SK Sohail Tutorial-6

F, 29

1. Mini. Spanning tree is a subset of the edges of a connected edge-weight of undirected graph that connects all the vertices together without any cycles & with the mini. possible edge weighted.

Applications:

(i) Consider x stations are to be linked using a communication network & lying of communication link b/w any 2 stations involves a cost.

(ii) Suppose you want to construct highways or railroads spaning several cities, then we can use the concept of mini. spanning trees.

(iii) Designing LAN.

(iv) laying pipelines connecting offshore drilling sites, refineries & consumer markets.

2. Time complexity of prim's algorithm: $O(|V|^2)$

Space complexity of prim's algorithm: $O(|V|)$

Time complexity of kruskal's algorithm: $O(|V| \log |V|)$

Space complexity of kruskal's algorithm: $(O(|V|))$

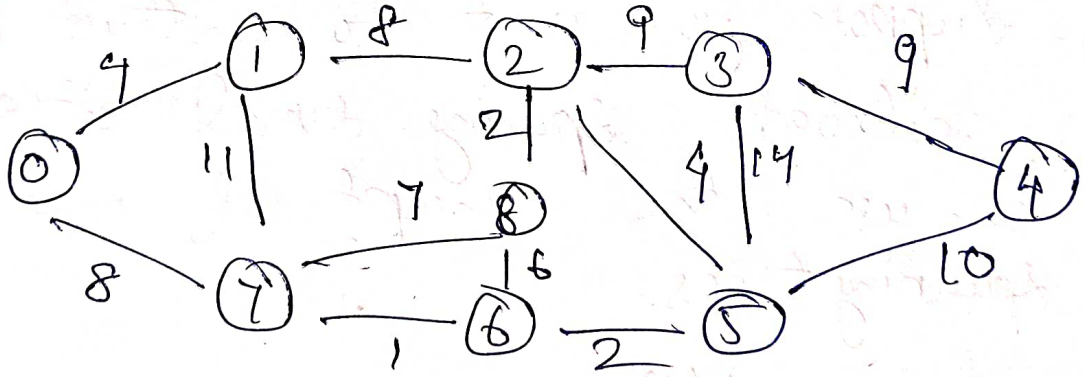
Time complexity of Dijkstra's algo: $O(V^2)$

Space complexity of Dijkstra's algo: $O(V^2)$

TC of Bellman's ford algo: $O(VE)$

SC of Bellman's ford algo: $O(E)$

3.

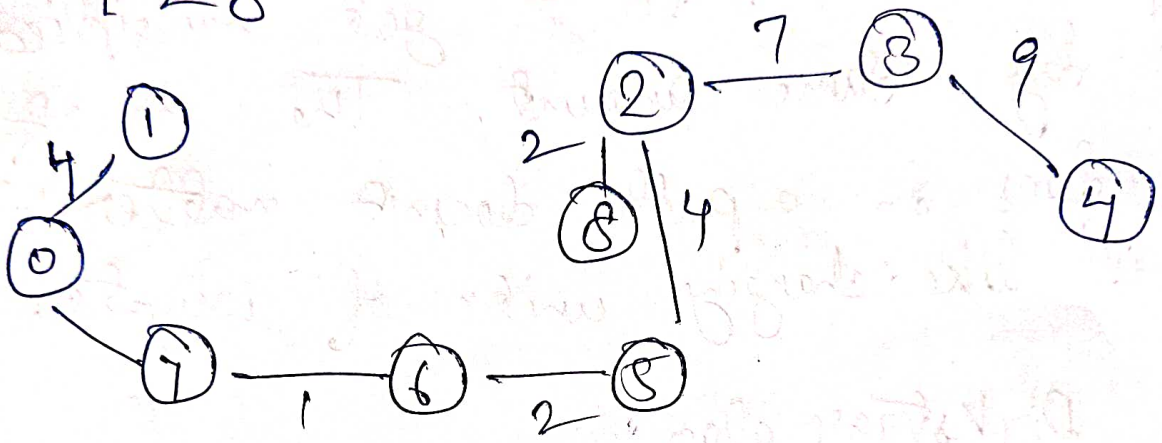


Kruskal's algo

O	V	W
6	7	1
5	6	2
2	8	2
0	1	4

O	V	W
4	3	9
4	5	10
1	7	11
3	5	14

2 5 4
6 8 6
2 3 7
7 8 7
0 7 8
1 2 8



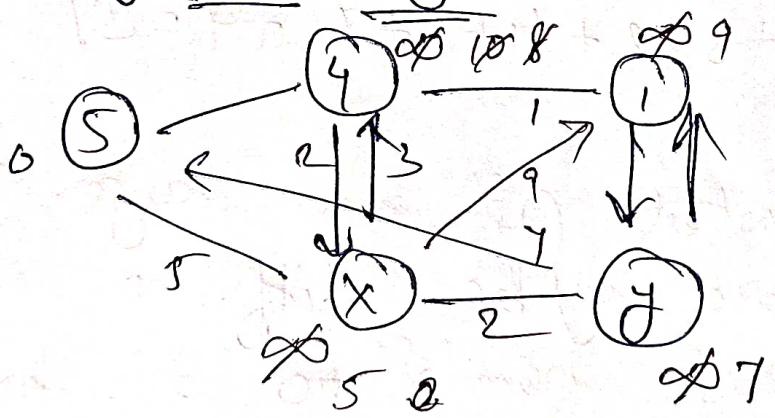
weight = 4+8+2+4+2+7+9 = 37

4. (i) The shortest path may change. The reason is there may be diff. no. of edges in diff. parts from 's' to 't'. for eg. let there be another path with 2 edges & total weight 25. The weight of the shortest path is increased by 5 & becomes 15+5 = 20 & height of the other path is 18 increased by 2 & becomes 25+20, so, the shortest

path changes to the other path with weight at 45.

(ii) If we multiply all edges weight by 60, the shortest path doesn't change. The reason is simple, weights of all the path from 's' to 't' get multiplied by same amount. The no. of edges on a path doesn't matter. It is like changing units of weights.

5. Dijkstra's algo



Node	Shortest dist from source node
u	8
x	5
v	9
y	7

Bellman's ford algorithm

1st → (s)0 (u)10 (v)∞ (x)5 (y)∞

2nd → (s)0 (u)10 (v)14 (x)5 (y)∞ 11

3rd → (s)0 (u)8 (v)9 (x)5 (y)7

4th → (s)0 (u)8 (v)9 (x)5 (y)7

graph doesn't have -ve cycle

Final graph