Basavarajeswari Group of Institutions

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

USN											Course Code	2	1	C	S	3	3

Third Semester B.E. Degree Examinations, April/May 2023

DATA STRUCTURES AND APPLICATIONS

(Common to CSE & AIML)

Duration: 3 hrs **Max. Marks: 100**

Note: ***1. Answer any* FIVE *full questions, choosing* ONE *full question from each module.***
2. Missing data, if any, may be suitably assumed

Q. No		*Question*	*Marks*	*(RBTL:CO:PI)*
		MODULE – 1		
1.	**a.**	Write a C program to define employee structure using members like ename, eid, DOJ (DD, MM, YY) and dept. Read and display details of 5 employees. Use nested structures.	**08**	(3 :1: 1.4.1)
	b.	Define data structures. Give its classification and explain with examples.	**06**	(2 :1: 1.4.1)
	c.	Define pointer. How do you declare and initialize pointers? Write a program to find sum of elements of an integer array using pointer.	**06**	(3 :1: 1.4.1)
		OR		
2.	**a.**	List and explain the C functions used for dynamic memory allocation.	**08**	(2 :1: 1.4.1)
	b.	Consider the following polynomials. $A(x) = 5x^{200} + 8x^3 + 2$ and $B(x) = 10x^5 - 4x^3 + x - 6$ Diagrammatically represent the above polynomials using array of structures. Also write C structure to represent a term of the polynomial.	**06**	(3 :2: 1.4.1)
	c.	What is Sparse matrix? With an example explain how to represent sparse matrix using triplet format.	**06**	(3 :2: 1.4.1)
		MODULE – 2		
3.	**a.**	Define Stack. Write C functions to perform push, pop and display operations using array.	**08**	(3 :2: 1.7.1)
	b.	Convert the following infix expressions to their postfix form (i) A+((B*C-D/E^F)*G)*H (ii) A-B/(C*D^E)	**06**	(3 :3: 2.5.2)
	c.	Write an algorithm to evaluate postfix expression.	**06**	(3 :3: 2.5.2)
		OR		
4.	**a.**	Define Recursion. Explain with diagram recursive solution for Tower of Hanoi problem.	**07**	(3 :3: 1.7.1)
	b.	What is the advantage of circular queue over linear queue? Write a C functions to perform insert and delete operations on a circular queue of integers.	**08**	(3 :3: 1.4.1)
	c.	Write a short note on DEQUEs and priority queues.	**05**	(3 :3: 1.4.1)
		MODULE – 3		
5.	**a.**	Differentiate between arrays and linked lists.	**03**	(3 :4: 1.4.1)
	b.	Write a C functions to perform the following operations on single linked list. (i) Insert a node at the beginning of linked list (ii) Delete a node at the end of linked list (iii) Display the elements of linked list	**09**	(3 :3: 1.4.1)

Note: (**RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI - Performance Indicator)**

	c.	Consider a doubly linked list of nodes 10, 20, 40, 80, 50. Write a procedure to perform the following operations on doubly linked lists. (i) Inserting node 30 after 20 (ii) Deleting node 80	**08**	(3 :3: 1.4.1)
		OR		
6.	**a.**	Write C functions to perform following operations on doubly linked list. (i) Search a key element in the doubly linked list (ii) Concatenate two doubly linked lists	**08**	(3 :3: 1.7.1)
	b.	Write an algorithm to perform addition of two polynomials using linked lists.	**08**	(3 :4: 1.7.1)
	c.	Give diagrammatic linked representation of the following sparse matrix. $\begin{bmatrix} 00400 \\ 65000 \\ 03010 \\ 00002 \end{bmatrix}$	**04**	(3 :4: 1.7.1)
		MODULE – 4		
7.	**a.**	Define the following terms and give examples. (i) Binary Tree (ii) Strictly Binary Tree (iii) Complete Binary Tree (iv) Skewed Binary Tree	**08**	(1 :3: 1.4.1)
	b.	Explain array and linked representation of binary trees with suitable example.	**06**	(3 :3: 1.4.1)
	c.	Write the C recursive functions to perform inorder, preorder and postorder traversals in a binary tree.	**06**	(3 :5: 1.7.1)
		OR		
8.	**a.**	Write a short note on Threaded binary tree.	**06**	(1 :4: 1.4.1)
	b.	Construct a Binary Search Tree (BST) for the nodes 100,85,45,55,110,70,20,65,105,125. Write inorder, preorder and postorder traversal sequences of the constructed BST.	**06**	(3 :5: 1.7.1)
	c.	Write C functions to perform the following operations on Binary Search Tree (BST) (i) Inserting a node into BST (ii) Search for a key element in BST using recursion	**08**	(3 :3: 1.7.1)
		MODULE – 5		
9.	**a.**	Define AVL Tree. Construct a balanced AVL tree for months of the year.	**10**	(3 :5: 1.7.1)
	b.	Explain Red Black Tree with an example.	**06**	(2 :5: 1.7.1)
	c.	Define the following terms and give examples (i) Graph (ii) Directed graph (iii) Undirected graph (iv) Sub graph	**04**	(1 :3: 1.4.1)
		OR		
10.	**a.**	Explain adjacency matrix and adjacency list representation of graphs with an example.	**08**	(2 :3: 1.4.1)
	b.	Write an algorithm for breadth first search traversal in a graph and explain with an example.	**06**	(3 :5: 2.5.2)
	c.	List and explain different hashing functions.	**06**	(1 :5: 1.4.1)

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