CS 101Fall 2020- Quiz 9-B

5/Dec/2020- 15 Minutes **Name:** **ID number:**

Problem 1 (10pts) Multiple choice

At least one option is correct, please fill in your answers in the table below.

1	2
B C	B

(1) Which of the following statement is/are true?

(A) Dijkstra's algorithm could work on negative-weighted graph.

(B) Prim's algorithm could work on negative-weighted graph.

(C) Bellman–Ford algorithm could work on negative-weighted graph.

(D) Bellman–Ford algorithm could work on negative-cycled graph.

(2) Suppose you run Dijkstra's algorithm in graph G and get the correct shortest path P. Now you change the cost of all edges in G as follows and return the new shortest path P'. Which P' is guaranteed to be the same with P? Assume $c(e) > 0$ for each e.

(A) $c'(e) = c(e) + 17$.

(B) $c'(e) = 17 \times c(e)$.

(C) $c'(e) = \log_{17} c(e)$.

(D) None of the above.

Problem 2 (10pts) Dijkstra's Algorithm Tiebreak

We are given a directed graph G with positive weights on **vertices** instead of edges, which means that when we visit a node, we need to cost its weight. We wish to find a shortest path from s to t. How would you modify Dijkstra's algorithm to this end? Just a description of your modification is needed.

Hint: you can just think about how to modify the graph instead of to modify Dijkstra's algorithm steps.

We construct a new graph G' according to graph G. For each $v_i \in G$, for $i = 0, 1, \cdots, n$ we construct two corresponding vertices v_i' and v_i" and edge (v', v''), and the edge's weight is equal to the weight of v. For the edge $(v1, v2) \in G$, we construct the corresponding edge $(v1'', v2')$, and the edge's weight is 0.