Скопировать



CSE221 Assignment 07 Summer 2025

A. Shortest Path

time limit per test: 1 second

memory limit per test: 1024 megabytes You are given an **directed weighted** graph with N nodes and M edges. The nodes are numbered from 1 to N. The graph contains no self-loops or

multiple edges. There is a source and a destination. Your task is to find the shortest distance from the source node to the destination node and print the path taken. If multiple shortest paths exist, print any one of them. If no such path exists, print -1.

Input The first line contains four integers $N,M,S,D(2\leq N\leq 2 imes 10^5,1\leq M\leq 3 imes 10^5,1\leq S,D\leq N)$ — the number of vertices, total number

of edges, source and destination. The second line contains M integers $u_1,u_2,u_3\ldots u_m$ $(1\leq u_i\leq N)$ — where the i-th integer represents the node that is one endpoint of the i-th edge.

edge. The fourth line contains M integers $w_1, w_2, w_3 \dots w_m$ $(1 \le w_i \le 10^6)$ — where the i-th integer represents the weight of the i-th edge.

The third line contains M integers $v_1,v_2,v_3\ldots v_m$ $(1\leq v_i\leq N)$ — where the i-th integer represents the node that is the other endpoint of the i-th

The i-th edge of this graph is from the i-th node in the second line to the i-th node in the third line.

Output ullet If a valid path exists from S to D, print the shortest distance S to D on the first line.

4 3 4 2

1 3 4

2 2 3 3 4 5

Input

Output

input

5 5 1 5

always 0.

Input

Output

2 1 3 2 3 5

3 4 3

1 2 3

4 6 1

output

4 3 1 2

3 4 5 4

output

input

6 5 5 3

1 2 4 1

1 6 6 2

4 6

output

input

input

1 4 1 6 4 2 1 6 2 6 3 3 4 3 4

output

input

output

input

1 1 4 5 2 3 2 4 5 3 4 4 5 3

3 8 2 6 6 4 3

path exists, print -1.

of edges, source, and destination.

• If no such path exists, print -1.

Input

Examples

input

4 3 2 3

2 1 3

output

5 7

-1

6 5

3 3 4 3 4 1

1 2 3 2

0 3 -1 2 -1 2

output

1 2 1

• On the second line, print the nodes in the path in order from S to D. If multiple shortest paths exist, print any one of them. • If no such path exists, print -1.

to N. The graph contains no self-loops or multiple edges.

Examples input

output Скопировать 4 3 2 input Скопировать 6 5 1 5 1 4 1 6 4 2 1 6 2 6 3 3 4 3 4 output -1 input 2 1 2 1 output 2 1

Скопировать Скопировать Скопировать input Скопировать 5 7 2 4 1 1 5 4 2 3 2 5 4 3 5 5 4 3 3 8 2 6 6 4 3 output Скопировать 2 3 4 B. Where to Meet? time limit per test: 2 seconds memory limit per test: 1024 megabytes

amount of time. Alice or Bob can wait at any node if they want to. The first line contains four integers $N,M,S,T(2\leq N\leq 2 imes 10^5,1\leq M\leq 3 imes 10^5,1\leq S,T\leq N)$ — the number of vertices, the total number of edges, the starting node of Alice, and the starting node of Bob.

Alice and Bob are in a hurry to meet each other and have to traverse through a directed graph with weighted edges. The nodes are numbered from 1

Alice starts from node S and Bob starts from node T. They want to find a common node in the graph where they can meet each other in the minimum

The next M lines will contain three integers $u_i,v_i,w_i (1 \le u_i,v_i \le N, 1 \le w_i \le 10^6)$ — there is a edge from the node u_i to the node v_i with a weight w_i .

Print two integers separated by a space: the minimum time required for Alice and Bob to meet, and the node where they meet. If there are multiple such nodes, print the smallest node. If no such node exists, print -1. **Examples**

2 3 1 5 3 2 1 4 2 5 4 2 output Скопировать 2 3 input Скопировать 6 5 1 5 1 2 3 4 1 3 1 6 4 6 2 3 4 6 4 output Скопировать -1 input Скопировать 2 1 2 2 2 1 7 output Скопировать 0 2 input Скопировать 5 7 2 5 1 5 3 1 4 8 5 3 2 4 5 6 2 5 6 3 4 4 2 3 3 output Скопировать 3 3 C. Minimize the Danger time limit per test: 2 seconds memory limit per test: 1024 megabytes You are in a city with N cities connected by M bi-directional roads. Each road has a danger level, where a higher number means the road is more dangerous. You start in city 1 and need to go to every other city. The goal is to find the minimum danger level you would face to reach each city from city 1. The danger of a path is defined as the highest danger level of any road on that path.

