

Contest Duration: 2025-04-12(Sat) 22:00 (<http://www.timeanddate.com/worldclock/fixedtime.html?iso=20250412T2100&p1=248>) - 2025-04-12(Sat) 23:40 (<http://www.timeanddate.com/worldclock/fixedtime.html?iso=20250412T2240&p1=248>) (local time) (100 minutes)

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E - Reachable Set

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Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 450 points

Problem Statement

You are given an undirected graph with N vertices and M edges. The vertices are numbered $1, 2, \dots, N$, and the i -th edge ($1 \leq i \leq M$) connects vertices u_i and v_i .

For each $k = 1, 2, \dots, N$, solve the following problem:

Consider the following operation.

- Choose one vertex, and delete that vertex together with all edges incident to it.

Determine whether one can repeat this operation to satisfy the following condition:

- The set of vertices reachable from vertex 1 by traversing edges consists exactly of the k vertices $1, 2, \dots, k$.

If it is possible, find the minimum number of operations required to do so.

Constraints

- $1 \leq N \leq 2 \times 10^5$
- $0 \leq M \leq 3 \times 10^5$
- $1 \leq u_i < v_i \leq N$ ($1 \leq i \leq M$)
- $(u_i, v_i) \neq (u_j, v_j)$ ($1 \leq i < j \leq M$)
- All input values are integers.

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Input

The input is given from Standard Input in the following format:

```
 $N$   $M$   
 $u_1$   $v_1$   
 $u_2$   $v_2$   
 $\vdots$   
 $u_M$   $v_M$ 
```

Output

Print N lines. On the i -th line ($1 \leq i \leq N$), if one cannot satisfy the condition for $k = i$, print -1; otherwise, print the minimum number of operations required to satisfy the condition.

Sample Input 1

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```
6 7  
1 2  
1 5  
2 3  
2 4  
2 5  
3 6  
5 6
```

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Sample Output 1

[Copy](#)

```
2  
3  
3  
2  
1  
0
```

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For example, for $k = 2$, deleting the three vertices 3, 4, 5 makes the set of vertices reachable from vertex 1 equal to the two vertices 1, 2. It is impossible with two or fewer deletions, so print 3 on the 2nd line.

For $k = 6$, deleting zero vertices makes the set of vertices reachable from vertex 1 equal to the six vertices 1, 2, ..., 6, so print 0 on the 6th line.

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Sample Input 2

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

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Sample Output 2

[Copy](#)

```
1
-1
-1
-1
0
```

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Sample Input 3

[Copy](#)

```
2 0
```

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Sample Output 3

[Copy](#)

```
0
-1
```

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There may be no edges.

Sample Input 4

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```
11 25
6 9
5 9
2 3
1 9
10 11
4 5
9 10
8 9
7 8
3 5
1 7
6 10
4 7
7 9
1 10
4 11
3 8
2 7
3 4
1 8
2 8
3 7
2 10
1 6
6 11
```

Sample Output 4

[Copy](#)

```
5
-1
-1
-1
-1
-1
4
3
2
1
0
```

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