Ayush Agarwal
Roll No - 30
Sec - I

Tutorial - 6

1) What do you mean by Minimum Spanning tree? What is application of MST.

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

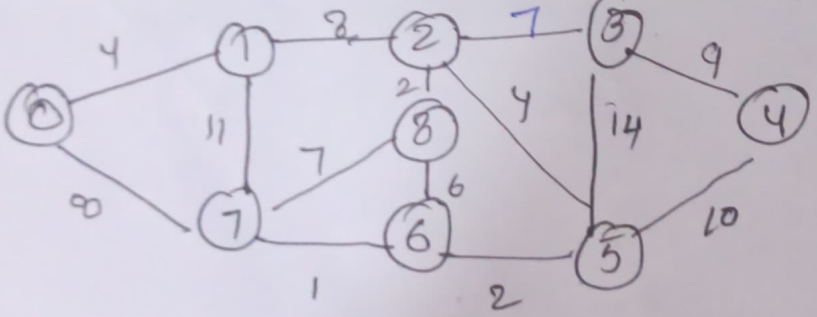
Application :-

- Designing LAN
- Laying pipelines connecting offshore drilling sites, refining & consumer markets.
- Suppose you want to const. highways or railroads spanning several cities then we use concept of MST.

Q2

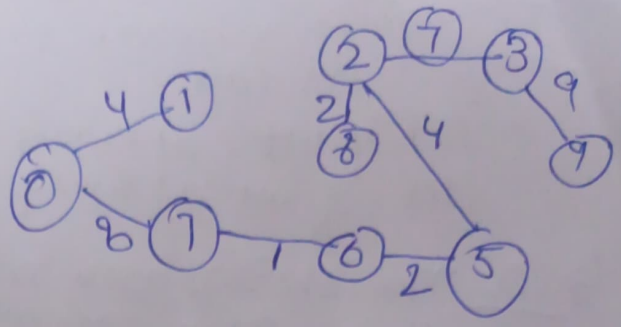
Algorithm	Time complexity	Space complexity
Prims	$O(V^2)$	$O(V+E)$
Kruskal	$O(E \log V)$	$O(\log E)$
Dijkstra's	$O(V+E)$	$O(V+E)$
Bellmanford	$O(VE)$	$O(V)$

Q3 Apply prim & kruskal's algo to compute MST & its wt.

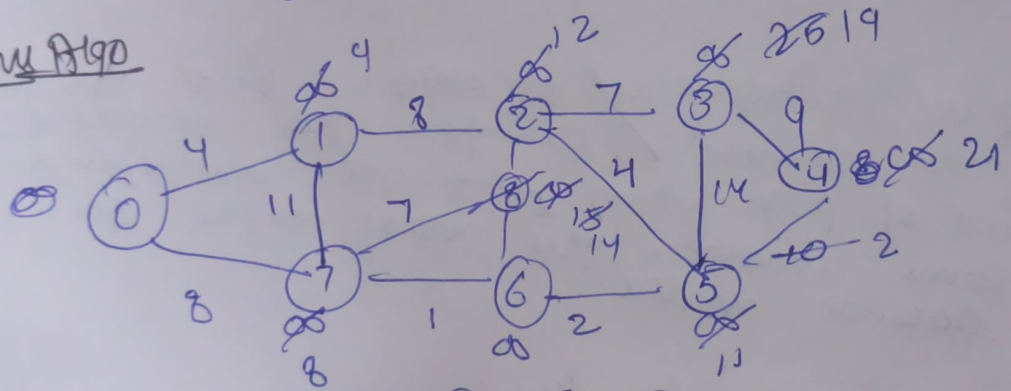


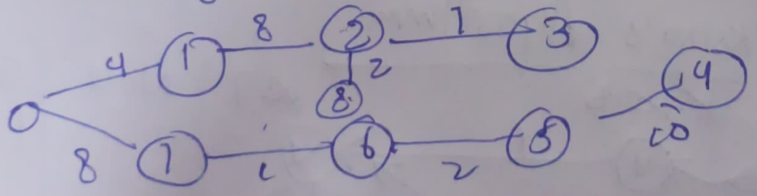
Kruskal

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 → 0 → 7
3→4	9
5→4	10
1→7	11
3→5	14



