

CS348 - Homework 1

Spring 2018

This homework is composed of two parts. Each part will be submitted separately on Blackboard. Here are some further details.

Part 1 (100 Points)- Relational Algebra, Relational Calculus, and QBE

Due: Wednesday, February 28, 2018 11:59 PM on Blackboard. Clearly label it as Part 1. Part 2 will be submitted separately (see below).

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

For the Course Registry database given below –

Students(snum, sname, major, standing, age, gpa)

Faculty(fid, fname, deptid)

Courses(cnum, cname, course_level, credits)

Offerings(onum, cnum, day, starttime, endtime, room, max_occupancy, fid)

Enrolled(snum, onum)

Write the Relational Algebra (RA), Tuple Relational Calculus (TRC), and Domain Relational Calculus (DRC) whichever is labelled against the question. Note that some of these queries might not be expressible in Relational Algebra, QBE, or Relational Calculus. For such queries, informally explain why they cannot be expressed.

1. (20 Points) (RA,TRC,DRC,QBE) Write a query which displays the student names and the courses (course name) which the student has taken.
 2. (20 Points) (RA,TRC,DRC,QBE) Find the names of students who are not enrolled in any course.
 3. (20 Points) (RA, TRC,DRC,QBE) Find the courses taught by faculty from more than two departments.
 4. (10 Points) (DRC, QBE) Find the name of the course with the highest total maximum occupancy (over all course offerings).
 5. (10 Points) (RA,TRC) Find the courses that have been taken by all students.
 6. (10 Points) (RA,DRC) Find students with a GPA > 3.0 that are taking exactly two courses.
 7. (10 Points) (TRC, QBE) Find courses taught by only one faculty member.
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Part 2 (100 Points)– The Entity Relationship Model

Due Friday March 9, 2018, 11:59 PM on Blackboard. Clearly label it as Part 2. Part 1 will be submitted separately (see above).

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

2.1. E-R Diagram (35 points)

Create an E-R diagram for the simple version of Pokemon Go game as described below -

- A Pokemon character has a number; a unique name; stamina, attack and defence values. There are also different (zero or more) Fast Moves which can be shown by a character.

- Each Pokemon character has a primary type. Each Pokemon may also have a secondary type.
- Pokemon type has a type name, a description and a type count (the number of characters with that type).
- A Pokemon type can be strong against zero or more Pokemon types.
- A creature is an instance of a Pokemon character. Each creature has a unique sequence number within all creatures for that character (Creatures of two different characters may have same sequence number, but creatures of same character will always have different sequence number) Each creature also has combat power (CP), experience points (EP) and a nickname.
- A player has a unique account name, an email and a level.
- A creature can be captured by a player at a location on a particular date.
- A location is identified by its latitude and longitude, plus a description.
- A player can own zero or more creatures. Not every creature must be owned by a player, but a creature can never be owned by two or more players.
- A gym is a special location which can be occupied with zero or more creature. A gym has a unique gym name. It also has a prestige value and is situated at a location.
- A creature may visit zero or more gym during the game.

State any assumptions that you make.

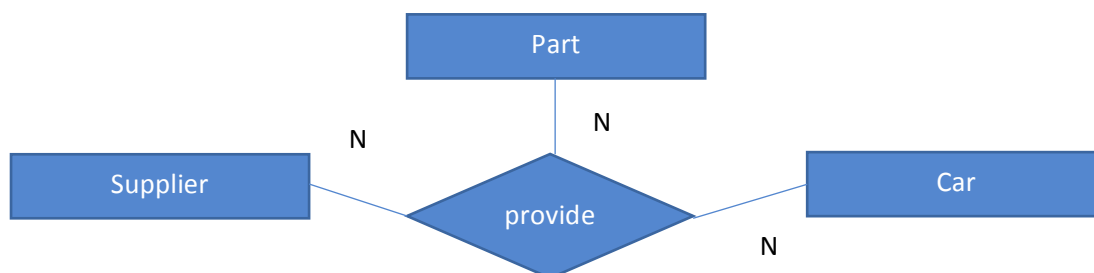
2.2 Converting an E-R Diagram to the relational model (35 points)

Convert the E-R model you designed in Part 1 into the relational model. Show relation names, attributes, primary keys, and the foreign keys (using connector lines with arrows pointing towards the attribute referred to).

Your representation can similar to the Schema Diagram shown in “The Relational Model” slides (Slide No. -15)

2.3. ER Basics (30 points)

1. (15 points) Convert in the ER diagram below showing ternary relationships into equivalent ER diagram having only binary relationship. Also, convert the ER diagram into an equivalent relational model.



2. (15 points)

- What is the primary key of a weak entity when converted to the relational model, explain with example.
- What are the advantages of weak entity set, why do not we always create strong entities? Explain with example.