Q1 **Minimum spanning tree**–

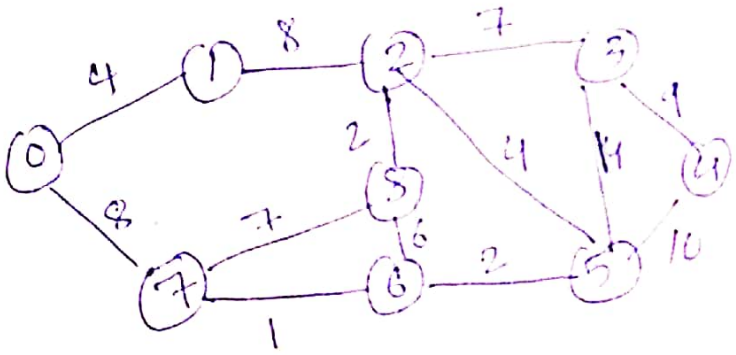
It is spanning tree which has minimum total cost. If we have a linked undirected graph with a weight combine with each edge. Then the cost of spanning tree would be the sum of the cost of its edges

**Application** – in design of networks including computer networks, telecommunication networks, transportation networks

Q2

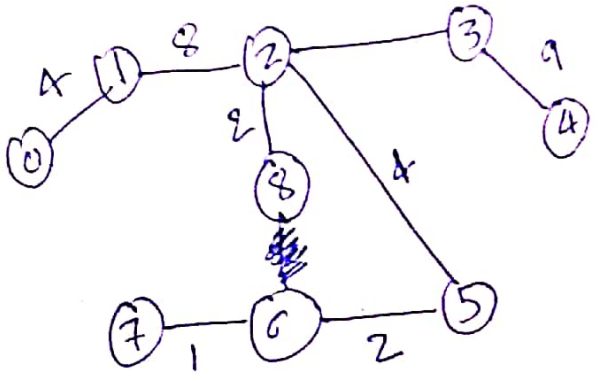
| | Prim | Dijkstra | Bellmann ford |
|---|---|---|---|
| Time Comple | $O((V+E)\log V)$ | $O(E \log V)$ | $O(VE)$ |
| Spaci | $O(V+E)$ | $O(V^2)$ | $O(N)$ |

Q3




i) Krushkals

[1, 2, 2, 4, 4, 6, 7, 7, 8, 8, 9, 10, 11, 14]




Min wt = 37

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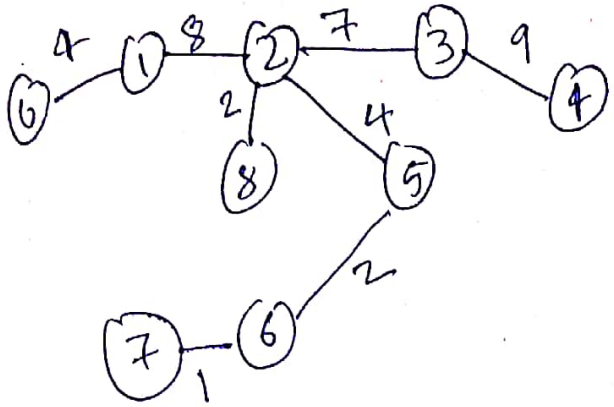
(ii) Prim

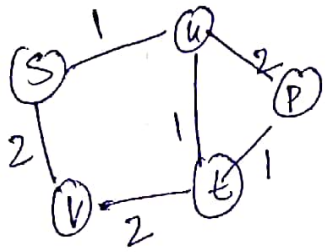



min wt = 37

Q4) let we have

initial shortest path

$s \to v \to t$.

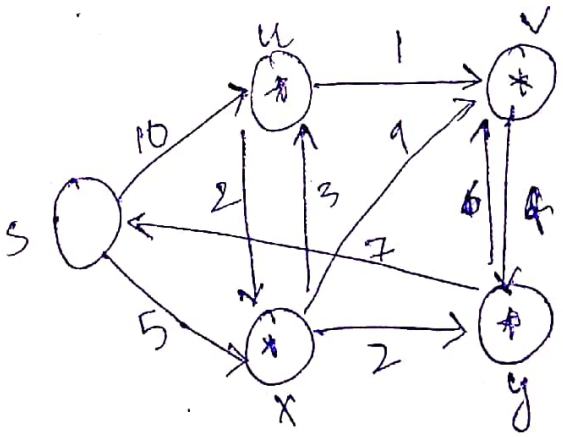



a) if we increase every edge by 10 units then also shortest path is same.

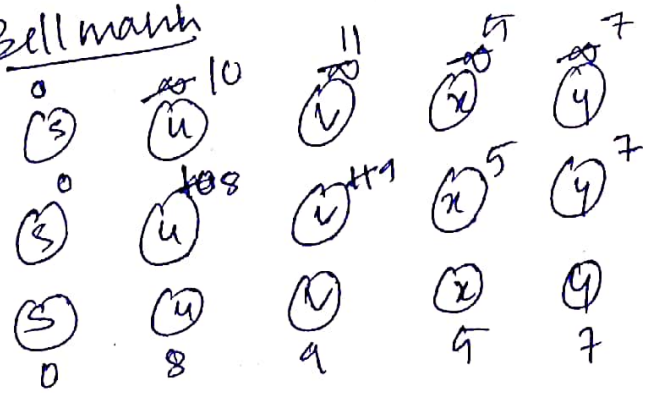
b) If we ~~incre~~ multiplied every edge by 10 units then also shortest path is same

Q5) Dijkstra

| node | dist from s |
|---|---|
| u | 8 |
| v | 9 |
| x | 5 |
| y | 7 |




Bellmann

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Q6

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

$$A_1 = \begin{bmatrix} 0 & \infty & 6 & 3 & \infty \\ 3 & 0 & 9 & 6 & \infty \\ \infty & \infty & 0 & 2 & \infty \\ \infty & 1 & 1 & 0 & \infty \\ \infty & 4 & \infty & 2 & 0 \end{bmatrix} \quad A_2 = \begin{bmatrix} 0 & \infty & 6 & 3 & \infty \\ 3 & 0 & 9 & 6 & \infty \\ \infty & \infty & 0 & 2 & \infty \\ \infty & 1 & 13 & 0 & \infty \\ \infty & 4 & 13 & 2 & 0 \end{bmatrix}$$

$$A_3 = \begin{bmatrix} 0 & \infty & 6 & 3 & \infty \\ 3 & 0 & 9 & 6 & \infty \\ \infty & \infty & 0 & 2 & \infty \\ \infty & 1 & 1 & 0 & \infty \\ \infty & 4 & 13 & 2 & 0 \end{bmatrix} \quad A_4 = \begin{bmatrix} 0 & 4 & 4 & 3 & \infty \\ 3 & 0 & 7 & 6 & \infty \\ \infty & 3 & 0 & 2 & \infty \\ \infty & 1 & 1 & 0 & \infty \\ \infty & 3 & 3 & 2 & 0 \end{bmatrix}$$

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

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