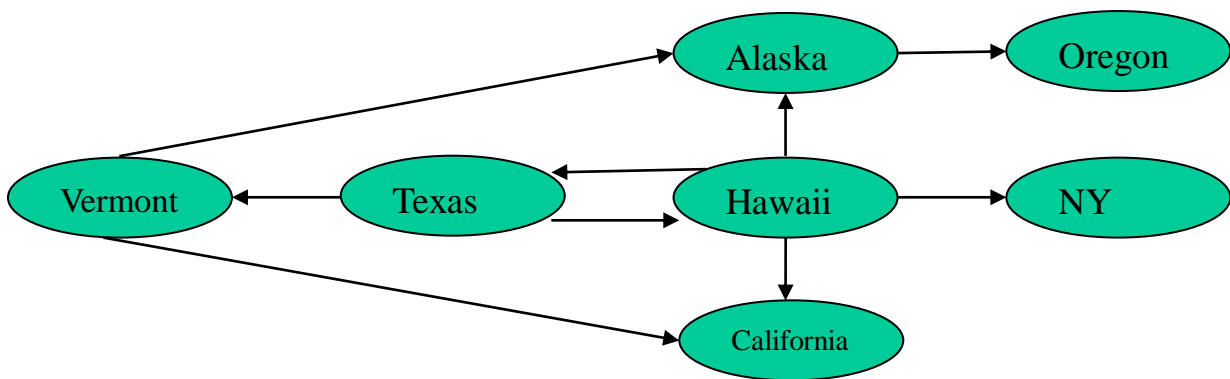


$V(\text{StateGraph}) = \{\text{Oregon, Alaska, Texas, Hawaii, Vermont, New York, California}\}$

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

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

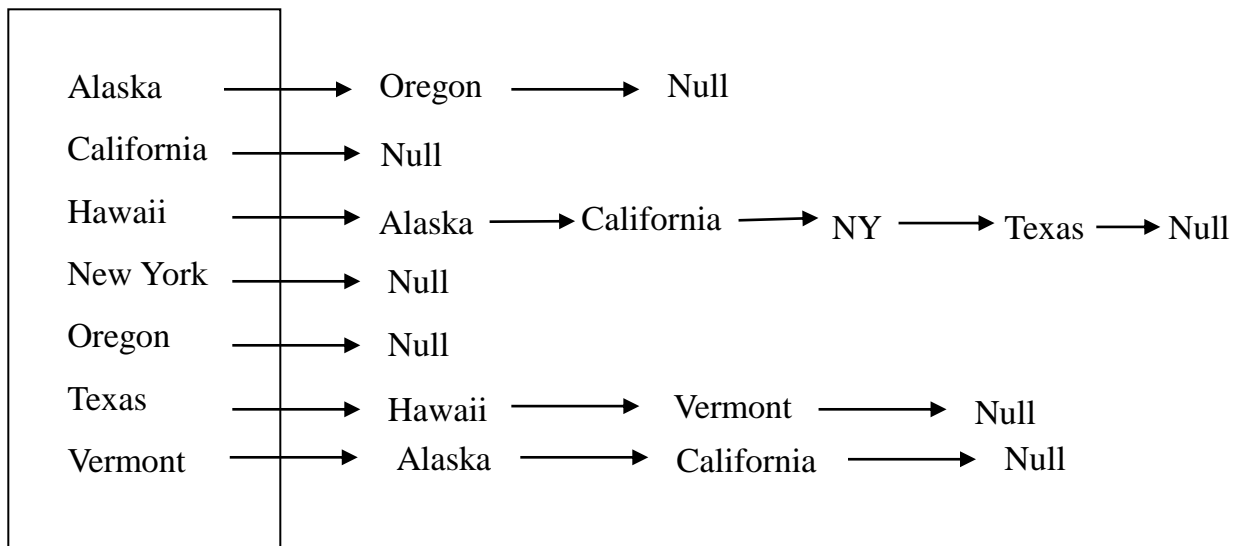
c. From which state(s) in the graph is there a path to Hawaii?

