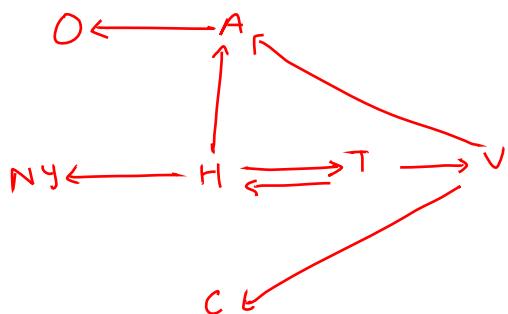


$$V(\text{StateGraph}) = \{\text{Oregon, Alaska, Texas, Hawaii, Vermont, New York, California}\}$$

$$E(\text{StateGraph}) = \{(\text{Alaska, Oregon}), (\text{Hawaii, Alaska}), (\text{Hawaii, Texas}), (\text{Texas, Hawaii}), (\text{Hawaii, California}), (\text{Hawaii, New York}), (\text{Texas, Vermont}), (\text{Vermont, California}), (\text{Vermont, Alaska})\}$$

1. Draw the StateGraph



1. Describe the graph pictured above, using the formal graph notation.

$$V(\text{StateGraph}) = \{\text{Oregon, Alaska, Texas, Hawaii, Vermont, New York, California}\}$$

$$E(\text{StateGraph}) = \{(\text{Alaska, Oregon}), (\text{Hawaii, Alaska}), (\text{Hawaii, Texas}), (\text{Texas, Hawaii}), (\text{Hawaii, California}), (\text{Hawaii, New York}), (\text{Texas, Vermont}), (\text{Vermont, California}), (\text{Vermont, Alaska})\}$$

2. a. Is there a path from Oregon to any other state in the graph?

*no*

- b. Is there a path from Hawaii to every other state in the graph?

*yes*

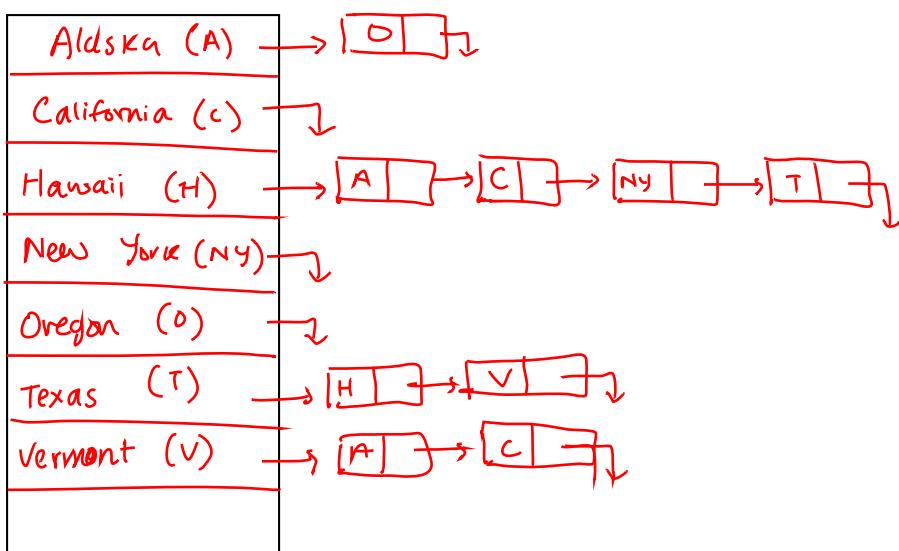
- c. From which state(s) in the graph is there a path to Hawaii?

