Problem C. Intermediate Verticality

Time limit:	1 second
Memory limit:	512 megabytes

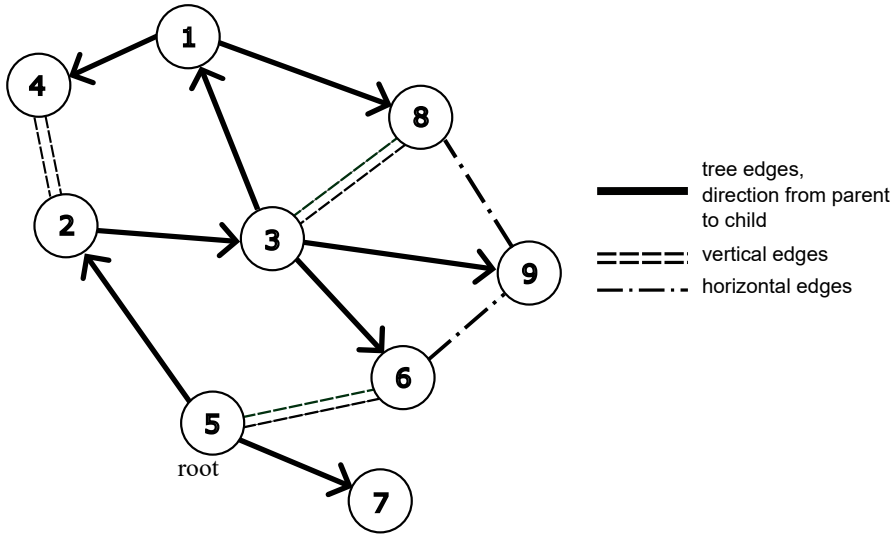
Two classical graph algorithms — depth-first search and breadth-first search — construct two spanning trees in a graph. The depth-first search is known for producing a tree that has no *horizontal* edges, which are edges connecting vertices that are not ancestors of each other, while breadth-first search is known for producing a tree that has no *vertical* edges — edges connecting a vertex to its ancestor in the tree. In this problem, you will need to construct an intermediate spanning tree that has a specified number of horizontal and vertical edges.

Recall that an undirected graph consists of a set of vertices V and a set of edges E, where each edge connects two vertices. We will consider connected graphs, where it is possible to reach any vertex from any other vertex via edges. A tree is a connected undirected graph that contains no cycles, and a spanning tree in a graph is a subset of its edges that forms a tree, allowing one to reach any vertex of the graph from any other. Recall two fundamental properties of a tree: in a tree with n vertices, there are exactly $n - 1$ edges, and there is exactly one path between any two vertices in a tree.

We will designate a vertex r in the graph, which we will call the *root* of the tree. The vertices that lie on the unique path from vertex x to vertex r are called the *ancestors* of vertex x, and the first vertex on this path is called the *parent* of vertex x and is denoted as p_x. The root has no parent.

If a root and a spanning tree are fixed in the graph, then all edges of the graph can be divided into three types:

- *tree edges* — the edges of the chosen spanning tree;
- *vertical edges* — the edges not belonging to the tree that connect a vertex to its ancestor;
- *horizontal edges* — the remaining edges of the graph.



The *verticality* of the spanning tree in the graph is defined as the number of vertical edges.

You are given a graph with n vertices and m edges, the root of the tree r, and a number h, $0 \le h \le m-n+1$. You need to construct a spanning tree of the given graph with root at r, having a verticality equal to h, or report that such a tree does not exist.

Input

Each test consists of several sets of input data. The first line contains one integer t — the number of sets of input data ($1 \le t \le 10^5$). Following this are descriptions of t sets of input data.

In the first line of each set of input data, there are four integers n, m, r, and h — the number of vertices and edges in the graph, respectively, the index of the root vertex, and the required verticality of the future spanning tree ($2 \le n \le 3 \cdot 10^5$; $n - 1 \le m \le 3 \cdot 10^5$; $1 \le r \le n$; $0 \le h \le m - n + 1$).

In each of the following m lines, there are two integers u_i, v_i — the indices of the vertices connected by an edge in the graph ($1 \le u_i, v_i \le n$; $u_i \ne v_i$).

It is guaranteed that all graphs are connected, contain no loops or multiple edges. It is guaranteed that the sum of n across all input data sets does not exceed $3 \cdot 10^5$. It is guaranteed that the sum of m across all input data sets does not exceed $3 \cdot 10^5$.

Output

For each test case, find the required spanning tree T and output in a separate line n integers $p_1, p_2, \ldots, p_n$, where p_i is the index of the parent of the i-th vertex in the tree T ($1 \le p_i \le n$). For p_r, you can output any number from 1 to n. If a tree T with the desired properties does not exist, output n numbers -1 instead.

Example

standard input	standard output
4 5 7 2 0 1 2 2 3 3 4 4 1 3 5 5 4 1 5 5 7 2 1 1 2 2 3 3 4 4 1 3 5 5 4 1 5 5 7 2 2 1 2 2 3 3 4 4 1 3 5 5 4 1 5 5 7 2 3 1 2 2 3 3 4 4 1 3 5 5 4 1 5	2 1 2 3 3 2 1 4 1 1 2 1 5 5 1 2 1 4 1 3