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TUTORIAL - 6

Ans → 1 Minimum Spanning Tree → A MST 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 min. possible total edge weight.

Applications →

(i) Consider n station are to be linked using a comm. network & lying of comm. link b/w any 2 station involved a cost. The ideal soln would be to exactly a subgraph termed as min. cost spanning tree.

(ii) Suppose u meant to contruct highways or railrods spanning several cities then we can use the concept of min. spanning tree

(iii) Design LAN.

(iv) Laying pipelines connecting offshore drilling sites, refineries & consume markets.

Ans→2

→ Time Comp. of Prim's algo → $O((V+E)\log)$

Space complexity of Prim's algo → $O(V)$

→ Time comp. of Kruskal's algo → $O(E \log V)$

Space " " " $O(|V|)$

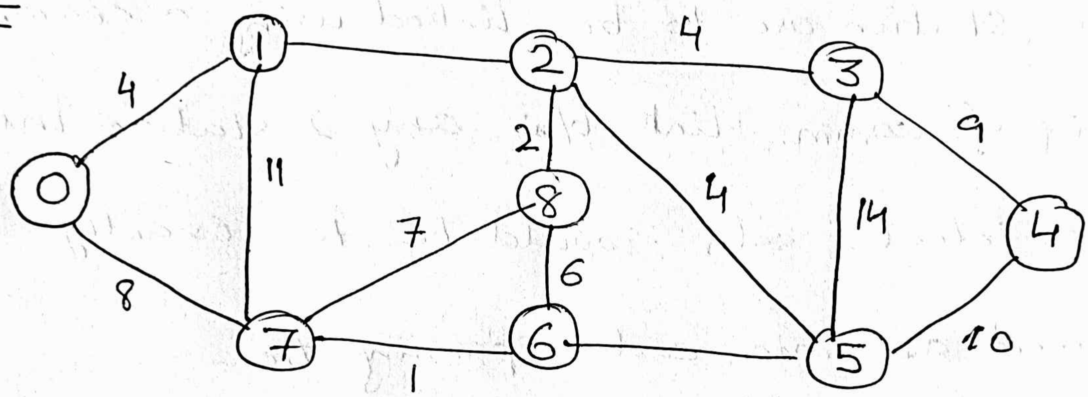
→ Time comp. of Dijkstra algo → $O(V^2)$

