Problem B
City Travel

Input File: *pb.in*
Time Limit: *1 second*

Problem Description

We have n cities that are connected by m bi-direction roads. Each city has a unique id from 1 to n, so we have cities $c_1, \ldots, c_n$. Let r_{ij} be the road connecting two cities c_i and c_j, then r_{ij} has a length l_{ij} and condition d_{ij}, where the length is a positive integer and the condition is an integer from 1 to k. Note that all roads are bidirectional so l_{ij} is equal to l_{ji} and d_{ij} is the same as d_{ji}.

We want to drive a car from a starting city c_s to a destination city c_d along a shortest route. However, the condition of a road has a severe impact on the suspension system of our car. That is, after driving through a road of condition c, we *cannot* drive through another road of condition c *immediately*, otherwise the suspension of our car will break down. For example, if road r_{12} has condition 1 and r_{23} also has condition 1, then we cannot drive from c_1 to c_2 to c_3. However, if road r_{12} has condition 1, r_{23} has condition 2, and r_{34} also has condition 1, then we can drive from c_1 to c_2 to c_3 to c_4, since we did not drive through two roads of the same condition consecutively.

Now given the condition and length of all roads and p pairs of starting and destination city pairs, please compute the shortest path for each pair of cities without going through two consecutive roads of the same condition.

Technical Specifications

1. The number of cities n is no more than 50.
2. The number of roads m is no more than 500.
3. The number of conditions k is no more than 50.
4. The number of source and destination city pairs p is no more than 15.
5. The length of each l_{ij} is at most 2^{15}.

Input File Format

The first line of the input file contains an integer, denoting the number of test cases to follow. The first line of each test case has the number of cities n, the number of roads m, the number of conditions k, and the number of city pairs p to compute the distance. Each of the next m lines has the information of a road, including the ids of the starting city i and the destination city j, the distance l_{ij} and the condition d_{ij}. To simplify the input presentation we also assume that $i < j$ so that a road will appear exactly once in the input. Each of the next p lines has the source and destination city pairs to compute the distance.

Output Format

For each test case, output the length of the shortest route from the starting city to the destination city without going through two consecutive roads of the same condition for the p city pairs. If there are no feasible routes between a pair of cities, please output “infinity”.

Sample Input

```
2
5 5 3 5
1 2 1 1
2 3 100 2
3 4 100 3
4 5 1 1
2 4 1 2
1 4
1 5
2 4
2 5
3 5
5 5 2 5
1 2 1 1
2 3 100 2
3 4 100 2
4 5 500 1
2 4 1 1
1 4
1 5
2 4
2 5
3 5
```

Sample Output

```
2
3
1
2
101
infinity
infinity
1
infinity
600
```