K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:I
Class:PG-I	Program:MCA
Branch Code:M.C.A.	Pattern:2024
Name of Course:Data Structures and Algorithms	Course Code:2409502
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains _2_page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

		Marks	CO
Question No. 1			
1a)	Analyze why sparse matrix representation saves memory compared to normal 2D array representation. Use a simple 6×6 matrix example.	(6)	CO5
Question No. 2			
2a)	Apply the concept of linked organization to create a singly linked list that stores 5 student roll numbers. Show the insertion steps.	(6)	CO1
Question No. 3			
3a)	Apply the push, pop, and peek operations on a stack implemented using linked nodes. Show pointer movement.	(8)	CO2
	OR		
3b)	Apply infix-to-postfix conversion on the expression A + (B * C – D) / (E + F * G). Show steps using stack.	(8)	CO2
3c)	Apply queue operations to simulate ticket booking for 5 customers. Show front and rear changes.	(8)	CO2
	OR		
3d)	Apply the logic of circular queue operations to show how the rear pointer wraps around after several insertions.	(8)	CO2
Question No. 4			
4a)	Apply the linked representation of a binary tree to construct a tree by inserting the nodes 45, 20, 60, 10, 30, 50, 70 Perform inorder, preorder, and postorder traversals and write the results.	(8)	CO3
	OR		
4b)	Construct a Binary Search Tree (BST) by inserting the following elements in the given order:	(8)	CO3

55, 25, 75, 10, 30, 65, 85

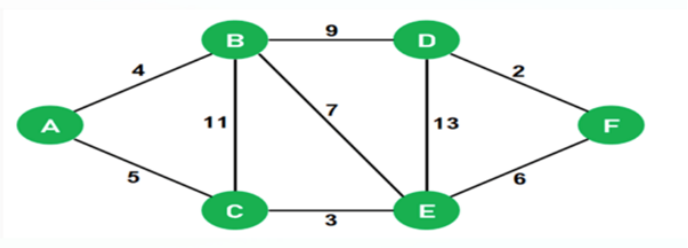
Draw the final BST using linked representation.

Delete the node having two children (node 55) using inorder successor method.

Search the node with key value 65.

4c) A graph is represented using an adjacency list. (8) CO3

Apply DFS traversal starting from vertex A on the following graph:



OR

4d) Given the graph in adjacency matrix form below: (8) CO3

	A	B	C	D
A	0	1	1	0
B	0	0	1	0
C	0	0	0	1
D	0	0	0	0

Apply BFS traversal starting from A and show the queue contents after each step.

Question No. 5

5a) Apply sequential search to find the element 35 in the list: 12, 18, 35, 42, 50. Show each comparison. (8) CO4

OR

5b) Apply binary search on the sorted list: 5, 10, 15, 20, 25, 30 to search for 20. Show mid-point steps. (8) CO4

5c) Apply bubble sort to arrange: 7, 3, 5, 2. Show each pass. What is the time complexity of bubble sort. (8) CO4

OR

5d) Analyze the working of the Heap Sort algorithm on the following dataset: (8) CO4

25, 10, 30, 5, 20, 35, 15

Construct the initial max-heap from the given array and explain each step of the heap-building process, including all required heapify operations

····· End of question paper·····