**INFSCI 2710 Database Management, Fall 2018**

**Homework 1: Relational Algebra, SQL SOLUTION**

**100 pts**

Consider the following schema:

city (id, city, state, country)

planes (plane-number, model, capacity, create-year)

pilot (ssn, *home-city,* fullname, day-of-birth, month-of-birth, year-of-birth, salary)

flight (flight-number, *captain-ssn,* *plane-number, takeoff-city, landing-city*, time-takeoff, time-landing)

Underlines attributes are the primary keys; attributes in italic style are foreign keys.

**Hint**: In relational algebra question joining tables without attributes of same name, you must specify matching condition explicitly, e.g.:

**Q1 [20 pt]** Write SQL DDL statements to create the above tables. Make sure that you capture the primary and foreign key constraints (if applicable), choose appropriate domain (data) type and constraints for each attribute.

**Q2 [10 pt]** Specify a relational algebra expression and an SQL query to find all cities in Germany.

**Q3 [10 pt]** Specify a relational algebra and a SQL expression to find all pilots who **live** in Germany.

**Q4 [10 pt]** Specify a relational algebra and an SQL expression to find all pilots who **fly to or**

**from** Germany.

**Q5 [10 pt]** Specify a relational algebra expression and an SQL query to find plane models that serve (fly to and from) only US cities.

**Q6 [15 pt]** Specify a relational algebra expression and an SQL query to find plane models that serve both US and international cities.

**Q7 [10 pt]** Consider the following relational algebra expressions:

1. Select the expression(s) from above that return the name of the pilot and the country where he or she is from.
2. Select expressions from above that are equivalent (e.g. return the same answer).

**Q8 [15 pt]** Consider the following relational algebra expression:

1. How many attributes will the result have?
2. Write in English what question the expression is trying to answer (e.g. describe what would be the result of the expression).
3. Write an equivalent version of the relational algebra expression that is the most efficient. Specify why your expression is more efficient.
4. Translate all expressions into SQL.