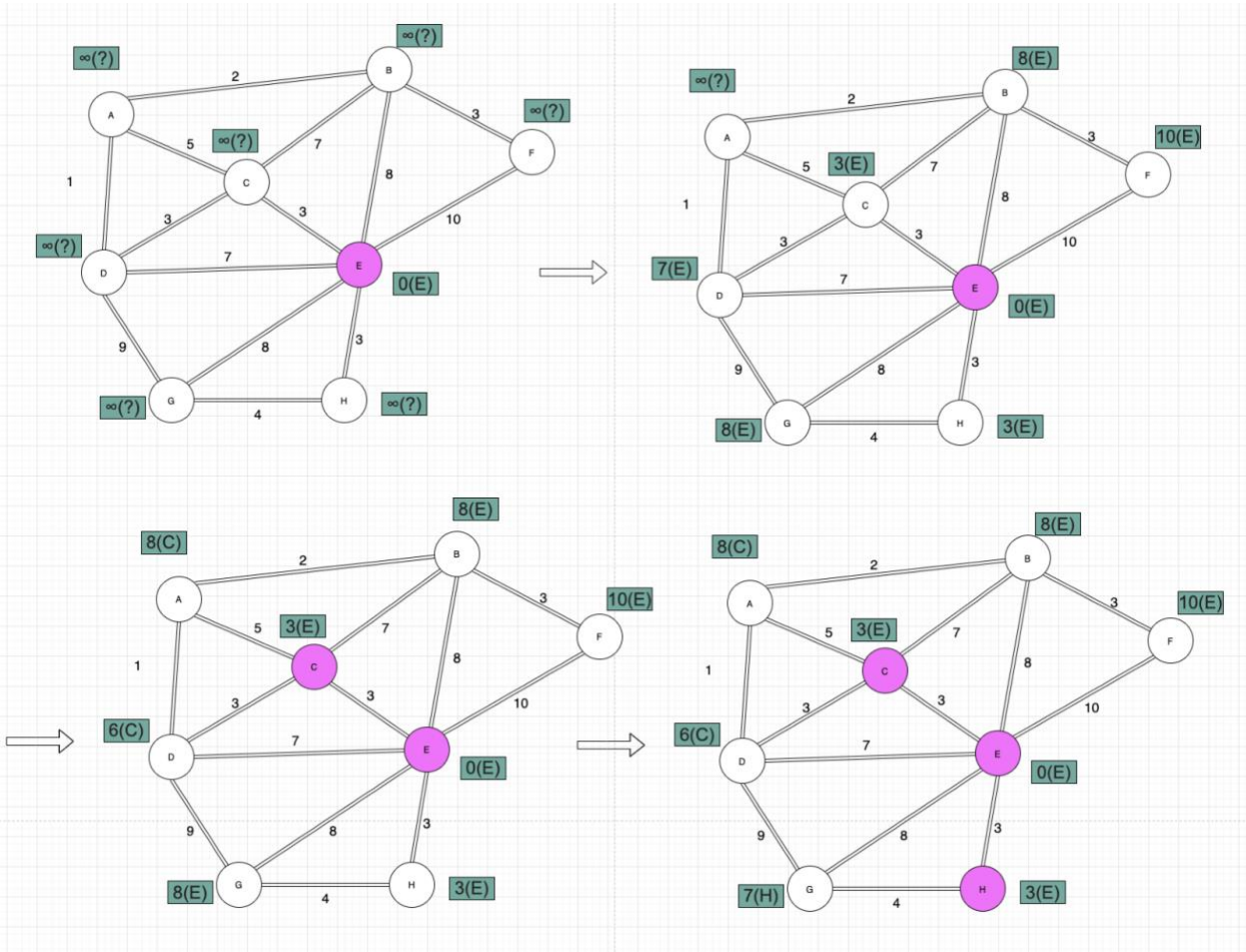
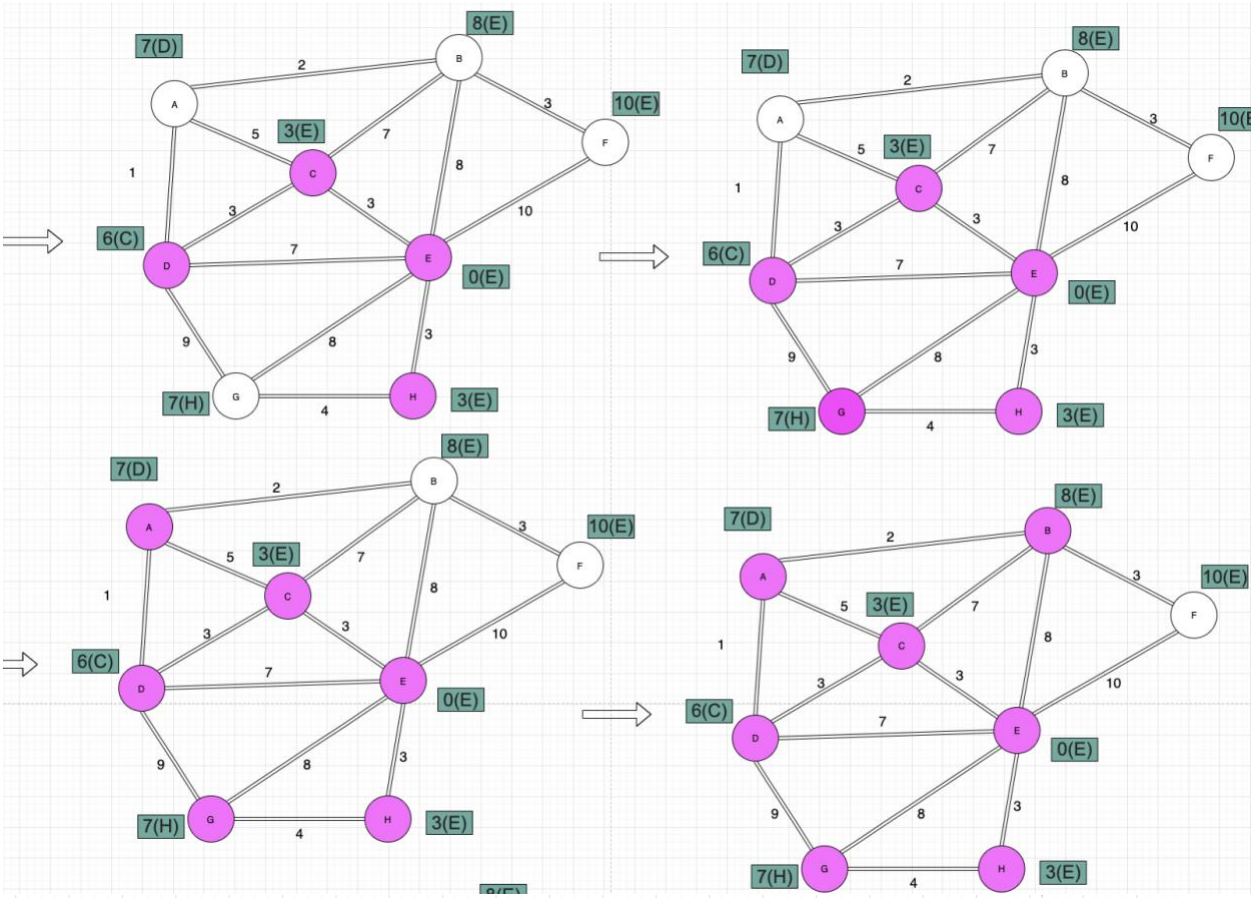
Görkem Yar 27970
CS300 Homework 5

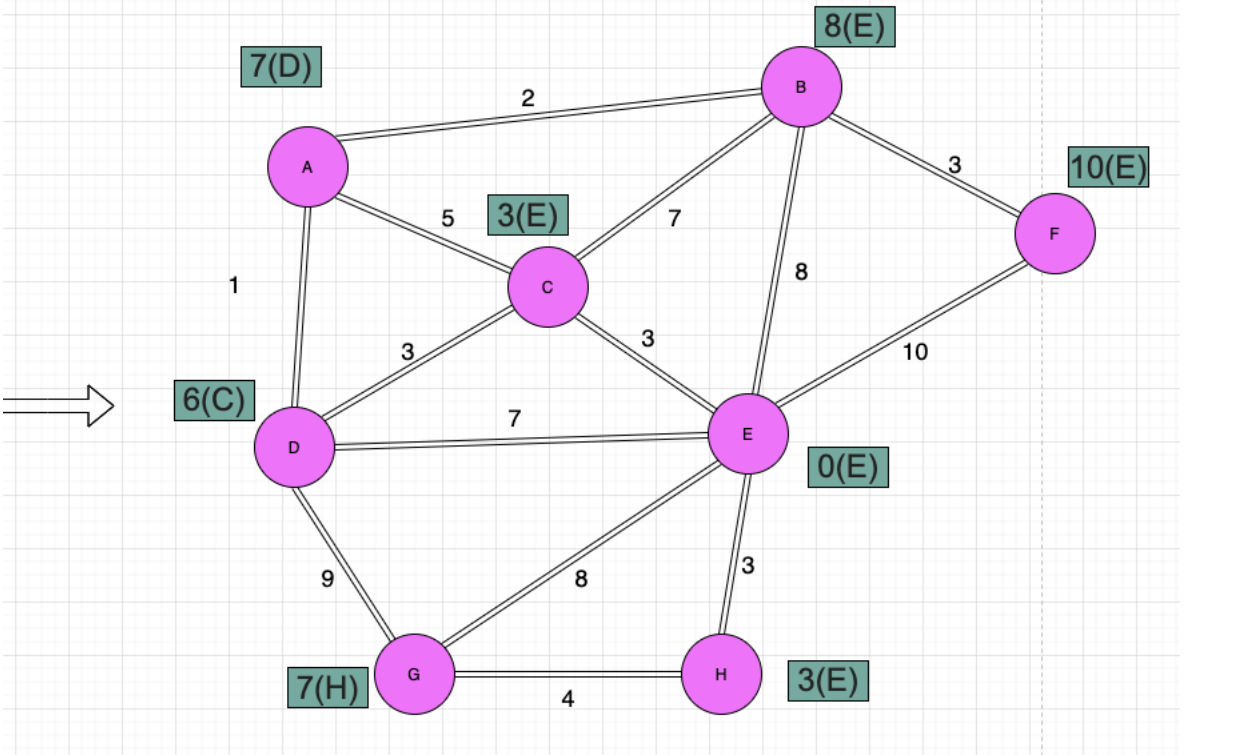
Question 1:

Question 1 (20 points)

Trace the operation of Dijkstra's *weighted* shortest path algorithm for the following graph. Use vertex E as your start vertex.




