~~Tutor~~

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Tutorial 6

Sol 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 weighted.

Applications:-

(I) Consider n stations are to be linked using a communication network and lying of communication link between any two station involve a cost. The ideal solution would be to extract a subgraph termed as minimum cost spanning tree.

(II) Suppose you want to construct highways or railroads spanning several cities. Then we can use the concept of minimum spanning Tree

(III) Designing LAN

(IV) Laying pipelines connecting offshore drilling sites, refineries & consumer markets

(V) Suppose you want to apply a set of houses with:-

* Electric Power
* Water
* Telephone Line
* Sewage Lines

Sol 2.> Time Complexity of prim's algorithm :- $O(|E| \log |V|)$

Space Complexity of prim's algorithm :- $O|V|$

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

Space Complexity of Kruskal's algorithm :- $(O|V|)$

Time complexity of Dijkstra's algorithm :- $O(V^2)$

Space complexity of Dijkstra's algorithm :- $O(V^2)$

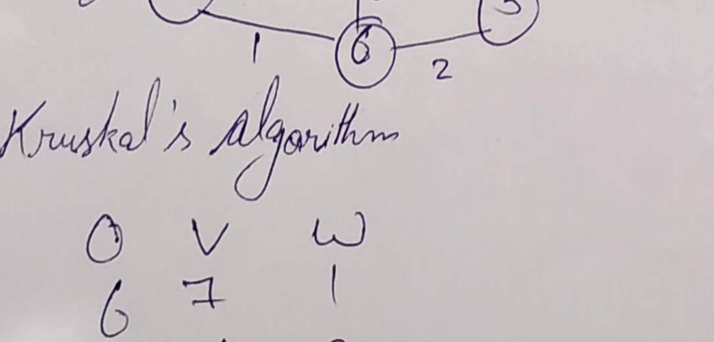
Time Complexity of Bellman ford's algorithm

$O(VE)$

Space complexity of Bellman ford's algorithm

$O(E)$

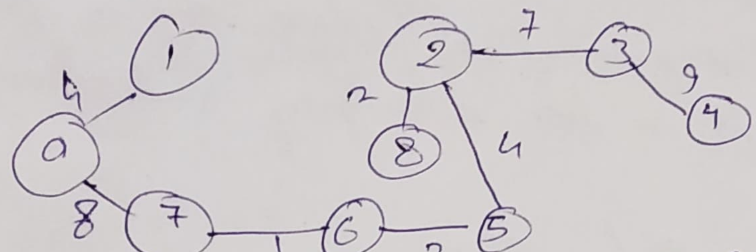
Sol 3



Kruskal's Algorithm

U	V	W
6	7	1
5	6	2
2	8	2
0	1	4
2	5	4
6	8	6

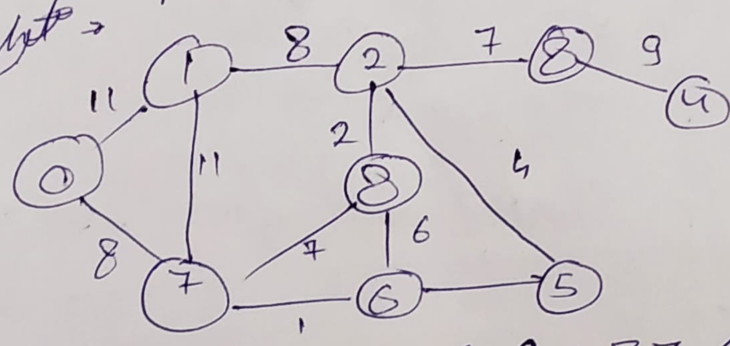
u	v	w
2	3	7
7	8	7
0	7	8
1	2	8
4	3	9
4	5	10
1	7	11
3	5	14



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

Prim's Algorithm

~~weight →~~

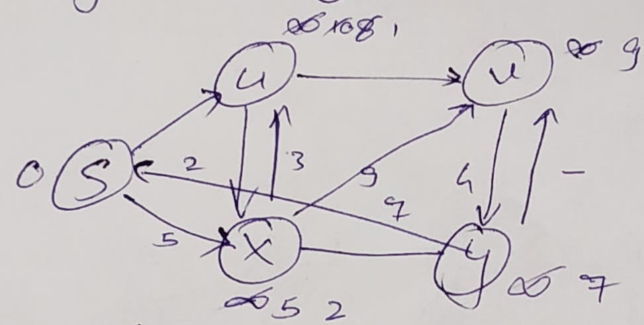


Weight -> 4+8+2+4+2+7+9 = 37 Ans

Ans 4 :- The shortest path may change. The reason is there may be different number of edges in different path from s to t. For eg :- Let shortest path ~~the~~ of weight 15 and has edge 5 edges. Let there be another path with 2 edges and total weight as. The weight of the shortest path is increased by $5V_{10}$ and becomes $15+50$ weight of the other path is increased by $2V_{10}$ & becomes $25+20$. So the shortest path changes to the other path with weight as 45

(11) if we multiply all edges weight by 60, the shortest path doesn't change, The reason is simple. weights of all path from s to t get multiplied by same amount. The number of edges on a path doesn't matter. It is like changing units of weights

Sol 5 Dijkstra Algorithm



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

llman Ford Algorithm

1st	s 0	u ~~∞~~ 10	v ∞	x ~~∞~~ 5	y ∞
2nd	s 0	u 10	v ~~∞~~ 11	x 5	y ∞
3rd	s 0	u 8 ~~10~~	v ~~11~~ 9	x 5	y ~~∞~~ 7
4th	s 0	u 8	v 9	x 5	y 7

graph doesn't have -ve cycle

Final graph: