LECTURE # 14

Revision :-

①

CS 313 - ADA

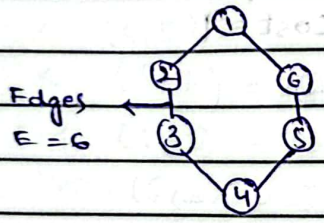
LECTURE # 16

13 - 12 - 2023

WEDNESDAY

→ Greedy Algorithm

Minimum Cost Spanning Tree
↳ a subgraph of graph



G = (V, E)

V → Set of vertices / nodes

E → Set of Edges

▸ Vertices of the graph with |V|-1 Edges and no cycle.

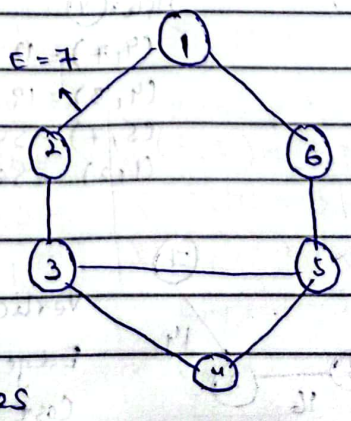
V = {1, 2, 3, 4, 5, 6}

E = {(1, 2), (2, 3), (3, 4), (4, 5), (5, 6), (6, 1)}

$^6C_5 = 6$ ⟵ Out of 6 Edges we have to choose 5.

$$\frac{6!}{5!(6-5)!} = \frac{6 \times 5!}{5!\,1!} = \frac{6}{1} = 6$$

$$^nC_r = \frac{n!}{r!(n-r)!}$$

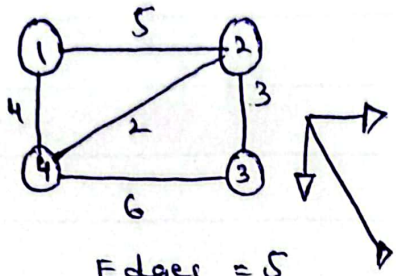


$^7C_5 = 2$ ← represents no. of cycles

$$^7C_5 - 2 = \frac{7!}{5!(7-5)!} - 2$$

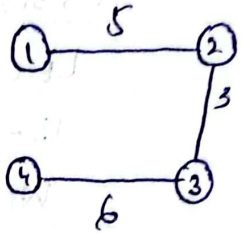
→ Minimum Cost Spanning Tree

(1) →



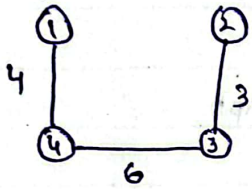
Edges = 5

(a)



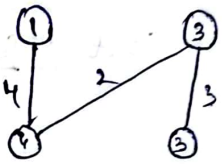
Cost = 5+3+6
= 14

(b)



Cost = 13

(c)

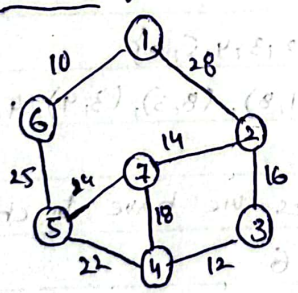


Cost = 9

Prim's
→ ~~Prince's~~ Algorithm.
→ Krusnals Algorithm.

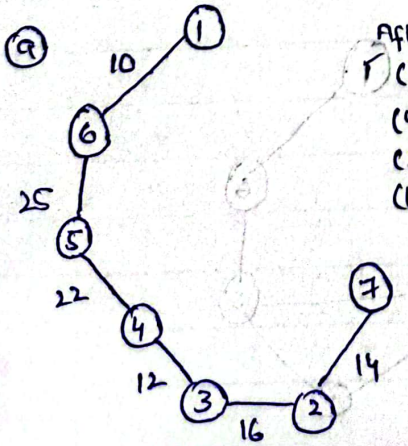
→ PRIM'S ALGORITHM ↓

(2) →



max. no. of Edges = $\frac{n(n-1)}{2} = \frac{4(4-1)}{2} = 6$

(a)