Space " " " → $O(V^2)$

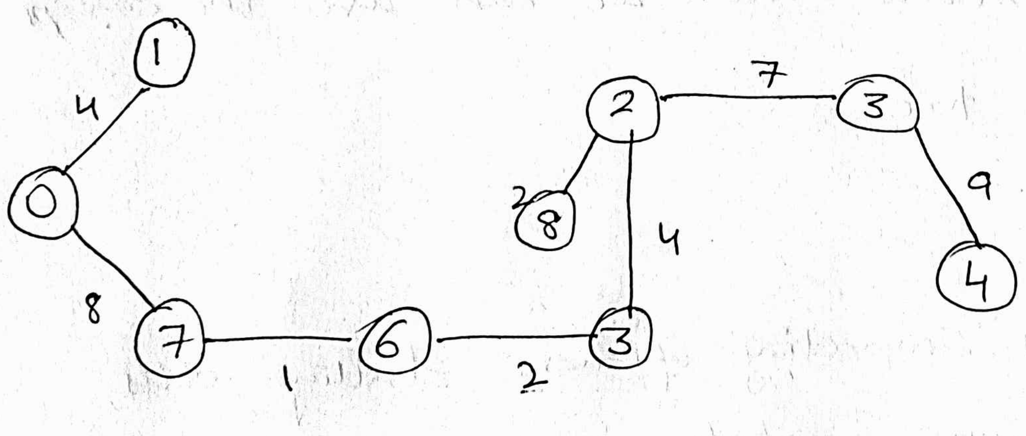
→ Time comp. of Bellman ford → $O(VE)$

Space " " " " → $O(E)$

Ans→3



→ Kruskal's algo



eight : 1+2+2+2+4+4+7+8+9=39

O	V	W	
6	7	1	✓
5	6	2	✓
2	8	2	✓
0	1	4	✓
2	5	4	✓
6	8	6	✗
2	3	7	✓
7	8	7	✗
0	7	8	✓
1	2	8	✗
4	3	9	✓
4	5	10	✓

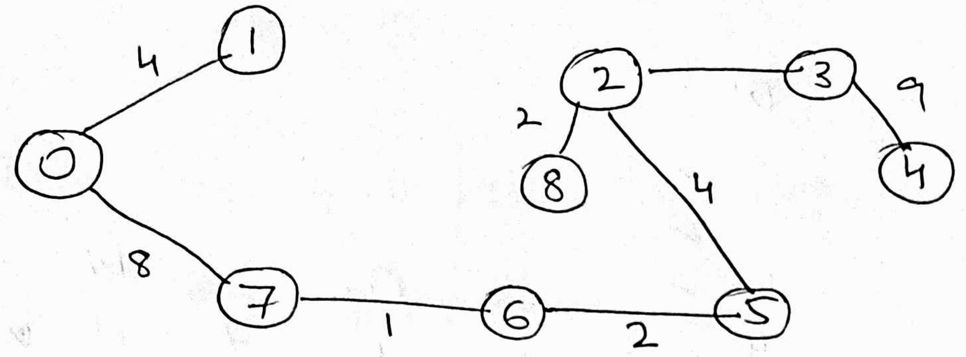
O	V	W	
0	7	11	✗
1	5	14	✗
3			

Prim's algo :

0	1	2	3	4	5	6	7	8
$\boxed{0\ \cancel{\infty}}$	∞	∞	∞	∞	∞	∞	∞	∞
							$\boxed{8}$	
	4					$\boxed{1}$		7
		8			4	1		$\boxed{2}$
	11		7					6
			7		2			
	4	14	1	10				
		$\boxed{7}$		$\boxed{9}$				

Parent :

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



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

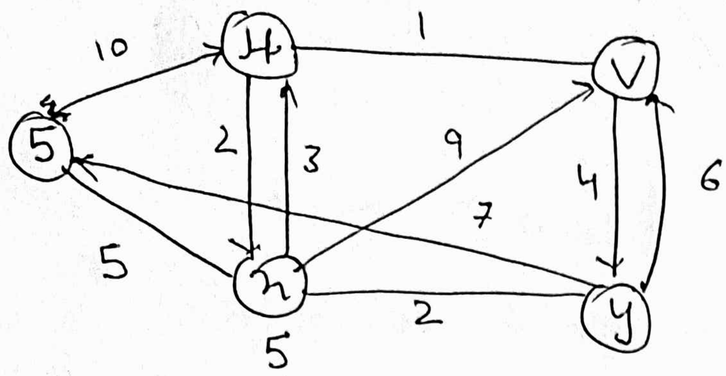
Ans → 4

i) The shortest path may changes. The reason is there may be diff. no. of edges in different paths from 's' to 't'. eg. let shortest path be of weight 15 & has edge 5. let there be another path with 2 edge & total weight 25. The weight of the shortest path is increased by 5 × 10 & becomes 15 + 50. Weight of other path is inc. by 2 × 10 & becomes 25 + 20 so the shortest path changes to 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 same amt, The no. of edges on a path don't matter, It is like changing limits of weight.

u→5

Dijkstra Algorithm:



node	Shortest dist from source node
u	8
x	5
V	9
y	7

Bellman - Ford algo :

	S	u	V	x	y
1st →	0	10	∞	5	∞
2nd →	0	10	11	5	∞
3rd →	0	8	9	5	7
4th →	0	8	9	5	7

→ grap does not have cycle