Tutorial - 6

Ques 1) What do you mean by Minimum Spanning Tree what is its application of MST

A minimum spanning tree or minimum weight spanning tree is a subset of the edges of a connected, edge-weighted undirected graph, that connects all the vertices together, without any cycle and with the minimum possible total edge weight.

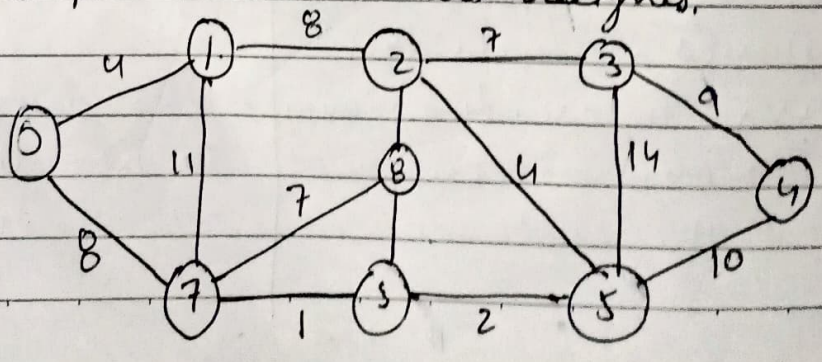
Application:-

- Defining local Area Network.
- Suppose you want to construct highways or railroad, spanning several cities, then we use the concept of MST. to connect.
- To reduce cost, you use the concept of MST to connect the houses.

Ques 2 Please analyse the time and space complexity of prims, Kruskal, dijkstra, and Bellman ford algo.

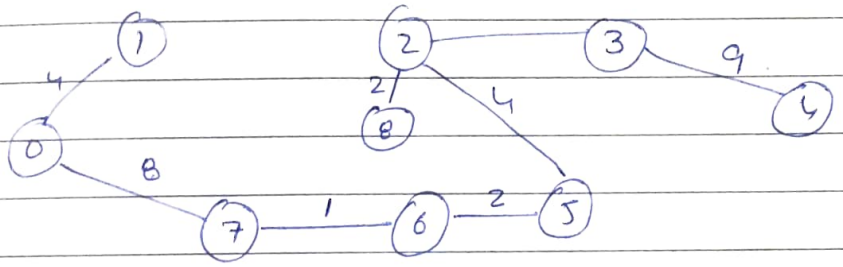
Algorithm	Time complexity	Space complexity
Prims	$O(V^2)$	$O(V+E)$
Kruskal	$O(E \log V)$	$O(\log(E))$
Dijkstra	$O(V+E)$	$O(V+E)$
Bellman	$O(VE$	$O(V)$

Ques (3) Apply prism and Kruskal algorithm on the graph to compute MST and its weights.

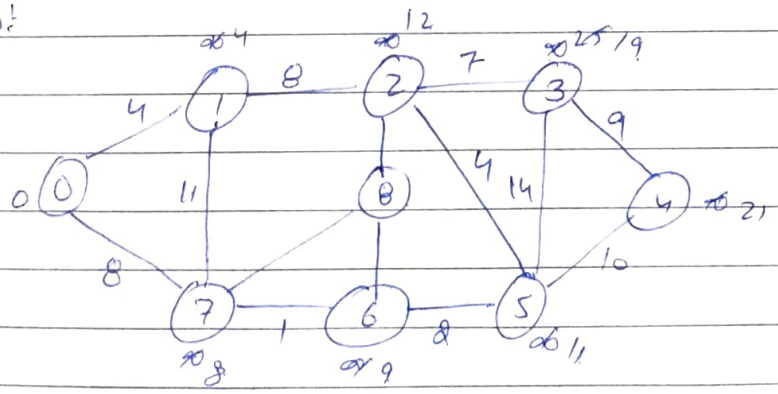


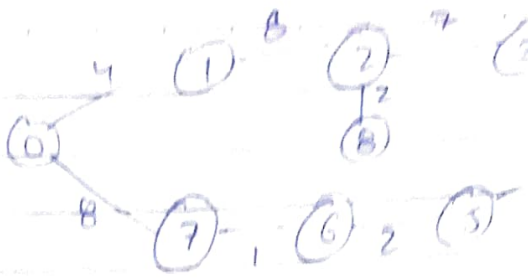
Kruskal

Path	Weight
7→6	1
6→5	2
2→8	2
0→1	4
2→5	4
8→6	6
2→3	7
7→8	7
1→2	8
3→4	9
5→4	10
1→7	11
3→5	14



Prims:





(4) MST

Ques 4 Given a weighted graph. You are also given its shortest path from a source vertex 's' to a given destination vertex 't'. Does its shortest path remain same in the modified graph or not.

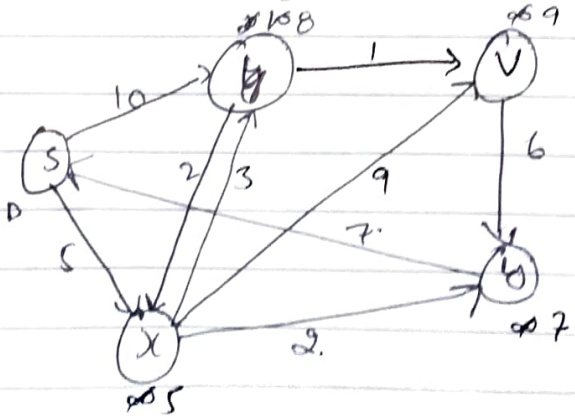
Sol

(i) The shortest path may change. The reason is that no. of edges in different paths from 's' to 't' for example. Let shortest path of weight 15 is with 5 edges. Let there be another path with 9 edges and total weight is 25. The weight of the shortest is increased by 5*10. become 15+50, Weight of other path is increased by 9*10. it becomes 25+90. So the shortest path changes to the other path whose weight is 45.

(ii) If we multiply all edges weighted by 10, the shortest path doesn't change. The reason is simple weight of all paths from s to t.

Ques 5 Sol →

(i) Dijkstra's Algorithm



node	Shortest distance from source node
u	
x	
v	
y	

Bellman ford Algorithm