January 2020 CSE208: Data Structures and Algorithms II Sessional

Online on Single Source Shortest Path Problem

In an imaginary galaxy Sombreroa, we have a planet named **Nilkiyaw.** There are a lot of species in Nilkiyaw, but two types of them are dominant, the **Lybans** and the **Tukans**. The Tukans are peace-loving in nature. But the Lybans are oppressing them. So the Tukans are fighting for their freedom. To get free from the oppression of the Lybans, the Tukans need to reach the oracle, **Kallixiza**. But Killixiza is currently staying in a **remote country**. The Lybans have headquarters in two countries. As the Lybans have gathered a lot of wealth by oppressing the Tukans, they have lots of sophisticated gadgets. They have an autonomous weapon, **Zimbim**, that travels to and fro **between the two headquarters** and destroys any Tukan it finds. If the Tukans have destroyed the path(s) between the Lybans headquarters, then the Zimbim protects the headquarters. The weapon always tries to reach the opposite headquarter in the shortest possible **time**. The Tukans need a safe path to reach Kallixiza. So by no means, they can **risk meeting the Zimbim**. But as the Lybans have taken almost all of their **money**, they need a **cheap** path. Help the Tukans to achieve their freedom by finding the *cheapest safe* path from their home to Kallixiza.

Input/Output:
You will take input from an input file and give output to an output file.

Input Format:
The roads in Nilkiyaw are two (2) ways.

The first line has two space-separated integers C and R, the total number of countries and roads in Nilkiyaw.

In each of the next R lines, there will be four (4) space-separated integers *(C1 C2 T D)* denoting a road. Here *C1* and *C2* denote the two countries the road is connecting and *T* and *D* denotes the time and cost to travel between *C1* and *C2* respectively.

In the next line, there will be two (2) space-separated integer (H1 H2) denoting the two headquarters of the Lybans.

In the next line, there will be two (2) space-separated integers (HT HK) denoting the countries where the Tukans and Kallixiza are currently staying.

You need to find the *cheapest safe* **route** and the cost to reach Kallixiza.
If there is no way to reach Kallixiza, then you need to say "Mission Impossible".

Output Format:
In the first line of the output file, you need to print the cost to reach Kallixiza.

In the next line, you need to print the route the Tukans should follow. You need to separate the cities with "->".

See the sample I/O for further clarification.

Constraints:
$1 < C \leq 1000$
$1 < R \leq C * (C - 1) / 2$
$0 \leq C1, C2, H1, H2, HT, HK < C$
$0 \leq T \leq 1000000$
$0 \leq D \leq 10000$

The sample I/O:

Input	Output
5 6 0 1 100 500 2 1 500 20 2 3 6000 2170 3 0 9001 1220 0 2 70 90 4 3 17002 1505 0 2 3 1	Mission Impossible
5 7 4 1 200 625 3 0 9001 1220 2 3 6000 2170 0 2 70 90 0 1 100 500 2 1 500 20 4 3 17002 1505 0 2 3 1	2130 3 -> 4 -> 1