

## CS430/630 – Midterm

March 22 2018

30 points, 75 minutes, 3 pages

For both questions, you are given the following relational schema.

```
Books(bid:integer, btitle:string, author:string, year:integer, price:integer)
Orders(cid:integer, bid:integer, quantity:integer)
Customers(cid:integer, cname:string, zipcode:string)
```

The meaning of attributes is as follows:

bid: book unique id, btitle: book title, quantity: number of book copies purchased with an order,  
cid: unique customer identifier, cname: customer name, zipcode: customer address zipcode.

### Question 1 (10 points)

Write **relational algebra** expressions for the following queries:

- (a) Find the zipcodes of customers who ordered in a single order at least 10 copies of a book that costs more than \$100.
- (b) Find the names of customers who ordered only books published in or after year 1990 (implies they ordered at least a book).
- (c) Find the names of customers who ordered at least a copy of a book by author 'Edgar Codd', or at least 10 copies of a book called 'Databases'.
- (d) Find the authors of books for which there is a single order placed.
- (e) [630 only] Find the titles of books ordered by those customers who are the only registered customers in their particular zipcode area (i.e., there is no other customer with the same zipcode in the Customers table).

Note: for this question, you are NOT ALLOWED to use SQL, answers in SQL will not receive any marks. Derive relational algebra expressions only.

### Question 2 (20 points)

Write **SQL queries** for the following:

- (a) Write a statement to create the table Orders. You do NOT need to provide create table statements for the other tables. Include necessary key constraints.
- (b) Find the title(s) of the oldest book(s) in the store (i.e., earliest publication year).
- (c) Find the zipcodes of customers who ordered only books with prices higher than \$200 (implies they ordered at least one book).
- (d) Find the names of customers who ordered exactly 5 copies (in a single order) of a book authored by 'Edgar Codd'.
- (e) For each customer who ordered at least 10 distinct book titles (regardless of publication year), find the price of the most expensive book published in 1990 which was ordered by that customer.
- (f) Find the names of customers who ordered at least 3 copies of all books that contain the string 'Databases' in the title (or said differently, "3 copies of every book that contains 'Databases' in title").
- (g) [630 only] Find the zipcode(s) that generated the highest revenue for the store (i.e., the largest combined dollar amount for orders originating in that zipcode).

Note: for this question you are not allowed to use views.

**Q1 Answer:**

**Q2 Answer:**