Problem 13: Barbieland-bound
13 Points

Problem ID: `barbieland`

Rank: 4

Introduction

Youngmin “El Coyote” Park has opened a new “transportation” service that shuttles people from Venice Beach, California to various tourist destinations in Barbieland and other universes with his brand new fleet of quantum teleporting CALICOrvettes. However, due to the digital nature of this form of transportation and the magical properties of Barbieland, space does not follow conventional rules of linear distance. This, combined with his capitalistic need to justify increasing fare prices (as well as his general disdain for the environment), he orders his drivers, the Kens, to take the most inefficient route to their destination. Help Youngmin monopolize the Barbieland “transportation” market by programming his onboard CALIComputers!

Problem Statement

There are $\mathbf{N}$ dreamhouses numbered 1 to $\mathbf{N}$ in Barbieland. You can travel between them using $\mathbf{M}$ bidirectional roads. The i^{th} road connects dreamhouse $\mathbf{U}_i$ to dreamhouse $\mathbf{V}_i$, and has a length of $\mathbf{W}_i$. It’s guaranteed that it’s possible to go from any dreamhouse to any other dreamhouse using a sequence of roads.

A route $u_1 \rightarrow u_2 \rightarrow \ldots \rightarrow u_{x-1} \rightarrow u_x$ is defined as a sequence of roads that connect a sequence of dreamhouses. Dreamhouses and roads may be included **more than once** in a single route (a walk). The length of a route is defined as the bitwise XOR ($\oplus$) of the road lengths: $w(u_1, u_2) \oplus w(u_2, u_3) \oplus \ldots \oplus w(u_{x-1}, u_x)$, where $w(u_i, u_j)$ is the length of the road connecting u_i and u_j.

There are $\mathbf{Q}$ passengers that Youngmin wants to transport. The i^{th} passenger needs to get from dreamhouse $\mathbf{A}_i$ to dreamhouse $\mathbf{B}_i$. For each passenger, find the maximum possible length of *any route* that starts at $\mathbf{A}_i$ and ends at $\mathbf{B}_i$.

Input Format

The first line of the input contains a single integer $\mathbf{T}$ denoting the number of test cases that follow. For each test case:

- The first line contains three space-separated integers $\mathbf{N}$ $\mathbf{M}$ $\mathbf{Q}$, where:
  - $\mathbf{N}$ denotes the number of dreamhouses.
  - $\mathbf{M}$ denotes the number of roads.
  - $\mathbf{Q}$ denotes the number of passengers.
- For each of the next $\mathbf{M}$ lines, the i^{th} line contains three space-separated integers $\mathbf{U}_i$ $\mathbf{V}_i$ $\mathbf{W}_i$ denoting that a road connects dreamhouse $\mathbf{U}_i$ to dreamhouse $\mathbf{V}_i$ with length $\mathbf{W}_i$.
- For each of the next $\mathbf{Q}$ lines, the i^{th} line contains two space-separated integers $\mathbf{A}_i$ $\mathbf{B}_i$ representing a query to find the maximum route length between dreamhouses $\mathbf{A}_i$ and $\mathbf{B}_i$.

Output Format

For each test case, output $\mathbf{Q}$ lines, each containing a single integer. The i^{th} line of the output should contain the maximum possible route length between dreamhouses $\mathbf{A}_i$ and $\mathbf{B}_i$.

Constraints

Time limit: 2 seconds.

$1 \leq \mathbf{T} \leq 100$
$1 \leq \mathbf{N}, \mathbf{M}, \mathbf{Q} \leq 10^5$
$1 \leq \mathbf{W}_i \leq 10^{18}$ for all i
The sum of $\mathbf{N}$ across all test cases in an input file does not exceed 10^5.
The sum of $\mathbf{M}$ across all test cases in an input file does not exceed 10^5.
The sum of $\mathbf{Q}$ across all test cases in an input file does not exceed 10^5.

Sample Test Cases

Sample Input Download

```
3
4 3 4
1 2 5
2 3 9
3 4 33
1 3
2 4
1 4
2 3
4 4 2
1 2 5
2 3 3
3 4 6
4 1 3
1 1
2 4
5 6 4
1 2 6
2 3 4
3 4 2
4 1 5
1 3 1
4 5 4
1 3
5 4
2 1
1 1
```

Sample Output Download

```
12
40
45
9
3
6
7
7
6
6
```

Sample Explanations

For test case #1, all routes between 1 and 3 have length 12. This is because the length of route 1 → 2 → 3 is the same as the route 1 → 2 → 1 → 2 → 3 or 1 → 2 → 3 → 4 → 3 → 2 → 3. The same applies to the rest of the queries, where all routes from one dreamhouse to another have the same length.

For test case #2, the longest route between 1 and itself is 1 → 2 → 3 → 4 → 1, which has length 3. Note that $\mathbf{A}_i = \mathbf{B}_i$ in this case. For a route between 2 and 4, we could take 2 → 3 → 4 to yield a route length of 5; however, taking route 2 → 1 → 4 yields a length of 6, so we output that one instead. Note that the multiple valid routes yield the same maximum length of 6—one of which is route 2 → 3 → 4 → 1 → 2 → 3 → 4.

For test case #3:

1. The longest route between 1 and 3 is 1 → 4 → 3, which has length 7.
2. The longest route between 5 and 4 is 5 → 4 → 1 → 2 → 3 → 1 → 4, which has length 7.
3. The longest route between 2 and 1 is 2 → 1, which has length 6.
4. The longest route between 1 and 1 is 1 → 4 → 3, which has length 6. Note that $\mathbf{A}_i = \mathbf{B}_i$.

Here's a rather *artistic* interpretation of the third test case (road lengths are in binary for easier interpretation):