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MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust®, Mangalore)
Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi
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Model Question Paper

First Semester MCA Degree Examination, 2025-26

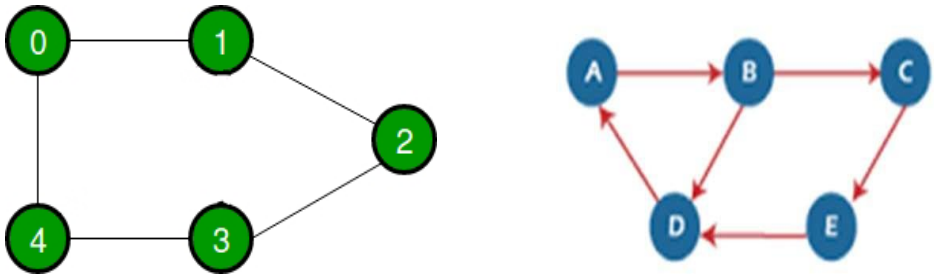
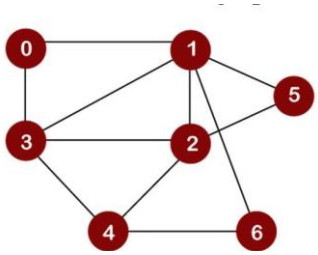
Data Structures

Time: 3 Hours **Max. Marks: 100**

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M: Marks, L: RBT (Revised Bloom's Taxonomy) level, C: Course outcomes.

		Module -1	M	L	C
Q1	a.	Write the Linear Search algorithm and trace it to search for a key element 12 in the given set of values: 22, 54, 45, 67,12, 90	10	L3	CO1
	b.	Use bubble sort technique to arrange the following set of values in ascending order: 33, 12, 56, 4, 88, 4 . Write a C code to implement bubble sort.	10	L3	CO1
		OR			
Q2	a.	Use the Binary Search algorithm in the given data: 20, 25, 30, 35, 40, 45, 50 and perform the following: a) Search for a key element: 50 b) Search for a key element: 10.	10	L3	CO1
	b.	Implement the Merge Sort algorithm to arrange the following data in ascending order: 10, 50, 20, 25, 13, 8, 1, 3	10	L3	CO1
		Module- 2			
Q3	a.	Write a C code to simulate stack operations (push and pop) using an array. Given an empty stack with MAX size is 5 perform the following operations step by step and show state of the stack in every step and the final stack state: • Push 10, 20, and 30 onto the stack. • Pop the top element. • Pop the top element. • Push 40,50,60,70onto the stack. • Push 80 onto the stack. • Pop six elements from the stack.	10	L3	CO2
	b.	Evaluate the following postfix expression and show the final result. a) 10 22 + 8 / 6 * 5 + b) 6 2 3 * / 3 4 * + 3 2 *	10	L3	CO2
		OR			
Q4	a.	Transform the given infix expressions into equivalent prefix expressions with detailed steps. a) (P * Q + R) * (S / T + U / V) + W b) K +((L * M* N) / (X + Y – Z))	10	L3	CO2

	b.	Apply recursive function to a) Calculate factorial of 5 b) Generate Fibonacci series when n= 5	10	L3	CO2
Module- 3					
Q5	a.	Apply the simple queue operations (Insert and Delete) on the following set of integers using arrays with the help of C functions: 25, 10, 45, 30, 5, 60	10	L3	CO3
	b.	Implement a circular queue using an array and perform the following operations on: 5, 15, 25, 35, 45 • Enqueue all elements • Dequeue two elements • Enqueue 55 and 65 • Display the final circular queue	10	L3	CO3
OR					
Q6	a.	Apply the priority queue operations (Insertion and Deletion) on the following set of elements using array implementation in C: 10, 40, 20, 60, 30, 50. Assume higher value = higher priority.	10	L3	CO3
	b.	Apply the concepts of Double Ended Queue to perform the following operations using the set of integers: 4, 9, 1, 7, 3, 8 Perform: • Insert 4, 9, 1 at rear • Insert 7, 3 at front • Delete one element from rear • Insert 8 at rear Show the Deque after each operation and write the algorithm for insert and delete.	10	L3	CO3
Module – 4					
Q7	a.	A singly linked list initially contains the elements: 10 → 20 → 30 → 40 → 50 Write algorithms and trace step-by-step for: • Insert 25 after 20 • Delete 40 • Reverse the list Show the list after each operation.	12	L3	CO4
	b.	A music player stores songs in a doubly linked list. Design algorithms using Doubly Linked list for: • Play next song • Play previous song • Delete current song Explain why DLL is suitable.	8	L3	CO4
OR					
Q8	a.	A college wants to maintain a list of students registering for a workshop. Students may join or leave at any time. Design a C program using a singly linked list to: • Add a student at the end of the list • Remove a student from the beginning • Display the current list of students	10	L3	CO4
	b.	Use C functions to demonstrate the following operations with a singly linked list a) Insert a node at the beginning of a Linked List. b) Insert a node at the end of a Linked List.	10	L3	CO4

Module – 5					
Q9	a.	Write a function to perform binary tree traversal and construct a linked list using the below tree. 	10	L3	CO5
	b.	Build the binary search tree for the following data: 15, 10, 23, 25, 20, 35, 42, 39, 30. Perform Preorder, Inorder and Postorder traversals for the constructed Binary Search Tree.	10	L3	CO5
OR					
Q10	a.	Write the adjacency list and adjacency matrix representation for the given graph.  (a) (b)	10	L3	CO5
	b.	Apply Breadth First Search(BFS) and Depth First Search(DFS) and show the step-by-step traversal for the below graphs. 	10	L3	CO5