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Q1. What do you mean by minimum Spanning Tree? What are the application of MST?

Ans Minimum Spanning Tree is a subset of edges of a connected edge-weighted undirected graph that connects all vertices together without any cycle and minimum possible get edge weighted.

Applications →

i) Consider n stations are to be linked using a communication network and lying of communication link between any two stations involves a cost. The ideal solution would be to extract a subgraph termed as minimum cost spanning tree

ii) Designing LAN

iii) Suppose you want to contruct highways or railroad spanning several cities, then we can used concept of MST

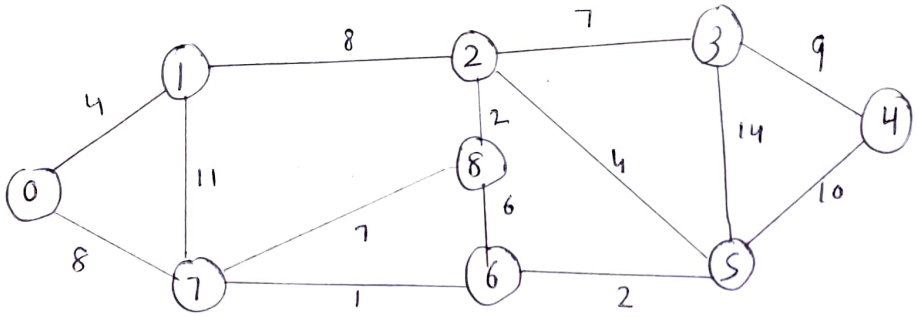
iv) Laying pipelines connecting offshore drilling sites, refineries and consumer markets.

Q2 Analyze time and space complexity of Prim, Krushal, Dijkstra and Bellman Ford Algorithm.

Ans =

Algorithm	Time Complexity	Space Complexity
• Prisms Algorithm	$O(\|E\| \log \|V\|)$	$O\|V\|$
• Krushals Algorithm	$O(\|E\| \log \|E\|)$	$O\|V\|$
• Dijkstra's Algorithm	$O[V^2)$	$O(V^2)$
• Bellman Ford's Algorithm	$O(VE)$	$O(E)$

(3) Apply Krushal and Prism's Algorithm on given g... to compute MST and its weight.



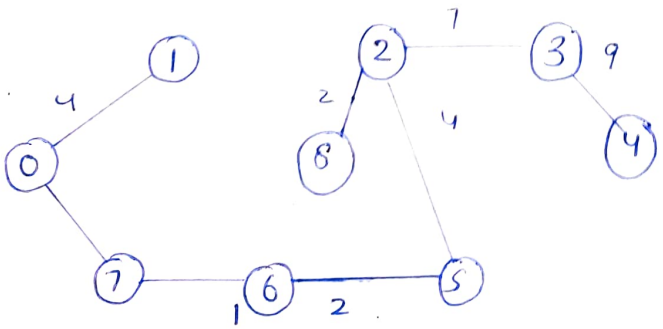
Ans

Krushal's Algorithm

u	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	×
1	7	11	×
3	5	14	×

Prisms Algorithm

weight = 4+8+2+4+2+7+9+3
= 37

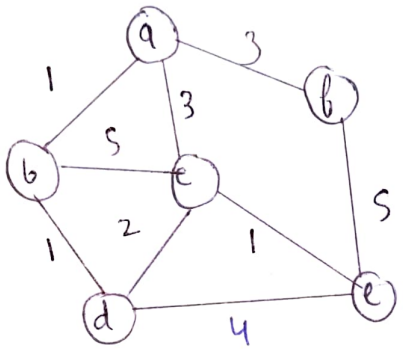


weight = 1+2+2+4+4+7+8+9

1 Given a directed weighted graph. You are also given the shortest path from a source vertex 's' to a destination vertex 't'. Does the shortest path remain same in following cases

i) If weight of every edge is increased by 10 units

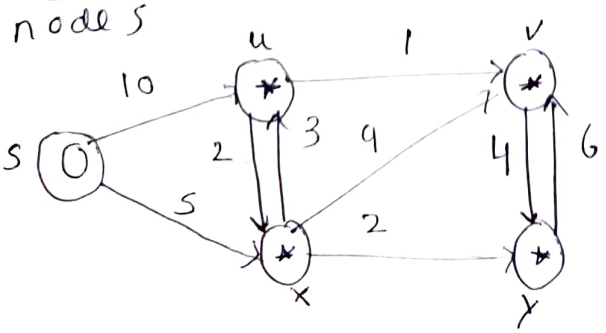
ii) If weight of every edge is multiplied by 10 unit.



