Tutorial-6

Q1. What do you mean by minimum spanning tree? What are the applications of MST?

Also known as minimum weight spanning tree for a weighted, connected, undirected graph is a spanning tree with a weight less than or equal to every other spanning tree.

→ A spanning tree of a graph is a subgraph that is a tree and connects all vertices together. (A single graph can have many spanning trees)

Applications:

→ Network design: telephone, Tv cable, water, sewage.

→ construct highways or railroads spanning several city then we can.

Q2 Analyse the TC and SC of Prims, Kruskal, Dijikstra's and Bellman Ford Algorithm.

Prims: TC = $O(|E| \log |V|)$

SC = $O(|V|)$

Kruskal's Algo = $O(|E| \log |V|)$

SC = $O(|V|)$

Dijikstra's Algo - TC = $O(V^2)$

TC = $O(E + V \log V)$ if Priority Queue is used.

SC = $O(V^2)$

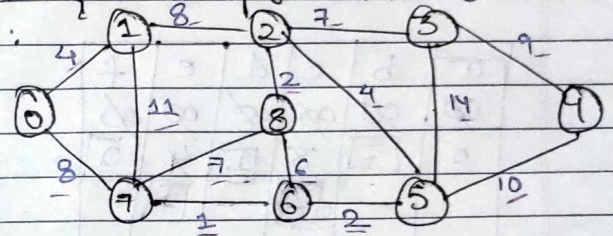
Bellman Ford Algo

TC = $O(VE)$

SC = $O(N)$

Q3 Apply Kruskal and Prim's Algo on right side of to compute MST and its weight

Kruskals:



0 1 4 7 6 1 ✓

2 8 2 ✓

6 3 7

0 1 4 ✓

2 5 4 ✓

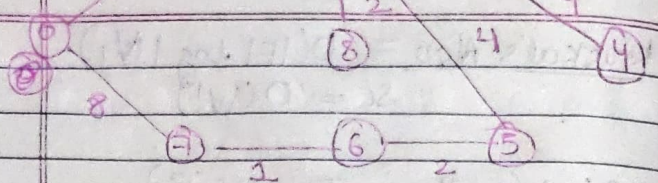
8 6 6 ✗

7 ~~8~~ 0 ~~8~~ 4 ~~38~~ 8 ✗

1 2 8 ✓

3 4 9 ✓

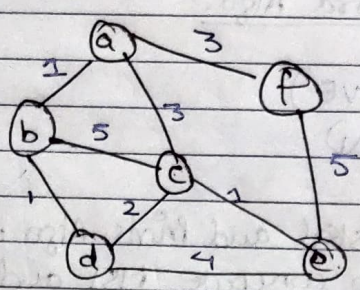
5 4 10 ✗



$4+8+1+2+4+2+9+7$

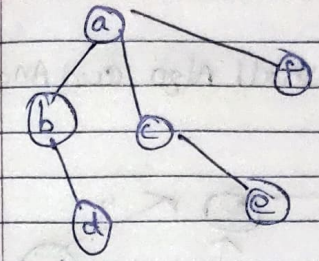
$= 37$

Prims Algo



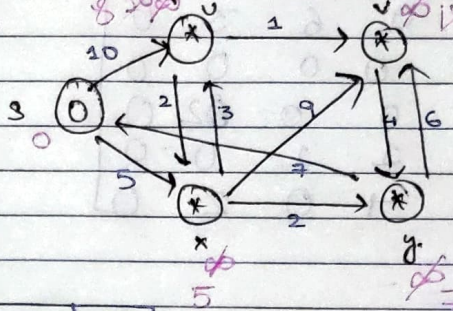
a	b	c	d	e	f
~~∞~~	~~∞~~	~~∞~~	~~∞~~	~~∞~~	~~∞~~
0	1	~~3~~ 2	1	~~4~~ 1	5

a	b	c	d	e	f
0	1	2	3	4	5
-1	~~-1~~ 0	~~-1~~ 0	~~-1~~ 1	~~-1~~ 2	~~-1~~ 0



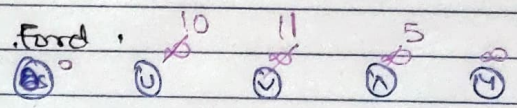
Q5] Apply Dijkstra's and Bellman algorithm on a graph given on RHS to compute shortest path to all nodes from node S.

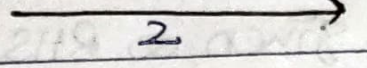
Dijkstra's



U	8
x	5
V	9
4	7

Bellman Ford :





	1	2	3	4	5
1	0	0	6	3	0
2	3	0	0	0	0
3	0	0	0	2	0
4	0	1	1	0	0
5	0	4	0	2	0

$K = 1$, $A_1 =$