Kruskals Algorithm

Kruskal algorithm is used to find the minimum spanning tree for a connected weighted graph

~~Main target to find~~

Spanning tree

ST is a subgraph of an undirected connected graph

minimum Spanning tree

MST is defined as the spanning tree in which sum of weights of the edge is minimum

Notes

→ No cycle allowed
→ all vertices should be included
→ Total weight should be minimum

Steps

→ Sort all the edges from low weight to high

→ take the edge with the lowest weight and add it to the spanning tree, if edges creates cycle reject that edge

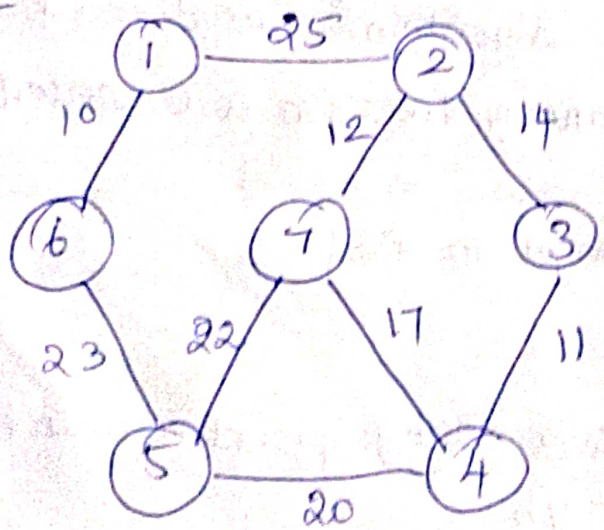
→ ~~contin~~ Repeat above process until all vertices added to the MST.