After (4)
(4,7) = 12
(4,3) = 18
(5,7) = 24
(1,2) = 28

After (3)
(3,2) = 16
(4,7) = 18
(5,7) = 24
(1,2) = 28

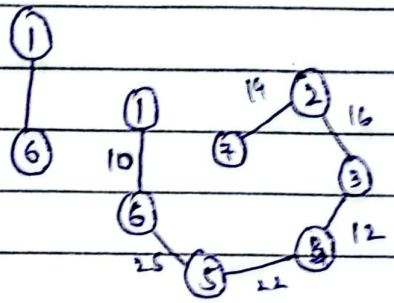
After (2)
(2,7) = 14
(1,2)/(2,1) = 28
(4,7) = 18
(5,7) = 24

Vertices = 7 (Complete)
Edges = 7-1 = |V|-1 = 6 (Complete)
Cost = 10+25+22+12+16+14 = 99

→ Krusnal's Algorithm

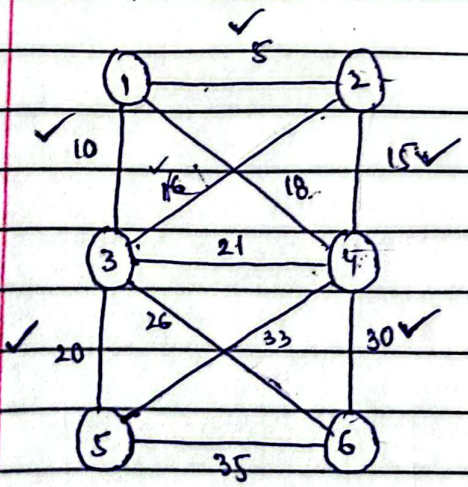
Arrange weights in ascending order.

- ✓ (1, 6) = 10
- ✓ (3, 4) = 14
- ✓ (2, 7) = 14
- ✓ (2, 3) = 16
- x (4, 7) = 18
- ✓ (4, 5) = 22
- x (5, 7) = 25
- ✓ (1, 2) = 28
- x (5, 6) = 25 → Because we'll not consider those who'll create a cycle.

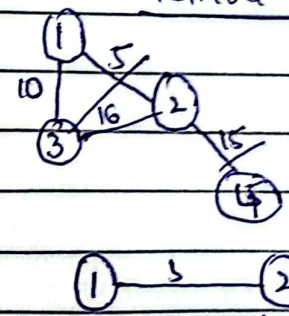


Cost = 99

Example # 1



Method # 1



(1,3) = 10
(1,4) = 18
(2,4) = 15
(2,3) = 16
(4,6) = 30
(4,5) = 33
x (3,4) = 21
x (1,4) = 18.
~~(2,4) = 21~~
x (2,3) = 16
~~(1,4) = 18~~

(3,4) = 21
(2,3) = 16
(1,4) = 18
✓ (2,4) = 15

Wednesday
13-Dec-2023

ADA - Quiz

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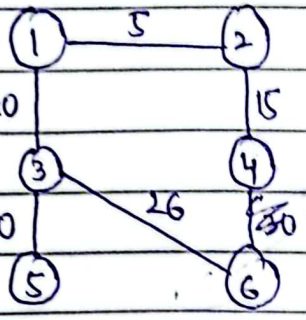
→ Prim's Algorithm :-



Vertices = 6

Edges = 6-1 = 5

Cost = ~~30~~ 76

= 5+15+10+20+~~26~~

#Step by Step on next page

After (6)

(6,5) = 35
(3,6) = ~~33~~ 26
(4,5) = 33
(3,4) = 21
✓ (3,5) = 20
x (2,3) = 16
x (1,4) = 18

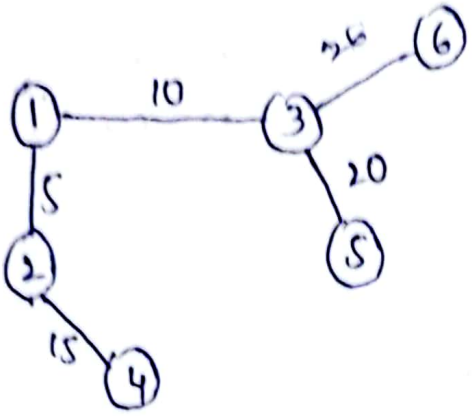
After (5)

x (5,6) = 35
x (5,4) = 33
x (6,3) = 26
x (3,4) = 21
x (2,3) = 16
x (1,4) = 18

→ Krusnal's Algorithm

✓ (1,2) → 5
✓ (1,3) → 10
✓ (2,4) → 15
x (2,3) → 16
x (1,4) → 18
✓ (3,5) → 20
x (3,4) → 21
✓ (3,6) → 26
x (4,6) → 30

