This exercise addresses relational design theory.

Consider a database with relations `Students(id, name, year)`, `Courses(id, title, ta)`, and `Enrolls(student, course, credits)`. A tuple $(i, n, y) \in$ `Students` denotes a student with student-identifier i, name n, and year y. A tuple $(i, t, a) \in$ `Courses` denotes a course with course-identifier i, title t, and whose teaching assistant's student-identifier is a. A tuple $(s, c, r) \in$ `Enrolls` denotes the enrollment of the student with identifier s in the class with identifier c, for r credits.

1. List the members of your group below. Underline your name.

2. Provide the smallest possible instance of the `Students` relation that *violates* the functional dependency `id`→`name`, `year`.

3. Provide the smallest possible instance of the `Courses` relation that *violates* both the functional dependencies `id`→`title` and `ta`, `title`→`id`.

4. Provide simple English descriptions of the dependencies in Questions 2 and 3.

5. List *all* superkeys and *all* keys of `Courses`, given the dependencies in Question 3.

6. Compute $\{\texttt{title}\}^+$ and $\{\texttt{id}, \texttt{ta}\}^+$ given the dependencies of Question 3.

7. Consider $R(A, B, C, D, E)$ with dependencies

$$\begin{array}{rcl} AB & \rightarrow & C \\ BC & \rightarrow & A \\ D & \rightarrow & E \\ CE & \rightarrow & B \end{array}$$

List all keys of R

8. Project the dependencies of Question 7 onto the relation $R'(A, B, C)$.

9. Decompose R as necessary to generate a BCNF schema.