Information and Database Management Systems I (CIS 4301)
(Fall 2016)
Instructor: Dr. Markus Schneider
TA: Yang Chen

Homework 2

Name: ____________________________
UFID: ___________________________
Email Address: ______________________

Pledge (Must be signed according to UF Honor Code)

On my honor, I have neither given nor received unauthorized aid in doing this assignment.

_______________________________________________
Signature

For scoring use only:

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Exercise 1 (Knowledge Questions) [25 points]

1. Briefly describe the terms primary key, alternate key, and foreign key. Give one simple example of each kind of key. [5 points]

2. Define Participation and Disjoint constraints, including the two variations of each constraint. [5 points]

3. List the basic operations of the Relational Algebra with their name and their correct symbolic notation [5 points].

4. Describe how to define the Intersection and Division operations using only the five basic operations listed above. [5 points]

5. What are aggregate functions? Give examples of some aggregate functions in SQL [5 points].

Exercise 2 (Relational Algebra) [25 Points]

Assume the following database schema for this exercise:

Employee (personName: string, street: string, city: string)

Work (personName: string, companyName: string, salary: integer)

Company (companyName: string, city: string)

Manage (personName: string, managerName: string)

Give an expression in the relational algebra to express each of the following queries.

1. Find the names of all employees who work for Sunshine Co. [5 points]

2. Find the names of all employees who live in the same city as their managers. [5 points]

3. Assume the company may be located in several cities. Find all companies located in every city in which Sunshine Co. is located. [5 points]

4. Assume a person may work for more than one company. Find the names of all employees who do not work for Sunshine Co. [5 points]

5. Find the names of all employees who earn more than every employee of Sunshine Co. [5 points]
Exercise 3 (Relational Algebra) [25 points]

Consider the following database schema:

**Flights** (flightNumber: string, travelFrom: string, travelTo: string, distance: integer, departs: time)

**Aircraft** (planeId: string, planeName: string, range: integer)

**Pilots** (employeeId: string, planeId: string)

**Employees** (employeeId: string, employeeName: string, salary: integer)

Express the following colloquial queries in Relational Algebra:

1. Find the employee Id’s of pilots who can operate the aircrafts of types "Boeing 747" and "Boeing 777". [3 points]

2. Find the id of the pilot, or pilots, with the highest salary. [3 points]

3. Find the airplane Id's of aircrafts that cannot fly non-stop from ATL to JFK. [3 points]

4. Find the names of pilots who can operate planes with a range greater than or equal to 1,500 miles but cannot operate "Boeing 747" and "Boeing 777" aircrafts. [5 points]

5. Find the flight numbers of flights that can be piloted by every pilot whose salary is under $100,000. [5 points].

6. Find the Id’s of the pilots that fly all aircrafts. [3 points]

7. Find the names of all employees who are not pilots. [3 points]
Exercise 4 (Relational Calculi) [25 points]

Consider the following database schema:

**EMPLOYEE** (emp_name, address_street, address_city, phone_no)

**DEPARTMENT** (dept_name, mgr_name, mgr_start_date)

**WORKS_ON** (emp_name, industry_name, salary)

**INDUSTRY** (industry_name, location_city)

**MANAGES** (emp_name, mgr_name)

Write the Tuple Relational Calculus expression for problems 1 and 2. Write the Domain Relational Calculus expression for problems 3, 4, and 5.

1. List the names of all employees who don’t work for ‘Verizon Wireless’ and make more than $50,000 per year. [5 points]
2. Find the names and phone number of all employees who work for Intel and live in Santa Clara. [5 points]
3. Find the names of all employees who live in the same city and on the same street as their managers. [5 points]
4. Find the names of all employees in this database who live in the same city [5 points]
5. Find all companies located in every city in which Intel is located. [5 points]