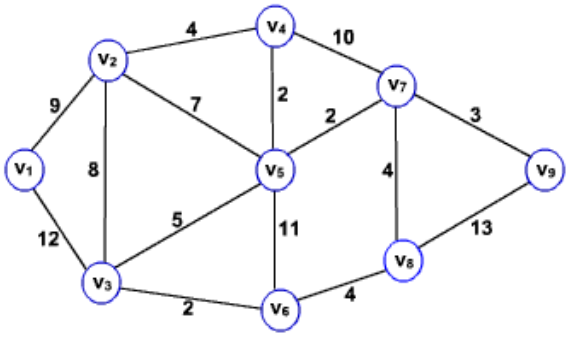
CSC175 Practice Assignment 5 Spring 2019 Name Solutions

1) For the weighted graph to the right, use Dijkstra's Algorithm to find the shortest path for each pair of vertices below. For each, **list the edges** in order used for your path and then the **sum** of that path.

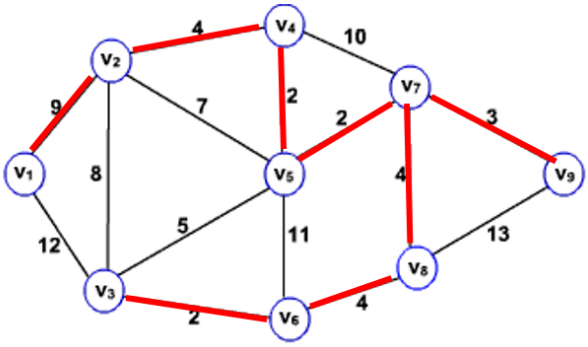


a) v1 to v9 Sum=3+2+2+4+9=20
{{v7,v9}, {v5,v7}, {v4,v5}, {v2,v4}, {v1,v2}} *see below
b) v4 to v6 Sum=2+5+2=9
{{v3,v6}, {v5,v3}, {v4,v5}}
c) v3 to v9 Sum=3+2+5=10
{{v7,v9}, {v5,v7}, {v3,v5}}

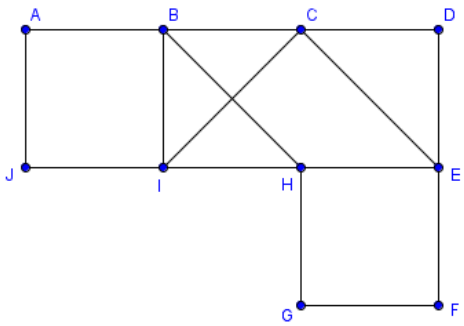
*Note, using Dijkstra's Algorithm, going from v1 to v9, we start at v9 with our list of vertices and work back to v1.

2) For the same weighted graph to the right, use Kruskal's algorithm to find the minimum spanning tree. Copy and paste the graph into your solution and highlight the minimum spanning tree. **List the edges**, in the order you found them using the algorithm. Finally, give the sum (length or weight) of the minimum spanning tree.

Start with one of the edges of weight 2.
One such order:
{{v3,v6},{v7,v5},{v5,v4},{v7,v9},{v4,v2},{v6,v8},{v8,v7},{v2,v1}}
Length = 2+2+2+3+4+4+4+9=30



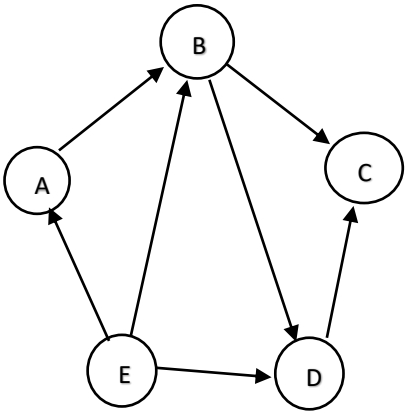
3) For the graph to the right,
a) Give an Euler path, if it exists. If not, state why.
b) Give an Euler circuit, if it exists. If not, state why.
c) List the degrees for each vertex in a table.



a) ABCDEFGHICEHBIJA (one example of many)
b) ABCDEFGHICEHBIJA (another: IBHICEHGFEDCBAJI)
c)

