Q1 minimum Spanning tree

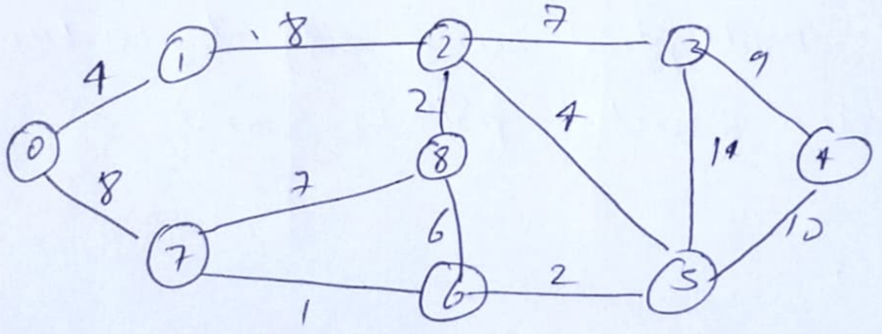
It is Spanning tree which has minimum total cost
If we have a linked undirected graph with a weight
Combine with each edge. then the cost of spanning
tree would be the sum of the cost of its edge

Application -> in design of networks including computer networks, telecommunication networks, transportation networks.

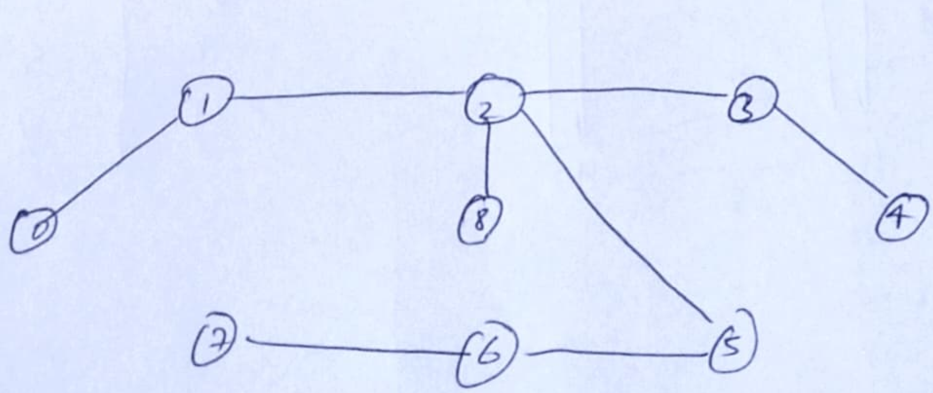
Q2

	Prim	Dijkstra	Bellmann ford
Time complex	$O((V+E)\log V)$	$O(E \log V)$	$O(VE)$
Space	$O(V+E)$	$O(V^2)$	$O(N)$

Q3

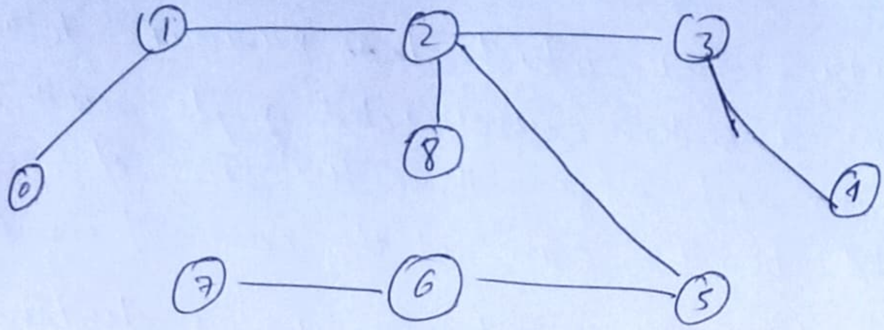


i) Krush :
[1, 2, 2, 4, 4, 6, 7, 7, 8, 8, 9, 10, 11, 14]



