TUTORIAL :- 06

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Ques :-

Solution :→ Minimum spanning tree is a subset of edges of a connected edge-weighted undirected graph that connects all the vertices together without any cycle & with minimum possible edge weighted.

APPLICATION

•) Consider n stations are to be linked using a communication network and laying of communication link between any two station involves a cost.

•) Designing LAN.

•) Suppose you want to construct highways or railroads spanning several cities, then we can use concept of MST

•) Laying pipes in connecting offshore drilling sites, refineries & consumer market.

Ques :-

Solution :- Time complexity of Prim's Algorithm : $O(|E| \log |V|)$
Space " " " " : $O(|V|)$

Time complexity of Kruskal's Algorithm : $O(|E| \log |E|)$
Space " " " " : $O(|V|)$

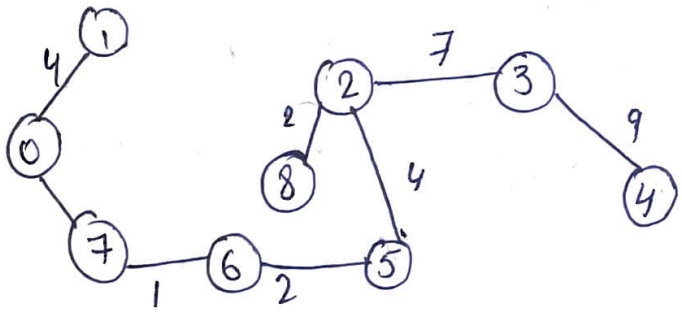
Time complexity of Dijkstra Algo. :→ $O(V^2)$
Space " " " " :→ $O(V^2)$

Time complexity of Bellman Ford Algo :→ $O(VE)$
Space " " " " :→ $O(E)$

Q3)

Solution: Kruskal's Algorithm.

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



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

Prim's Algorithm

weight = 4+8+2+4+2+7+9+3
= 37

Q4):-

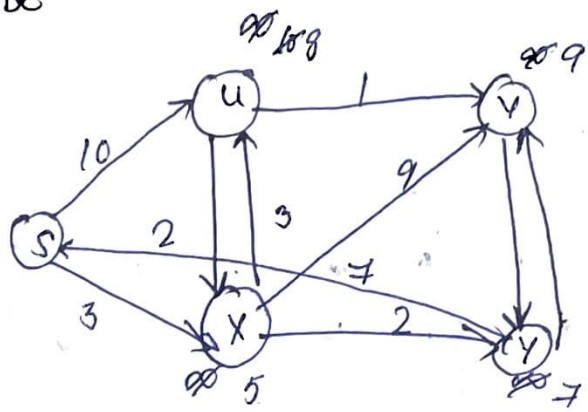
Solution:- i) The shortest path may change. The reason is that there may be different no. of edges in different path from 's' to 't'.

ii) If we multiply all edges weight by 10, the shortest path doesn't change. The reason is that weight of all path from 's' to 't' get multiplied by same unit. The no. of edges on path doesn't matter.

5 Qus

Solution:- Dijkstra's Algorithm

NODE	SHORTEST DISTANCE FROM SOURCE NODE
u	8
x	5
v	9
y	7.



Bellman Ford Algorithm:-

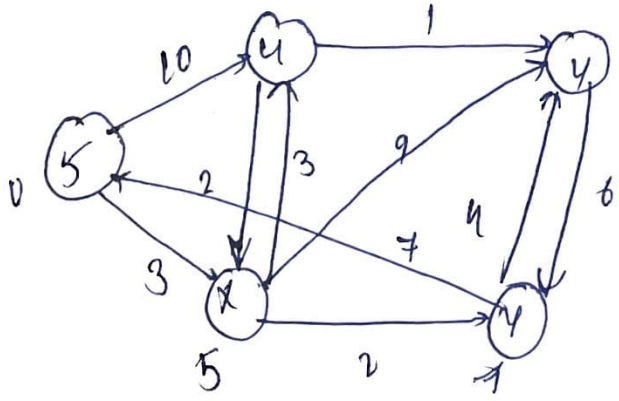
1'st :→ 

2nd :→ 

3rd :→ 

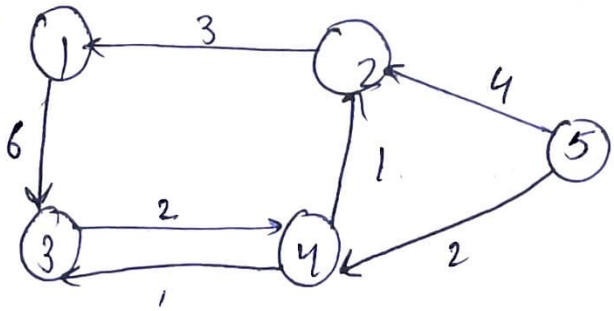
4th :→ 

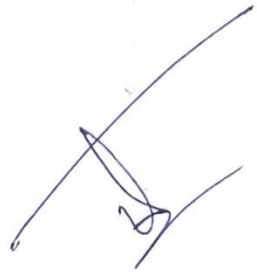
graph does not have negative cycle.



6Qus:-

Solution:-





	1	2	3	4	5
1	0	∞	6	3	∞
2	2	0	∞	∞	∞
3	∞	∞	0	2	∞
4	∞	1	1	0	∞
5	∞	4	∞	2	0

	1	2	3	4	5
1	0	∞	8	3	∞
2	2	0	8	5	∞
3	∞	∞	∞	2	∞
4	∞	1	0	0	∞
5	∞	4	∞	2	0

	1	2	3	4	5
1	0	∞	6	3	∞
2	2	0	8	5	∞
3	∞	∞	0	2	∞
4	3	1	1	0	∞
5	6	4	12	2	0

	1	2	3	4	5
1	0	∞	6	3	∞
2	2	0	8	5	∞
3	∞	∞	0	2	∞
4	3	1	1	0	∞
5	6	4	12	2	0

time complexity $\Rightarrow O(|V|^3)$

space complexity $\rightarrow O(|V|^2)$