TUTORIAL → 6

① A minimum spanning tree is a special kind of tree that minimizes the length of the edges of the tree

Application:

(i) Designing local area network

(ii) Construct highways and railroads connecting several cities.

(iii) Consider n stations to be linked using a communication network & laying of communication links b/w any two stations involves a cost.

② Time & space complexity of

① Prim's algorithm

$TC \to O(|E| \log(|V|))$

$SC = O(|V|)$

② $TC = TC = O(|E| \log(|E|))$

$SC = O(|V|)$

③ Dijkstra's algo

- TC is $O(V^2)$ when algo does not use priority queue

when algo use fibonacci heap as priority queue $O(E + V\log V)$

when algo use binary heap as priority queue

$O(E \log v)$

$SC = O(v^2)$

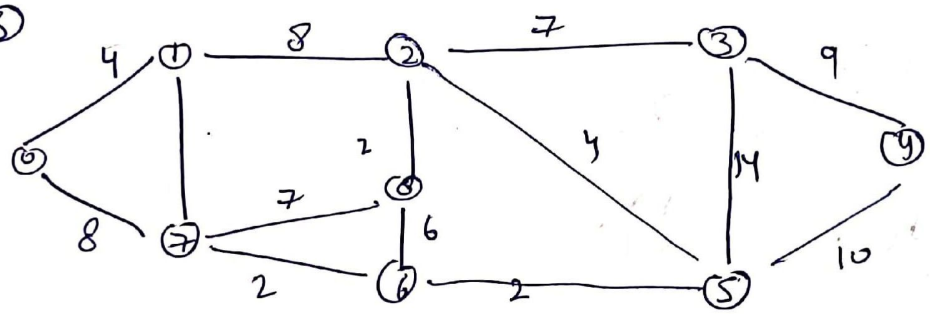
(v) Bellman ford:-

TC is $O(VE)$

In case of complete graph $O(V^3)$

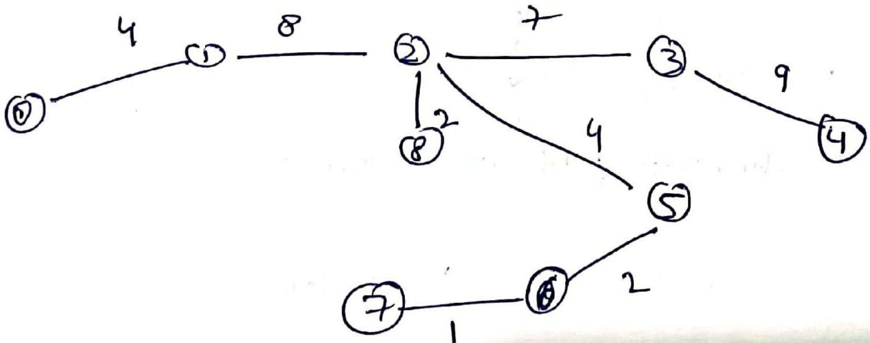
$SC = O(V)$

(3)



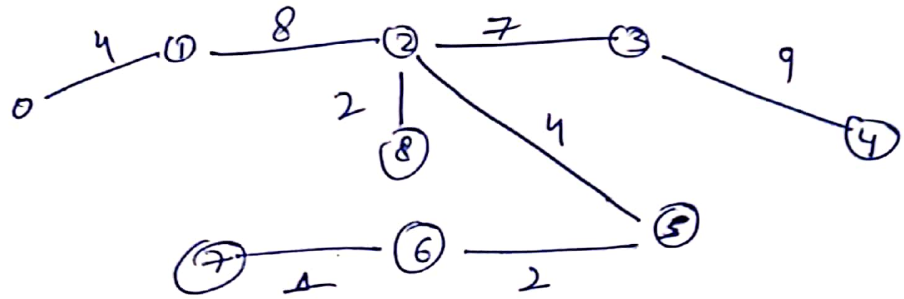
(i) Kruskal's (Greedy)

