

over what is Minimum spanning Tree? What are applications of MST

MST is the subset of edges of a connected edge-weighted undirected graph that connects all vertices together without any cycles & with min possible edge weight.

Applications

1) Designing LAN

2) To construct highways connecting multiple cities.

3) Laying pipelines in a city.

2) ANALYZE THE time complexity of Bellman Ford

Time complexity of Prim's space complexity

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

Prim, Kruskal, Dijkstra and

$O|V|$

Prim

Kruskal

$O|E| \log |E|$

$O|V|$

Dijkstra

$O(V^2)$

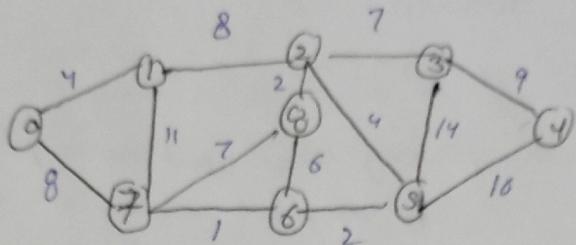
$O(V^3)$

Bellman Ford

$O(V^3)$

$O(E)$

Q. Apply Kruskal & Prim's Algorithm on given graph and find MST

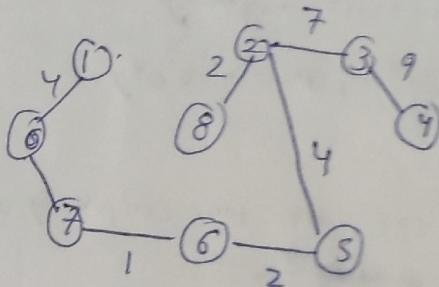


Kruskal's

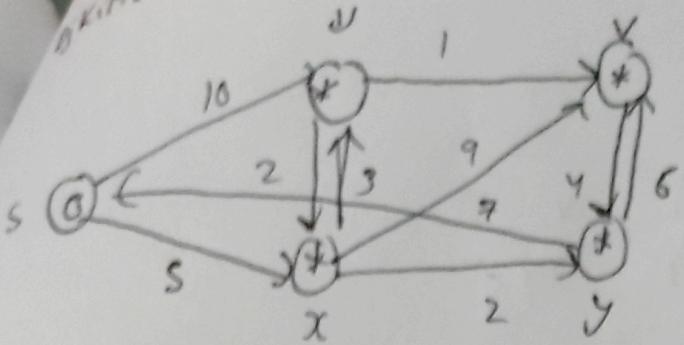
σ	v	w	
6	7	1	✓
5	6	2	✓
2	8	2	✓
0	1	4	✓
2	5	4	✓
6	8	6	X
2	3	7	✓
7	8	7	X
0	7	8	✓
1	2	8	X
4	3	9	✓
4	5	10	X
1	7	11	X
3	5	14	X

Prim's

$$\text{Weight} = 4 + 8 + 2 + 4 + 2 + 7 + 9 + 3 \\ = 37$$



$$\text{Weight} = 1 + 2 + 2 + 4 + 4 + 7 + 8 + 10 \\ = 37$$



Dijkstra's

No dp

4

X

V

Y

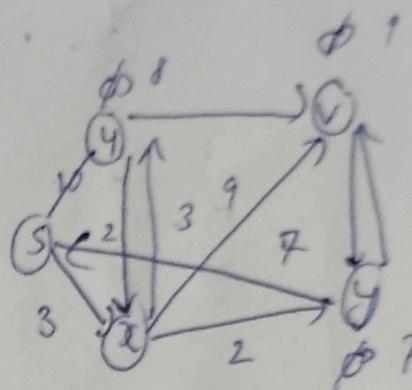
Shortest Dist from source

8

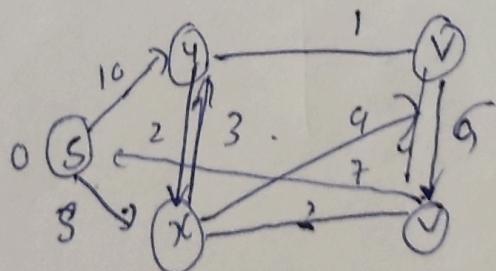
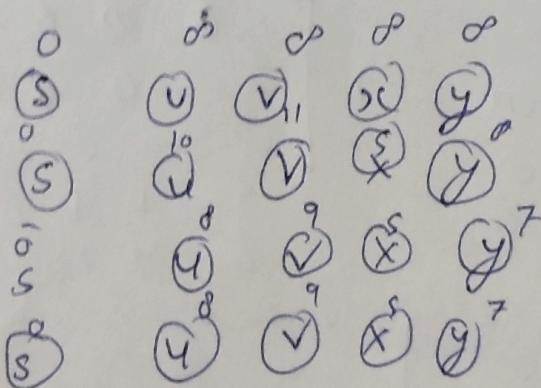
5

9

7

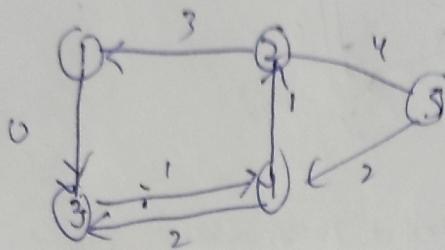


BELLMAN FORD



Final graph

Qn Apply all pair shortest path algo Floyd Warshall - Also analyse space & time complexity of



$$\begin{bmatrix} \infty & 2 & 3 & 4 & 5 \\ 0 & 0 & 6 & 3 & \infty \\ 1 & \infty & 0 & 3 & \infty \\ 2 & \infty & 6 & 0 & \infty \\ 3 & \infty & 2 & 0 & \infty \\ 4 & \infty & 1 & 0 & \infty \\ 5 & \infty & 0 & 2 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 0 & 6 & 3 & \infty \\ 2 & 0 & 0 & 1 & \infty \\ \infty & 0 & 0 & 2 & \infty \\ 0 & 1 & 1 & 0 & \infty \\ \infty & \boxed{4} & 0 & 2 & 0 \end{bmatrix} \rightarrow \begin{bmatrix} 0 & 0 & 6 & 3 & \infty \\ 2 & 0 & 0 & 5 & \infty \\ \infty & 0 & 0 & 2 & 0 \\ 3 & 1 & 1 & 0 & 0 \\ 0 & 4 & 12 & 2 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 0 & 6 & 3 & \infty \\ 2 & 0 & 0 & 5 & \infty \\ \infty & 0 & 0 & 2 & 0 \\ 3 & 1 & 1 & 0 & \infty \\ 6 & 4 & 12 & 2 & 0 \end{bmatrix}$$

Time comp $\rightarrow O(|V|^3)$

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