8(E)
7(D)
2
B
A
10(E)
3
5
3(E)
7
F
C
1
8
3
3
10
6(C)
D
7
E
0(E)
9
8
3
7(H)
G
4
H
3(E)


8(E)
7(D)
2
B
A
10(E)
3
5
3(E)
7
F
C
1
8
3
3
10
6(C)
D
7
E
0(E)
9
8
3
7(H)
G
4
H
3(E)

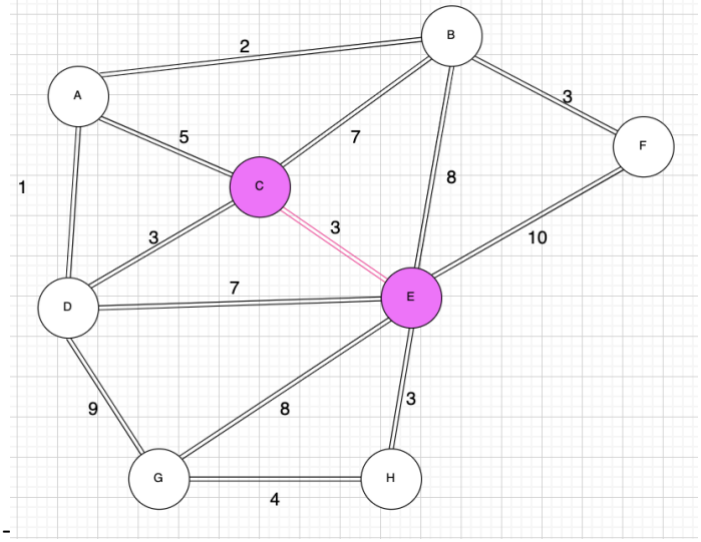
Question 2:

Question 2 (20 points)

Trace the operation of Prim's minimum spanning tree algorithm for the graph in Figure 1. Use vertex E as your start vertex.

Answer:

Step 1: Take the shortest edge (to an unvisited vertex) connected to graph.



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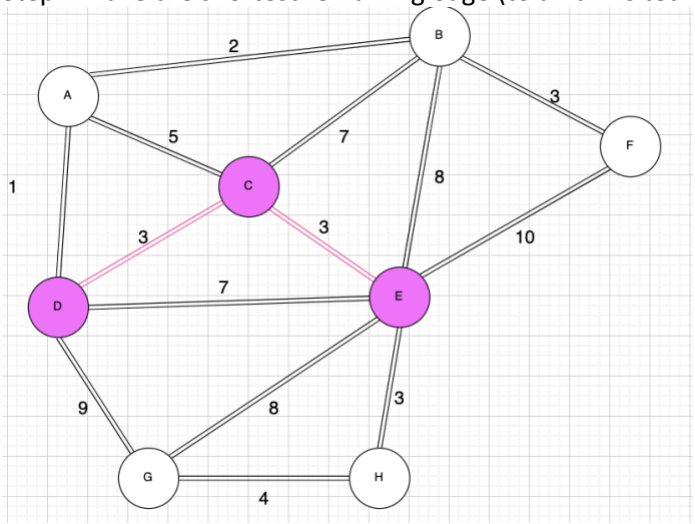
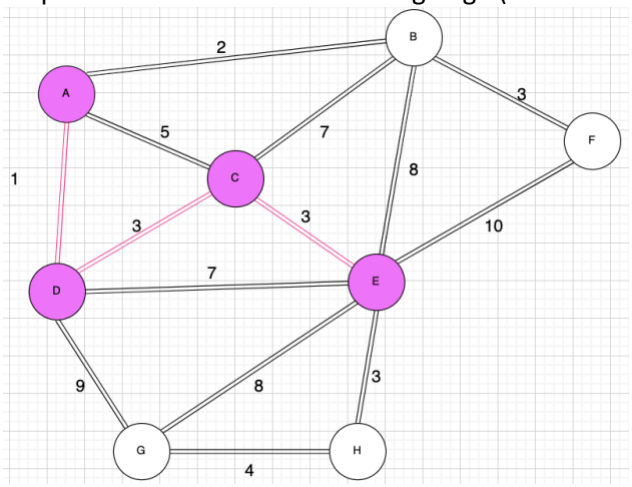
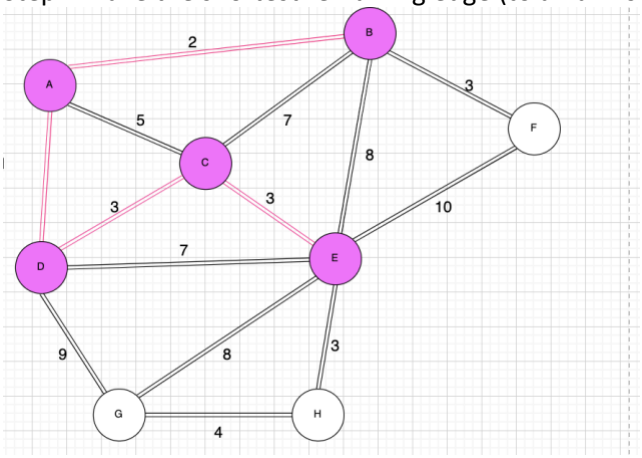
Step 2: Take the shortest remaining edge (to an unvisited vertex) connected to graph.



