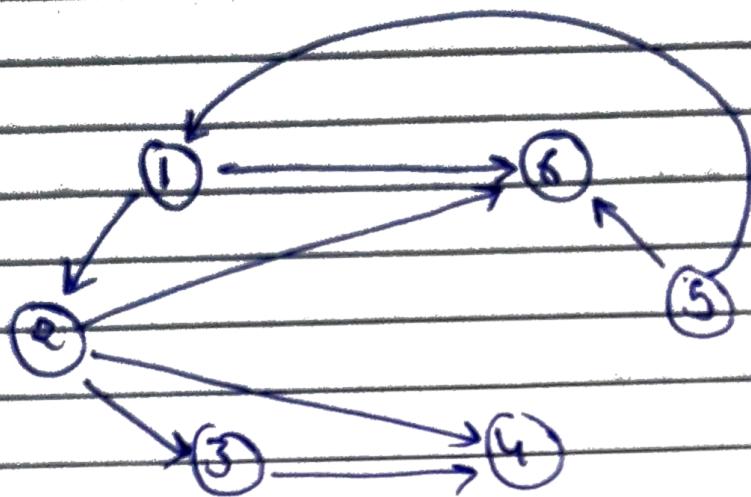


(i)



(ii)

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

Adjacency Matrix

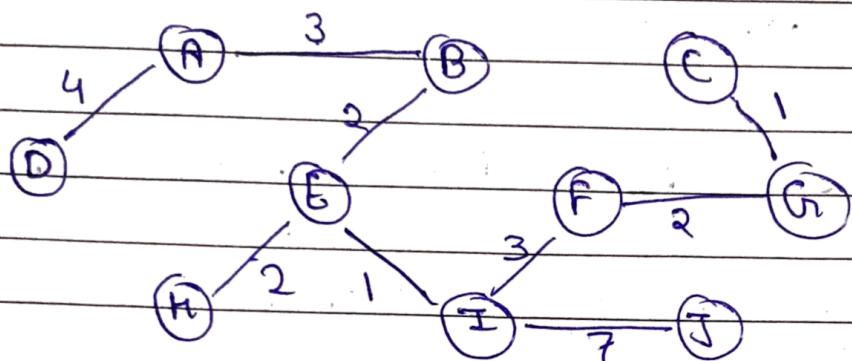
(iii)

	1	2	3	4	5	6
1	0	12	0	0	0	16
2	0	0	23	24	0	25
3	0	0	0	34	0	0
4	0	0	0	0	0	46
5	S1	0	0	0	0	S6
6	0	0	0	0	0	Q

Path Matrix

- ② Prim's Algorithm grows a sol<sup>n</sup> from a random vertex by adding the next cheapest vertex to existing tree  
 Kruskal's Algorithm grows a sol<sup>n</sup> from cheapest edge by adding the next cheapest edge to existing tree.

