

MASTER OF COMPUTER APPLICATIONS (MCA)

MCA/ASSIGN/SEMESTER-II

ASSIGNMENTS

(July - 2019 & January - 2020)

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



**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.

Course Code : **MCS-021**
Course Title : **Data and File Structures**
Assignment Number : **MCA(II)/021/Assignment/2019-20**
Maximum Marks : **100**
Weightage : **25%**
Last Dates for Submission : **15th October, 2019 (For July, 2019 Session)**
15th April, 2020 (For January, 2020 Session)

This assignment has four questions which carry 80 marks. Answer all the questions. Each question carries 20 marks. You may use illustrations and diagrams to enhance the explanations. Please go through the guidelines regarding assignments given in the Programme Guide. All the implementations should be in C language.

- Q1.** Write an algorithm that accepts a Binary Tree as input and prints the number of leaf nodes to standard output.

- Q2.** Write an algorithm for the implementation of an AVL Tree.

- Q3.** Write a note of not more than 5 pages summarizing the latest research in the area of “Trees”. Refer to various journals and other online resources. Indicate them in your assignment.

- Q4.** Write an algorithm for the implementation of a Stack.

Course Code	:	MCS-022
Course Title	:	Operating System Concepts and Networking Management
Assignment Number	:	MCA (II)/022/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 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)** What are the two criteria for classification of the advanced operating systems? Discuss any two operating systems in both the categories. **(6 Marks)**
- (b) Discuss the key characteristics of modern operating systems. **(5 Marks)**
- Q2.** Discuss the objectives and primary functions of the following connecting devices: **(5 Marks)**
- (i) Hubs
- (ii) Routers
- Q3.** Explain virtual to physical address mapping concepts with the help of an abstract model. **(5 Marks)**
- Q4.** Describe important Linux directories and files. **(4 Marks)**
- Q5. (a)** What will be the output of followings? **(6 Marks)**
- ```
$ cat myfile. text | head-7 | tail-5
$ cat file name | more ls- l >temp
$ sort my file. text | unique.
$ cat my file . text | grep "mohan" | wc- l
$ l s - l | grep "jan"
$ l s - l | grep | sort
```
- (b) What options can be used with **grep** command? **(3 Marks)**
- Q6.** Briefly describe the features of followings and how are they configured in Linux? **(6 Marks)**
- (i) Apache web server
- (ii) DNS
- (iii) NFS server

- Q7.** What are the purposes of dynamic addressing and directory services in Windows 2000? How are they configured? **(5 Marks)**
- Q8.** What is the purpose of VPN and name VPN technologies supported by Windows 2000? **(5 Marks)**
- Q9.** What are intrusion detection systems(IDS)? What IDS can do? **(5 Marks)**
- Q10.** Elaborate the primary aspects of firewall? What are the limitations of firewall? **(5 Marks)**
- Q11.** How does RAID support fault tolerance systems? How is it implemented in Windows 2000? **(5 Marks)**
- Q12.** List the different types of malicious code and compare the virus protection tools. **(5 Marks)**
- Q13.** What is Kerberos? Describe Kerberos management in Windows operating system. **(5 Marks)**
- Q14.** Define IPSec? What are its features? Discuss its implementation in Windows 2000. **(5 Marks)**

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|--------------------------------|---|---------------------------------------------------------------------------------------------------------------------------------|
| <b>Course Code</b>             | : | <b>MCS-023</b>                                                                                                                  |
| <b>Course Title</b>            | : | <b>Introduction to Database Management Systems</b>                                                                              |
| <b>Assignment Number</b>       | : | <b>MCA (II)/023/Assignment/2019-20</b>                                                                                          |
| <b>Maximum Marks</b>           | : | <b>100</b>                                                                                                                      |
| <b>Weightage</b>               | : | <b>25%</b>                                                                                                                      |
| <b>Last Date of Submission</b> | : | <b>15<sup>th</sup> October, 2019 (For July, 2019 Session)</b><br><b>15<sup>th</sup> April, 2020 (For January, 2020 Session)</b> |

**This assignment has six questions carrying a total of 80 marks. Answer all questions. Rest 20 marks are for viva-voce. You may use illustrations and diagrams to enhance your 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. (20 Marks)**

Design an ER diagram for an ABC IT Training Institute that will meet the training needs for individuals and employees of corporate offices. Clearly indicate the entities, relationships, cardinality and the key constraints. The description of the environment is as follows:

