Trophic Balance Species

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	128 megabytes

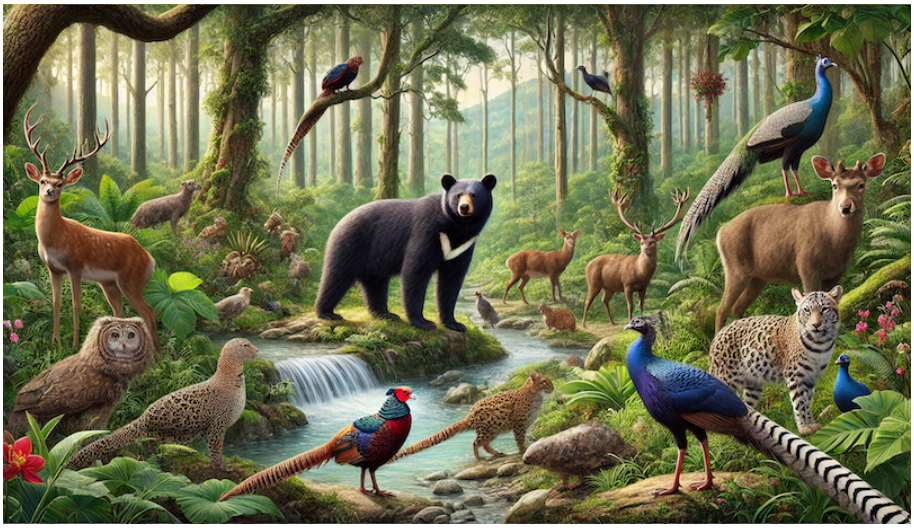

Image generated by ChatGPT 4o.

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

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.

- $1 \leq n \leq 2 \times 10^5$
- $0 \leq m \leq \min\{n(n-1), 4 \times 10^5\}$

- 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.

Output

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

Examples

standard input	standard output
4 3 1 2 2 3 2 4	2
4 5 1 2 1 3 1 4 2 3 3 2	2 3 4