NAME: JIGYASU DEO

Univ. Roll No. : 2015245

SECTION : M.L

CLASS Roll No : 32

SUBJECT : DESIGN AND ANALYSIS OF ALGORITHM

SUBJECT CODE : TCS 505

Tutorial-6

Ans 1: The cost of Spanning Tree is the Sum of the weights of all the edges in the tree. There Can be many Spanning trees. Minimum Spanning tree is the Spanning tree where the cost is minimum among all the Spanning trees. There also can be many minimum Spanning trees.

Minimum Spanning tree has direct application in the design of networks. It is used in algorithms approximating the travelling Salesman problem, multi-terminal minimum cut problem and minimum-cost weighted perfect matching.

Other Practical Applications Are :-

1. Cluster Analysis
2. Handwriting recognition
3. Image Segmentation

Ans 2:

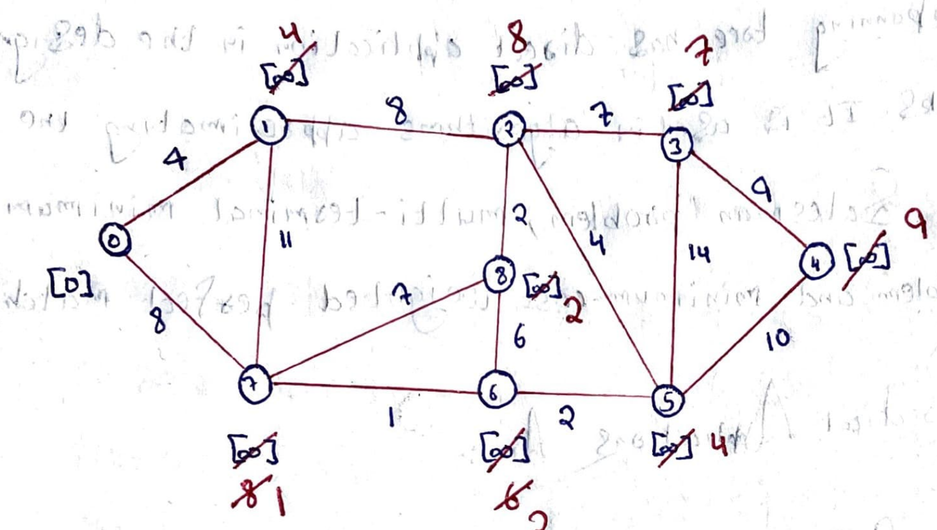
	Time Complexity	Space Complexity
Prim's Algo	$O(V^2)$ $O(E\log V)$ using Fibonacci Heaps	$O(\lvert V\rvert)$
Kruskal	$O(E\log E) = O(E\log V)$	$O(\lvert V\rvert)$

