CSE 4304-Data Structures Lab. Winter 2022-23
Date: 24 October 2023
Target Group: SWE B
Topic: DSU & Graph Basic
Instructions:
- Regardless of when you finish the tasks in the lab, you have to submit the solutions in the Google Classroom. The deadline will always be at 11.59 PM of the day in which the lab has taken place.
- Task naming format: <fullID>_<Task><Lab><Group>.c/cpp. Example: 170041034_T01L02A.cpp
- If you find any issues in the problem description/test cases, comment in the google classroom.
- If you find any test case that is tricky that I didn't include but others might forget to handle, please comment! I'll be happy to add.
- Use appropriate comments in your code. This will help you to easily recall the solution in the future.
- Obtained marks will vary based on the efficiency of the solution.
- Do not use the <bits/stdc++.h> library.

Task:1

You will be given an array A of n integers and q operations. There are two types of operations:

- `1 x y`, for this operation, you should replace all the occurrences of element x in the array with y
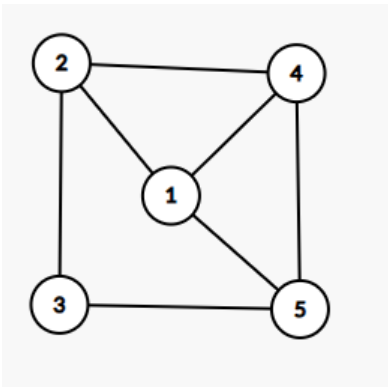- `2 idx`, output the value of A[idx]

Input	Output
1 5 4 1 2 3 4 5 1 1 3 2 1 1 3 5 2 1	Case 1: {3, 2, 3, 4, 5} 3 {5, 2, 5, 4, 5} 5 After the first update: A = {3, 2, 3, 4, 5} A[1] = 3 After the second update: A = {5, 2, 5, 4, 5} A[1] = 5
3 3 3 1 2 3 1 3 4 1 2 3 2 2 3 5 1 2 3 1 2 3 1 3 4 2 1 2 2 2 3 3 3 1 2 3 1 4 5 1 2 4 2 2	Case 1: {1 2 4} {1 3 4} 3 Case 2: {1 3 3} {1 3 3} {1 4 4} 1 4 4 Case 3: {1 2 3} {1 2 3} {1 4 3} 4

Task:2

Given n nodes and m edges of a graph, show the adjacency matrix and adjacency list representation of the graph.
First line of the input consists of two integer numbers n and m.
Following m lines have two integer numbers u, v denoting an undirected edge between u and v.

Input	Output	Commnet
5 7 1 2 2 4 3 5 1 4 1 5 2 3 4 5	List view: 1 -> 2 4 5 2 -> 1 3 4 3 -> 2 5 4 -> 1 2 5 5 -> 1 3 4 Matrix view: 1 2 3 4 5 1 x x x 2 x x x 3 x x 4 x x x 5 x x x	

Task:3

Given n nodes and m edges of a graph, Find out if it is possible to go from a given node x to given node y.
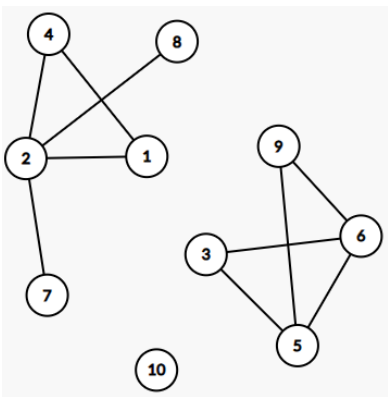First line of the input consists of two integer numbers n and m.
Following m lines have two integer numbers u, v denoting an undirected edge between u and v.
Next line will contain an integer q denoting the number of queries.
Following q lines have two integers x, y. Print Yes if it is possible to go from x to y otherwise No.

You have to use the IDEA of DSU

Input	Output	Comment
10 10 1 2 2 4 3 5 1 4 6 5 3 6 2 7 2 8 5 9 6 9 10 1 8	 Yes	

7 8	Yes	
7 4	Yes	
7 10	No	
3 6	Yes	
9 5	Yes	
10 9	No	
6 1	No	
2 5	No	
5 10	No	

Task:4

Given n nodes and m edges of a graph, Find the number of connected components and the connected node sets.

First line of the input consists of two integer numbers n and m.

Following m lines have two integer numbers u, v denoting an undirected edge between u and v.

You have to use DFS.

Bonus if you can solve it using DSU also.

Input	Output	Comment
10 10 1 2 2 4 3 5 1 4 6 5 3 6 2 7 2 8 5 9 6 9	Components: 3 Component sets: {1 2 4 8 7} {3 5 6 9} {10}	