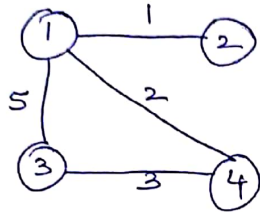


Prim's algorithm :- Used to obtain minimum spanning tree.

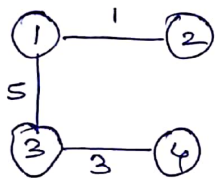
- A minimum spanning tree of a given graph is the minimum acyclic sub-graph of given graph.

Ex:-

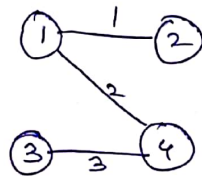


$$V^1 = V$$

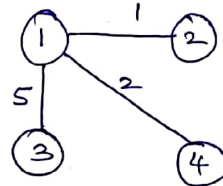
Spanning trees :-



$$C = 9.$$



$$C = 6$$



$$C = 8.$$

Algorithm :-

1 // Minimum Spanning tree = T

2 // Set of explored nodes = U

$$T = \phi$$

U = {x} where x is any arbitrary vertex.

while (U \neq V)

let (u, v) be the lowest cost edge.

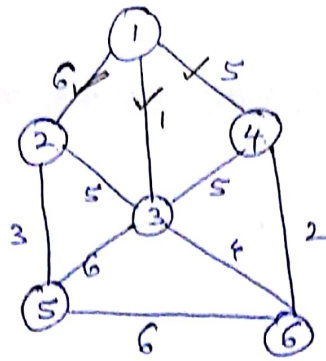
such that $u \in U$ and $v \in V - U$

$$T = T \cup \{(u, v)\}$$

$$U = U \cup \{v\}$$

end while.

Example :-



Consider the arbitrary vertex $x = 1$.

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

Step	U	V - U	Cost
<u>1</u>	1	2	6
	1	3	1
	1	4	5
	1	5	∞
	1	6	∞

min cost.

Add:

$v = 3$ to U.

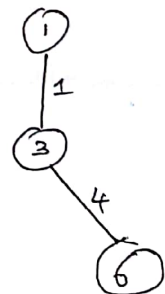


$\Rightarrow U = \{1, 3\}$ $V - U = \{2, 4, 5, 6\}$

U	V - U	Cost
1	2	6
1	4	5
3	2	5
3	4	5
3	5	6
3	6	4

min cost.

Add $v = 6$ to U.

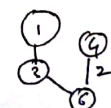


$\Rightarrow U = \{1, 3, 6\}$ $V - U = \{2, 4, 5\}$

U	V - U	Cost
1	2	6
1	4	5
1	5	∞
3	2	5
3	4	5
3	5	6

6	2	∞
6	4	2
6	5	6

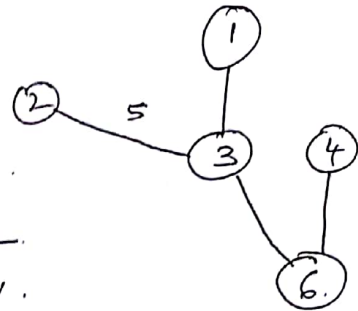
min
Add
ref
to U.



4) $U = \{1, 3, 6, 4\}$ $V - U = \{2, 5\}$

U	V - U	Cost
1	2	6
1	5	∞
3	2	5
3	5	6
6	2	∞
6	5	6

min cost
Add 2
to U.

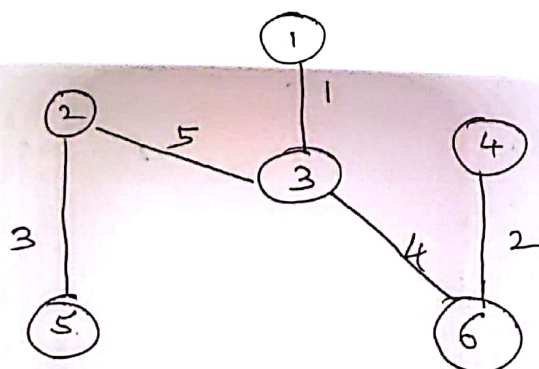


5) $U = \{1, 3, 6, 4, 2\}$ $V - U = \{5\}$

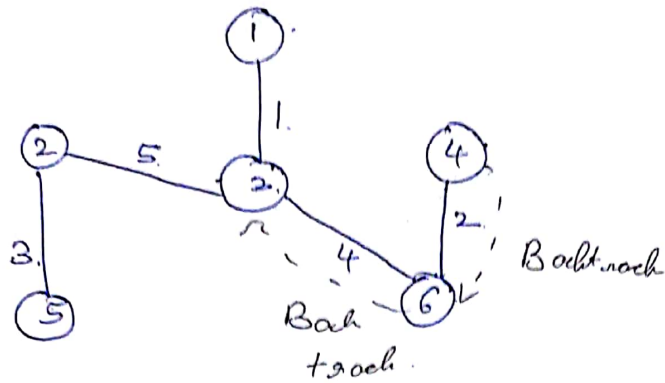
U	V - U	Cost
1	5	∞
3	5	6
6	5	6
4	5	∞
2	5	3

min cost
Add 5 to U.

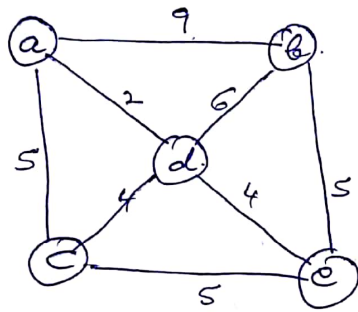
Minimum Spanning tree is.



Shortcut



Example 2



1) $V - U = \{a, b, c, e\}$

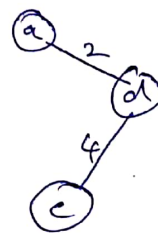
U	V-U	Cost
d	a	2
d	b	6
d	c	4
d	e	4

Add c to U.

2) $U = \{d, c\}$ $V - U = \{a, b, e\}$

U	V-U	Cost
d	a	2
d	b	6
d	e	4
c	a	5
c	b	5
c	e	5

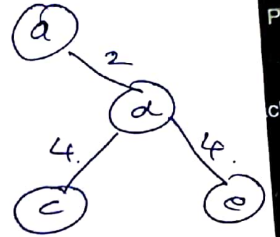
Add a to U.



2) $U = \{d, c, a\}$ $V - U = \{b, e\}$

U	V-U	Cost
d	b	6
d	e	4
c	b	∞
c	e	5
a	b	9
a	e	∞

Add e to U.



3) $U = \{d, c, a, e\}$ $V - U = \{b\}$

U	V-U	Cost
d	b	6
c	b	∞
a	b	9
e	b	5

Add b to U.

Min Cost Spanning tree

