Due: 3rd November 2024,
20% penalty for 1 day late
40% penalty for 2 days late
Submission not allowed afterwards

CS2009: Design and Analysis of Algorithms
Assignment 03
Total Marks: 100 points

Group assignment (Submission as a group of **3** students)

Go through the website.

1. Understand how these problems can be solved using Dynamic Programming. Now, solve each problem using an example. [80 Marks]
   a) For Longest-Common-Subsequence, X: {B, First Alphabet in the Name of Group Member 1, B, C, A, B} and Y: {First vowel in the Name of Group Member 2, D, A, B, A, B}
   b) For Shortest-Common-Supersequence, X: First Name of Group Member 1 and Y: First Name of Group Member 2
   c) For Longest-Increasing-Subsequence, {4th Digit of Group Member 1, 10, 2, 4th Digit of Group Member 2, 20}
   d) For Levenshtein-distance (edit-distance) problem, str1 = "KITTEN",str2 = "SITTING"
   e) For Matrix Chain Multiplication, p0 = 4, p1 = 6, p2 = 5, p3 = 20, p4 = 1 p5 = length of first name of Group member 3, Show parenthesis at the end.
   f) For 0-1-knapsack-problem, Value = [1, 4, 5, 7, 4], Weight = [1, 3, 4, 5, 2], W = Number of characters in First name of Group Member 1.
   g) For the partition problem, The Set contains 6 numbers. The first three numbers are the conversion of the first three alphabets of Group Member 1 into respective numbers, and the last three numbers are from the first three alphabets of Group Member 3.
      Just for an example (don't solve this example): if two group members are: Ahmed and Waqas then S = {1, 8, 13, 23, 1, 17}. That is by letting A = 1, B=2, C = 3, etc.
   h) For Rod Cutting Problem, length [] = {1, 2, 3, 4, 5, 6, 7, 8}, price [] = {1, 5, 8, 9, 10, 16, 18, 20}, Rod Length: 8.
   i) For Coin-change-making-problem, S = {1,5,6,8}, Desired Change is 13
   j) For Word Break Problem, S = {i, like, ice, cream, icecream, mobile, apple}, Input: ilikeapple.
2. Take any real-world daily life task and write an algorithm to solve that using dynamic programming approach that is mapped on one of the problems above. For example, You want to plan meals for a week while maximizing nutritional value within a budget. Each meal has a cost and a nutritional value. The goal is to select meals that fit within your budget and maximize total nutritional value. Also dry run the algorithm. [20 Marks]