CBCS SCHEME

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

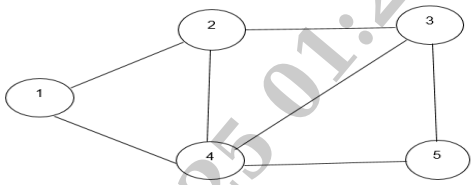
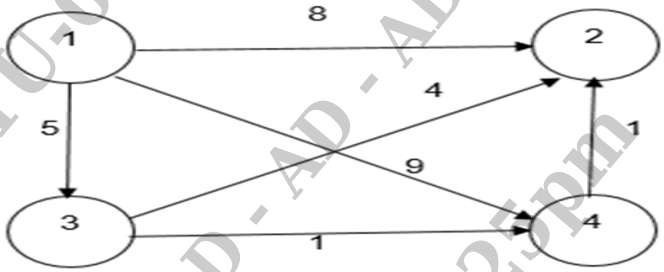
MMC203

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.  Fig Q5c	**6**	**L4**	**CO2**
		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 dijkastras algorithm to find single source shortest path assuming 1 as the source vertex.  Fig Q6b	**8**	**L4**	**CO2**
	c.	Explain BFS and DFS traversal of a graph. List the differences between them.	**6**	**L4**	**CO2**
		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**

*****