The Institute offers 5 advanced courses of 3 months duration each. The Institute has 20 faculty and can handle up to 40 trainees per batch. The training will be conducted batch wise. They can accommodate maximum 5 batches per day (2 batches in the pre-lunch session and 3 batches in the post-lunch session). The student can register up to 2 courses simultaneously. Training consists of theory and practical. Theory and practical are scheduled on alternate days. Each batch is assigned a faculty member who takes theory sessions as well as practical sessions. Sunday is holiday for everyone. A test will be conducted per course every week to continuously evaluate the performance of the student. The question paper will be set by the faculty concerned whoever is teaching the batch. The result/grade will be declared at the end of the third month after conducting course-end exam.

**Q2. (10 Marks)**

Design the Relational Schema for the E-R diagram that you have drawn for part *Question 1*. The relations must be at least in 2 NF. Perform the following on the relations:

- Enter about 5 sets of meaningful data in each of the relations.
- Identify the domain of various attributes.
- Identify the Primary keys of all the relations.
- Identify the Foreign keys and referential integrity constraints in the relations.

**Q3. (10 Marks)**

- “For creating a Employee Management Information System of an Organisation a database management system(DBMS) is better or a file management system.” Justify the statement given above.
- Assume that you are assigned the role of Database Administrator for the Organisation database, mention the key responsibilities you have to handle?

Q4.

(10 Marks)

Given the *relational schema*:

*ENROL (ENo, C\_Id, Class) - ENo represents student number*

*TEACH (Prof, C\_Id, Class) - C\_Id represents course number*

*ADVISE (Prof, ENo) - Prof is project guide of ENo (Student's enrol\_no)*

*PRE\_REQ (C\_Id, Pre\_C\_Id) - Pre\_C\_Id is prerequisite course*

*GRADES (ENo, C\_Id, Grade, Year)*

*STUDENT (ENo, SName) - SName is student name*

Write SQL statements for the following:

- (i) List all students whose project guide is Prof.Murthy.
- (ii) List the grade for the student with ENo=1234
- (iii) List those professors who teach more than one class.
- (iv) List all the student names and ENo's who got Grade A in the year 2018 in C\_Id= 100.
- (v) List all the students who has taken the pre-requisite course Pre\_C\_Id= 001.

*Note: Make suitable assumptions, if any.*

Q5.

(12 Marks)

What are the advantages of indexed-sequential file organisation? With the help of an example explain the structure of indexed-sequential file.

Q6.

(6X3=18 Marks)

- a) What are the problems associated with data Redundancy in a relation? How can you solve those problems? Can referential integrity constraints help in addressing those problems? Give reasons in support of your answer.
- b) Consider the following employee record in an organization:

*Employee ( ID, Name, date of birth, date of joining, age, address, department, manger, IDs of projects working on, role in the project, project name, project team leader, duration of project, dependent names)*

An employee works in one department. Each department is managed by one manager. An employee can work on many projects. A project has a team leader. An employee can have many dependents, however, one dependent can be related to only one employee.

Identify the functional dependencies in the relation given above. Normalise the relation up to BCNF. Make suitable assumptions, if any.

- c) Consider a relation Student(ID: 9 characters, name: 25 characters, department: 10 characters, programme\_code: 4 characters) having about 1,000,000 student records. The database is stored on a disk having a disk block size of 1 MB. Assume that the primary index of the relation is ID and this relation is required mostly for the application that generates programme wise list of student names in alphabetical order. Create a secondary index that will improve the performance of the system for the given application. Show how many block transfers will be saved on average due to creation of index. Make suitable assumptions if any.



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|--------------------------------|---|---------------------------------------------------------------------------------------------------------------------------------|
| <b>Course Code</b>             | : | <b>MCS-024</b>                                                                                                                  |
| <b>Course Title</b>            | : | <b>Object Oriented Technologies and Java Programming</b>                                                                        |
| <b>Assignment Number</b>       | : | <b>MCA(II)/024/Assignment/2019-20</b>                                                                                           |
| <b>Assignment Marks</b>        | : | <b>100</b>                                                                                                                      |
| <b>Maximum Marks</b>           | : | <b>25%</b>                                                                                                                      |
| <b>Last Date of Submission</b> | : | <b>15<sup>th</sup> October, 2019 (For July, 2019 Session)</b><br><b>15<sup>th</sup> April, 2020 (For January, 2020 Session)</b> |