Dijkstra $O(E \log V)$ $O(|V|+|E|)$

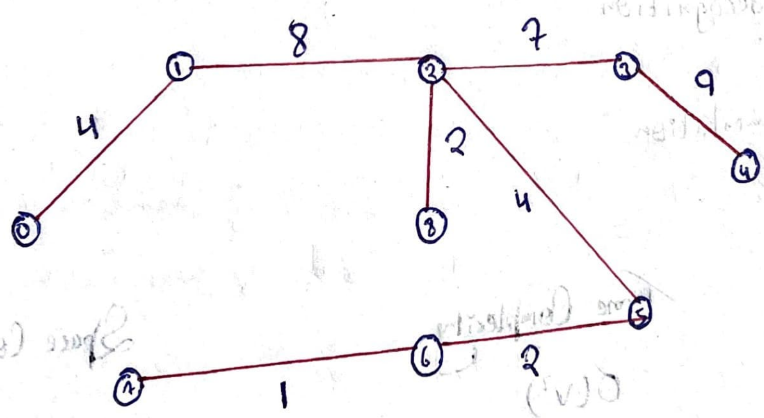
Using Priority Queue

Bellman Ford $O(VE)$ $O(V)$

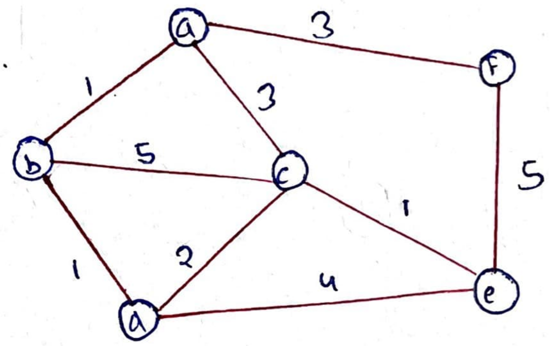
Ans 3 =



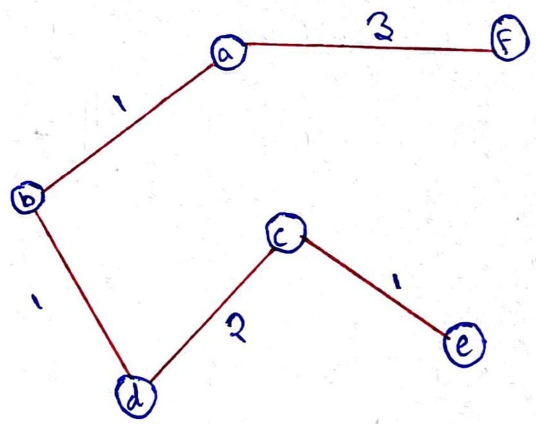
PRIM's Algorithm



Min weight = 37



Kruskal

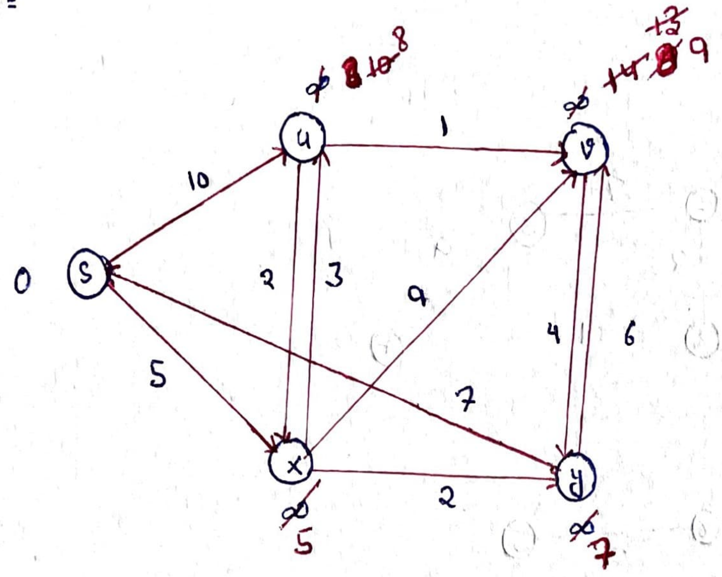


Min Weight = 8

Ans4= i) The Shortes path may change. The reason is, there may be different number of edges in different Paths from s to t. For Example, let Shortest path be of weight 15 and has 5 edges. Let there be anothe path with 2 edges and total weight 25. The weight of the Shortest path is increased by 5 * 10 and becomes 15+50. Weight of the other path is increased by 2 * 10 and becomes 25 + 20. So the Shortest path changes to the other path with weight as 45.

ii) If we multiply all edge weight by 10, Shortest path doesn't change. The no. of edges on a path doesn't matter

Ans 5 =



Dijkstra Algorithm

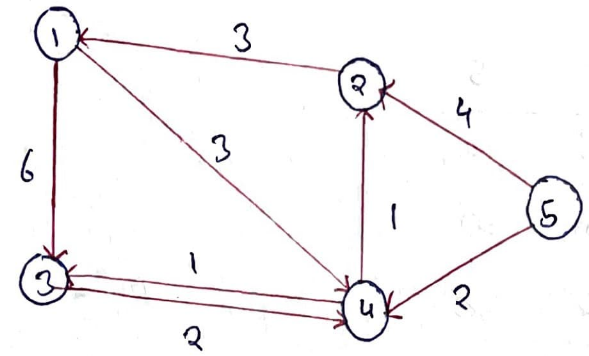
Node	Shortest dist. from Source node 0
u	8
v	9
x	5
y	7

Bellman Algorithm

S	u	v	x	y
0	∅	∅	∅	∅
	~~10~~	9	5	7
	8			

S	u	v	x	y
0	8	9	5	7

Ans6=



D =

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

D_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

D_2 =

	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_3 =

	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_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

Time Complexity

$O(V^3)$

Space Complexity

$O(V^2)$