

Second Semester MCA Degree Examination, June/July 2025

Data Structure & 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			M	L	C
Q.1	a.	Explain data structures and its classification with a neat diagram.	6	L2	CO1
	b.	Write functions in C to demonstrate the following operations on a singly linked list: 1. Insert an element from front 2. Insert a node at end 3. Display all the elements	8	L4	CO2
	c.	Show that : If $t1(n) \in O(g1(n))$ and $t2(n) \in O(g2(n))$ then $t1(n)+t2(n) \in O(\max(g1(n), g2(n)))$	6	L4	CO2
OR					
Q.2	a.	Explain Asymptotic notations with examples.	6	L2	CO1
	b.	Write C functions to insert and delete an element in an array.	8	L4	CO2
	c.	Explain abstract data types with examples.	6	L2	CO1
Module - 2					
Q.3	a.	What is a Stack? Write functions in C to implement push and pop operations in a Stack.	6	L4	CO2
	b.	Write a program to implement tower of Hanoi using recursion and trace the output for 3 disks.	8	L4	CO2
	c.	What is a Queue? Write a C program to implement queue of integers using arrays.	6	L4	CO2
OR					
Q.4	a.	What is a Circular Queue? Write functions in C to implement Insert and delete operations in a Circular Queue.	6	L4	CO2
	b.	Evaluate the following postfix expression: $6\ 8\ 3\ * + 5\ 4\ 2\ / + *$ by showing the contents of stack.	8	L4	CO2
	c.	Write the General Plan for Analyzing the Time Efficiency of Recursive Algorithms.	6	L4	CO2
Module - 3					
Q.5	a.	What is a binary Tree? Write a note on array and linked list representation of a binary tree.	6	L4	CO2

	b. Construct a Binary Search Tree for the following numbers and traverse in Preorder, Inorder and Post order. 14, 15, 4, 9, 7, 18, 3, 5, 16, 20, 17.	8	L4	CO2
	c. What is a graph? Give the adjacency list and adjacency matrix representation of the graph in Fig Q5c.	6	L4	CO2

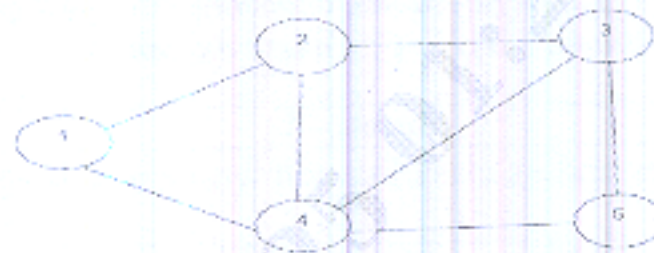


Fig Q5c

OR

Q.6	a. What is an AVL tree? Explain the different rotations of an AVL tree with an example.	6	L4	CO2
	b. Apply dijkstras algorithm to find single source shortest path assuming 1 as the source vertex.	8	L4	CO2

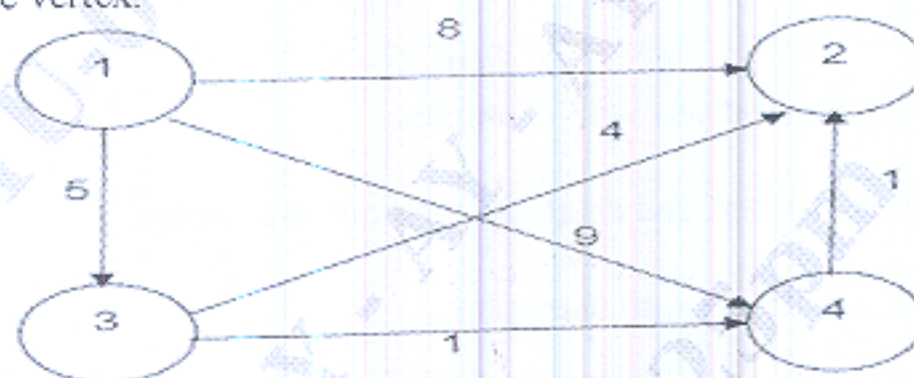


Fig Q6b

Module – 4				
Q.7	a. Write a C program to implement bubble sort. Obtain its time complexity.	6	L2	CO4
	b. Implement the hash function $h(k) = k \% 11$ on the numbers 25, 46, 10, 36, 18, 29 and 43. Show the hash table. Resolve the clashes using linear probing.	8	L2	CO3
	c. Write an algorithm for insertion sort. Sort the following numbers using insertion sort. 35, 10, 15, 45, 25, 20 and 40. Obtain its time complexity.	6	L2	CO4

OR

Q.8	a. Sort the following numbers using radix sort and show the table of various passes of radix sort. 338, 249, 112, 589, 699, 478, 728, 246, 532.	6	L2	CO3
	b. Write a C program to implement linear search. Obtain Best case, Worst case and Average case efficiency.	8	L2	CO3
	c. What is hash Collision? Explain linear probing and separate chaining methods.	6	L2	CO3

Module – 5					
Q. 9	a.	Write Short notes on i) Greedy Technique ii) Divide and Conquer	10	L4	CO5
	b.	What is a heap? Explain the construction of max heap by taking the following numbers : 13, 86, 43, 38, 54, 23, 8, 63 using bottom-up approach.	10	L4	CO5
OR					
Q.10	a.	Write Short notes on: i) Dynamic Programming ii) Trie	10	L4	CO5
	b.	Explain Segment and Fenwick tree with an example.	10	L4	CO5
