CS354: Problem Set 2

Deadline: 15th September 2020   **Submission Filename: CS354_ps2.pdf**

1. Consider the following database schema.
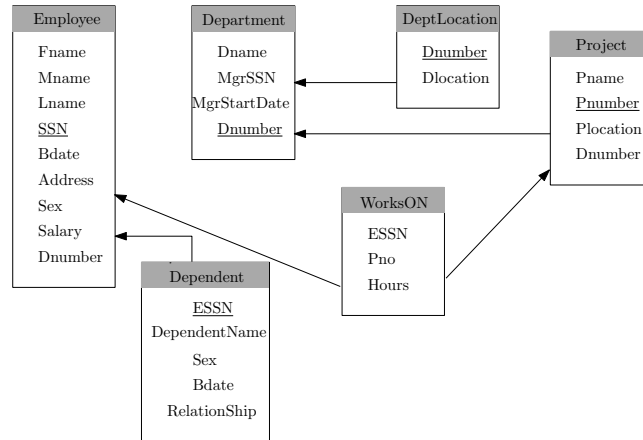
Employee($FName, Mname, Lname, SSN, Bdate, Address, Sex, Salary, Dnumber$) *Dnumber* is FK of Department
Department($Dname, Dnumber, MgrSSN, MgrStartDate$) *MgrSSN* is a FK of Employee
DeptLocations($Dnumber, Dlocation$) *Dnumber* is a FK of Department
Project($Pname, Pnumber, Plocation, Dnumber$) *Dnumber* is a FK of Department
worksON($ESSN, Pno, Hours$) *ESSN* FK of Employee
Dependent($ESSN, DependentName, Sex, Bdate, Relationship$) *ESSN* FK of Employee

For each of the following queries, write the corresponding RA (Relational Algebra), Tuple Relational Calculus (TRC) and Domain Relational Calculus (DRC) expressions.

   (a) List the name and address of all employees who work for the 'Research' department

   (b) For every project located in 'Delhi', list the project number, the controlling department number, and the department manager's last name, birthdate, and address.

   (c) List of the names of employees who have no dependents

   (d) List the name of manager who have one dependent

2. Given below is a small DB schema covering student enrollments in university courses, with primary keys underlined and foreign keys listed to the right.

   Student($\underline{Id}, Name, Major$), Major is a FK to Dept in Course
   Course($\underline{Dept, Num}, Title$), Dept is a FK to Abbrev in Dept;
   Dept($\underline{Abbrev}, Name, Office$);
   Enroll($\underline{SID, Dept, Num}, Date$), SID is a FK to ID in Student, Dept-Num is a FK to Dept-Num in Course;

   (a) Using this schema express the queries given below in RA and TRC form

      i. What are the IDs of the MATH students taking "Discrete Structures"?
      ii. On which dates, did students enroll in "Database Design"?

   (b) Using this schema express the queries given below in RA and DRC form

      i. What are the titles of the courses being taken by majors in the "Education" department?
      ii. To which office, should we go to ask about "MATH243"?