U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: III**

Branch: Computer Science and Business Systems **Duration: 3 hrs.**

Course Code: 23BS3PCDSA **Max Marks: 100**

Course: Data Structure and Application

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	*CO*	*PO*	Marks
1	a)		Define data structure. With a neat diagram illustrate in detail how data structure can be classified.	*CO1*	*PO1*	**10**
	b)		Write C functions to perform the following operations. i. Inserting an element at a given position in a singly linked list. ii. To delete alternate nodes in a singly linked list.	*CO2*	*PO3*	**10**
			OR			
2	a)		Distinguish between linked list and arrays (Any 6).	*CO1*	*PO2*	**06**
	b)		Discuss Dynamic Memory Allocation. Illustrate the functions supported by dynamic memory allocation. Write a C code to print the alternate elements of a singly linked list.	*CO1*	*PO2*	**10**
	c)		Write a C function to count the number of nodes in a singly linked list.	*CO2*	*PO3*	**04**
			UNIT – II			
3	a)		Explain doubly linked list. Write a C code to sort the elements of doubly linked list in ascending order.	*CO2*	*PO3*	**10**
	b)		Implement stack operations with the help of a neat diagram using singly linked list.	*CO2*	*PO2*	**10**
			OR			
4	a)		Write a C code to implement the following operations using doubly linked list. i. Insert the new node at the beginning of the node. ii. Delete the node from the specified position. iii. Display the status of the doubly linked list.	*CO2*	*PO3*	**10**

		b)	Define Circular linked list. Explain the advantages of circular linked list over singly linked list with an example. Given circular singly linked list, develop a C function to delete the first node.	*CO2*	*PO2*	**10**
			UNIT – III			
	5	a)	Analyze the functionalities of priority queue for real-time applications and implement C routines to perform insert and delete operations.	*CO3*	*PO3*	**10**
		b)	Write an algorithm to evaluate a given postfix expression. Also evaluate the postfix expression using stack : 5 6 7 + * 8 - Show the content of the stack at each step.	*CO3*	*PO3*	**10**
			OR			
	6	a)	Write an algorithm to convert an infix expression to postfix expression. Convert the following infix expression to postfix expression. i. **A+(B*C+D)/E** ii. **A*(B*C+D*E)+F**	*CO3*	*PO3*	**10**
		b)	Write a C code to compute the factorial of a number. Show the recursive function calls for computing the factorial (n) for n=5. Draw the recursion tree for the same.	*CO3*	*PO3*	**10**
			UNIT – IV			
	7	a)	Write the functions for the following. i. To insert a newnode in a binary search tree. ii. Find the maximum element in a binary search tree. iii. Count the number of binary search tree present in a binary tree.	*CO2*	*PO2*	**10**
		b)	Explain the Properties of Binary Search Tree. Briefly illustrate Binary Search tree operations. Write an algorithm to delete an element.	*CO2*	*PO3*	**10**
			OR			
	8	a)	Illustrate BST. Construct a binary tree for the following preorder, inorder and postorder traversal. i. Preorder: 18, 211, 90, 20, 190 ii. Inorder: 42, 10, 17, 29, 2, 30, 42 iii. Postorder: DEBFGCA Write an algorithm for the same.	*CO2*	*PO2*	**10**
		b)	Write a C code to perform the following operations on a binary search tree. i. Insertion ii. Deletion iii. Post order traversal iv. Pre order traversal	*CO2*	*PO3*	**10**

			UNIT – V			
	9	a)	Illustrate the rules used to create the Red-Black tree. How is balancing done in Red-Black tree? Discuss the cases involved in inserting a node in to a Red-Black tree.	*CO2*	*PO2*	**10**
		b)	Discuss AVL tree. Give Example. List their advantages. Construct AVL tree for the following sequence. 10, 15, 9, 12, 13, 79, 45, 36, 22. Show the steps of construction.	*CO3*	*PO3*	**10**
			OR			
	10	a)	Justify the properties of Red-Black trees with an example tree of atleast 6 nodes.	*CO2*	*PO2*	**10**
		b)	Outline algorithms for the following. i. Inserting a node in RED-Black Tree. ii. Deleting a node in a splay tree.	*CO3*	*PO3*	**10**

****