

Nepal College Of Information Technology

DBMS

Assignment-2 Solution

1. Consider the relational database of Figure below, where the primary keys are underlined.

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)

manages (person-name, manager-name)

a. Find the names of all employees who work for First Bank Corporation.

Ans: $\Pi_{person-name} (\sigma_{company-name = \text{"First Bank Corporation"}} (works))$

b. Find the names and cities of residence of all employees who work for First Bank Corporation.

Ans: $\Pi_{person-name, city} (\sigma_{company-name = \text{"First Bank Corporation"}} (employee \bowtie works))$

c. Find the names, street address, and cities of residence of all employees who work for First Bank Corporation and earn more than \$10,000 per annum.

Ans: $\Pi_{person-name, street, city} (\sigma_{(company-name = \text{"First Bank Corporation"} \wedge salary > 10000)} works \bowtie employee)$

d. Find the names of all employees in this database who live in the same city as the company for which they work.

Ans: $\Pi_{person-name} (employee \bowtie works \bowtie company)$

e. Modify the database so that Jones now lives in Newtown.

Ans: $employee \leftarrow \Pi_{person-name, street, \text{"Newtown"}} (\sigma_{person-name = \text{"Jones"}} (employee)) \cup (employee - \sigma_{person-name = \text{"Jones"}} (employee))$

f. Give all employees of First Bank Corporation a 10 percent salary raise.

Ans: $works \leftarrow \Pi_{person-name, company-name, 1.1 * salary} (\sigma_{(company-name = \text{"First Bank Corporation"})} (works)) \cup (works - \sigma_{company-name = \text{"First Bank Corporation"}} (works))$

g. Delete all tuples in the *works* relation for employees of Small Bank Corporation.

Ans: $works \leftarrow works - \sigma_{company_name = \text{"Small Bank Corporation"}} (works)$

i. Find the names of all employees in this database who do not work for First Bank Corporation.

Ans: $\Pi_{person-name} (\sigma_{company-name \neq \text{"First Bank Corporation"}} (works))$

j. Find the company with the most employees.

Ans: $t1 \leftarrow company_name Gcount_distinct person_name (works)$
 $t2 \leftarrow \max_{num_employees} (p_{company_strength}(company_name, num_employees)(t1))$
 $\Pi_{company_name} (pt3(company_name, num_employees)(t1) \bowtie pt4(num_employees)(t2))$

2. Consider the following relations:

Doctor (SSN, FirstName, LastName, Specialty, YearsOfExperience, PhoneNum)

Patient (SSN, FirstName, LastName, Address, DOB, PrimaryDoctor_SSN)

Medicine (TradeName, UnitPrice, GenericFlag)

Prescription (Id, Date, Doctor_SSN, Patient_SSN)

Prescription_Medicine (Prescription Id, TradeName, NumOfUnits)

Write the relational algebra expressions for the following queries.

- a. List the trade name of generic medicine with unit price less than \$50.

Ans: $\Pi_{\text{TradeName}}(\sigma_{\text{genericFlag}=\text{True} \wedge \text{UnitPrice} < 50}(\text{Medicine}))$

- b. List the first and last name of patients whose primary doctor named 'John Smith'.

$R1 \leftarrow \Pi_{\text{SSN}}(\sigma_{\text{FirstName}='John' \text{ and } \text{LastName}='Smith'}(\text{Doctor}))$

$\text{Result} \leftarrow \Pi_{\text{FirstName}, \text{LastName}}(R1 \bowtie_{\text{SSN}=\text{PrimaryDoctor_SSN}}(\text{Patient}))$

- c. List the first and last name of doctors who are not primary doctors to any patient.

$R1 \leftarrow \Pi_{\text{SSN}}(\text{Doctor}) - \Pi_{\text{SSN}} \leftarrow \Pi_{\text{PrimaryDoctor_SSN}}(\text{Patient})$

$\text{Result} \leftarrow \Pi_{\text{FirstName}, \text{LastName}}(R1 \bowtie \text{Doctor})$

- d. For medicines written in more than 20 prescriptions, report the trade name and the total number of units prescribed.

Ans: $R1 \leftarrow G_{\text{TradeName}, \text{CNT}} \leftarrow \text{count}(\text{Prescription_Id}), \text{SUM} \leftarrow \text{sum}(\text{NumOfUnits})$
 $(\text{Prescription_Medicine})) \text{Result} \leftarrow \Pi_{\text{TradeName}, \text{SUM}}(\sigma_{\text{CNT} > 20}(R1))$

- e. List the SSN of distinct patients who have 'Aspirin' prescribed to them by doctor named 'John Smith'.

$R1 \leftarrow \Pi_{\text{ID}}(\sigma_{\text{FirstName}='John' \text{ AND } \text{LastName}='Smith'}(\text{Doctor}) \bowtie_{\text{SSN}=\text{Doctor_SSN}} \text{Prescription})$

$R2 \leftarrow \Pi_{\text{ID} \leftarrow \text{Prescription_id}}(\sigma_{\text{TradeName}='Aspirin'}(\text{Prescription_Medicine})) \cap R1$

$\text{Result} \leftarrow \delta(\Pi_{\text{Patient_SSN}}(R2 \bowtie \text{Prescription}))$

- f. List the first and last name of patients who have no prescriptions written by doctors other than their primary doctors.

$R1 \leftarrow \Pi_{\text{SSN}}(\text{Patient} \bowtie_{\text{SSN}=\text{Patient_SSN} \text{ AND } \text{Doctor_SSN} \neq \text{PrimaryDoctor_SSN}} \text{Prescription})$

$R2 \leftarrow \Pi_{\text{SSN}}(\text{Patient}) - R1$

$\text{Result} \leftarrow \Pi_{\text{FirstName}, \text{LastName}}(R2 \bowtie \text{Patient})$