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Date
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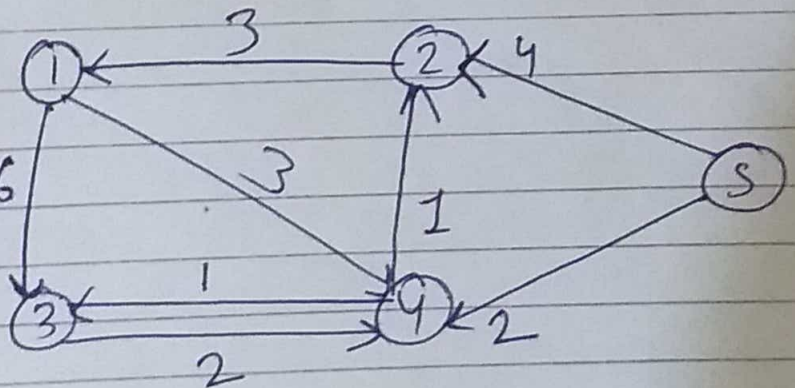
Tutorial-6

1. A minimum spanning tree or minimum weight 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 minimum possible total edge weight.

Applications-

1. In a cable company wanting to lay line to multiple neighbourhoods, by minimizing amount of cable laid, the cable company will save money.
2. designing local area networks.
3. laying pipelines connecting offshore drilling site, refineries and consumer markets.

6.



$D^0 =$

	1	2	3	4	S
1	0	∞	6	3	0
2	3	0	9	6	∞
3	∞	∞	0	2	∞
4	∞	1	1	0	∞
S	∞	4	∞	2	0

$D_1 =$

	1	2	3	4	5
1	0	∞	6	3	∞
2	3	0	9	6	∞
3	∞	∞	0	2	∞
4	~~∞~~ 4	1	1	0	∞
5	~~∞~~ 7	4	~~∞~~ 13	2	0

$D_2 =$

	1	2	3	4	5
1	0	∞	6	3	0
2	3	0	9	6	∞
3	∞	∞	0	2	∞
4	4	1	1	0	∞
5	7	4	13	2	0

$D_3 =$

	1	2	3	4	5
1	0	~~∞~~ 4	4 ~~6~~	3	∞
2	3	0	7 ~~9~~	6	∞
3	~~∞~~ 6	~~∞~~ 3	0	2	∞
4	4	1	1	0	∞
5	~~7~~ 6	~~4~~ 3	~~13~~ 3	2	0

