CS127 Homework #2

Due: September 26th, 2018 6:00 P.M.

Handing In

Upload your homework to gradescope. Please write your Banner ID on your submission. Do not write your name on the submission.

Grading Information

Grading for the homeworks works as follows:

- The set of warm-up problems will be graded as one of (✓+, ✓, ✓-)
- All other problems will be graded in detail and will be given a score.

Solutions for the warmup problems will be provided along with your graded work.

Warmup #1

Explain the distinction between total and partial constraints

Warmup #2

Consider the following database:

\[
\begin{align*}
\text{employee} &= (\text{person\_name, street, city}) \\
\text{works} &= (\text{person\_name, company\_name, salary}) \\
\text{company} &= (\text{company\_name, city}) \\
\text{manages} &= (\text{person\_name, manager\_name})
\end{align*}
\]

Give expressions in tuple relational calculus for each of the following queries:

1. Find the names and cities of residence of all employees who work for Whole Foods Market.
2. Find the names, cities of residence, and street address of all employees who work for Eastside Marketplace and earn more than $10,000.

Problem 3 (To Be Graded)

Using the relations in Warmup #3, write an expression in tuple relational calculus to find the names of all employees in the database who live in the same city as that in which the company for which they work is located.
Problem 4 (To Be Graded)

In this problem you are going to design a relational database for a farmer. The farmer has the following requirements:

- The farmer has a number of regions, which represent different distribution points. Every region has a unique id, name and address (containing street, city, state and zip code).
- Every region serves a number of buyers. Every buyer has a unique id, first and last name, address (street, city, state and zip code) and account balance. Every buyer belongs to a single region.
- Buyers can make multiple orders. Every order has a unique id, date, status ("Processing", "Paid", "Delivered", etc.).
- Every order contains one or more items, where each item represents something that every region sells. Each item has a unique id, name and price. An order can contain more than one of the same item. At this point you can assume that all regions have the same list of items.

1. Assuming the requirements above construct an E-R diagram and a relational schema for the database.

The farmer decided to change requirements as follows:

- Every region can have different vegetables for sale now. The basic properties of the vegetables remain the same (unique id, name, price), but now every region has its own listing of vegetables and different regions might have different quantities for the same vegetable in stock. Different vegetables from the same order might be fulfilled by different regions.
- For analytical purposes the farmer decides to keep some historical information about every order. Every historical record contains information about the order, the customer, the total cost and the date of the order.

2. Give a brief description of the key changes you have to make to your database schema to accommodate the new requirements. Design a new E-R diagram to reflect your changes.

Note: As always, multiple designs are possible, but you should try to come up with a “better” one in a general sense. For instance, it is a better practice to avoid information duplication in a relation. Thus, putting all information about an order, including all its items, in a single relation is a bad idea.