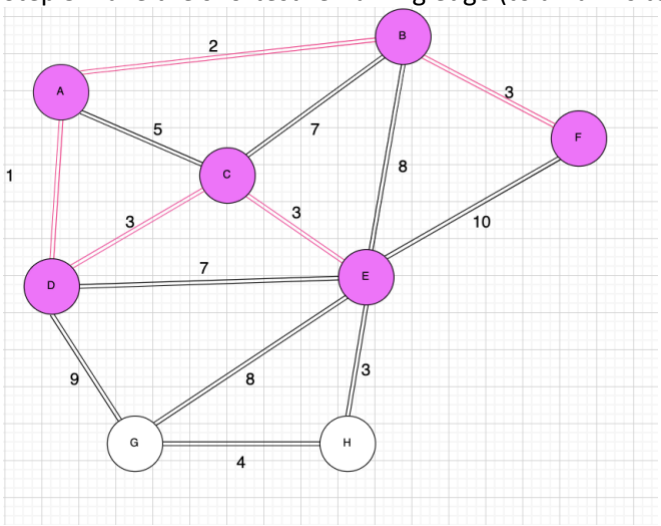
Step 3: Take the shortest remaining edge (to an unvisited vertex) connected to graph.



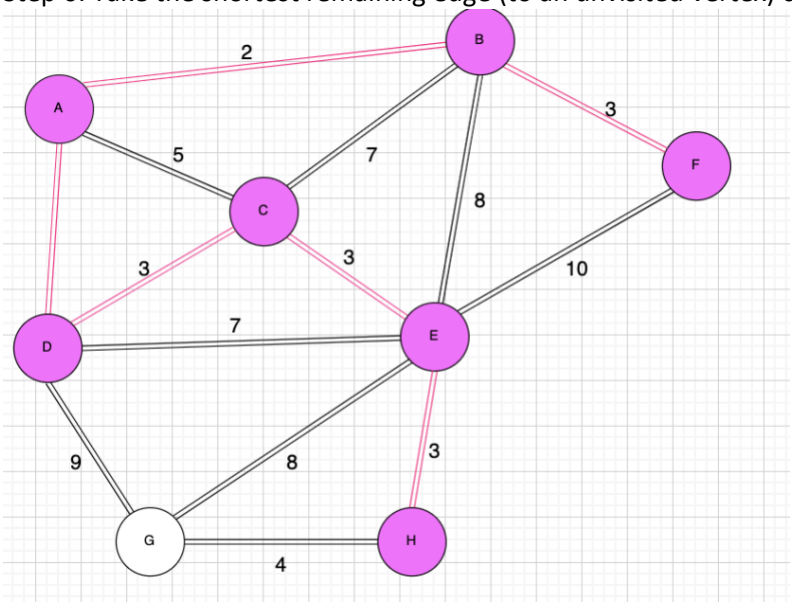
Step 4: Take the shortest remaining edge (to an unvisited vertex) connected to graph.



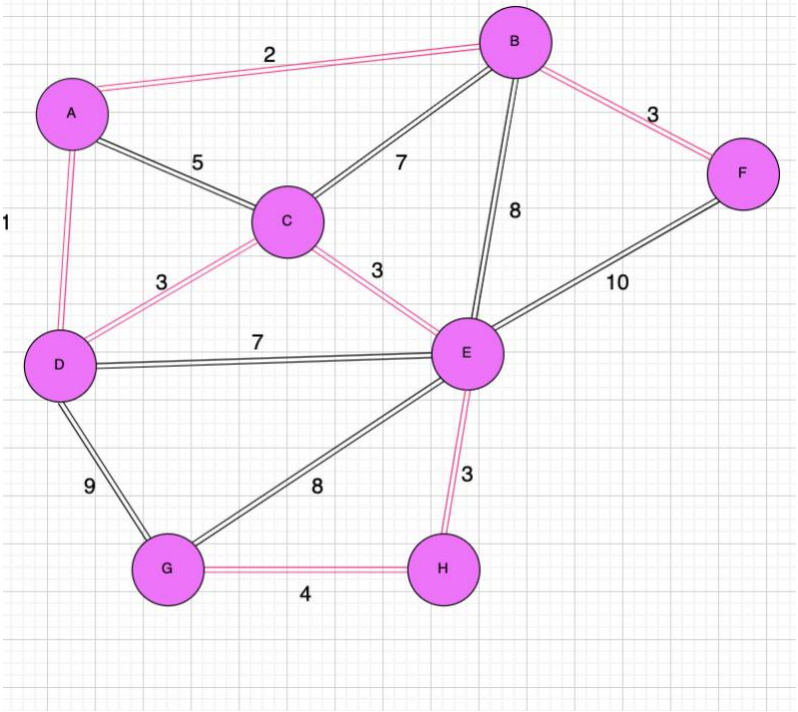
Step 5: Take the shortest remaining edge (to an unvisited vertex) connected to graph.



Step 6: Take the shortest remaining edge (to an unvisited vertex) connected to graph.



Step 7: Take the shortest remaining edge (to an unvisited vertex) connected to graph.



