

Reg. No.:

Name :



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TERM END EXAMINATIONS (TEE) – August 2024

Programme	: B.Tech.	Semester	: Fall Semester 2024-2025
Course Title	: Data Structures and Analysis of Algorithms	Course Code	: CSD3009
Date of Exam	: 22 Aug 2024/Session I	Slot	: A21+A22+A23+D21+D22
Time	: 3 Hrs.	Max. Marks	: 100

Answer ALL the Questions

- | Q. No. | Question Description | Marks |
|----------------------------|---|----------------|
| PART A – (60 Marks) | | |
| 1 | (a) Describe the primary reasons why selecting the right data structure is crucial in algorithm design. Categorise following into primary, linear secondary, and non-linear secondary data structures:
float, stack, tree, int, graph, queue, char, bool
OR | (8+4) |
| 2 | (b) Compare and contrast the efficiency of array-based list implementation with linked list implementation, focusing on their time and space complexity.
(a) Explain the queue data structure, and how does its First-In-First-Out (FIFO) principle differ from the stack's LIFO principle? Mention few applications of stack and queue data structure.
OR | 12
(8+4) |
| 3 | (b) Explain the circular queue data structure, and how does it address the limitations of a standard linear queue? Consider a queue 3, 12, 9, 5, 17 where 3 being at front and 17 at rear end. What will be the queue structure after following sequence of operations: add(23), del(), add(7), add(21), del(), del(), del(), where, add() and del() are addition and deletion functions defined for queue data structure.
(a) Discuss the concept of height-balanced/AVL trees. Construct an AVL tree for the following sequence of numbers: 20, 30, 10, 50, 40, 70, 80, 60
OR | (8+4)
(6+6) |
| 4 | (b) Describe the concept of directed acyclic graphs (DAGs). Explain the process of topological sorting, and find topological sorting sequence for following graph:
<pre>graph TD; 0((0)) --> 2((2)); 0((0)) --> 4((4)); 1((1)) --> 2((2)); 2((2)) --> 3((3)); 4((4)) --> 2((2));</pre>
(2+4+6) | (4+4+4) |

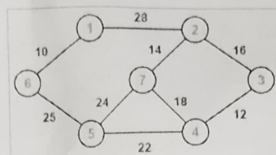
OR

(b) Describe the radix/bucket sort algorithm, and how does it differ from comparison-based sorting algorithms? Sort following sequence using radix/bucket sort, and clearly show each pass and steps: **26, 2, 567, 91, 1, 1003, 51, 7839** (4+2+6)

5 (a) Compare Prim's and Kruskal's algorithms for finding the Minimum Spanning Tree. (8+4)
What are the primary differences in their approaches?

OR

(b) Explain Kruskal's Algorithm briefly, and use Kruskal's algorithm to find the minimum spanning tree for the following graph: (4+8)

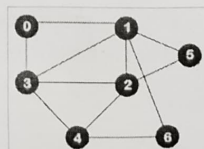


PART B – (40 Marks)

6 Provide a visual step-by-step explanation of how recursion can be implemented using a stack. Use a specific recursive function (e.g., factorial calculation or Fibonacci series) to demonstrate how the stack grows and shrinks during the function's execution. (4+4)

7 Using a diagram, illustrate the concept of a circular queue. Explain how it differs from a linear queue (4+4)

8 Write BFS and DFS traversal sequences for the following graph, (show each step using queue and stack data structure): (4+4)



9 Mention the time complexity of Quick Sort Algorithm in best, average, and worst case? Show step by step procedure for selection sorting of the following sequence: (2+6)

10 Use Dijkstra's Algorithm to find the shortest paths to all the other nodes from the source node S in the following graph:

