

Basavarajeswari Group of Institutions
BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT
 (Autonomous Institute under Visvesvaraya Technological University, Belagavi)

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Course Code	22CS/AI/CA/CD/34
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Third Semester B.E. Degree Examinations, March/April 2024

DATA STRUCTURES AND APPLICATIONS

(Common to CSE, AIML, CSE- AI, CSE- DS)

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>
Module-1			
1.	a. What are structures? How structures are different from arrays? Explain self-referential structure with an example.	06	(2:1:1.4.1)
	b. Define Data Structures and give the classification. List the basic operations performed on data structures.	08	(2:1:1.4.1)
	c. Write a program to swap the values of two variables using call by reference mechanism.	06	(3:1:1.7.1)
(OR)			
2.	a. What is dynamic memory allocation? Illustrate the C library functions used for dynamic memory allocation.	08	(2:1:1.4.1)
	b. Write C structure to represent a polynomial of N terms using array of structures and also write C function to add two polynomials.	07	(3:1:1.7.1)
	c. Write the triplet format for the following sparse matrix and also find its transpose.	05	(3:1:1.7.1)
$\begin{bmatrix} 15 & 0 & 0 & 22 & 0 & -15 \\ 0 & 11 & 3 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -6 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 91 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 28 & 0 & 0 & 0 \end{bmatrix}$			
Module-2			
3.	a. Define Stack. Write the algorithms to perform push, pop and display operations.	08	(2:2:1.4.1)
	b. Apply the algorithm and show the contents of stack to convert the following parenthesized Infix expression to postfix. $(A + B^D) / (E - F) + G$	06	(3:2:2.5.2)
	c. Write the algorithm to evaluate postfix expression.	06	(2:2:2.5.2)
(OR)			
4.	a. Define Recursion. Write recursive functions to (i) generate Fibonacci series (ii) solve Tower of Hanoi problem	06	(3:2:1.7.1)
	b. Write a C program to implement linear queue using arrays	08	(3:2:1.7.1)
	c. Write a short note on different types of queues.	06	(2:2:1.4.1)

Module-3

5. a. Compare and contrast arrays and linked lists. **04** (3:3:1.4.1)
- b. Write the algorithms to perform following operations on singly linked list **08** (2:3:1.4.1)
 (i) Insert a node at end of linked list (ii) Delete from beginning of linked list (iii) Display the nodes of linked list (iv) Count the number of nodes in linked list
- c. Write a C program to implement stack using linked list **08** (3:3:1.7.1)

(OR)

6. a. Write the C structure to represent a doubly linked list (DLL) node and write procedures perform following operations **10** (3:3:1.7.1)
 (i) Create a node in DLL (ii) Insert at the beginning of DLL (iii) Delete node from beginning of DLL.
- b. Write the procedure to (i) Search an element in a Circular linked list **06** (3:3:1.7.1)
 (ii) Concatenate two Circular lists
- c. Write a diagrammatic linked representation of the given sparse matrix. **04** (3:3:1.7.1)

$$\begin{bmatrix} 7 & 0 & 0 \\ 0 & 6 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 4 \end{bmatrix}$$

Module-4

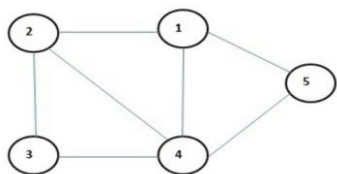
7. a. Explain array and linked representation of binary trees with suitable example. **06** (2:4:1.4.1)
- b. Prove that $N_0 = N_2 + 1$ in a Binary Tree. **05** (2:4:1.4.1)
- c. Write C Recursive Routines to perform In-order traversal, Pre-order traversal, and post-order traversal in a Binary Tree. **09** (3:4:1.4.1)

(OR)

8. a. What are the rules to construct threaded binary tree? Explain with example. **06** (2:4:1.4.1)
- b. Construct BST for the following sequence of nodes and perform inorder, preorder and post order traversals 12,28,15,6,3,9,34,52,10,6,15,4. **08** (3:4:1.7.1)
- c. Explain the recursive searching procedure to search a key element in binary search tree (BST) with an example. **06** (3:4:1.7.1)

Module-5

9. a. Define the following terms and give examples **08** (2:5:1.4.1)
 (i) Graph (ii) Sub graph (iii) Simple Path (iv) Cycle
- b. Explain the adjacency matrix and adjacency list representation of graphs. **06** (3:5:1.4.1)
 Write the adjacency matrix and adjacency list for the graph given below.



- c. Write the algorithm to perform breadth first search traversal in a graph and explain with an example. **06** (3:5:2.5.2)
- (OR)
- 10 a. Write a program to implement Depth First Search (DFS) traversal technique. **06** (3:5:1.4.1)
- b. Explain different hashing functions with examples. **08** (2:5:1.4.1)
- c. What do you mean by collision? Explain how do you resolve collision using linear probing technique? **06** (2:5:1.4.1)

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