**1**

1Find the names of all employees who work for “Walmart”.

$\Pi_{\text{person\_name}}(\text{employee} \bowtie_{\text{employee.id = works.id}}(\sigma_{\text{company\_name=“Walmart”}}(\text{works})))$

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

$\Pi_{\text{person\_name, id, city}}(\text{employee} \bowtie_{\text{employee\_id = works.id}}(\sigma_{\text{company name = “Walmart”}}(\text{works})))$

3 Find the ID, name, street address, and city of residence of each employee who works for “Walmart” and earns more than $2000.

$\Pi_{\text{person\_name, id, street, city}}(\sigma_{\text{company name = “Walmart”}}(\text{works}) \wedge_{\text{salary >2000}}(\text{works} \bowtie_{\text{employee.id = works.id.employee}}))$

4 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.

$\Pi_{\text{person\_name, id}}(\sigma_{\text{employee.city=companu.city}}(\text{employee} \bowtie_{\text{employee\_id = works.id}} (\text{works} \bowtie_{\text{works.company name = company.company name}} \text{company}))$

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

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

$\Pi_{\text{person\_name}}(\text{employee} \bowtie_{\text{employee.id = works.id}}(\sigma_{\text{company\_name} \neq \text{“Walmart”}}(\text{works})))$

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

$\Pi_{\text{person\_name, street, city}}(\sigma_{\text{company name = “Walmart”}}(\text{works}) \wedge_{\text{salary >1000}}(\text{works} \bowtie_{\text{employee.id = works.id.employee}}))$

**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.

Inserting a tuple:

(10111, Ostrom, Economics, 110,000)

into the instructor table, where the department table does not have the department Economics, would violate the foreign key constraint.

• Deleting the tuple:

(Biology, Watson, 90000)

from the department table, where at least one student or instructor tuple has dept name as Biology, would violate the foreign key constraint.

employee (person name, street, city)

works (person name, company name, salary)

company (company name, city)

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

Primary key is an attribute in a table which can uniquely identify that table. In employee table the **person_name**, in works table **person_name** and in company table **company_name** are the primary keys.