USN | | | | | | | | | | |

22MCA13

First Semester MCA Degree Examination, June/July 2024
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.	What are Data Structures? How would you classify them?	6	L2	CO1
	b.	Explain the basic operations on stack data structure.	6	L2	CO1
	c.	Convert the following infix expression to postfix form using a stack: $p + q * r \wedge s - (t * u - v) - w.$	8	L3	CO1
		OR			
Q.2	a.	What are the operations that can be performed on data structures in general? Explain each of them.	6	L1	CO1
	b.	Write a program to convert an Infix expression to postfix form using stack.	8	L3	CO1
	c.	Evaluate the following post fix expression using stack: $5\ 3\ 4 * 5\ 6\ 2 / - * +$	6	L3	CO1
		Module – 2			
Q.3	a.	What is Recursion? What are its merits and demerits?	5	L1	CO2
	b.	What is a queue? Write C functions to implement add Q and delete Q operations.	10	L3	CO1
	c.	What is a circular queue? What are its advantages over an ordinary queue?	5	L2	CO2
		OR			
Q.4	a.	Write a recursive function in C to calculate the factorial of a given number. Trace your function to calculate the factorial of 4.	6	L3	CO1
	b.	What are priority queues? What are its uses?	5	L1	CO2
	c.	Give a recursive definition of tower of Hanoi problem. Using your definition give the steps to move 3 disks.	9	L3	CO2
		Module – 3			
Q.5	a.	What is Linked list? What are its advantages and disadvantages?	6	L2	CO3
	b.	Explain different types of Linked lists.	9	L2	CO3
	c.	Explain the getnode( ) and freenode( ) operations.	5	L2	CO3
		OR			
Q.6	a.	Write C functions to delete a node from i) beginning ii) end and iii) a given node of a singly linked list and explain the steps.	10	L3	CO3

	b.	What do you mean by static and dynamic memory allocation? Explain some commonly used dynamic memory management functions.	10	L2	CO4
Module – 4					
Q.7	a.	Define: Binary Tree. Explain important properties of binary trees.	10	L2	CO3
	b.	Compare the preorder, inorder and postorder traversal algorithms of binary trees. Give the three traversals of the following tree: Fig.Q.7(b)	10	L4	CO3
OR					
Q.8	a.	What is a binary search tree? What are its applications? Give an algorithm to search for an element in a binary search tree.	8	L3	CO3
	b.	Along with examples, explain the steps to delete an element from a binary search tree for each of the following cases: i) The element is a leaf node ii) It has one child node iii) It has two child nodes.	7	L3	CO3
	c.	With an example, explain how a binary tree can be represented using an array.	5	L2	CO3
Module – 5					
Q.9	a.	Define Graph. Explain how graphs can be represented using adjacency matrix and adjacency lists.	8	L2	CO3
	b.	Explain BFS graph traversal algorithm.	4	L2	CO3
	c.	What is Hashing? Write a short note on hash table organization.	8	L1	CO4
OR					
Q.10	a.	For the given undirected graph: i) Give the adjacency matrix representation. ii) Give the adjacency list representation. iii) List the degree of each vertex. iv) Do a depth first search starting from vertex 2. Fig.Q.10(a)	10	L3	CO3
	b.	What is Radix sort? Explain how the algorithm works by sorting the following elements using radix sort: 632, 198, 058, 005, 279, 323, 762, 096, 901, 123.	10	L3	CO4

* * * * *

2 of 2