Exam.Code:1006
Sub. Code: 35087

2055

M.E. (Information Technology)

Second Semester

MEIT-2205: Advanced Algorithm Analysis & Data Structures

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt five questions in all, including Question No. 1 (Section-A) which is compulsory and selecting two questions each from Section B-C.

x-x-x

Section-A

Q1. a) Differentiate between iterative and recursive algorithms in terms of complexity. 10

b) Why is Quick Sort considered efficient in practice, despite its worst-case time complexity being $O(n^2)$?

c) What is the worst-case time complexity of the Sum of Subsets problem using backtracking?

d) What is the role of bounding functions in the Branch and Bound method?

e) What is hashing, and why is it used as a search structure?

Section-B

Q2. a) Consider an algorithm with the following execution times for different input sizes: 6

Input size(n)	Execution time (ms)
1000	0.5
2000	1.2
4000	3.6
8000	14.4

Identify the complexity of the algorithm and justify your answer.

b) Explain the significance of space complexity in algorithm design. 2

c)Why is constant time complexity (O(1)) considered the best-case scenario? 2

Q3. a)Given an array of 10,000 elements, estimate the expected number of comparisons in Quick Sort assuming a random pivot selection. 4

b) Given the sequence of numbers: 50,30,70,20,40,60,80

- Construct the Binary Search Tree (BST).
- Perform in-order, preorder, and postorder traversals. 6

Q4. a) Describe the Sum of Subsets problem and use Backtracking to find subsets that sum to 10 for the set {2, 3, 5, 7, 10}. 5

b) Compare dynamic programming and Backtracking in terms of time complexity and suitability for different problems. 5

P.T.O.

Section-C

Q5. a) Explain how Branch and Bound is applied to Travelling Salesman Problem with an example. 5

b) Explain the role of heuristic functions in improving the performance of Branch and Bound algorithms. 5

Q6. a) Explain how a Fibonacci Heap maintains its structure after a decrease-key operation. 4

b) Construct a B-Tree of order 3 for the sequence: 10, 20, 30, 40, 50, 60, 70, 80, 90. 6
Show the tree after each insertion.

Q7. Write a short note on following:

i) Randomized Algorithm 5

ii) Parallel Algorithm 5