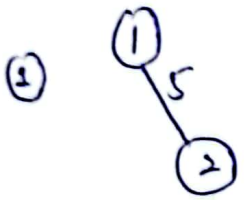
~~(3+6) = 33~~
x (5,6) → 35
x (5,4) → 33

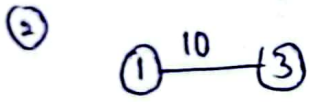


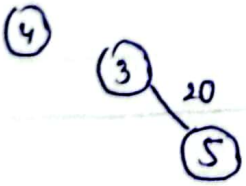
Cost = 15 + 5 + 10 + 20 + 26

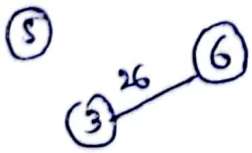
= 76

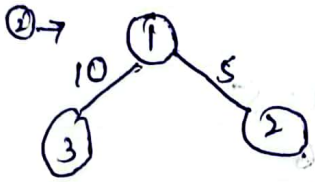
Node - by - Node

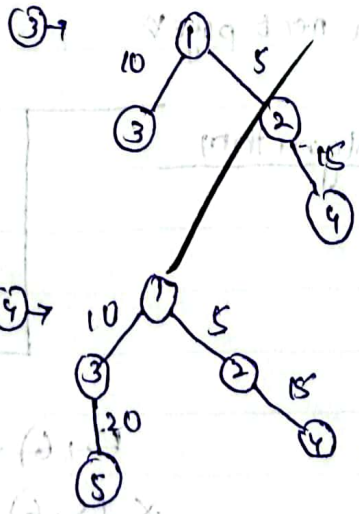


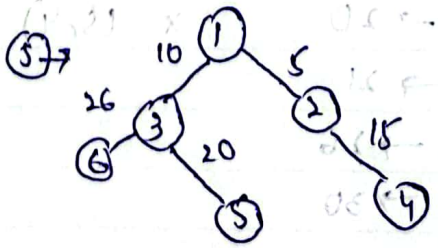












→ Prim's Node-by-Node

① 1 —5— 2

② 1 —10— 3

③ 2 —15— 4

④ 3 —20— 5

⑤ 3 —26— 6

Cost = 5 + 10 + 15 + 20 + 26
= 76

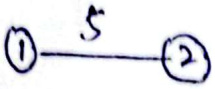
After ⑤ →
(5,6) = 35
(4,5) = 33
(4,6) = 30
✓ (3,6) = 26
× (3,4) = 21
× (1,4) = 18
× (2,3) = 16

② → After ②
✓ (1,3) → 10
(1,4) = 18
(2,4) = 15
(2,3) = 16

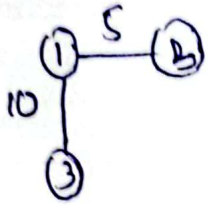
③ → After ③
(3,5) = 20
(3,6) = 26
(3,4) = 21
(2,3) = 16
✓ (2,4) = 15
(1,4) = 18

④ → After ④
(4,6) = 30
(4,5) = 33
(3,4) = 21
× (1,4) = 18
✓ (3,5) = 20
(3,6) = 26
× (2,3) = 16

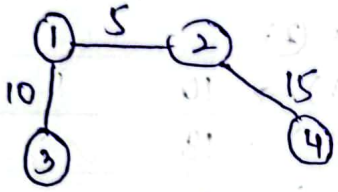
× (1,4) = 18



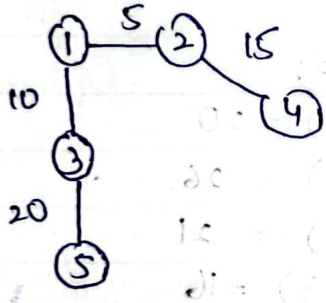
2→



3→



4→



5→