Written Assignment #3
CAS CS 460/660: Introduction to Database Systems
Spring 2015

Due Date and Time: Thursday, March 19, 2015, in class

Problem 1. [25 pts]
Consider the following schema:

Suppliers(sid:int, sname:string, address:string)
Parts(pid:int, pname:string, color:string)
Catalog(sid:int, pid:int, cost:real)

The Catalog relation lists the prices charged for parts by Suppliers. Write the following queries in **relational algebra**:

1. Find the *sids* of suppliers who supply a red part and a green part.
2. Find the *snames* of suppliers who supply every part.
3. Find the *snames* of suppliers who supply every green part.
4. Find the *pnames* of parts supplied by Acme Widget Suppliers and by no one else.
5. For each part, find the *sname* of the supplier who charges the most for that part.

Problem 2. [25 pts]
Consider the following relational database that stores information about the performance of credit card companies:

Issuer(bank, card)
Bank_location(bank, location)
Max_limits(card, max_limit)

An instance of the database is the following:

Issuer	
Bank	**Card**
American	Amex
Fist Federal	Visa
Fist Federal	MasterCard
Citizens	Visa
Citizens	MasterCard
Citizens	Discovery
Fleet	Visa

Bank_location	
Bank	**Location**
American	Chicago
Fist Federal	LA
Chase	NY
Citizens	Boston
Fleet	Boston

Max_limits	
Card	**Max_limit**
Visa	$50,000
MasterCard	$100,000
Discovery	$100,000
Amex	$500,000

Write the following queries in **Relational Algebra**:

1. Which credit cards are issued by banks in Boston?
2. Which credit cards *are not* issued in NY?
3. Which banks issue credit cards with a limit less than $100,000?
4. Which banks issue only one credit card?

5. Which banks issue MasterCard and Visa but *no* other cards?

Problem 3. [25 pts]
Consider the following relational schema. An employee can work in more than one department; the *pct* time field of the Works relation shows the percentage of time that a given employee works in a given department.

Emp(eid: integer, ename: string, age: integer, salary: real)
Works(eid: integer, did: integer, pct time: integer)
Dept(did: integer, dname: string, budget: real, managerid: integer)

Write the following queries in SQL:

1. Print the names and ages of each employee who works in both the Hardware and the Software departments.
2. Print the name of each employee whose salary exceeds the budget of all of the departments that he or she works in.
3. Find the enames of managers who manage the departments with the largest budgets.
4. If a manager manages more than one department, he or she controls the sum of all the budgets for those departments. Find the managerids of managers who control more than $5 million.
5. Find the managerids of managers who control the largest amounts.

Problem 4. [25 pts]
Consider the following database for the music store "Championship Vinyl":

Albums(album_id, title, year, label_id, artist_id, price)
Songs(song_id, album_id, title, duration)
Artists(artist_id, name, dob)
Labels(label_id, name, year, country)
Sales(album_id, date, copies)

The Albums relation stores information about albums and the Songs relation about songs. The Artists relation stores data about artists and the Sales relation stores how many copies of a particular album was sold each day (only for the albums that were sold that day). The underlined attributes are the keys of each relation.

Write the following queries in SQL:

1. Find the name of the artists that released an album in 2014 using a label company from the UK.
2. Find the name of the artists that have created more than 100 songs.
3. List the name of artists that have released more than two albums with at least 13 songs in each one of them.
4. Find the artists who have produced albums with all the label companies in the US.
5. Find the artist(s) who has produced the albums with the maximum average profit.