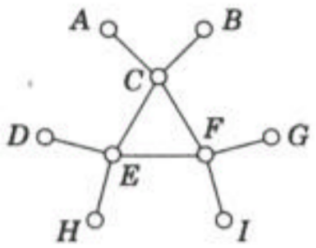
CS 101 Fall 2020 - Quiz 8-A

11/24/2020 - 20 Minutes **Name:** **ID number:**

Question 1(4pts):

How many spanning trees dose the following graph have?

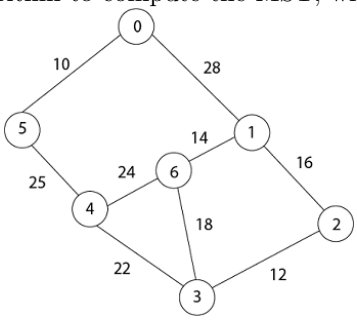


(A) 1
(B) 2
(C) 3
(D) 4
(E) None of the above.

Answer: C. We just need to consider the cycle formed by C, E, F.

Question 2(4pts):

In the figure below, using Kruskal's algorithm to compute the MST, which edge should we choose last?

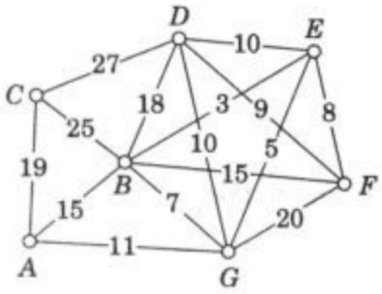


(A) (0,1)
(B) (4,5)
(C) (3,6)
(D) (4,6)
(E) None of the above.

Answer: B

Question 3(4pts):

Write down the sequence of edges added to the minimum spanning tree using Prim's algorithm. Suppose we start from vertex "A". (You can randomly choose one edge if you meet two edges with the same weight.)



Answer:

AG

GE

EB

EF

FD

AC

Question 4(6pts):

Christmas Day is approaching, and there are n activites we would like to hold on that day. Unfortunately, only one classroom is available and the classroom can be used to hold only one activity at any time. Given the start time and end time of each activity (s_i, e_i), $i \in [1, n]$. i.e. activity a_i will take time period $[s_i, e_i)$ of the day, please give an algorithm that schedules acivities as more as possible without time conflicts on Christmas Day.

1) Describe your algorithm.

2) Analyze time complexity.

Solutions:

1) Sort the activities w.r.t. e_i's in ascending order, then always select the activites ends the earliest without causing time confict with the former one.

2) 'Sorting' takes $O(nlogn)$, and 'selecting the activity ends the earliest without causing time conflicts with the former' takes $O(n)$. In total, $O(nlogn)$