

# Lab 1(Databases) Mukhit Nassyrov

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

1.

- $\Pi_{ID, person\_name} (\sigma_{company\_name = "BigBank"}(works))$
- $\Pi_{ID, person\_name, city} (\sigma_{company\_name = "BigBank"}(works \bowtie employee))$
- $\Pi_{ID, person\_name, street, city} (\sigma_{company\_name = "BigBank" \wedge salary > 10,000}(works \bowtie employee))$
- $\Pi_{ID, person\_name} (works \bowtie employee \bowtie company)$

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

2.

- $\Pi_{ID, person\_name} (\sigma_{company\_name \neq "BigBank"}(employee \bowtie works))$
- $E1 = \Pi_{ID, person\_name, salary}(works), E2 = \Pi_{ID, person\_name, salary}(works).$   
 $\Pi_{ID, person\_name} (works - (E1 \bowtie_{salary < salary} E2))$

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.

3.

If we try to insert tuple to instructor relation that has value of attribute dept\_name that does not exist in department relation or delete some dept\_name from department relation, it can cause a violation.

For example, assume that department relation has values Physics, Math, Music of attribute dept\_name and we try to insert some row with key Healthcare of attribute dept\_name. If we delete Math from department relation and if some row has key Math of dept\_name.

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

4.

I think {ID} would be very appropriate, also {ID, person\_name} would be good.