

## Problem F Count on the path

bobo has a tree, whose vertices are conveniently labeled by  $1, 2, \dots, n$ .

Let  $f(a, b)$  be the minimum of vertices **not** on the path between vertices  $a$  and  $b$ .

There are  $q$  queries  $(u_i, v_i)$  for the value of  $f(u_i, v_i)$ . Help that bobo answer them.

### Input

The first line contains 2 integers  $n, q$  ( $4 \leq n \leq 10^6, 1 \leq q \leq 10^6$ ). Each of the following  $(n - 1)$  lines contain 2 integers  $a_i, b_i$  denoting an edge between vertices  $a_i$  and  $b_i$  ( $1 \leq a_i, b_i \leq n$ ). Each of the following  $q$  lines contains 2 integer  $u'_i, v'_i$  ( $1 \leq u_i, v_i \leq 10^5$ ).

The queries are encrypted in the following manner.

- $u_1 = u'_1, v_1 = v'_1$ .
- For  $i \geq 2$ ,  $u_i = u'_i \oplus f(u_{i-1}, v_{i-1}), v_i = v'_i \oplus f(u_{i-1}, v_{i-1})$ .

Note  $\oplus$  denotes bitwise exclusive-or.

It is guaranteed that  $f(a, b)$  is defined for all  $a, b$ .

### Output

For each queries, a single number denotes the value.

#### Sample input 1

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

#### Sample output 1

```
4
```

#### Sample input 2

```
5 2
1 2
1 3
2 4
2 5
1 2
7 6
```

#### Sample output 2

```
3
1
```