Problem A

Transitive Closure

Let $G = (V, E)$ be an unweighted graph defined as a finite set V of nodes and a set E of edges, which are pairs of nodes. Given a directed graph G and two nodes $s, v \in V$, the reachability problem is related to find out whether there is a path from s to v. The generalization of the reachability problem is called Transitive Closure problem (TC). The solution of every reachability problem applied to a distinct vertex of a graph is the transitive closure of the own graph.

The transitive closure is based on finding if a vertex s is reachable from another vertex v for all vertex pairs (s, v). Thus, the transitive closure of a graph G is a graph that contains an edge (s, v) whenever there is a directed path from s to v in G. The transitive closure problem can be solved by different graph algorithms that use several techniques, such as: search algorithms, shortest paths algorithms, algorithms that find out strongly connected components of a graph and so on.

Create a parallel version of an algorithm that generates the transitive closure of a given graph.

Input

The input follows the GTgraph format. The lines starting with “c” are comment lines containing information about the graph. The problem line, starting with “p”, is unique and must appear as the first non-comment line. This line has the format “p sp n m”, where n and m are the number of nodes and the number of arcs (edges), respectively. Arc descriptors are of the form “a U V W”, where U and V are the tail and the head node ids, respectively, and W is the arc weight.

The input must be read from the standard input.

Output

The output must have only the adjacency matrix. Columns separated by white space and each line ending with a newline (“\n”).

The output must be written to the standard output.

Example

<table>
<tr><th>Input</th><th>Output for the input</th></tr>
<tr><td><pre>
c FILE   : graph_5.gh
c No. of vertices   : 5
c No. of directed edges   : 9
c Max. weight   : 1
c Min. weight   : 1
c A directed arc from u to v of weight w
c is represented below as ' a u v w '
p sp 5 9
a 1 3 1
a 1 4 1
a 1 5 1
a 2 5 1
a 3 1 1
a 3 2 1
a 3 5 1
a 4 1 1
a 5 4 1
</pre></td><td><pre>
0 0 1 1 1
0 0 0 0 1
1 1 0 0 1
1 0 0 0 0
0 0 0 1 0
</pre></td></tr>
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