eg. No.															

Question Paper Code	13557

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Third Semester

Electronics and Instrumentation Engineering

(Common to Instrumentation and Control Engineering)

20ESIT301 - DATA STRUCTURES AND ALGORITHMS

Regulations - 2020

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	*K – Level*	*CO*
1.	What is an Abstract Data Type (ADT) in the context of data structures? (a) A specific implementation of a data structure. (b)A way to represent data in a physical memory location. (c) A high-level description of a set of operations on data without specifying the implementation (d) A programming language feature for creating arrays.	*1*	*K1*	*CO1*
2.	If the MAX_SIZE is the size of the array used in the implementation of circular queue. How is rear manipulated while inserting an element in the queue? (a) rear=(rear%1)+max_size (b) rear=rear%(max_size+1) (c) rear=(rear+1)%max_size (d) rear=rear+(1%max_size)	*1*	*K1*	*CO1*
3.	How is the deletion of a node at the end of a Doubly Linked List different from a Singly Linked List? (a) It requires traversing the entire list (b) It involves updating two pointers (c) It does not require any pointer update (d) It requires finding the middle of the list	*1*	*K1*	*CO2*
4.	"Dummy" nodes are known as _____ and they do not store elements of the primary sequence. (a) Sentinels (b) Header nodes (c) Guards (d) Both sentinels & Guards	*1*	*K1*	*CO2*
5.	What is a Tree in data structures? (a) A collection of nodes connected in a linear fashion (b) A non-linear data structure with nodes connected by edges (c) A sequence of elements in a line (d) A graph with no vertices	*1*	*K1*	*CO3*
6.	Which of the following is a characteristic of a full binary tree? (a) Every node has exactly 0 or 2 children (b) Every node has exactly 1 child (c) All leaf nodes are at the same level (d) The root has only one child	*1*	*K1*	*CO3*
7.	In graph terminology, what does a "path" mean? (a) A cycle that includes all vertices (b) A sequence of edges connecting vertices (c) An isolated vertex (d) A tree structure	*1*	*K1*	*CO4*
8.	An Euler Circuit must satisfy _____ condition. (a) All vertices must have odd degree (b) All edges must be visited exactly once and return to the starting vertex (c) It can visit vertices multiple times (d) It must include all vertices	*1*	*K1*	*CO4*
9.	Which of the following is NOT a step in the Binary Search algorithm? (a) Dividing the list into two halves (b) Recursively searching in one half (c) Swapping elements to order the list (d) Comparing the target value with the middle element	*1*	*K1*	*CO5*

10.	What is the main purpose of hashing? (a) To sort data (b) To map data to a specific location (c) To compress data (d) To access data sequentially	*1*	*K1*	*CO6*

PART - B (12× 2 = 24 Marks)

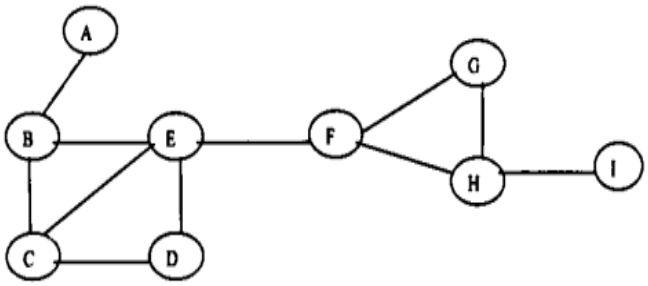
Answer ALL Questions

11.	Compare linear and non-linear data structure.	*2*	*K2*	*CO1*
12.	Define priority queues. What are the ways to implement priority queue?	*2*	*K1*	*CO1*
13.	Show the key difference between an Array-Based List and a Linked List.	*2*	*K2*	*CO2*
14.	Define Polynomial ADT.	*2*	*K1*	*CO2*
15.	State threaded binary tree.	*2*	*K1*	*CO3*
16.	Define heap. How it can be used to represent a priority queue?	*2*	*K1*	*CO3*
17.	Define weighted, unweighted, directed, path, cyclic and acyclic in a graph.	*2*	*K1*	*CO4*
18.	How does the Bellman-Ford algorithm differ from Dijkstra's algorithm?	*2*	*K2*	*CO4*
19.	Show the various factors to be considered in deciding a sorting algorithm.	*2*	*K2*	*CO5*
20.	What do you mean by internal and external sorting?	*2*	*K1*	*CO5*
21.	What factors should be considered when choosing a hash function for a specific application?	*2*	*K1*	*CO6*
22.	Define separate chaining.	*2*	*K1*	*CO6*

PART - C (6 × 11 = 66 Marks)

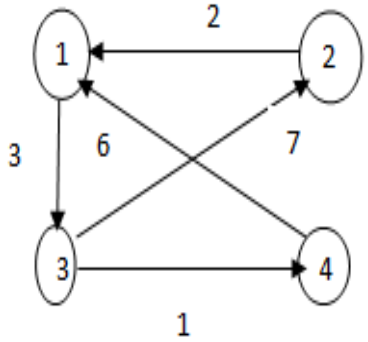
Answer ALL Questions

23.	a)	Explain Stack ADT and its operations. Explain array based implementation of stack.	*11*	*K2*	*CO1*
		OR			
	b)	What is Queue? Why is it known as FIFO? Write an algorithm to insert and delete an element from Queue.	*11*	*K2*	*CO1*
24.	a)	Identify the array implementation of list and discuss the various operations of the list ADT with examples.	*11*	*K2*	*CO2*
		OR			
	b)	Discuss the creation of a doubly linked list and write routine to insert an element in doubly linked list and delete an element in doubly linked list.	*11*	*K2*	*CO2*
25.	a)	Write an algorithm for Preorder, Inorder and Postorder traversal of a binary tree. Apply the concept with suitable examples.	*11*	*K3*	*CO3*
		OR			
	b)	Show the result of inserting **43,11,69,72 and 30** into an initially empty AVL tree. Show the results of deleting the nodes **11 and 72** one after the other from the constructed tree.	*11*	*K3*	*CO3*
26.	a)	Apply Breadth First Search technique for the given graph.	*11*	*K3*	*CO4*



OR

b) Compute shortest path for the following graph using Floyd's algorithm. *11 K3 CO4*



27. a) Explain the algorithm for Binary Search. Apply Binary Search algorithm to search the number **26** from the list of numbers and give the steps. **10,7,17,26,32,92** . *11 K3 CO5*

OR

b) Apply an algorithm to sort a set of 'N' numbers using bubble sort and demonstrate the sorting steps for the following set of numbers: **30, 52, 29, 87, 63, 27, 19, 54.** *11 K3 CO5*

28. a) Given input {4371, 1323, 6173, 4199, 4344, 9679, 1989} and a hash function h(x) =x mod 10. Prepare the resulting for the following: *11 K3 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).

OR

b) Explain the concept of rehashing and extendible hashing in detail. Apply the concept with suitable example. *11 K3 CO6*