Reg. No.																

Question Paper Code	14230

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

Third Semester

Information Technology

(Common to Computer Science and Engineering, Computer and Communication Engineering & Sixth Semester -Electrical and Electronics Engineering)

20ITPC301 - DATA STRUCTURES

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Which stack operation shows the last inserted item without removing it? (a) size() (b) push() (c) top() (d) pop()	1	K1	CO1
2.	Which data structure helps in changing an infix expression to postfix form? (a) Linked List (b) Priority Queue (c) Stack (d) Queue	1	K1	CO1
3.	Which operation is easier in doubly linked lists compared to singly linked lists? (a) Sorting (b) Insertion at the head (c) Traversal (d) Deletion of the last node	1	K1	CO2
4.	In a circular linked list, where does the last node link to? (a) The previous node (b) NULL (c) A header node (d) The first node	1	K1	CO2
5.	In a tree, which node has no parent? (a) Internal node (b) Leaf (c) Sibling (d) Root	1	K1	CO3
6.	Which tree type is often used to show arithmetic expressions? (a) Heap (b) AVL tree (c) Expression tree (d) B-tree	1	K1	CO3
7.	How is a graph formally defined? (a) A set of edges only (b) A set of vertices and a set of arrays (c) A set of nodes only (d) A set of vertices and a set of edges	1	K1	CO4
8.	Which data structure is typically used to implement Breadth First Traversal? (a) Tree (b) Stack (c) Queue (d) Heap	1	K1	CO4
9.	Topological sorting is used on which type of graph? (a) Complete graph (b) Weighted graph (c) Directed acyclic graph (DAG) (d) Undirected graph	1	K1	CO5
10.	Which search algorithm works only on sorted arrays? (a) Hashing (b) Binary Search (c) Jump Search (d) Linear Search	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

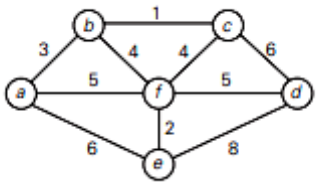
Answer ALL Questions

		Marks	K – Level	CO
11.	What is called rear and front in Queue ADT?	2	K1	CO1
12.	Differentiate between Simple Queue and Circular Queue**.**	2	K2	CO1
13.	What is a Singly Linked List, and how is it different from an array?	2	K2	CO2
14.	Why is dynamic memory allocation used in linked lists instead of static arrays?	2	K1	CO2
15.	Define depth and height of a tree.	2	K1	CO3
16.	What are LL, RR, LR, and RL rotations in AVL trees?	2	K1	CO3
17.	Enlist the types of graphs.	2	K1	CO4
18.	In which scenario is BFS preferred over DFS?	2	K2	CO4
19.	What is a cut vertex and why is it important in a graph?	2	K1	CO5
20.	How is Prim's algorithm different from Kruskal's algorithm for finding a minimum spanning tree?	2	K2	CO5
21.	Write short notes on radix sort.	2	K1	CO6
22.	Give the benefits provided by extendible hashing.	2	K1	CO6

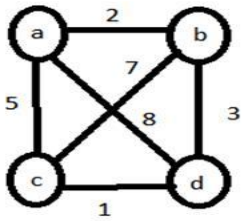
PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Convert the following infix expression to postfix form using stack-based algorithm: a + b * c + (d * e + f) * g. Write the pseudo code for the operations.	*11*	*K2*	*CO1*
		OR			
	b)	Compare and contrast Simple Queue, Circular Queue, and Dequeue in terms of implementation and efficiency.	*11*	*K2*	*CO1*
24.	a)	Swap two adjacent elements by adjusting only the pointers (not the data) using: a. Singly linked lists. b. Doubly linked lists.	*11*	*K2*	*CO2*
		OR			
	b)	Explain how to represent a polynomial using a linked list. Demonstrate the following operations and provide examples for each operation. 1. Insertion 2.Deletion	*11*	*K2*	*CO2*
25.	a)	Apply Binary Search Trees (BSTs) to enable efficient searching, insertion, and deletion operations.	*11*	*K3*	*CO3*
		OR			
	b)	Apply the delete-max operation on a max-heap containing the elements {31, 41, 59, 26, 53, 58, 97}. Show the resulting heap after the first delete-max operation.	*11*	*K3*	*CO3*
26.	a) (i)	Show how to represent a graph using both an adjacency matrix and an adjacency list with an example.	*5*	*K2*	*CO4*
	(ii)	Find whether articulation point exists in graph.	*6*	*K2*	*CO4*
		OR			
	b)	Explain graph traversal algorithm Depth First Search (DFS) with an example.	*11*	*K2*	*CO4*
27.	a)	Apply Prim's and Kruskal's algorithm to find the Minimum Spanning Tree (MST) for the following weighted graph and explain each step.	*11*	*K3*	*CO5*



		OR			
	b)	Apply Dijkstra's algorithm for the following graph and find the shortest path.	*11*	*K3*	*CO5*



28.	a)	Explain bubble sort and demonstrate the sorting steps for the following set of numbers: 30, 52, 29, 87, 63, 27, 19, 54.	*11*	*K2*	*CO6*
		OR			
	b)	Explain the Linear Probing to insert the keys {89, 18, 49, 58, 69} into a hash table of size 10 using the hash function h(x)=x%10. Show the final state of the hash table after all insertions.	*11*	*K2*	*CO6*