

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

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Course Code

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Third Semester B.E. Degree Examinations, September /October 2024

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

<u>Q. No</u>	<u>Question</u>	<u>Marks</u>	<u>(RBTL:CO:PI)</u>
<u>MODULE – 1</u>			
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)
<u>MODULE – 2</u>			
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)
<u>MODULE – 3</u>			
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. **08** (3 :3: 1.4.1)
 (i) Inserting node 30 after 20 (ii) Deleting node 80

OR

6. a. Write C functions to perform following operations on doubly linked list. **08** (3 :3: 1.7.1)
 (i) Search a key element in the doubly linked list
 (ii) Concatenate two doubly linked lists
 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. **04** (3 :4: 1.7.1)

$$\begin{bmatrix} 00400 \\ 65000 \\ 03010 \\ 00002 \end{bmatrix}$$

MODULE – 4

7. a. Define the following terms and give examples. **08** (1 :3: 1.4.1)
 (i) Binary Tree (ii) Strictly Binary Tree
 (iii) Complete Binary Tree (iv) Skewed Binary Tree
 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) **08** (3 :3: 1.7.1)
 (i) Inserting a node into BST
 (ii) Search for a key element in BST using recursion

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 **04** (1 :3: 1.4.1)
 (i) Graph (ii) Directed graph (iii) Undirected graph (iv) Sub graph

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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