Appln

→ used as layout for electrical wiring among cities

→ LAN connection

Ex

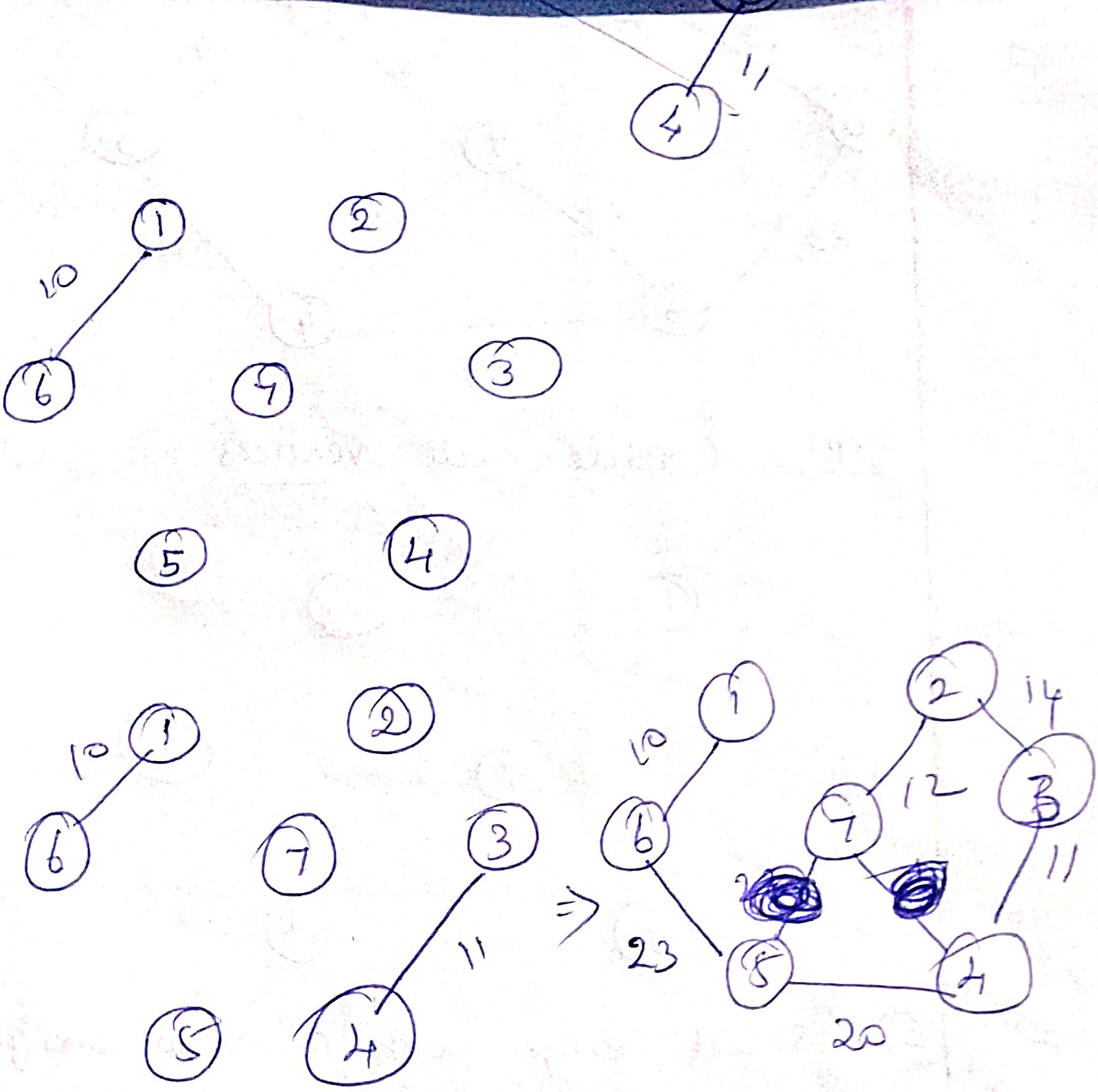


$|V| = 7$

$|E| = 9$

Sort edge

1-6	1-2	2-3	3-4	5-4	7-4	7-5	6-5	2-7
10	25	14	11	20	17	22	23	12
I	IX	IV	II	VI	V	VII	VIII	III



total weight = 10 + 23 + 20 + 12 + 11 + 14

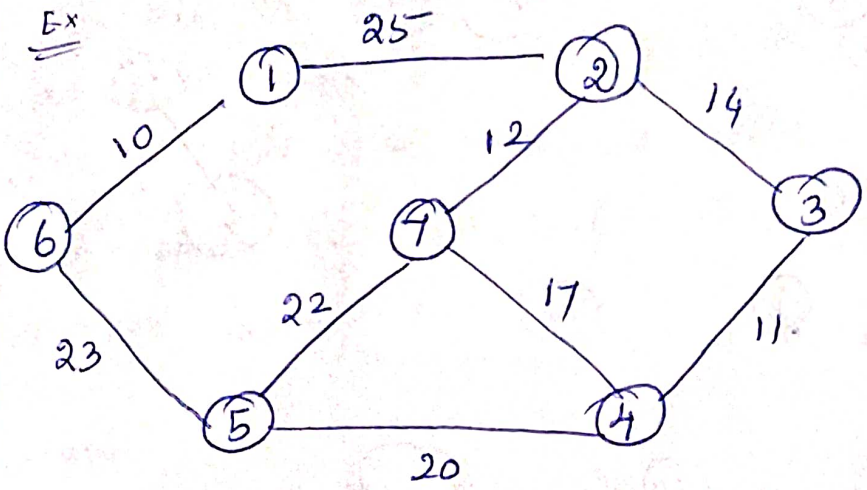
total weight = 90

for MST

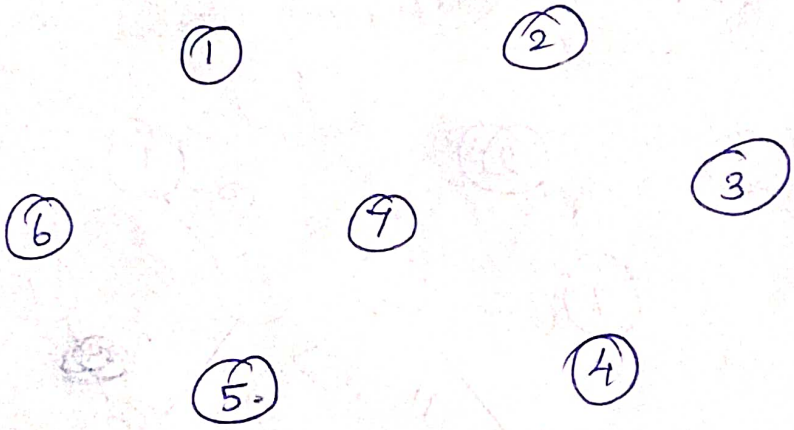
Prim's algorithm

Prims algorithm used to find minimum Spanning tree of undirected graph

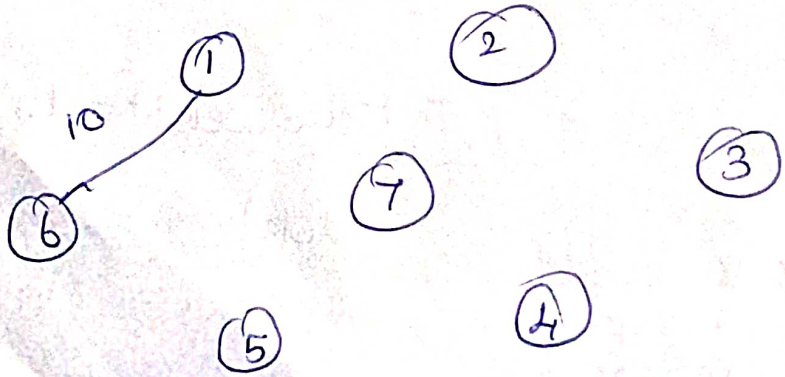
