

2026

COMPUTER SCIENCE — MINOR

Paper : MN-3

(Data Structure)

Full Marks : 75

The figures in the margin indicate full marks.

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

1. Answer **any five** questions : 2×5
- (a) Define an Abstract Data Type (ADT). Give an example.
 - (b) Explain sparse matrix. Mention one method of representing a sparse matrix.
 - (c) Differentiate between arrays and linked lists (any two points).
 - (d) State advantage of circular linked list over singly linked list.
 - (e) Define stack. Mention any two applications of stacks.
 - (f) Explain tail recursion.
 - (g) Differentiate between linear search and binary search based on time complexity.
 - (h) Define hashing. What is meant by collision in hashing?

Section-A

Answer **any three** questions.

- 2. Write an algorithm for insertion and deletion operations in a singly linked list. Explain with a suitable example. 3+2
- 3. Convert the infix expression $(A+B)*(C-D)/E$ into postfix form and write the algorithm for infix to postfix conversion using stack. 5
- 4. Explain sparse matrix representation and polynomial representation using arrays. 5
- 5. Explain array representation of stack with PUSH and POP operations. 5
- 6. Explain Binary Search Tree (BST). Describe searching and insertion operations in BST with suitable examples. 1+4

Please Turn Over

(6378)

Section - B

Answer **any five** questions.

7. (a) Construct the following queue of characters where queue is a circular array which is allocated six memory cells.

FRONT=2 REAR=4 QUEUE : _,A, C, D,_,_

Describe the Queue as the following operations take place :

- (i) F is added to the Queue
- (ii) Two letters are from the Queue
- (iii) K,L,M are added to the Queue
- (iv) Two letters are deleted from the Queue
- (v) R is added to the Queue
- (vi) One letter is deleted from the Queue.

- (b) Write an algorithm for inorder traversal of a threaded binary tree. 5+5

8. (a) Write a recursive algorithm (pseudocode) for sorting an array using straight merge sort technique.

- (b) Discuss the drawback of linear probing and its possible remedy. 6+4

9. (a) Define heap. Construct a max-heap with the following array of elements :

17, 25,10, 7,16,19, 23, 42, 37, 4, 33,1, 5, 11, 21

Show with explanation, the different intermediate stages in the process of forming the heap.

- (b) Show the result of inserting 5, 3, 6, 8,11,4, 7, 9 into an initially empty binary search tree. Then show the result of deleting the root. Insertions and deletion should be shown in step by step manner. (1+4)+5

10. (a) Given input {4371,1323, 6173, 4199, 4344, 9679,1989} and a hash function $h(X) = X \bmod 10$, show the result of the following :

- (i) Open addressing hash table using linear probing.
- (ii) Open addressing hash table using quadratic probing.

- (b) Explain the terms row-major order and column-major order with an example. 6+4

11. (a) "Recursion is not always advantageous to use instead of iteration."— Justify with a suitable example.

- (b) Write an algorithm (pseudocode) for insert and delete operations of a circular queue represented by an array. 4+6

12. (a) What do you mean by priority queue? Explain how the insert and delete operations are performed in a priority queue.

- (b) Write an algorithm (pseudocode) to add two single variable polynomial using linked list. 5+5

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13. (a) Show all the steps to sort the following data using quicksort (ascending order) :

25,15, 30,10,40,19, 21, 34, 10, 29, 4

- (b) Write an algorithm (pseudocode) to reverse a singly linked list.
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5+5