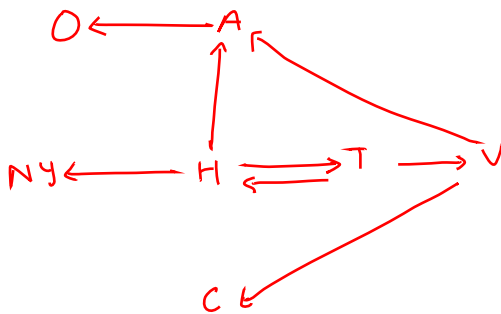


$V(\text{StateGraph}) = \{\text{Oregon, Alaska, Texas, Hawaii, Vermont, New York, California}\}$

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

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

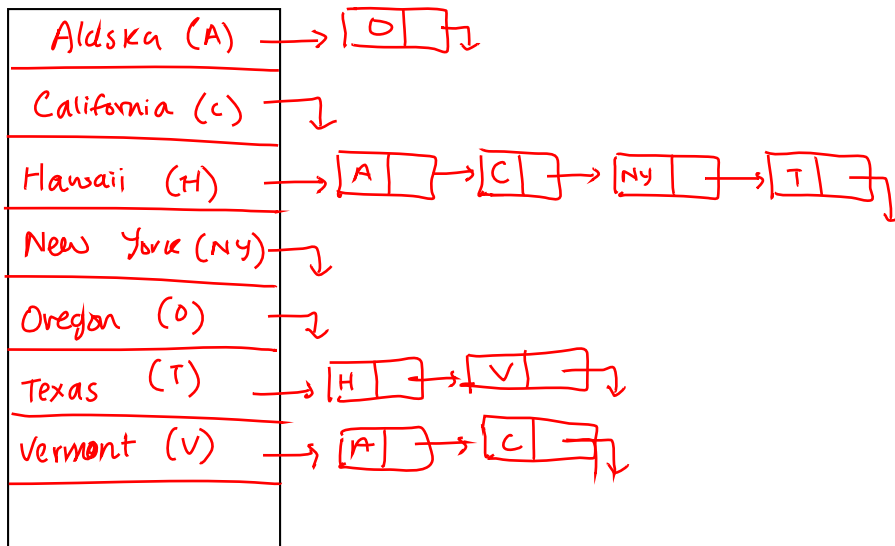
c. From which state(s) in the graph is there a path to Hawaii?

