CS 101 Fall 2021 - Quiz 8-A

11/29/2021 - 20 Minutes **Name:** **ID number:**

The following questions are choice questions, each question may have **one** or **multiple** correct answers. Select all the correct answer, you will get half points if you choose a strict subset(excluding empty set) of the right answer. *Note: You should write those answers* ***in the box*** *below.*

Question 1	Question 2	Question 3

Question 1(4pts):

Consider the graph M with 5 vertices. Its adjacency matrix is shown below and we assume the cost of each edge is 1. Which of the following is true?

$$M = \begin{bmatrix} 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 \end{bmatrix}$$

(A) Graph M has no minimum spanning tree.

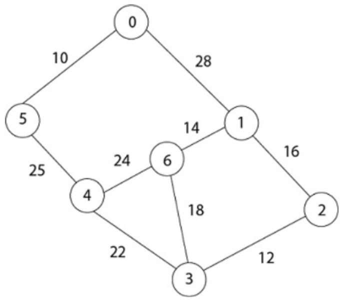
(B) Graph M has a unique minimum spanning trees of cost 4.

(C) Graph M has 3 minimum spanning trees of cost 4.

(D) Graph M has 3 spanning trees of different costs.

Question 2(4pts):

In the figure below, using Prim's algorithm to compute the MST(suppose we start from vertex "0"), select the edge we will not choose.



(A) (3,4)

(B) (3,6)

(C) (4,5)

(D) (4,6)

(E) All of the above.

Question 3(4pts).

Which of the following algorithms reflect(s) the idea of greedy algorithms?

(A) Kruskal

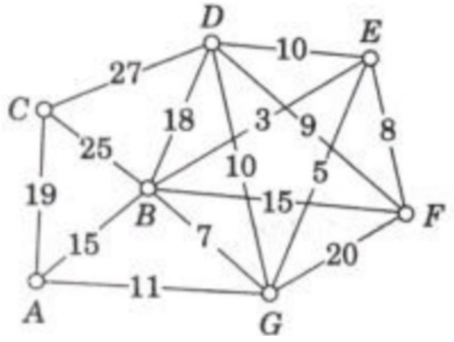
(B) Prim

(C) Quicksort

(D) Mergesort

Question 4(4pts):

Write down the sequence of edges added to the minimum spanning tree using Kruskal's algorithm. (You can randomly choose one edge if you meet two edges with the same weight.)



Question 5(6pts):

Given a long sequence S of n characters, find an efficient way to detect whether it contains a subsequence S' with m characters. Characters in S' may not be consecutive in S, but they must follow the same order. For example,

$$A, B, C, A$$

is in

$$C, A, B, Q, D, C, A, A$$

1) Please give an efficient algorithm (less than $O(n^2)$) for this problem. (Both natural language and psedo-code are okay to show your answer)

2) What is the time complexity of your algorithm?