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

DATA STRUCTURES & PROGRAM METHODOLOGY/DATA STRUCTURE

(MSCIT/DCA/MSCCS)

Examination, June 2025

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 a data structure with an example. Explain the different types of data structures with examples

2. What is a doubly linked list ? How is it different from a singly linked list ? Also discuss the significance of header nodes in linked lists with suitable example.

3. What is a B-tree ? How is it different from a binary tree ? Represent the following binary tree using an array. Show the array indices and values in the tree.
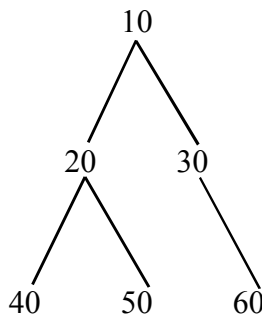
4. Sort the following array using Quick Sort. Show the steps of partitioning at each stage :

   Array : 10; 80, 30, 90, 40, 50, 70, 60

5. Discuss the advantages and disadvantages of binary search over linear search Perform Binary Search to find the element 22 in the sorted array [3, 6, 9, 12, 15, 18, 21, 24, 27, 30]. Show all intermediate steps.

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 an algorithm. What is time complexity of an algorithm ? Explain with an example.

2. Discuss the representation and traversal methods (preorder, inorder, and postorder) in a binary tree.

3. Implement a stack using an array. Write functions for push, pop, and display operations.

4. Explain the steps involved in heap sort. Construct a max heap from the following numbers : 3, 1, 6, 5, 2,

5. Explain how an AVL tree maintains balance after insertion. Give an example.

6. Explain Heap Sort and provide an implementation in C. Analyze its time complexity for best, average, and worst cases.

7. Construct a B-tree of order 3 (maximum 2 keys per node) by inserting the following keys :

10, 20, 5, 6, 12, 30, 7, 17.

8. Explain the concept of program development life cycle. What are the different phases PDLC follows ?

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