U.S.N.										

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

Autonomous Institute Affiliated to VTU

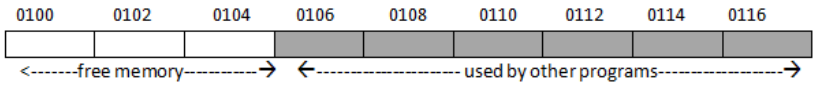
April 2024 Semester End Main Examinations

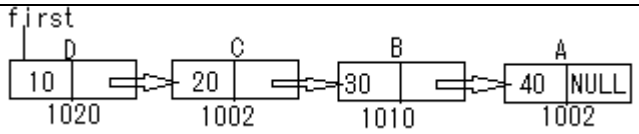
Programme: B.E. **Semester: III**
Branch: CSE(ICB) / CSE(DS) / AI&DS **Duration: 3 hrs.**
Course Code: 23DC3PCDSC **Max Marks: 100**
Course: Data Structures

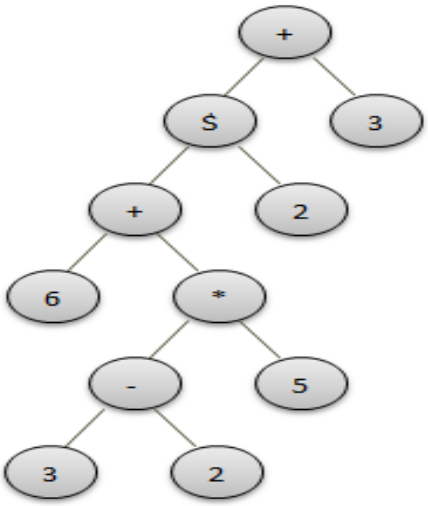
Instructions:1.Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

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.

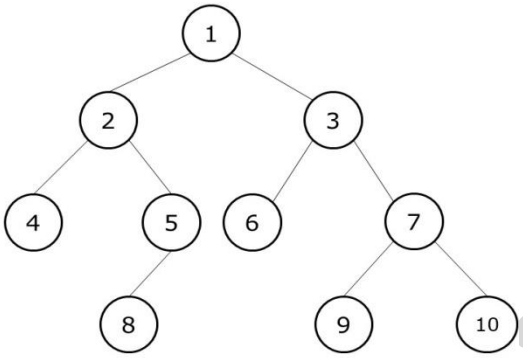
			UNIT - I	CO	PO	Marks

1	a)	Consider the following memory status and write your inference on the execution of given memory allocation program segments (i,ii and iii) along with the steps involved in memory allocation
		 
		
		i). int *ptr;
		ptr =(int *) malloc (8);
		ii). int *ptr;
		ptr =(int *) calloc (2,sizeof(int));
		iii). int *ptr;
		free (ptr);
			CO 2	PO 2	6

	b)	Consider a structure faculty containing 4 fields such as name, faculty id, and salary. Write C code to perform the below: i) Create a node structure along with the declaration ii) Allocate memory for storing N faculty details using dynamic memory allocation function.	CO 1	PO1	6
	c)	Design a C program to read n numbers into a dynamic array and print the maximum of value of the array.	CO 3	PO 3	8
		UNIT - II			
2	a)	 Consider the given Linked List where each node contains info field and link field. Write C code snippets for the below tasks i) Print the link of what C contains ii) Insert a new node called 'E' containing 23 in the info field to the front of list and print the updated list iii) Insert a new node to the left of the node which contains the value 30.	CO2	PO2	6
	b)	Design a C program to create a linked list of nodes simulating the operations of Stack data structure.	CO3	PO3	8

		c)	Implement C routines for the following operations on a circular linked list i. Count the number of nodes. ii. Insert at the beginning of the list	*CO2*	*PO2*	**6**
			OR			
	3	a)	Write C routine to print alternate nodes of non-empty singly linked list.	*CO3*	*PO3*	**6**
		b)	A playlist of songs is being stored in circular buffer. Develop a C program to construct this playlist with the right choice of data structure.	*CO3*	*PO3*	**8**
		c)	Design a C function for a doubly linked list to delete a node whose info field is given.	*CO 3*	*PO 3*	**6**
			UNIT - III			
	4	a)	'Anand' a first semester student arguing with his classmate 'Babu' that, iterative version of the program is best technique to use during programming, whereas 'Babu' says recursive version is better to adapt. As a senior student, help them compare both techniques with their advantages and disadvantages.	*CO1*	*PO1*	**4**
		b)	Implement a C program to read a valid infix expression and convert it to its equivalent postfix expression using stacks.	*CO1*	*PO1*	**8**
		c)	Write a menu driven C Program to simulate the working of a queue of vehicles on toll-tax bridge: The vehicle that comes first to the toll tax booth leaves the booth first. The vehicle that comes last leaves last. (Use integers to represent vehicles registration numbers).	*CO3*	*PO3*	**8**
			UNIT - IV			
	5	a)	Obtain the prefix, infix and postfix expressions for the tree given below.  	*CO 1*	*PO 1*	**6**
		b)	Prove that the number of Null pointers in a binary tree of N nodes is N+1	*CO2*	*PO2*	**4**

		c)	Design C routines for insert and deletion operations on a binary search trees of characters. Assume duplicate values are allowed to be inserted to the binary search tree.	*CO3*	*PO3*	**10**
			OR			
	6	a)	What is a strictly binary tree? Design a C routine to check if a binary tree is Strict or not.	*CO 1*	*PO 1*	**6**

		b)	Consider the given binary tree and write the output obtained by executing following routines on the binary tree.
			 
			
			i).
			`void traverse1(NODE root)`
			`{`
			`if(root==NULL) return ;`
			`traverse1(root->right); printf("%d",root->info);`
			`traverse1(root->left);`
			`}`
			
			ii).
			`void traverse2(NODE root)`
			`{`
			`if(root==NULL) return ;`
			`traverse2(root->right);`
			`traverse2 (root->left);`
			`printf("%d",root->info);`
			`}`
				CO2	*PO2*	**6**

		c)	Construct a Binary Search Tree for the sequence of numbers inserted successively. Traverse the resulting tree in pre order traversal. Assume duplicate values are allowed in the BST. 14, 15, 4, 9, 7, 18, 3, 5, 16, 4, 20, 17, 9, 14, 5	*CO1*	*PO1*	**8**
			UNIT - V			
	7	a)	Write a C function to perform Left single rotation in an AVL tree.	*CO1*	*PO1*	**6**
		b)	Start with an empty red-black tree and insert the following keys in the given order. 15, 14, 13, 12, 11, 10, 9, 8, 7. Draw the tree after each insertion. Label all the nodes with their color.	*CO2*	*PO2*	**10**
		c)	Assume a splay tree of six nodes and demonstrate Splaying on any chosen leaf node.	*CO3*	*PO 3*	**4**

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