DMPG '16 G5 - Continuation Passing

Time limit: 1.0s   **Memory limit:** 256M

Consider a graph organized into a grid of nodes and edges, where each row has N nodes and there is an infinite number of rows. In this graph, node (x, y) refers to the y-th node in the x-th row. A given bipartition function will add M directed edges per row, each of which joins the a_i-th node in that row (row x) to the b_i-th node in the row immediately after (row $x + 1$).

Someone who lives on this graph is interested in travelling to various rows. He can only start his trip from some node in row 1, and sets the condition that, in order to reach any destination node, he must start his travels from node $(1, y)$ such that y is minimized. Formally, he will not travel from node $(1, y)$ to any destination (r, s) if there exists at least one path from node $(1, y')$ to (r, s), and $y' < y$. To plan his trip to a desired row, he would like to reflect on how many distinct sequences of nodes he could travel through in order to reach his destination.

Help him by answering Q queries:

> For every node in row q_i, how many distinct ways **modulo** $1\,000\,000\,007\,(= 10^9 + 7)$ are there to travel from the desired node in row 1 to this node?

Two ways are considered distinct if they pass through different sequences of nodes. Note that in some rows, the desired starting point (in row 1) may be different for different nodes.

Input Specification

On the first line, read the three integers N, M, and Q.

On each of the next M lines, read the two integers a_i and b_i. $1 \le a_i, b_i \le N$

On each of the next Q lines, read one integer q_i.

Output Specification

For each query, print one line containing the answers for nodes 1 to N in row q_i, with each answer separated by a single space.

Subtasks and Constraints

For all subtasks:

$1 \le N, Q \le 100$

$M \le N^2$

$2 \le q_i \le 10^{13}$

Subtask 1 [5%]

$N \leq 10$

$q_i \leq 10$

Subtask 2 [10%]

$q_i \leq 1000$

Subtask 3 [35%]

$Q = 1$

Subtask 4 [50%]
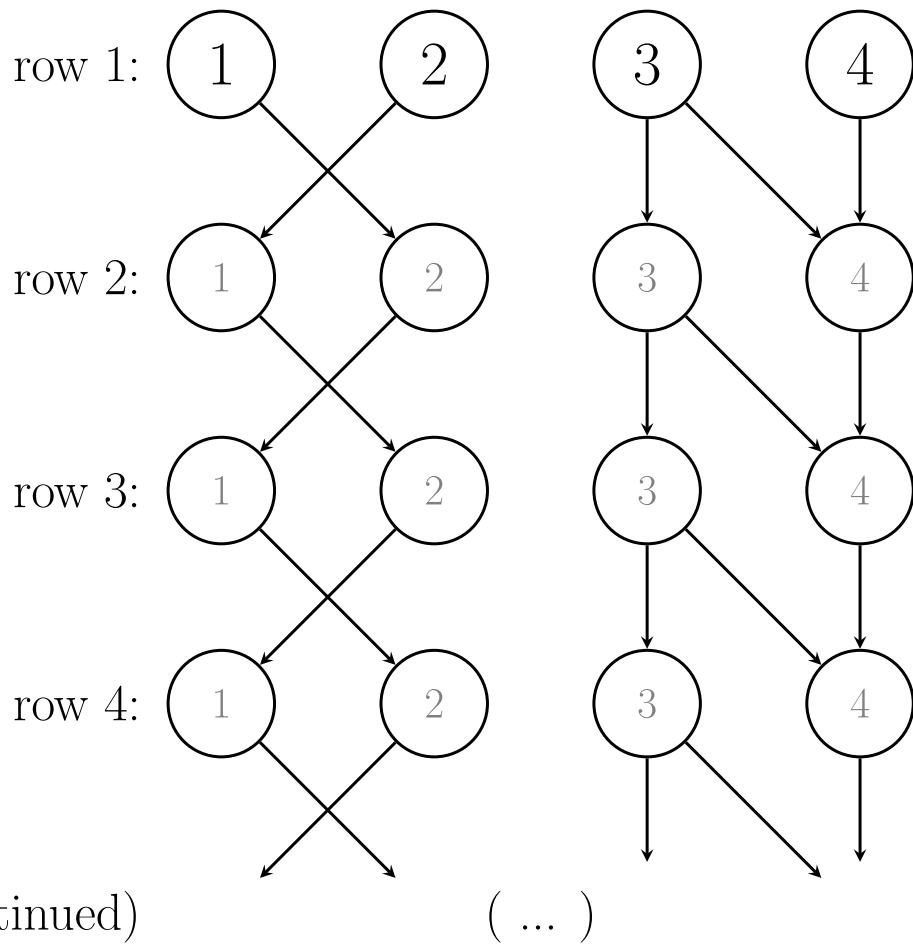
No additional constraints.

Sample Input 1

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

Sample Output 1

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

Explanation for Sample 1

The graph is as illustrated below.

row 1: ① ② ③ ④

row 2: 1 2 3 4

row 3: 1 2 3 4

row 4: 1 2 3 4

(continued) (…)

For node $(3, 4)$, the two distinct ways are to travel from $(1, 3)$ to $(2, 3)$ and from $(1, 3)$ to $(2, 4)$ before reaching it. Note that it is also reachable from $(1, 4)$, but that is irrelevant, as $(1, 3)$ is a lower numbered node in the first row.

For node $(4, 4)$, the three ways are ($(1, 3) \rightarrow (2, 3) \rightarrow (3, 4) \rightarrow (4, 4)$), ($(1, 3) \rightarrow (2, 3) \rightarrow (3, 3) \rightarrow (4, 4)$), and ($(1, 3) \rightarrow (2, 4) \rightarrow (3, 4) \rightarrow (4, 4)$).

Sample Input 2

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

Sample Output 2

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