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Date : \_\_\_/\_\_\_/\_\_\_

## Tutorial-6

1. Minimum Spanning Tree is a subset of edges of a connected edge weighted undirected graph that connects all the vertices together without any cycles & with minimum possible edge weighted.

### Applications -

- (i) Consider 'n' stations are to be linked using a communication network and laying of communication link b/w any two stations involves a cost.
- (ii) Designing LAN.
- (iii) Laying pipeline connecting offshore drilling sites, refineries & consumer markets.

2. Prim's Algorithm:	Time	Space
	$O( E  \log  V )$	$O( V )$
Kruskal's Algo:	$O( E  \log  E )$	$O( V )$
Dijkstra's Algo:	$O(V^2)$	$O(V^2)$
Bellman Ford	$O(VE)$	$O(E)$

3. Kruskal's Algo:	O	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

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

Prim's Algo: Weight:  $4+8+2+4+2+7+9+3$   
 $= 37$

5. Dijkstra's Algo: NODE Shortest Dist from source node

u	8
x	5
v	9
y	7

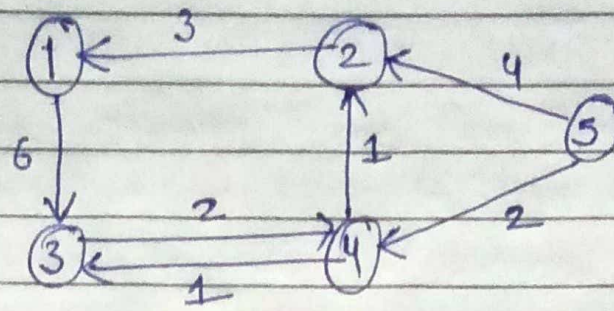
Bellman Ford Algo:

1<sup>st</sup> →  $\overset{0}{(5)}$   $\overset{\infty}{(4)}$   $\overset{\infty}{(v)}$   $\overset{5}{(x)}$   $\overset{\infty}{(y)}$   
 2<sup>nd</sup> →  $\overset{0}{(5)}$   $\overset{10}{(4)}$   $\overset{11}{(v)}$   $\overset{5}{(x)}$   $\overset{\infty}{(y)}$   
 3<sup>rd</sup> →  $\overset{0}{(5)}$   $\overset{8}{(4)}$   $\overset{9}{(v)}$   $\overset{5}{(x)}$   $\overset{7}{(y)}$   
 4<sup>th</sup> →  $\overset{0}{(5)}$   $\overset{8}{(4)}$   $\overset{9}{(v)}$   $\overset{5}{(x)}$   $\overset{7}{(y)}$

Graph does not have negative cycle



6.



	1	2	3	4	5
1	0	$\infty$	6	3	$\infty$
2	2	0	$\infty$	$\infty$	$\infty$
3	$\infty$	$\infty$	0	2	$\infty$
4	$\infty$	1	1	0	$\infty$
5	$\infty$	4	$\infty$	2	0

	1	2	3	4	5
1	0	$\infty$	6	3	$\infty$
2	2	0	8	5	$\infty$
3	$\infty$	$\infty$	0	2	$\infty$
4	$\infty$	1	1	0	$\infty$
5	$\infty$	4	$\infty$	2	0

	1	2	3	4	5
1	0	$\infty$	6	3	$\infty$
2	2	0	8	5	$\infty$
3	$\infty$	$\infty$	0	2	$\infty$
4	3	1	1	0	$\infty$
5	6	4	12	2	0

	1	2	3	4	5
1	0	$\infty$	6	3	$\infty$
2	2	0	8	5	$\infty$
3	$\infty$	$\infty$	0	2	$\infty$
4	3	1	1	0	$\infty$
5	6	4	12	2	0

$$T.C = O(|V|^3)$$

$$S.C = O(|V|^2)$$