Ex



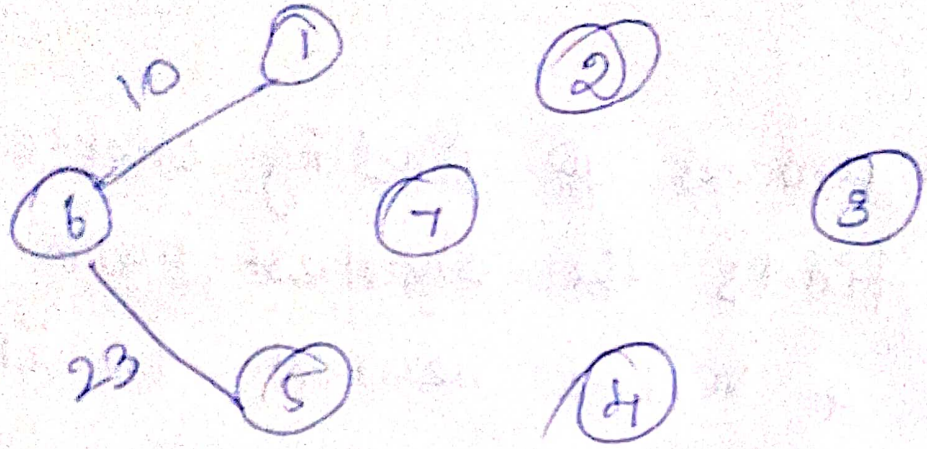
Step 1: Consider all vertices

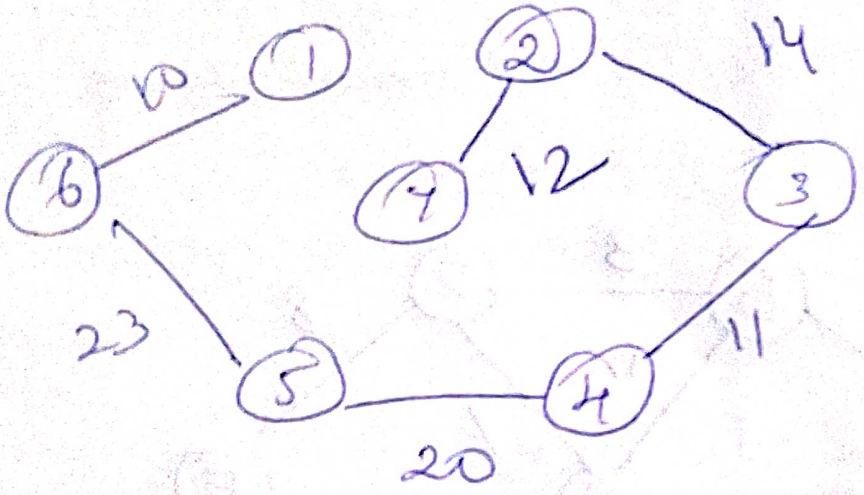


(2) select edge with minimum weight



(3) Select adjacent edge with minimum cost





Total weight = 90

Dijikstra's algorithm

→ Dijikstra algorithm is a shortest path algorithm

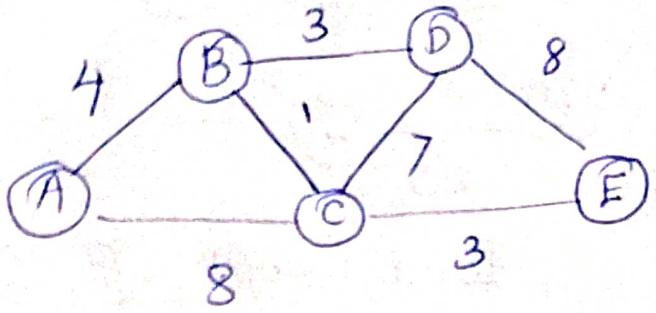
→ This is also called as single source shortest path algorithm

→ Given weighted Graph 'G', Source vertex (3) the algorithm returns the shortest path from (3) to any other vertices.

