CS3431: Project Description
B-term, 2011
Building a Database Application
Phase 2: Logical Design & Relational Algebra

Due Date: Nov. 11, 2011 (8:00 AM).

Description:

In this phase, you will convert the **Entity Relationship model** in Phase 1 to **Relational model**. Also you will express the queries you suggested in your application using the **Relational algebra**.

1) **[20 Points]** Given the ER diagram that you designed in Phase 1, convert this diagram to the relational model. You need to define all the tables that will be in your relational model plus all constraints you specified in Phase 1. You should follow the refinement rules given in the class while generating the relational model. You should deliver the following:

   a. **List of CREATE TABLE commands:** Each command is creating a table. You need to specify the column names, data type of each column, and any constraints that you can put in the commands, e.g., NOT NULL, default values, Unique keys, primary keys, Foreign keys, etc. You can define the constraints in the *CREATE TABLE* command, or using separate commands like *ALTER TABLE* to add constraints.

   b. **Additional constraints not captured in ERD:** Any constraints in your application that can be added to the relational model but not captured in the ERD, you should define them in the relational model. For example, the following constraint is not captured in the ERD but can be captured in the relational model.
   `"A Grade field can take only A+, A-, B+, B-, C+, C-, D+, D-"`

   c. **Additional constraints that cannot be captured in the relational model:** Define any business constraints that cannot be captured even in the relational model. For example, the following constraint cannot be captured in the relational model:
   `"A Customer cannot take more than 3 loans within one year"`

2) **[30 Points]** Given the list of queries you provided in Phase 1 (at least 15 queries), express each query in the relational algebra using the operators we studied in class. For each query provide the following:
   a. **English description:** This is basically the text description you provided in Phase 1.
   b. **Algebraic expression:** The relational algebra expression to answer the query.

Grading:
The maximum grade is 50 Points. Late submissions follow the rules stated on the website.

Deliverables:
Each team should deliver a report containing the above requirements.

Submission:
Submit a hardcopy in the beginning of the class (8:00AM), or submit electronically via blackboard.wpi.edu website.