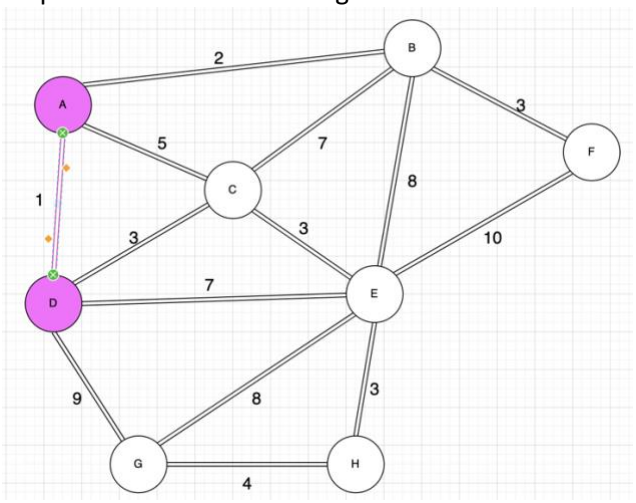
Finished, all the vertexes are visited.

Question 3:

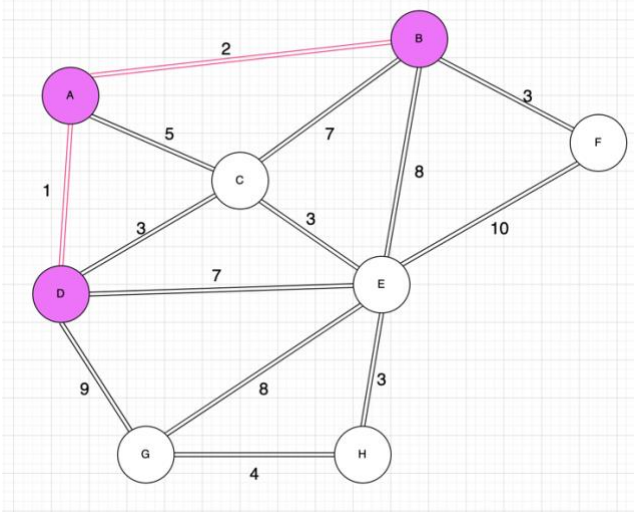
Question 3 (20 points)

Trace the operation of Kruskal's minimum spanning tree algorithm for the graph in Figure 1.

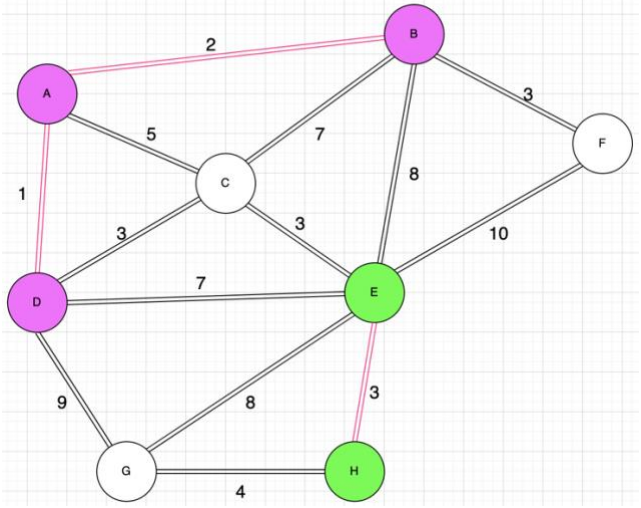
Step 1: Take the shortest edge and make vertexes in the same equivalent class.



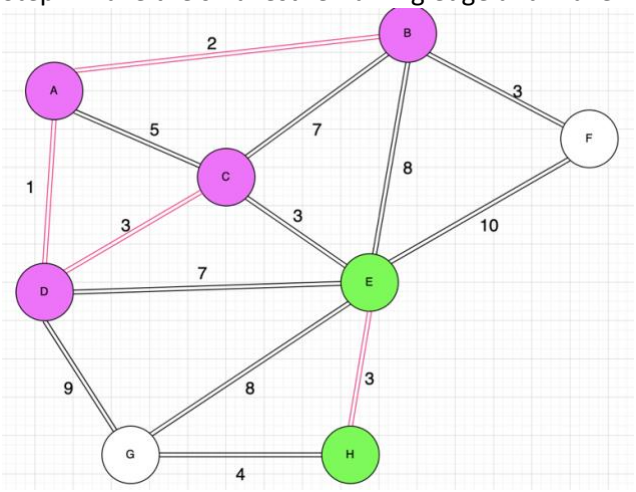
Step 2: Take the smallest remaining edge and make A and B in the same equivalent class.



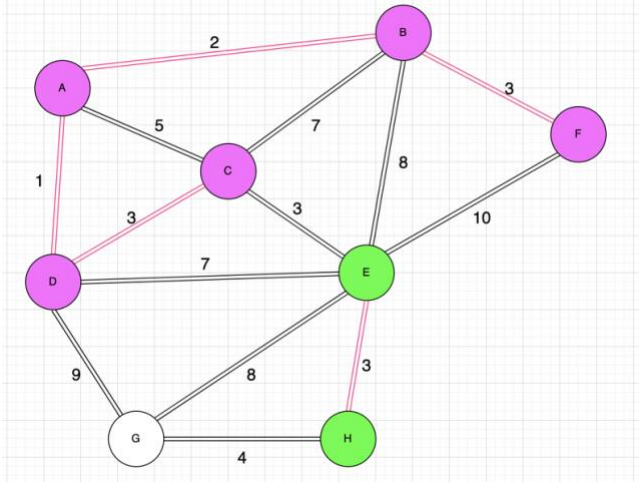
Step 3: Take the smallest remaining edge and make E and H in the same equivalent class.



