Problem D. Decomposition

Input file:	`standard input`
Output file:	`standard output`
Time limit:	5 seconds
Memory limit:	256 megabytes

You are given a graph P with n vertices and m edges. You should decompose it to cartesian product of some graph Q and boolean cube graph with **maximal power** k.

Graph of boolean cube of power k is a graph with 2^k vertices numerated from 0 to $2^k - 1$. Two vertices are adjacent if and only if their binary representations (with leading zeros) differ in exactly one position.

Cartesian product $G\square H$ of graphs G and H is a graph such that

1. the vertex set of $G\square H$ is the Cartesian product of sets $V(G) \times V(H)$
2. any two vertices (u, u') and (v, v') are adjacent in $G\square H$ if and only if either
   - $u = v$ and u' is adjacent with v' in H, or
   - $u' = v'$ and u is adjacent with v in G.

Input

First line contains 2 integers n, m ($1 \le n \le 2 \cdot 10^5, 0 \le m \le 2 \cdot 10^5$) — the number of vertices and the number of edges in the graph P.

Each of next m lines contains 2 integers a_i, b_i ($1 \le a_i, b_i \le n, a_i \ne b_i$), describing i-th edge.

It's guaranteed that there is at most one edge between any pair of vertices.

Output

First line should contains one integer k.

If $k > 0$ then output another n lines. i-th of them should contain one integer $1 \le c_i \le \frac{n}{2^k}$ and a k-bit string, denoting the vertex number in graph Q and description of boolean cube vertex which was used to product i-th vertex of graph P.

In other words, you should describe the bijection between the vertices of the input graph and pairs (u, v) where u is the vertex of the graph Q and v is the vertex of the boolean cube graph.

Examples

standard input	standard output
4 4 1 3 3 2 2 4 4 1	2 1 00 1 11 1 01 1 10
6 9 1 4 2 5 3 6 1 2 1 3 2 3 4 6 5 6 4 5	1 1 0 3 0 2 0 1 1 3 1 2 1
3 3 1 2 2 3 1 3	0

Note

In mathematics, a Cartesian product is a mathematical operation which returns a set (or product set or simply product) from multiple sets. That is, for sets A and B, the Cartesian product $A \times B$ is the set of all ordered pairs (a, b) where $a \in A$ and $b \in B$. (Wikipedia)