Problem G
Graph-Theoretic Machine

Time limit: 2 seconds
Memory limit: 2048 megabytes

Problem Description

The PCCA kingdom has n cities numbered $1, 2, \ldots, n$. There are m bidirectional roads, each connecting two different cities. It is known that these cities and roads satisfy the following conditions:

- No two roads connect the same pair of cities.
- Each city is incident to at most 4 roads.
- It is possible to reach any city from any other city by traveling along a sequence of roads.
- If we draw a map of the kingdom, then all cities are at different locations, each road is a line segment between two cities, and no two roads intersect each other.

To attract more tourists to the kingdom, the queen has decided to color each city in one of red, green, blue or yellow. For a more exquisite view, she wants to choose the colors in a way that two cities have a different color if there is a road between them. However, finding such way of coloring is a difficult task, so she sought help from the kingdom's best scientists.

The scientists have invented the powerful Graph-Theoretic Machine (GTM). This machine works in the following way. First, the queen assigns a number to each city, called its *priority*. The priorities are integers between 1 and n (inclusive), and all cities have distinct priorities. Therefore, there are $n!$ different ways to assign priorities to all cities. Once they are assigned, the machine performs the steps below:

1. Pick an uncolored city u that satisfies the condition: if this city becomes colored, then it is possible to go from any uncolored city to any other uncolored city by traveling along roads, without visiting any colored city in between. If no such u exists, the machine crashes, and if multiple u's satisfy the condition, the one with the highest priority is chosen.
2. Pick a color c from the set $\{\text{red}, \text{green}, \text{blue}, \text{yellow}\}$ such that no city connected to u with a road is colored with c. If no such c exists, the machine crashes, and if multiple c's are valid, one of them is chosen uniformly at random.
3. Color the city u with c.
4. If there are any uncolored cities left, go back to step 1.

The queen has to assign the priorities carefully, because some assignments will lead to a chance of the machine crashing and ruining the kingdom. She wants to know the number of different

ways she can assign priorities, such that the probability of the machine crashing is not zero.

Input Format

The first line contains two integer n and m, denoting the number of cities and roads. The i^{th} of the next m lines contains two integers u_i and v_i denoting a road between the cities numbered u_i and v_i.

Output Format

Print the number of different ways to assign priorities such that the machine has a nonzero probability of crashing. Output the result modulo 998244353.

Technical Specification

- $3 \leq n \leq 10^5$
- $n - 1 \leq m \leq 3n - 6$
- $1 \leq u_i, v_i \leq n$ for $i = 1, 2, \ldots m$
- $u_i \neq v_i$ for $i = 1, 2, \ldots m$

Sample Input 1

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

Sample Output 1

```
0
```

Sample Input 2

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

Sample Output 2

```
24
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