Tutorial-6

Ans1 minimum spanning tree :- Also called minimum weight spanning tree is a subset of the edges of a connected to edge-weighted undirected graph that connected all the vertices together, without any cycles and with the minimum possible that edge weight.

Applications :

* Suppose you meant to construct highways or railroads spanning several cities then we can use the concept of minimum spanning tree
* Design LAN
* laying pipelines containing connecting offshore drilling sites, refineries and consumer markets

Ans 2

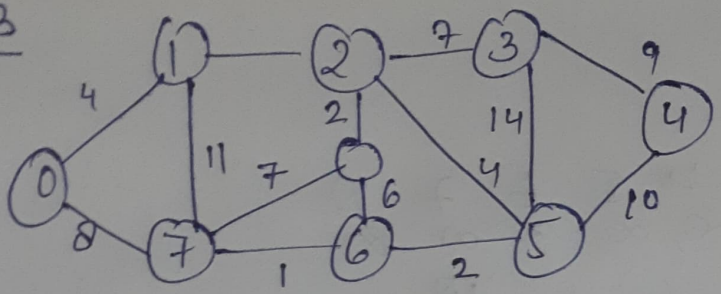
Prim's algorithm : TC → O((V+E)log)
SC → O(V)

Kruskal's algorithm : TC → O(E(logV))
SC → O(|V|)

Dijkstra Algorithm : TC → $O(V^2)$
SC → $O(V^2)$

Bellmanford : TC → O(VE)
SC → O(E)

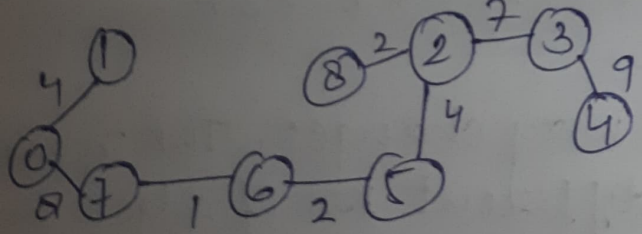
Ans 3



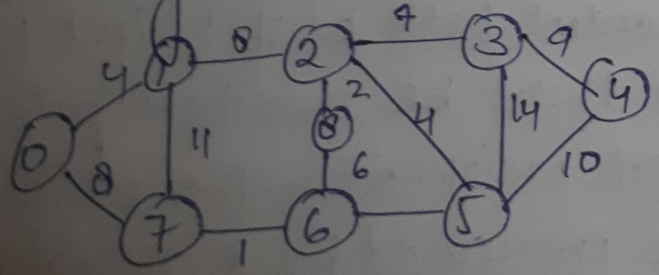
Kruskal's algorithm :-

U	V	W	
6	7	1	✓
5	6	2	✓
2	8	2	✓
0	1	4	✓
2	5	4	✓
6	8	6	X
2	3	7	✓
7	0	7	X
0	7	8	✓
1	2	8	X
4	3	9	✓
4	5	10	X
1	7	11	X
3	5	14	X

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



Prim's algorithm :-

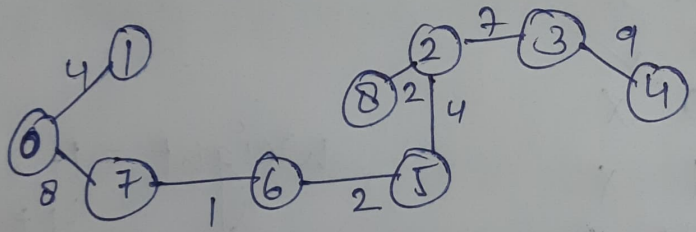


Weight:-

0	1	2	3	4	5	6	7	8
0 ~~∞~~	∞	∞	∞	∞	∞	∞	∞	∞
	4						[8]	
		8				[1]		7
	11		7		4	1		[2]
			7		2			6
	4		14		1	10		
			[7]					
						[9]		

parent:

0	1	2	3	4	5	6	7	8
~~1~~	~~x~~	~~x~~	1	1	1	~~x~~	~~x~~	1
	6	1				1	1	



Weight:- 4+8+1+2+4+2+7+9 → 37

Ans4 i) The shortest path may changes. The reason is there may be different no. of edges in different paths from s to t.

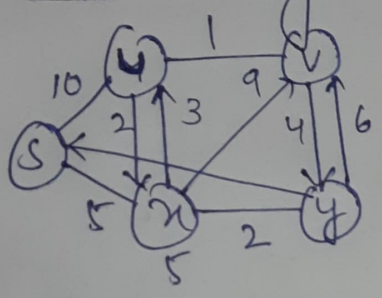
for ex: let shortest path be of weight 15 & has edge 5. let there be another path with 2 edge and total weight 25. The weight of the shortest path is increased by 5" to and becomes 15+50. weight of the other path is increased

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 edges weight by 10, the shortest path don't change. The reason is simple, weight of all path from s to t. get multiplied by the same amount. The no. of edges on a path don't matter. It is like changing units of weight.

Ans5

Dijkstra Algorithm :-



node	shortest distance from source node
u	0
x	5
v	9
y	7

Bellmanford algorithm:-

1st →	s	u	v	x	y
	0	10	∞	5	∞
2nd →	0	10	11.1	5	∞
	s	u	v	x	y
3rd →	0	8	9	5	7
	s	u	v	x	y
4th →	0	8	9	5	7
	s	u	v	x	y

graph does not have cycles