Tutorial-6 (DAA)

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Qu.1 What do you mean by Min spanning tree? What are the applications of MST?

Ans Minimum spanning tree is a subset of edges of a connected edge-weighted graph that connects all the vertices together without any cycles & with min possible edge weighted

Applications:

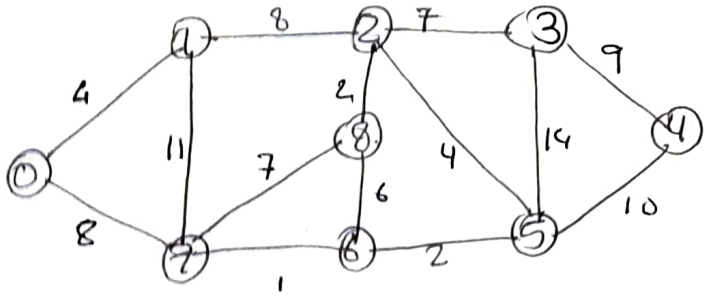
1. Consider n stations are to be linked using a communication network and lying of communication link between any two stations involved a cost. The ideal condition is to extract a subgraph formed as min cost spanning tree
2. Designing LAN
3. Laying pipeline connecting offshore drilling sites, refineries & consumer markets

Qu-2 Analyze time & space complexity of different algorithms

Ans

Algorithm	Time Comp	Space Comp
Prim's Algorithm	$O(\|E\|\log\|V\|)$	$O\|V\|$
Kruskal's Algorithm	$O(\|E\|\log\|E\|)$	$O\|V\|$
Dijkstra's Algorithm	$O(V^2)$	$O(V^2)$
Bellman Ford's Algorithm	$O(VE)$	$O(E)$

Ans-3

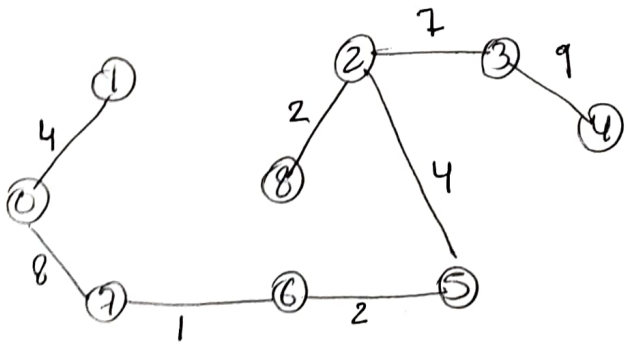


Kruskal's Algorithm :-

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	8	7	x
0	7	8	✓
1	2	8	x
4	3	9	✓
4	5	10	x
1	7	11	x
3	5	14	x

Prim's Algorithm

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



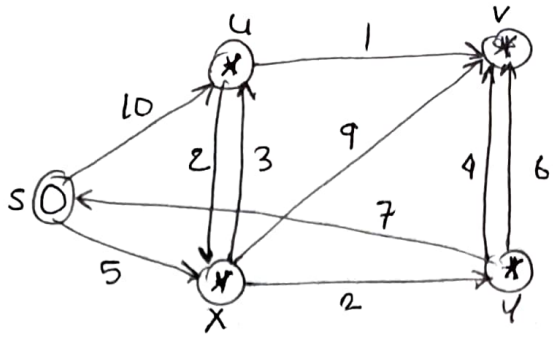
weight = 1+2+2+4+4+7+8+9
= 37

Ans-4

(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 edge and total weight 25. The weight of shortest path is measured by 5*10 and becomes 15+50 weight of other path is increased by 2*10 & becomes 25+20 so the shortest Path changes to other path with weight as 45.

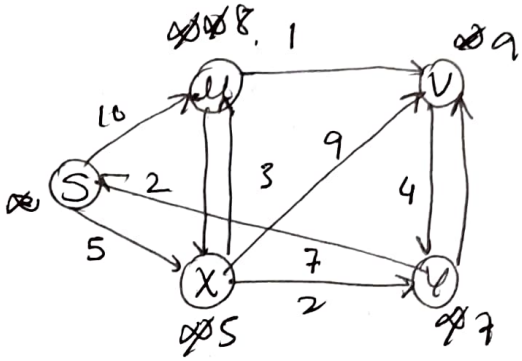
(ii) If we multiply all edges weight by 10, the shortest path do not change. The reason is that weights of all path from S to t gets multiplied by same unit the nubes of edges of path doesn't matter.

Ans-5



Dijkstra's Algorithm:

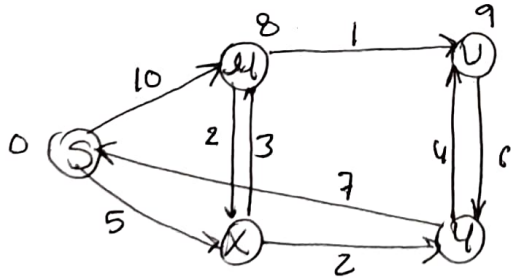
Node	Shortest dis from source node
u	8
x	5
v	9
y	7



Bellman Ford Algorithm:

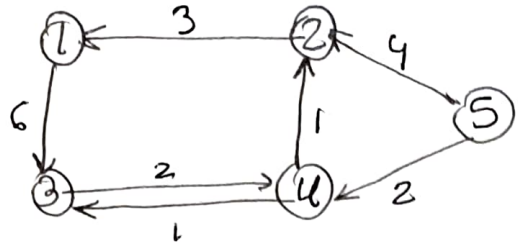
1st →	0	∞	∞	5	∞
2nd →	0	10	11	5	∞
3rd →	0	8	9	5	7
4th →	0	8	9	5	7

graph does not have -ve cycle



Final Graph

Ans-6



	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	∞	∞	∞	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

	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

Ans

Time comp → $O(|V|^3)$

Space comp → $O(|V|^2)$