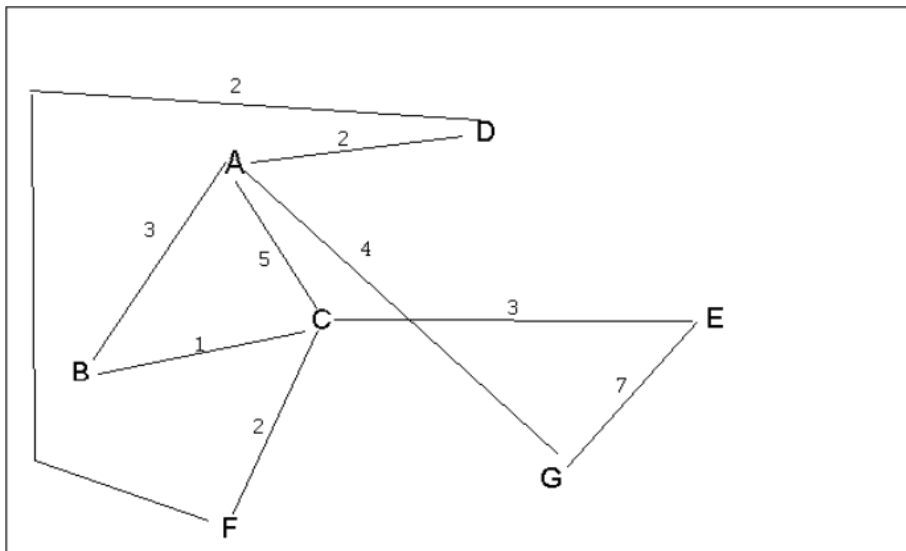
Texas

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

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



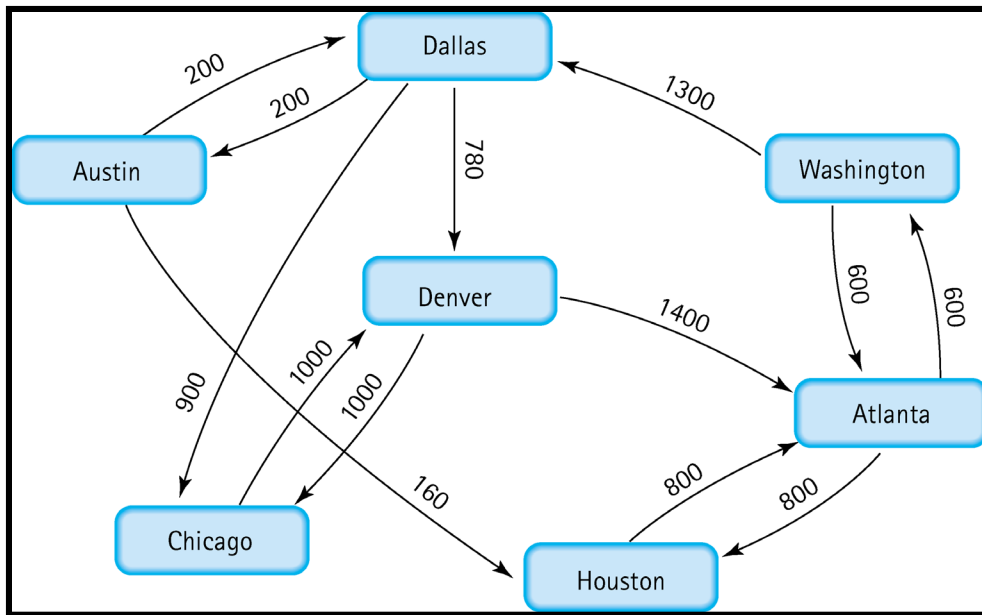


4 a. Which of the following lists the graph nodes in depth first order beginning with E?

- 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

Atlanta — Austin: $600 + 1300 + 200 = 2100$

" — Chicago: $600 + 1300 + 900 = 2800$

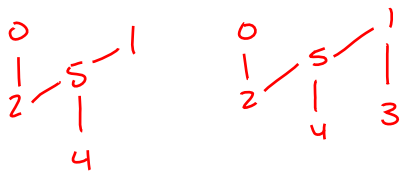
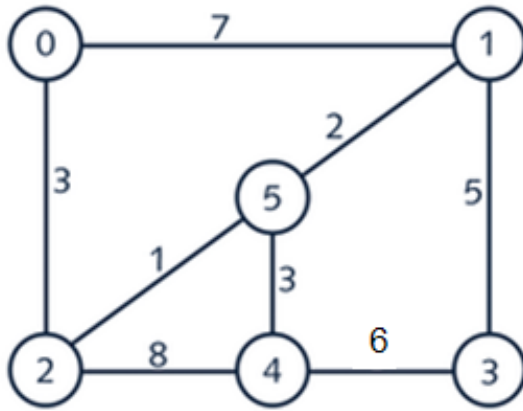
" — Dallas: $600 + 1300 = 1900$

" — Denver: $600 + 1300 + 780 = 2680$

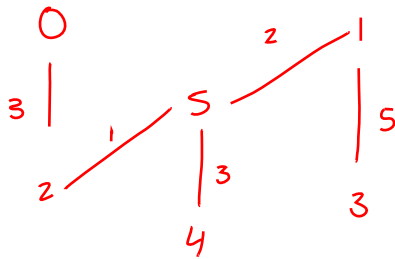
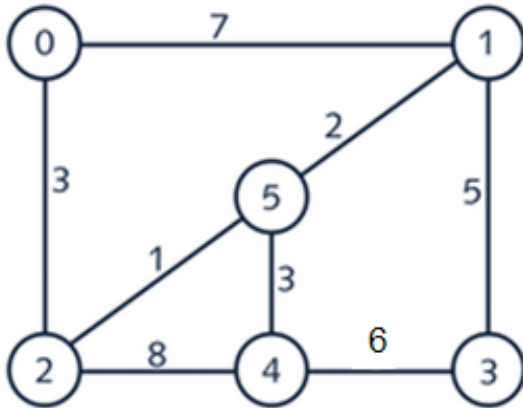
" — Houston: 800

