Habib University

CS 412: Design and Analysis of Algorithms

Spring 2024 – Quiz 04 – L1

April 5, 2024. Time: 25 minutes. Total points: 05.

1. **[3 points]** In software development, tools/commands, e.g., *diff* allow programmers to compare two source files [or commits] to see what differentiates them. These tools show where new lines of code have been added, if variable names have been changed, or if any lines of code have been removed. Give a bottom-up dynamic programming solution [in pseudocode] to solve the problem of finding the difference between two files. Identify the optimal substructure. Does this problem exhibit the 'overlapping subproblems' property?

2. **[2 points]** You are climbing a staircase. It takes n steps to reach the top. Each time you can either climb 1 or 2 steps. In how many distinct ways can you climb to the top? Solve this problem using top-down or bottom-up dynamic programming. Give the pseudocode of your solution. What is the runtime complexity?