F - Jump Traveling

Editorial (/contests/abc414/tasks/abc414_f/editorial)

Time Limit: 3 sec / Memory Limit: 1024 MiB

Score : 525 points

Problem Statement

You are given a tree with N vertices numbered from 1 to N and an integer K. The i-th edge bidirectionally connects vertices u_i and v_i.

You are currently at vertex 1. You can repeat the following operation zero or more times:

- Choose a vertex whose distance from the vertex you are currently at is K, and move to that vertex. Here, the distance between two vertices is the number of edges in the simple path connecting the two vertices.

For each $k = 2, \ldots, N$, determine whether you can move to vertex k by repeating the operation, and if you can move, find the minimum number of operations.

You have T test cases, so solve each of them.

Constraints

- $1 \leq T \leq 10^5$
- $2 \leq N \leq 2 \times 10^5$
- $1 \leq K \leq 20$
- $1 \leq u_i < v_i \leq N$
- The given graph is a tree.
- The sum of N over all test cases is at most 2×10^5.
- All input values are integers.

Input

The input is given from Standard Input in the following format, where case_i means the i-th test case.

$$
\begin{aligned}
&T\\
&\mathrm{case}_1\\
&\mathrm{case}_2\\
&\vdots\\
&\mathrm{case}_T
\end{aligned}
$$

Each test case is given in the following format:

$$
\begin{aligned}
&N \quad K\\
&u_1 \quad v_1\\
&u_2 \quad v_2\\
&\vdots\\
&u_{N-1} \quad v_{N-1}
\end{aligned}
$$

Output

Output T lines. The i-th line should contain the answer for the i-th test case in the following format:

$$
\mathrm{ans}_2 \quad \mathrm{ans}_3 \quad \dots \quad \mathrm{ans}_N
$$

ans_i is the answer for $k = i$. If you can move to vertex i by repeating the operation, ans_i is the minimum number of operations; otherwise, ans_i is -1.

Sample Input 1

Copy

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

Sample Output 1

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```
-1 1 1 -1 2
```

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This sample input/output consists of one test case.

The vertices whose distance from vertex 1 is 2 are vertices 3 and 4, so you can move to these two vertices with one operation.

Also, by moving from vertex 1 to vertex 4, then moving to vertex 6 whose distance from vertex 4 is 2, you can move to vertex 6 with two operations.

You cannot move to vertices 2 and 5 no matter how you perform the operations.

Sample Input 2 Copy

Copy

```
3
2 20
1 2
10 2
1 9
1 8
1 5
6 8
4 5
2 8
5 10
7 9
3 5
10 1
2 6
2 9
8 9
9 10
3 9
4 9
7 9
1 6
3 5
```

Sample Output 2 Copy

Copy

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

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