Strongly Connected Components

A strongly connected component (SCC) of a directed graph $G = (V, E)$ is defined as a maximal set of vertices $C \subseteq V$ such that for every pair of vertices u and v in C, the two vertices are reachable from each other. In this lab assignment, you are asked to decompose a given directed graph $G = (V, E)$ into a collection of SCCs.

The input has the following format. There are two integers on the first line. The first integer represents to the number of vertices $|V|$. The second integer is the number of edges $|E|$. Vertices are indexed by $0, 1, \ldots, |V| - 1$. On the following $|E|$ lines, there are two integers u v meaning that there is an edge (u, v) in G. The output contains the SCC ID of every vertex in the graph. An SCC's ID must be the smallest index of any vertex in the SCC. In other words you have to output, for each vertex v, the ID of the unique SCC the vertex v belongs to. You must output the result for each vertex in the order of $0, 1, \ldots, |V| - 1$.

Examples of input and output

```
Input
8 13
0 1
1 2
1 4
1 5
2 3
2 6
3 2
3 7
4 0
4 5
5 6
6 5
6 7
```

```
Output
0
0
2
2
0
5
5
7
```

The graph is decomposed into four SCCs, $\{0, 1, 4\}, \{2, 3\}, \{5, 6\}, \{7\}$. Note that all vertices in the same SCC have the same label, which is equal to the smallest index of all vertices in the same component. For example, vertices 0,1 and 4 are all labeled with 0.

Submission   Submit the source code `SCC.cpp` through the assignments page of CatCourses by the deadline. Be careful since CatCourses strictly enforces the assignment deadline. You may be asked to compile, run, and explain the code to the TA to prove that you understand what you wrote.

Grading   We provide 10 test cases for you to try your implementation. Each of them is valued at 1 point if executed correctly. We will use 10 additional test cases to check that your implementation is general enough. These are not provided to you and are also valued at 1 point each.

Important Note   We will use plagiarism software to detect cheating. Offenders will be subjected to the UCM Academic Honesty Policy which states: *if any violation of the UCM Academic Honesty Policy is suspected in a course, the instructor of record must fill out the Faculty Report for Academic Misconduct.*