Tutorial - 6

Ans 1 :- **Min Spanning Tree :-** A min spanning tree (MST) is a subset of edges of a connected edge weighted undirected graph that connects all vertices together, without any cycle and with min possible total edge weight.

Applications :-

(i) Suppose you meant to construct highways or railroads spanning several cities.

(ii) Consider n station are to be linked using a communication network.

(iii) Design LAN.

(iv) Laying pipelines

Ans 2 :- Prim's Algorithm

$TC = O((V+E)\log)$

$SC = O(V)$

Kruskal's Algo

$TC = O(E(\log V))$

$SC = O(|V|)$

Dijkstra's Algo

$TC = O(V^2)$

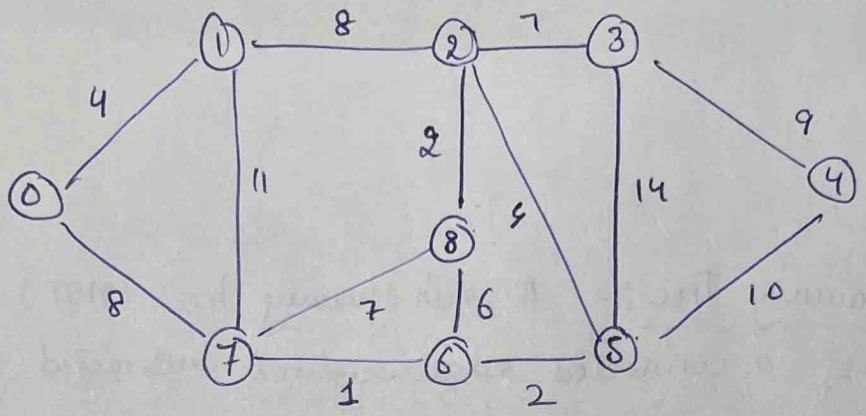
$SC = O(V^2)$

Bellman ford

$TC = O(VE)$

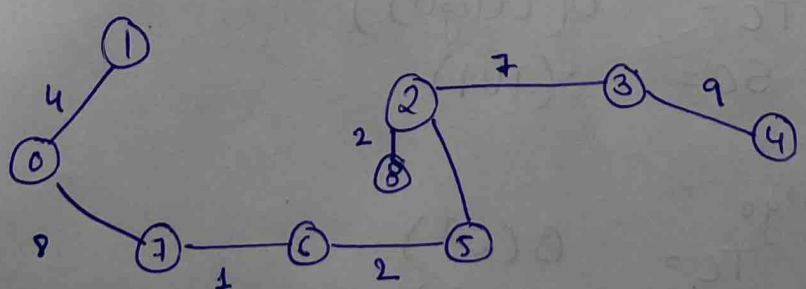
$SC = O(E)$

Ans 3:-



Kruskal's Algo:-

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
1	7	11	X
3	5	14	X



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

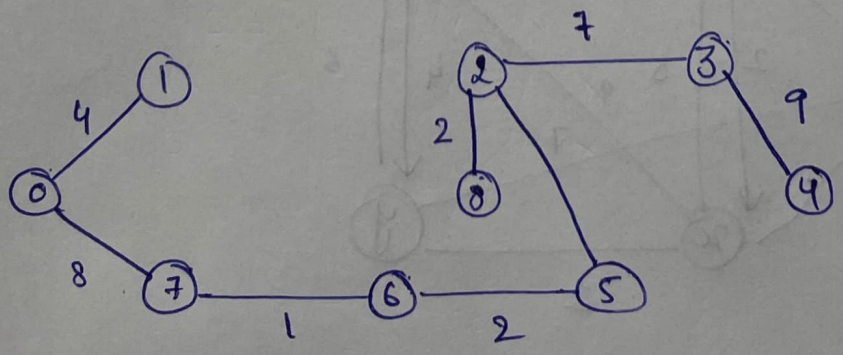
Prim's Algo :-

weight :-

0	1	2	3	4	5	6	7	8
[0]	∞	∞	∞	∞	∞	∞	∞	∞
	4						[8]	
		8				[1]		7
	11		7		4	1		[2]
			7		2			6
	4		14		1	10		
			[7]					
					[9]			

Parent

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



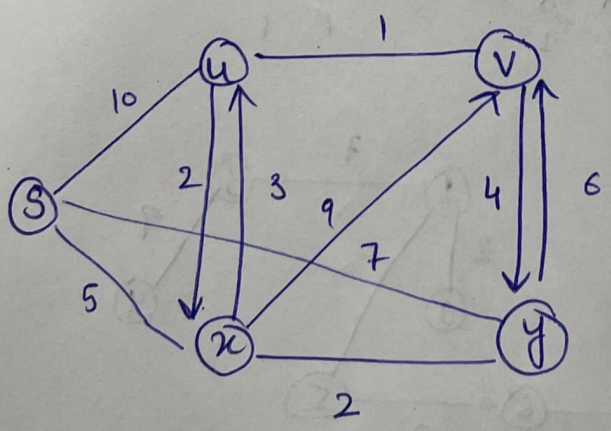
Weight :- 4+8+1+2+4+2+7+9 = 37 Ans

Ans 4 :- The shortest path may change. The reason is there may be diff no. of edges in diff path from 's' to 't' for ex. Shortest path can be of weight 15 and has edge 5. Let there be another path with edge 2 and Total weight 25. The weight of shortest path is inc. & becomes 15+50 & weight of other path inc. and becomes 25+20 so that shortest path changes to the other path.

(ii) If we multiply all edge weight by 10, the shortest path don't change. The reason is simple that weight of all path from 's' to 't' gets multiplied by 10 (ie same amount).

Ans 5: -

Dijkstra's Algorithm.



node	Shortest dist 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^{11}	x^{5}	y^{∞}	→ graph does not have cycle
3rd →	s^0	u^{8}	v^{9}	x^{5}	y^{7}	
4th →	s^0	u^{8}	v^{9}	x^{5}	y^{7}