1. Consider the employee database of figure below. Give an expression inthe 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)

Figure

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

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

- Find the ID, name, and city of residence of each employee who worksfor “BigBank”.
- $\Pi_{ID,\ person\_name,city}(\sigma_{company\_name=\text{"BigBank"}}(employee * works))$

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

$$\Pi_{ID,\ person\_name,street,city}(\sigma_{company\_name=\text{"BigBank"}\wedge salary > 10000}(employee * works))$$

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

$$\Pi_{ID,\ person\_name,}(\sigma_{employee.city=company.city}(employee * company))$$

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

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

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

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

$$minimal \leftarrow \Pi_{ID,\ person_{name}}(\sigma_{works.salary \leq someworks.salary}(works * \rho_{someworks}(works)))$$

$$\Pi_{ID,\ person_{name}}(works) - minimal$$

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

employee (<u>ID</u>, person_name, street, city)
works (<u>ID</u>, person_name, company_name, salary)
company (<u>company_name</u>, city)