Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam - 603 110
(An Autonomous Institution, Affiliated to Anna University, Chennai)

UCS2403: DESIGN & ANALYSIS OF ALGORITHMS

Assignment 7

1. Given two sequences $X = \langle x_1, \ldots, x_m \rangle$ and $Y = \langle y_1, \ldots, y_n \rangle$, the longest common sub-sequence problem (LCS) seeks to find a maximum length common sub-sequence of X and Y.
   For example, if $X = \langle A, B, C, B, D, A, B \rangle$ and $Y = \langle B, D, C, A, B, A \rangle$, then the sequences $\langle B, C, B, A \rangle$ and $\langle B, D, A, B \rangle$ are the longest common sub-sequences, since X and Y have no common sub-sequence of length 5 or greater.

   (a) Obtain a recursive formula for the LCS problem.

   (b) Design a dynamic programming algorithm to solve the LCS problem using the recursive formula in Q 1(a). Write the Python code to implement the same.

   (c) Populate the table using bottom-up approach, starting from the base case(s), for the below example: $X = \langle A, B, A, A, B, A \rangle$ and $Y = \langle B, A, B, B, A, B \rangle$. Find the answer using the data populated in the table.

   (d) Compare the output/answers obtained in Q 1(b) and Q 1(c) for the given example.