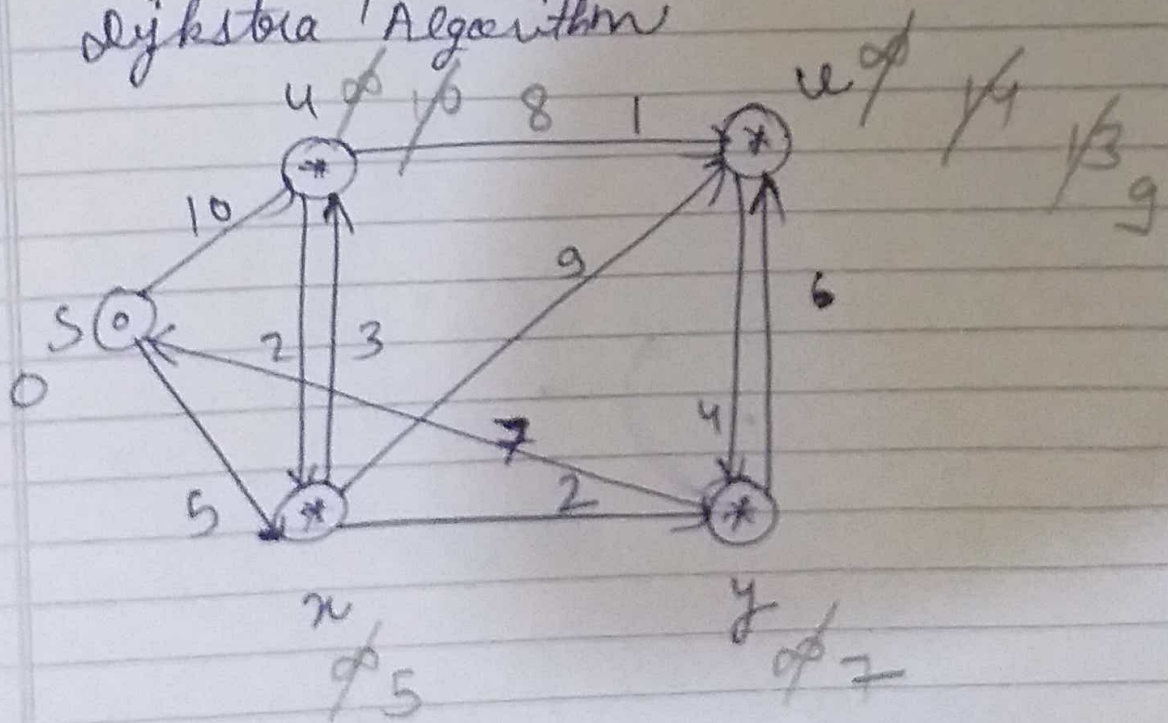
$D_4 =$

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

$D_5 =$

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

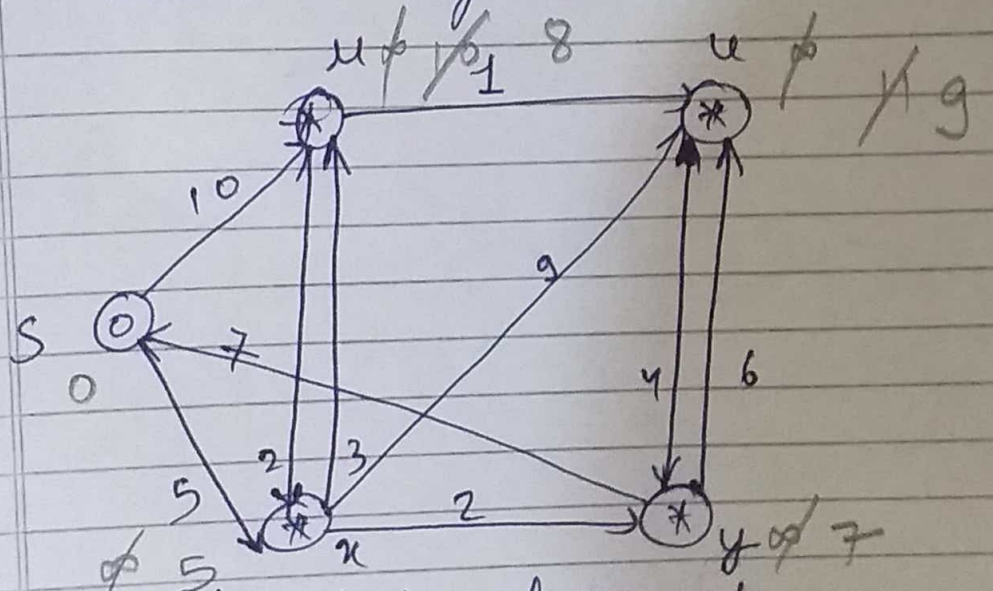
5. Dijkstra's Algorithm



Source(A)	S	u	v	x	y
{ }	(0)	∞	∞	∞	∞
{s}	0	10	∞	(5)	∞
{s, x}	0	8	14	5	(7)
{s, x, y}	0	(8)	13	5	7
{s, x, y, u}	0	8	(9)	5	7

S	u	v	x	y
0	~~∞~~ 10 8	~~∞~~ 14 ~~13~~ 9	~~∞~~ 5	~~∞~~ 7

Bellman algorithm



Edge to be processed

(s,u), (s,x), (u,v), (x,y), (y,v), (u,y), (u,x), (x,v), (y,s), (x,v)

I st iteration

II nd iteration

2. Time complexity of Prims algorithm is

$O(V \log V + E \log V) = O(E \log V)$
It can be improved $= O(E + \log V)$

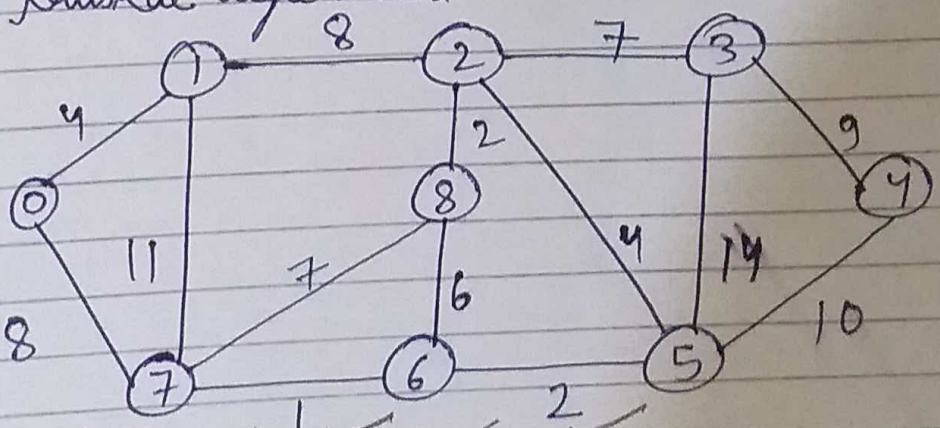
Space complexity - $O(V)$

Kruskal algorithm -
Time complexity $= O(E \log V)$
Space complexity $= O(\log E)$

