CS348: Introduction to Database Systems

(Winter 2017)

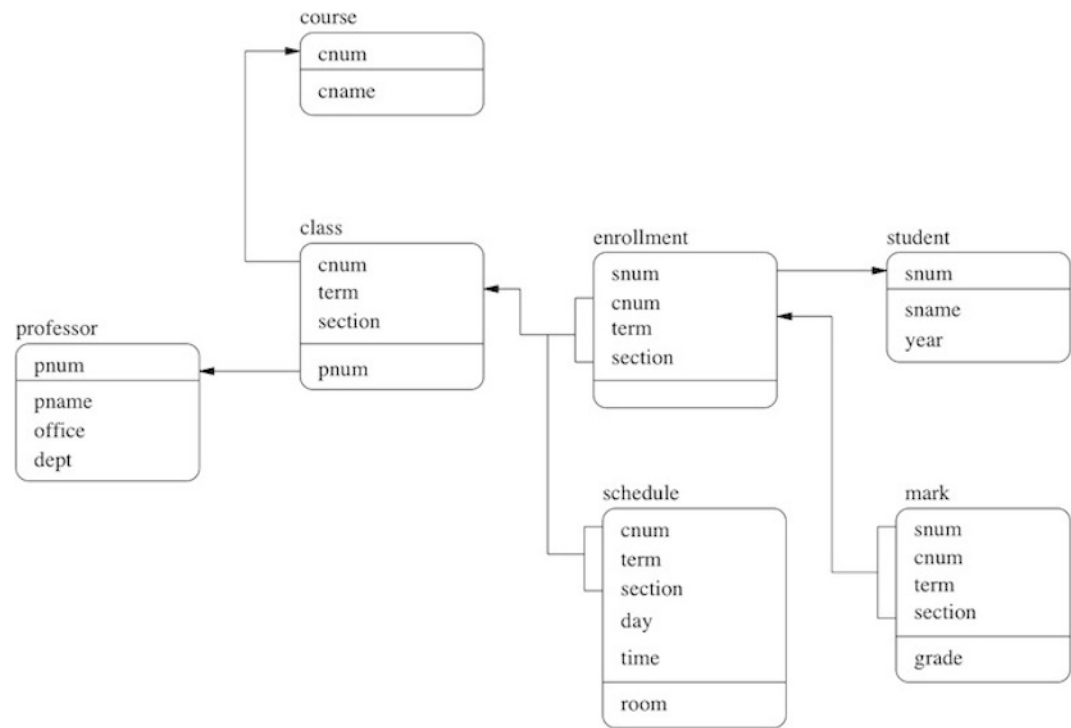## Assignment 1 (due by 12noon on Friday, October 13th)

Overview: For the first question, you must use your Unix accounts and DB2 to compose and evaluate a number of SQL queries for a database that records information about courses. The conceptual view of the database (and also the single external view) is illustrated by the following relational database schema. Note that this includes an indication of primary and foreign key constraints in the manner discussed in class. The SQL commands for defining the base tables for this schema and for inserting sample test data should be downloaded from the course web site. Note that the sample test data should be reviewed to understand more specific formatting assumed for various attributes.

The schema stores information about both ongoing and past classes for a course. In particular, this means two things: (1) *no* marks are recorded for any enrollment of an ongoing class, and (2) for a past class, a mark is recorded for *each* of its enrollments. Again, see the above-mentioned SQL commands for samples of data values, in particular, note how values for attributes `cnum` and `term` are recorded. Finally, you may assume that each class has at least one enrollment and that a department has at least one professor.

Assignment submission: By 12noon on Friday, October 13th, you must have used the `submit` command to submit a file containing SQL queries that implement each of the requests for information given in Question 1. You are also to have submitted written or typed answers to Question 2 through *crowdmark* (pls see the general instructions on the assigmnents web page).

For the submission, put *all* your queries (in numerical order) in one file named "a1.sql". We should be able to run the queries using the command "db2 -f a1.sql". Assume a database connection already exists (i.e., you do not need `connect` or `disconnect` statements in your submitted file). To submit your assignment, use the following: "`submit cs348 a1 .`".

For the written part follow the general *crowdmark* instructions.

course
- cnum
- cname

class
- cnum
- term
- section
- pnum

enrollment
- snum
- cnum
- term
- section

student
- snum
- sname
- year

professor
- pnum
- pname
- office
- dept

schedule
- cnum
- term
- section
- day
- time
- room

mark
- snum
- cnum
- term
- section
- grade

Question 1: Write SQL queries that implement each of the following requirements.

1. The student number and name of each 3rd or 4th year student who has obtained a grade of at least 85 in CS240 and in CS245.

2. The number and name of professors who are not in the pure math (PM) department, and who are teaching CS245 for the first time.

3. The number, name and year of each student who has obtained a grade in CS240 that is within 3 marks of the highest ever grade recorded for that course.

4. The number and name of students who have completed two years, who have a final grade of at least 85 in every computer science course that they have taken, and who have always been taught by a professor in the computer science (CS) department.

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5. A sorted list of all departments who have a professor who is currently teaching a pair of (not necessarily distinct) classes with lectures on Mondays before noon and on Fridays after noon.

6. The ratio of professors in pure math (PM) to professors in applied math (AM) who have taught a class in which the average grade obtained in the class was greater than 77.

7. For each pair of professors who have taught the same course in the same term, their average enrollment counts and average final grades in the course for that term. For each of the two professors, the result should include the number of the professor, the course number, the term, and the required two statistics.

8. For each term, the percentage of enrollments in classes for any course that has never been taught by either a computer science (CS) or combinatorics and optimization (CO) professor. The result should be in chronological order of the term.

9. The minimum and maximum final grade for each class taught in the past on both Mondays and Fridays by a professor in the computer science department. The result should include the number and name of the professor, and the primary key of the class.

10. The percentage of professors in applied math (AM) or pure math (PM) who are neither currently teaching, nor have ever taught in the past, classes for at least two different courses in the same term.

Question 2: Write queries in the relational calculus for each of the above specifications for which this is possible.