$E(\log V)$
$|V|)$

Date

TUTORIAL 6

Solution :- 1.

Minimum spanning tree :- A minimum spanning tree (MST) or minimum weight spanning tree is a subset of the edges of a connected edge-weighted undirected graph that connects all the vertices together, without any cycles and with the minimum possible total edge weight

Applications :-

i) Consider n station are to be linked using a communication network and lying of communication link between any two station involves a cost. The ideal solution would be to enact a subgraph termed as minimum cost spanning tree.

(ii) Suppose you meant to construct highways or railroads spanning several cities then we can use the concept of minimum spanning tree

iii) Design LAN.

(iv) Laying pipelines connecting offshore drilling sites, refineries and consume markets.

Solution :- 2

→ Time complexity of Prim's algorithm
$O((V+E)\log)$.

Space complexity of Prim's algorithm
$O(V)$.

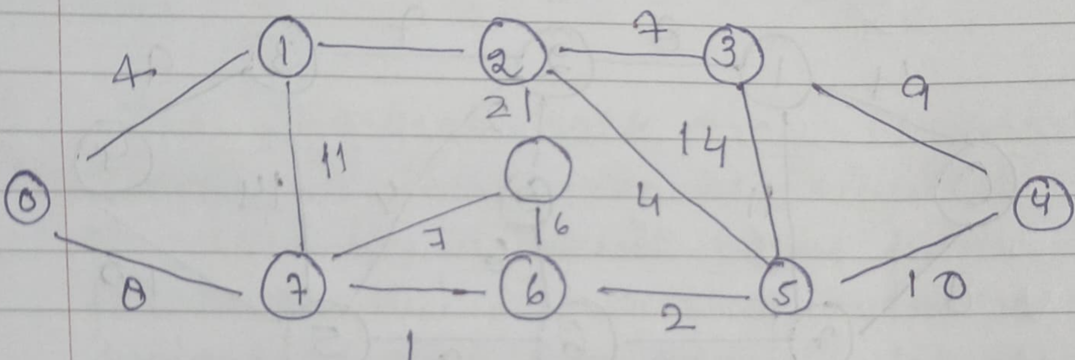
Date

Time Complexity of Kruskal's Algo:- $O(E(\log V))$
Space Complexity of Kruskal's Algo:- $O(|V|)$.

Time complexity of Dijkstra Algo:- $O(V^2)$.
Space complexity of Dijkstra Algo:- $O(V^2)$.

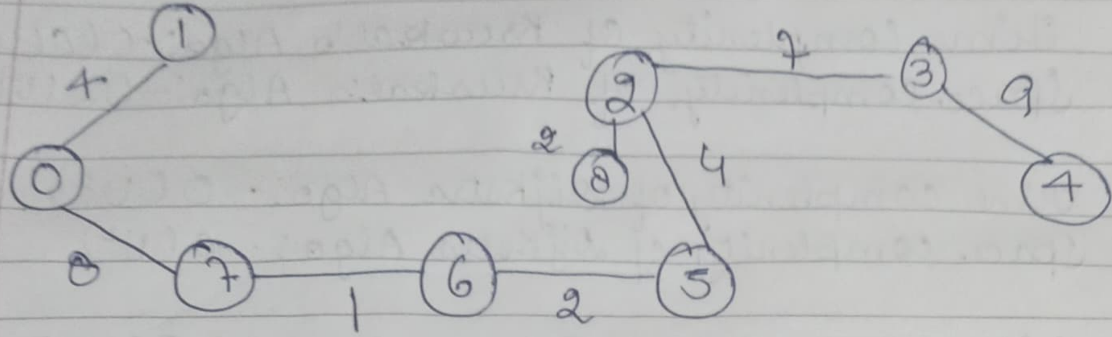
Time complexity of Bellmanford:- $O(VE)$.
Space Complexity of Bellmanford:- $O(E)$.

Solution:- 3



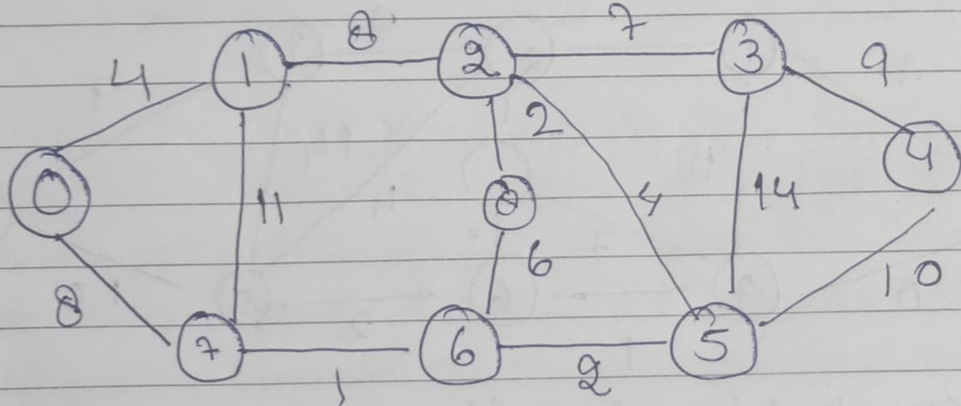
→ Kruskal's algorithm.

