

VANCOUVER ISLAND UNIVERSITY
CSCI 370 — MIDTERM EXAMINATION
21 February 2018, 14:30 — 15:50

TO BE ANSWERED IN BOOKLETS

DURATION: 80 Minutes

INSTRUCTOR: H. Liu

Instructions

- Students must count the number of pages in this examination paper before beginning to write, and report any discrepancy immediately to the invigilator.
- This examination paper consists of 4 pages.
- This is a CLOSED BOOK examination. You are allowed to have one piece of letter-sized and double-sided notes.
- Calculators are NOT permitted.
- Remember to state any assumptions and show rough work.
- Note carefully the weight of each question, and answer appropriately.
- Attempt all questions. All questions relate to material covered in the lectures, labs and assignments.

The following schema is used in questions 1 to 3 in this exam. There are four relations in the database. The primary key of each relation is underlined.

Teachers(tid, name, email)
Courses(cid, subject, level, credits, description)
Students(sno, name, email)
Records(sno, cid, term, tid, mark)

This schema describes a relational database used by a high school to manage the academic records of the students.

- Each record in relation **Teachers** describes a teacher with a unique teacher id (tid), a name and an email address.
- Each record in relation **Courses** describes a course offered by the school. Each course is given a unique cid, is about a subject (such as ‘Physics’, ‘Math’, etc) in a certain level (8 to 12). Each course is assigned a certain number of credits (usually 4), and has a short description.
- Each record in relation **Students** stores the information of a student with a unique student number (sno), a name and an email address.
- Relation **Records** stores the academic records of all students. Each record in this relation tells us that a student (identified by sno) has taken a course (identified by cid) in a particular term (e.g., ‘2016-1’ means the first term in year 2016, ‘2016-2’ means the second term in year 2016). The course was taught by a teacher identified by the tid. And the mark the student got in this course is an integer number in the range of 0 to 100 (inclusive).

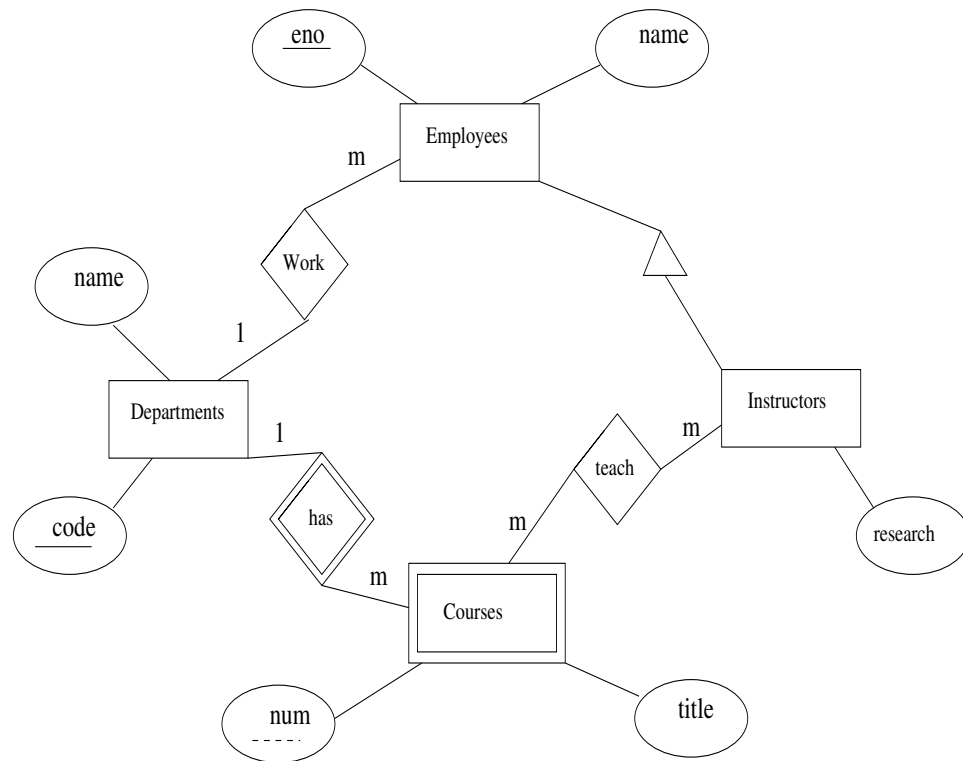
1. (25 Marks) Express each of the following queries in SQL against the relational schema defined before. Each query should be expressed using a *single* SQL statement.
 - (a) List the name and email of each student who took level 12 Physics or Chemistry in the first term of year 2017.
 - (b) List the subject, level and description of each course that has never been taken by any student.
 - (c) List the sno and name of John Smith's classmates in his Math 12 course taken in the first term of year 2017.
 - (d) List the sno and name of each student and the number of courses he/she has taken and passed (i.e., got more than 50). Sort the result in descending order of the number of courses.
 - (e) List the name and email of each student who has earned more than 8 credits from level 12 courses. (Note that you don't earn the credits of the course, if your mark is below 50 in that course.)
2. (10 Marks) Express the following query in Relational Algebra and Datalog respectively against the relational schema defined before.

List the sno and name of each student who has taken at least one level 12 course, but hasn't taken English 12.

3. (6 Marks) You are told that a student (whose student number is 231196) took English 12 (course id is ENGL-12) in the first term of year 2016, and his mark should be 87. But the instructing teacher (whose id is E10257) made a mistake when entering marks for that course in that term. The student's mark may be entered wrong or may not be entered at all.
You are asked to correct this situation and make sure the student's correct mark is recorded in the database. You have the privilege to fully access the tables. How can you accomplish this task using SQL?

4. (9 Marks) ER Model

Below you will find an ER diagram. In the ER diagram, identifiers and discriminators are shown with solid and dashed underlines respectively. The cardinality of relationship Work should read as one department has many employees, and one employee works in one department.



Answer following questions according to the above ER diagram.

- What is the identifier of entity Courses?
- Explain the relationship between entity Employees and entity Instructors.
- Translate the above ER diagram to a relational schema. Clearly and unambiguously show all of the necessary tables and their attributes, primary keys and foreign keys.

===== END OF EXAM QUESTIONS =====