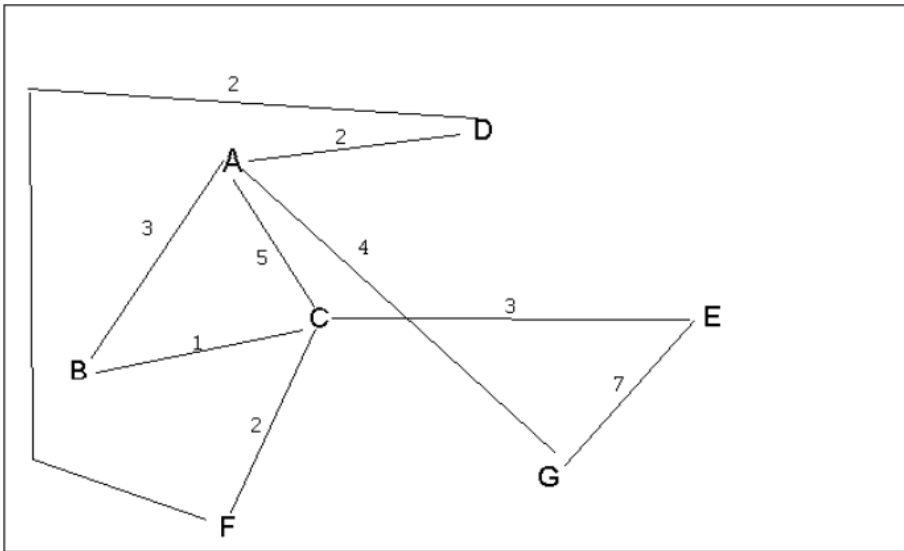
Texas

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

States	A	C	H	NY	O	T	V
Alaska	0	0	1	0	0	0	1
California	0	0	1	0	0	0	1
Hawaii	0	0	0	0	0	1	0
New York	0	0	1	0	0	0	0
Oregon	1	0	0	0	0	0	0
Texas	0	0	1	0	0	0	0
Vermont	0	0	0	0	0	1	0

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



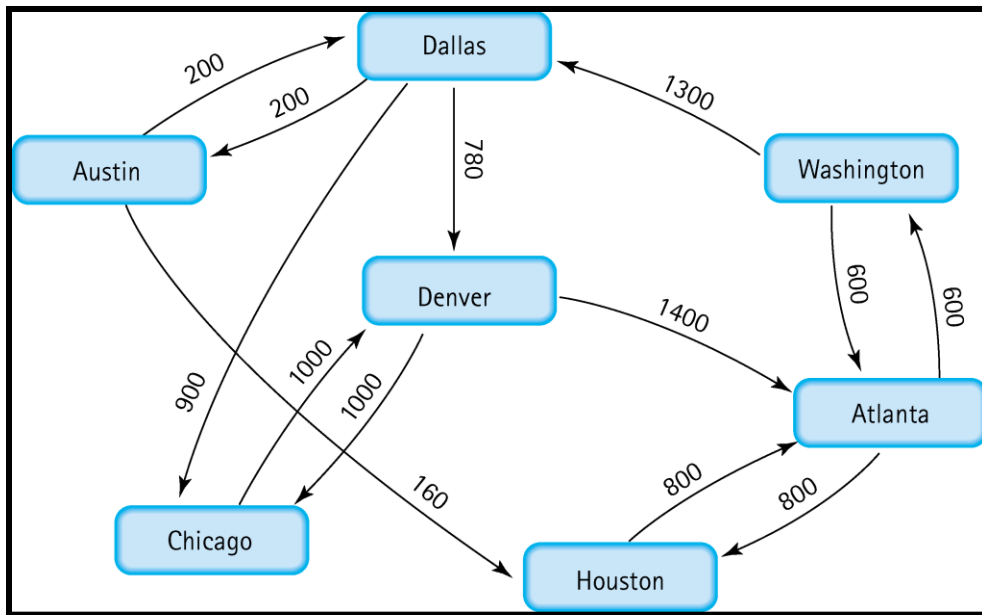


4 a. Which of the following lists the graph nodes in depth first order beginning with E?

- 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  $\rightarrow$  Washington = 600