i) Prim's



$$C = \{1^*, 6, 10\}$$

$$G_1 = \{1, (3), 8\}$$

$$F = \{2^*, 0, 11, 11, 3\}$$

$$I = \{(1), 3^*, 7, 4\}$$

$$E = \{1, (2), 5, 11, (6), 4\}$$

$$B = \{2, (3), 10, 3\}$$

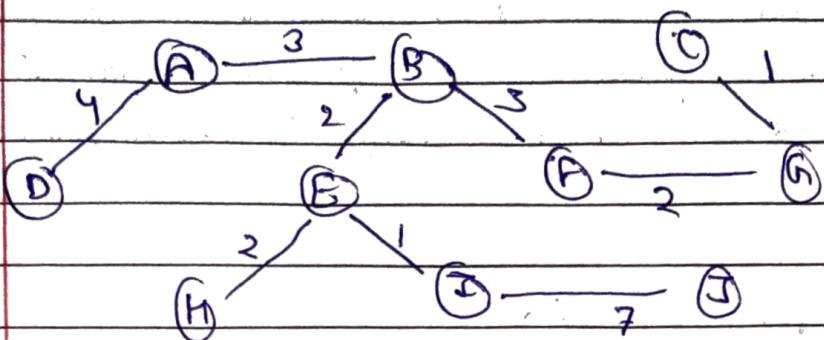
$$H = \{2^*, 4, 6\}$$

$$A = \{3^*, 4, (4)\}$$

$$D = \{6, 5, 4^*\}$$

Minimum Spanning Tree = 25  
 Cost

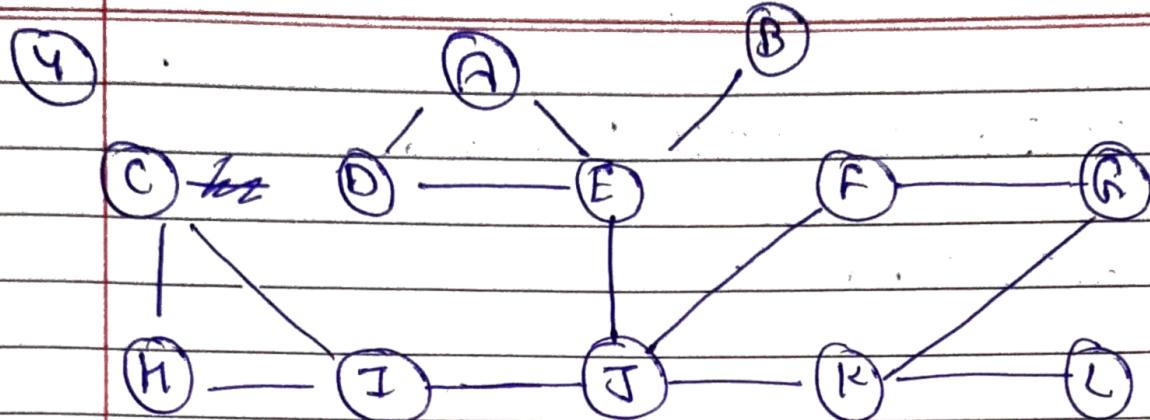
## (1) Kruskal's Algorithm



- ① Connected G to I as it's weight is 1. Then C to G which has same weight 1
- ② E to H & G to F and B to E as they all have most least weight 2
- ③ A to B and B to F as they have most least weight 3
- ④ A to D
- ⑤ I to J

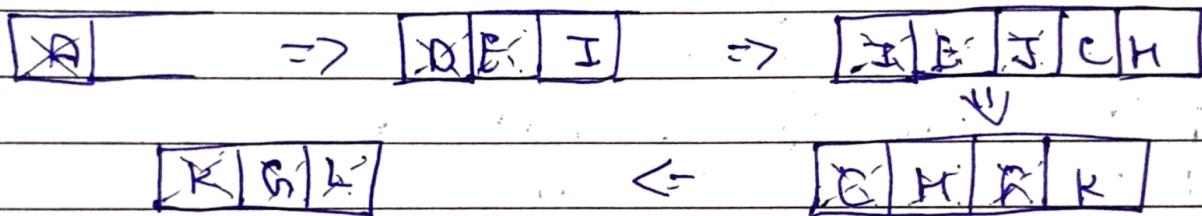
Cost = 25

(3) via A



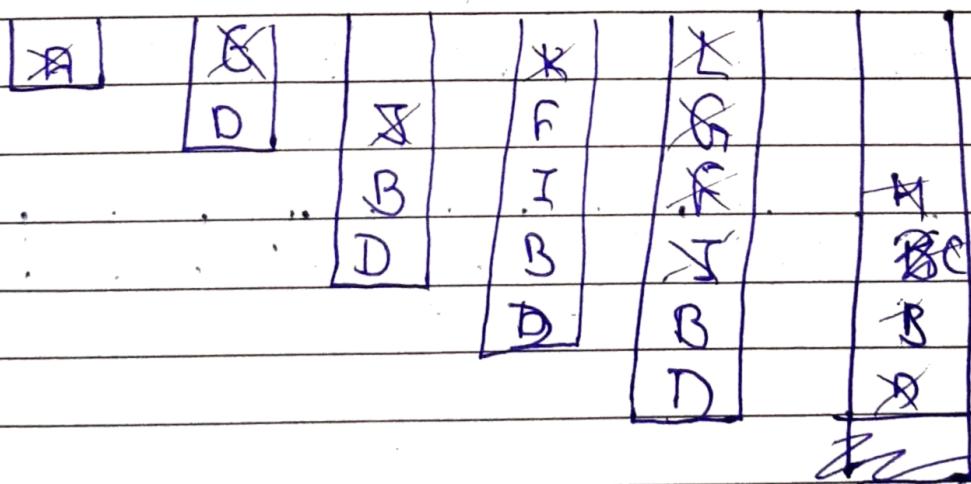
BFS

A D E I B J C H F K G L



BFS = A D E I B J C H F K G L

DFS: A E J K L G F I M C B D



(5) Key: 12H4, 13, 88, 23, 94, 11, 39, 20, 16, 5

$$h(i) = \{(2i+5) \bmod 11\}$$

$$h(12) = \{(24+5) \bmod 11\} = 29 \bmod 11 = \underline{2}$$

$$h(44) = \{(88) \bmod 11\} = \underline{5}$$

$$h(13) = \{31 \bmod 11\} = \underline{9}$$

$$h(88) = \{176 \bmod 11\} = 5 \text{ add } 1 = \underline{6}$$

$$h(23) = 51 \bmod 11 = 7 \text{ add } 1 = \underline{8}$$

$$h(94) = 143 \bmod 11 = 6 \text{ add } (1+1+1+1) = \underline{10}$$

$$h(11) = 23 \bmod 11 = 5 \text{ add } 5 = \underline{11}$$

$$h(39) = 83 \bmod 11 = 6 \text{ add } 6 = \underline{12}$$

$$h(20) = 45 \bmod 11 = \underline{1}$$

$$h(18) = 37 \bmod 11 = \cancel{\underline{8}} \quad \text{add } \cancel{8} = \cancel{\underline{16}}$$

$$h(5) = 15 \bmod 11 = 4 \text{ add } 9 = \underline{13}$$

20			16	44	88	12	23	13	94	11	39	5	
6	1	2	3	4	5	6	7	8	9	10	11	12	13 14