Q1. LCS

Consider two strings A = “qpqrr” and B = “pqprqrp”. Let x be the length of the longest common subsequence (not necessarily contiguous) between A and B and let y be the number of such longest common subsequences between A and B. Then x + 10y = _.

33

23

44

34

Q2. Knapsack Problem

You are given a knapsack that can carry a maximum weight of 60. There are 4 items with weights {20, 30, 40, 70} and values {70, 80, 90, 200}. What is the maximum value of the items you can carry using the knapsack?

160

200

170

90

Q3. Rod Cutting Problem

What is the time complexity of the dynamic programming implementation of the rod cutting problem?

$O(2^n)$

$O(n^2)$

O(1)

O(n)

Q4. Properties of Dynamic Programming

If an optimal solution can be created for a problem by constructing optimal solutions for its subproblems, the problem possesses ___ property.

Overlapping subproblems

Optimal substructure

Memoization

Greedy

Q5. Greedy with Dp

A greedy algorithm can be used to solve all the dynamic programming problems.

True

False

Q6. Travelling Salesman

What is the time complexity of travelling salesman problem with n vertices using dynamic programming?

Linear time

Logarithmic time

Exponential time

Q7. Top Down DP

When a top-down approach of dynamic programming is applied to a problem, it usually _

Decreases both, the time complexity and the space complexity

Decreases the time complexity and increases the space complexity

Increases the time complexity and decreases the space complexity

Increases both, the time complexity and the space complexity

Q8. Working of an algo

An algorithm to find the length of the longest monotonically increasing sequence of numbers in an array A[0 :n-1] is given below. Let Li denote the length of the longest monotonically increasing sequence starting at index i in the
array.

Initialize $L_{n-1} = 1$

For all i such that $0 \le i \le n-2$

$$L_i = \begin{cases} 1 + L_{i+1} & \text{if } A[i] < A[i+1] \\ 1 & \text{Otherwise} \end{cases}$$

Finally the length of the longest monotonically increasing sequence is $\text{Max}(L_0, L_1, \ldots, L_{n-1})$.

Which of the following statements is TRUE?

The algorithm uses dynamic programming paradigm

The algorithm has a linear complexity and uses branch and bound paradigm

The algorithm has a non-linear polynomial complexity and uses branch and bound paradigm

The algorithm uses divide and conquer paradigm

Q9. Matrix Chain Multiplication

Four matrices M1, M2, M3 and M4 of dimensions pxq, qxr, rxs and sxt respectively can be multiplied is several ways with different number of total scalar multiplications. For example, when multiplied as ((M1 X M2) X (M3 X M4)), the total number of multiplications is pqr + rst + prt. When multiplied as (((M1 X M2) X M3) X M4), the total number of scalar multiplications is pqr + prs + pst.

If p = 10, q = 100, r = 20, s = 5 and t = 80, then the number of scalar multiplications needed is

25000

248000

44000

19000

Q10. Matrix Chain Multiplication 1

Consider the matrices P, Q, R and S which are 20 x 15, 15 x 30, 30 x 5 and 5 x 40 matrices respectively. What is the minimum number of multiplications required to multiply the four matrices?

6050

7500

7750

12000