TUTORIAL-6

Q1 What do you mean by Minimum spanning tree what is the application of MST.

Ans 1 A minimum spanning tree or minimum weight spanning tree is a subset of the edges of a connected spanning tree is a subset of the edges of a connected, edge weighted undirected graph, all the vertices together, without any cycle and with the minimum possible total edge weight.

Application:

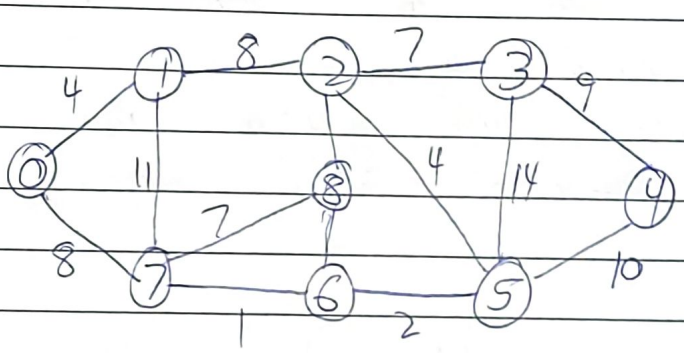
- Defining local Area Networks.
- Suppose you want to construct highway or rail road, spanning several cities, then we use the concept of MST to connect.
- To reduce cost, you use the concept of MST to connect the houses.

Q2 Please analyse the time and space complexity of prims, Kruskal, dijkstra and and Bellman food algo.

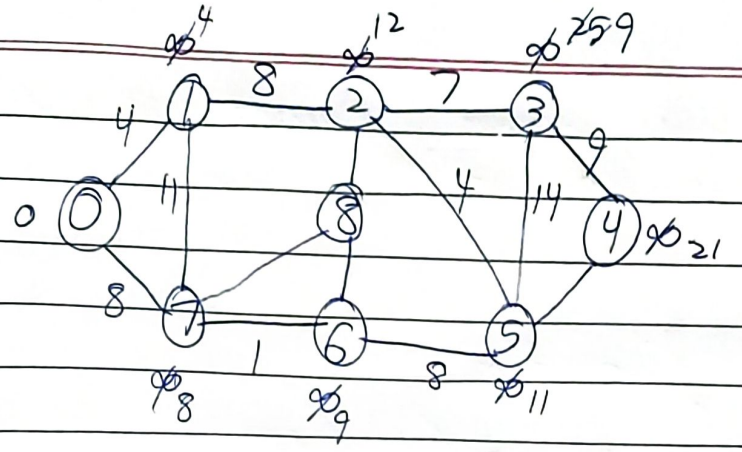
Ans 2

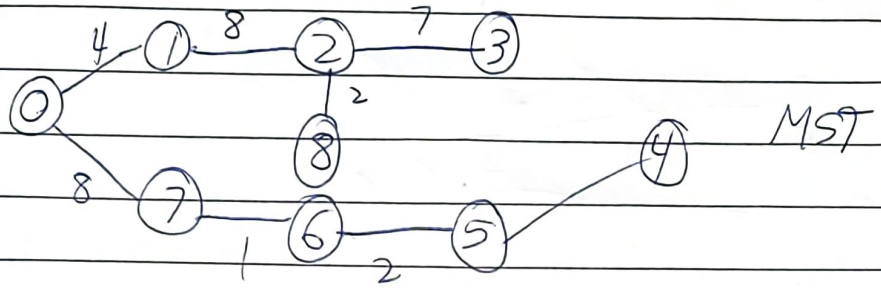
Algorithm	Time complexity	Space complexity
Prims	$O(V^2)$	$O(V+E)$
Kruskal	$O(E \log V)$	$O(\log(E))$
Dijkstra	$O(V+E)$	$O(V+E)$
Bellman	$O(V)$	$O(V)$

Q3 Apply Prims and kruskal algorithm on the graph to compute MST and its weight.



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





Q4 Given a weighted graph. You are also given the shortest path from a source vertex is to a given destination vertex 'F'. Does the shortest path remain same in the modified graph.

Ans/ (1) 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 and has 5 edges, let there be another path with 2 edges and total weight is 25. The weight of the shortest is increased by 5*10 becomes 15+50, weight of other path is increased by 2*10, it becomes 25+20. So the shortest path changes to the other path whose weight is 45.

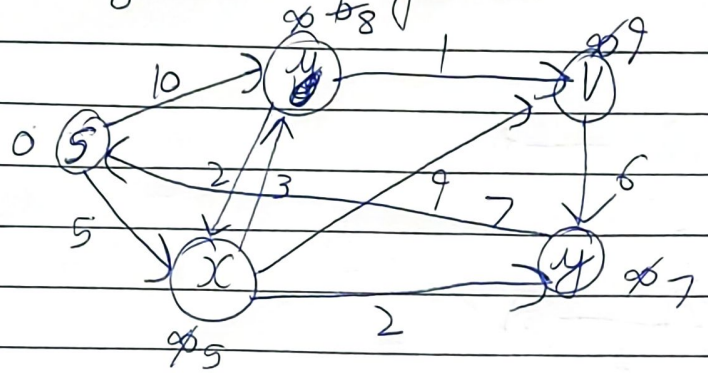
(2) If we multiply all edges weighted by 10, the shortest path doesn't change.

The reason is simple weight of all paths from s to t.

Q5

Ans 5

Dijkstra's Algorithm



node	Shortest distance from Source node
u	
x	
v	
y	

Bellman ford Algorithm