Tutorial 6

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Section - 9

Roll no - 36

Q1. what do you mean by minimum spanning Tree. write down its applications.

minimum spanning tree (MST) or minimum weight spanning tree is a subroute of edges of a connected edge weighted undirected graph that connects all the vertices together without any cycles and with minimum possible total edge weight.

Applications.

1) Design LAN

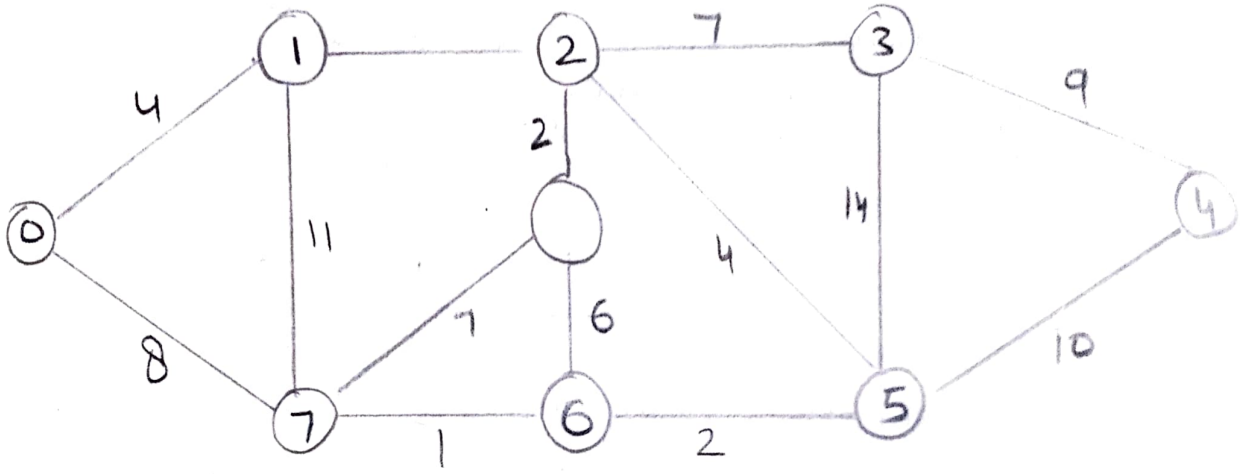
2) Laying pipelines / connecting offshore, drilling sites, refineries & consume markets.

3) construct highways and railroads spanning several cities then we can use MST.

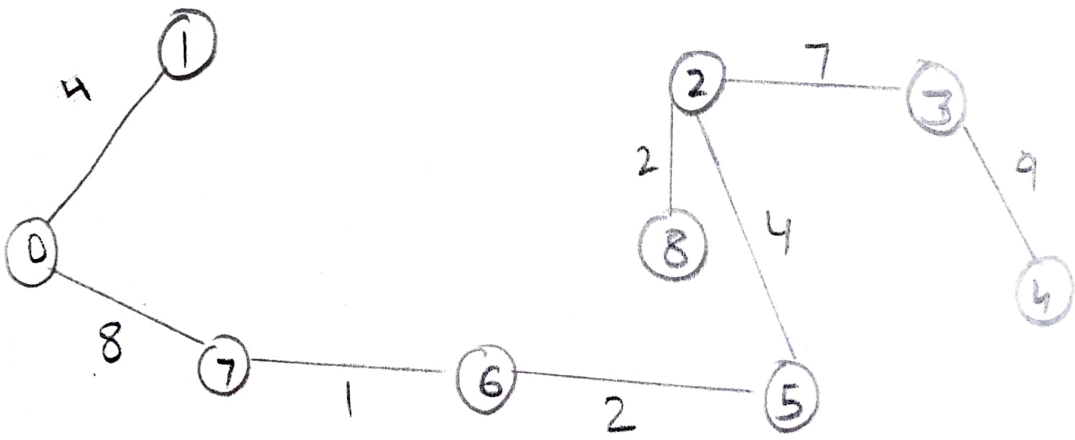
2. Analyse time and space of Prim, Kruskal, Dijistra and Bellman Ford.

