Recitation 1

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1 Problem 1

Consider the following schema:

- Person(**id**,name,address)
- Student(**id**)
- Teacher(**id**, office)
- Course(**cid**, name, teacherId)
- Takes(**id**, **cid**, grade)
- Requires(**cid**, requiredCid)

Where primary keys are in bold and id in Student and Teacher are foreign keys of Person, id in Takes is a foreign key of Student, teacherId in Course is a foreign key of Teacher, cid in Takes and Requires is a foreign key of Course, and finally requiredCid is a foreign key of Course.

Answer at least 2 of the following queries in relational algebra:

- a. Names of all the students
- b. Name of the teacher teaching the course with id DD1368
- c. Names of the students taking the course with id DD1368

1.1 Solution

a. Names of all the students:

$$\Pi_{name}(Student \bowtie_{Student.id=Person.id} Person)$$

We use *Theta join* to join the table Student and Person, condition is the Student id and Person's id are same, which means the person is a stundet, then use *Projection* to list the name.

b. Name of the teacher teaching the course with id DD1368

$$\Pi_{name}(Person \bowtie_{Teacher.id=Person.id} (Teacher \bowtie_{Teacher.id=Course.teacherId} (\sigma_{cid=DD1368}(Course)))$$

c. Names of the students taking the course with id DD1368

2 Problem 2

Answer at least 2 of the following in relational algebra

- a. Names of students that have never scored an E in any course
- b. Names of teachers who teach more than 1 course
- c. Highest grade achieved in DD2471 (Note that '¿' can compare grades (e.g. A ¿ D) and that it is possible that no one got an A in the course.)

2.1 Solution

a. Names of students that have never scored an E in any course:

$$\Pi_{name}(Person \bowtie_{student.id=Person.id} (Student \bowtie_{Takes.id=Studet.id} (\sigma_{Takes.grade!=E}(Takes))))$$

b. Names of teachers who teach more than 1 course

$$\Pi_{name}(Person \bowtie_{Teacher.id=Person.id} (Teacher \bowtie_{Course.TeacherId=Teacher.id})(\sigma_{Course.cid!=Course.cid \wedge Course.TeacherId=Course.TeacherId}(Course)))$$

3 Problem 3

Answer at least 3 of 1a,1b,2a,2b,2c in tuple calculus.

3.1 Solution

1a
$\{t.name | Student(t)\}$