A–1295

Total Pages : 4 **Roll No. .....**

MCS-405/DCA-105/MIT(CS)-401

(MSCIT/DCA/MSCCS)

Data Structure & Program Methodology/ Data Structure

Examination February, 2026

Time : 2:00 Hrs. Max. Marks : 70

Note* :–** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these Sections according to the detailed instructions given therein. ***Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

Section–A

(Long Answer Type Questions) (2×19=38)

***Note* :–** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *two* (02) questions only.

1. Define Data Structure. Discuss the different types of data structures, giving suitable examples and their real-life applications.

2. What is an Algorithm ? Explain the characteristics and properties of a good algorithm. Define Time Complexity. Derive the time complexity for Linear Search and Binary Search.

3. What is a Linked List ? Explain node structure and insertion/removal operations at s beginning, middle, and end. Also explain linked list implementation of Stack and Queue.

4. Define B-Tree and explain its properties. Compare B-Tree and AVL Tree in terms of height and performance. Also explain insertion operation in a B-Tree with step-by-step example.

5. Define Program Testing and its importance. Explain how effective testing improves software reliability and user confidence.

Section–B

(Short Answer Type Questions) (4×8=32)

***Note* :–** Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. Define Big(0), Bit Theta (θ) and Big Omega (Ω) rotation.

2. Define Stack. Explain Overflow and Underflow conditions in Stack.

3. What is Merge Sort ? Explain the Divide and Conquer approach used in it.

4. What is an AVL Tree ? Why balancing is required in an AVL tree ?

5. Define a Set. Explain Union and Intersection operations on sets with examples.

6. Explain in the Program Development Life-Cycle (PDLC). Explain its phases.

7. Sort the following array with Merge Sort and count the total number of comparisons performed :

$$A = [9, 3, 7, 5, 6, 4, 8, 2]$$

8. Insert the following keys into an AVL Tree and show tree after each insertion :

50, 20, 60, 10, 25, 70, 5, 15

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