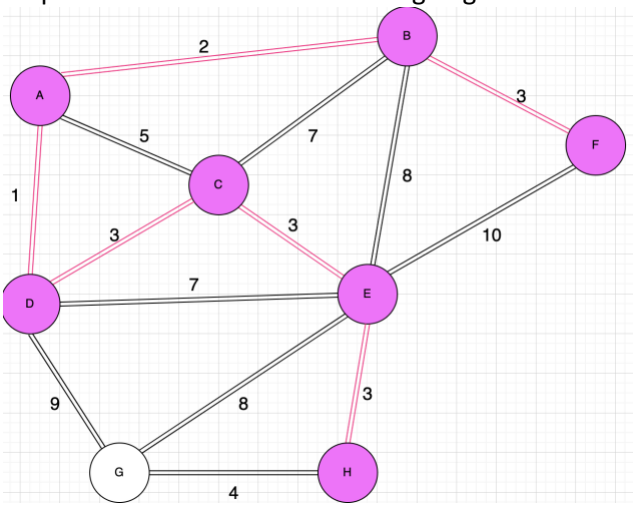
Step 4: Take the smallest remaining edge and make D and C in the same equivalent class.



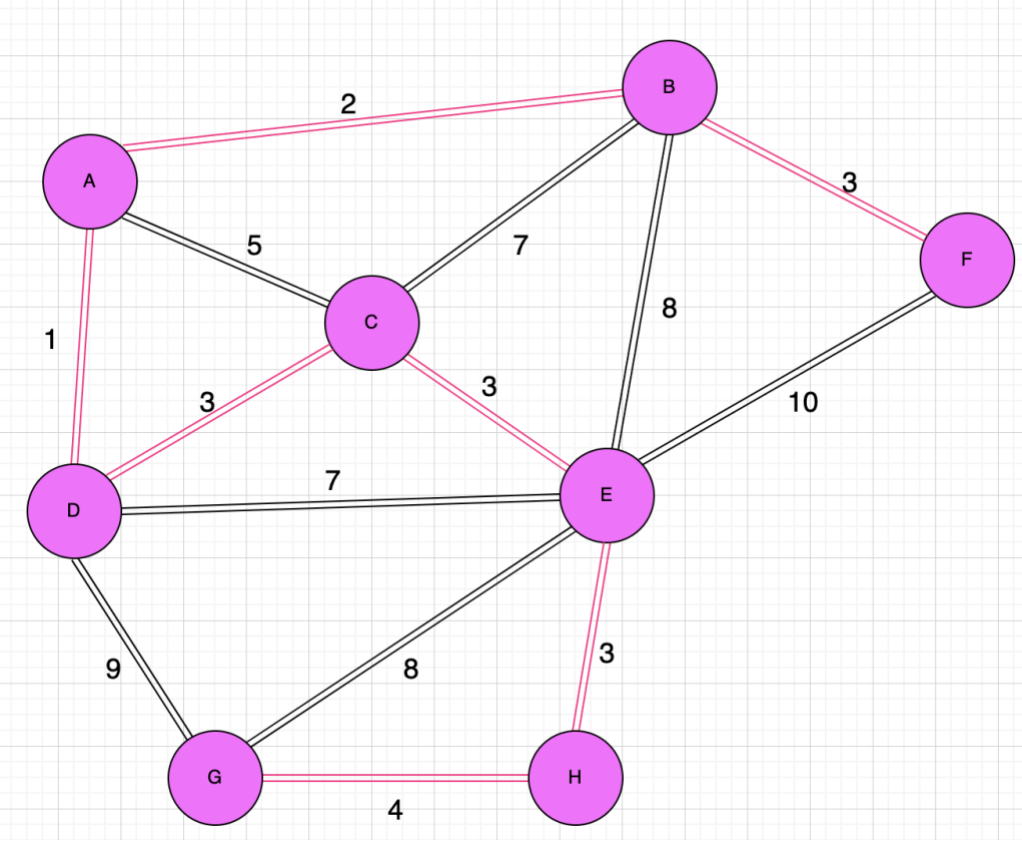
Step 5: Take the smallest remaining edge and make B and F in the same equivalent class.



Step 6: Take the smallest remaining edge and make C and E in the same equivalent class.



Step 7: Take the smallest remaining edge and make H and G in the same equivalent class.



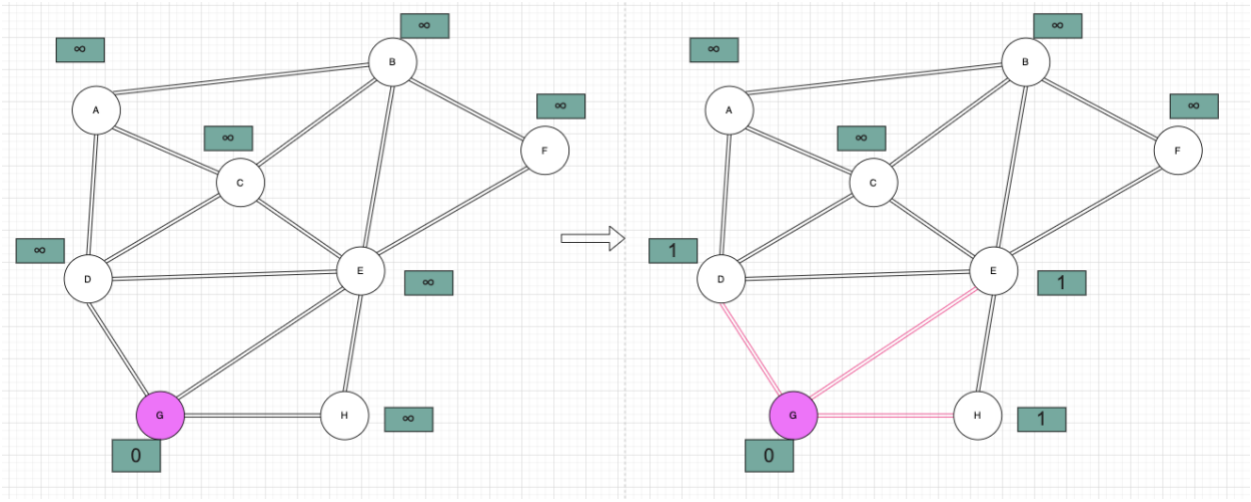
All the vertexes are in the same equivalent class, so accepted edge count = vertex count –1, algorithm is finished.

