

Roll No:

Date:

St. Claret College

Autonomous, Bengaluru

UG END SEMESTER EXAMINATION-MAY 2025

BCA – II SEMESTER

CA 2124: DATA STRUCTURES

TIME: 3 hours.

9

MAX. MARKS: 80

This paper contains TWO printed pages and FOUR parts

Instructions:

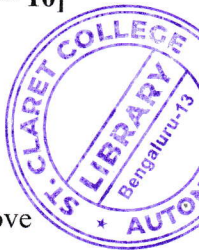
1. Verify and ensure that the question paper is completely printed.
2. Any discrepancies or questions about the exam paper must be reported to the COE within 1 hour after the examination.
3. Students must check the course title and course code before answering the questions.

PART-A

Answer ALL questions. Each answer carries ONE mark.

[1 x 10 = 10]

1. If an algorithm has a complexity of $O(n^2)$, it is considered as
 - a. Linear
 - b. Quadratic
 - c. Constant
 - d. Logarithmic
2. Which of the following is NOT a linear data structure?
 - a. Array
 - b. Stack
 - c. Graph
 - d. Queue
3. 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
4. Which matrix type has most elements as zero?
 - a. Identity matrix
 - b. Diagonal matrix
 - c. Sparse matrix
 - d. Square matrix
5. What is the purpose of garbage collection in linked lists?
 - a. To free unused memory
 - b. To allocate memory dynamically
 - c. To store extra elements
 - d. To manage pointers
6. What is the maximum number of elements that can be stored in an array-based stack of size n ?
 - a. $n+1$
 - b. $n-1$
 - c. n
 - d. $2n$
7. What is the postfix notation of the expression $(A + B) * C$?
 - a. $A B + C *$
 - b. $A + B * C$
 - c. $A B C * +$
 - d. $A B C + *$
8. Which data structure follows the First In First Out (FIFO) principle?
 - a. Stack
 - b. Queue
 - c. Tree
 - d. Graph
9. What is the balance factor in an AVL tree?
 - a. Height of left subtree - height of right subtree
 - b. Maximum height of the tree
 - c. Height of right subtree - height of left subtree
 - d. Sum of left and right subtree heights
10. Which of the following is NOT an application of graphs?
 - a. Social Networks
 - b. Web Crawling
 - c. Function Calls in Programming
 - d. Quick Sort



PART-B

Answer any **FIVE** questions. Each answer carries **TWO** marks.

[5 x 2 = 10]

11. Define ADT.
12. What is time space trade off?
13. What is a self-referential structure?
14. What is reverse polish notation?
15. Mention the application of the queue.
16. Define AVL tree.
17. What is hashing?

PART-C

Answer any **FOUR** questions. Each answer carries **FIVE** marks.

[4 x 5 = 20]

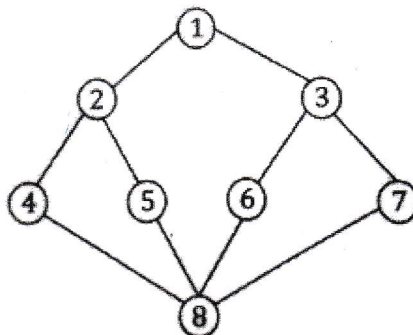
18. What is a string? Explain its operations with an example.
19. Develop an algorithm to perform a binary search with an example.
20. Create an algorithm to insert an element at a particular position in the singly linked list.
21. Explain the Tower of Hanoi problem for 3 disks with an example.
22. Explain different types of queues.
23. Construct a binary search tree for elements 45, 15, 79, 90, 10, 55, 12, 20, 50.

PART-D

Answer any **FOUR** questions. Each answer carries **TEN** marks.

[4 x 10 = 40]

24. a) Explain the classification of data structures.
b) Explain the asymptotic notations. (6 + 4)
25. a) Explain different types of linked lists.
b) Write a C program to arrange n numbers using bubble sort. (5 + 5)
26. a) Create an algorithm to insert and delete an element in an array.
b) Write an algorithm to perform 1) push and 2) pop operations in a stack. (6 + 4)
27. a) Convert infix to postfix expression using stack $A + (B * C - (D/E \wedge F) * G) * H$.
b) Evaluate the postfix expression $P = 6, 3, +, 5, *, 2, 3, +, +$. (7+3)
28. a) Discuss different techniques used for designing hashing functions with examples.
b) Develop an algorithm to insert an element in a linear queue with an example. (5 + 5)
29. a) Explain the Depth-First Search (DFS) traversal for the given graph, step-by-step, starting from vertex 1.



- b) Define tree traversal. Mention its types.

(8 + 2)