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



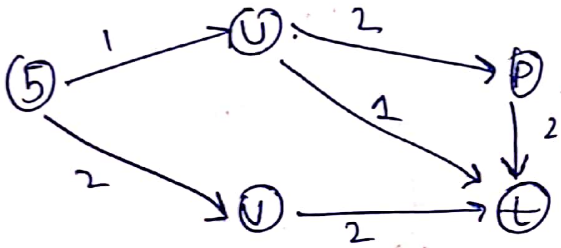
Minimum weight = 37

(ii) Prism's



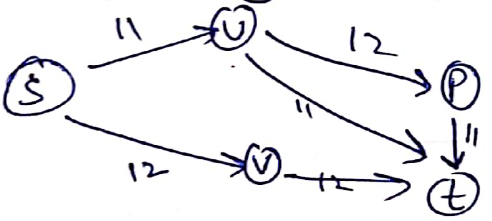
Minimum weight = 37

(4) Let we have graph



intially shortest path is $s \to u \to t$

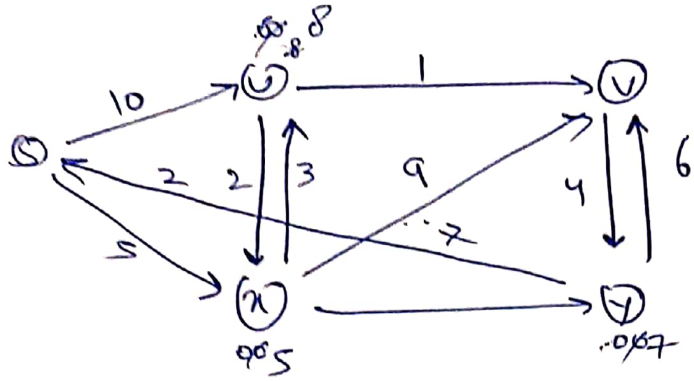
Case 1: if weight of every edge increased by 10 units



still shortest path is $s \to u \to t$

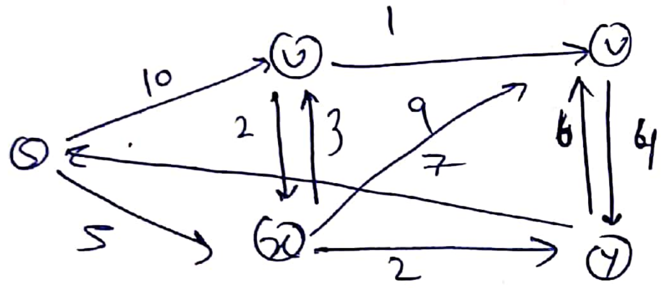
Case II: It will remain $s \to u \to t$

(5) Dijkstra's



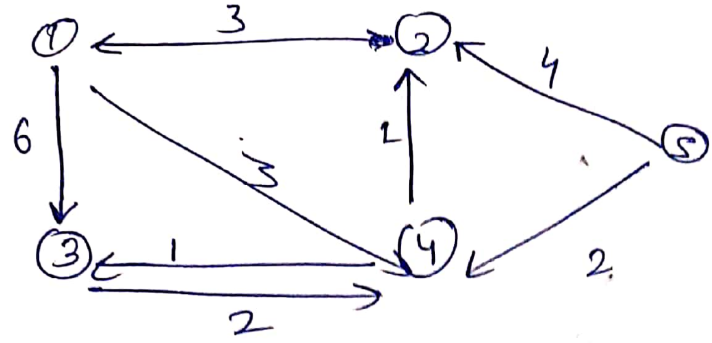
node	shortest dist. from (S)
u	8
v	9
x	5
y	7

Bellman Ford



S	U	V	X	Y
0	~~∞~~ 10	~~∞~~ 11	~~∞~~ 5	~~∞~~ 7
0	~~10~~ 8	~~11~~ 9	5	7
0	8	9	5	7
0	8	9	5	7

6



$$D = \begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{array} \begin{bmatrix} 0 & \infty & 6 & 3 & \infty \\ 3 & 0 & \infty & \infty & \infty \\ \infty & \infty & 0 & 2 & \infty \\ \infty & 1 & 1 & 0 & \infty \\ \infty & 4 & \infty & 1 & 0 \end{bmatrix}$$

$$D_1 = \begin{bmatrix} 0 & \infty & 6 & 3 & \infty \\ 3 & 0 & 9 & 6 & \infty \\ \infty & \infty & 0 & 2 & \infty \\ \infty & 1 & 1 & 0 & \infty \\ \infty & 4 & \infty & 2 & 0 \end{bmatrix}$$

$$D_2 = \begin{bmatrix} 0 & \infty & 6 & 3 & \infty \\ 3 & 0 & \cancel{\infty}9 & \cancel{\infty}6 & \infty \\ \infty & \infty & 0 & 2 & \infty \\ 4 & 1 & 1 & 0 & \infty \\ 7 & 4 & \infty & 2 & 0 \end{bmatrix}$$

$$D_3 = \begin{bmatrix} 0 & \infty & 6 & 3 & \infty \\ 3 & 0 & \cancel{\infty}9 & \cancel{\infty}6 & \infty \\ \infty & \infty & 0 & 2 & \infty \\ 4 & 1 & 1 & 0 & \infty \\ 7 & 4 & \infty & 2 & 0 \end{bmatrix}$$

$$D_4 = \begin{bmatrix} 0 & 4 & 4 & 3 & \infty \\ 3 & 0 & \cancel{\infty}9 & \cancel{\infty}6 & \infty \\ 6 & 3 & 0 & 2 & \infty \\ 4 & 1 & 1 & 0 & \infty \\ 6 & 3 & 3 & 2 & 0 \end{bmatrix}$$

$$* \; D5 = \begin{bmatrix} 0 & 4 & 4 & 3 & \infty \\ 3 & 0 & 9 & 6 & \infty \\ 6 & 3 & 0 & 2 & \infty \\ 4 & 1 & 1 & 0 & \infty \\ 6 & 3 & 3 & 2 & 0 \end{bmatrix}$$