Question 4:

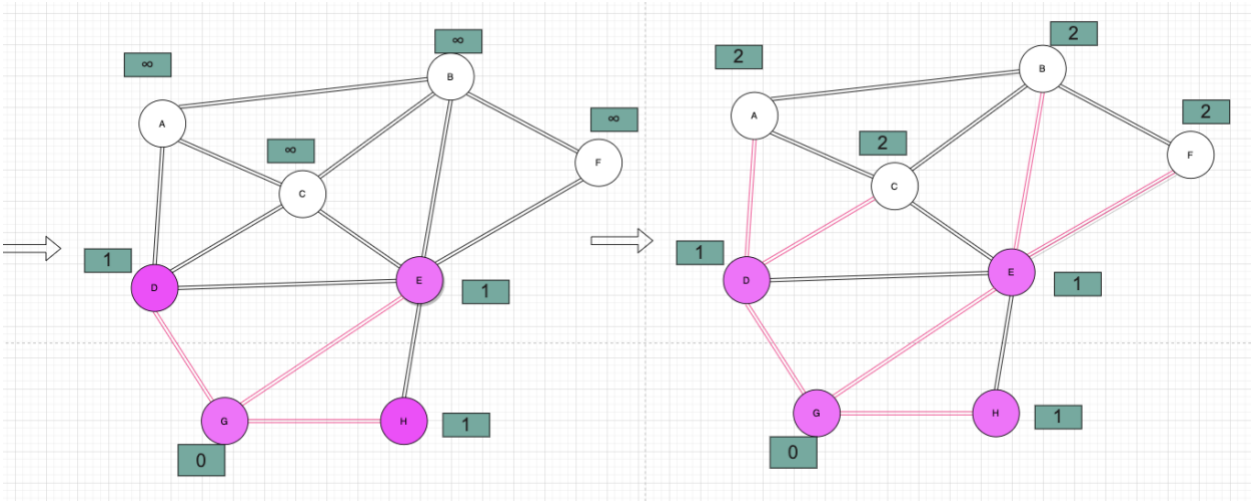
Question 4 (20 points)

Find shortest *unweighted* path from G to all other vertices for the graph in Figure 1. Use breadth-first search algorithm in your answer. Do NOT forget to show the trace.

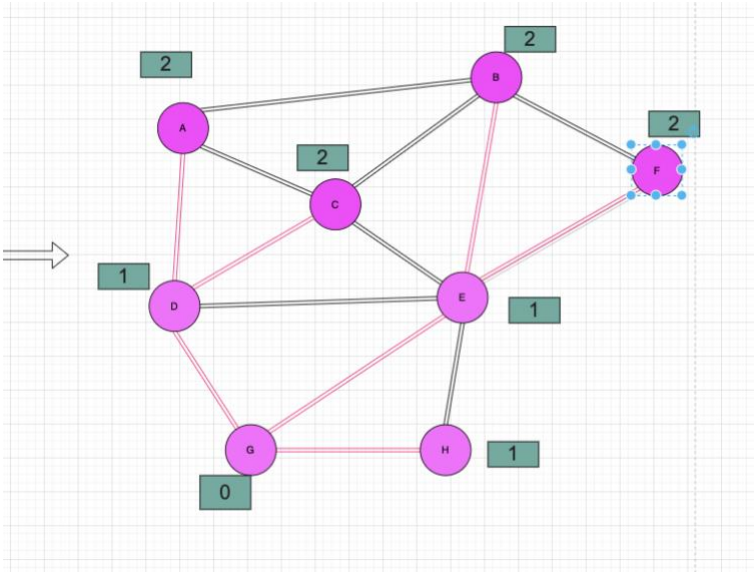
Initial:



With 1 step:



With 2 steps:



Every vertex is covered.

Question 5:

Question 5 (20 points)

Find a topological ordering of the graph in Figure 2.

