COMP 550, Spring 2015
Quiz 6 (Open Book)
Apr 22, 2015

1) (80') Name _____ PID _____

2) (6') True of False

(a) ___ Given a graph G = (V, E) with positive edge weights, the Bellman-Ford algorithm and Dijkstra's algorithm can produce different shortest-path trees despite always producing the same shortest-path weights.

(b) ___ If a depth-first search on a directed graph G = (V, E) produces exactly one back edge, then it is possible to choose an edge $e \in$ E such that the graph G' = (V, E − {e}) is acyclic.

(c) ___ Consider a weighted directed graph G = (V, E, w) with negative weighted edges, and let X be a shortest s-t path for s, t $\in$ V . If we make all weights non-negative, by setting w'(e) = w(e) + $\max_i\{|w_i|\}$ for each e $\in$ E, then X is still shortest s-t path in the new graph (V, E, w').

3) (14') Shortest path with odd number of edges.

Ted and Marshall are taking a roadtrip from Somerville to Vancouver (that's in Canada). Because it's a 52-hour drive, Ted and Marshall decide to switch off driving at each rest stop they visit; however, because Ted has a better sense of direction than Marshall, he should be driving both when they depart and when they arrive (to navigate the city streets).

Given a route map represented as a weighted undirected graph G = (V, E, w) with positive edge weights, where vertices represent rest stops and edges represent routes between rest stops, devise an efficient algorithm to find a route (if possible) of minimum distance between Somerville and Vancouver such that Ted and Marshall alternate edges and Ted drives the first and last edge.