Vertex	Degree
A	2
B	4
C	4
D	2
E	4
F	2
G	2
H	4
I	4
J	2

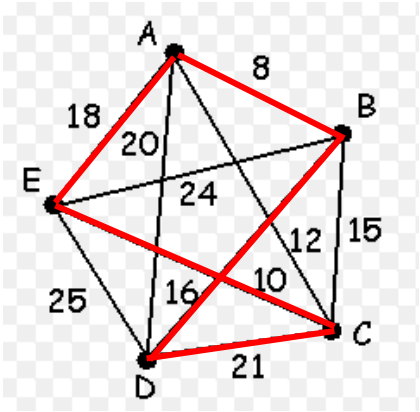
4) For the directed graph to the right,
a) Give a Hamiltonian path, if it exists. If not, state why.
b) Give a Hamiltonian circuit, if it exists. If not, state why.
c) List the in-degrees and out-degrees for each vertex in a table.



a) EABDC
b) None, can't get in to E or out of C
c)

Vertex	In-degree	Out-degree
A	1	1
B	2	2
C	2	0
D	2	1
E	0	3

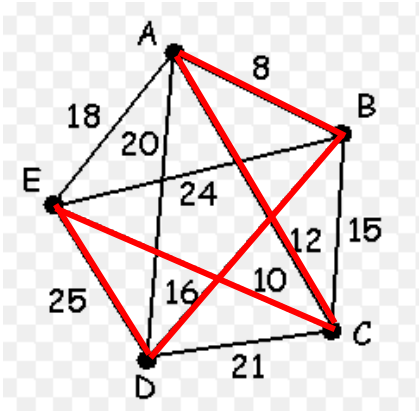
5) For each problem below, use the weighted graph to the right. Copy and paste the graph first so you have two copies to highlight, one for part a and one for part b.



a) Use the Nearest Neighbor Algorithm to find a Hamiltonian circuit starting at the vertex C. Highlight the edges, list the vertices in order, and give the weight.

EABDCE Weight = 10+18+8+16+21 = 73

b) Use the Sorted Edges Algorithm to find a Hamiltonian circuit. Highlight the edges, list the edges in order, and give the weight.



{{A,B}, {E,C}, {A,C}, {D,B}, {E,D}}

Weight = 8+10+12+16+25 = 71

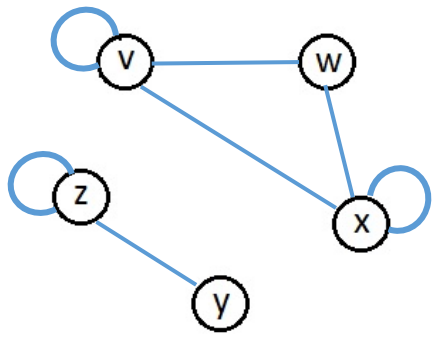
For #6 and #7 below,

a) Create a computer generated graph of each, clearly labeling the vertices. Pay attention if it is directed or undirected!

b) List the degrees, in-degrees, and/or out-degrees (where applicable) for each vertex in a table.

6) G1 = (V1, E1), where V1 = {v, w, x, y, z} and E1 = {{v,v}, {v,x}, {z,y}, {z,z}, {x,x}, {w,x},{w,v}.

a)

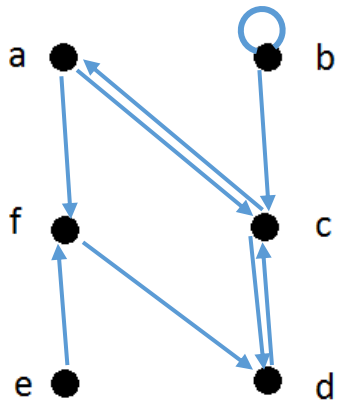


b)

Vertex	Degree
v	4
w	2
x	4
y	1
z	3

7) G2 = (V2, E2), where V2 = {a,b,c,d,e,f} and E2 = {(a,c),(a,f),(b,b),(b,c),(c,a),(c,d),(d,c),(e,f),(f,d)}.

a)



b)

Vertex	In-degree	Out-degree
a	1	2
b	1	2
c	3	2
d	2	1
e	0	1
f	2	1