Problem 1

Consider the following set of requirements for a UNIVERSITY database that is used to keep track of students transcripts.

1. The university keeps track of each student's name, student number, Social Security number, current address and phone number, permanent address and phone number, birth date, sex, class (freshman, sophomore, ..., graduate), major department, minor department (if any), and degree program (B.A., B.S., ..., Ph.D.). Some user applications need to refer to the city, state, and ZIP Code of the student's permanent address and to the student's last name. Both Social Security number and student number have unique values for each student.

2. Each department is described by a name, department code, office number, office phone number, and college. Both name and code have unique values for each department.

3. Each course has a course name, description, course number, number of semester hours, level, and offering department. The value of the course number is unique for each course.

4. Each section has an instructor, semester, year, course, and section number. The section number distinguishes sections of the same course that are taught during the same semester/year; its values are 1, 2, 3, ..., up to the number of sections taught during each semester.

5. A grade report has a unique grID, student, section, letter grade, and numeric grade (0, 1, 2, 3, or 4).

Refer to the ER/EER diagrams from Homework 1 solutions to create relations in relational schema according to the rules discussed in class. Ensure that you use the same notation for primary keys, foreign keys and such.
Problem 2

Consider a CONFERENCE_REVIEW database in which researchers submit their research papers for consideration. Reviews by reviewers are recorded for use in the paper selection process. The database system caters primarily to reviewers who record answers to evaluation questions for each paper they review and make recommendations regarding whether to accept or reject the paper. The data requirements are summarized as follows:

- Authors of papers are uniquely identified by e-mail id. First and last names are also recorded.
- Each paper is assigned a unique identifier by the system and is described by a title, abstract, and the name of the electronic file containing the paper.
- A paper may have multiple authors, but one of the authors is designated as the contact author.
- Reviewers of papers are uniquely identified by e-mail address. Each reviewer's first name, last name, phone number, affiliation, and topics of interest are also recorded.
- Each paper is assigned between two and four reviewers. A reviewer rates each paper assigned to him or her on a scale of 1 to 10 in four categories: technical merit, readability, originality, and relevance to the conference. Finally, each reviewer provides an overall recommendation regarding each paper.
- Each review has a revID and also contains two types of written comments: one to be seen by the review committee only and the other as feedback to the author(s).

Refer to the ER/EER diagrams from Homework 1 solutions to create relations in relational schema according to the rules discussed in class. Ensure that you use the same notation for primary keys, foreign keys and such.
Problem 2 Solution:
Problem 3

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. Draw an EER diagram of the library database.

Case Study:
The UC Berkeley Library management system is described in following text. 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 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 out-of-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. Also, the librarians must know how many copies of each book are in the library or out on loan at any given time. Library staff includes chief librarian, departmental associate librarians, reference librarians, check-out staff, and library assistants.

A catalog of books is available online that lists books by author(s), title, and subject area(s). 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.

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 members photo on it. This card is good for four years. 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.

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

Refer to the ER/EER diagrams from Homework 1 solutions to create relations in relational schema according to the rules discussed in class. Ensure that you use the same notation for primary keys, foreign keys and such.
Problem 3 Solution: