Database Systems I
CS3431
C-2013

Solution of Homework 2

Problem 1 (Map ERD to Relational Model) [30 Points]

Publisher (Name, address, phone, startYear)
Author (ID, DoB, name, address)
AuthorPhone(AuthorID, Phone)
Foreign key AuthorPhone.AuthorID references Author.ID

Book (ISBN, title, type, numPages, PublishDate, PublisherName)
Novel (ISBN,sequel)
Textbook (ISBN,edition)
Foreign key Book.PublisherName references Publisher.Name
Foreign key Novel.ISBN references Book.ISBN
Foreign key Textbook.ISBN references Book.ISBN

BookAuthor (ISBN, AuthorID)
Foreign key BookAuthor.ISBN references Book.ISBN
Foreign key BookAuthor.AuthorID references Author.ID

Contract (ContractID, TotalPayment, Date, NumBooks, PublisherName, AuthorID)
Foreign key Contract.PublisherName references Publisher.Name
Foreign key Contract.AuthorID references Author.ID

ContractLines (ContractID, LineNum, BookType, DueDate, PartialPayment)
Foreign key ContractLines.ContractID references Contract.ContractID

Problem 2 (Relational Algebra) [30 Points (5 Points each query)]

Q1:

$$\pi_{name}\ (\sigma_{phone=\text{"1-555-444-7777"}}\ (\text{Author} \bowtie_{ID=AuthorID} \text{AuthorPhone}))$$

Q2:

$$\sigma_{ISBN=\text{"1112223333444"}}(\text{Book})$$

Q3:

R1 $\leftarrow$ $\sigma_{date>=Jan-01-2007\ and\ date<=Dec-31-2008\ and\ TotalPayment>100{,}000}$(Contract)

R2 $\leftarrow$ (R1 $\bowtie_{AuthorID=Author.ID}$ Author) $\bowtie_{PublsiherName=Publisher.Name}$ Publisher

Result $\leftarrow$ $\pi_{author.name,\ author.address,\ publisher.name,\ publisher.address,\ date}$ (R2)

Q4:

$$\pi_{publisherName}(\sigma_{cnt>10}\ (\gamma_{publisherName,\ cnt<-count(ISBN)}(Book)))$$

Q5:

$$\pi_{numPages}(\sigma_{title="TheCountry"}(Book)\ \bowtie\ \sigma_{edition=3}(TextBook))$$

Q6:

$$R1 \leftarrow \gamma_{ContractID,sumPartial<-sum(PartialPayment)}(\text{ContractLines})$$

$$\pi_{R1.ContractID}(\sigma_{TotalPayment<>sumPartial}\ (R1 \bowtie \text{Contract}))$$

Problem 3 (Relational Algebra) [15 Points (5 Points each)]

1. R ⋈ S

   Min = 0 Max = nm

2. σ_p(R) × S, for some predicate ***p*** and assume ⌀ × S = ⌀, where ⌀ is an empty relation.

   Min = 0 Max = nm

3. π_l(R) – S, for some list of attributes ***l,*** and assume that the difference operation is valid.

   Min = 0 Max = n