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## First Semester MCA Degree Examination, June/July 2023 Data Structures with Algorithms

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1					
Q.1	a.	What are data structures? Explain the classification of data structures.	M 6	L L2	C CO1
	b.	Explain polish and reverse polish expression.	4	L2	CO1
	c.	Define STACK. Write C program to implement stack operation using arrays (by passing parameters).	10	L3	CO2
OR					
Q.2	a.	Write a C program to convert infix to postfix expression.	10	L3	CO2
	b.	Show the detailed contents of stack for an expression : 623 + - 382 / + * 2 - 3 + and evaluate the expression.	10	L3	CO2
Module – 2					
Q.3	a.	Write a recursive function fact(n) to find the factorial of an integer. Diagrammatically explain how the stacking and unstacking takes place during execution for fact(u).	10	L3	CO2
	b.	What is Queue? Write a function to demonstrate insert and delete operation in a linear queue.	10	L3	CO2
OR					
Q.4	a.	What is recursion? Write a program to implement towers of Hanoi problem using recursion and trace the output for 3 disks.	10	L3	CO2
	b.	Define circular queue. Explain its advantages over ordinary queue and C program to implement circular queue.	10	L3	CO2
Module – 3					
Q.5	a.	Discuss about different types of memory management functions.	10	L2	CO3
	b.	Write a function for each of the following operations on linked list: i) Insert a node at the beginning ii) Delete a node at the front end.	10	L3	CO3
OR					
Q.6	a.	Write a note on getnode( ) and freenode( ).	6	L2	CO3
	b.	Discuss the limitations of array implementations.	4	L2	CO3
	c.	Explain linked implementation of stacks with push and pop operation using singly linked list.	10	L2	CO3

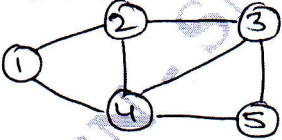
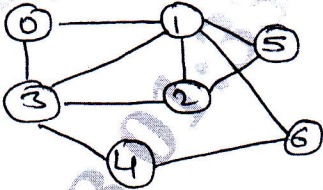
## Module – 4

Q.7	a.	Define a Tree. With suitable example explain: i) Binary Tree ii) Complete binary tree iii) Strictly binary tree iv) Skewed binary tree	10	L2	CO3
	b.	Write the routines to traverse the given tree using i) Pre-order traversal    ii) Post-order traversal    iii) In-order traversal.	10	L2	CO3

## OR

Q.8	a.	Construct a binary search tree for the given set of values 14, 15, 4, 9, 7, 18, 3, 5, 16, 20. Also perform inorder, preorder, and postorder traversal of the obtained tree.	10	L3	CO3
	b.	Explain threaded binary tree and their representation with a neat diagram.	10	L2	CO3

## Module – 5

Q.9	a.	Define Graphs. Give the adjacency matrix and adjacency list representation for the following graph in Fig.Q.9(a).  Fig.Q.9(a)	10	L3	CO3
	b.	Briefly explain Breadth-First Search (BFS) and Depth-First Search (DFS) traversal of a graph. Also, show the BFS and DFS traversals for the following graph in Fig.Q.9(b).  Fig.Q.9(b)	10	L3	CO3

## OR

Q.10	a.	Write an algorithm for insertion sort suppose an array contains 8 elements as follows: 77, 33, 44, 11, 88, 22, 66, 55. Sort the array using insertion sort algorithm.	10	L3	CO4
	b.	What is hashing? Explain the following hash functions with proper examples: i) Division    ii) Midsquare    iii) Folding.	10	L3	CO4

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