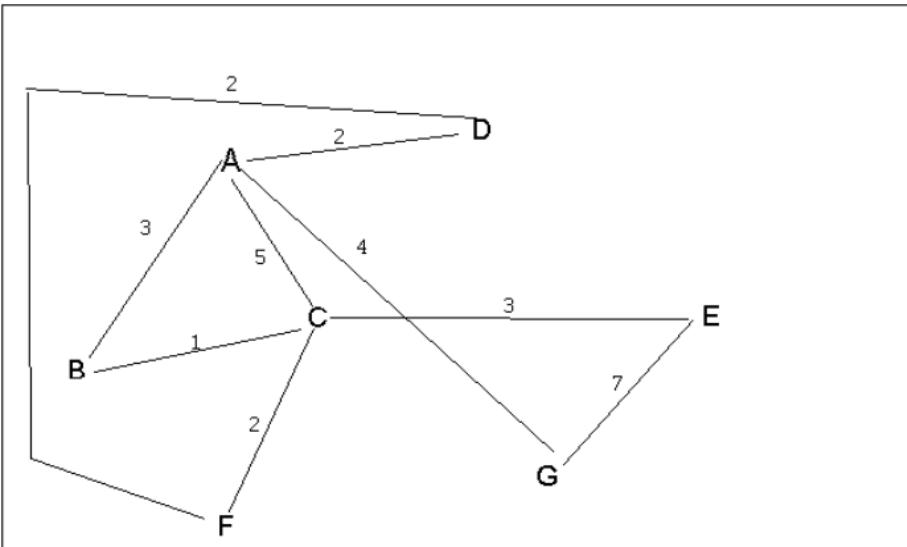
*Texas*

3. a. Show the adjacency matrix that would describe the edges in the graph.  
 Store the vertices in alphabetical order

States	0	1	2	3	4	5	6
Alaska	0	0	0	0	1	0	0
California	1	0	0	0	0	0	0
Hawaii	2	1	1	0	1	0	1
NY	3	0	0	0	0	0	0
Oregon	4	0	0	0	0	0	0
Texas	5	0	0	0	0	0	0
Vermont	6	1	1	0	0	0	0

3. b. Show the adjacency lists  
 that would describe the edges in the graph



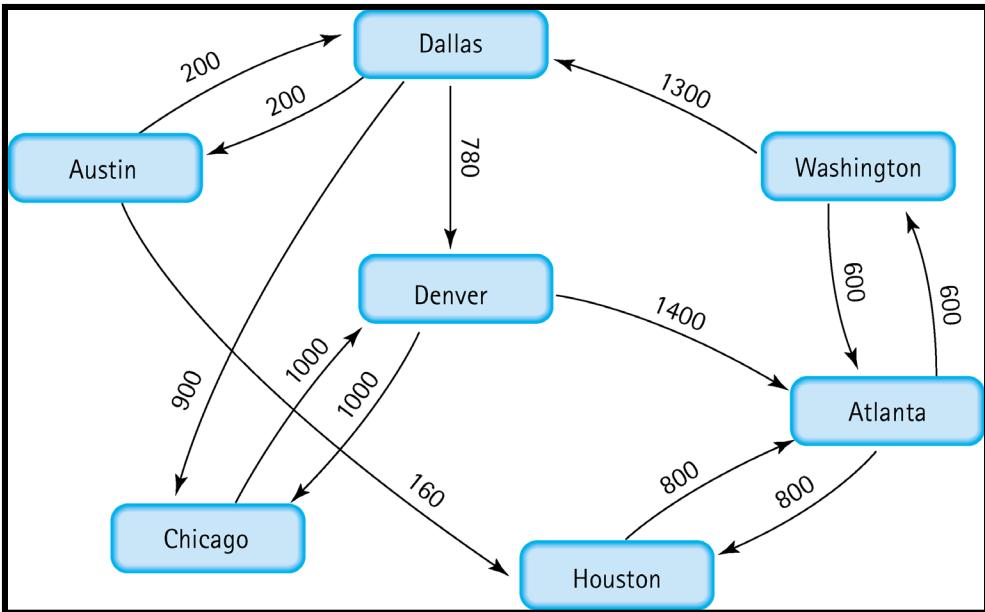


4 a. Which of the following lists the graph nodes in depth first order beginning with E?

- A) E, G, F, C, D, B, A
- B) G, A, E, C, B, F, D
- (C)** E, G, A, D, F, C, B
- D) E, C, F, B, A, D, G

4 b. Which of the following lists the graph nodes in breadth first order beginning at F?

- (A)** F, C, D, A, B, E, G
- B) F, D, C, A, B, C, G
- C) F, C, D, B, G, A, E
- D) a, b, and c are all breadth first traversals



5. Find the shortest distance from Atlanta to every other city

$$\text{Atlanta} - \text{Austin} : 600 + 1300 + 200 = 2100$$

$$" - \text{Chicago} : 600 + 1300 + 900 = 2800$$

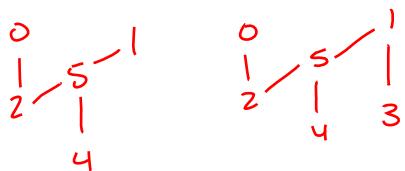
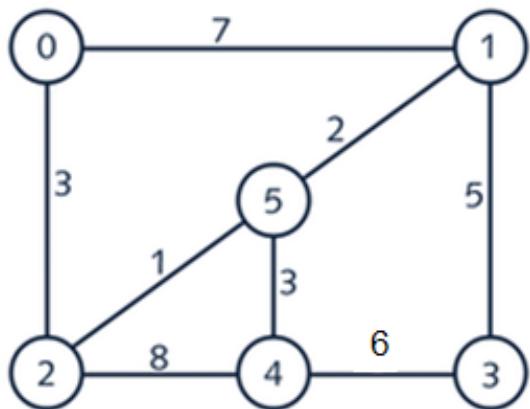
$$" - \text{Dallas} : 600 + 1300 = 1900$$

