Tutorial - 6

Ans-1 Minimum Spanning Tree

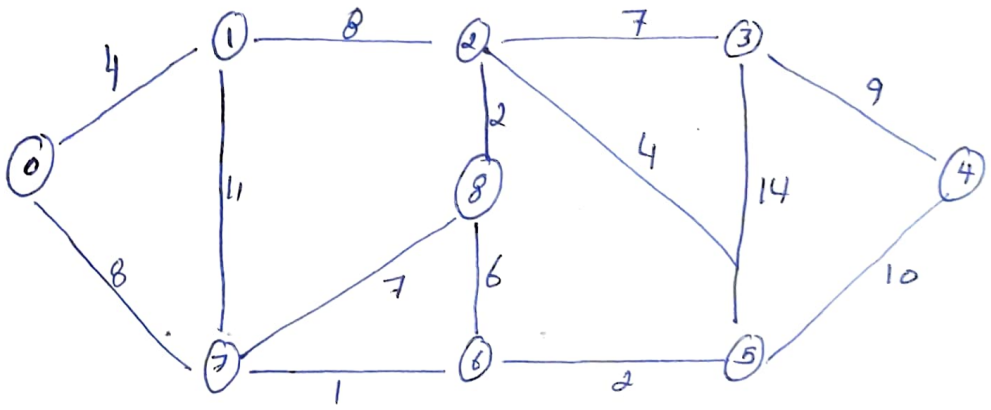
A Spanning Tree of an undirected graph is a subgraph that is a tree and joined by all vertices. One of that tree which has minimum total cost would be its minimum spanning tree.

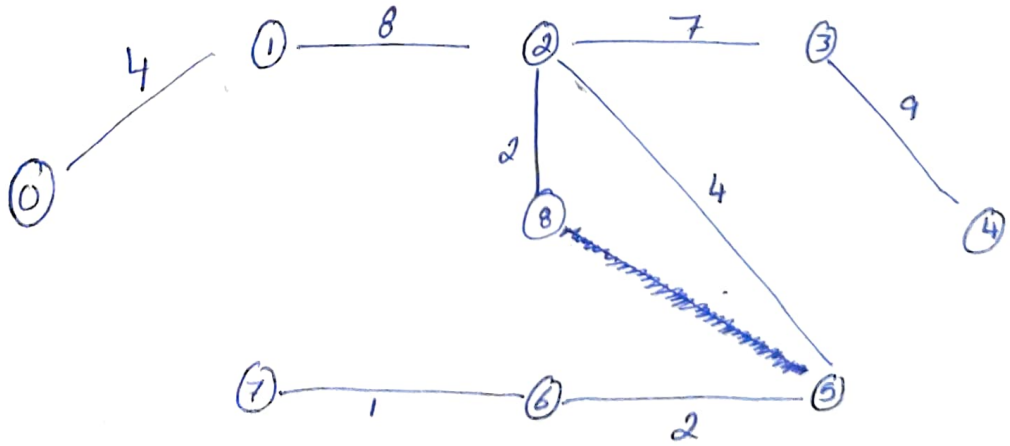
- It has direct application in the design of network including to Computer network, telecommunication network, transportation network etc

Ans-2

	Prim's algo	Kruskal's algo	Dijkastra algo	Bellman ford algo
TC	$O(V^2)$	$O(E \log V)$	$O(V+E\log V)$	$O(VE)$
SC	$O(V+E)$	$O(\|E\|+\|V\|)$	$O(V^2)$	$O(V^2)$

Ans-3

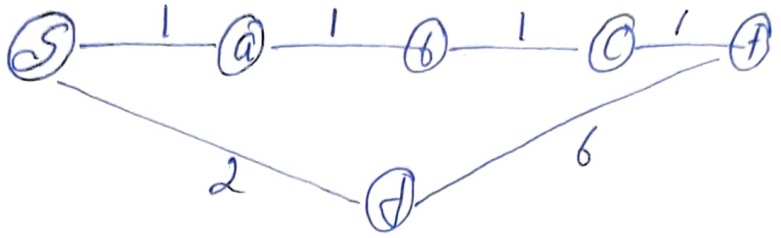




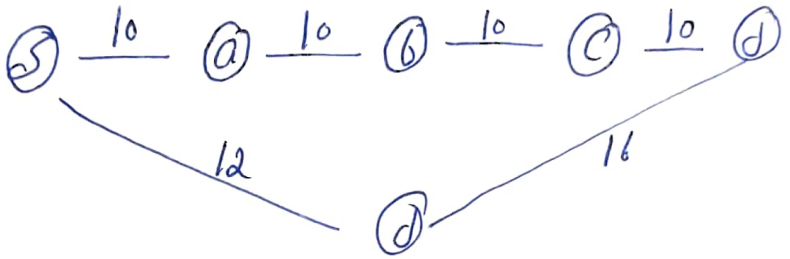
min weight → 37

Ans-4 i) if 10 unit is added to each edge, the overall weight of the Path may change

Eg



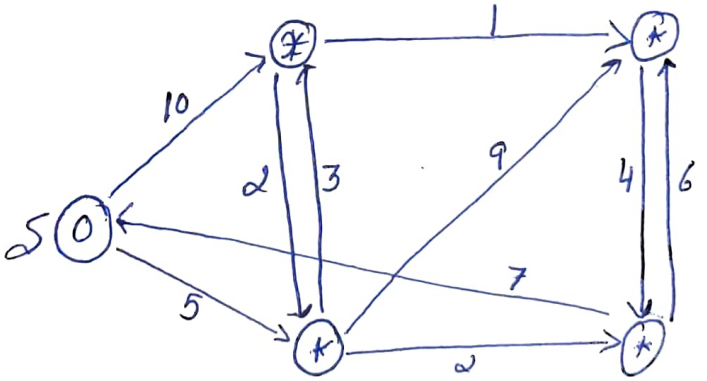
Shortest Path $s \to a \to b \to c \to d$ with min weight = 4



Shortest Path $s \to d \to t$ wit min weight = 28

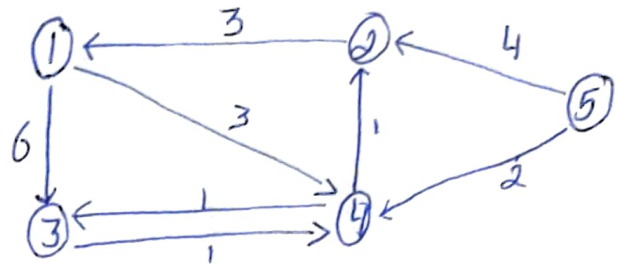
ii) multiplying the weight of each edge by 10 unit will have no impact on Shortest Path.

Ans-5



s	u	v	x	y
0	∞	∞	∞	∞
0	10	∞	5	∞
0	10	11	5	∞
0	10	11	5	7

Am-6 All Pair Shortest Path algorithm – Floyd warshall



A_0 =

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

A_1 =

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

$A^0[2,3] = \infty$

$A^0[2,1] + A^0[1,3] = 3 + 6 = 9, \quad 9 < \infty$

$A^0[2,4] = \infty$

$A^0[2,1] + A^0[1,4] = 3 + 3 = 6, \quad 6 < \infty$

$A^0[2,5] = \infty$

$A^0[2,1] + A^0[1,5] = 3 + \infty$

$A_2 =$

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

$A_1[1,3] = 6$

$A_1[1,2] + A_1[2,3] = \infty + 9, \quad 6 < \infty + 9$

$A_3 =$

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

$A_4 =$

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

$A_5 =$

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