Roll No:
Date: __/__/____

St. Claret College

Autonomous, Bengaluru

ST. CLARET COLLEGE LIBRARY Bengaluru-13 AUTONOMOUS

UG END SEMESTER EXAMINATION-MAY 2026
B.Sc. II SEMESTER
CS 224: DATA STRUCTURES

9

TIME: 3 hours. **MAX. MARKS: 80**

This paper contains TWO printed pages and FOUR parts

Instructions:
1. **Verify and ensure that the question paper is completely printed.**
2. **Any discrepancies or questions about the exam paper must be reported to the COE within 1 hour after the examination.**
3. **Students must check the course title and course code before answering the questions.**

PART-A

Answer ALL questions. Each answer carries ONE mark. **[10 x 1 = 10]**

1. Time-space trade-off means
   a) Reducing time complexity may increase space usage
   b) Reducing space complexity always reduces time complexity
   c) Time complexity and space complexity are independent
   d) Using more space will always reduce execution time
2. Which operation accesses each element exactly once?
   a) Searching b) Sorting c) Traversing d) Merging
3. The data structure stores elements sequentially in memory is _____.
   a) Non-linear structure b) Linear structure c) Graph d) Tree
4. The function used to delete a node from a linked list is _____.
   a) free() b) malloc() c) delete() d) remove()
5. How is a two-dimensional array stored in memory?
   a) Row-major order b) Column-major order
   c) Both a and b d) None of the above
6. The applications of stacks include _____.
   a) Function calls in recursion b) Expression evaluation
   c) Undo operations d) All of the above
7. A queue that allows insertion at both ends is _____.
   a) Circular queue b) Priority queue
   c) Deque d) Simple queue
8. The maximum number of children in a binary tree node is _____.
   a) 1 b) 2 c) 3 d) Unlimited

9. The traversal that uses a queue is
   a) Depth First Search
   b) Breadth First Search
   c) Inorder traversal
   d) Postorder traversal
10. Nodes with no children are known as
   a) Root nodes
   b) Internal nodes
   c) Leaf nodes
   d) Parent nodes

PART-B

Answer any TEN questions. Each answer carries TWO marks. **[10 x 2= 20]**

11. Define data structure.
12. List down different data structure operations.
13. What is time and space complexity?
14. Define a sparse matrix.
15. What is self-referential structure?
16. Define stack ADT.
17. What is postfix notation?
18. Define priority queue.
19. Mention the applications of queue.
20. What is an AVL tree?
21. Define hash function.
22. What is graph traversal?

PART-C

Answer any FOUR questions. Each answer carries FIVE marks. **[4 x 5 = 20]**

23. Explain the classification of data structures.
24. Write an algorithm to perform traversal of a linear array.
25. Construct an algorithm to traverse a singly linked list.
26. Illustrate the Tower of Hanoi problem and its solution with an example.
27. Discuss the concept of a double-ended queue (deque).
28. Construct a binary search tree for elements 45, 15, 79, 90, 10, 55, 12, 20, 50

PART-D

Answer any THREE questions. Each answer carries TEN marks. **[3 x 10 = 30]**

29. a) Explain the asymptotic notations used to calculate the time complexity of an algorithm. [5]
    b) Explain basic mathematical functions and notations used in algorithms. [5]
30. a) Describe the types of linked lists. [5]
    b) Develop an algorithm to insert an element into a linear array. [5]
31. a) Outline an algorithm to insert an element at the beginning of a singly linked list. [5]
    b) Write an algorithm to delete an element from the queue. [5]
32. Convert infix to postfix expression using stack A + (B * C – (D/E ^ F)* G) * H.
33. a) Enumerate the different methods of hash functions. [5]
    b) Define graph. How a graph data structure is represented in memory. [5]