$$" - \text{Denver} : 600 + 1300 + 780 = 2680$$

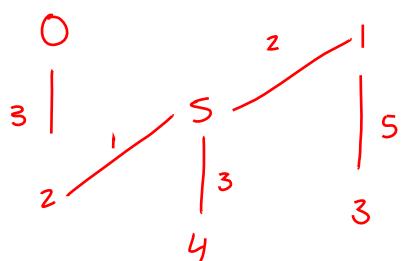
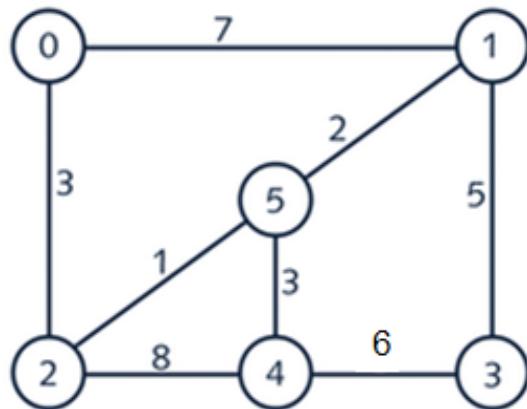
$$" - \text{Houston} : 800$$

$$" - \text{Washington} : 600$$

6. Find the minimal spanning tree using Prim's algorithm. Use 0 as the source vertex . Show the steps.



7. Find the minimal spanning tree using Kruskal's algorithm.  
Show the weights in order and the steps.



$$2 - 5 : 1$$

$$1 - 5 : 2$$

$$0 - 2 : 3$$

$$4 - 5 : 3$$

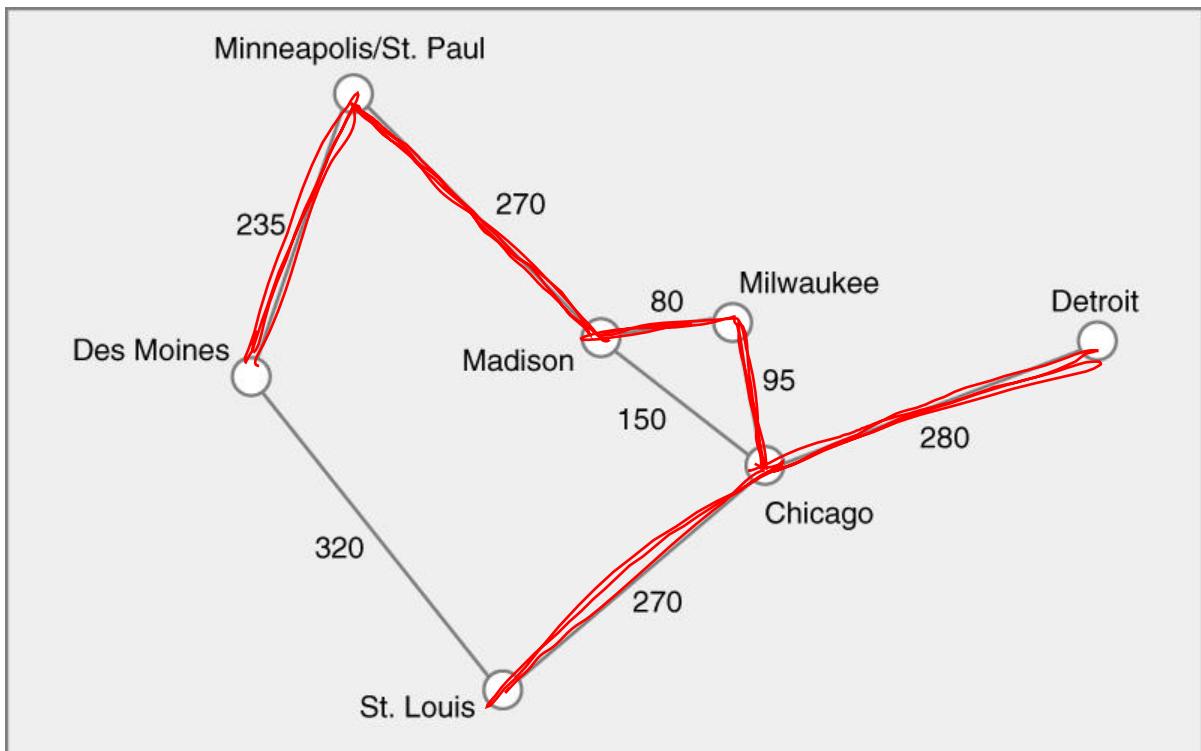
$$1 - 3 : 5$$

$$\cancel{2 - 4 : 6}$$

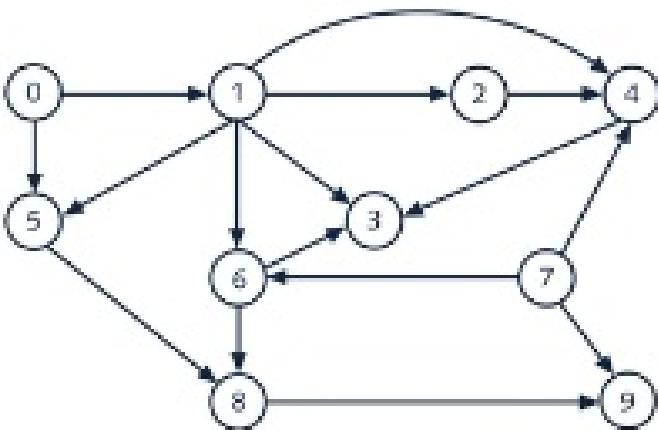
$$\cancel{0 - 1 : 7}$$

$$\cancel{2 - 4 : 8}$$

8. Find the minimal spanning tree using the algorithm you prefer. Use Minneapolis/St. Paul as the source vertex