⇒ This algorithm applicable for only non-negative weights.

→ In this process of finding shortest path, first it finds the shortest path from source to a vertex nearest to it, then second nearest and so on

Ex



Source vertex	Distance with other Vertices
A	A-B = 4
	A-C = 8
	A-D = ∞
	A-E = ∞
B	B-C = 4+1 = 5
	B-D = 4+3 = 7
	B-E = ∞
C	C-D = 5+7 = 12
	C-E = 5+3 = 8
D	D-E = 7+8 = 15

⇒ Shortest Distance from A to E is

[A - B - C - E] : path

path length = 4 + 1 + 3 = 8

Algo: Screen Shot.

Floyd warshall algorithm

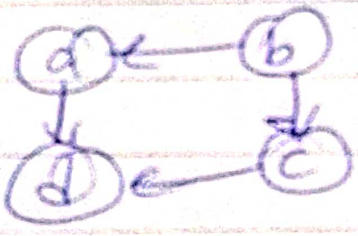
→ also called as all pairs shortest path algorithm

→ Dynamic programming

Directed Graph

→ Graph in which all edges are directed it is called directed graph

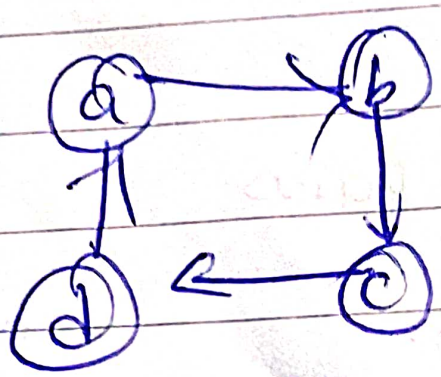
adjacency matrix



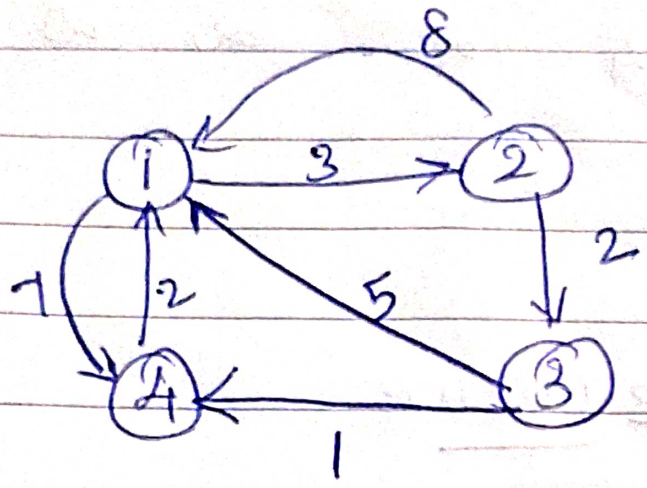
if there is path (edge) between $V_i - V_j$ then entry in adjacency matrix = 1

	a	b	c	d
a	0	1	0	0
b	0	0	1	0
c	0	0	0	1
d	1	0	0	0

Transitive closure

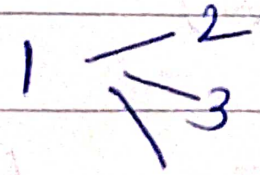


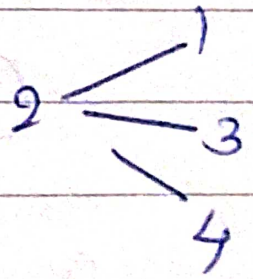
	a	b	c	d
a	1	1	1	1
b	1	1	1	1
c	1	1	1	1
d	1	1	1	1

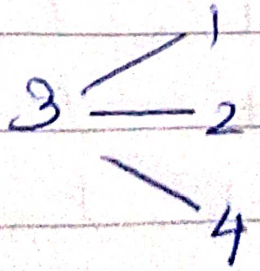


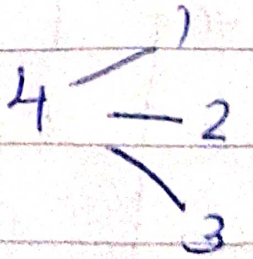
All-pairs

Q:-









$$A^0 = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 1 & 0 & 3 & \infty & 7 \\ 2 & 8 & 0 & 2 & \infty \\ 3 & 5 & \infty & 0 & 1 \\ 4 & 2 & \infty & \infty & 0 \end{bmatrix} \end{array}$$