" — Washington: 600

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

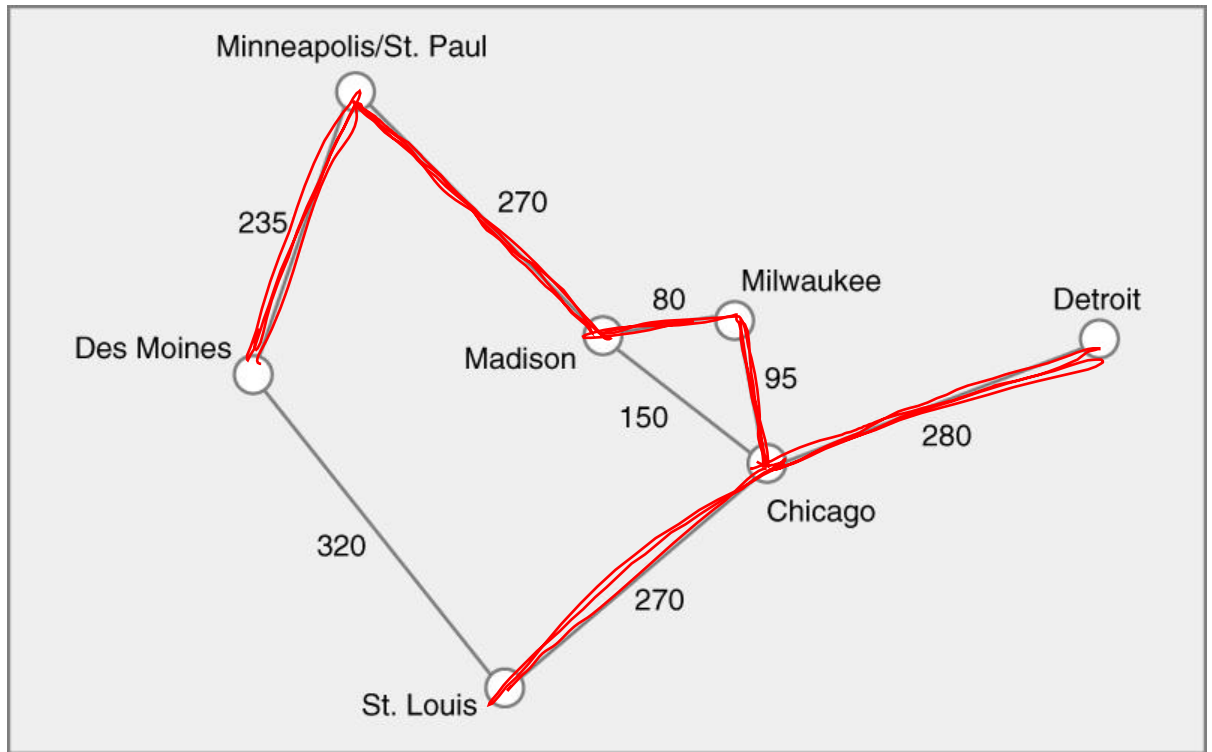


7. Find the minimal spanning tree using Kruskal's algorithm. Show the weights in order and the steps.

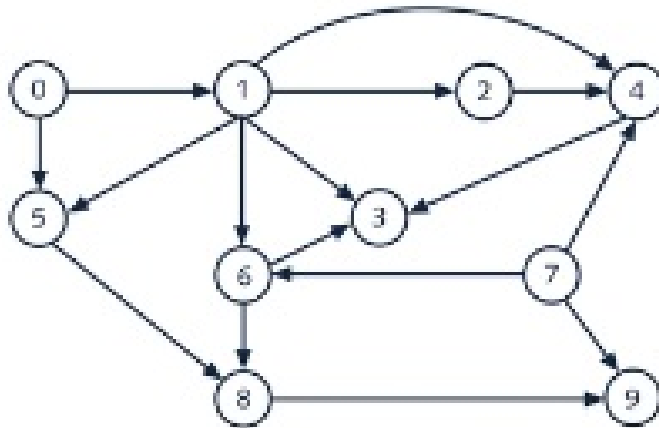


$2-5 : 1$
 $1-5 : 2$
 $0-2 : 3$
 $4-5 : 3$
 $1-3 : 5$
 ~~$3-4 : 6$~~
 ~~$0-1 : 7$~~
 ~~$2-4 : 8$~~

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

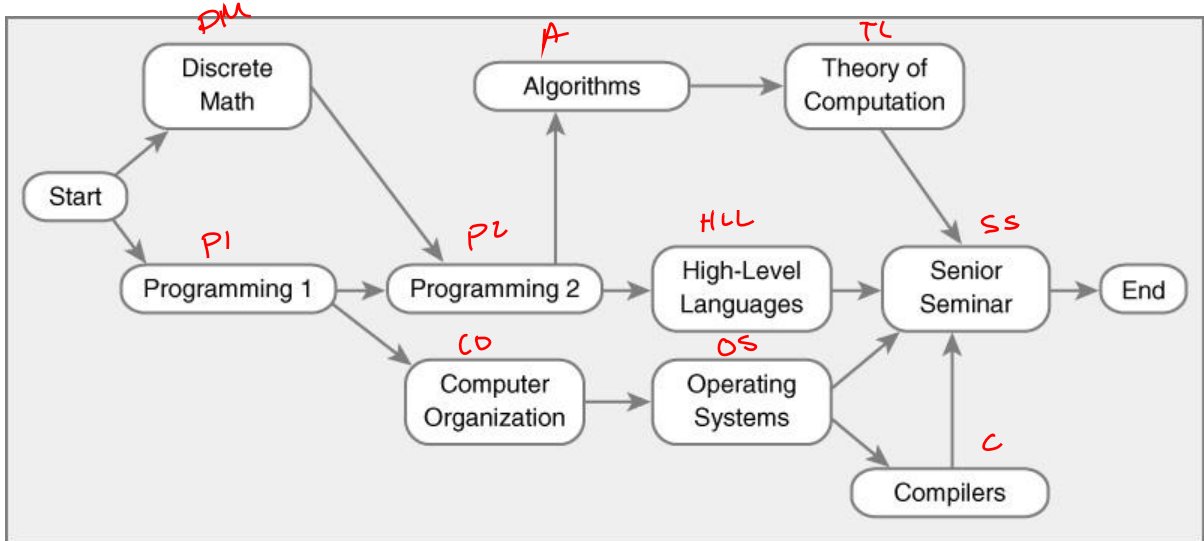


\emptyset 1 2 3 4 5 6 7 8 9
pred Count 0 0 0 0 0 0 0 0 0

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
S	1	2	3	4	5	6	7	8	9	10	11
pred count	0	0	0	0	0	0	0	0	0	0	0

queue

~~S~~ PM P1 P2 CO A HLL OS TC C SS E

Top. order

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