Prims Algo





MST

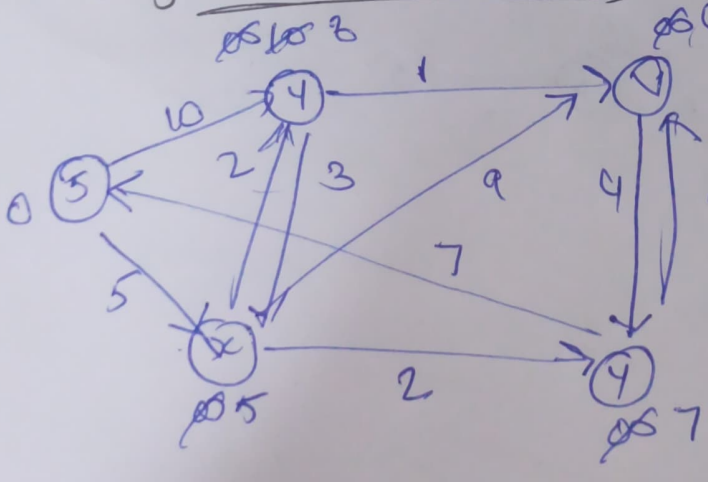
Q4 Given a weighted Graph. You are also given the shortest path from a source vertex 's' to a given destination vertex 't'. Does the shortest path remains same in following modified graphs in following case.

(i) if wt of every edge is inc by 10 units
(ii) if wt of every edge is multiplied by 10 units

↳ (i) The shortest path may change. The reason is that there may me diff. no of edges on different paths from 's' to 't'. For ex let shortest path of wt 15 & has 5 edges. Let there be another path with 2 edges & total wt is 25. The wt of shortest is inc by 5*10 becomes 15+50 wt of other path is inc by 2*10 it becomes 25+20 so shortest path changes to other path whose wt is 45.

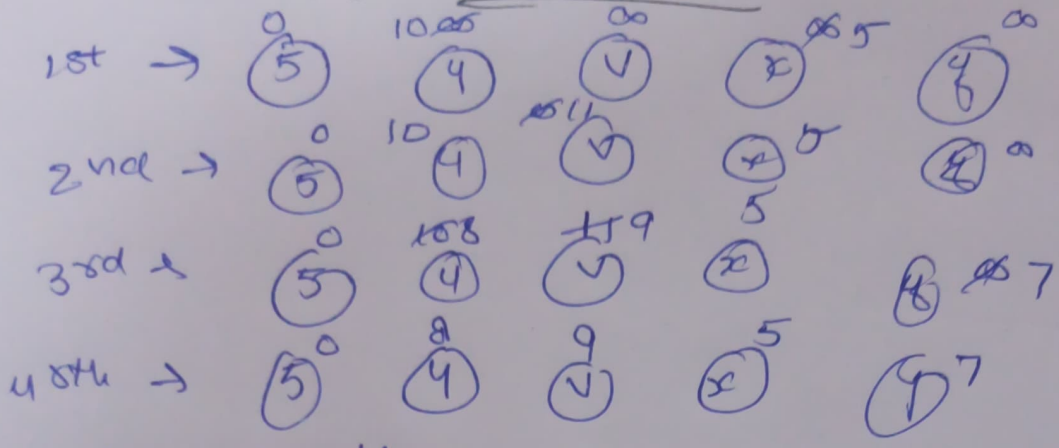
↳ (ii) If we multiply all edges wt by 10, the shortest path doesnot change. The reason is simple wt of path from s to t get multiplied by some amount. The no of edges on a path doesnot matter.

(6) Dijkstra's Algorithm



Node	Shortest dis. from source node
4	8
2	5
1	7
4	9

Bellman Ford Algo



final Graph