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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: CSE (IoT)/AI&DS/CSE(DS) **Duration: 3 hrs.**

Course Code: 23DC3PCDSC **Max Marks: 100**

Course: Data Structures

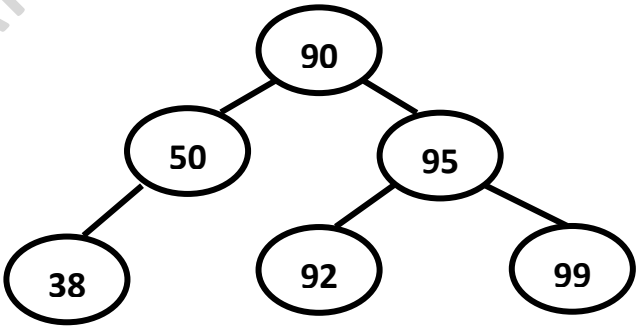
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

			UNIT – I	*CO*	*PO*	Marks
1	a)	What is data structure? Explain different types of data structures with example.		*CO1*	*PO1*	**07**

	b)	What is pointer? Predict the output for the following snippet and justify the answer.
		int* pc, c;
		c = 5;
		pc = &c;
		c = 1;
		printf("%d", c);
		printf("%d", *pc);
				CO1	*PO1*	**06**

	c)	Define structure. Explain nested structure with example.		*CO1*	*PO1*	**07**
		OR				
2	a)	Which is advantageous dynamic memory allocation or static memory allocation? Justify your answer.		*CO1*	*PO1*	**05**
	b)	Develop a structure to represent the planets in the solar system. Each planet has fields for the planet's name, its distance from the sun (in miles), and the number of moons it has. Write a program to read the data for each planet and store it. Also, print the name of the planet that has the highest number of moons.		*CO2*	*PO2*	**10**
	c)	Considering details of books and its authors as an example, explain structures, nested structures and self-referential structures.		*CO2*	*PO2*	**05**

			UNIT – II			
	3	a)	Assume a four node SLL with 15, 25, 40 and 50 data. Write C function to perform the following: i. Insert a node with data value 30 in between the nodes 25 and 40. ii. Delete a node with data value 40.	*CO2*	*PO2*	**10**
		b)	Write a program to input an n digit number. Now, break this number into its individual digits and then store every single digit in a separate node thereby forming a linked list. Then delete a node with data 5, if list contains.	*CO2*	*PO2*	**10**
			OR			
	4	a)	Develop a C function to add two polynomials using circular singly linked list with header node.	*CO2*	*PO2*	**10**
		b)	Implement string palindrome using doubly linked list.	*CO2*	*PO2*	**10**
			UNIT – III			
	5	a)	Convert the following infix expression into postfix expression using stack trace : A – (B / C + (D % E + F) / G)* H)	*CO2*	*PO2*	**07**
		b)	Draw the stack structure in each case when the following operations are performed on an empty stack. Assume size of the stack is 5. (i) Add A, B, C, D, E, F (ii) Delete two letters (iii) Add G (iv) Add H (v) Delete four letters (vi) Add I	*CO3*	*PO3*	**06**
		c)	Differentiate between an iterative function and a recursive function. Which one will you prefer to use and in what circumstances?	*CO3*	*PO3*	**07**
			OR			
	6	a)	Write a program to create a queue which permits insertion at any vacant location at the rear end.	*CO3*	*PO3*	**07**
		b)	Draw the queue structure in each case when the following operations are performed on an empty queue. Assume size of the queue is 5. (i) Add A, B, C, D, E, F (ii) Delete two letters (iii) Add G (iv) Add H (v) Delete four letters (vi) Add I	*CO3*	*PO3*	**06**
		c)	Write a program to reverse the elements of a queue.	*CO3*	*PO3*	**07**
			UNIT - IV			
	7	a)	Implement the following operations on a Binary tree:	*CO1*	*PO1*	**08**

			i) Postorder traversal ii) Count the number of leaf nodes Calculate the height of the tree			
		b)	Construct Binary Search Tree whose preorder traversal is 14, 27, 24, 34, 29, 44, 54, 69, 59, 49, 39.	*CO2*	*PO2*	**06**
		c)	Employee details are stored in a Binary Search Tree. Assuming the insertions are based on the Salary field, design a routine to print the details of the employee with the highest salary.	*CO1*	*PO1*	**06**
			OR			
	8	a)	Explain different ways of representing binary trees in the memory. Which one do you prefer and why?	*CO1*	*PO1*	**06**
		b)	Write a C function to delete a node from binary search tree.	*CO3*	*PO3*	**08**
		c)	Construct the Binary tree whose traversals are as given below: Inorder: G D H B E A C F Preorder: A B D G H E C F	*CO2*	*PO2*	**06**
			UNIT – V			
	9	a)	Construct an AVL tree by inserting the following elements in the given order. 63, 9, 19, 27, 18, 108, 99, 81.	*CO4*	*PO3*	**10**
		b)	Explain splay trees in detail with relevant examples.	*CO4*	*PO3*	**05**
		c)	Draw all possible binary search trees of 7, 9, and 11.	*CO4*	*PO3*	**05**
			OR			
	10	a)	Discuss the properties of a red-black tree. Explain the insertion cases.	*CO4*	*PO3*	**10**
		b)	Derive the resulting splay tree after searching for the values 38 and 92 successively on the below splay tree: 	*CO1*	*PO1*	**05**
		c)	Describe the properties of a Red Black tree with an example Red black Tree with at least 6 nodes.	*CO2*	*PO2*	**05**

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