Problem K
Trophic Balance Species

Time limit: 3 seconds
Memory limit: 128 megabytes
Please note the unusual memory limit.

Problem Description



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In an interdisciplinary collaboration, an ecosystem scientist and a computer scientist join forces to analyze the structure of a complex ecosystem using computational methods. The ecosystem scientist models the ecosystem as a directed graph $D = (V, A)$, where each species is represented by a node $v \in V$, and each feeding relationship is represented as a directed edge $(x, y) \in A$ from prey x to predator y. This graph structure allows them to simulate the flow of energy throughout the ecosystem from one species to another.

Two essential features of the ecosystem are defined:

- **Independent Trophic Group**: A set S of animal species is classified as an *independent trophic group* if no species $x \in S$ can reach another species $y \in S$ (for some $y \neq x$) through a series of directed feeding relationships, meaning there is no directed path in D from x to y.
- **Trophic Balance Species**: A species is termed a *trophic balance species* if it has a nearly equal number of species that affect it as directly or indirectly predators (species it can reach via a directed path in D, excluding itself) and species that affect it as directly or indirectly prey (species that can reach it via a directed path in D, excluding itself). Specifically, trophic balance species are those for which the absolute difference between the above two numbers is minimum among all species in the ecosystem.

Consider an ecosystem with $n = 4$ species and $m = 3$ feeding relationships:

- Species 1: Grass (Node 1)
- Species 2: Rabbits (Node 2)
- Species 3: Foxes (Node 3)
- Species 4: Hawks (Node 4)

The directed edges representing the feeding relationships are as follows:

- $(1, 2)$: Grass is eaten by Rabbits.

- $(2, 3)$: Rabbits are eaten by Foxes.
- $(2, 4)$: Rabbits are also eaten by Hawks.

Now, consider the set $S = \{3, 4\}$ (Foxes and Hawks). There are no directed paths between Foxes (Node 3) and Hawks (Node 4); Foxes cannot reach Hawks, and Hawks cannot reach Foxes through any directed paths. Therefore, this set qualifies as an independent trophic group.

Examination of Species

- Species 1 (Grass):
  - Can reach: 3 (Rabbits, Foxes, and Hawks)
  - Can be reached by: 0 (None)
  - Absolute difference: $|3 - 0| = 3$
- Species 2 (Rabbits):
  - Can reach: 2 (Foxes and Hawks)
  - Can be reached by: 1 (Grass)
  - Absolute difference: $|2 - 1| = 1$
- Species 3 (Foxes):
  - Can reach: 0 (None)
  - Can be reached by: 2 (Grass and Rabbits)
  - Absolute difference: $|0 - 2| = 2$
- Species 4 (Hawks):
  - Can reach: 0 (None)
  - Can be reached by: 2 (Grass and Rabbits)
  - Absolute difference: $|0 - 2| = 2$

Among these species, Rabbits have the smallest absolute difference of 1, indicating that they are a trophic balance species within the ecosystem.

It is known that any independent trophic group in the ecosystem has a size of at most k. The task is to find the set of all trophic balance species in the ecosystem.

Input Format

The first line contains exactly two integers n and m, where n (resp. m) denotes the number of nodes (resp. edges) in the directed graph D induced by the investigated ecosystem. The nodes are numbered as $1, 2, \ldots, n$. Then, m lines follow. The i-th line contains two integers x_i and y_i indicating a directed edge from node x_i to node y_i.

Output Format

Output on a single line the node identifiers of all trophic balance species in ascending order. For any two consecutive node identifiers, separate them by a space.

Technical Specification

- $1 \leq n \leq 2 \times 10^5$
- $0 \leq m \leq \min\{n(n-1), 4 \times 10^5\}$
- k is not an input value, and it is guaranteed that $1 \leq k \leq 16$ for each investigated ecosystem.
- For all i $(1 \leq i \leq m)$, $1 \leq x_i, y_i \leq n$ and $x_i \neq y_i$.
- Each ordered pair (x_i, y_i) appears at most once in the input.

Sample Input 1

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

Sample Output 1

```
2
```

Sample Input 2

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

Sample Output 2

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2 3 4
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