Reg. No.															

Question Paper Code	14707

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2026

Third Semester

Electronics and Instrumentation Engineering

24ESIT301 - DATA STRUCTURES

Regulations - 2024

Duration: 3 Hours | Max. Marks: 100

PART – A (i) (MCQ)
(16 × 1 = 16 Marks)
Answer ALL Questions

		Marks	K – Level	CO
1.	A polynomial $5x^2+3x+2$ is stored using a linked list. What does each node typically contain? a) Only coefficient b) Exponent only c) Coefficient and exponent d) Address only	1	K3	CO1
2.	Why is a linked list preferred over an array for frequent insertions? a) Arrays occupy less memory b) Linked lists allow dynamic memory allocation c) Arrays are slower in searching d) Linked lists store elements contiguously	1	K2	CO1
3.	What is the time complexity of accessing an element in an array by index? a) O(n) b) O(logn) c) $O(n^2)$ d) O(1)	1	K1	CO1
4.	In a queue, deletion of an element takes place from the a) Rear b) Middle c) Top d) Front	1	K1	CO2
5.	Which of the following applications commonly uses stacks? a) CPU Scheduling b) Printer Queue c) Function Calls d) Network Routing	1	K2	CO2
6.	What will be the postfix expression for the infix expression A+B∗CA + B * CA+B∗C? a) AB+C* b) ABC*+ c) AB*+C d) +AB*C*	1	K3	CO2
7.	Which data structure is commonly used to implement a priority queue? a) Stack b) Queue c) Linked List d) Binary Heap	1	K1	CO3
8.	Which traversal is useful for evaluating an expression tree? a) Postorder b) Inorder c) Reverse order d) Preorder	1	K2	CO3
9.	Insert 30, 20, 10 into an AVL tree. Which rotation is required? a) Left Rotation b) Right Rotation c) Left-Right Rotation d) Right-Left Rotation	1	K3	CO3
10.	Which graph traversal technique uses a queue? a) Breadth First Search b) Depth First Search c) Topological Sort d) Dijkstra Algorithm	1	K1	CO4

11.	A graph has 5 vertices. How many entries are there in its adjacency matrix?		*1*	*K3*	*CO4*
	a) 5	b) 10			
	c) 25	d) 15			
12.	Why is DFS useful in cycle detection?		*1*	*K2*	*CO4*
	a) It uses matrices only	b) It avoids recursion			
	c) It removes edges	d) It visits all neighbors deeply			
13.	In Binary Search, the search starts from the:		*1*	*K1*	*CO5*
	a) First element	b) Last element			
	c) Middle element	d) Random element			
14.	Which algorithm is most suitable for sorting large external files?		*1*	*K3*	*CO5*
	a) Quick Sort	b) Merge Sort			
	c) Radix Sort	d) Shell Sort			
15.	What is the main drawback of linear probing?		*1*	*K2*	*CO6*
	a) Causes primary clustering	b) Requires trees			
	c) Uses extra linked lists	d) Cannot store integers			
16.	During insertion into a binary heap, the new element is first inserted at:		*1*	*K3*	*CO6*
	a) Random position	b) Left subtree only			
	c) Root position	d) Next available leaf position			

PART – A (ii) (Short Answer Questions)
(6 × 3 = 18 Marks)
Answer ALL Questions

17.	Identify and compare array implementation and linked list implementation of List ADT for insertion operation.	*3*	*K3*	*CO1*
18.	Develop the stack contents during the evaluation of the postfix expression: 5 1 2 + 4 ∗ + 3 −	*3*	*K3*	*CO2*
19.	Construct a Binary Search Tree for the elements 50, 30, 70, 20, 40, 60, 80 and analyze inorder traversal.	*3*	*K4*	*CO3*
20.	Compare adjacency matrix and adjacency list representations of graphs.	*3*	*K4*	*CO4*
21.	Construct the steps involved in Radix Sort for the elements 45, 20, 35, 10, 50.	*3*	*K3*	*CO5*
22.	Construct a hash table using separate chaining for the keys 15, 25, 35, and 45. Assume the hash function is h (k) = k mod 10.	*3*	*K4*	*CO6*

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

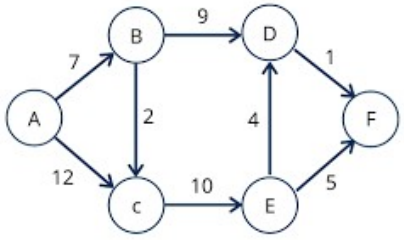
23.	a)	Identify how to merge two sorted linked lists into a single sorted list and explain it with an example.	*11*	*K3*	*CO1*
		OR			
	b)	Identify and explain the process of adding two polynomials using linked list with an example.	*11*	*K3*	*CO1*
24.	a)	Apply the array mechanism to implement the operations in the Stack ADT.	*11*	*K3*	*CO2*
		OR			
	b)	Apply the linked list mechanism to implement the operations in the Queue ADT.	*11*	*K3*	*CO2*

25. a) Construct the binary search tree using following elements: 35,15,40,7,10,100,28,82,53,25,3. Examine each step in the construction of BST and show it diagrammatically. *11 K4 CO3*

OR

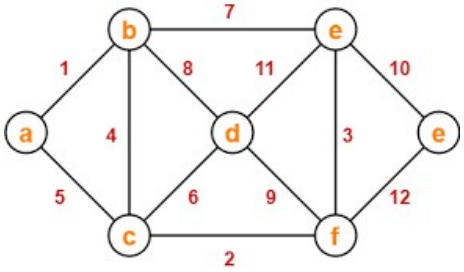
b) Construct an AVL Tree by inserting the keys: 15, 10, 20, 8, 12, 17, 25, 6 Show it diagrammatically and Examine the result of balanced tree at the end of each stage of the insertion. *11 K4 CO3*

26. a) Apply Dijkstra's Algorithm to find the shortest path from vertex A to all other vertices in the following graph: *11 K4 CO4*



OR

b) Apply Prim's Algorithm to find the Minimum Spanning Tree for the following graph starting from vertex a**.** *11 K4 CO4*



27. a) (i) Apply the quick sort algorithm for the following data: 88, 11, 22, 44, 66, 99, 32, 67, 54, 10. *6 K3 CO5*

(ii) Develop an algorithm for Merge sort with an example. *5 K3 CO5*

OR

b) (i) Apply the heap sort algorithm for the following data: 35,12,14,9,15,45,32,95,40,5 *6 K3 CO5*

(ii) Develop an algorithm for Shell sort. *5 K3 CO5*

28. a) (i) Insert the following keys by applying separate chaining method**:** 22, 1, 13, 11, 24, 33, 44, 52, 65 and draw the resulting chained hash table of size 11. *6 K3 CO6*

(ii) Apply double hashing technique with secondary hash function $h_2(k) = 5- (k \bmod 5)$ and insert the following values 27, 18, 29, 28, 39, 13, 16 into a hash table of size 3. *5 K3 CO6*

OR

b) Insert the following keys by applying the linear probing and Quadratic probing: 12, 44, 13, 88, 23, 94, 11, 39 for the table of size 10. *11 K3 CO6*