Kunal Patel

CSE 310 Assignment #8
(Max. Points: 30)

Due on: Friday, Dec. 6, 2019, 11:59pm Arizona time

General Instructions:

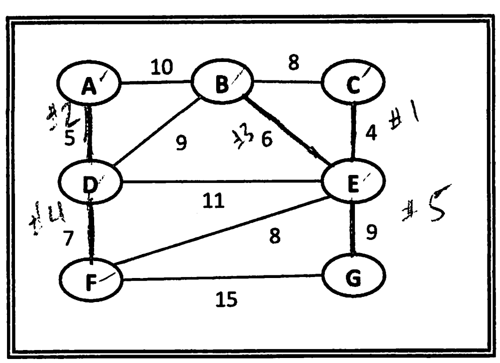
- For all written exercises: **your answer should be clearly typed or written and must be saved in .pdf or .jpg format**. Note: **unreadable answer receives no credits!**
- All assignments must be submitted through the link posted on Blackboard, we do NOT accept any hand-in submissions or submissions sent through emails!
- Submission link will be closed automatically once the due date/time is past and **no late assignment will be accepted**.
- You will be allowed 3 times to submit the assignment before the due date/time, but we will only grade your last submission.

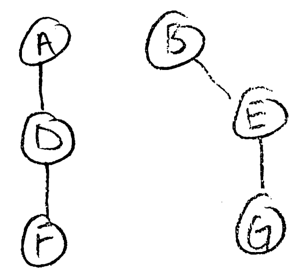
Objectives

- Kruskal's MST algorithm.
- Prim's MST algorithm.
- Dijkstra's Shortest Path Algorithm
- Longest Common Subsequence problem

Questions

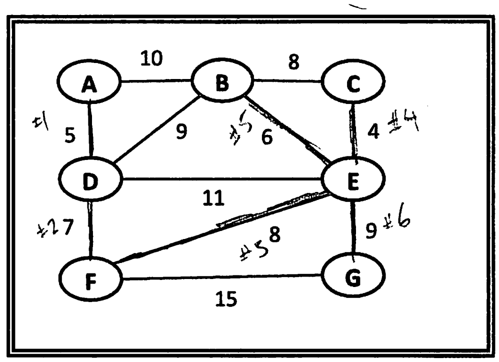
1. [6 pts] Show the execution of Kruskal's algorithm on the following graph step-by-step. When there are two or more than two edges that have the same weight, always consider them in alphabetical order of the vertices, *i.e*, if edge (*A, B*) and (*B, E*) have the same weight, we will pick edge (*A, B*). (see Fig.23.4 on textbook pp.632 as one example). Draw the resulting MST and compute its weight.

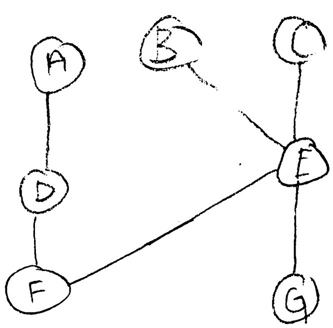




$4+5+6+7+9=31$

2. [6 pts] Show the execution of Prim's algorithm on the following graph step-by-step, assume the source vertex is *A*. When there are two or more than two edges that have the same weight, always consider them in alphabetical order of the vertices, *i.e*, if edge (*A, B*) and (*A, C*) have the same weight, we will pick edge (*A, B*). (see Fig.23.5 on textbook pp.635 as one example). Draw the resulting MST and compute its weight.



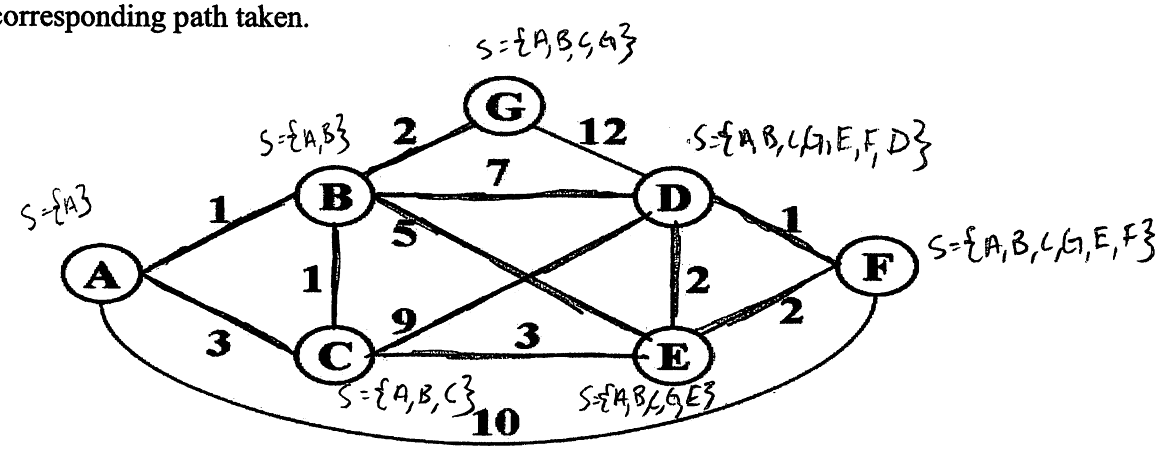


$5+7+8+4+6+9=39$

3.[10 pts] Step through Dijkstra's algorithm to calculate the order in which the vertices are visited from vertex A to all other vertices in the undirected graph given below. Then to calculate:

A) the shortest path distance from A to all other vertex and

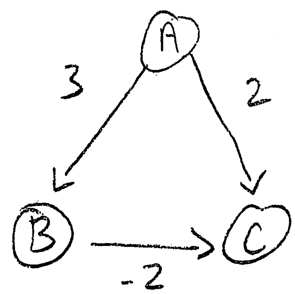
B) the corresponding path taken.



A) 1+1+2+3+2+1 = 10

B) S= {A,B,C,G,E,F,D}

4. [2 pts] Show an example to demonstrate that Dijkstra doesn't work with negative edge weights.



Starting Vertex is A going to C. By Dijkstras algorithm you would say the shortest path from A to C is 2, but it isn't the case. Dijstra doesn't account for negatives, the correct shortest path is 1.

5. [6 pts] Given the following two sequences X and Y, fill in the table to compute the LCS-Length on X and Y. Also follow the arrows from the lower right corner to get the elements of the LCS.

X = {A, G, A, C, T, G, T, C}

Y = {T, A, G, T, C, A, C, G}

	j	0	1	2	3	4	5	6	7	8
i		y_j	T	A	G	T	C	A	C	G
0	x_i	0	0	0	0	0	0	0	0	0
1	A	0	0↑	1↖	1←	1←	1←	1↖	1←	1←
2	G	0	0↑	1↑	2↖	2←	2←	2←	2←	2↖
3	A	0	0↑	1↖	2↑	2←	2←	3↖	3←	3←
4	C	0	0↑	1↑	2↑	2←	3↖	3←	4↖	4←
5	T	0	1↖	1↑	2↑	3↖	3←	3←	4↑	4↑
6	G	0	1↑	1↑	2↖	3↑	3←	3←	4↑	5↖
7	T	0	1↖	1↑	2↑	3↖	3←	3←	4↑	5↑
8	C	0	1↑	1↑	2↑	3↑	4↖	4←	4↖	5↑

LCS of X and Y is: { A, G, A, C, G }