Ans i) The shortest path may change. The reason is that there may be different no. of edges in different path from 's' to 't' for eg - Let the shortest path of weight 15 and has edges 5. Let there be another path with 2 edges and total weight 25. The weight of shortest path is increased by 5*10 and becomes 25+20. So, the shortest path changes to other path with weight as 45.

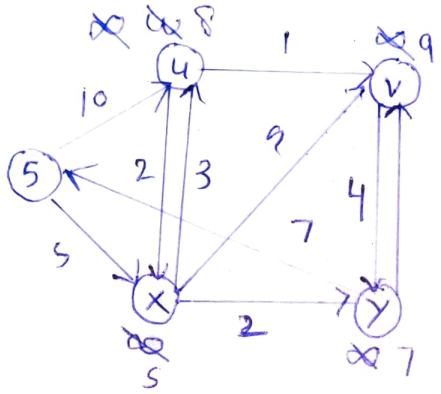
ii) If we multiply all edges weight by 10, the shortest path does not change. The reason is that weight of all path from 's' to 't' gets multiplied by same unit. The numbers of edges or path doesn't matter

Q5) Apply Dijkstra & Bellman Ford algorithm on graph given right side to compute shortest path to all nodes from node s

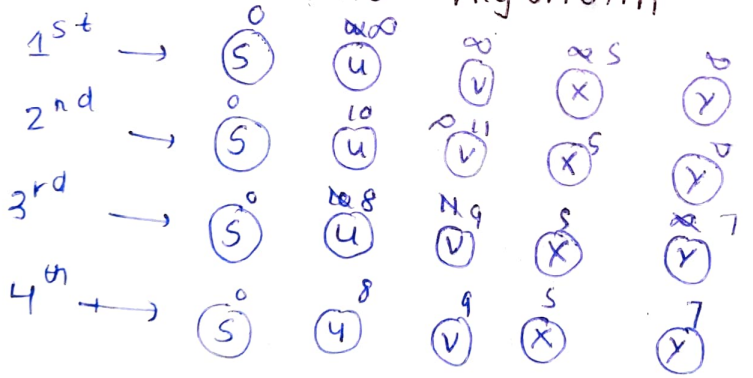


Ans Dijkstra's Algorithm

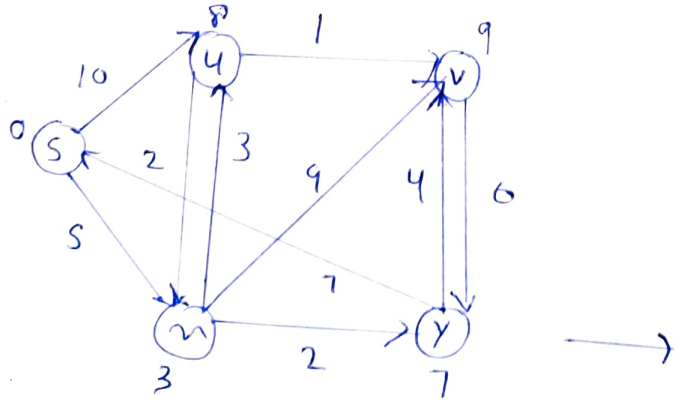
NODE	SHORTEST DIST FROM SOURCE NODE
u	8
x	5
v	9
y	7



Bellman Ford Algorithm

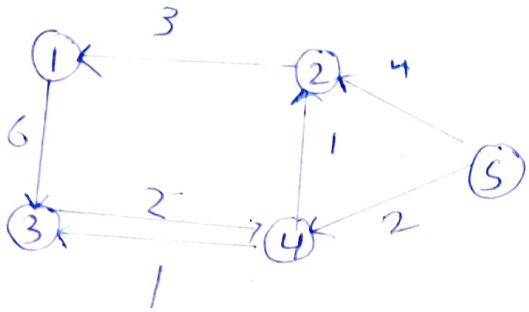


graph doesn't have -tive cycle



→ FINAL GROUP

Q6 Apply all pair shortest path algorithm · Floyd Warshall on below mentioned graph · Also analyze space & time complexity of it



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

	1	2	3	4	5
1	0	∞	6	3	∞
2	2	0	8	5	∞
3	∞	∞	0	2	∞
4	∞	1	1	0	∞
5	∞	4	∞	2	0

	1	2	3	4	5
1	0	∞	6	3	∞
2	2	0	8	5	∞
3	∞	∞	0	2	∞
4	3	1	1	0	∞
5	6	4	12	2	0