MASTER OF COMPUTER APPLICATIONS (MCA)

MCA/ASSIGN/SEMESTER-II

ASSIGNMENTS

(July - 2023 Onwards)

MCS-021, MCS-022, MCS-023, MCS-024, MCSL-025

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

Course Code	**:**	**MCS-021**
Course Title	**:**	**Data and File Structures**
Assignment Number	**:**	**MCA(II)/021/Assignment**
Maximum Marks	**:**	**100**
Weightage	**:**	**30%**
Last Dates for Submission	**:**	**15th October (For July Session)** **15th April (For January Session)**

This assignment has 10 questions of 8 Marks each, 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: Elaborate various asymptotic notations used 10 to evaluate the efficiency of the algorithm. **(8 Marks)**

Q2: Write a program that accepts two polynomials as input and displays the resultant polynomial after multiplication of input polynomials. **(8 Marks)**

Q3: Write a C programme to implement a doubly linked list. Also write functions to perform insertion and deletion operations in it. **(8 Marks)**

Q4: What is a Circular Queue? Write an algorithm to perform insertion and deletion operation in a Circular Queue **(8 Marks)**

Q5: Write a program in C for insertion sort. Write the step-by-step working of the insertion sort for the following set of data: 10, 25, 86, 1, 16, 95, 37, 56, 5, 15, 20, 4. Also count the number of swaps and comparison operations performed for it. **(8 Marks)**

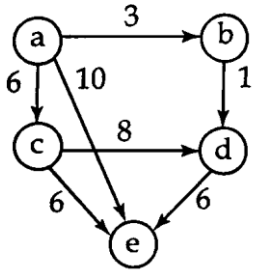
Q6: Write a detailed note on file organization techniques. **(8 Marks)**

Q7: Create the binary tree for which the in-order and post order traversal are given as below: **(8 Marks)**
In-order: QUVTMPSYZXR
Post-order: VUTQZYXSRPM

Q8: Create a B tree of order-5 for the following keys, inserted in the sequence. **(8 Marks)**
25, 5, 10, 2, 3 35, 45, 30, 50, 55, 60, 12, 18, 20, 1
Further, delete the keys 1, 2, 10, and 12. Show all the intermediate steps.

Q9: Create AVL tree for the following keys inserted in the order: **(8 Marks)**
5, 15, 3, 25, 10, 2, 35, 7, 45, 30, 12, 20, 14
Further, delete the keys 2, 5, 7, and 8. Show all the intermediate steps.

Q10: Solve the following instance of single source shortest paths problem with vertex 'a' as the source using suitable method. **(8 Marks)**



Course Code	**:**	**MCS-022**
Course Title	**:**	**Operating System Concepts and Networking Management**
Assignment Number	**:**	**MCA(II)/022/Assignment**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**15th October (For July Session)** **15th April (For January Session)**

Answer all the questions of the assignment having 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. Answer of each part of the question should be confined to about 300 words.

Q1:

(a) Explain two approaches used to improve system performance by overlapping input, output and processing in CPU. **(6 Marks)**

(b) Explain the characteristics of multiprocessor operating system. **(4 Marks)**

Q2:

(a) What is Token Ring? How does it work? Differentiate between token ring and token bus. **(5 Marks)**

(b) What is meant by Trust Relationship? Discuss the role of Kerberos and Domain controller in maintaining trust relationships. **(5 Marks)**

Q3:

(a) Describe the pre-installation checks and information gathering that need to be carried out before installing LINUX on a computer **(6 Marks)**

(b) Differentiate between absolute and relative path names, along with an example of each. **(4 Marks)**

Q4: Answer the following questions related to Linux commands: **(10 Marks)**

(a) Is desired to create a file in LINUX called "newfile" that consists of the last 15 lines of a file "filer followed by the last 6 lines of a file "file2". Both "filet" and "file2" already exist. Write the sequence of commands in LINUX to achieve this

(b) Write the LINUX command to change the password of a user called "SOCIS" to "E93df!kN#". Who can run this command?

(c) Write the LINUX command to find the number of users currently logged into the system?

(d) Write the LINUX command to take a text file named "source-file" as input and circularly shift every small case letter forward by 5 characters, such that "a" becomes "f", "z" becomes "e" and so on, but "A", "3", "$" and other such characters are left unchanged.

Q5:

(a) What is the Active Directory in Windows 2000? Describe, with the help of a diagram, the logical structure of the Active Directory. **(5 Marks)**

(b) Differentiate the role and responsibilities of user mode and kernel mode of Windows 2000 system. **(5 Marks)**

Q6:

(a) Write a shell script which will generate the list of users along with details of files those are created /modified by the respective user during the specified time. **(5 Marks)**

(b) Differentiate between LAN, MAN and WAN in terms of size, protocols, access mechanism, hardware devices and switching methods. **(5 Marks)**

Q7:

(a) What are the security services provided by IPsec? Discuss the two IPsec components in WINDOWS 2000. Also explain the policy options for IPsec implementation. **(5 Marks)**

(b) List and describe various security features in WINDOWS 2000 O/S. **(5 Marks)**

Q8: Write short notes on the following: **(10 Marks)**

(a) NTFS
(b) Packet switching
(c) EFS services
(d) Firewall

Course Code	**:**	**MCS-023**
Course Title	**:**	**Introduction to Database Management Systems**
Assignment Number	**:**	**MCA(II)/023/Assignment**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Date of Submission	**:**	**15th October (For July Session)** **15th April (For January Session)**

This assignment has four questions. Answer all questions of total 80 marks. 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.

