**(101MC24)**

M.C.A. DEGREE EXAMINATION, JUNE/JULY 2025.

First Semester

DATA STRUCTURE WITH C++

Time : Three hours Maximum : 70 marks

SECTION A – (7 × 2 = 14 marks)

Answer questions No. 1 compulsory.

1. (a) Define data abstraction in C++ with an example.

   (b) What is a pointer? Give syntax for declaring and using it.

   (c) What is the difference between singly and doubly linked lists?

   (d) Write two advantages of recursion over iteration.

   (e) Define stack and mention any two applications.

   (f) What is an AVL Tree?

   (g) What is meant by a minimal spanning tree?

SECTION B — (4 × 14 = 56 marks)

Answer ONE question from each unit.

UNIT I

2. (a) Explain the concept of class and object in C++ with examples.

   (b) Describe constructors and destructors with suitable code snippets.

Or

3. Explain pointer variables in detail. How are arrays implemented using pointers in C++?

UNIT II

4. (a) Describe different types of linked lists. How do you insert and delete nodes in a doubly linked list?

   (b) Write an algorithm for the N-Queens problem using recursion and backtracking.

Or

5. What is hashing? Explain quadratic probing and chaining with examples.

UNIT III

6. (a) Write algorithms for push and pop operations in a stack using arrays.

   (b) Explain the implementation of priority queue using linked list.

Or

7. Discuss and compare quick sort and merge sort. Write pseudocode for either.

UNIT IV

8. (a) Define binary search tree. Write algorithms for inorder, preorder, and postorder traversals.

   (b) Explain BFS and DFS traversal in graphs with an example.

Or

9. Describe Prim's and Kruskal's algorithms for finding the minimum spanning tree.

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**(102MC24)**

M.C.A DEGREE EXAMINATION, JUNE / JULY 2025.

First Semester

DATABASE MANAGEMENT SYSTEMS

Time : Three hours Maximum : 70 marks

SECTION A – (7 × 2 = 14 marks)

Answer Question No.1 compulsory.

1. (a) Define DBMS and list two of its key advantages.

(b) What is a schema? How is it different from an instance?

(c) What is a primary index?

(d) Define a weak entity with an example.

(e) List any two SQL DDL commands.

(f) Define functional dependency.

(g) What is meant by serializability in transactions?

SECTION B – (4 × 14 = 56 marks)

Answer One question from each unit.

UNIT-I

2. (a) Explain the three-schema architecture of a database system with a neat diagram.

(b) Describe the various types of data models used in DBMS.

Or

3. Write a detailed note on disk storage structures. Explain RAID levels and file organization techniques.

UNIT-II

4. (a) What are relational algebra operations? Explain SELECT, PROJECT, JOIN, and UNION with examples.

(b) Discuss Tuple and Domain relational calculus with examples.

Or

5. Write SQL queries for the following:
Create a table Employee
Insert *3* sample records
Update salary for a specific employee
Retrieve employees with salary > 50,000
Use GROUP BY and HAVING clauses.

UNIT-III

6. (a) What are the different normal forms? Explain INF, 2NF, and 3NF with suitable examples.

(b) Describe the properties of relational decomposition.

Or

7. Define multivalued dependency and join dependency. Explain 4NF and 5NF with examples.

UNIT-IV

8. (a) Explain Two-Phase Locking protocol and its types.

(b) Describe time-stamp ordering-based concurrency control method.

Or

9. Explain the architecture of distributed databases. Discuss data fragmentation and replication strategies.

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**(103MC24)**

M.C.A DEGREE EXAMINATION, JUNE/JULY 2025.

First Semester

Computer Applications

OPERATING SYSTEMS

Time : Three hours Maximum : 70 marks

SECTION A – (7 × 2 = 14 marks)

Answer question No.1 Compulsory.

1. (a) Define operating system.

(b) What is a system call?

(c) Mention any two advantages of multithreading.

(d) Define a critical section.

(e) What is a deadlock?

(f) State any two advantages of virtual memory.

(g) What is meant by file mounting?

SECTION B – (4 × 14 = 56 marks)

Answer ONE question from each Unit.

UNIT I

2. Explain the structure of an operating system. Discuss the different services provided by an OS.

Or

3. What is a process? Describe process states, transitions and operations in detail.

UNIT II

4. Explain various multithreading models and discuss thread libraries.

Or

5. Describe various process scheduling algorithms and explain how scheduling criteria affect performance.

UNIT III

6. Explain the methods for handling deadlocks. Describe deadlock prevention and avoidance techniques.

Or

7. Explain paging in memory management. Discuss the structure of a page table and provide an example.

UNIT IV

8. Explain the concept of files, their types, access methods and directory structure.

Or

9. Describe file system mounting, sharing and protection mechanisms in operating systems.

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**(104MC24)**

M.C.A. DEGREE EXAMINATION, JUNE/JULY 2025.

First Semester

Computer Applications

PROBABILITY AND STATISTICS

Time : Three hours Maximum : 70 marks

SECTION A – (7 × 2 = 14 marks)

Answer question No.1 Complusory

1. (a) Define conditional probability.
   (b) What is the difference between binomial and Poisson distribution?
   (c) What is a confidence interval?
   (d) Define a p-value in hypothesis testing.
   (e) Write a note on pairwise comparison in ANOVA.
   (f) What is multicollinearity in multiple linear regression?
   (g) Write the general form of a simple linear regression model.

SECTION B – (4 × 14 = 56 marks)

Answer ONE question from each unit

UNIT I

2. (a) Explain the axiomatic approach to probability with examples.
   (b) A card is drawn from a well-shuffled deck of 52 cards. What is the probability that it is a red king, given that it is a king?

Or

3. (a) Discuss the properties of the normal distribution.
   (b) The weights of a certain population of apples are normally distributed with a mean of 150g and a standard deviation of 15g. What percentage of apples weigh between 135g and 165g?

UNIT II

4. (a) Describe the procedure to test a hypothesis about population variance.
   (b) A machine fills cans with a standard deviation of 3 ml. A sample of 10 cans has a standard deviation of 4 ml. Test the claim at 5% significance level that the variance has increased.

Or

5. (a) Explain how to compare two proportions using hypothesis testing.

(b) In a sample of 150 men, 90 are smokers. In a sample of 200 women, 80 are smokers. Test at 5% level whether smoking habits differ by gender.

UNIT III

6. (a) Explain the F-test procedure for comparing two variances.

(b) Two brands of batteries have lifespans (in hours) with the following variances:

Brand A: s2=20,n=15; Brand B: s2=10,n=12. Test whether the variances differ significantly at 5% significance level.

Or

7. (a) Perform ANOVA on the following data:

| Group | Values |
|---|---|
| A | 12,15,14 |
| B | 20,22,19 |
| C | 25,27,26 |

(b) Perform pairwise comparisons if ANOVA shows significance.

UNIT IV

8. (a) Define correlation coefficient and explain its interpretation.

(b) Calculate Pearson's correlation coefficient for the data:

| X | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Y | 2 | 4 | 5 | 7 |

Interpret the result.

Or

9. (a) Explain inference about the slope in simple linear regression.

(b) Using the data:

| s | 3 | 5 | 7 | 9 |
|---|---|---|---|---|
| Y | 6 | 10 | 14 | 18 |

Test if the slope is significantly different from zero at the 5% level.

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**(105MC24)**

M.C.A. DEGREE EXAMINATION, JUNE/JULY 2025.

First Semester

COMPUTER ORGANIZATION

Time : Three hours Maximum : 70 marks

SECTION A — (7 × 2 = 14 marks)

Answer question no. 1 compulsory.

1. (a) What is a decoder?

   (b) Mention any two binary codes other than BCD.

   (c) Define shift microoperation with an example.

   (d) What is the role of the Instruction Register (IR)?

   (e) Define stack. Mention two operations on stack.

   (f) What are the types of interrupts in I/O systems?

   (g) Define memory hierarchy.

SECTION B — (4 × 14 = 56 marks)

Answer ONE question from each unit.

UNIT I

2. Describe the construction and working of shift registers and binary counters with neat diagrams.

Or

3. Explain fixed-point and floating-point number representations with suitable examples.

UNIT II

4. Explain the RTL for memory and bus transfer operations. Draw relevant diagrams.

Or

5. Describe the instruction cycle and how control signals manage the execution of instructions in a basic computer.

UNIT III

6. Explain the design of a microprogrammed control unit. Describes the role of control memory and sequencing

Or

7. Discuss instruction formats and various types of addressing modes used in CPU design.

UNIT IV

8. Explain in detail the multiplication algorithm for signed binary numbers.

Or

9. Describe the different I/O data transfer modes. Explain the concept of priority interrupt.

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