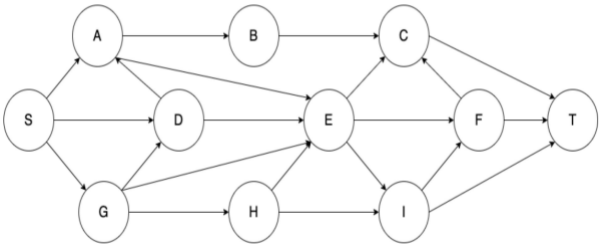
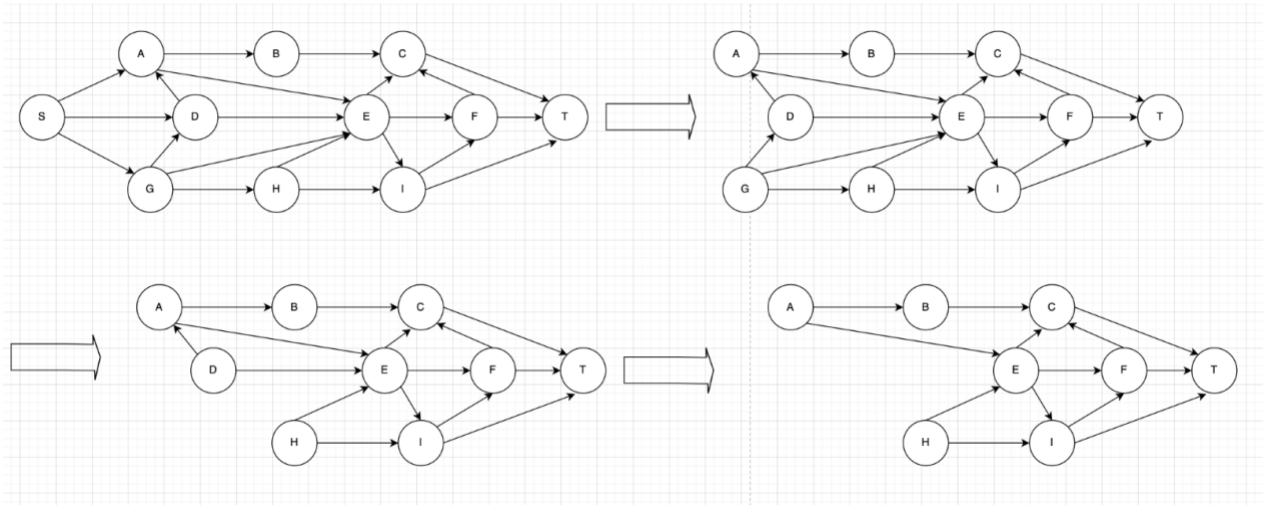
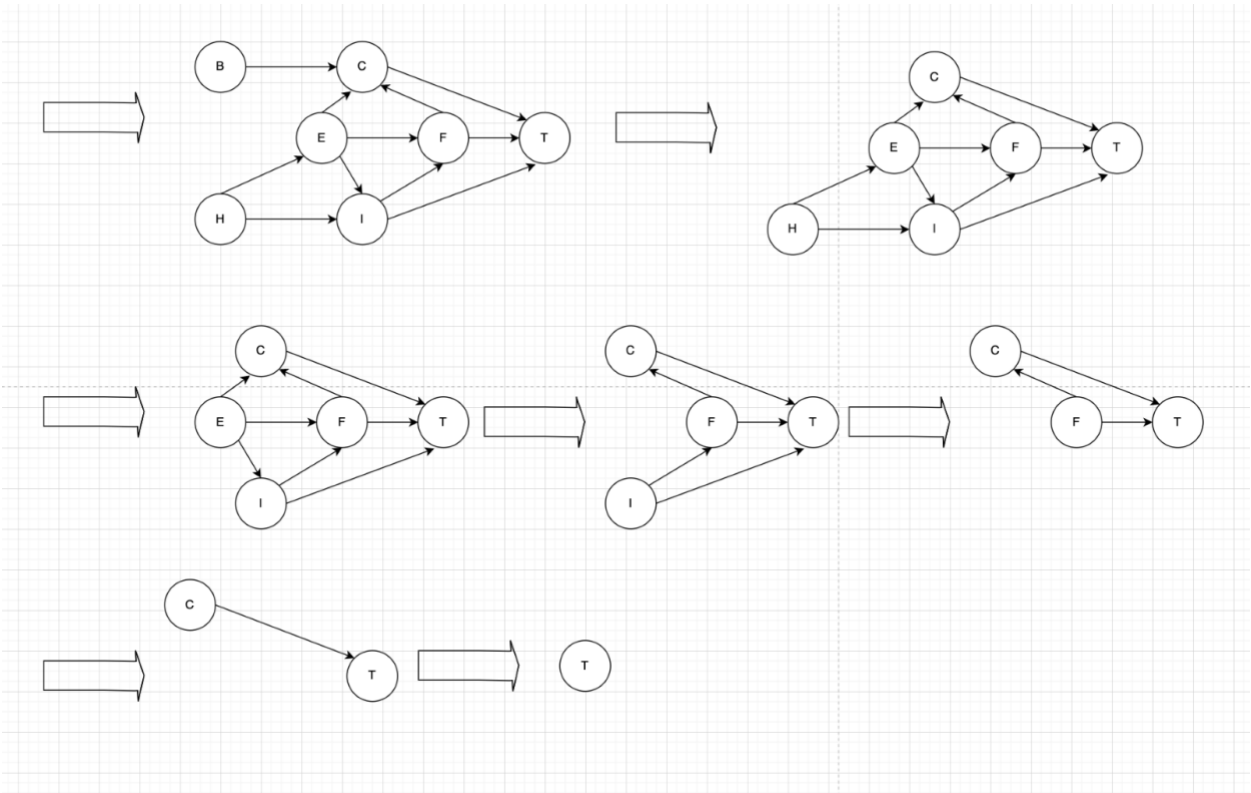


Figure 2: A directed acyclic graph.

Solution:





A topological sort: S->G->D->A->B->H->E->I->F->C->T