

Wireless Lab 2

DSR

Add a comment with your name and BN at the beginning of your submission.

Dynamic Source Routing is a routing protocol used in wireless **ad hoc networks**. The DSR protocol is designed to find and maintain routes between nodes in a wireless network, without the need for a centralized routing infrastructure.

In DSR, when a source node wants to send a packet to a destination node, it first searches its **route cache for** a route to the destination. If a route is not found, the source node initiates a route discovery process. During route discovery, the source node broadcasts a route request packet, which is received by its neighbors. Each neighbor forwards the packet to its neighbors, until the packet reaches the destination or a node that **has a route to the destination in its cache**. The route discovery process creates a route from the source to the destination, which is added to the route cache of all nodes along the path. Once a route has been established, packets can be sent between the source and destination using the discovered route.

In this challenge, you will simulate the DSR route discovery process.

Given a graph of **n vertices and m edges**. Each node has no prior knowledge of the network topology.

Then two vertices are given, your **task is to initiate the route discovery process from the source to the destination**. Each vertex should broadcast the RREQ to the neighboring vertices. Output the path forwarded in the RREQ.

Input Format

The first line consists of two integers n and m - the number of vertices and the number of edges.

Each of the following m lines contains a pair of integers x and y , that show that an edge exists between vertices x and y . For each pair of vertices there will be at most one edge between them, no edge connects a vertex to itself.

The next line contains a pair of integers u and v , asking about the route between them.

Constraints

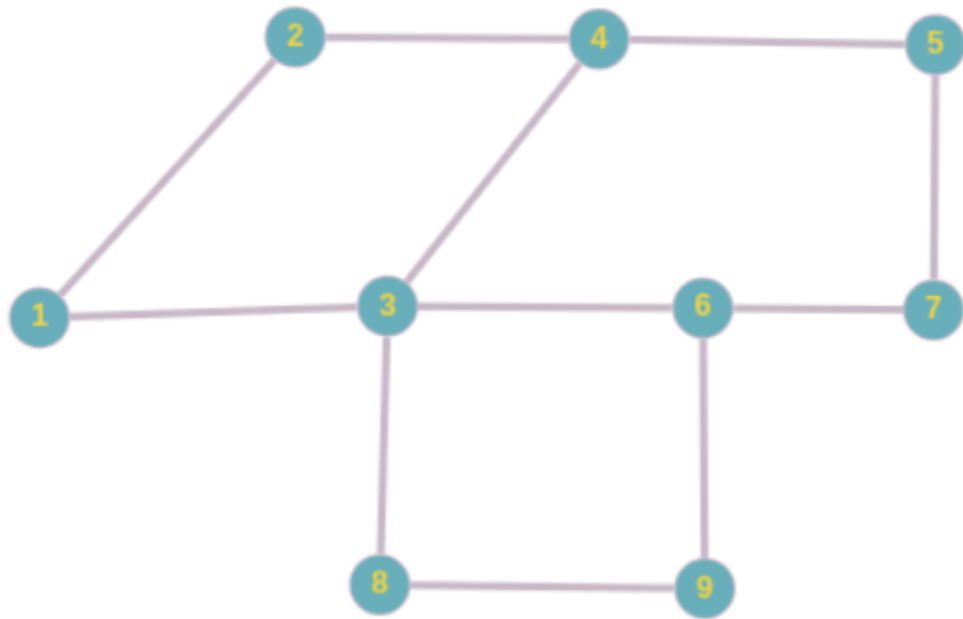
- $2 \leq n \leq 1000$
- $1 \leq m \leq (n \cdot (n-1)) / 2$
- $1 \leq x, y \leq n, x \neq y$
- $1 \leq u, v \leq n, u \neq v$

Output Format

Output n lines. The i th line represents path forwarded in RREQ for vertex i - ($1 \leq i \leq n$).

If there are multiple possible paths, output the shortest one having the lexicographically smallest path. If a vertex won't forward a RREQ, output -1.

Sample Input 0	Sample Output 0
9 11 1 2 1 3 2 4 3 4 3 6 3 8 4 5 5 7 6 7 6 9 8 9 8 4	8 3 1 8 3 1 2 8 3 -1 8 3 6 7 5 8 3 6 8 3 6 7 8 8 9



- First, Node 8 starts the route discovery and broadcasts RREQ with path [8] to 3 and 9.
- Node 3 broadcasts to 1, 4, 6 and 8 with path [8, 3].
- Node 1 broadcasts to 2 and 3 with path [8, 3, 1].
- Node 2 broadcasts to 1 and 4 with path [8, 3, 1, 2].
- Node 4 will not forward RREQ as it is the destination.
- Node 9 broadcasts to 6 and 8 with path [8, 9].
- Node 6 receives RREQ from 3 and 9, but will forward that of 3 as it is lexicographically smaller. It will forward to 7, 3 and 9 with path [8, 3, 6].
- Node 7 broadcasts to 5 and 6 with path [8, 3, 6, 7].
- Node 5 broadcasts to 4 and 7 with path [8, 3, 6, 7, 5].

Sample Input 1	Sample Output 1
6 7 1 2 1 3 2 4 3 4 3 5 4 6 5 6 1 4	1 1 2 1 3 -1 1 3 5 1 3 5 6

Sample Input 2	Sample Output 2
4 3 1 2 2 3 3 4 2 3	2 1 2 -1 -1

This is an **individual** assignment.

Write your name, section and BN in a comment at the top of your submission.

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