

Online 4 Set A

Instructions:

- Write the code by yourself. **Do not adopt any unfair means** (No internet, no previous resource, no class code, **nothing except what you yourself wrote at the moment of exam.**). **-100% Penalty for adopting any unfair means.**
- You **must** submit the code/codes in ELMS.

Q1. Implement the following pseudo code for disjoint set

MAKE-SET(x) 1. $p[x] \leftarrow x$ 2. $rank[x] \leftarrow 0$	UNION(x, y) 1. LINK(FIND-SET(x), FIND-SET(y))	
	LINK(x, y) 1. if $rank[x] > rank[y]$ 2. then $p[y] \leftarrow x$ 3. else $p[x] \leftarrow y$ 4. if $rank[x] = rank[y]$ 5. then $rank[y]++$	FIND-SET(x) 1. if $x \neq p[x]$ 2. then $p[x] \leftarrow \text{FIND-SET}(p[x])$ 3. return $p[x]$

Q2. Implement the **following** algorithm for finding the Minimum Spanning Tree in an undirected weighted graph and **print the MST** using the above implementation of disjoint set.

```
Kruskal()
{
    T =  $\emptyset$ ;
    for each  $v \in V$ 
        MakeSet( $v$ );
    sort E into nondecreasing order by weight w
    for each  $(u, v) \in E$  (in sorted order)
        if FindSet( $u$ )  $\neq$  FindSet( $v$ )
            T = T  $\cup$   $\{(u, v)\}$ ;
            Union(FindSet( $u$ ), FindSet( $v$ ));
}
```

Sample Input #vertices #edges the edges of the graph	Sample Output
4 5 0 1 10 0 2 6 0 3 5 1 3 15 2 3 4	MST 2 - 3 0 - 3 0 - 1 Weight: 4+5+10 = 19