



**Third Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026**  
**Data Structures and Applications**

Max. Marks: 100

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

**Module-1**

- 1 a. Define Data Structures. Explain with a neat block schematic different types of data structures with examples. (08 Marks)
- b. Compare Structures and Unions. (04 marks)
- c. Define a sparse matrix and explain its characteristics with example. (08 Marks)

**OR**

- 2 a. Explain dynamic memory allocation with an example. (06 marks)
- b. What are Self – referential Structures? Explain with example. (06 marks)
- c. Explain the commonly used string handling functions in C. provide example for each. (08 Marks)

**Module-2**

- 3 a. Define stack, implement stack operations using arrays. (05 marks)
- b. Convert the following infix expression to postfix using stack  $A + B | (C | D \$ E)$ . (05 marks)
- c. What is recursion? Write recursive programs for factorial, GDC, Fibonacci sequence. And Tower of Hanoi. (10 Marks)

**OR**

- 4 a. Define Queue. Implement queue operations using arrays. (08 Marks)
- b. Explain the disadvantages of ordinary queues and how circular queues address them. (06 Marks)
- c. Write a note on : (06 Marks)
  - i) deQue
  - ii) Priority Queue.

**Module-3**

- 5 a. Define linked list. Describe the representation of linked lists in memory. (06 marks)
- b. Develop a C function to add two polynomials using singly linked list. (06 Marks)
- c. Constrain C functions for singly linked list to : (08 Marks)
  - i) Reverse the list
  - ii) Concatenate two lists.

**OR**

- 6 a. What is a doubly linked list? Outline the declaration of a doubly linked list in C. (05 marks)
- b. Write C functions to doubly linked list : (08 Marks)
  - i) insert\_front()
  - ii) delete\_front()
- c. Write short notes on circular lists with example to insert a node at the front and rear end. (07 Marks)

**Module-4**

- 7 a. Define a binary tree, with an example, show array and linked representations of a binary tree. (06 Marks)
- b. Explain binary tree traversals with example. (06 Marks)
  - i) inorder ii) preorder iii) postorder.
- c. Define Binary Search Tree (BST). Draw the BST for the following input 14, 15, 4, 9, 7, 18, 3, 5, 16, 20, 17, 9. (08 Marks)

**OR**

- 8 a. Explain the array and linked representations of binary search trees. (06 Marks)
- b. What are the advantages of threaded binary tree over binary trees? Construct the threaded binary tree for 10, 20, 30, 40, 50. (06 Marks)
- c. Develop a C functions to implement the following : (08 Marks)
  - i) Search a key value in a binary search tree
  - ii) Copying a binary tree.

**Module-5**

- 9 a. Define the following terminologies with examples : (06 Marks)
  - i) Digraph
  - ii) Weighted graph
  - iii) Self loop
  - iv) Parallel edges.
- b. Suppose an array contains 8 elements as follows : 77, 33, 44, 11, 88, 22, 66, 55 sort the array using insertion sort algorithm. (06 Marks)
- c. What is Hashing? Explain the hash functions with proper examples : (08 Marks)
  - i) Division
  - ii) Midsquare
  - iii) Folding.

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**OR**

- 10 a. Write an algorithm for breadth first search and depth first search. (06 Marks)
- b. Write an algorithm for radix sort. (04 Marks)
- c. Explain any five operations related to file with syntax and example. (10 Marks)

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