Assignment #2
Due Tuesday October 17, 5:00 PM

Many of these problems look like the problems on HW#1, but now they are to be done in the Entity/Relationship model. For each of the E/R problems, you should draw an E/R diagram, remembering to indicate (where appropriate):

1. Attributes that belong to keys.
2. Any weak entity sets and their keys.
3. Roles if a relationship involves an entity set more than once.
4. Arrows in cases of many-one or one-one relationships.

Please start each problem on a new page **and place your name on each page**, since we shall be dividing them among TA's for grading.

Problems to Work and Hand In

1. (10 pts.) The *Beer Drinkers' Database* consists of information about beers, drinkers, and bars, telling:
   (a) The name of each beer, bar, and drinker.
   (b) The address of each bar.
   (c) The beers liked by each drinker.
   (d) The beers served by each bar.
   (e) The bars frequented by each drinker.

   Give an E/R diagram for the Beer Drinkers' Database. Give the classes (interfaces), attributes and relationships for each class, and information about the inverses of relationships.

2. (10 pts.) Give an E/R diagram for a database of persons, giving their names, addresses, Mother, Father, and children. *Person* should be the only entity set in this design.

3. (10 pts.) Now, modify your design of Problem 2 so that *Persons* has subclasses *Mothers*, *Fathers*, and *Children*. Add an attribute *OrderOfBirth* for *Children* and add a relationship *Married* between *Mothers* and *Fathers*. Show the appropriate **isa** relationships. Do not forget to include the information of Problem 2 that tells who is Mother or Father of whom.

4. (15 pts.) Give an E/R diagram for a fictional database maintained by the Stanford University registrar's office. The data should include information about students (such as their ID# and name), information about instructors (such as their ID#, name, and office), and information about courses (such as their department, course#, time, room, and enrollment). The data should also include which students are enrolled in which courses and the grade they are receiving, and which courses are being taught by which instructors. Please state any assumptions you make about the real world; for example, you may or may not choose to assume that each instructor teaches at most one course. Note that there is no single right answer to this question, although some answers may be better than others.

5. (10 pts.) Your design for Problem 4 would profit from some referential-integrity constraints. For each attribute that is not part of a key, indicate whether or not it should be allowed to be `NULL`. Also, for each many-one relationship, indicate whether the "one" should be allowed to be `NULL`, or whether a real entity should be there. As in Problem 4, there is no one right answer, but some are better (i.e., they better match the real world) than others. Your answer should be based on whether or not `NULL` is likely to be the true situation in practice, and on whether allowing a `NULL` causes inconsistency or would make no sense to the user of the database. If you are not sure, add a sentence explaining your reasoning.

6. (10 pts.) As we discussed in class, it is sometimes possible for a relationship to be its own inverse. However, not every relationship from one entity set or class to the same entity set or class is its own inverse. In order for a relationship to be self-inverse, its possible instances must satisfy a simple constraint. What is that constraint? Justify your answer briefly, explaining both why a relation is its own inverse if its instances must satisfy the constraint and why the relation is not its own inverse if it allows even one instance that does not satisfy the constraint.

Second Step of Your Personal Database Application

(35 pts.) Convert the ODL design of your project from last week into an E/R diagram. Give all the information (keys, etc.) asked for in general at the top of this assignment.

If you wish to make any modifications in your design, or even redo it completely, you may do so but please (a) point out the changes and (b) conform to the size guidelines of HW #1.