Sub Code:R2331055A **R23** **Set No. 1**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY-GURUJADA VIZINAGARAM
III B. Tech I Semester Regular Examinations November -2025
DATA STRUCTURES
(ECE)

Time: 3 hours **Max. Marks: 70**

The Question paper consists of Part A & Part B.
Part A is compulsory, Answer all questions. Part B Answers any one question from each unit.
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1		PART-A	(20Marks)
	a)	If the sequence of operations - push (1), push (2), pop, push (1), push (2), pop, pop, pop, push (2), pop are performed on a stack, then What is the sequence of popped out values?	[2]
	b)	Differentiate between Overflow and underflow in stacks.	[2]
	c)	Consider an array where the first half contains elements in increasing order and the second half contains elements in decreasing order. If we apply quick sort to this array, what will be the time complexity of sorting algorithm? Justify you answer. Θ (n) b) Θ(n2) c) Θ(nlogn) d) Θ(n2logn)	[2]
	d)	Construct the following queue of characters, where the queue is implemented as a **circular array** of size six. • **FRONT = 2, REAR = 4** • **QUEUE = [……, A, C, D, ……, ……]** Perform the following operations in sequence: Insert **E,** Insert **F,** Delete, Delete, Insert **G,** Delete, Insert **H** After performing these operations, what are the **index positions of the FRONT and REAR pointers**?	[2]
	e)	What is **stable sorting**? Explain the concept with a suitable example.	[2]

	f)	What's the time complexity of the following code?
		for (i = 1; i<= N; i++) // N is the input
		{
		for (j= 1;j<= i^2;j=j+i)
		{ //some code }
		}
			[2]

	g)	How trees are represented in memory? Give an example.	[2]
	h)	Calculate the complexity of Linear search algorithm.	[2]
	i)	Which sorting technique is best in terms of complexity? Justify.	[2]
	j)	What is the benefit of circularly linked list over singly linked list in search applications?	[2]
		PART-B	(50Marks)

		Question from **Unit - I**	
2	a)	In a modified version of merge sort, the midpoint is calculated using the formula: Mid $= \frac{\text{Start Index + Last Index}}{3}$, As a result, the array is divided into two subarrays of sizes $\frac{n}{3}$ and $\frac{2n}{3}$, respectively, where n is the size of array. Drive the time complexity of this modified merge sort algorithm. Describe in a step-by-step process how the above algorithm is applied on the following list to sort the data in descending order. 50, 40, 30, 60, 20, 50, 90, 80, 70, 30, 60, 10.	[5]
	b)	What is the Quick sort? Write its algorithm and explain with suitable example.	[5]
		(OR)	
3	a)	Design an efficient algorithm to count the number of 1's in a sorted array that contains only 0's and 1's. Clearly describe the algorithm, and analyze its time complexity with proper justification.	[5]
	b)	What is the Insertion sort? Write its algorithm and explain with suitable example.	[5]
		Question from **Unit - II**	
4	a)	Write an algorithm for **infix to postfix conversion**.	[5]
	b)	Evaluate step by step using a stack:5, 6, 2, +, *, 12, 4, /, -	[5]
		(OR)	
5	a)	Write an algorithm to implement a stack using an array.	[5]
	b)	What is stack? Convert the following infix expression into equivalent postfix expression using stack. A*(B+C)/E-F*(G+H/K)	[5]
		Question from **Unit - III**	
6	a)	What are linear queues? Write an algorithm to insert and delete an element from a linear queue.	[5]
	b)	What are the disadvantages of linear Queue? How can we overcome these disadvantages in case of circular queue? Explain with an example.	[5]
		(OR)	
7	a)	Write an algorithm to reverse the order of elements in a queue Q	[5]
	b)	Given a queue Q of integers, write an algorithm to **sort the elements in ascending order** using only a **stack** as auxiliary storage.	[5]
		Question from **Unit - IV**	
8	a)	Write an algorithm to reverse the singly linked list.	[5]
	b)	Implement the polynomial addition using singly linked list.	[5]
		(OR)	
9	a)	Given two sorted linked lists L1 and L2. Exemplify and write the functions to compute L1 ∩ L2.	[5]
	b)	Write an algorithm to insert a node at the end of a doubly linked list.	[5]
		Question from **Unit - V**	
10	a)	The post-order traversal of a binary tree is 8,9,6,7,4,5,2,3,1.	[5]

		The in-order traversal of the same tree is 8,6,9,4,7,2,5,1,3. The height of a tree is the length of the longest path from the root to any leaf. Find Pre-order traversal. Show all steps to determine the pre-order traversal. Find the height of the above binary tree.	
	b)	Write functions to: I. Count the number of leaf nodes. II. Find the height of the binary tree.	[5]
		(OR)	
11	a)	Construct a binary search tree by inserting 3, 1, 4, 9, 6, 5, 2, 8, and 7 intoan initially empty tree. Show the results of deleting the nodes 6 and 7one after the other of the constructed tree.	[5]
	b)	Write a non – recursive algorithm for in-order, traversal of a binary tree.	[5]

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