**There are eight questions in this assignment which carried 80 marks. Rest 20 marks are for viva-voce. Answer all the questions. Give appropriate comments in programs to increase understandability. Wherever required, you may write java program, run it on machine and take its output as part of solution. Please go through the guidelines regarding assignments given in the Program Guide for the format of presentation.**

**Q1.**

- (a) Explain basic concepts of Object Oriented Programming? Explain how data hiding is achieved. **(5 Marks)**
- (b) Explain use of different types of operators available in java with the help of examples. **(5 Marks)**

**Q2.**

- (a) Explain how class is defined in java with the help of an example. Also explain what are the things which are kept inside a class. **(2 Marks)**
- (b) Write a java program to create an Account class and define constructors in it. Inherit Saving\_Bank\_Account class from Account class. Override constructors of Account class in Saving\_Bank\_Account class. Define appropriate methods to operate the accounts. Make necessary assumptions. **(8 Marks)**

**Q3.**

- (a) Explain use of static methods in java. **(2 Marks)**
- (b) Write a java program to add two matrices of 4X4 in java. **(3 Marks)**
- (c) Explain different types of inheritance that are supported by java with the help of examples. **(5 Marks)**

**Q4.**

- (a) Explain uses of final and super keywords in java with the help of examples. **(4 Marks)**
- (b) Explain the need of package in Java. Explain accessibility rules for packages. **(3 Marks)**
- (c) Explain advantages of polymorphism with the help of example. **(3 Marks)**

**Q5.**

- (a) What is interface? How it is different from abstract class? Explain. **(2 Marks)**
- (b) What is an exception? Explain various causes of exceptions. With the help of a program explain how exceptions are handled in java. **(4 Marks)**
- (c) What is multithreading? Explain how threads are created in java. Describe java thread model. **(4 Marks)**

**Q6.**

- (a) Explain various applications where multithreading may be used. Also explain how interthread communication takes place in java. **(5 Marks)**
- (b) Create an Applet to draw different shapes on the basis of input given by user. **(5 Marks)**

**Q7.**

- (a) What is object serialization? Explain working and use of object serialization. **(3 Marks)**
- (b) Explain different stream classes in java. Also write a java program to save the given data in a file. **(5 Marks)**
- (c) Explain difference between Srting and StringBuffer classes. **(2 Marks)**

**Q8.**

- (a) What is proxy server? Explain URL class and its methods in java. **(3 Marks)**
- (b) Explain advantages of JDBC. **(2 Marks)**
- (c) What is Servlet? Explain GET and POST methods of Servlet. **(3 Marks)**
- (d) Explain TCP/IP Sockets. **(2 Marks)**

|                                  |   |                                                                                                                                 |
|----------------------------------|---|---------------------------------------------------------------------------------------------------------------------------------|
| <b>Course Code</b>               | : | <b>MCSL-025</b>                                                                                                                 |
| <b>Course Title</b>              | : | <b>Lab Course</b>                                                                                                               |
| <b>Assignment Number</b>         | : | <b>MCA(II)/L025/Assignment/2019-20</b>                                                                                          |
| <b>Maximum Marks</b>             | : | <b>100</b>                                                                                                                      |
| <b>Weightage</b>                 | : | <b>25%</b>                                                                                                                      |
| <b>Last Dates for Submission</b> | : | <b>15<sup>th</sup> October, 2019 (For July, 2019 Session)</b><br><b>15<sup>th</sup> April, 2020 (For January, 2020 Session)</b> |

**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 multiplication 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 Breadth 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 that start with character B  
**(5 Marks)**
- Q2.** Your PC is on a network. Make necessary settings in your PC so that none of the folders are shared with Public.  
**(5 Marks)**

#### **PART-3: MCS-023**

- Q1.** Create a database consisting of Name of Hospital, Number of Branches, Total number of Clinical Specialities offered, Total Number of Visitors every day on average  
After creating the database, perform the following tasks: **(10 Marks)**
- (i) List the names of those Hospitals which are having at least 200 Visitors per day

#### **PART-4: MCS-024**

- Q1.** Write a program in Java for addition 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 names of Hospitals which are offering a particular speciality. Input to the Java program will be Speciality. 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.*