Laboratory work 2

Please write your answers to the pdf file for defense:

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

employee (*person_name*, *street*, *city*)
works (*person_name*, *company_name*, *salary*)
company (*company_name*, *city*)

Figure

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

$\Pi_{person\_ID,\ person\_name}(\sigma_{company\_name=\text{“BigBank”}}(works))$

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

$\Pi_{person\_ID,\ person\_name,\ city}(\sigma_{company\_name=\text{“BigBank”}}(works \bowtie employee))$

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

$\Pi_{person\_ID,\ person\_name,\ street,\ city}(\sigma_{company\_name=\text{“BigBank”} \wedge salary > 10000}(works \bowtie employee))$

- 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.

$\Pi_{person\_ID,\ person\_name}(employee \bowtie works \bowtie company)$

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".

  $\Pi_{person\_ID,\ person\_name}(\sigma_{company\_name \neq \text{"BigBank"}}(works))$

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

  $\Pi_{person\_ID,\ person\_name}(works) - (\Pi_{works.person\_name}(works \bowtie_{(works.salary \leq works2.salary \wedge works2.company\_name = \text{"BigBank"})} \rho_{works2}(works)))$

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.

   instructor(name, dept name, salary)
   department(dept_name, city, street)

   If we insert:
   (Pythagoras, Philosophy, 30000) into the instructor table, where the department Philosophy does not exists in the department table, we can cause the violation of the foreignkey constraint.

   If we delete :
   (Physics, London, Baker Street) from the department table, where at least one instructoror student tuple has dept_name Physics, we can cause the violation of the foreign-key constraint.

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

   employee (<u>person name</u>, street, city)
   works (<u>person name</u>, company name, salary)
   company (<u>company name</u>, city)