Bissenova Anara / 20BD / Lab1

Task 1. Consider the employee database of figure below. Give an expression in the relational algebra to express each of the following queries:

Employee (id, person_name, street, city)
Works (id, person_name, company_name, salary)
Company (company_name, city)

- Find the ID and name of each employee who works for “BigBank”.

$$\Pi_{id,person\_name}(\delta_{company\_name=\text{"BigBank"}}(Works))$$

- Find the ID, name, and city of residence of each employee who works for “BigBank”.

$$\Pi_{employee.id,employee.person\_name,city}(\delta_{employee.id=works.id \wedge company\_name=\text{"BigBank"}}(Employee\ X\ Works))$$

- Find the ID, name, street address, and city of residence of each employee who works for “BigBank” and earns more than $10000.

$$\Pi_{employee.id,employee.person\_name,street,city}\ (\delta_{employee.id=works.id \wedge company\_name=\text{"BigBank"} \wedge\ salary>10000}\ (Employee\ X\ Works))$$

- Find the ID and name of each employee in this database, who lives in the same city as the company for which she or he works.

$$\Pi_{employee.id,employee.person\_name}(\delta_{works.company\_name=company.company\_name \wedge employee.city=company.city \wedge employee.id=works.id}\begin{pmatrix}(Employee\ X\ Works)\\ X\ Company\end{pmatrix})$$

Task 2. Consider the employee database of figure above. Give an expression in the relational algebra to express each of the following queries:

- Find the ID and name of each employee who does not work for “ BigBank”.

$$\Pi_{id,person\_name}(\delta_{company\_name\neq\text{"BigBank"}}(Works))$$

- Find the ID and name of each employee who earns at least as much as every employee in the database.

$$\Pi_{id,person\_name}(\delta_{salary \geq \mathcal{G}_{avg(salary)}(Works)}(Works))$$

Task 3. Consider the foreign-key constraint from the dept_name attribute of instructor to the department relation. Give examples of inserts and deletes to these relations that can cause a violation of the foreign-key constraint.

1) A foreign key constraint states that on any database instance, the value of A (foreign key) for each tuple of relation R1 must also be the value of B (primary key) for each tuple in relation R2. That is why in case of inserting the new tuple only in instructor table with new dept_name which is not mentioned in department table, leads the destruction of connection (reference) between tables. For example, INSERT (223, 'AAA, 'Z, '10000), while the company table consists of departments with names starting with 'B' letter. It would not make sense for a tuple in instructor to have a value for dept_name that does not correspond to a department in the department relation. However, it is essential for department relation. In this case, new tuple in instructor does not have the same value in department table, while the attribute is the foreign key that is why it causes the violation.

2) In case of deleting the tuple from the department table, where at least one tuple has the deleted dept_name, it cases the violation, because, similarly for previous explanation, in any database instance, given any tuple from the instructor relation, there must be some tuple in the department relation such that the value of the dept_name attribute in IR is the same as the value of the primary key, dept_name, of DR.

Task 4. Consider the employee database of figure above. What are the appropriate primary keys?

- For employee table, primary key is id.
- For works table, primary key is id.
- For company table, primary key is company_name