Sheriruth

Input file:	`standard input`
Output file:	`standard output`
Time limit:	5 seconds
Memory limit:	1024 megabytes

You're given a simple directed graph $G = (V, E)$, in which $V = \{0, 1, 2, \ldots, n-1\}$ and $|E| = m$.

If $a, b, c \in V$ satisfy all of the following restrictions:

- $b \neq c$
- $(a \to b) \in E$
- $(a \to c) \in E$
- $(b \to c) \notin E$

Then we would join the edge $b \to c$ into the edge set E.

Keep doing such operation until you can't do it. We can prove that the final graph $G' = (V, E')$ is unique.

Then we would ask you q questions. For each question, we would give you nodes $u, v \in V$. You need to answer how many paths are from u to v on G' and along which we'd not meet any node for more than once.

For the reason that the answer may be too large, you need only to tell us the answer mod S.

Input

The first line of the input contains four integers n, m, q and S ($1 \leq n \leq 5 \times 10^5$, $0 \leq m \leq 10^6$, $1 \leq q \leq 10^6$, $1 \leq S \leq 2^{30}$).

The following m lines gives out each edge in E. Each line contains two integers u and v, ($0 \leq u, v \leq n-1, u \neq v$), which means an edge $u \to v$ in E. It is guaranteed that there are no multiple edges or self loops in the graph.

The following q lines describes all the questions. Each line contains two integers u and v ($0 \leq u, v \leq n-1$).

Output

Output q lines. The i-th line of these lines contains a single integer, indicating the answer modulo S.

Example

standard input	standard output
11 9 30 998244353 0 1 0 2 3 4 5 4 6 5 7 8 8 9 9 8 10 9 0 1 0 2 1 0 1 2 2 0 2 1 3 4 3 5 3 6 4 3 4 5 4 6 5 3 5 4 5 6 6 3 6 4 6 5 7 8 7 9 7 10 8 7 8 9 8 10 9 7 9 8 9 10 10 7 10 8 10 9	2 2 0 1 0 1 1 0 0 0 0 0 0 1 0 0 1 1 1 1 0 0 1 0 0 1 0 0 1 1