

CSc4710 / CSc6710

Fall 2006

Assignment 1

Due Date: September 14th, 2006 @ 5:30PM

Problem 1 (10 points)

Jack Brown wants to store information (salary, tax, bills, loans, etc.) about his monthly living expense. The amount of data compels him to buy a database system. To save money, he wants to buy one with the fewest possible features, and he plans to run it as a stand-alone application on his PC. Jack does not plan to share the information with anyone. Indicate which of the following DBMS features Jack should pay for; in each case also indicate why Jack should/should not pay for that feature.

- (1) A security facility.
- (2) Concurrency control.
- (3) Crash recovery.
- (4) A view mechanism.
- (5) A query language.

Problem 2 (10 points)

A university database contains information about professors (identified by SSN) and courses (identified by courseID). Professors teach courses; each of the following situations concerns the Teaches relationship set. For each situation, draw an ER diagram that describes it (no further constraints hold).

1. Professors can teach the same course in several semesters, and each offering must be recorded.
2. Professors can teach the same course in several semesters, and only the most recent such offering needs to be recorded. (This condition applies in all the subsequent questions.)
3. Every professor must teach some course.
4. Every professor teaches exactly one course.
5. Certain courses can be taught by a team of professors jointly, but it is possible that no one professor in a team can teach the course.

Problem 3 (30 points)

Consider the following set of requirements for a company database:

- (a) Each customer is assigned a customer number. Also, the company keeps track of each customer's name, birthday, marital status, credit rating, address, phone number, fax number. Some user applications need to refer to the city, state, and zip of the customer's address. The company only maintains the information of the customers who have made at least one order.
- (b) Each employee is assigned an employee number and the following information of an employee need to be included in the database: name, address,

- email, SSN, birthday, position, sex, salary, start date working at this company, work phone number and home phone number.
- (c) Each order made by a customer is described by an order number, order date, billing address, status. Each order is taken care of by one employee and one invoice is created for this order. Each order may contain one or multiple products. The quantity of each product in an order also needs to be recorded.
 - (d) Each invoice is described by an invoice number, created date, date paid, payment method ('1' for cash, '2' for check, '3' for credit card. These information also need to recorded).
 - (e) A product has a product number, name, unit price, quantity on hand.

Draw an ER diagram for the company database. Specify key attributes of each entity type and structural constraints on each relationship type. Specify any additional assumptions.

Problem 4 (25 points)

A database is needed for maintaining the Web sites related to courses taught at a university.

- The characteristics of a Web page include a unique ID, a title, its URL, and the number of times that the Web page has been accessed. A course Web page has an associated *base* page and a base Web page serves as the base of all of the Web pages associated with the course. A Web page can be accessed through the link on another page.
- A Web page can display many graphics and a graphic can be displayed by many Web pages. The characteristics of a graphic include a unique ID, the name of the graphic, the format of the image, such as 'gif', 'jpg' or 'bmp', and the directory in which the graphic image is located.
- A Web page can provide ftp links to several courseware files and a courseware file must be linked to by some Web page(s). The characteristics of courseware include a unique ID, a description of the course material, the directory in which the file material is located and a category describing the type of course material, such as 'P' for publication, 'N' for notes.

Design an ER diagram for the above. Specify key attributes of each entity type and structural constraints on each relationship type. Specify any additional assumptions.

Problem 5 (15 points)

Construct a relational model for the database described in Problem 3. For each relation, specify its primary key.

Problem 6 (10 points)

Construct a relational model for the database described in Problem 4. For each relation, specify its primary key.