

COSC 3304 – Algorithms Design and Analysis

Assignment 9

Due: 23:59:00pm, 04/04/2024

1. The longest nondecreasing subsequence of a sequence is the longest subsequence in which all the elements are nondecreasing. This subsequence is not necessarily contiguous, or unique.

For example: 'lamar' has 3 longest nondecreasing subsequences, 'lmr', 'amr', and 'aar'.

The longest common subsequence can be used to find the longest nondecreasing subsequence of a sequence.

- (1) The first sequence is the given original sequence,
- (2) The second sequence is a sorted sequence by ordering all elements in the first sequence in nondecreasing/alphabetical order.
- (3) Apply LCS to the first and second sequences to find the longest nondecreasing subsequence of the given original sequence (i.e., the first sequence).

Please find the longest nondecreasing subsequence of 'algorithm' using the steps above. (50 points)

2. The change problem: The total amount is 28 and the denominations are 16, 13, and 1. How many bills will be used if applying a greedy algorithm? Is it the optimal solution? If not, what is the optimal solution? (20 points)

3. Please solve the fractional knapsack problem. What is the maximized benefit? (30 points)

4 items

Max weight is 8

Item 1: weight 5; benefit 7

Item 2: weight 2; benefit 4

Item 3: weight 3; benefit 5

Item 4: weight 4; benefit 6