

Assignment 10: Disjoint sets

1. Perform the following operations on disjoint set:
 - a. Make-set
 - b. Union
 - c. Find-set
2. Perform the Union by-element_value (weight) operations on 10 elements (0-9, each initially in their own set). Draw the forest of trees that result $U(1,5); U(3,7); U(1,4); U(5,7); U(0,8); U(6,9); U(3,9)$.
3. Perform union-by-rank for disjoint sets.
4. Perform path compression in tree-based disjoint sets. Verify using Find-set operation.
5. Find out the number of connected component in a given undirected graph and display their representative. You are free to choose representative in a given set. Vertices are numbered from 1 to V .

Input: (T, |V_i|, Adj_i)

```
2
10
0 1 1 0 0 0 0 0 0 0
1 0 1 0 0 0 0 0 0 0
1 1 0 1 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0
0 0 0 0 0 1 1 0 0 0
0 0 0 0 1 0 1 0 0 0
0 0 0 0 1 1 0 0 0 0
0 0 0 0 0 0 0 0 1 0
0 0 0 0 0 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0
10
0 1 1 0 0 0 0 0 0 0
1 0 1 0 0 0 0 0 0 0
1 1 0 1 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0
0 0 0 0 0 1 1 0 0 0
0 0 0 0 1 0 1 1 0 0
0 0 0 0 1 1 0 0 1 0
0 0 0 0 0 1 0 0 1 0
0 0 0 0 0 0 1 1 0 0
0 0 0 0 0 0 0 0 0 0
```

Output:

```
4
1 5 8 10
3
1 5 10
```

6. Check whether given graph is connected or not using disjoint sets.

Input: (T, |V_i|, Adj_i)

2

6

```
0 1 1 1 0 0
1 0 1 0 1 0
1 1 1 1 0 0
0 1 0 1 0 0
0 0 0 0 0 0
```

6

```
0 1 1 1 0 0
1 0 1 0 1 1
1 1 1 1 0 0
0 1 0 1 0 0
0 1 0 0 0 1
```

Output:

Disconnected

Connected

7. Detect cycle in a given undirected graph (adjacency matrix) using disjoint set operations.

Input: (T, |V_i|, Adj_i)

2

5

```
0 1 1 1 1
1 0 1 1 0
1 1 0 0 1
1 1 0 0 0
1 0 1 0 0
```

3

6

```
0 1 0 0 0 0
1 0 1 0 0 0
0 1 0 1 0 0
0 0 1 0 1 0
0 0 0 1 0 1
0 0 0 0 1 0
```

Output:

Yes

No