U.S.N.										

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

Autonomous Institute Affiliated to VTU

June / July 2024 Semester End Make-Up Examinations

Programme: B.E. **Semester: III**
Branch: CSE(ICB) / CSE(DS) / AI&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.

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)		What is a data structure? Differentiate between primitive and non- primitive data structure providing examples for each.	CO1	PO1	4
	b)		Compare the dynamic memory allocation functions of C: malloc, calloc and realloc.	CO1	PO1	6
	c)		Develop a C program to store details of n hotels.Each hotel has a name, address and rating. Design routines to read the details and print names of hotels whose rating is more than 4.	CO3	PO3	10
			UNIT - II			
2	a)		Illustrate the advantages of linked list data structure over static arrays.	CO1	PO1	4
	b)		Design C functions for the following operations on a singly linked list: i. To count the number of nodes in the list ii. To search for a key element in the list iii. To insert a new node at the middle of the list	CO1	PO1	10
	c)		There are n people standing in a circle. A random value K is chosen. The counting starts from some point in the circle. K^{th} person is chosen as the leader. Simulate the scenario using circular linked list.	CO3	PO3	6
			OR			
3	a)		Compare singly linked list with circular and doubly linked list.	CO2	PO2	4
	b)		Write C functions implementing following operations on a doubly linked list: i. To display alternate nodes ii. To delete the middle node	CO3	PO3	10
	c)		What is the advantage of representing sparse matrix using linked list? Assuming a sparse matrix of 4X4, derive the linked list corresponding to it.	CO1	PO1	6

			UNIT - III			
	4	a)	Design an algorithm or a C code to convert a given infix expression (without parenthesis) into postfix expression using stack. Using the same, convert the following infix to postfix. Show each step of the conversion: A+B/C*D-A	***CO1***	***PO1***	**10**
		b)	Compare recursion with iteration strategy. Write recursive C functions for the following: i. Tower of Hanoi. ii. To identify maximum value of the array.	***CO1***	***PO1***	**10**
			UNIT – IV			
	5	a)	Construct a binary tree whose traversals are as given below. Inorder: a,b,c,d,e,f,g,h,i,j,k Postorder: a,c,b,e,f,h,j,k,i,g,d	***CO2***	***PO2***	**6**
		b)	Prove or disprove the statement that in a Binary tree, total number of leaf nodes is always one more than the total number of nodes with two children.	***CO2***	***PO2***	**04**
		c)	Illustrate the different scenarios of deletion in binary search tree with an example for each. Give the algorithm or C code for deletion in binary search tree.	***CO2***	***PO2***	**10**
			OR			
	6	a)	Write recursive C functions for a binary tree i. To visit the tree in preorder ii. To find the height of the tree iii. To find the total number of nodes in the tree iv. To find the total number of leaf nodes in the tree	***CO1***	***PO1***	**10**
		b)	Define binary search tree. Construct a binary Search tree by inserting the keys 18, 4, 1, 0, 47, 65, 90, 21, 7, 12. Traverse the constructed tree in preorder, inorder and postorder.	***CO1***	***PO1***	**10**
			UNIT - V			
	7	a)	What is a balanced tree? List their advantages. Construct AVL tree for the keys: 101, 112, 133, 134, 145, 156, 157. Each step of the construction must be shown.	***CO1***	***PO1***	**10**
		b)	What is a Splay tree? List the advantages and limitations of Splay trees. Give one example each for the following Splay rotations. i. Zag-Zig rotation ii. Zig-Zag rotation	***CO1***	***PO1***	**06**
		c)	Justify the properties of Red black trees with an example tree of at least 6 nodes	***CO2***	***PO2***	**04**

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