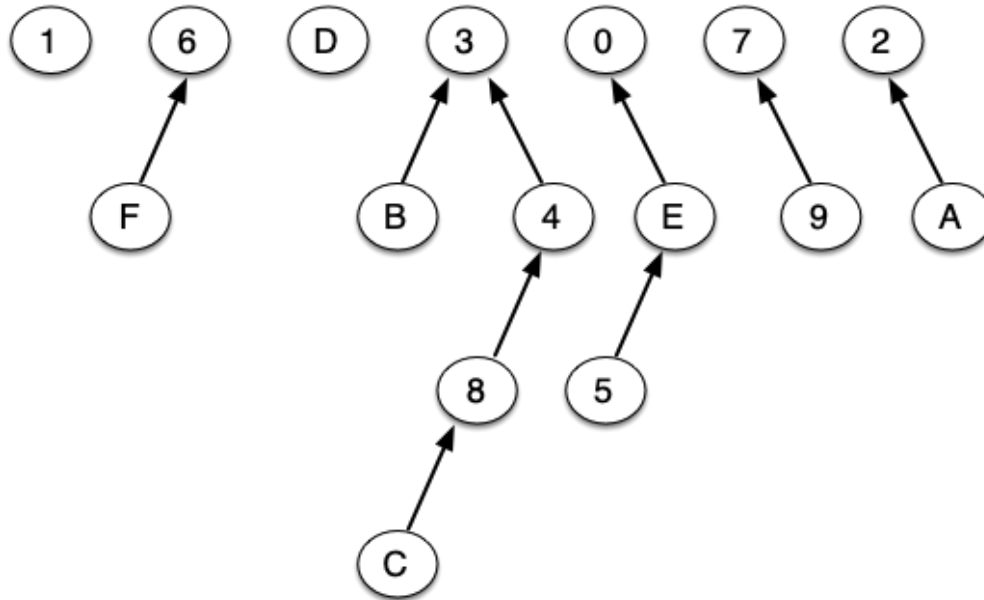


CS 130A Data Struc & Alg 1

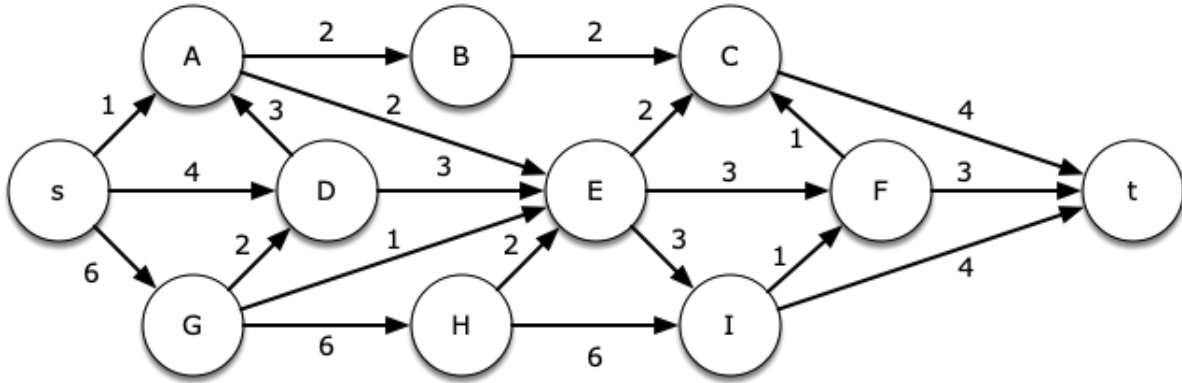
1. Consider the following disjoint set structure represented as a forest.



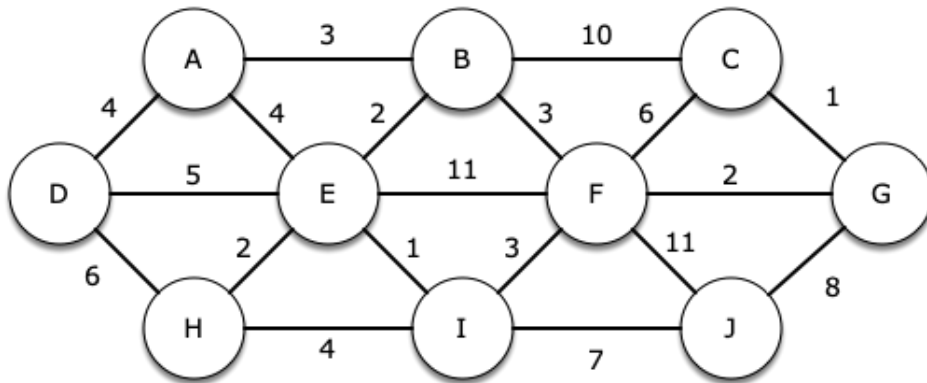
Answer the following questions:

- Write the set representation of the equivalence classes implied by this forest.
- Give the linear array data structure representation of this forest assuming arbitrary union strategy.
- What are the returned values of the operations $\text{Find}(1)$, $\text{Find}(8)$, $\text{Find}(F)$, $\text{Find}(5)$?
- What is the complexity of a single Find operation in a forest of n nodes? What is the complexity of m consecutive Find operations in a forest of n nodes?
- Give the linear array data structure representation of the forest (Step a) assuming union-by-size strategy.
- Perform the operation $\text{union}(5,3)$ on the forest (Step e) using union-by-size strategy. Draw the resulting new forest and give the linear array data structure representation.
- Give the linear array data structure representation of this forest (Step a) assuming union-by-height strategy.
- Perform the operation $\text{union}(5,3)$ on the original forest (Step g) using union-by-height strategy. Draw the resulting new forest and give the linear array data structure representation (following Step g).

2. Find a topological ordering of the following graph.



3. Find a minimum spanning tree for the following graph using both Prim's and Kruskal's algorithms.



Deliver the assignment via Gradescope. Late submissions are not accepted.