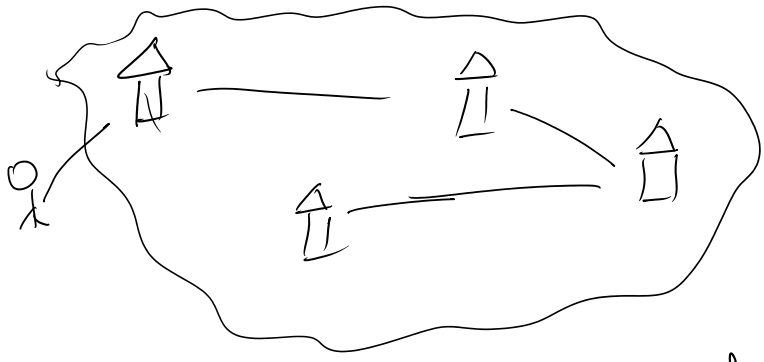


Task

↓

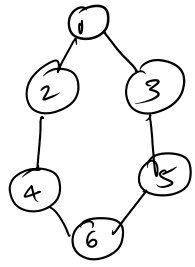
Unique path

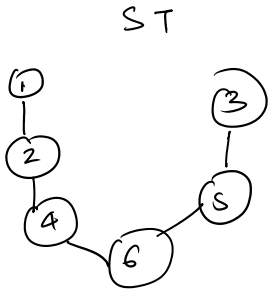
to connect all the houses without forming a loop/ cycle

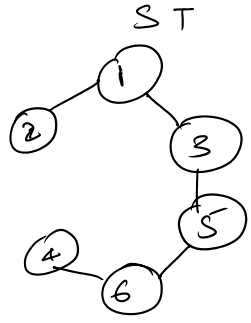
- Given an undirected graph $G = (V, E)$

Spanning Tree $S \subseteq G$ $S = (V, E')$

#g

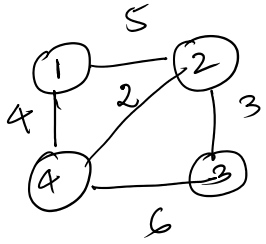


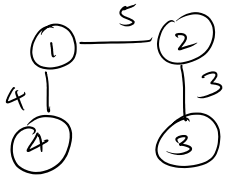




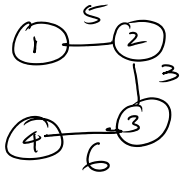
n nodes , (n-1) edges $S = (|V|, |V-1|)$ E'

#g

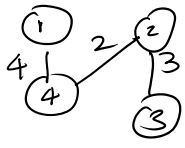




Cost = 12



Cost = 14



Cost = 9

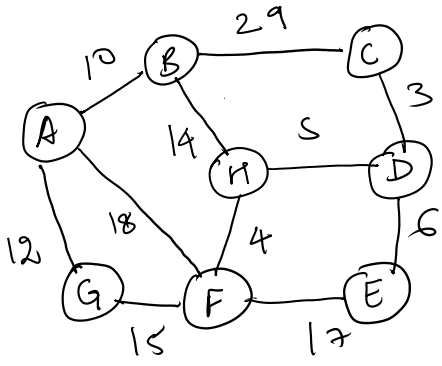
- Minimum Spanning Tree – Spanning tree with min. cost

Prim's

Kruskal's

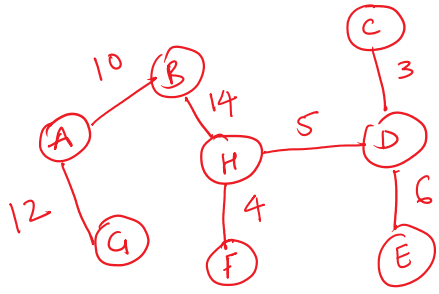
1. Choose any vertex in G
2. Add it to empty tree
3. Until we have all vertices of G in the tree
   - Choose the edge of the least cost that starts from any of the nodes in the tree
   - Add that edge & that vertex in the tree

#g.