O	V	W		O	V	W
6	7	1 ✓		1	7	11 ×
5	6	2 ✓		3	5	14 ×
2	8	2 ✓				
0	1	4 ✓				
2	5	4 ✓				
6	8	6 ×				
2	3	7 ✓				
7	8	7 ×				
0	7	8 ✓				
1	2	8 ×				
4	3	9 ✓				
4	5	10 ×				



Weight = 1 + 2 + 2 + 2 + 4 + 4 + 7 + 8 + 9 = 37

Prim's Algorithm

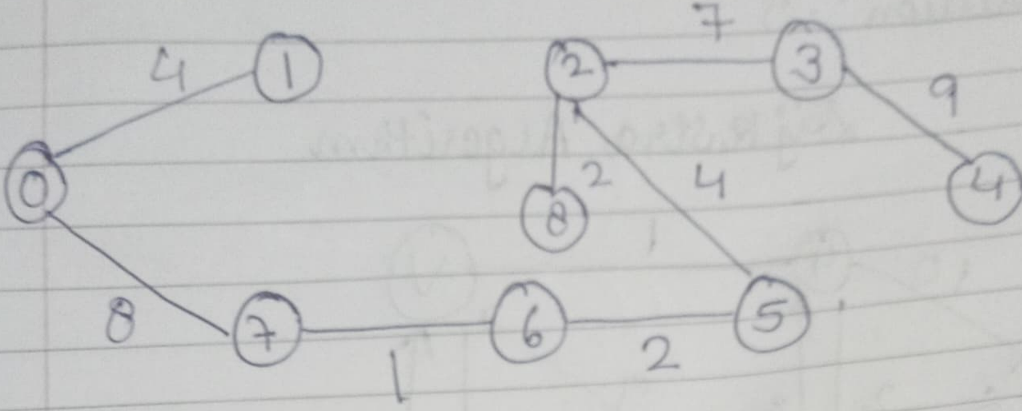


Weight :-

0	1	2	3	4	5	6	7	8
$\boxed{0\ \cancel{\infty}}$	∞	∞	∞	∞	∞	∞	∞	∞
	4						$\boxed{8}$	
						$\boxed{1}$		
		8						7
	11		7		4	1		$\boxed{2}$
			7		2			6
	4	14	1	10				
		$\boxed{7}$						
				$\boxed{9}$				

Parent:-

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



weight = 4 + 8 + 1 + 2 + 4 + 2 + 7 + 9 = 37 Ans.

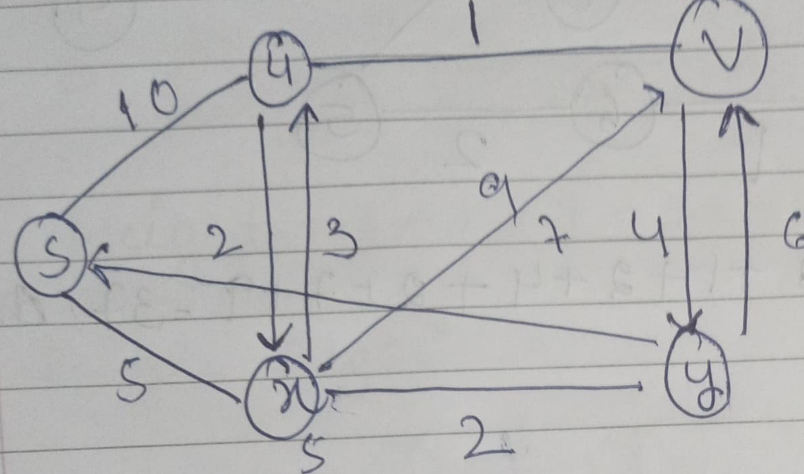
Solution :- 4.

i) The shortest path may changes. The reason is there may be different number of edges in different paths from 's' to 't'. for example:- let shortest path be of weight 15 and has edge 5. let there be another path with 2 edge and total weight 25. The weight of the shortest path is increased by 5 10 and becomes 15 + 50. weight of the other path is increased by 2 10 and becomes 25 + 20 so the shortest path changes to the other path with weight as 45.

ii) If we multiply all edges weight by 10, the shortest path don't change. The reason is simple, weight of all path from 's' to 't' ge multiplied by same amount. The no. of edges on a path don't matter, It is like changing units of weight.

Solution :- 5

Dijkstra Algorithm



node	Shortest distance from source node
u	8
x	5
v	9
y	7

Bellman ford algorithm.

	S	u	v	x	y
1st →	0	10	∞	5	∞
2nd →	0	10	11.1	5	∞
3rd →	0	8	9	5	7
4th →	0	8	9	5	7

→ graph does not have cycle