

CS 480: DATABASE SYSTEMS

Homework(2)

Due on: September 27, Wednesday in the class

No late submissions accepted

Consider the following database maintained by a car dealer:

- Customer(SSN:integer,name:string,gender:string,city:string)
SSN: Customer's Social Security Number, name: Customer's Name ,
gender: Male or Female, city: Customer's residence city
- BuyVehicle(VID:integer,SSN:integer,price:real,year:integer)
SSN: Customer's Social Security Number, VID: Vehicle's Identification
Number, price: car's sale price, year: year of the sale
- Vehicle(VID:integer,make:string,model:string,year:integer)
make: car's make, model: car's model, year: production year of the
car

Primary Key is underlined in each relation. The customer relation gives the social security number (SSN), name, gender and the city of residence of customers; here name is also a candidate key. The BuyVehicle relation contains information about purchases of vehicles. Each of its tuple contains the VID of the vehicle purchased, the SSN of the customer (i.e., purchaser), the price and the year of the purchase. The Vehicle relation contains information about the vehicles such as the VID, the make, the model and the year of manufacture. (Please note that the field "year" in relation "BuyVehicle" and "Vehicle" has different meaning.)

Write expressions in **Relational Algebra**, to retrieve answers to each of the following queries. Also, write queries in **tuple relational calculus** that retrieve the answers to the first three queries.

1. Find the names of ALL male customers from Chicago.
2. Find the names of ALL customers who bought at least one vehicle with price over 40,000.
3. Find the makes of all vehicles bought by customers from Chicago
4. Find all models made by Ford (i.e. the make is Ford) such that vehicles of these models were bought by at least 2 female customers from Chicago.

5. Find the names of ALL customers who NEVER bought a vehicle.
6. Find all pairs of (s, y) , where s is a social security number and y is a year, such that the customer with social security number s is a male and he bought at least two Ford cars made in the year y .
7. Find the social security numbers of customers who bought at least one car of every make and model (e.g. Ford Mustang; here make is Ford and model is Mustang).