Atlanta  $\rightarrow$  Houston = 800

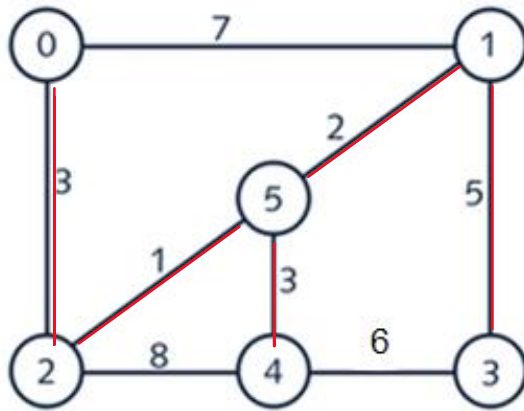
Atlanta  $\rightarrow$  Dallas = 1900

Atlanta  $\rightarrow$  Austin = 2100

Atlanta  $\rightarrow$  Denver = 2680

Atlanta  $\rightarrow$  Chicago = 2800

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



MST: 0

Step 1:  $3 < 7$

MST: 0 2

Step 2:  $1 < 8$

MST: 0 2 5

Step 3:  $2 < 3$

MST: 0 2 5 1

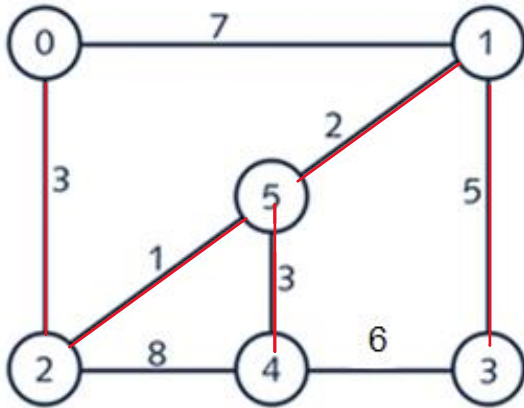
Step 4:  $5 < 7$

MST: 0 2 5 1 3

Step 4:  $3 < 6$

MST: 0 2 5 1 3 4

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



2-5 (1)

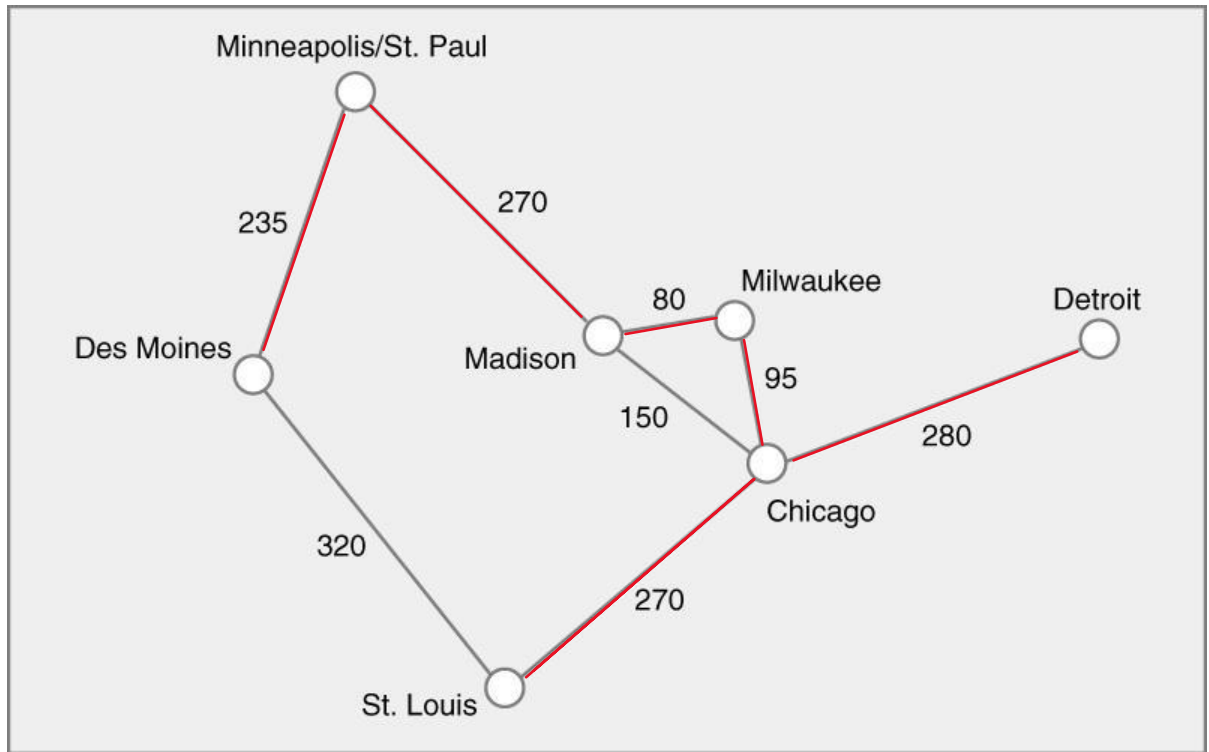
5-1 (2)

