Design and Analysis of Algorithms

Unit-I

1. (a) Describe an algorithm for each of PUSH, POP, AddQ, and DeleteQ.
   (b) What are Hash Tables? Explain their applications with examples.

2. (a) What do you mean by a Binary Search Tree? Write and explain algorithm for Deletion from a Binary Search Tree.
   (b) What are recurrences? Explain any two methods to solve recurrences.

Unit-II

3. (a) Explain following with example:
   (i) Dynamic Programming
   (ii) Divide and Conquer

(b) Describe Task Scheduling Problem in brief.
4. Describe an algorithm for Longest Common Subsequence (LCS) problem and determine an LCS between following two given sequences X and Y.
   \[ X = \{ A, B, D, E, B, A, C \} \]
   \[ Y = \{ B, A, B, E, D, B, C \} \]

Unit-III

5. Describe the system of Difference Constraints. Describe various steps involved in solving the Difference Constraints.

6. Discuss Bellman-Ford’s Algorithm to solve Single-Pair Shortest Path Problem. Also find the shortest path in the given graph.

Unit-IV

7. (a) If a Comparison Network with \( n \) inputs sorts all \( 2^n \) possible sequences from the set \( \{0,1\} \) correctly, then prove that it sorts all sequences of arbitrary numbers correctly.

8. (a) Discuss the properties of Flow Networks with suitable examples.

(b) State and prove Maximum Flow-Minimum Cut Theorem.