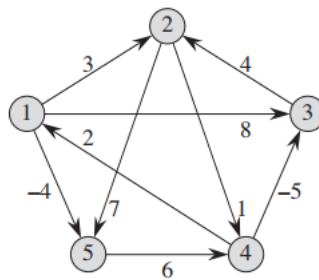


CSE 113 – Data Structure and Algorithms

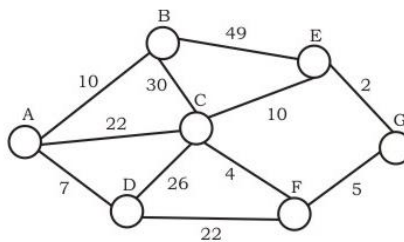
Assignment 2

Semester: July 2023

1. Discuss the variants of shortest path problem.
2. Apply Floyd Warshall algorithm to determine the all-pairs shortest path to the following graph.



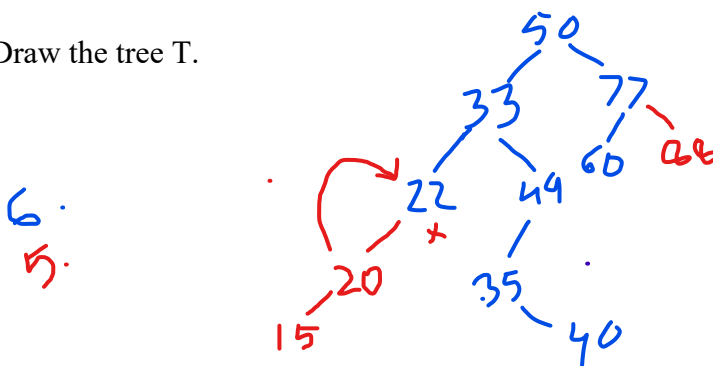
3. Using Prim's algorithm to construct a minimum spanning tree starting with node A, which one of the following sequences of edges represents a possible order in which the edges would be added to construct the minimum spanning tree?



4. Suppose the following eight numbers are inserted in order into an empty binary search tree T:

50, 33, 44, 22, 77, 35, 60, 40

Draw the tree T.



5. Consider the binary search tree draw in question 3. Draw the tree T if each of the following operations is applied to the original tree T.

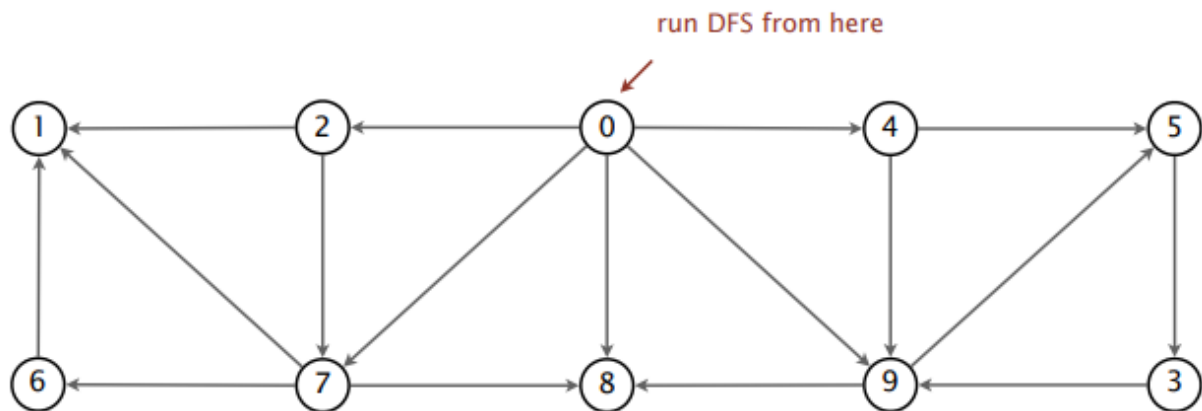
i. Node 20 is added to T. ii. Node 15 is added to T. iii. Node 88 is added to T

iv. Node 22 is deleted from T. v. Node 25 is deleted from T. vi. Node 75 is deleted from T

Not found

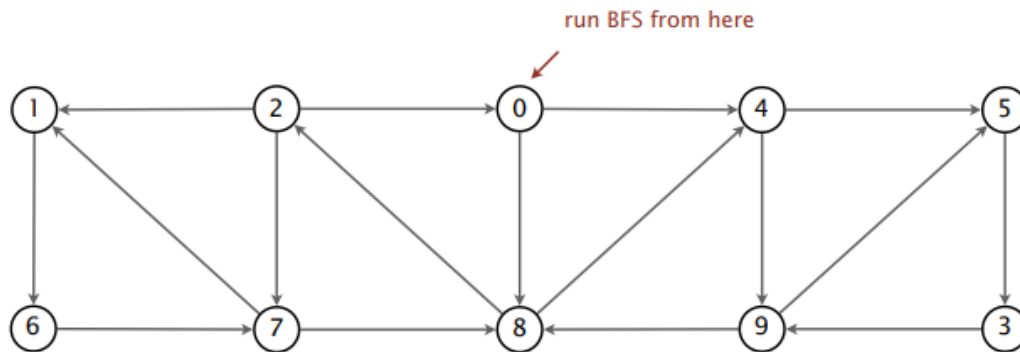
7. Suppose the six weights 4, 15, 25, 5, 8, 23 are given. Find a 2-tree T with the given weights and a minimum weighted path length P.

8. Run depth-first search on the following digraph, starting from vertex 0. Assume the adjacency lists are in sorted order: for example, when iterating over the edges pointing from 7, consider the edge $7 \rightarrow 1$ before either $7 \rightarrow 6$ or $7 \rightarrow 8$.



- i. List the 10 vertices in preorder.
- ii. List the 10 vertices in postorder.
- iii. Does this digraph have a topological order? If yes, write one in the box below; if no, succinctly explain why not.

9. Run breadth-first search on the following digraph, starting from vertex 0. Assume the adjacency lists are in sorted order: for example, when iterating over the edges pointing from 7, consider the edge $7 \rightarrow 1$ before either $7 \rightarrow 6$ or $7 \rightarrow 8$.



List the 10 vertices in the order in which they are added to the queue.

10. Consider the following directed graph as an adjacency matrix.

	0	1	2	3	4	5	6	7
0	0	190	0	230	220	0	0	130
1	190	0	280	0	0	0	0	0
2	0	280	0	0	0	0	250	300
3	230	0	0	0	240	0	0	0
4	220	0	0	240	0	0	0	0
5	0	0	0	0	0	0	150	0
6	0	0	250	0	0	150	0	0
7	130	0	300	0	0	0	0	0

Find the minimum spanning tree using Kruskal's algorithm. All the steps must be shown.