

Problem: Dynamic Resource Allocation at NovaCorp

Story

In the year 2150, NovaCorp stands at the forefront of technological innovation, operating a massive orbital research complex. The complex houses n cutting-edge research projects, each requiring specific combinations of m rare cosmic resources—ranging from quantum-entangled processors to stabilized dark matter cores.

Each project has a unique resource requirement pattern. The cosmic market is highly volatile, causing project resource demands to fluctuate dramatically. As Chief Resource Allocator, you must perform real-time feasibility checks at q critical decision points.

At each moment t , you receive updated total demand values $D_{t,i}$ for each project i —representing the total units needed across all resources that project i requires. Given the fixed resource capacities C_j aboard the station, you must determine whether a **perfect allocation** exists that exactly satisfies every project's demand without exceeding any resource's capacity.

The fate of humanity's technological advancement rests on your algorithmic prowess!

Formal Description

You are given:

- n projects and m resource types.
- A binary matrix A of size $n \times m$, where $A_{i,j} = 1$ iff project i requires resource j .
- Resource capacities C_1, C_2, \dots, C_m .
- q time points, each with demand array $D_{t,1}, D_{t,2}, \dots, D_{t,n}$.

For each time t , determine whether there exists a non-negative allocation matrix $X^{(t)} \in \mathbb{Z}_{\geq 0}^{n \times m}$ such that:

$$\begin{aligned}\forall i \in [1, n], \quad & \sum_{j=1}^m X_{i,j}^{(t)} = D_{t,i} \\ \forall j \in [1, m], \quad & \sum_{i=1}^n X_{i,j}^{(t)} \leq C_j \\ \forall i, j, \quad & A_{i,j} = 0 \implies X_{i,j}^{(t)} = 0\end{aligned}$$

Input Format

The first line contains three integers n, m, q ($1 \leq n, m \leq 50, 1 \leq q \leq 1000$).

The next n lines each contain a string of length m consisting of '0' and '1'. The i -th string describes which resources project i needs.

The next line contains m integers C_1, C_2, \dots, C_m ($1 \leq C_j \leq 10^4$).

Finally, q lines follow. The t -th of these lines contains n integers $D_{t,1}, D_{t,2}, \dots, D_{t,n}$ ($0 \leq D_{t,i} \leq 10^4$).

Output Format

Output q lines. The t -th line should contain YES if a feasible allocation exists at time t , otherwise NO.

Constraints

- $1 \leq n, m \leq 50$
- $1 \leq q \leq 1000$
- $1 \leq C_j \leq 10^4$
- $0 \leq D_{t,i} \leq 10^4$
- Each project requires at least one resource (each row of A contains at least one '1').
- Time limit: 2.0 seconds
- Memory limit: 512 MB

Sample Input

```
3 2 4
10
01
11
5 5
2 3 4
1 2 3
0 0 0
5 5 5
```

Sample Output

```
YES
YES
YES
NO
```

Sample Explanation

Resource requirements:

- Project 1 needs only resource 1.
- Project 2 needs only resource 2.
- Project 3 needs both resources 1 and 2.

Time 1: Demands = [2, 3, 4]. One possible allocation:

- Project 1: 2 units from resource 1.
- Project 2: 3 units from resource 2.
- Project 3: 3 units from resource 1 and 1 unit from resource 2.

Total used: resource 1: 5, resource 2: 4 (within capacities 5 and 5).

Time 2: Demands = [1, 2, 3]. Allocation exists.

Time 3: Demands = [0, 0, 0]. Trivially satisfied by allocating nothing.

Time 4: Demands = [5, 5, 5]. Impossible because:

- Projects 1 and 3 share resource 1. Maximum they can get is $C_1 = 5$.
- Projects 2 and 3 share resource 2. Maximum they can get is $C_2 = 5$.
- But project 1 needs 5, project 2 needs 5, and project 3 needs 5 from both resources.
- Resource 1 would need at least $5 + 5 = 10 > 5$, similarly for resource 2.