9. List the nodes of the graph in a breadth first topological ordering. Show the steps using arrays predCount, topologicalOrder and a queue

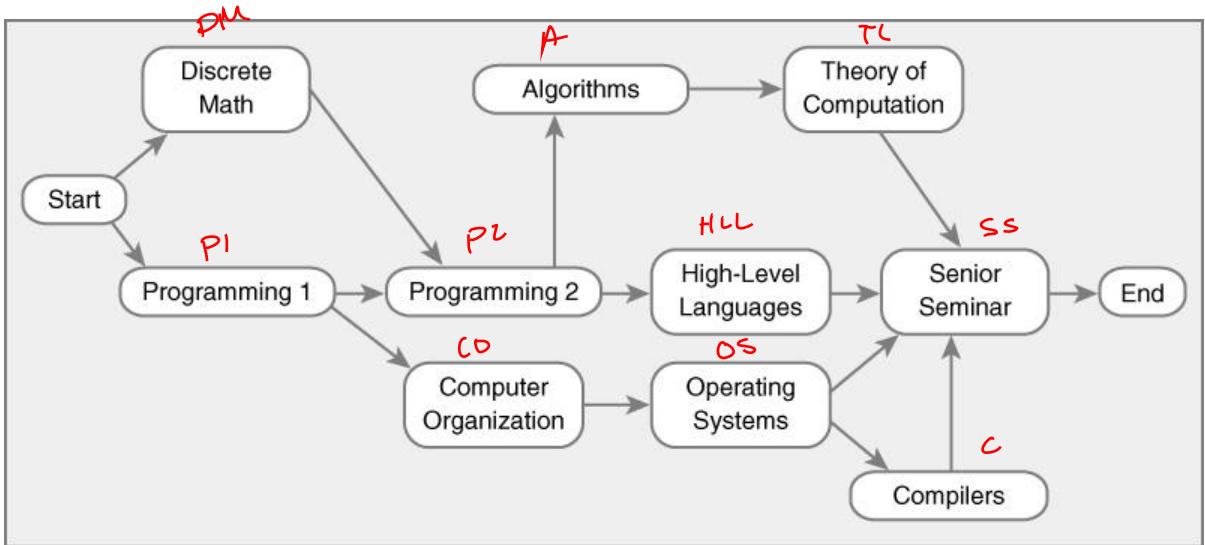


$\emptyset \text{ } 1 \text{ } 4 \text{ } 3 \text{ } 9 \text{ } 5 \text{ } 6 \text{ } 7 \text{ } 8 \text{ } 9$   
 pred Count 0 0 0 0 0 0 0 0 0 0

Top Order 0 7 1 2 5 6 4 8 3 9

queue 0 7 1 2 5 6 4 8 3 9

10. List the nodes of the graph in a breadth first topological ordering.



S	PM	P1	P2	CO	A	HLL	OS	TC	SS	C	E
pred count	0	1	1	0	0	0	0	1	0	0	0
∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅

W<sub>e</sub>re

∅ pm ∅ p1 ∅ p2 ∅ co ∅ a ∅ hll ∅ os ∅ tc ∅ ss ∅ c ∅ e

Top. order

PM , P1 , P2 , CO , A , HLL , OS , TC , C , SS