Test 1 - CIS 451/551
2016 November 07, am10:00-10:50

This test is closed book, but you may have one page of notes (both sides). You have 50 minutes and the test is worth 50 points.

1. [20 points] Consider the following relational schema. Primary keys are underlined and foreign keys are in italics (you can see an ER diagram for this on the last page).

   PERSON: ssn, fname, lname, address, phone, bdate
   EMPLOYEE: ssn, job_title, date_hired
   SAILOR: ssn, rating
   BOATMODEL: model#, model_name, manufacturer
   BOAT: reg#, bname, color, model#
   RESERVATION: sailor_ssn, date_reserved_for, boat_reg#, emp_ssn

Provide SQL answering the following queries:
   a) List the boat names and model names of all boats that have no reservations.
   b) Count the number of boats made by each manufacturer. List them by manufacturer name, in decreasing order of the number of boats.
   c) List the first and last name of all customers and the model name and color of the boat they have reserved, for all reservations in November 2016.
   d) List the names of all sailors whose reservation was handled by any of the three most least busy employees (an employee is considered busy or not busy by counting the number of reservations they have handled). You may assume that all employees have different numbers of reservations (no ties not a concern).
   e) [551 only] List the names of all maximal reservers. A sailor is a maximal reserver if the set of boats (s)he has reserved is not a proper subset of any other sailors. (This may be turned in by midnight.)
2. [15 points] Give an ER diagram for a library as described below. Show relevant constraints. Use Chen notation (as in the text) or Crowsfoot notation (as in MySQLWorkbench).

• Each employee has an ssn, fname, lname, and address.
• An employee is classified into one of three categories: managerial, research, and floor. Floor employees are paid by the hour and have an hourly wage rate. The other two categories have a salary. Research workers have a specialty, while managerial workers have a job title.
• Customers are identified by their card number, and also have a fname, lname, and address.
• Each book is identified by its LCN (Library of Congress Number). It has a title, and one or more authors.
• An author has as a key an author code, since (fname, lname) does not suffice. We also keep track of their birth date and date of death.
• Customers may check out books. We keep track of the date it was checked out, as well as the date of return, if it has been returned.
• Each time a book is checked out, we want to track which employee was involved in that transaction. Checking out a book can be handled by floor or research staff, but not managerial staff.
• Each member of the floor staff has exactly one member of the managerial staff as a supervisor.
3. [15 points] Derive a relational schema based on the attached ER diagram. Indicate all foreign keys and NOT NULL constraints.
Crowsfoot ER diagram for the relational model used in question 1.