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**22MCA13**

## First Semester MCA Degree Examination, Jan./Feb. 2023 Data Structures

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			M	L	C
Q.1	a.	Define data structures. Explain classification of data structures with example.	10	L2	CO1
	b.	Explain the two types of representation of a stack with neat diagram.	4	L2	CO1
	c.	Write an algorithm to convert a valid infix expression into postfix expression.	6	L3	CO2
OR					
Q.2	a.	What is stack? Explain the stack operations push and POP with C functions.	8	L3	CO1
	b.	Convert the following expression from infix to postfix: i) $(A + B) * C - D \wedge E$ ii) $A + B / (D + E) * F \wedge G$	4	L3	CO2
	c.	Write an algorithm to evaluate post fix expression using stack.	8	L3	CO2
Module – 2					
Q.3	a.	What is recursion? Write C program to find GCD of 3 Nos using recursion.	8	L3	CO2
	b.	What is Queue? Write C program to implement queue operations Enqueue, Dequeue and display using array as datastructure.	12	L3	CO3
OR					
Q.4	a.	Explain queue variants with neat diagram.	4	L2	CO3
	b.	Implement circular queue operations Insert, Remove and Display using C program.	10	L3	CO3
	c.	Write a C program to find factorial of a number using recursion.	6	L3	CO3
Module – 3					
Q.5	a.	What is DMA? Discuss different types of memory management functions in C.	10	L2	CO2
	b.	Write functions in C to demonstrate the following operations on singly linked list: i) Insert at front ii) Remove node from front iii) Insert node at end.	10	L3	CO3

OR					
Q.6	a.	Explain getNode() and freeNode() operation with C code snippet.	6	L2	CO3
	b.	Write a note on header nodes in linked list with neat diagram.	4	L2	CO3
	c.	Write C code snippet to demonstrate application of linked list as stack for implementing push and POP operations.	10	L3	CO3
Module – 4					
Q.7	a.	What is binary tree? Write note on threaded binary tree with neat diagram.	10	L2	CO3
	b.	Construct the binary search tree for the data 27, 5, 36, 47, 19, 250, 21, 44, 6. Perform preorder, Inorder and Postorder traversal for the constructed BST.	10	L3	CO4
OR					
Q.8	a.	Write a note on Array and linked representation of binary tree.	8	L3	CO3
	b.	Write recursive function for the following operations on binary search tree: i) Insert key in BST    ii) Search key in BST.	12	L3	CO3
Module – 5					
Q.9	a.	Define DFS and BFS. Obtain the difference between both. Traverse the following graph using DFS and BFS. Assume the source node is B.	10	L3	CO4
<pre> graph TD     A((A)) --- B((B))     B --- C((C))     C --- E((E))     E --- D((D))     D --- A   </pre>			Fig.Q.9(a)		
	b.	What is radix sort? Sort the following numbers using radix sort and show the table of various passes of radix sort. List : 326, 453, 608, 835, 751, 435, 704, 690.	10	L3	CO4
OR					
Q.10	a.	What is a graph? Explain array representation of graph with neat diagram.	4	L2	CO4
	b.	What is hash collision? Explain various methods for resolving hash collisions.	6	L2	CO4
	c.	Implement the hash function $h(k) = k \% 10$ on the numbers: 10, 34, 23, 56, 14, 89, 65, 94, 53, 21, 63, 33. Show the hash table. Resolve hash clashes using separate chaining method.	10	L3	CO4

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