Assignment Tutorial – 6

Design and analysis of algorithm

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DS1
14

Q1) What do you mean by minimum spanning tree? What are the application of MST?

A minimum spanning Tree (MST) is a subset of edges of a connected undirected graph that connect all the vertices together, without any cycle and without any cycles and with the minimum possible total edge weight. It is a way to connect all the vertices in a graph in way that minimize the total weight of the edge in a tree.

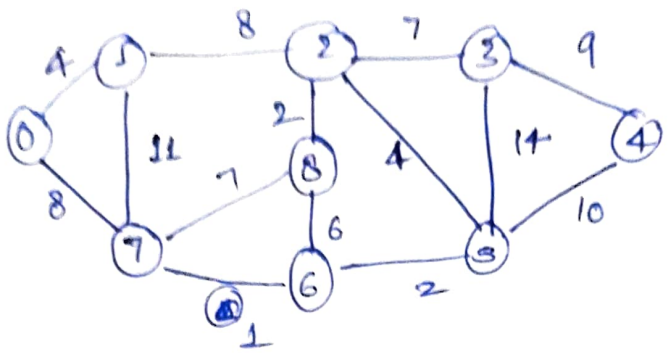
Application of MST.

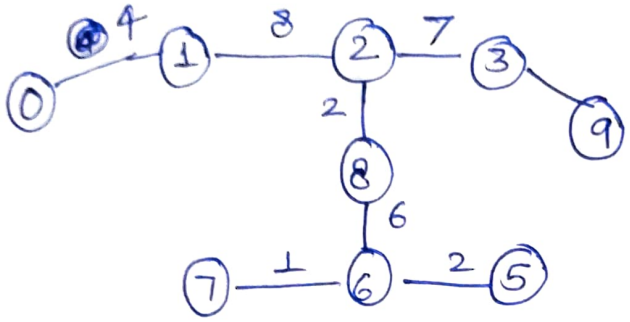
1) Network design.
2) Cluster analysis
3) Approximation Algorithm.
4) Routing algorithm
5) Image Segmentation

Q2) Analyse the time and space complexity of Prism, kruskal, Dijkstra and Bellman Ford Algorithm.

	Time complexity	Space Complexity
Prim	$O(V^2)$	$O(E \log V)$
Krustkal	$O(E \log E)$	$O(E+V)$
Dijkstra	$O(V^2)$	$O(V+E)$
Bellman ford	$O(VE)$	$O(V+E)$

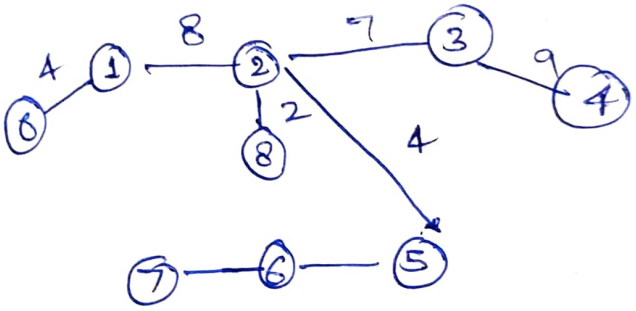
(8) Apply Kruskal and Prim's Algorithm on given graph. on right side to compute MST and its weight.





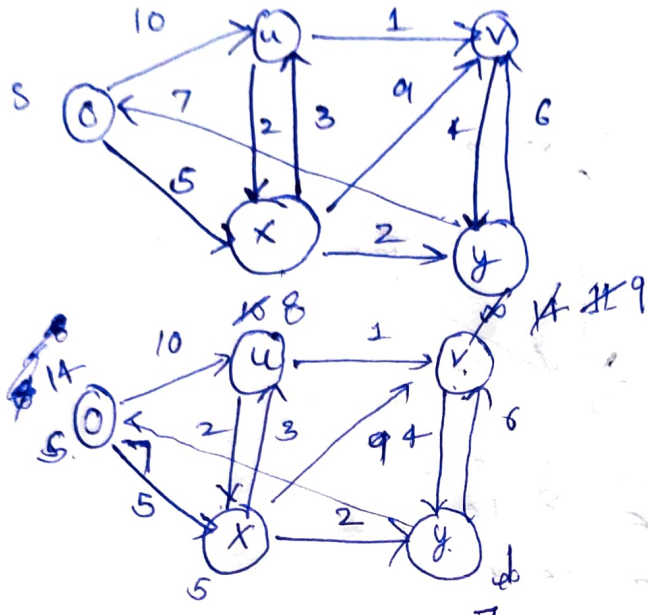
MST.