Prim's Algorithm	Kruskal Algorithm	Dijistra's Algorithm	Bellmanford
Time : $O(V+E\log)$	Time : $O(E \log V)$	Time : $O(V^2)$	Time $O(VE)$
Space : $O(V)$	Space : $(O(V))$	Space : $O(V^2)$	Space $O(E)$

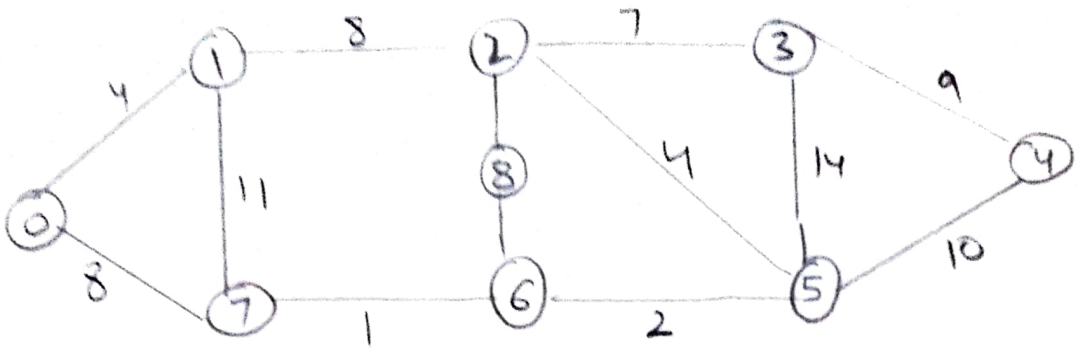
3. Apply Kruskal's and Prim's Algorithm on the graph below →



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



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

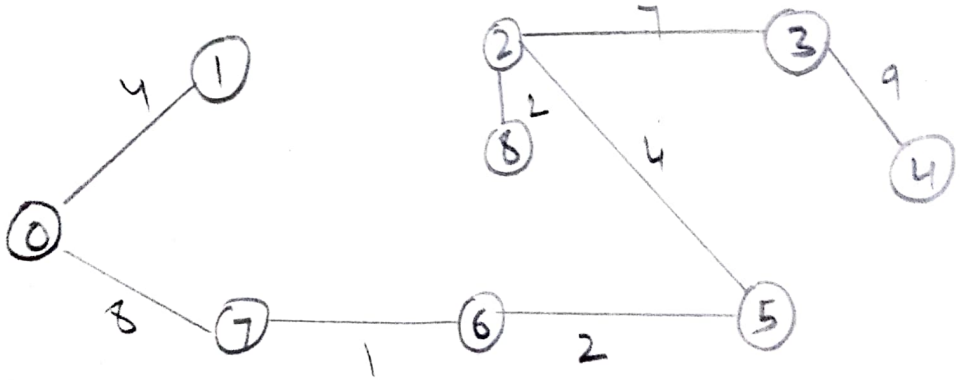


Weight

0	1	2	3	4	5	6	7	8
0 ~~0~~	∞	∞	∞	∞	∞	∞	∞	∞
	4	∞	∞	∞	∞	∞	8	∞
		8	∞	∞	∞	1	7	∞
			7	∞	4	1	2	∞
			7	∞	2	1	6	∞
	4	14	1	10	2	1	6	∞
		7	1	9	2	1	6	∞

Parent -

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



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

Q. Given a directed weighted graph. You are also given the shortest path from a source vertex 's' to 't' (destination vertex). Does the shortest path remain same in following cases →

1) If weight of every edge is increased by 10 units

2) If weight of every edge is multiplied by 10 units

1) Shortest path will change if every edge is increased by 10 units.

Reason

Let shortest path be of weight 15 and has edge 5. Let there be another path with 2 edge and total weight 25. The weight of shortest path is increased by 5 10 and becomes 15 + 50. weight of other path is increased by 2*10 and becomes 25 + 20 so the shortest path change to other path with weight as 45.

2) If weight of every edge is multiplied by 10 units

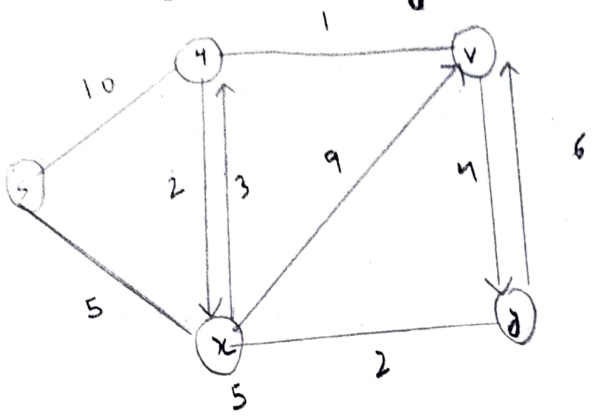
The shortest will not change

Reason

Not dependent on no. of edges.

Q5. Apply Dijistra and Bellman algorithm on graph to compute shortest path to all nodes from s.

Dijistra Algo



node	shortest distance
u	0
x	5
v	9
y	7

Bellman Ford