

Assignment 4

APRG TAs

April 2023

Question 1

You will be given as input a weighted tree T with N vertices.

You need to answer queries of the form $u v$, where u and v are vertices of T , with the distance in T between u and v .

The first line of input will contain two integers N and Q . The next $N - 1$ lines will describe the edges of T in the form $u v w$, indicating that there is an edge of weight w between u and v . The next Q lines will contain the queries.

Sample Input:

```
5 3
1 2 1
2 3 3
2 4 2
3 5 3
1 5
2 3
2 4
```

Sample Output:

```
7
3
2
```

NOTE: You are expected to solve the problem in $O((Q + N) \log N)$.

Question 2

Jose Mourinho needs pick his squad for the 2023/24 Serie A season. He needs your help.

There are N candidates who Jose has shortlisted for the squad. However, there are some problems.

We number the players from 1 to N . Jose has given us his assessment of the players. There are 3 situations that the players find themselves in:

- 1 $i j$ - Jose definitely needs at least one of player i and player j to join his squad.
- 2 $i j$ - Player i does not like player j , and will not join the squad if player j does.
- 3 $i j$ - Jose is willing to select player i only if player j also joins the squad.

Can you determine whether there exists a squad selection that would satisfy Jose?

In the first line of input you are given N and Q , the number of players and the number of lines of information we have about them. In the next Q lines, you are given information about the players in the above format.

On the first line, output 1 if a selection is possible, and 0 otherwise.

On the second line, output N space separated integers. The i^{th} integer should be 1 if the valid selection includes the i^{th} player, and 0 otherwise.

Sample Input:

```
4 3
1 1 2
2 2 3
3 4 3
```

Sample Output:

```
1
1 0 1 1
```

NOTE: You are expected to solve this problem in time $O(N + Q)$