Problem H
A Hard Problem

Time limit: 20 seconds

Memory limit: 2048 megabytes

Problem Description

You are given a simple undirected graph consisting of n nodes and m edges. The nodes are numbered from 1 to n, and the edges are numbered from 1 to m. Node i has a non-negative integer value V_i and the weight $W_{u,v}$ of edge $\{u, v\}$ is defined as $\|V_u \oplus V_v\|$ where $\oplus$ is the exclusive-or operator (equivalent to `^` in C) and $\|x\|$ is the number of set bits in the binary representation non-negative integer z.

The node values $V_1, V_2, \ldots, V_n$ must satisfy q constraints. Each of the constraints can be represented as a 5-tuple (t, u, i, v, j).

- if $t = 0$, then $getBit(V_u, i) = getBit(V_v, j)$
- if $t = 1$, then $getBit(V_u, i) \neq getBit(V_v, j)$

where the function $getBit(x, i)$ returns the $(i + 1)$-th least significant bit of x. For examples, $getBit(11, 0)$ is 1 and $getBit(11, 2) = 0$. In the C programming language, $getBit(x, i)$ can be computed by `((x >> i) & 1U)` if x is a 32-bit unsigned integer and i is a non-negative integer at most 31.

Unfortunately, some node values are missing now. Your task is to assign new values to them to minimize $\sum_{\{u,v\} \in E} W_{u,v}$ without violating any given constraint. Please write a program to help yourself to complete this task.

Input Format

The input consists of five parts. The first part contains one line, and that line contains two positive integers n and m. n is the number of nodes, and m is the number of edges. The second part contains m lines. Each of them contains two integers u and v, indicating an edge $\{u, v\}$ of the given graph. The third part contains one line. That line consists of n space-separated integers $x_1, x_2, \ldots, x_n$. For any $k \in \{1, 2, \ldots, n\}$, if the node value V_k is missing, x_k will be `-1`; otherwise, V_k is x_k. The fourth part contains one integer q, indicating the number of constraints. The fifth part contains q lines, and each of them contains five space-separated integers t, u, i, v, j indicating that (t, u, i, v, j) is a constraint.

Output Format

Output an integer which is the minimum value under the q constraints. If it is not possible to satisfy all the constraints, output `-1`.

Technical Specification

- $1 \leq n \leq 1000$

- $1 \leq m \leq 5000$
- $-1 \leq V_i < 2^{16}$
- $0 \leq q \leq 8$
- $t \in \{0, 1\}$
- $0 \leq u, v < n$
- $0 \leq i, j < 16$

Sample Input 1

```
4 4
1 3
1 2
3 2
0 3
-1 -1 60091 51514
2
1 2 0 1 5
0 2 6 0 15
```

Sample Output 1

```
13
```

Sample Input 2

```
3 2
0 1
1 2
-1 -1 -1
2
1 2 0 1 5
0 1 5 2 0
```

Sample Output 2

```
-1
```