CS 348 - Homework 2

Relational Algebra (RA), Tuple Relational Calculus (TRC), and
Domain Relational Calculus (DRC)
(100 Points)

Fall 2019

Due on: Friday 09/27/19 11:59pm

Note: There will be a 10% penalty for each late calendar day. After five calendar days, the homework will not be accepted.

1. (40 points) Consider the following schema with the details about a theater complex.

   MOVIES(***mid***: `int`, *mname:* `string`, *screenedfrom:* `date`, *screenedtill:* `date`)
   SCREENS(***sid***: `int`, *theatername:* `string`, *stype:* `string`, *ssize:* `int`)
   PROJECTIONISTS(***pid***: `int`, *pname:* `string`, *salary:* `int`)
   TRAINED(***pid***: `int`, ***sid***: `int`)

   Note that every projectionist is trained to operate some specific type of screen (IMAX, 3D, etc.) Write the following queries in RA, TRC, and DRC. They key field are underlined.

   A. (10 points) Find the *pname*s of projectionists who is trained to operate IMAX screen type.

B. (10 points) Identify the *pid*s of projectionists who make the highest income.

C. (20 points) Find the *pname*s of projectionists who are trained to operate screens capable of projecting flim strip size (*ssize*) greater than 35mm but are not trained on IMAX screen type.

2. (20 points) Write tuple calculus and domain calculus expressions for the following RA operations.

   A. (10 points) `SELECT P=r (R(P, Q, R))`:

   B. (10 points) `PROJECT <P, Q> (R(P, Q, R))`:

3. (40 points) Consider the follwing schema of car dealerships:

   DEALERS(***did***: `int`, *dname:* `string`, *dcity:* `string`)
   CARS(***cid***: `int`, *ctype:* `string`, *cmaker:* `string`)
   CATALOG(***did***: `int`, ***cid***: `int`, *cprice*: `float`)

   The key data fields are underlined. Cost of the cars set by the dealers are given in the catelog field.

   A. (10 points) What does the following query compute:

$$\pi_{dname}(\pi_{did}((\sigma_{cmaker='Ford' and\ ctype='sedan'}CARS) \bowtie (\sigma_{cprice<24000}CATALOG)) \bowtie DEALERS)$$

B. (10 points) What does the following query compute:

$$\pi_{dname}(\pi_{did}((\sigma_{cmaker='Ford' and\ ctype='sedan'}CARS) \bowtie (\sigma_{cprice<24000}CATALOG) \bowtie DEALERS))$$

C. (20 points) Write RA, TRC, and DRC for the query: Find the *cid*s of cars sold by at least two different dealers.