**2CS503 Design and Analysis of Algorithms**

**Tutorial 6: Dynamic Programming**

1. What are the similarities and differences between “Divide-and-Conquer” approach and “Dynamic Programming” approach?
2. Explain the following terms:
3. Optimization problems
4. Overlapping sub problems
5. Optimal substructure property
6. List out the sequence of steps to be followed while developing a dynamic programming algorithm.
7. Differentiate between: Tabulation and Memoization.
8. Find out the minimum number of scalar multiplications required to perform the chained matrix multiplications for the following matrices. Also obtain the optimal parenthesization of the matrices.

Matrix Dimensions

A1 30 X 35

A2 35 X 15

A3 15 X 5

A4 5 X 10

A5 10 X 20

A6 20 X 25

1. Given a sequence of dimensions of n matrices, design an optimal algorithm that computes minimum number of scalar multiplications required to perform chained matrix multiplication.
2. Let A1, A2, A3, and A4 be four matrices of dimensions 10 x 5, 5 x 20, 20 x 10, and 10 x 5, respectively. The minimum number of scalar multiplications required to find the product A1A2A3A4 using the basic matrix multiplication method is \_\_\_\_\_\_\_
3. Consider two input sequences: “ABCDGH” and “AEDFHR”. Find the Longest Common Subsequence (LCS) of these two sequences.
4. Consider two input sequences: “AGGTAB” and “GXTXAYB”. Find the Longest Common Subsequence (LCS) of these two sequences.
5. Given two input strings: X = <x1, x2, …, xm> and Y = <y1, y2, …, yn>. Design an optimal algorithm that computes Longest Common Sequence (LCS) of these two sequences.