Pradip Dhungana - 201751 BESE(DAY)
Assignment - 2

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 (comany-name, city)
manages (person-name, manager-name)

a) Find the names of all employees who work for first Bank corporation.

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

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

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

c) Find the names, street address, and cities of residence of all employees who work for first Bank corporation & earn more than $10,000 per annum.

$\Rightarrow \Pi_{\text{person-name, street, city}}(\sigma_{\text{company-name} = \text{"First Bank Corporation"} \wedge \text{salary} > 10,000}(\text{Work} \bowtie \text{Employee}))$

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

⇒ $\Pi_{person\text{-}name}(\sigma_{city = city}(employee \bowtie works \bowtie company))$

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

⇒ $Employee \leftarrow \Pi_{person\text{-}name, street, city = "Newtown"}(\sigma_{person\text{-}name = "Jones"}(Employee)) \cup (Employee - \sigma_{person\text{-}name = "Jones"}(Employee))$

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

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

g) Delete all tuples in the works relation for employees of small Bank Corporation.

⇒ $Works \leftarrow works - \sigma_{company\text{-}name = "small\ Bank\ Corporation"}(works)$

h) Find the names of all employees in this data-base who do not work for First Bank Corporation.

⇒ $\Pi_{person\text{-}name}(\sigma_{company\text{-}name <> First\ Bank\ Corporation}(works))$

i) Find the company with the most employees

⇒ $\Pi_{company\text{-}name}(Company \bowtie (\sigma_{company\text{-}count}(\Pi_{company\text{-}name, count(person\text{-}name)}(works \bowtie employee))))$

2) Consider the following relations:

- Doctor (SSN, firstName, lastName, specialty, Years of Experience, 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.

⇒ $\Pi_{\text{trade-name}}(\sigma_{\text{GenericFlag}=1 \wedge \text{UnitPrice} < 50}(\text{Medicine}))$

b) list the first & last name of patients whose primary doctor named 'John Smith'

⇒ $\Pi_{\text{firstName, lastName}}(\text{Patient} \bowtie (\Pi_{\text{SSN}}(\text{Doctor} \bowtie (\sigma_{\text{firstName}=\text{'John'} \wedge \text{lastName}=\text{'Smith'}}(\text{Doctor})))))$

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

⇒ $\Pi_{\text{first-name, lastName}}((\text{Doctor} - \Pi_{\text{primaryDoctor\_SSN}}(\text{Patient})) \bowtie \text{Doctor})$

d) For medicines written in more than 20 prescriptions, report the trade name and the total number of units prescr

⇒ $\Pi_{\text{TradeName, NumberOfUnits}}(\text{Prescription} \bowtie \text{Medicine} \bowtie (\Pi_{\text{TradeName}}(\text{Prescription}) \bowtie (\sigma_{\text{count}(\text{Prescription-Id})>20}(\text{Prescription-Medicine}))))$

e) List the SSN of patients of who have 'Aspirin' & 'Vitamin' trade names in one prescription.

⇒ $\Pi_{\text{patient\_ssn}}((\sigma_{\text{TradeName}=\text{'aspirin'}}(\text{Prescription-Medicine})) \bowtie \sigma_{(\text{TradeName}=\text{'vitamin'})}(\text{Prescription-Medicine}))$

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

⇒ $\Pi_{\text{patient-ssn}}((\sigma_{\text{TradeName}=\text{"Aspirin"}}(\text{Prescription-Medicine})) \bowtie (\Pi_{\text{ssn}}(\text{Doctor} \bowtie (\text{FirstName}=\text{"John"} \wedge \text{LastName}=\text{"Smith"})(\text{Doctor}))))$

g) List the first & last name of patients who have no prescriptions written by doctors other than their primary doctors.

⇒ $\Pi_{\text{FirstName, LastName}}((\text{Patient}.(\Pi_{\text{PatientSSN}})(\sigma_{\text{Doctor-ssn}<>\text{PrimaryDoctor-ssn}}(\text{Prescription}) \bowtie \text{Patient}))$