Reg. No.															

Question Paper Code	14011

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

Third Semester

Information Technology

(Common to Computer Science and Engineering (IoT) & Computer Science and Engineering (Cyber Security))

24ITPC301 - DATA STRUCTURES AND ALGORITHMS

Regulations - 2024

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	If we try to remove the element from the empty stack then it is called _____. (a) overflow (b) Underflow (c) empty Stack (d) None	1	K1	CO1
2.	Which operation checks the front element of a queue without removing it? (a) Pop (b) Peek (c) Enqueue (d) Dequeue	1	K1	CO1
3.	In a circular linked list, the last node points to: (a) Null (b) The first node (c) The previous node (d) None of the above	1	K1	CO2
4.	In a singly linked list, each node contains: (a) Data and two pointers (b) Only data (c) Data and one pointer (d) Two data fields	1	K1	CO2
5.	The balance factor of a node in an AVL tree is defined as: (a) Height of left subtree – Height of right subtree (b) Height of right subtree – Height of left subtree (c) Maximum height of subtrees (d) Minimum height of subtrees	1	K1	CO3
6.	The number of edges from the root to the node is called _____ of the tree. (a) Height (b) Depth (c) Length (d) Width	1	K1	CO3
7.	Which problem does Floyd's algorithm solve? (a) Minimum spanning tree (b) Shortest path between all pairs of vertices (c) Shortest path from source to all vertices (d) Topological ordering	1	K1	CO4
8.	Which of the following algorithms is used for finding Minimum Spanning Tree? (a) Kruskal's Algorithm (b) Prim's Algorithm (c) Both (a) and (b) (d) Bellman-Ford Algorithm	1	K1	CO4
9.	Bubble Sort works by: (a) Selecting the smallest element and placing it in the first position (b) Comparing adjacent elements and swapping if needed (c) Dividing the array into halves and merging (d) Using a pivot to partition the array	1	K1	CO5
10.	If an algorithm's time complexity is proportional to the size of input n, then it is ____ (a) O(1) (b) O(n) (c) $O(n^2)$ (d) O(log n)	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

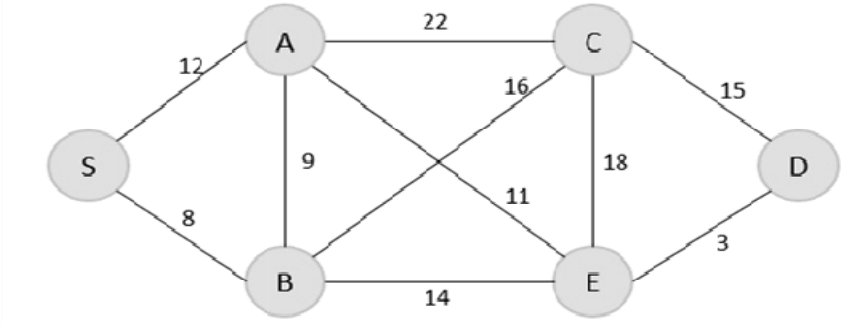
11.	Convert the infix expression (A + B) * C into **postfix** form.	2	K2	CO1
12.	How does a deque differ from a regular queue?	2	K2	CO1
13.	Draw a diagrammatic representation of Circular Linked List with an example.	2	K2	CO2
14.	How is insertion performed in a doubly linked list?	2	K2	CO2
15.	Draw the expression tree for (A + B) * (C – D).	2	K2	CO3
16.	How are tree nodes visited in different traversal methods?	2	K2	CO3
17.	In what ways does topological sort help in scheduling tasks.	2	K2	CO4
18.	Compare BFS and DFS.	2	K2	CO4

19.	Explain the basic working principle of Bubble Sort.	2	K2	CO5
20.	How does Linear Search find an element in a list?	2	K2	CO5
21.	State the meaning of recurrence relation with respect to recursive functions.	2	K2	CO6
22.	Differentiate between greedy and dynamic programming approaches.	2	K2	CO6

PART - C (6 × 11 = 66 Marks)

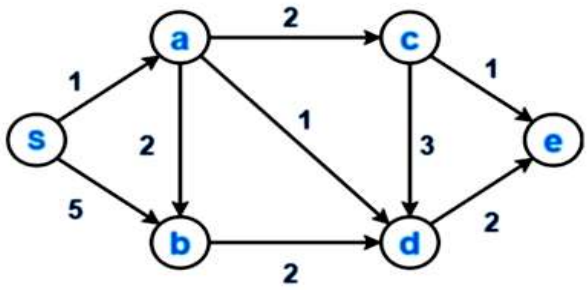
Answer ALL Questions

23.	a)	(i) Convert the infix ((A + B) * (C - D)) / (E + F ^ G) into postfix expression.	6	K3	CO1
		(ii) Implement a circular queue using arrays with insertion and deletion functions, and demonstrate how circular structure overcomes the unused space problem.	5	K3	CO1
		OR			
	b)	Implement a stack using arrays with functions for push, pop, peek, isEmpty, and isFull, and trace the operations: push(10), push(20), pop(), push(30), peek().	11	K3	CO1
24.	a)	Write a program to create a singly linked list and display all its elements. Demonstrate these operations with sample inputs.	11	K3	CO2
		OR			
	b)	Implement a doubly linked list with insert and delete operations at both ends. Demonstrate these operations with sample inputs.	11	K3	CO2
25.	a)	Develop an algorithm to insert an item into a binary search tree. Create a binary search tree for the following numbers starting from an empty binary search tree 45,26,10,60,70,30,40. Delete keys 10,60 and 45 one after the other and show the trees at each stage.	11	K3	CO3
		OR			
	b)	Construct an AVL tree with values 1,2,3,4,5,6,7,8,9,10 into an initially empty tree. Write the code for inserting into an AVL tree.	11	K3	CO3
26.	a)	Construct the Minimum Spanning tree for the given graph using Prim's Algorithm with S as the Arbitrary root.	11	K3	CO4



OR

b) Apply Dijiktra's algorithms to find the shortest path for the given graph for the source vertex S to other vertices of the graph and also give the order in which the vertices visited. *11 K3 CO4*



27. a) Apply Bubble Sort to the following list of numbers and show the intermediate steps of sorting. [64, 34, 25, 12, 22, 11, 90] and analyze its time complexity. *11 K3 CO5*

OR

b) Apply linear search algorithms to search the number 88 from the following array: 77, 33, 44, 11, 88, 22, 66, 55. *11 K3 CO5*

28. a) Illustrate various asymptotic Notations and analyze it for a sorting algorithm. Depict the same graphically and explain. *11 K4 CO6*

OR

b) Analyze the performance of the greedy technique for solving the 0/1 knapsack problem with knapsack capacity W = 10. Compare the greedy solution with the optimal solution and justify whether greedy is suitable for 0/1 knapsack. *11 K4 CO6*

Item	Weight	Value
1	2	10
2	3	20
3	4	30
4	5	40