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1. CSE Department want to determine the courses to offer for next semester. We have a set of instructors (u), a set of courses (v), and a list of courses that each instructor is qualified to teach (M). Only one instructor may teach a given course and no instructor is required to teach more than one course.

1. Show how the bipartite matching problem can be used to solve this problem

The problem is solved by having a loop through the courses that checks if each instructor is qualified to teach the course and also check if the course has already been assigned an instructor. If it has been assigned to another instructor, it will check if that instructor is qualified to teach any other courses and if the previous instructor can, it will assign the course to the current instructor. It checks for conflicts between instructor qualifications and courses as it assigns them. The program could add a counter that keeps track of the number of courses assigned to instructors, therefore being able to show the maximum number of courses that can be taught.

2. What is the maximum number of courses that can be offered in term of u , v , M ?

The maximum number of courses that can be offered is the result from the bipartite matching problem. v is the set of courses, so all of them can be taught as long as there is an instructor qualified to teach the course.

3. What is the time complexity of your solution in term of u , v , M ?

The time complexity would be $O(uv)$, the number of courses that the program has to iterate through in order to assign an instructor to it.