

Data Structures and Algorithms – (COMP SCI 2C03)  
Fall, 2021  
Assignment 4

Due at 11:59pm on December 3rd, 2021

- **No late assignments accepted.**
- Make sure to submit a version of your assignment ahead of time to avoid last minute uploading issues.
- Submit one assignment solution as a PDF file on Avenue.
- If the solution submitted by any student is identical to another student, both students will get a zero mark on the assignment.
- Present your algorithms in Java or Pseudocode (Pseudocode is preferred).
- It is advisable to start your assignment early.

This assignment consists of 4 questions, and is worth 20 marks.

1. Give the Pseudocode or Java of an algorithm that checks whether or not a given permutation of a DAG's vertices is a topological order of that DAG. [5 marks]
2. Given a connected edge-weighted undirected graph  $G$  and a specified set of edges  $S$  (having no cycles), give the pseudocode or Java code for an algorithm to find a minimum-weight spanning tree of  $G$  that contains all the edges in  $S$ . [5 marks]

3. Give an outline of your algorithm for finding an edge, whose removal causes maximal increase in the shortest-paths length from one given vertex to another given vertex in a given edge-weighted digraph. [5 marks]
4. Give Pseudocode or JAVA code of your algorithm that runs in  $O(|A| + |B|)$  to find the longest suffix of a string  $A$  that exactly matches a prefix of another string  $B$ . Explain the running time of your algorithm. [5 marks]