Basavarajeswari Group of Institutions

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

USN											Course Code	2	3	M	C	A	1	3

First Semester MCA Degree Examinations, November 2024

DATA STRUCTURES AND APPLCIATIONS

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.**	Define data structure. List and explain different types of data structures.	**08**	(1 :1: 1.7.1)
	b.	Write a C program to search an element using linear search technique.	**06**	(3:1: 1.7.1)
	c	Define recursion and explain with an example.	**06**	(3:1: 1.7.1)
		(OR)		
2.	**a.**	List and explain different types of dynamic memory allocation techniques with an appropriate examples.	**10**	(1:1: 1.7.1)
	b.	Define pointers and explain how to declare and initialize a pointer variable.	**04**	(1:1: 1.7.1)
	c.	List and explain different types of operations on data structures,	**06**	(1:1: 1.7.1)
		MODULE – 2		
3.	**a.**	List different operations of stack. Write a C program to implement stack operations using arrays.	**10**	(3:2: 1.7.1)
	b.	List and explain different applications of stack data structure.	**05**	(1:2: 1.7.1)
	c.	List and explain different types of queues.	**05**	(1:2: 1.7.1)
		(OR)		
4.	**a.**	List different operations of queue. Write a C program to implement ordinary queue operations using arrays.	**10**	(1:2: 1.7.1)
	b.	Define sparse matrix. Write the triplet form for the given matrix and explain.	**10**	(3:2: 1.7.1)

$$\begin{pmatrix} 15 & 0 & 0 & 22 & 0 & -15 \\ 0 & 11 & 3 & 10 & 0 & 0 \\ 0 & 0 & 0 & 0 & -6 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 91 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 28 & 0 & 0 & 0 \end{pmatrix}$$

		MODULE – 3		
5.	**a.**	Write an algorithm to perform the following operations on singly linked list. (i) Inserting an element at the beginning of the linked list. (ii) Deleting an element at the ending of the linked list.	**10**	(3:3: 1.7.1)
	b.	List and explain different types of linked lists.	**05**	(1:3: 1.7.1)

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

c. Write a diagrammatic linked representation of given sparse matrix. **05** (2:3: 1.7.1)

$$\begin{pmatrix} 2 & 0 & 0 & 0 \\ 4 & 0 & 0 & 3 \\ 0 & 0 & 0 & 0 \\ 8 & 0 & 0 & 1 \\ 0 & 0 & 6 & 0 \end{pmatrix}$$

(OR)

6. **a.** With the C-statements, illustrate how do you create a node, add and delete on singly linked list with proper message where each node is containing the details of student in the form of usn, name, branch sem; phno as data fields. **10** (3:3: 1.7.1)

b. Discuss polynomial and sparse matrix representation using linked list. **10** (2:3: 1.7.1)

MODULE – 4

7. **a.** Define binary tree. Write the C routine for the following operations: (i) Inorder Traversal (ii) Preorder Traversal (iii) Postorder Travesal **10** (3:4: 1.7.1)

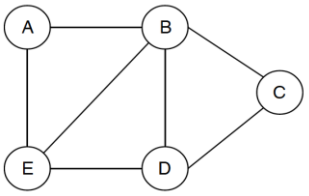
b. Construct Binary search tree for the given data **1,2,3,4,5,6,7,8,9,10,11,12,12,13,14,15.** **05** (3:4: 1.7.1)

c. Write a C function to search an element in a binary search tree. **05** (3:4: 1.7.1)

(OR)

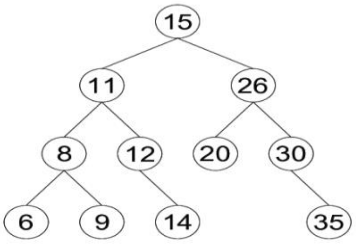
8. **a.** List and explain different graph traversal techniques. **10** (1:4: 1.7.1)

b. Define graph. Give the adjacency matrix for the graph given in Q. 8(b). **04** (2:4: 1.7.1)



Q. 8(b)

c. Write in-order, pre-order, post-order traversal sequence for the binary tree shown in Q. 8(c). **06** (3:4: 1.7.1)



Q. 8(c)

MODULE – 5

9. **a.** List and explain important problem types in the analysis of an algorithm. **05** (2:5: 2.8.1)

b. Define algorithm. List and explain different characteristics of an algorithm. **05** (2:5: 2.8.1)

c. List and explain different asymptotic notations with suitable diagrams in the analysis of an algorithm. **10** (2:5: 1.7.1)

(OR)

10. **a.** Explain analysis framework in detail. **10** (2:5: 2.8.1)

b. Write a C program to find shortest possible routes between the given set of cities using Brute force technique. **10** (2:5: 2.8.1)

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