Dijkstra Algorithm -
Time Complexity $= O((|V| + |E|) \log V)$
Space complexity $= O(|V| + |E|)$

Bellman Ford algorithm
Time Complexity $= O(E)$
Space Complexity $= O(V)$

3. Kruskal algorithm

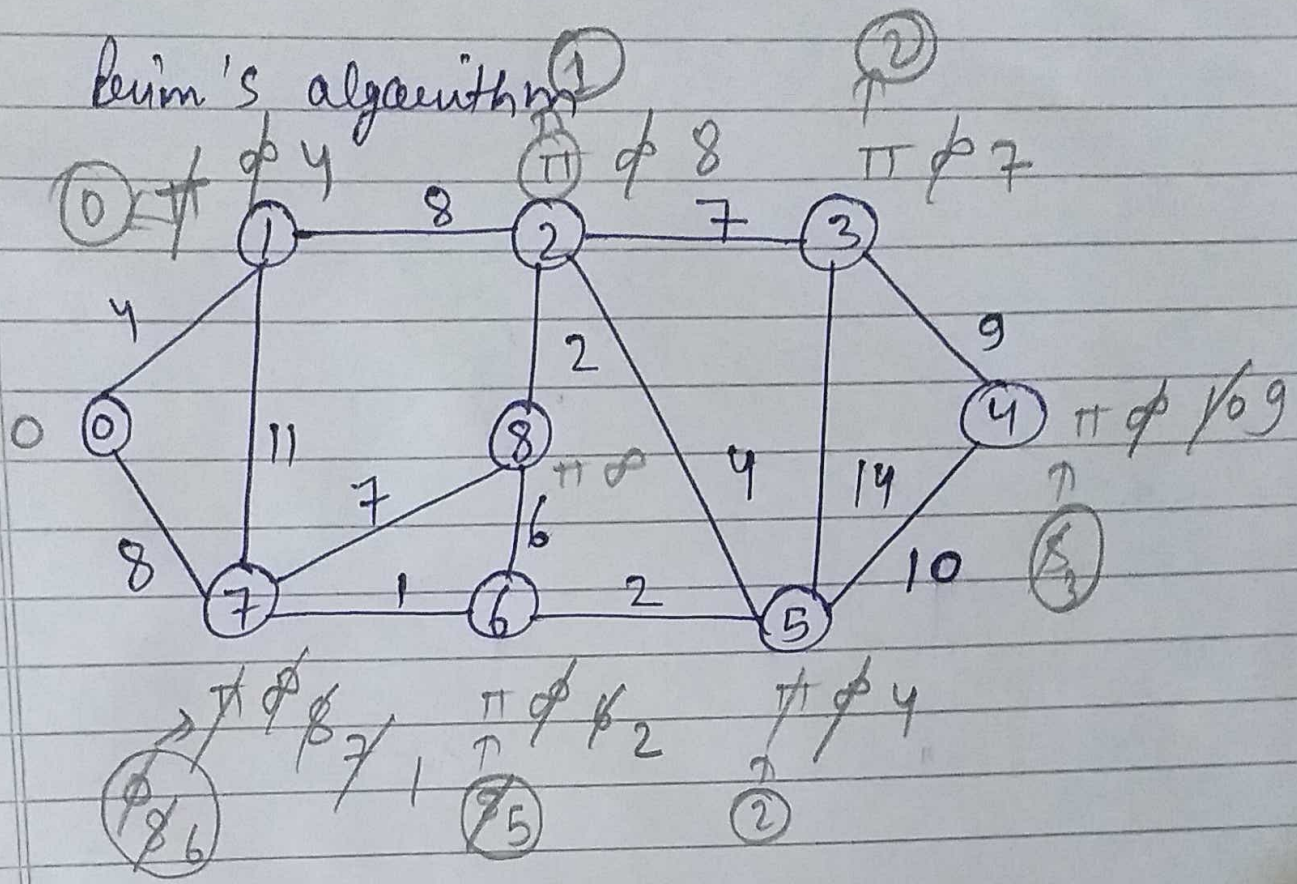


1 2 2 4 4 6 7 7 8 8

76, 28, 65, 25, 10, 86, 78, 23, 07, 12
9 10 11 14
34, 45, 17, 35

Weight of MST = 1+2+2+4+4+7+8+9
= 37

Prim's algorithm



0	1	2	3	4	5	6	7	8
0	4	8	7	10	4	2	1	2