M.Tech / B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Third Semester

Computer Science and Engineering

(Common to Electronics and Instrumentation Engineering, Instrumentation and Control Engineering & M.Tech - Computer Science Engineering)

24CSPC302 - DATA STRUCTURES

Regulations - 2024

Duration: 3 Hours   Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)
Answer ALL Questions

		Marks	K-Level	CO
1.	What is the advantage of a Doubly Linked List over a Singly Linked List? (a) It uses less memory (b) It has faster traversal (c) It is simpler to implement (d) It allows traversal in both directions	1	K1	CO1
2.	A variant of the linked list in which none of the nodes contains NULL pointers? (a) Singly Linked list (b) Doubly linked list (c) Circular Linked list (d) None of these	1	K1	CO1
3.	In Reverse Polish Notation (RPN), where are operators placed in relation to their operands? (a) Before the operands (b) After the operands (c) Between the operands (d) Above the operands	1	K1	CO2
4.	What happens when you try to enqueue an element into a full circular queue? (a) An error is thrown, and the enqueue operation fails. (b) The oldest element in the queue is automatically dequeued. (c) The new element is placed at the front of the queue. (d) The new element overwrites the oldest element in the queue.	1	K1	CO2
5.	Which of the following is NOT a characteristic of a skewed binary tree? (a) It is unbalanced (b) Nodes are arranged either left or right side (c) It has the minimum height (d) It is a degenerate tree	1	K1	CO3
6.	Which of the following is true for B+ trees but not for B-trees? (a) Internal nodes do not contain actual keys (b) Leaf nodes are linked for sequential access (c) Internal nodes store ranges of keys (d) B+ trees allow duplicate keys	1	K1	CO3
7.	What is the key difference between BFS and DFS? (a) BFS uses a queue, DFS uses a stack (b) DFS can only be applied to directed graphs (c) BFS is slower than DFS (d) BFS cannot find connected components	1	K1	CO4
8.	Which of the following is a common representation of a graph? (a) Array representation (b) Adjacency matrix (c) Linked list only (d) Both A and B	1	K1	CO4
9.	In amortized analysis, the term "amortized" refers to: (a) The upper bound cost (b) The specific cost of an individual operation (c) The average case cost of an operation (d) The lower bound cost of an operation	1	K1	CO5
10.	Double hashing is an improvement over which of the following techniques? (a) Chaining (b) Linear probing (c) Quadratic probing (d) Open addressing	1	K1	CO6

PART - B (12 × 2 = 24 Marks)
Answer ALL Questions

		Marks	K-Level	CO
11.	Define ADT. Mention the features of ADT.	2	K1	CO1
12.	Show how a doubly linked list can be represented as a circular linked list?	2	K2	CO1
13.	List out the advantage of representing a stack using a linked list rather than an array.	2	K1	CO2
14.	Define double ended queue. Give example.	2	K1	CO2

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   **14007**

15. Compare full binary tree and complete binary tree.	2	K2 CO3
16. Summarize tree traversal and mention the type of traversals.	2	K2 CO3
17. Define weighted, unweighted, directed, path, cyclic and acyclic in a graph.	2	K1 CO4
18. Describe the two traversal strategies used in traversing a graph.	2	K2 CO4
19. Define counting sort with a suitable example.	2	K1 CO5
20. Compare stable and unstable sorting algorithms with a suitable example.	2	K2 CO5
21. Define hash table. Give example.	2	K1 CO6
22. Describe how buckets are managed in extendible hashing?	2	K2 CO6

PART - C (6 × 11 = 66 Marks)
Answer ALL Questions

23. a) Explain array implementation of the list ADT and its various operations with an example.   *11   K2   CO1*

OR

b) Explain how insertion and deletion of a node are performed at the beginning of the singly linked list.   *11   K2   CO1*

24. a) Demonstrate an algorithm or routine to insert and delete an element from a simple Queue and why is it known as FIFO?   *11   K2   CO2*

OR

b) Explain stack ADT and its operations using array based implementation and show any one application of the stack.   *11   K2   CO2*

25. a) Construct an AVL trees for the following elements step by step in sequence into an empty AVL tree 63, 9, 19, 27, 18, 108, 99, 81 and describe the different rotations defined for AVL trees.   *11   K3   CO3*

OR

b) Develop an algorithm to insert an element into a B-Tree. Construct B-Tree to insert the following key elements (order of the tree is 3) 5,2,13,3,45,72,4,6,9,22   *11   K3   CO3*

26. a) Apply BFS and DFS algorithm and find the solution for the given graph.   *11   K3   CO4*
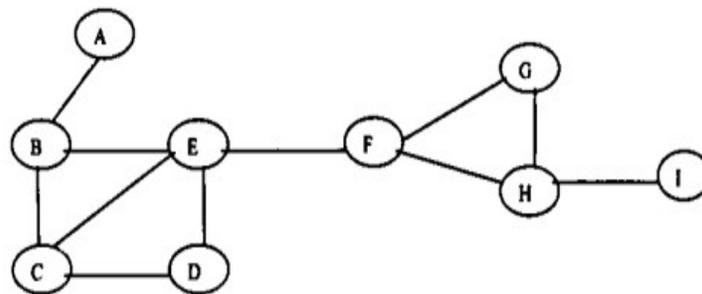
OR

b) Identify the topological sort ordering of the given graph using a suitable algorithm. *11 K3 CO4*
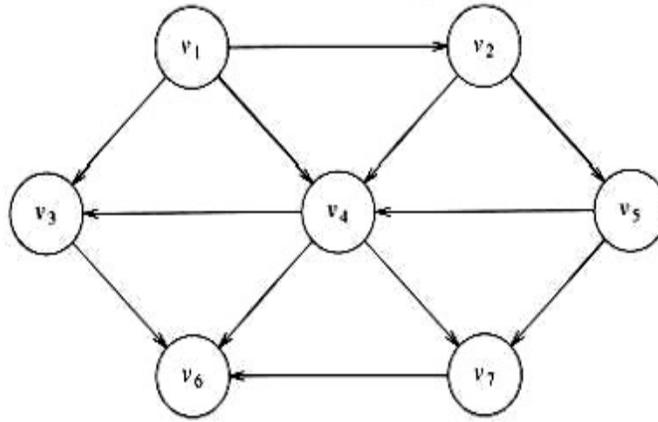
27. a) Make use of the concept of divide and conquer to show how the elements 12,24,8,71,4,23,6,89,56 are sorted using Merge sort. *11 K3 CO5*

OR

b) Write an algorithm to sort 'n' numbers using quick sort. Show how the following numbers are sorted using quick sort 5,3,1,9,8,2,4,7? *11 K3 CO5*

28. a) Analyze the concept of hashing and the different types of hash functions with a suitable example. *11 K4 CO6*

OR

b) Examine how the given keys {4371, 1323, 6173, 4199, 4344, 9679, 1989} are mapped into a hash table using the hash function h(x) = x mod 10 and find the resulting for the following: *11 K4 CO6*
i) Open a hash table.
ii) Open addressing hash table using linear probing.
iii) Open addressing hash table using quadratic probing.
iv) Open addressing hash table with second hash h2(x)=7- (x mod 7).