

## Database Management - Homework #1

**Problem 1.** Every weak entity set can be converted to a strong entity set by simply adding the appropriate attributes. Why, then, do we have weak entity sets?

**Problem 2.** Give a 1-m relationship set example, i.e., give two entity sets and the (binary) relationship set between them. The examples must be "realistic". For each entity set, discuss whether it has a "full participation" in the relationship set (explain why).

**Problem 3.** Suburban Virginia University (SVU) has decided to consolidate the functionality of three small overlapping database systems, which support applications for 1) teaching (e.g. instructor assignment and evaluation), for 2) registration (e.g. online course status, waiting lists), and for 3) student records (e.g. transcript generation). The resulting new system will support the following enterprise description: Professors and GTAs are assigned to teach the sections of each class being offered in a semester. At the end of the semester, they get a "team rating" (i.e., professors and GTAs together get one rating per section, the rating is for the entire group and not for individuals). To support the assignment of professors to sections, a record is kept of which class each professor can teach. Classes can have one or more prerequisite classes. Students can take several sections each semester, and receive a grade for taking each section. Students may end up waiting for some sections, and receive a "rank" (determining the order they will be admitted if other students drop). However, no more than 10 students can wait on a class at the same time. Note that GTAs are students, however they differ in that they have a salary. All people (e.g. students, professors) are uniquely identified by their social security number. All classes are identified by department name (e.g. "INFS") and course number (e.g. "614"). Sections of classes are distinguished by their section number (e.g. "02").

Given this functional description of the business processes at SVU, do the following:

- A. Draw an ER-diagram for the database, identifying the following:
  - (i) all entity sets;
  - (ii) all relationship sets and their constraints (cardinality, participation)
  - (iii) the primary key for each entity set (and weak entity set, if any) and relationship set.
- B. Indicate any features of the above description can NOT be captured in your ER-diagram.
- C. Which entity and relationship sets in your diagram participate in the generation of a section roster? Of a student transcript? How are a section roster and a student transcript alike? How do they differ?
  - As an optional extension (not graded): Consider *other* types of reports that can be produced from this database. For example "A list of the GTAs who have NOT taken all the prerequisite classes for the classes that are assigned to teach".
- D. Convert your entity-relationship design into a relational database scheme, as taught in Lecture 3. Write an SQL script to create all the relational tables corresponding to your ER diagram, and insert at least two tuples into each table. Your script should execute on GMU's Oracle. For each SQL CREATE TABLE statement, indicate the primary key and all other attributes, and any uniqueness, foreign key, or NOT NULL constraints.

**Submission:** Please type your solution, or write very clearly. Scan your answer and submit it as a PDF file on blackboard. For question (3.D) also submit your SQL script.