

## CS430/630 – Midterm

30 points, 75 minutes

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, `author`: name of book author, `year`: book publication year, `price`: unit price per copy;

`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:

- Find the titles of books that were ordered only in quantities of at least 100.
- Find the authors of books that cost at most \$40 and were ordered from zipcode 12345.
- Find the names of customers who ordered some book published in year 2000 and also ordered at least 10 copies of some book that costs more than \$100.
- Find the authors of books for which there are at least two orders placed.
- [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:

- Find the authors of the books that were ordered only from zipcode 02125.
- Find the zipcodes of customers who ordered at least 10 copies (in a single order) of a book written by an author whose name starts with "Cod".
- For each customer who ordered at least 5 distinct books (regardless of publication year), find the price of the most expensive book published in 1990 which was ordered by that customer. In the output, the customer should be listed by name.
- Find the title(s) of the book(s) that were ordered from every zipcode present in the customers table.
- Find the total dollar amount of purchases for every customer in zipcode 02125; list customer name in the output along with the amount.
- [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).