5-4 (3)

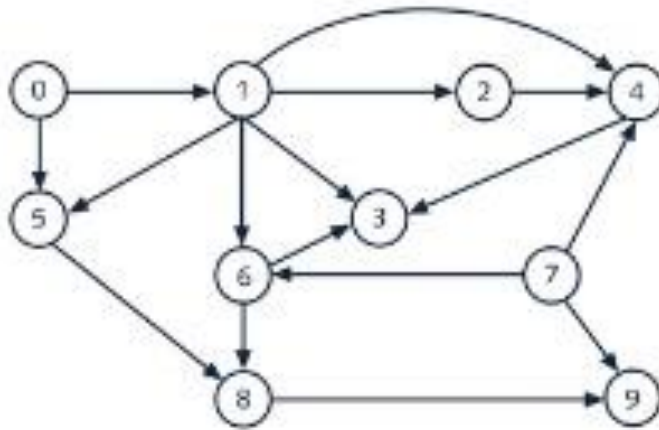
2-0 (3)

1-3 (5)

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



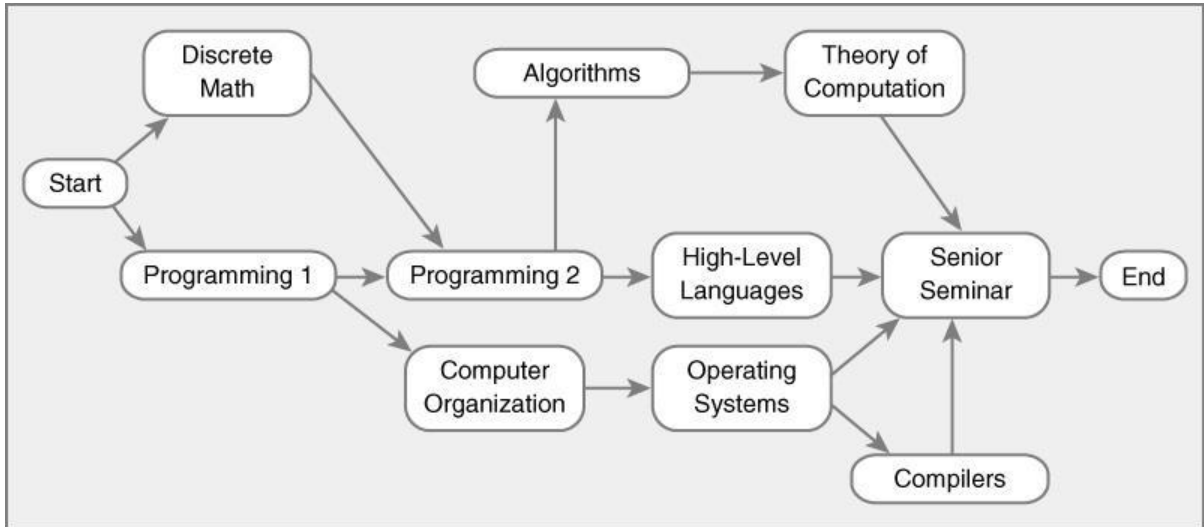
9. List the nodes of the graph in a breadth first topological ordering. Show the steps using arrays predCount, topologicalOrder and a queue



predCount	topologicalOrder	queue
0 1 1 3 3 2 2 0 2 2		0 7
0 0 1 3 3 1 2 0 2 2	0	7 1
0 0 1 3 2 1 1 0 2 1	0 7	1
0 0 0 2 1 0 0 0 2 1	0 7 1	2 5 6
0 0 0 2 0 0 0 0 2 1	0 7 1 2	5 6 4
0 0 0 2 0 0 0 0 2 1	0 7 1 2 5	6 4
0 0 0 1 0 0 0 0 0 1	0 7 1 2 5 6	4 8
0 0 0 0 0 0 0 0 0 1	0 7 1 2 5 6 4	8 3
0 0 0 0 0 0 0 0 0 0	0 7 1 2 5 6 4 8	3 9
0 0 0 0 0 0 0 0 0 0	0 7 1 2 5 6 4 8 3	9
0 0 0 0 0 0 0 0 0 0	0 7 1 2 5 6 4 8 3 9	



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



Start

Discrete Math

Programming 1

Programming 2

Computer Organization

Algorithms

High-Level Languages

Operating Systems

Theory of Computation

Compilers

Senior Seminar

End