K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

WINTER-2024	
Exam Seat No.:	
Academic Year:2024-2025	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)	Classify linear data structures and non-linear data structures with examples.	(6)	CO5

Question No. 2

2a)	Write a program to implement a singly linked list that performs insertion of nodes at the beginning, end, and a specific position.	(6)	CO1

Question No. 3

3a)	Enlist the applications of Stack. Solve the following Infix expression to convert into postfix using Stack data structure. $(A + B) \times C - (D - E) \wedge F$ [Infix to postfix]	(8)	CO2

OR

3b)	Use a stack data structure to reverse a string and explain the steps involved.	(8)	CO2
3c)	Experiment with implementing a stack using both an array and a linked list.	(8)	CO2

OR

3d)	Show how a queue can be implemented using a linked list and demonstrate the enqueue and dequeue operations.	(8)	CO2

Question No. 4

4a)	Define binary search tree. Construct binary search tree(BST) for following elements: 100,85,45,55,120,20,70,90,115,65,130. Traverse the tree using inorder, preorder and post order traversing technique.	(8)	CO3

OR

4b) Traverse the given tree using Inorder, Preorder, and Postorder traversals.   (8)   CO3

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        P
       / \
      Q   R
     / \   \
    S   T   U
   / \
  V   W
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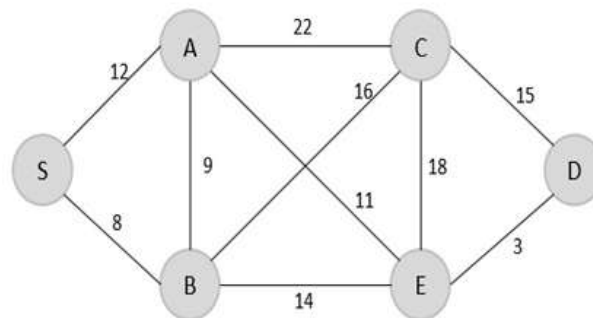Identify the depth and height of the tree and explain their significance.

4c) Illustrate the Kruskal's algorithm with example.   (8)   CO3

OR

4d) Write Prim's algorithm. Apply this algorithm to the following graph to construct the minimum spanning tree.   (8)   CO3

Question No. 5

5a) Write an algorithm to implement Bubble sort. Explain with suitable example.   (8)   CO4

OR

5b) What is a Heap? Sort the following list of elements in ascending order using heap sort: (8)   CO4

11, 3, 14, 1, 17, 61, 51, 18, 91, 1, 19, 10.

5c) How binary search is different from linear search? Apply binary search to find item 40 in the sorted array: 11   22   25   27   30   33   37   40   44   48 50   55.   (8)   CO4

Also discuss the time complexity of binary search.

OR

5d) You are given an unsorted array [15, 10, 35, 40, 25, 5, 20] and asked to find the number 35 using Fibonacci Search. Explain whether Fibonacci Search can be applied to this array and why or why not.   (8)   CO4

····· **End of question paper**·····