

## Lecture 6

### Problems & Exercises

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#### Exercise (1): Design an ER schema for the following enterprise:

Consider a MAIL\_ORDER database in which employees take orders for parts from customers. The data requirements are summarized as follows:

- The mail order company has employees, each identified by a unique employee number, first and last name, and Zip Code.
- Each customer of the company is identified by a unique customer number, first and last name, and Zip Code.
- Each part sold by the company is identified by a unique part number, a part name, price, and quantity in stock.
- Each order placed by a customer is taken by an employee and is given a unique order number. Each order contains specified quantities of one or more parts. Each order has a date of receipt as well as an expected ship date. The actual ship date is also recorded.

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## Exercise (2)

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

- (a) The university keeps track of each student's name, student number, social security number, current address and phone, permanent address and phone, birthdate, 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 of the student's current address, and to the student's last name. Both social security number and student number have unique values for each student.
- (b) Each department is described by a name, department code, office number, office phone, and college, department could be offer courses. Both name and code have unique values for each department.

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- (c) Each course has a course name, description, course number, number of semester hours, level, and offering department. The value of course number is unique for each course.
- d) Each section has an instructor, semester, year, course, and section number. The section number distinguishes different 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.
- (e) A grade report has a student, section, letter grade, and numeric grade (0, 1, 2, 3, 4 for F, D, C, B, A, respectively).

Design an ER schema for this application, and draw an ER diagram for that schema. Specify key attributes of each entity type and structural constraints on each relationship type. Note any unspecified requirements, and make appropriate assumptions to make the specification complete.

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### Exercise (3)

Draw an ER schema diagram for courses database and consider the assumptions below. Specify each entity type and **structural constraints** on each relationship type.

- ❖ A course may or may not use a textbook, but that a text by definition is a book that is used in some course. A course may not use more than five books.
- ❖ Instructors teach from two to four courses
- ❖ Each course is taught by exactly one instructor.
- ❖ Each textbook is used by one and only one course.
- ❖ An instructor does not have to adopt a textbook for all courses.
- ❖ If a textbook exists, it is used in some course; hence it is adopted by some instructor who teaches that course.

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### Exercise (4): Design an ER schema for the following Conference Review system:

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.

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## Exercise (5): Design an ER schema for the following airline reservations system

- (1) The database represents each AIRPORT, keeping its unique Airport Code, the AIRPORT Name, and the City and State in which the AIRPORT is located.
- (2) Each airline FLIGHT has a unique number, the Airline for the FLIGHT, and the Weekdays on which the FLIGHT is scheduled (for example, every day of the week except Sunday can be coded as X7). FAREs are kept for each FLIGHT, restrictions, code and amount are recorded for each fare.
- (3) A FLIGHT is composed of one or more FLIGHT LEGs (for example, flight number CO1223 from New York to Los Angeles may have two FLIGHT LEGs: leg 1 from New York to Houston and leg 2 from Houston to Los Angeles). Each FLIGHT LEG has a DEPARTURE AIRPORT and Scheduled Departure Time, and an ARRIVAL AIRPORT and Scheduled Arrival Time.

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- (4) A LEG INSTANCE is an instance of a FLIGHT LEG on a specific Date (for example, CO1223 leg 1 on July 30, 1989). The actual Departure and Arrival AIRPORTs and Times are recorded for each flight leg after the flight leg has been concluded. The Number of available seats and the AIRPLANE used in the LEG INSTANCE are also kept.
- (5) The customer RESERVATIONS on each LEG INSTANCE include the Customer Name, Phone, and Seat Number(s) for each reservation.
- (6) Information on AIRPLANES and AIRPLANE TYPEs are also kept. For each AIRPLANETYPE (for example, DC-10), the TypeName, manufacturing Company, and Maximum Number of Seats are kept. The AIRPORTs in which planes of this type CAN LAND are kept in the database. For each AIRPLANE, the AirplaneId, Total number of seats, and TYPE are kept.

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# THANK YOU



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