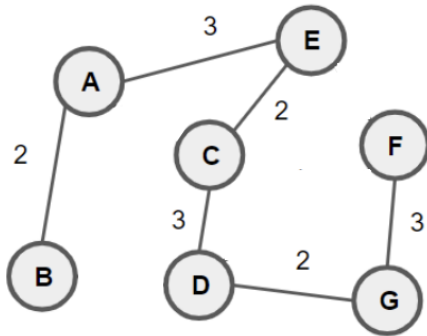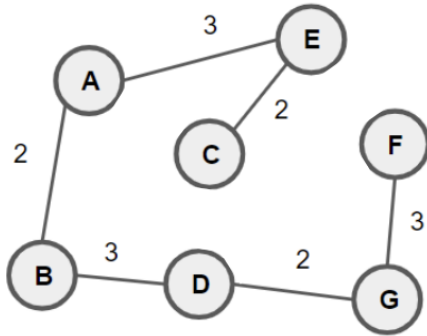# CS2040S Tutorial 10
AY 24/25 Sem 2 — github/omgeta

Q1. (a.) Prim's:

Kruskal's:

(b.) Insert each vertex in $O(V \log V)$, then decrease keys $O(E)$ and extract minimum vertex V times. Time: $O(V \log V + E)$

Q2. Time: $O(E \log V)$

1. Create a dummy node connected to all power plant nodes
2. Use Prim's to find MST

Q3. Time: $O(n \log n + m \log m + m)$

1. Sort m bales in $O(m \log m)$ by weight
2. Sort n horses in $O(n \log n)$ by strength
3. For each bale, add horse cost with strength $\geq$ bale weight into a min-heap
4. If min-heap is empty, return not possible
5. Else, pop horse with min cost and assign to current bale
6. Repeat from step 3 next bale

Q4. (a.) Time: $O(n)$

(b.) Find: $O(1)$
Union: $O(\log n)$ per object, total $O(m \log n)$ for m operations

(c.) Use maxheap for storing tasks ordered by priority. Keep each corporation hashed by name in HashMap.

1. `getNextTask`: use `getMin` in $O(1)$
2. `executeNextTask`: use `extractMin` in $O(\log n)$
3. `merge`: merge in $O(nm(\log n)(\log nm))$