ETH Zurich
Institut für Theoretische Informatik
Prof. Dr. Angelika Steger
Prof. Dr. Emo Welzl
Prof. Dr. Peter Widmayer

Algorithms Lab

Exercise – *DFS*

Compute the DFS timestamps of discovery and finishing of all vertices starting from a given vertex. The order in which the DFS traversal visits the vertices should be such that it *always* visits the unvisited neighbour of the current vertex *with the smallest identifier*.

Input The first line of the input contains the number $t \leq 10$ of test cases. Each of the t test cases is described as follows.

- It starts with a line that contains three integers `n m v`, separated by a space, denoting the number of vertices, the number of edges, and the starting vertex, and such that $0 \leq n \leq 10^3$, $0 \leq m \leq \binom{n}{2}$, and $0 \leq v \leq n-1$.
- The following m lines each contain two integers `a b`, separated by a space, indicating that $\{a, b\}$ is an edge of the graph.

Output For each test case you should output two lines: the first containing the timestamps of discovery separated by a space and ordered by increasing labels; the second containing timestamps of finishing separated by a space and ordered by increasing labels. If a vertex cannot be reached, both of its timestamps are -1.

Points There is one group of test sets, worth 100 points in total.

Sample Input

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

Sample Output

```
0 1 3 4 6
9 2 8 5 7
-1 -1 0 1
-1 -1 3 2
```