Q1: **(40 Marks)**

a) Give the limitations of file based system. How can they be overcome using DBMS? **(4 Marks)**
b) Discuss the 3-level architecture of DBMS. Explain how it leads to data independence. **(4 Marks)**
c) What are integrity constraints? Discuss the various types of integrity constraints that can be imposed on database. **(4 Marks)**
d) What is the two phase locking protocol? How does it guarantee Serializability? Explain. **(4 Marks)**
e) Discuss the anomalies due to insertion, updation and deletion in a relation that is not in QNF. Illustrate with the help of an example.
f) List and explain the 4 basic properties of a Transaction with the help of appropriate examples.
g) Explain the Log-based recovery scheme with the help of an example. **(4 Marks)**
h) Explain the need of Distributed DBMS over Centralized DBMS. Also give the structure of Distributed DBMS. **(4 Marks)**
i) Write SQL commands for each of the following. Also illustrate the usage of each command through suitable example. **(2 Marks each)**
   (i) Creation of views
   (ii) Creation of sequences
   (iii) Outer join
   (iv) To give access permission to any user

Q2: **(20 Marks)**

A bookshop has a huge collection of books to sell them online and therefore requires a database to track its sales. For each book they store the Title, Author(s), name, Publisher, Volume, ISBN No., Price, Stock (no. of copies), Year of publication, etc. To help the customers to search the book, they require that each book is assigned to one or more categories such as Engineering, Sciences, Fiction, Literature, Applications, etc. If at all, any discounts that are there for certain books, need to be notified on the site (best-buy offer). To buy a book, a customer needs to register on the site. Also it maintains the profile of the user and also their earlier purchases. The bookshop also sends "Newsletter" to all the registered users to update them about the publications.

Identify the entities, relationships, constraints and cardinality and construct an ER diagram for the above mentioned specifications. List your assumptions and clearly indicate the cardinality mappings as well as any role indicators in your ER diagram.

Q3: **(10 Marks)**

Consider the following tables:
WORKS(Pname, Cname, Salary)
LIVES(Pname, Street, City)
LOCATED(Cname, City)
MANAGER(Pname, Mname)

Write a query in SQL for the following:

(i) List the names of the people who work for the company Wipro' along with the cities they live in.
(ii) Find the people who work for the company `Infosys' having salary greater than 50,000.
(iii) List the names of the people, along with the street and city addresses.
(iv) Find the persons whose salaries are more than that of all of the 'Oracle' employees.
(v) Find the names of the persons who do not work in `Infosys'.

Make suitable assumptions, if any.

Q4: **(10 Marks)**

(a) Compute the closure of the following set F of functional dependencies for relation schema
R = (A, B, C, D, E).
$A \rightarrow BC$
$CD \rightarrow E$
$B \rightarrow D$
$E \rightarrow A$

List the candidate keys for R.

(b) Consider the relation R (A, B, C, D, E) and the set of functional dependencies :-
F($A \rightarrow D$, {A,B} $\rightarrow C$, $D \rightarrow E$)

Assume that the decomposition of R into {R1 (A, B, C) and R2 (A, D, E)}.
Is this decomposition lossless? Justify?

Course Code	**:**	**MCS-024**
Course Title	**:**	**Object Oriented Technologies and Java Programming**
Assignment Number	**:**	**MCA (II)/024/Assignment**
Maximum Marks	**:**	**100%**
Last Date of Submission	**:**	**15th October (For July Session)** **15th April (For January Session)**

This assignment has three questions of 80 marks. Rest 20 marks are for viva voce. Answer all questions. 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: How does Object Oriented Programming differ from Procedural Programming? What are its advantages and disadvantages? **(30 Marks)**

Q2: Explain how you will define EMPLOYEE class in java. Also, define MANAGER class. You need to derive MANAGER from EMPLOYEE. **(30 Marks)**

Q3: Write a program in Java to compute Salary of Employees of an Institution. Make necessary assumptions. **(20 Marks)**

Course Code	**:**	**MCSL-025**
Course Title	**:**	**Lab Course**
Assignment Number	**:**	**MCA(II)/025/Assignment**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**15th October (For July Session)** **15th April (For January Session)**

This assignment has four parts. Answer all questions of each part. Each part is of 10 marks. Lab records of each part will carry 10 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.

PART-1: MCS-021

Q1: Write a program in C language for addition of two sparse matrices using Pointers **(5 Marks)**

Q2: Write a program in C language that will accept a Graph as input and will perform a Depth First Search on it. Make necessary assumptions. **(5 Marks)**

PART-2: MCS-022

Q1: Write a shell script in Linux/Unix that accepts a text file as input and prints the number of words in the file with at least two vowels **(5 Marks)**

Q2: Your PC is on a network. Make the printer that is directly connected to your machine as non-sharable **(5 Marks)**

PART-3: MCS-023

Q1: Create a database consisting of Name of Hospital, Number of Departments, Number of Patients in each Department, Number of Patients who are discharged within a week's time of their admission to Hospital. Make necessary assumption. **(10 Marks)**

After creating the database, perform the following tasks:

(i) List the names of all Hospitals during last five years from where less than 50% patients admitted are discharged within a week's time. Make necessary assumptions.

Part-4: MCS-024

Q1: Write a program in Java for multiplication of two sparse matrices **(5 Marks)**

Q2: Write a program in Java that connects to a database and generates a report that consists of the list of all areas (names with pin codes) in a specific city / town where at least one person tested positive for Covid-19 during last 24 hours. Make assumptions wherever necessary **(5 Marks)**

Note: You must execute the program and submit the program logic, sample inputs and outputs along with the necessary documentation for this question. Assumptions can be made wherever necessary.