

CS430/630 – Midterm

30 points, 75 minutes, 3 pages

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

Books(bid:integer, bname:string, author:string, year:integer, price:integer)

Orders(cid:integer, bid:integer, quantity:integer)

Customers(cid:integer, cname:string, age:integer, zipcode:string)

The meaning of attributes is as follows:

- bid: unique book identifier,
- bname: book name,
- author: book author,
- year: book publication year,
- price: book price,
- quantity: number of books purchased with an order,
- cid: unique customer identifier,
- cname: customer name,
- age: customer age,
- zipcode: customer address zipcode.

Question 1 (15 points)

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

- (a) Find the ages of customers who bought only books published after year 2000. Consider only customers that bought at least one book.
- (b) Find the names of customers who bought a book by “Edgar Codd”, but also never bought a book more expensive than \$100.
- (c) Find the zipcodes of customers who bought in a single order at least 20 units of a book called “Databases” authored by “Edgar Codd”.
- (d) Find the name(s) and zipcode(s) of the customer(s) who bought the most expensive book sold (note that there may be books that were never sold!).
- (e) [630 only] Find the title(s) of the most expensive book(s) purchased by customer(s) with the lowest age. Note that there may be age and price ties.

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 (15 points)

Write **SQL queries** for the following:

- (a) List zipcodes of customers who bought at least one book for every publication year over the time duration covered by the database. List each zipcode once.
- (b) Find for each customer who spent a total of at least \$10,000 at the store the price of the most expensive book purchased by that customer.
- (c) Find the distinct ages of customers who bought only books that contain “Databases” in the title (assume they purchased at least one book).
- (d) Find the ages(s) of the customers who bought the most expensive book(s) sold (note that some books may have never been sold).
- (e) [630 only] Find the name(s) of the most valuable customer(s), defined as the customers who spent the most amount of money at the store.

Q1 Answer:

Q2 Answer: