

302/Comp.Sc(N)

UG/3rd Sem/CS-MI-T-3(A&B)/24

**U.G. 3rd Semester Examination - 2024**

**COMPUTER SCIENCE**

**[MINOR]**

**Course Code : CS-MI-T-3(A&B)**

**[NEP-2020]**

Full Marks : 25

Time : 2 Hours

*The figures in the right-hand margin indicate marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**Answer all the questions from Selected Option.**

**OPTION-A**

**CS-MI-T-3**

**(Database Management Systems)**

**GROUP-A**

1. Answer any **five** questions: 1×5=5
  - a) Name any two advantages of using a DBMS over a traditional file system.
  - b) What is the difference between candidate key and super key?
  - c) What do you mean by referential integrity in a relational database?
  - d) Define the term data redundancy.

*[Turn over]*

- e) What is the difference between a database and a DBMS?
- f) Define 2nd normal form.
- g) What is the difference between commit and rollback?
- h) What is an index in a database?

**GROUP-B**

2. Answer any **two** questions: 5×2=10

- a) Explain the concept of data independence. Differentiate between logical data independence and physical data independence with examples. 5
- b) Discuss different types of keys in DBMS. Explain the significance of the primary key and foreign key with examples. 5
- c) Differentiate between Relational Algebra and Relational Calculus. Provide an example of each. 5
- d) Differentiate between DDL, DML, and DCL commands in SQL. Provide examples for each category. 5

### GROUP-C

Answer any **one** question:

10×1=10

3. What is Boyce-Codd Normal Form (BCNF)? How is it different from Third Normal Form (3NF)? Explain with examples. 2+3+5
4. Explain the ACID properties of a transaction. Define serializability in DBMS. Explain the Two-Phase Locking (2PL) protocol. 5+2+3
5. Explain different file operations in DBMS. Differentiate between unordered and ordered file organization. What are different types of indexing structures in DBMS? 5+3+2
6. Write a short note on any **two** of the following: 5×2=10
  - a) Concurrency control and Recovery Management
  - b) 4NF
  - c) Relational Algebra Operations

**OPTION-B**

**CS-MI-T-3**

**(Introduction to Data Structure and Algorithms)**

**GROUP-A**

1. Answer any **five** questions: 1×5=5
- a) Name two types of data structures.
  - b) Write two advantages of using a linked list over an array.
  - c) What is a priority queue?
  - d) Define a binary search tree (BST).
  - e) Write the differences between linear search and binary search.
  - f) Define Big-O notation.
  - g) Define recursion and give an example.
  - h) What is the significance of the LIFO principle in stacks?

**GROUP-B**

2. Answer any **two** questions: 5×2=10
- a) Define an Abstract Data Type (ADT). How does it help in designing efficient data structures?  
2+3
  - b) What is the difference between row-major and column-major order in multi-dimensional arrays? Explain with an example. 2+3

- c) What are the limitations of using arrays to implement stacks? How can these limitations be overcome? 2+3
- d) Write an algorithm to insert a node at the beginning of a circular linked list. 5

### GROUP-C

Answer any **one** question: 10×1=10

3. Describe the insertion and deletion operations in a Binary Search Tree (BST). What are the different types of binary tree traversals? Differentiate between best case, worst case, and average case complexity with an example. 6+2+2
4. Explain the working of Linear Search and Binary Search algorithms. Compare their time complexities and discuss when each should be used. 5+5
5. Compare and contrast queue and stack data structures. What is recursion? What are the advantages of recursion in problem-solving? 5+2+3
6. Write a short note on any **two** of the following: 5×2=10
- a) Asymptotic Notations
  - b) Insertion Sort
  - c) Array representation of Queue