Habib University

CS 412: Design and Analysis of Algorithms

Spring 2024 – Quiz 04 – L2

April 4, 2024. Time: 25 minutes. Total points: 05.

1. **[3 points]** An old public library wants to digitize its book cataloging process, with the goal of optimizing the storage and retrieval system. The books need to be stored in a way that maximizes the use of limited shelf space while ensuring that popular books are easily accessible to interested readers. Formulate this as a bottom-up dynamic programming problem. Does the problem exhibit optimal substructure and overlapping subproblems property? Give a pseudocode to solve this problem. What is its runtime complexity?

2. **[1 point]** Given a dag G and a source vertex s, give a linear time solution [in pseudocode] to find the longest distances from s to all other vertices in G.

3. **[1 point]** Prof. Geller claims that when it comes to asymptotic runtime complexity, bottom-up dynamic programming and memorization are not different. Do you dis/agree with this statement? Give your rationale in one to two sentences only.