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ICS 409
Tutorial 6

Ques1 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 -

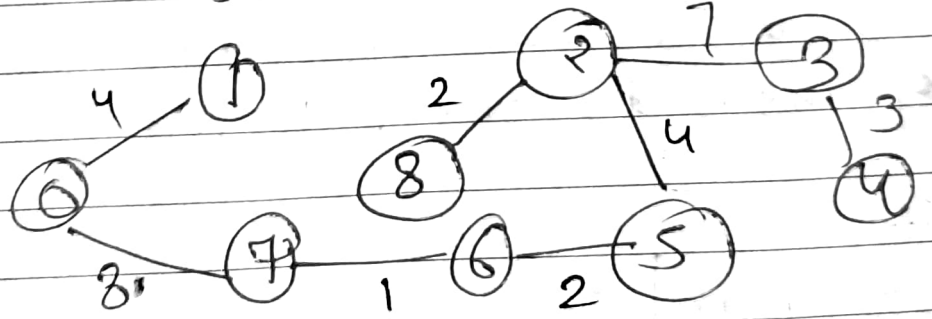
1) Designing local area Network.
2) Laying pipelines connecting offshore drilling sites, refineries & consumer markets.
3) To reduce cost, you use the concept of MST to connect the houses.

Ques2

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

Ques3 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	→ 0 → 7 → 8
3 → 4	8
5 → 4	9
1 → 7	10
3 → 5	11
	14

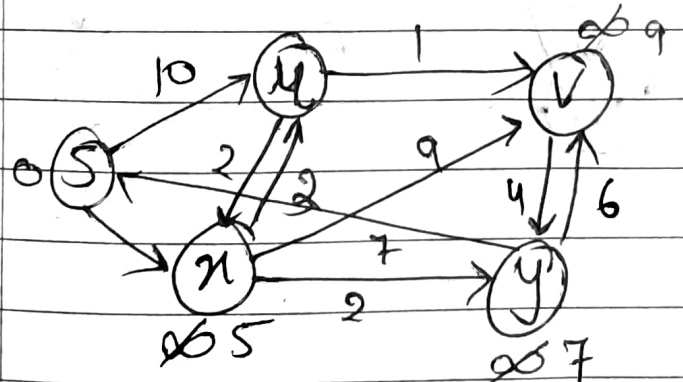


Ques4 (i) The shortest path may change. The reason is that there may be different no. of edges in different paths weighted 's' to 't'. for ex, let shortest path of weight 15 and has 5 edges. let there be another path with 2 edges and total weight is 25. The

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.

(ii) If we multiply all edge weight by 10, the shortest path doesn't change. The reason is simple, weight of all paths from s to t get multiplied by same amount. The no. of edges on a path doesn't matter.

Ques Dijkstra's Algorithm



node	shortest distance from source
u	8
x	5
v	7
y	9

Bellman ford algorithm

	s	t	v	x	y
1st →	0	10	∞	5	∞
2nd →	0	10	11	5	∞
3rd →	0	8	9	5	7
4th →	0	8	9	5	7

Final Graph