INFS 614 - Database Management
Fall 2013

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Homework 1 – Due 9/10

Problem 1.

For each binary relationship given below, indicate its multiplicity (i.e., one-to-one, one-to-many, many-to-one, many-to-many). Clearly state any assumption you make.

	Entity 1	**Entity 2**
1	STUDENT	SOCIAL_SECURITY_CARD
2	CLASSROOM	WALL
3	COUNTRY	CURRENT_PRESIDENT
4	COURSE	TEXTBOOK
5	ITEM	ORDER
6	STUDENT	CLASS
7	CLASS	INSTRUCTOR
8	INSTRUCTOR	OFFICE
9	EBAY_AUCTION_ITEM	EBAY_BID
10	FACEBOOK_USER	FACEBOOK_USER

Problem 2.

Suppose a University Database contains an Entity Set named *Student*. Each Entity in the Entity Set *Student* has five attributes: Student ID, SSN, Name, Phone number, GPA. Both Student ID and SSN have unique values for each student.

    (1) Choose a Primary Key for *Student*. Motivate your choice by making proper assumptions.

    (2) List all Candidate Keys for *Student*. Provide the necessary explanations to support your design.

    (3) List all Superkeys for *Student*. How many Superkeys are there for *Student*?

    (4) In general, if a relation R has n attributes $A_1, A_2, \ldots, A_n$, and exactly 2 candidate keys $\{A_1\}$ and $\{A_2\}$, how many Superkeys does R have?

Problem 3.

Suppose you want to design and implement a database for a member-only supermarket inventory and check-out system (think Costco).

The database should store information about the customers: membership number, customer name, birthday, gender, and address.

The database should also have information on current store inventory. For each product, store the Universal Product Code (UPC), brand, product name, product description (e.g. 12 16-oz bottles of Coke), category (e.g. Fruit, Vegetable, Meat, Beverage, etc.), marked price per unit, and quantity. For simplicity, assume that each product belongs to only one category.

All transactions are recorded. A transaction (from one check-out) contains a (unique) transaction ID, the transaction date, products purchased in the transaction, quantities, and the customer who made the transaction. The payment method (credit card, check, cash) should also be recorded.

Every week, a list of products goes on sale. Sale prices of these products should be recorded. Each sale has a promotion period, indicated by promotion start date and promotion end date. For simplicity, you may use a unique sale ID for each sale period.

Draw the ER diagram for the given database, identifying the following:

    (i) all the entity sets and their attributes;

    (ii) all the relationship sets;

    (iii) all the required key constraints and participation constraints;

    (iv) the primary key for each entity set (and weak entity set, if any).

In some cases, you may have to make your own constraint assumptions. Clearly state, and justify your assumptions. Does your diagram capture all the given requirements? If not, specify which requirement(s) is (are) not captured.

While there are many variations of ER diagrams, please follow the same notations used in the textbook.

Problem 4.

The following questions concern the ER diagram resulting from Problem 3:
a) Convert the entity-relationship design to a schema for a relational database. List all relational schema. For each relational schema, state
    (i)   the name of the relation,
    (ii)   the names of its attributes,
    (iii)   the domain (or data type) of each attribute,
    (iv)   the primary key, and

(v)   the foreign key(s).

b) Use Oracle on ITE LAB machine to create the tables from a) above and insert at least two tuples to each table. Implement all these in one script (text) file.

Some Hints:

Free tools for drawing ER diagrams:

You can download Microsoft Visio Professional 2010 for free from GMU's msdn academic alliance (http://msdn05.e-academy.com/elms/Storefront/Home.aspx?campus=gmu_bsit). You need to register with the software center then download the program for free (or you can have the Visio 2010 CD mailed to you for $19.95). If you have problem you can contact the IT&E support @703-993-1515 (more on the support page: http://labs.ite.gmu.edu/index.php/FAQ/MSDNAA#a2). Please be aware that the notation employed by Visio is not exactly the same as the one used in the textbook.

Also, you can download a trail version of SmartDraw (http://www.smartdraw.com/). The good news is the notation is similar to the textbook, and the bad news is you have to pay if you want to get a full version.

Oracle DBMS:

1. If you have troubles creating a table, try to clean up your database. Proceed as follows:
        select table_name
        from all_tables
        where owner='YOURACCOUNTNAMEINUPPERCASE';
    to see what tables you have in your database. Then use
        drop table table_name;
    to delete them in sqlplus.

2. If you still have troubles creating a particular table, try a different name. A name (like order, group, etc) may be a reserved word.

3. When creating tables that contain foreign keys, make sure the tables that are referenced have already been created.