Prim Algorithm.



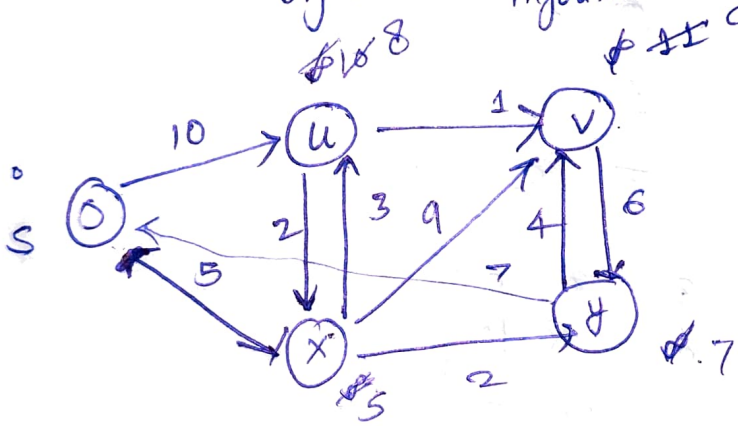
wt	u	v
1	6	7
2	6	5
2	8	2
~~2~~	~~2~~	8
4	0	1
4	5	2
6	8	6
7	7,	8
7	2	3
8	0	7
8	1	2
9	3	4
10	2	5
11	1	7

(5) Apply Dijkstra and Bellman algorithm on given graph to compute the shortest path to all nodes from node S.



u	d[u]
x	5
u	~~8~~
v	9
y	7

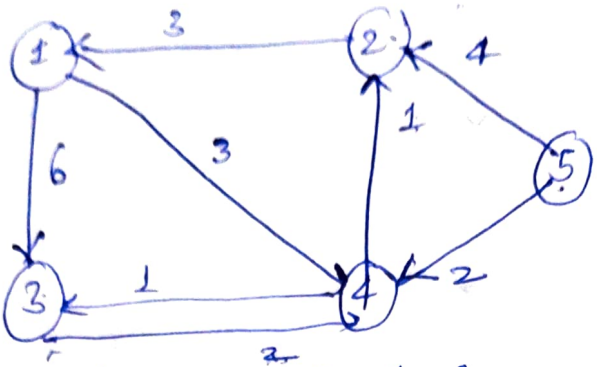
Dijkstra Algorithm



(0,u) (0,x) (u,x) (u,v) (x,y) (y,v) (x,v) (x,u) (x,y) (0,

a	d[a]
u	8
x	5
v	9
y	7

(6) Apply all pair shortest path algorithm - Floyd Warshall on below mentioned graph and also analyse time and space complexity of an algorithm



$A^0 =$

	1	2	3	4	5
1	0	∞	6	8	10
2	3	0	9	10	∞
3	∞	3	0	2	7
4	4	1	1	0	∞
5	7	4	3	2	0

$A^1 =$

	1	2	3	4	5
1	0	∞	6	8	10
2	3	0	9	10	13
3	∞	3	0	2	7
4	4	1	1	0	14
5	7	4	3	2	0

$A^2 =$

	1	2	3	4	5
1	0	∞	6	8	10
2	3	0	9	10	13
3	6	3	0	2	7
4	4	1	1	0	14
5	7	4	3	2	0

$A^3 =$

	1	2	3	4	5
1	0	9	6	8	10
2	3	0	9	10	13
3	6	3	0	2	7
4	4	1	1	0	8
5	7	4	3	2	0

$A^4 =$

	1	2	3	4	5
1	0	9	6	8	10
2	3	0	9	10	13
3	6	3	0	2	7
4	4	1	1	0	8
5	6	3	3	2	0

Time complexity = $O(V^3)$

Space complexity = $O(V^2)$

$A^5 =$

	1	2	3	4	5
1	0	9	6	8	10
2	3	0	9	10	13
3	6	3	0	2	7
4	4	1	1	0	8
5	6	3	3	2	0