

CS3431
B-Term, 2013
Homework 1: Entity-Relationship & Relational Models

Post Date: Nov. 1, 2013

Due Date: Nov. 8, 2013 (3:00PM)

General Instructions

- The homework is to be done individually.
- In your ERD design, clearly indicate the keys and the cardinalities of the relationships.
- Any assumptions you make, which are not stated in the problem definition, need to be written explicitly. The assumptions you add must be “*in addition*” to the specified requirements in the problem definition without deleting any of these requirements.
- Indicate if there is any information (constraints or other concepts) listed in the description that cannot be modeled by the ER model.

Problem 1 (Bank Database) [20 Points]

Design an ER diagram for *Bank database* that should reflect the following requirements:

- Each bank has a unique ID, name, and headquarter address. Each bank has many branches, and for each branch we need to keep the branch ID (unique within the bank but not unique across different banks), location, and telephone number.
- Customers can have many accounts at the same branch or at different branches. An account has a unique account ID, type (E.g., saving, or checking), currency (E.g., dollar, euro), and balance.
- A customer can take many loans from different branches, however there are a restriction that a customer cannot take more than one loan from a given branch in the same year. For each loan we need to keep the loan amount and the year.
- Each customer has a SSN (unique ID), name, address, and DoB properties.
- We need to capture the transactions done by each customer over each account. We capture the type of the transaction (E.g., either *withdrawal* or *deposit*), the transaction time, and the amount.

Problem 2 (Bank Database) [20 Points]

Design an Entity-Relationship Diagram (ERD) for a *car race database* with the following requirements.

- We have cars, for each car we keep its VIN number (unique ID), engine type, color, make, and model
- We have drivers, for each driver we keep ID (unique), name, DoB, and age (derived attribute)
- Drivers use cars to enter races, each race has some attributes such as the race number (unique ID), race type, the number of rounds, and date.
- Each driver can enter many races and can use the same car or different one in each race. Thus the same car can participate in many races.
- In the design, we want to capture which car is used by which driver and in which race.
- We also need to capture the winner of each race (the driver who won the race) and the winning time (the time taken to finish and win the race).

Problem 3 (University Database) [20 Points]

Create a Relational Model (the CREATE TABLE statements) for the following database:

- We have students; each student has a unique Id, name, address, gender, and overall GPA (has default value of 0).
- Each student must have one major (mandatory attribute) and optionally one minor.
- The model must check that the gender takes values either “Male” or “Female”
- We have courses, each course has a unique CourseId, title, and number of credits
- Students will register in courses in certain semesters. We need to keep track of the grade that a student has received in a given course. The model should allow a student to take the same course in different semesters.

Your CREATE TABLE statements should clearly indicate the following: 1) The attribute names and their data types (choose appropriate types), 2) The primary keys in each table, 3) The NULL (or NOT NULL) and the DEFAULT constraints, 4) The CHECK domain constraints, and 5) The foreign key constraints.

Grading:

The maximum grade is 60 Points. Late submissions follow the rules stated on the website.

Deliverables:

Each student should deliver a report containing the required solution. You may use tools like (MS word, or power point) to draw the ERD.

Submission:

Submit a hardcopy in the beginning of the class (3:00PM), or submit electronically via blackboard.wpi.edu website. Electronic submission is recommended.