CSC 226 SUMMER 2023
ALGORITHMS AND DATA STRUCTURES II
ASSIGNMENT 3
UNIVERSITY OF VICTORIA

1. Suppose all edge weights in a graph are integers in the range from 1 to $|V|$ where V is the set of vertices. How fast can you make Kruskal's algorithm run? Explain.

2. Given an MST for an edge-weighted graph G, suppose that an edge in G that does not disconnect G is deleted. Design an algorithm using which we could find the minimum spanning tree for the modified graph easily without constructing the new tree from scratch again. What is its running time?

3. Show how to solve the single source shortest path problem of the graph in the lecture slides on Dijkstra's algorithm, slide 11 using Dijkstra's algorithm, when the source node is g. Give the initial values of $D(v)$ for each node v. Each time a node is pulled into the cloud, give the D values which have changed as a result.

4. Show how to solve the single source shortest path problem of the graph in the lecture slides on Bellman-Ford's algorithm, slide 8 using the Belllman Ford algorithm, when the source node is b. Give the sequence of D values for all the nodes initially and then just give changes to D values which occurs, by giving the node affected and its new D value, in order of which they occur. In each round, consider the edges in lexicographic order.

5. Design an algorithm for the single source shortest path problem (SSSP) on directed acyclic graphs (DAGs) in $O(m + n)$ time.