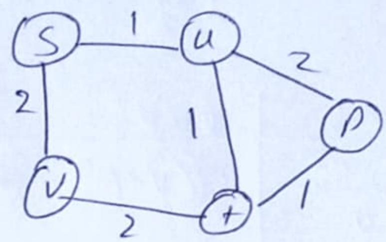
min wt = 37

ii) Prim



min wt = 37

Q4 let we have



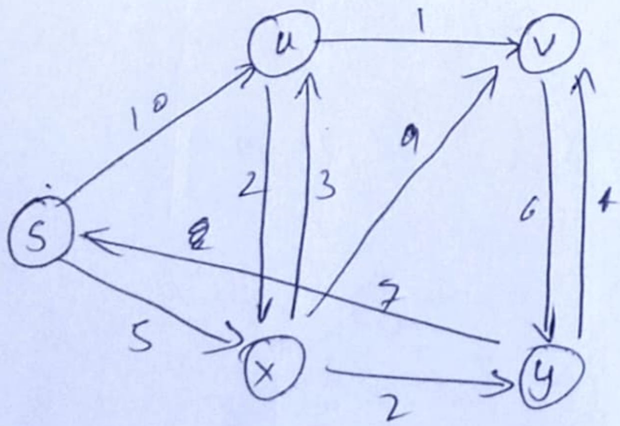
Initial shortest path

$S \to V \to t$

a) if we increase every edge by 10 unit then also shortest path is same

b) if we multiplied every edge by 10 units then also shortest path is same.

Q5 Dijkstra



node	distance from s
u	8
V	9
x	5
y	7

Bellman

0	$\cancel{\infty}$ 10	$\cancel{\infty}$ 11	$\cancel{\infty}$ 5	$\cancel{\infty}$ 7
S	u	v	x	y

0	$\cancel{10}$ 8	$\cancel{11}$ 9	5	7
S	u	v	x	y

0	8	9	5	7
S	u	v	x	u

Q6

$$A_0 = \begin{bmatrix} 0 & \infty & 6 & 3 & \infty \\ 3 & 0 & \infty & \infty & \infty \\ \infty & \infty & 0 & 2 & \infty \\ \infty & 1 & 1 & 0 & \infty \\ \infty & 4 & \infty & 2 & 0 \end{bmatrix}$$

$$A_1 = \begin{bmatrix} 0 & \infty & 6 & 3 & \infty \\ 3 & 0 & 9 & 6 & \infty \\ \infty & \infty & 0 & 2 & \infty \\ \infty & 1 & 1 & 0 & \infty \\ \infty & 4 & \infty & 2 & 0 \end{bmatrix}$$

$$A_2 = \begin{bmatrix} 0 & \infty & 6 & 3 & \infty \\ 3 & 0 & 9 & 6 & \infty \\ \infty & \infty & 0 & 2 & \infty \\ \infty & 1 & 1 & 0 & \infty \\ \infty & 4 & 3 & 2 & 0 \end{bmatrix}$$

$$A_3 = \begin{bmatrix} 0 & \infty & 6 & 3 & \infty \\ 3 & 0 & 9 & 6 & \infty \\ \infty & \infty & 0 & 2 & \infty \\ \infty & 1 & 1 & 0 & \infty \\ \infty & 4 & 13 & 2 & 0 \end{bmatrix}$$

$$A_4 = \begin{bmatrix} 0 & 4 & 4 & 3 & \infty \\ 3 & 0 & 7 & 6 & \infty \\ \infty & 3 & 0 & 2 & \infty \\ \infty & 1 & 1 & 0 & \infty \\ \infty & 3 & 3 & 2 & 0 \end{bmatrix}$$

$$A_5 = \begin{bmatrix} 0 & 4 & 4 & 3 & \infty \\ 3 & 0 & 7 & 6 & \infty \\ \infty & 3 & 0 & 2 & \infty \\ \infty & 1 & 1 & 0 & \infty \\ \infty & 3 & 3 & 2 & 0 \end{bmatrix}$$