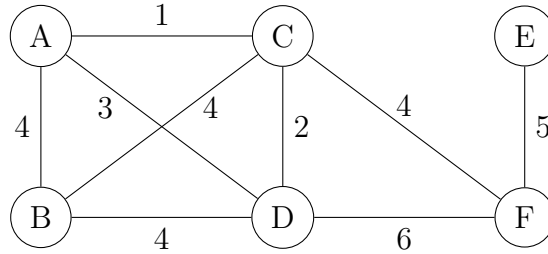© 2021 Ji Wang   **Discussion 9**

Minimum Spanning Tree

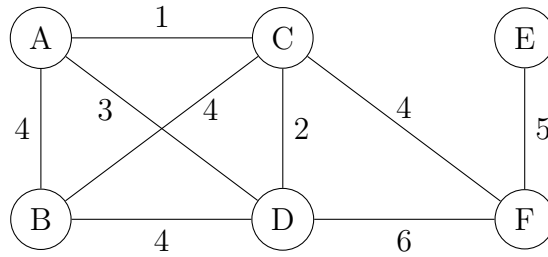Figure 1: A weighted, connected undirected graph G_1

(a) Prim's algorithm

MST-PRIM(G, w, r)

```
1   Q = EMPTY
2   for each vertex v ∈ V
3        v.key = +INFTY
4        v.pi = NIL
5        INSERT(Q, v)
6   DECREASE-KEY(Q, r, 0)
7   while Q not EMPTY
8        u = EXTRACT-MIN(Q)
9        for each v ∈ Adj[u]
10            if v ∈ Q and w(u, v) < v.key
11                 v.pi = u
12                 v.key = w(u, v)
13   return {(v, v.pi) : v ∈ V - {r}}
```

Figure 2: A weighted, connected undirected graph G_1

(b) Kruskal's Algorithm

MST-KRUSKAL(G, w)

1   $A = $ EMPTY
2   **for** each vertex $u \in V$
3   MAKE-SET(u)
4   Sort the edges E in nondecreasing order by w
5   **for** each edge $(u, v) \in E$, taken in nondecreasing order by w
6   **if** FIND-SET$(u) \neq$ FIND-SET(v)
7           $A = A \cup \{(u, v)\}$
8   UNION(u, v)
9   **return** A