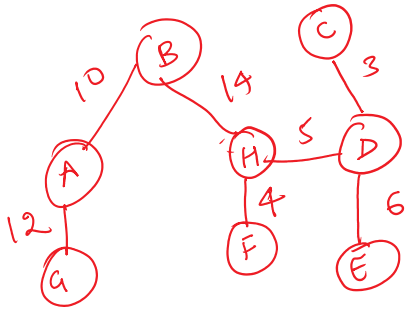


Start with A

MST



Start with E



Cost = Total weight of edges in MST

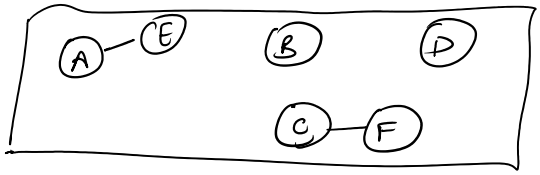
= 54

Start at H?

Kruskal's Algo

1. construct a forest with n vertices

FOREST



graph whose all connected sub-components are trees

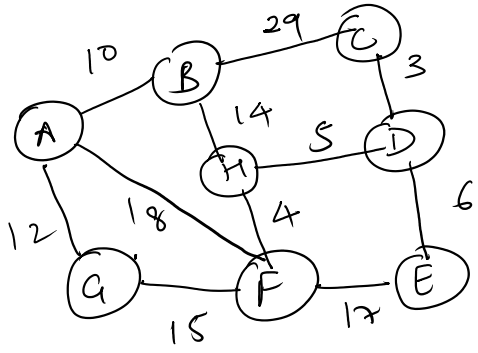
•2 Put the edges in a sorted form in a queue

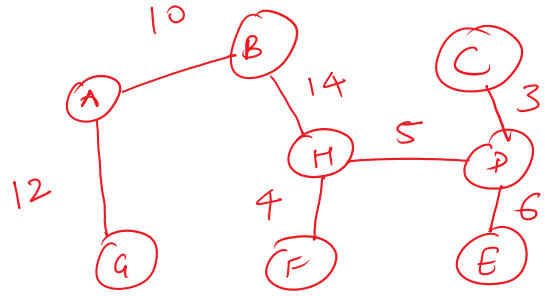
•3 Until (N-1) edges in the forest

i) Extract "min cost" edge from Queue

- If it is forming a cycle, discard it
- Else add it into the forest

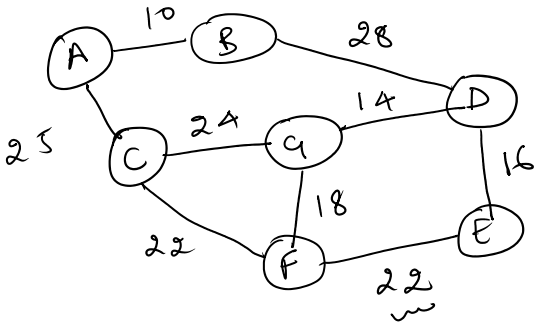
#g



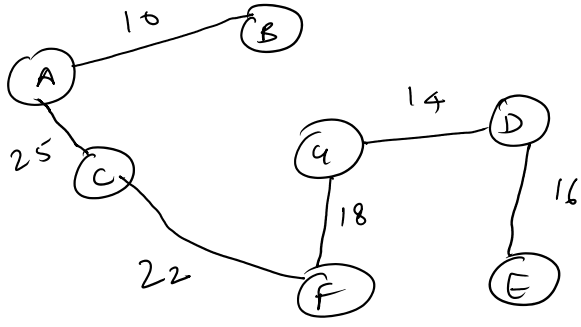


{ ~~(C,D)~~, ~~(H,F)~~, ~~(H,D)~~, (D, ~~E~~), ~~(A,B)~~, ~~(A,G)~~, (B,H), (G,F), (F,E), (A,F), (B,C) }

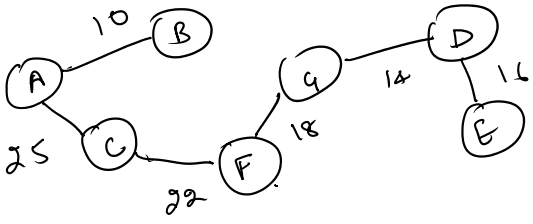
#g



Kruskal's



Prim's



Time complexity. $|E| = |V| - 1$

Kruskal $O(V.\text{Extract min})$

Arrays

$O(E)$

$O(V^2)$

Heaps $\log(E)$

$\log(|V|-1)$

$O(V \log V)$