The next M lines will contain three integers $u_i,v_i,w_i (1\leq u_i,v_i\leq N,1\leq w_i\leq 10^6)$ — node u_i is connected to node v_i with a weight w_i . Output n integers, where i-th integer represents the minimum danger level you'd have to face in order to go from city 1 to city i.

For each city, find the minimum danger level of the path from city 1. If a city is not reachable from city 1, print -1. The danger of reaching city 1 is

The first line contains two integers $N, M(2 \le N \le 2 \cdot 10^5, 1 \le M \le 3 \cdot 10^5)$ — the number of cities, the total number of roads.

Examples input Скопировать 4 3

0 3 5 5 input 6 5

input Скопировать 2 1 2 1 5 output Скопировать 0 5 input Скопировать 5 7 1 5 3 1 4 2 5 3 1 5 4 6 5 2 5 3 4 4 3 2 8 output Скопировать 0 5 3 2 3 D. Beautiful Path time limit per test: 2 seconds memory limit per test: 1024 megabytes You are given an **directed** graph with N nodes and M edges. The graph contains no self-loops or multiple edges. The edges have no weight. The nodes are numbered from 1 to N and have a weight. You need to find the cost of a path, if there is any, from node S to node D with the minimum cost. The cost of a path is the sum of the weights of the nodes in that path. Input The first line contains four integers $N,M,S,D(2\leq N\leq 2 imes 10^5,1\leq M\leq 3 imes 10^5,1\leq S,D\leq N)$ — the number of vertices, total number of edges, source, and destination. In the next line, there will be N integers $w_1, w_2, w_3 \dots w_n$ $(1 \le w_i \le 10^6)$ separated by spaces – representing the weights of each node. The next M lines will contain two integers u_i,v_i $(1\leq u_i,v_i\leq N)$ — there is an edge from the node u_i to the node v_i . Output If a valid path exists from S to D, print the minimum cost of the path. Otherwise, print -1. **Examples** input Скопировать

2 1 1 1 7 6 2 1 output Скопировать input Скопировать 5 7 3 5 3 8 2 6 6 1 5 1 4 5 3 3 4 2 3 output Скопировать 14 E. Parity Edges time limit per test: 1.5 seconds@ memory limit per test: 1024 megabytes You are given a **directed weighted** graph with N nodes and M edges. The nodes are numbered from 1 to N. The graph contains no self-loops or multiple edges. Your task is to find the shortest distance from node 1 to node N, with an additional constraint: the path cannot contain two consecutive edges with the same parity (i.e., both even or both odd). If no such path exists, print -1. Input The first line contains two integers $N, M(2 \le N \le 2 \times 10^5, 1 \le M \le 3 \times 10^5)$ — the number of vertices, total number of edges. The second line contains M integers $u_1,u_2,u_3\ldots u_m$ $(1\leq u_i\leq N)$ — where the i-th integer represents the node that is one endpoint of the i-th edge. The third line contains M integers $v_1,v_2,v_3\ldots v_m$ $(1\leq v_i\leq N)$ — where the i-th integer represents the node that is the other endpoint of the i-th edge. The fourth line contains M integers $w_1,w_2,w_3\dots w_m$ $(1\leq w_i\leq 10^6)$ — where the i-th integer represents the weight of the i-th edge. The i-th edge of this graph is from the i-th node in the second line to the i-th node in the third line. Output Print a single integer — the minimum distance from node 1 to node N following the given constraint. If there is no valid path, print -1. **Examples** input Скопировать 4 3 1 3 2 4 4 3 3 4 5 output Скопировать

F. Shortest Path Revisited time limit per test: 3 seconds memory limit per test: 1024 megabytes You are given a **bidirectional weighted** graph with N nodes and M edges. The nodes are numbered from 1 to N. The graph contains no self-loops or multiple edges. There is a source and a destination. Your task is to find the cost of the second shortest path from the source node to the destination node. If no such

The first line contains four integers $N,M,S,D(2\leq N\leq 2 imes 10^5,1\leq M\leq 3 imes 10^5,1\leq S,D\leq N)$ — the number of vertices, total number

The next M lines will contain three integers $u_i,v_i,w_i (1\leq u_i,v_i\leq N,1\leq w_i\leq 10^6)$ — there is an edge between the node u_i and the node v_i with a weight w_i . Output

• If a valid path exists from S to D, print the cost of the second shortest path from S to D.

Note: Second shortest path will be strictly greater than the shortest path

2 3 5 3 4 3 output 11 input

Скопировать 6 5 3 4 1 2 3 1 4 5 1 6 2 2 6 3 4 6 1 output Скопировать -1 input Скопировать 2 1 2 2 2 1 5 output Скопировать 10 Скопировать input 5 7 2 5 1 5 3 1 4 2 5 3 1 5 4 6 5 2 5 3 4 4 3 2 8 output Скопировать

Соревнования по программированию 2.0