Problem M. Minor Evil

Input file:	`standard input`
Output file:	`standard output`
Time limit:	16 seconds
Memory limit:	1024 megabytes

Evil is Evil. Lesser, greater, middling. Makes no difference. The degree is arbitrary, the definition's blurred... but not for Gebyte. In-depth reflection on moral ambiguities is not easy while being permanently hangover[8], so whenever two people ask Gebyte to kill the other person, in a blink of an eye he knows which choice is the lesser evil.

As a powerful witch, you can see what awaits Gebyte on his trail: each of the following k days he is going meet a pair of people in conflict. You are also able to foresee which person he is going to kill in each encounter. You decided to use this insight for your own advantage: you want to ensure that a few people whom you don't particularly like end up among the victims.

Unfortunately, your magic is not powerful enough to force Gebyte to make a decision he considers the greater evil. However, you are well versed in charms that can drive the hangover away. If you cast such a spell before a given encounter, the Witcher – suddenly having regained extraordinary clarity of reasoning – will start to reflect more deeply on the dilemma he is facing, not killing either person as the result. (In the evening, though, he is sure to visit a local inn, so the next morning he will be back to his usual hangover-self.)

You can cast spells as many times as you like. Are you able to ensure that all your enemies perish at the hand of Gebyte?

Note that a person can participate in multiple conflicts. **Any given encounter only occurs if both people are still alive** – otherwise, nothing happens that day.

Input

The first line of input contains the number of test cases z ($1 \leq z \leq 1\,000$). The descriptions of the test cases follow.

The first line of the test case contains two integers n, k ($2 \leq n \leq 10^6$, $1 \leq k \leq 10^6$), denoting the number of people and the number of meetings on Gebyte's trail, respectively. People are numbered from 1 to n, and meetings from 1 to k.

The following k lines describe the meetings. Each i-th of them contains two integers a_i, b_i ($1 \leq a_i, b_i \leq n$, $a_i \neq b_i$), meaning that on the i-th day Gebyte will encounter a conflict between persons a_i and b_i and he will decide that killing the person b_i is the lesser evil.

The next line contains one integer s ($1 \leq s \leq n$) – the number of your enemies.

The last line of the test case contains s distinct integers s_j ($1 \leq s_j \leq n$) in ascending order. All the people appearing on this list should die at Gebyte's hand. All the other people **may or may not** survive.

Sums of values of n and k over all test cases do not exceed $4\,000\,000$ each.

Specification

If Gebyte meets the same pair of people more than once, then you **cannot** assume that his choice is the same every time. Perhaps in the meantime he has gained some new information that altered his judgement. In other words, it is possible that $\exists_{i,j}(a_i = b_j \land a_j = b_i)$.

Output

For each test case, print the solution in the following format.

[8] The earlier tale of Gebyte fighting hangover and monsters alike can be found in the problem "Gebyte's Grind"from AMPPZ 2021.

If a solution exists, in the first line of output write a single word TAK. In the next line, write a string composed of k letters T and N. If on the i-th day you want to let Gebyte kill person b_i, then the i-th letter of the sequence should be T. On the other hand, if you want Gebyte not to kill anyone on the i-th day, then the i-th letter of the sequence should be N. (If in your solution Gebyte has already killed person a_i and/or person b_i, then it does not matter whether you print T or N on the i-th position – the conflict will not take place, and Gebyte will not kill anyone on that day.) Your solution will be accepted if none of your s enemies listed on the input survives until the end.

If there is no correct solution, in a single line write NIE.

Example

standard input	standard output
2 5 6 1 2 2 1 2 5 2 3 2 4 4 2 3 1 2 3 3 2 1 2 2 3 2 2 3	TAK NTTTNT NIE

Notes

In the first test case, if we allowed Gebyte to choose the lesser evil each time, then on the first day he would kill person number 2 and none of the subsequent conflicts would take place. Therefore, persons 1, 3, 4 and 5 would survive.

On the other hand, if we stop Gebyte on the first and fifth days (the NTTTNT solution), then Gebyte will kill person 1 on the second day, person 5 on the third day, person 3 on the fourth day, and person 2 on the sixth day. Therefore, only person 4 will survive. Another correct solution is NTNTNT, which lets persons 4 and 5 survive.

In the second test case, it is impossible to get both person 2 and person 3 killed.