

Mooncake Delivery

Input file: **standard input**
Output file: **standard output**
Time limit: 1 second
Memory limit: 256 megabytes



Melon is a rabbit living on the moon who is responsible for delivering moon cakes at the Mid-Autumn Festival every year. Besides the Earth, many other planets also have a demand for mooncakes. Therefore, Melon needs to consume her fairy power to travel among different planets when delivering mooncakes.

There are n planets numbered from 1 to n , along with m tunnels. Each tunnel undirectedly connects two planets. Each planet i has a color c_i and a cost w_i indicating the power that Melon needs to consume to land on it.

In order to save the power for interstellar travel, Melon will use a special skill: planting cinnamon trees. Initially, no cinnamon trees are planted on any of the planets. Once Melon lands on a planet without a cinnamon tree, she will immediately plant a cinnamon tree there, but she will not plant more than one cinnamon tree on each planet. If a planet is already planted with a cinnamon tree, Melon will not consume any power when she lands on that planet again. In addition, when she is on planet i , she can select a planet j that is planted with a cinnamon tree and is not colored c_i , and then remotely cut down the cinnamon tree on planet j and recover w_j power.

Formally, Melon can perform any one of the following actions at any time on planet u :

- Move to an adjacent planet v that is not planted with a cinnamon tree via a tunnel, consume w_v power, and plant a cinnamon tree on planet v .
- Move to an adjacent planet that is planted with a cinnamon tree via a tunnel, without consuming power and without planting additional trees.
- Select a planet v that is planted with a cinnamon tree and is not colored c_u , and then remotely cut down the cinnamon tree on planet v (i.e., no cinnamon tree is planted on planet v thereafter) and recover w_v power. Please note that this action can be performed multiple times on the same planet.

Melon's fairy power cannot be lower than 0, so she must prepare enough power before she departs. Melon wants to know the minimum amount of power she needs to prepare for the travel from the starting planet s to the terminal planet t . Specially, Melon needs to consume w_s power and plant a cinnamon tree on the starting planet s .

Input

The first line contains an integer T ($1 \leq T \leq 100$), indicating the number of test cases.

The first line of each test case contains two integers n and m ($2 \leq n \leq 300$, $1 \leq m \leq \frac{n(n-1)}{2}$), indicating the number of planets and tunnels.

The second line of each test case contains n integers c_1, c_2, \dots, c_n ($1 \leq c_i \leq n$), indicating the color of each planet.

The third line of each test case contains n integers w_1, w_2, \dots, w_n ($1 \leq w_i \leq 10^9$), indicating the power to be consumed on each planet.

Each of the following m lines contains two integers u and v ($1 \leq u, v \leq n, u \neq v$), indicating an undirected tunnel between planet u and v . It is guaranteed that there is at most one tunnel between any two different planets, and there exists a path between any two different planets.

It is guaranteed that $\sum n \leq 300$ over all test cases.

Output

Output n lines, each of which contains n integers separated by spaces. The integer in the i -th row and j -th column indicates the minimum amount of power that needs to be prepared for the travel from the starting planet i to the terminal planet j . Specially, output 0 when $i = j$.

Example

standard input	standard output
1	0 3 7 6
4 4	3 0 6 8
1 1 2 3	6 6 0 8
1 2 4 5	6 6 7 0
1 2	
2 3	
3 4	
1 4	

Note

For the sample, here is a way to go from planet 3 to planet 1 with 6 initial power:

1. Consume 4 power and plant a cinnamon tree on planet 3. (Remaining power: 2)
2. Move to planet 2, consume 2 power and plant a cinnamon tree on it. (Remaining power: 0)
3. Cut down the cinnamon tree on planet 3 and recover 4 power. (Remaining power: 4)
4. Move to planet 1, consume 1 power and plant a cinnamon tree on it. (Remaining power: 3)