code** | **:** | **MCS-044** |
| **Course Title** | **:** | **Mini Project** |
| **Assignment Number** | **:** | **MCA (IV)/P044/Assignment/2019-20** |
| **Assignment Marks** | **:** | **100** |
| **Maximum Marks** | **:** | **25%** |
| **Last Date of Submission** | **:** | **15th October, 2019 (for July, 2019 session)**<br>**15th April, 2020 (for January, 2020 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 bank proposes to develop an information portal for its customers. The portal provides secure login to customer account and online information services. The services include finding the list of all the accounts hold by a logged in customer, balance in his/her accounts, recent transactions, m-passbook and service requests like stopping the payment of a cheque, issue of a new cheque book, and complaint registration. A customer can have more than one accounts with the Bank, however, for online information purposes they all can be linked to a single user name and password. The proposed application can have only read only access to the accounts of the customer. Also the website should be a secure website as this application requires confidential information.

You may study the requirements of this system in more details by experiencing the online services of your own bank. Perform the following tasks for the system proposed above:

**Q1.** **(5+5 = 10 Marks)**

(a) Which Systems Development Life Cycle (SDLC) will you propose for the specification given above?

(b) Justify you selection by evaluating suitability of at least two SDLCs.

**Q2.** **(2+2+2+4=10 Marks)**

(a) What would be the major costs of the system?

(b) What may be the financial benefits of installing such a system?

(c) Perform a cost-benefit analysis for the proposed software and report its findings.

(d) 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.

**Q3.** **(10+15=25 Marks)**

(a) 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.

(b) 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 use object oriented analysis approach and create class diagram, use case diagram, use cases etc.

**Q4.** **(15+10=25 Marks)**

(a) 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 constraints.

(b) Create the system flow chart or detailed process design and state transition diagrams. Also design the user input screens and output report formats.

**Q5.** Design various unit test cases for the application given above using different testing strategies.

**(10 Marks)**

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| **Course Code** | **:** | **MCSL-045** |
| **Course Title** | **:** | **UNIX and DBMS Lab** |
| **Assignment Number** | **:** | **MCA(IV)/L045/Assignment/2019-20** |
| **Maximum Marks** | **:** | **100** |
| **Weightage** | **:** | **25%** |
| **Last Date of Submission** | **:** | **15th October, 2019 (for July, 2019 session)**<br>**15th April, 2020 (for January, 2020 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

**Q1.**

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

(a) To search for text using specific regular expressions in file.
(b) To sort the contents of a file in reverse alphabetical order.
(c) To count the no. of characters and words in a given text file.
(d) Create a small text file from your console.
(e) Change the file permissions to Read, Write and Execute for everyone on a data file created by you.
(f) To create a physical link between two files ***f1*** and ***f2***.
(g) Compare two text files and display the first difference.
(h) To display the disk usage.
(i) Create a file containing 20 lines, split it into two files containing 10 lines each.
(j) To change the owner of a file.

**Q2.**

(a) Write a shell program to count and print the no. of positive and negative integers in a list of integers given as input by the user. **(5 Marks)**

(b) Given two filenames by the user as the input, write a shell script to append the contents of file2 to file1. **(5 Marks)**

(c) Write a shell script to display the no. of times the given pattern occurs in a ***.dat*** file and display the count. **(5 Marks)**

## PART-II: MCS-043

**Q1.**

Design a database for a Mobile Phones' Sales and Service Showroom which deals with sales and service of various brands of mobile phones. It also sells various accessories pertaining to mobile phones. You are required to perform the following activities for the maintenance of the above:

(a) Draw an enhanced entity relationship (EER) diagram. **(3 Marks)**

(b) Create the complete database. **(2 Marks)**

(c) Write the following queries using SQL: **(4 Marks)**

(i) To display the Brand, Model and Price of the all the mobile phones sold on a particular date.

(ii) To find the details of the mobile phones which were purchased in the same shop and were serviced on a particular date.

(iii) To display all the Brands and Models of the mobile phones whose price is more than Rs.15000/-.

(iv) Create a view of the items for the manager showing overall performance of the week for each Brand and Model of the mobile phones.

(d) Perform the following activities:

(i) Create a trigger that prints the daily catalogue on change of a price of any mobile phone or accessory. **(2 Marks)**

(ii) Create a trigger whenever there is a new entry (of a new model) in the mobile phone table. Also design a trigger whenever there is a deletion of the record. **(3 Marks)**

(e) Create a transaction that finds the total items sold per week and prints the overall revenue generated. **(3 Marks)**

(g) Create two different types of users: the first user – a manager who can see reports and change the items and its price value and second user (a salesperson) who sells these items. **(3 Marks)**