Tutorial-6

Ans-1 Minimum spanning tree is a subset of the edges of a connected edge-weighted undirected graph that connects all the vertices together, without any cycles & with the minimum possible total edge weight.

Applications:-

1) Design LAN
2) Laying pipelines connecting offshore drilling sites, refineries & consume markets.

Ans-2 → Time complexity of Prim's algorithm $O((V+E)\log)$

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

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

Space " " " " :- $O(|V|)$

Time Complexity of Dijkstra Algo :- $O(V^2)$

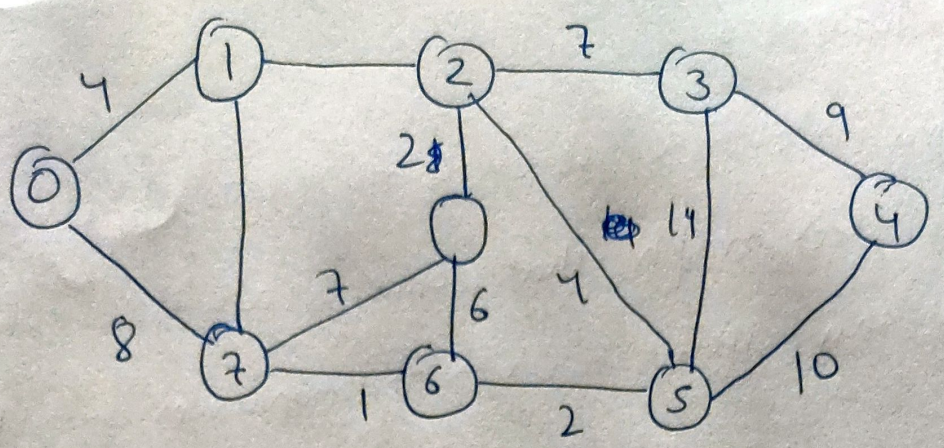
Space " " " " :- $O(V^2)$

Time complexity of Bellmanford :- $O(VE)$

Space " " " :- $O(E)$

Ans-3

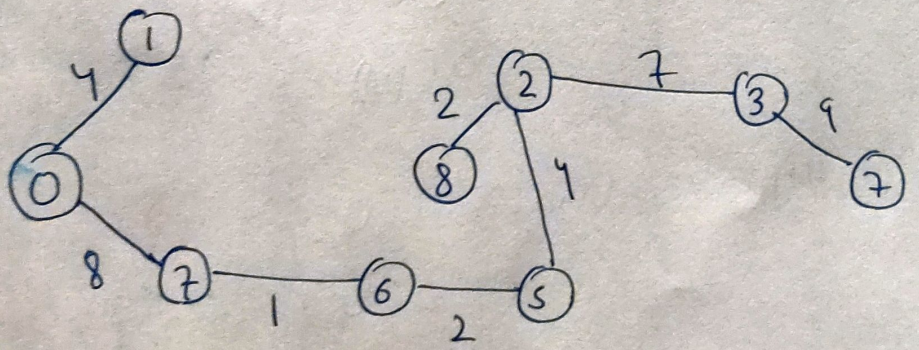
Ans-3



→ Kruskal's algorithm

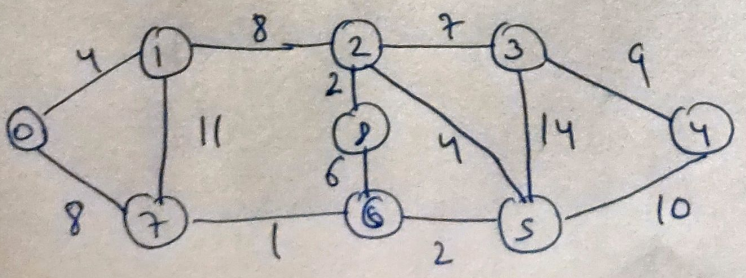
U	V	W	
6	7	1	✓
5	6	2	✓
2	8	2	✓
0	1	4	✓
2	5	4	✓
6	8	6	X
2	3	7	✓
7	8	7	X
0	7	8	✓
1	2	8	X
4	3	9	✓
4	5	10	X

U	V	W	
1	7	11	X
3	5	14	X



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

Prim's Algorithm

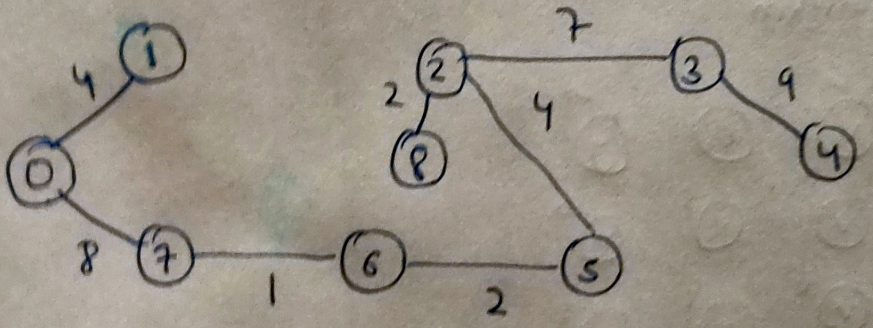


weight :-

0	1	2	3	4	5	6	7	8
0	∞	∞	∞	∞	∞	∞	∞	∞
	4						12	
		8			11			7
			15	14	11			12
				14				16
	14			10				
	14							

Parent :-

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



weight

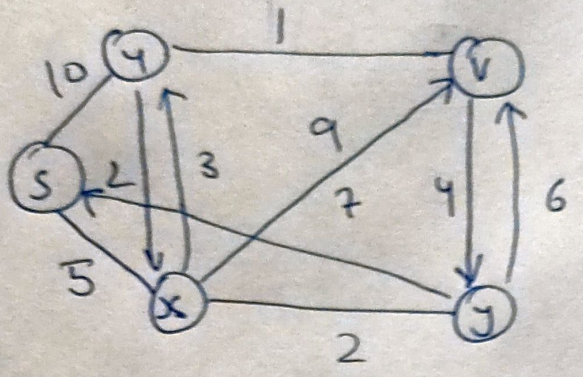
= 4+8+1+2+4+2+7+9 = 37 Ans.

Ans-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 & has edges 5. Let there be another path with 2 edge & total weight 28. The weight of the shortest path is increased by 5 & become 15 + 50. Weight of another path is increased by 2*10 & become 28 + 20 so

the shortest path change to the other path with weight as 45.

(iv) If we multiply all the edges weight by 10, the shortest weight of all path from 's' to 't' multiplied by same amount the no. of edges on a path don't matter. It is like changing limits of weight.

Ans =



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

Bellman ford algorithm

1st :- s(0) u(10) v(∞) x(5) y(∞)

2nd :- s(0) u(10) v(14) x(5) y(∞)

3rd :- s(0) u(8) v(9) x(5) y(7)

4th :- s(0) u(8) v(9) x(5) y(7)