

CS304 Database System Concepts

Assignment 3

Due: March 6, 2012

(Please submit hard copies to class or to Zheng on due date.)

Name:

Matric No:

Q1. (2 points) Consider a table T(A,B,C) with owner Amy, and the following sequence of statements related to privileges on T. Each statement is numbered and prefaced with the user issuing it.

- 1 - Amy: Grant Select On T To Bob With Grant Option
- 2 - Bob: Grant Select On T To Carol With Grant Option
- 3 - Carol: Grant Select(A,C) On T To David With Grant Option
- 4 - Carol: Grant Select(A,B) On T To Eve With Grant Option
- 5 - Amy: Grant Select On T To Eve
- 6 - Amy: Grant Select(C) On T To Frank
- 7 - David: Grant Select(A,C) On T To Frank With Grant Option
- 8 - Eve: Grant Select(A,C) On T To Frank
- 9 - David: Grant Select(A) On T To Gary
- 10 - Eve: Grant Select(A) On T To Gary
- 11 - Amy: Revoke Select On T From Eve Restrict
- 12 - Carol: Revoke Select(A,C) On T From David Restrict
- 13 - David: Revoke Select(A) On T From Eve
- 14 - Bob: Revoke Select On T From Carol Cascade
- 15 - Amy: Revoke Select On T From Bob Restrict

- (a) Which of the Grant statements, if any, should be disallowed?
- (b) Which of the Revoke statements, if any, should be disallowed?
- (c) After the statements complete execution (excluding any disallowed ones), what privileges does user Frank have on table T?

Q2. (2 points) Consider the following relations:

Student(snum:integer, sname:string, major:string, level:string, age:integer)

Class(cname:string, meets_at:time, room:string, fid:integer)

Enrolled(snum:integer, cname:string)

Faculty(fid:integer, fname:string, deptid:integer)

The meaning of these relations is straightforward; for example, Enrolled has one record per student-class pair such that the student is enrolled in the class.

1. Write the SQL statements required to create these relations, including appropriate versions of all primary and foreign key integrity constraints.

2. Express each of the following integrity constraints in SQL unless it is implied by the primary and foreign key constraint; if so, explain how it is implied. If the constraint cannot be expressed in SQL, say so. For each constraint, state what operations (inserts, deletes, and updates on specific relations) must be monitored to enforce the constraint.

(a) Every class has a minimum enrollment of 5 students and a maximum enrollment of 30 students.

(b) At least one class meets in each room.

(c) Every faculty member must teach at least two courses.

(d) Only faculty in the department with deptid=33 teach more than three courses.

Q3. (2 points) Exercise 5.7 on page 196 of Text book.

Q4. (2 points) Consider the following relations containing airline flight information:

Flights(flno:integer, from:string, to:string, distance:integer, departs:time, arrive:time)

Aircraft(aid:integer, aname:string, cruisingrange:integer)

Certified(eid:integer, aid:integer)

Employees(eid:integer, ename:string, salary:integer)

Note that the Employees relation describes pilots and other kinds of employees as well; every pilot is certified for some aircraft (otherwise, he or she would not qualify as a pilot), and only pilots are certified to fly.

Write the following queries in relational algebra, tuple relational calculus, and domain relational calculus. If some queries cannot be expressible in relational algebra, please informally explain why they cannot be expressed.

- (1) Find the eids of pilots certified for some Boeing aircraft.
- (2) Find the names of pilots certified for some Boeing aircraft.
- (3) Find the eids of employees who make the highest salary.
- (4) Find the eids of employees who make the second highest salary.

Q5. (2 points) Using the E-R model we have learned in the class, design a database for the SJTU PRP system. The entities involved are faculty members, students, projects. Each faculty can supervise at most 4 PRP projects, and each PRP project can have at most 4 students, while each student can only join one PRP project at a time. A PRP project has a title, a description, start time and end time, duration (1 or 2 semester), budget (\$), advisor, and participants. Each participating student has a name, a student ID, an email address and a final score. Each faculty member has a name, an ID and an email address. You can use either binary relations or n-ary relations. First draw the E-R diagrams for your design and then write down the database schemas for your design (for the actual tables).