Tutorial Sheet - 6

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M-38

Sol 1

Min Spanning tree is a subset of the edges of a connected edge-weighted undirected graph that connects all the vertices together without any cycles & with the min possible ~~the~~ total edge weighted.

Applications:

(i) Consider n stations are to be linked using a comm n/w & lying of comm links b/w any two involves a cost. The ideal sol would be to extract a subgraph termed as min cost spanning tree.

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

(iii) Designing LAN.

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

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

=> electric power
=> water
=> telephone lines
=> sewage lines

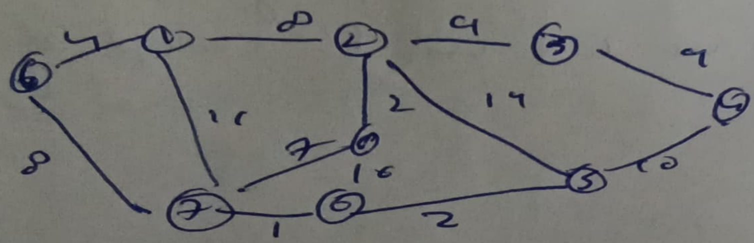
Sol 2 T.C of prim's algo : O(|E| log(|V|)) Space C of prim's algo : O(V)

=> T.C of kruskal's algo : O(|E| log |E|)
Space C of kruskal's algo : O(|V|)

=> T.C of Dijkstra's algo : O(V²)
S.C of " " = O(V²)

=> T.C of Bellman Ford algo = O(VE)
S.C " " " " = O(E)

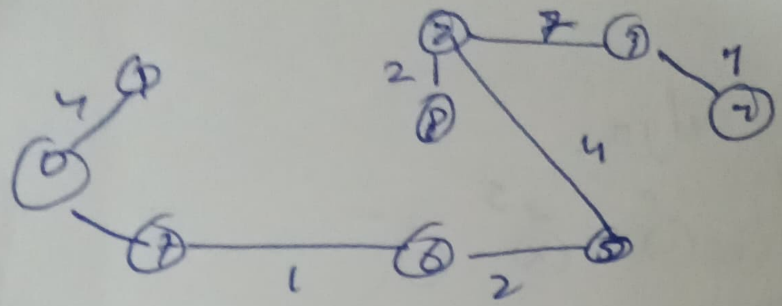
Sol 3



Kruskal's algo :-

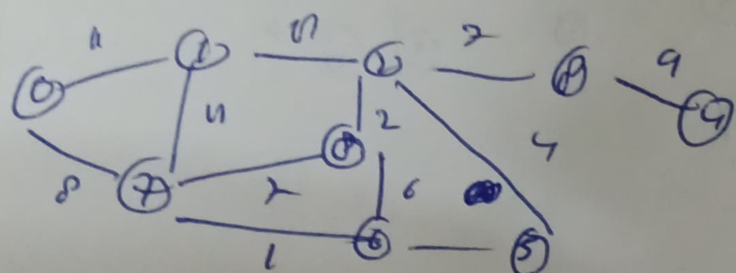
u	v	w	
6	2	1	✓
5	6	2	✓
2	8	2	✓
0	1	4	✓
2	5	4	✓
6	8	6	✗
2	3	2	✓
7	8	2	✗
0	7	8	✓
1	2	8	✗

u	v	w	
4	3	4	✓
4	5	10	✗
1	2	11	✗
3	5	14	✗



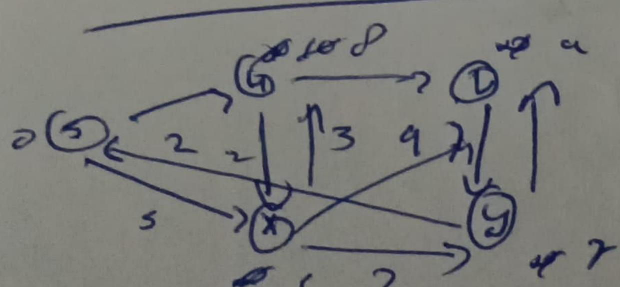
weight = 1 + 2 + 2 + 4 + 9 + 7 + 8 + 4 = 37

Prims algo:



weight = 4 + 8 + 1 + 2 + 4 + 2 + 7 + 4 = 37

Sol 5 Dijkstra Algo



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

⇒ Bellman ford algo:

1st → s^{0} $u^{\cancel{\infty}\,10}$ v^{∞} $x^{\cancel{\infty}\,5}$ y^{∞}

2nd → s^{0} u^{10} $v^{\cancel{\infty}\,11}$ x^{5} y^{∞}

3rd → s^{0} $u^{\cancel{10}\,8}$ $v^{\cancel{11}\,14}$ x^{5} $y^{\cancel{\infty}\,7}$

4th → s^{0} u^{8} v^{9} x^{5} y^{7}

graph doesn't have -ve cycle

Final Graph