Database Management
2015-2016
Midterm Homework: Lİbrary Database
(Do the homework with your 2-to-4 members team. Due date is 24-25 December 2015)

PART-I (MANDATORY): In this homework, you will draw an EER diagram of the library database.

Identify all the important concepts represented in the library database case study described below. In particular, identify the abstractions of classification (entity types and relationship types), aggregation, identification, and specialization/generalization. Specify (min, max) cardinality constraints whenever possible. List details that will affect the eventual design but that have no bearing on the conceptual design. List the semantic constraints separately. Case Study:The Georgia Tech Library (GTL) has approximately 16,000 members, 100,000 titles, and 250,000 volumes (an average of 2.5 copies per book). About 10 percent of the volumes are out on loan at any one time. The librarians ensure that the books that members want to borrow are available when the members want to borrow them. Also, the librarians must know how many copies of each book are in the library or out on loan at any given time.

A catalog of books is available online that lists books by author, title, and subject area. For each title in the library, a book description is kept in the catalog that ranges from one sentence to several pages. The reference librarians want to be able to access this description when members request information about a book. Library staff includes chief librarian, departmental associate librarians, reference librarians, check-out staff, and library assistants.

Books can be checked out for 21 days. Members are allowed to have only five books out at a time. Members usually return books within three to four weeks. Most members know that they have one week of grace before a notice is sent to them, so they try to return books before the grace period ends. About 5 percent of the members have to be sent reminders to return books. Most overdue books are returned within a month of the due date. Approximately 5 percent of the overdue books are either kept or never returned. The most active members of the library are defined as those who borrow books at least ten times during the year. The top 1 percent of membership does 15 percent of the borrowing, and the top 10 percent of the membership does 40 percent of the borrowing. About 20 percent of the members are totally inactive in that they are members who never borrow.

To become a member of the library, applicants fill out a form including their SSN, campus and home mailing addresses, and phone numbers. The librarians issue a numbered, machine-readable card with the member's photo on it. This card is good for four years. A month before a card expires, a notice is sent to a member for renewal. Professors at the institute are considered automatic members. When a new faculty member joins the institute, his or her information is pulled from the employee records and a library card is mailed to his or her campus address. Professors are allowed to check out books for three-month intervals and have a two-week grace period. Renewal notices to professors are sent to their campus address.

The library does not lend some books, such as reference books, rare books, and maps. The librarians must differentiate between books that can be lent and those that cannot be lent. In addition, the librarians have a list of some books they are interested in acquiring but cannot obtain, such as rare or outof-print books and books that were lost or destroyed but have not been replaced. The librarians

must have a system that keeps track of books that cannot be lent as well as books that they are interested in acquiring. Some books may have the same title; therefore, the title cannot be used as a means of identification. Every book is identified by its International Standard Book Number (ISBN), a unique international code assigned to all books. Two books with the same title can have different ISBNs if they are in different languages or have different bindings (hardcover or softcover). Editions of the same book have different ISBNs.

The proposed database system must be designed to keep track of the members, the books, the catalog, and the borrowing activity.

PART-II (OPTIONAL): In this part, you will transform the conceptual database you designed in the first PART, into a relational database model (both logical and physical).

1. Write down the appropriate SQL scripts (DDL statements) for creating the database and its relational model. You can select any of the DBMS you wish.

2. Populate the database you just created again using SQL script file loaded with sample tuples. (The tables should have enough number of tuples for the SELECT statements to be run accordingly.)

3. Write down 3 triggers for 3 different tables. Triggers should be meaninful.

4. Write down 3 check constraints and 3 assertions. Check constraints and assertions should be meaninful.

5. Write down the following SQL statements:
    a. Write sample INSERT, DELETE and UPDATE statements for 3 of the tables you have chosen.
    b. Write 10 SELECT statements for the database you have implemented.
        i. 3 of them should use just one table.
        ii. 4 of them should use minimum 2 tables.
        iii. 3 of them should use minimum 3 tables.

Good luck.