NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CSPC42- Design and Analysis of Algorithms

Programme: B.TECH **Session: JAN/2024**

Date: 02.04.2024 **Cycle Test-2** **Duration: 1 Hour** **Total Marks: 20**

Answer all the questions

1. Prove that Matrix chain multiplication problem can be solved with dynamic programming approach. Write DP bottom-up approach program. Find the total number of recursive calls, unique number of recursive calls and derive the time and space complexity. Explain this with a suitable example. ((CO1, CO4), 4 M)

2. Find a contiguous subsequence, A[i] to A[j], within an array of n numbers, where the sum of elements within the subsequence is maximized. Can we apply DP to solve this problem. If so, write recurrence relation, bottom-up approach program and analyze its time and space complexity. **Ex1:** {1, -3, 4, -2, -1, 6}, then contiguous subsequence is {4, -2, -1, 6}, max Sum: 4 + (-2) + (-1) + 6 = 7, **Ex2:** {-2, 1, -3, 4, -1, 2, 1, -5, 4}, }, then contiguous subsequence is {4, -1, 2, 1}, Max sum: 4 + (-1) + 2 + 1 = 6 ((CO1, CO4), 4 M)

3. Given a collection of non-negative integers and a target sum, the objective is to determine whether there exists a subset within the collection whose elements sum up to the specified target. Can we apply DP to solve this problem. If so, write recurrence relation, bottom-up approach program and analyze its time and space complexity.
Ex: Set of non-negative integers: {1, 2, 4, 6}, Target sum: 8, There exists a subset {2, 6} whose sum equals the target sum 8. ((CO1, CO4), 4 M)

4. Two strings, S1 and S2 are given, find the longest common subsequence of given strings using DP by constructing a table. Write a recurrence relation for the solution and discuss time and space complexity. S1= {A, B, C, B, D, A, B}, S2= {B, D, C, A, B, A} ((CO1, CO4), 4 M)

5. What is Amortized analysis? How is it different from Asymptotic analysis? Explain with a dynamic array. ((CO1, CO3), 4 M)

*** Best Wishes***