Q1) Minimum Spanning tree is subset of edges of connected edge weighted undirected graph that connects all the vertices together without any cycles & with the minimum possible total edge weighted.

Applications -

(i) Consider n stations are to be linked using a communication network & lying of communication link b/w any two stations involves cost. The ideal solⁿ would be to extract a subgraph termed as minimum cost spanning tree.

(ii) Suppose you want to construct highway or railroad spanning several cities then we can use concept of minimum spanning tree.

(iii) Designing LAN

(iv) Tying Pipelines connecting offshore drilling sites, refineries & consumer markets.

(v) Suppose you meant to apply a set of houses with →

→ Electric power → Water → Telephone lines → Sewage lines

Q2) Prim's Algorithm →

Time Complexity : $O(|E| \log |V|)$

Space Complexity : $O(|V|)$

Kruskal's Algorithm →

Time Complexity - $O(|E| \log |V|)$

Space Complexity - $O(|V|)$

Dijkstra's Algorithm -

Time Complexity - $O(V^3)$

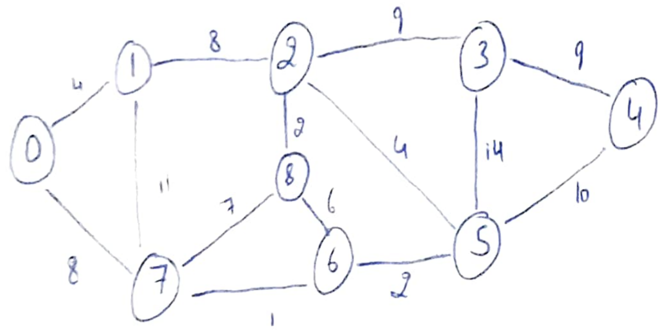
Space Complexity - $O(V^2)$

Bellman Ford's Algorithm -

Time Complexity - $O(VE)$

Space Complexity - $O(E)$

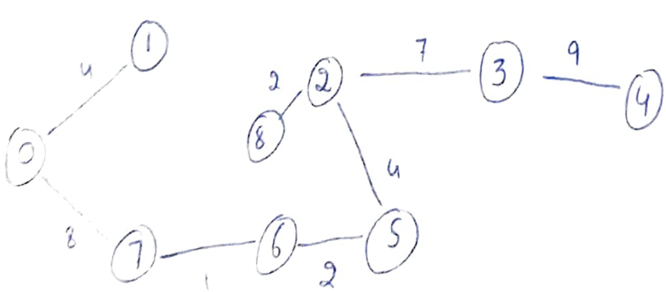
Q3)



Kruskal's Algorithm -

O	U	W	
6	7	1	✓
5	6	2	✓
2	8	2	✓
0	1	4	✓
2	5	4	✓
6	8	6	×
2	3	7	✓

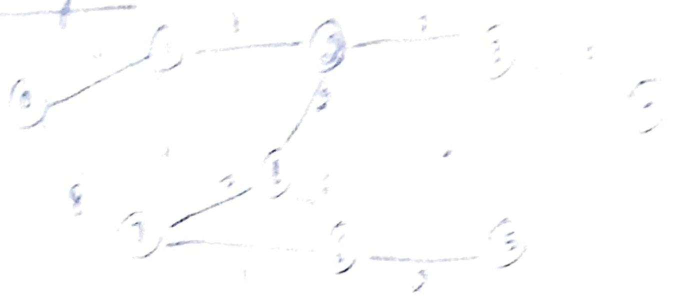
O	U	W	
7	8	7	×
0	7	8	✓
1	2	8	×
4	3	9	✓
4	5	10	×
1	7	11	×
3	5	14	×



Weight - $1+2+2+4+4+7+8+9$

$= 37$

Prim's Algorithm

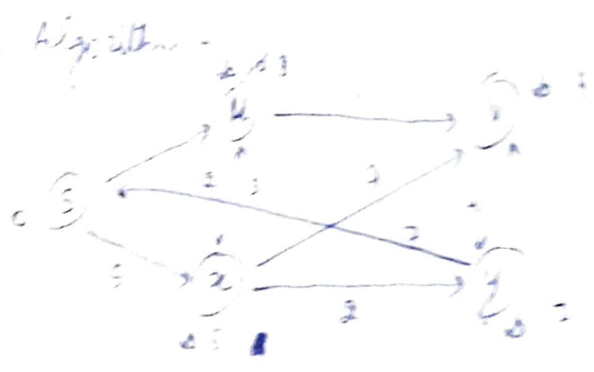


Weight = [illegible]

Q4) (i) The shortest path may change. The reason is there may be different number of edges in different paths from s to t. For eg. if shortest path has a weight [illegible] & has [illegible] edges & there be another path with 2 edges & total weight 20. The weight of shortest path is increased by 5×10 and becomes [illegible] weight of other path is increased by 2×10 & becomes 20+20 so the shortest path changes to other path with weight 40.

(ii) If we multiply all edges weight by 10 so, the shortest path doesn't change. The reason is as the weights of all paths from s to t get multiplied by same amount. The number of edges in a path doesn't matter. It is like changing units of weight.

Q5) Dijkstra's Algorithm –



Node	Shortest Distance from source node
u	2
x	[illegible]
v	[illegible]
y	[illegible]

Bellman ford algorithm

Graph does not have -ve cycle

Final Graph