E - Walking on a Tree

Editorial (/contests/agc025/tasks/agc025_e/editorial)

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 1500 points

Problem Statement

Takahashi loves walking on a tree. The tree where Takahashi walks has N vertices numbered 1 through N. The i-th of the $N-1$ edges connects Vertex a_i and Vertex b_i.

Takahashi has scheduled M walks. The i-th walk is done as follows:

- The walk involves two vertices u_i and v_i that are fixed beforehand.
- Takahashi will walk from u_i to v_i or from v_i to u_i along the shortest path.

The *happiness* gained from the i-th walk is defined as follows:

- The happiness gained is the number of the edges traversed during the i-th walk that satisfies one of the following conditions:
  - In the previous walks, the edge has never been traversed.
  - In the previous walks, the edge has only been traversed in the direction opposite to the direction taken in the i-th walk.

Takahashi would like to decide the direction of each walk so that the total happiness gained from the M walks is maximized. Find the maximum total happiness that can be gained, and one specific way to choose the directions of the walks that maximizes the total happiness.

Constraints

- $1 \leq N, M \leq 2000$

- $1 \leq a_i, b_i \leq N$
- $1 \leq u_i, v_i \leq N$
- $a_i \neq b_i$
- $u_i \neq v_i$
- The graph given as input is a tree.

Input

Input is given from Standard Input in the following format:

$$
\begin{array}{ll}
N & M \\
a_1 & b_1 \\
\vdots & \\
a_{N-1} & b_{N-1} \\
u_1 & v_1 \\
\vdots & \\
u_M & v_M
\end{array}
$$

Output

Print the maximum total happiness T that can be gained, and one specific way to choose the directions of the walks that maximizes the total happiness, in the following format:

$$
\begin{array}{ll}
T & \\
\boxed{\texttt{u\^{}'\_1}} & \boxed{\texttt{v\^{}'\_1}} \\
\vdots & \\
\boxed{\texttt{u\^{}'\_M}} & \boxed{\texttt{v\^{}'\_M}}
\end{array}
$$

where ($\boxed{\texttt{u\^{}'\_i}}$,$\boxed{\texttt{v\^{}'\_i}}$) is either ($u_i$,$v_i$) or ($v_i$,$u_i$), which means that the i-th walk is from vertex $\boxed{\texttt{u\^{}'\_i}}$ to $\boxed{\texttt{v\^{}'\_i}}$.

Sample Input 1 Copy

Copy

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

Sample Output 1 Copy

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```
6
2 3
3 4
4 2
```

If we decide the directions of the walks as above, he gains the happiness of 2 in each walk, and the total happiness will be 6.

Sample Input 2

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

Sample Output 2

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

Sample Input 3

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

Sample Output 3

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```
9
2 4
6 3
5 6
4 5
```

#telegram)

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