

CS34800 HW3

QBE and Datalog

Due Sunday March 10, 2019 at 11:59PM on Blackboard.

(There will be a 10% penalty for each late calendar day. After five calendar days, the homework will not be accepted.)

Consider the following relational schema:

Department(deptid, dname, location)

Student(snum, sname, deptid, age)

Faculty(fid, fname, deptid)

Class(cname, deptid, meets_at, room, faculty)

Enrolled(snum, cname, score, grade)

Assume that:

- All students and faculty members must major/work in one department;
 - Faculty teach courses only in the department they belong to;
 - The names of the courses are unique for each department;
 - Scores are numbers in [0,100];
 - Faculty in Table Class is a subset of fid in Table Faculty.
- Write each of the following queries using Query-by-Example (QBE). If you believe any one of the following is not expressible in QBE, informally explain why it cannot be expressed.
 1. (15 pts) Print the names of the department(s) that have more courses than the CS department(deptid=101).
 2. (10 pts) Print the ids and names of the students along with their scores and grades in each course they have enrolled.
 3. (15 pts) Print the names of the faculty members who instruct at least two courses.

4. (10 pts) Print the names of the students who are enrolled in the most number of courses.
 5. (10 pts) Print the student ids with the maximum average score in the courses they have enrolled in.
 6. (5 pts) Delete the departments that do not have any faculty or courses at all.
- Write each of the following queries using Datalog. If you believe any one of the following is not expressible in Datalog, informally explain why it cannot be expressed.
 7. (10 pts) Find the faculty who have instructed at least one course in the CS department but have never instructed any course in the Mathematics department.
 8. (10 pts) Find the names of courses each student gets the lowest score in, i.e., if a student takes 2 courses A and B and scores 50 and 60, respectively, then A is the name of the course in which that student (can be different for different students depending on their score) has scored the lowest.
 9. (15 pts) What are the possible outcomes if a Datalog rule is unsafe? Please illustrate two different scenarios for this case by designing unsafe rules for the relational schema mentioned above, and explain the answers to these rules.