Review Questions II

// NO REALITZAR 1. Notice that for the SECTION entity, we only showed SecID as an underlined key, but because of the miniworld constraints, several other combinations of values have to be unique for each section entity . For exemple, each of the following combinations must be unique based on the typical miniworld constraints:

- (SecNo, Sem, Year, CCode (of the COURSE related to the SECTION): This specifies that the section numbers of a particular course must be different during each particular semester and year.
- (Sem, Year, DaysTime, Id (of the INSTRUCTOR teaching the SECTION)): This specifies that in a particular semester and year, an instructor cannot teach two sections at the same days/time.

¿Which combinations of attributes have to be unique for each individual SECTION entity in the UNIVERSITY database?

a) This specifies that in a particular semester and year, a classroom cannot be used by two different sections at the same days/time.

b) During a particular semester and year, a student cannot attend clases for two sections at a particular DaysTime value.

2. Composite and multivalued attributes can be nested to any number of levels. Suppose we want to design an attribute for an EMPLOYEE entity to keep track of previous job experiences. Such an attribute will have one entry for each company previously worked at, and each such entry will be composed of company name, join and end dates, position entries (positions hold at that company, if any), and salary entries (salary received at various positions held). Each position entry contains the position name and the month and year the position was awarded, and each salary entry contains a basic pay, allowances, duration in years, and grade. Design an attribute to hold this information.

3. Consider the ER diagram in Figure 3.21, which shows a simplified schema for an airline reservations system. Extract from the ER diagram the requeriments and constraints that produced this schema. Try to be as precise as possible in your requeriments and constraints specifications.

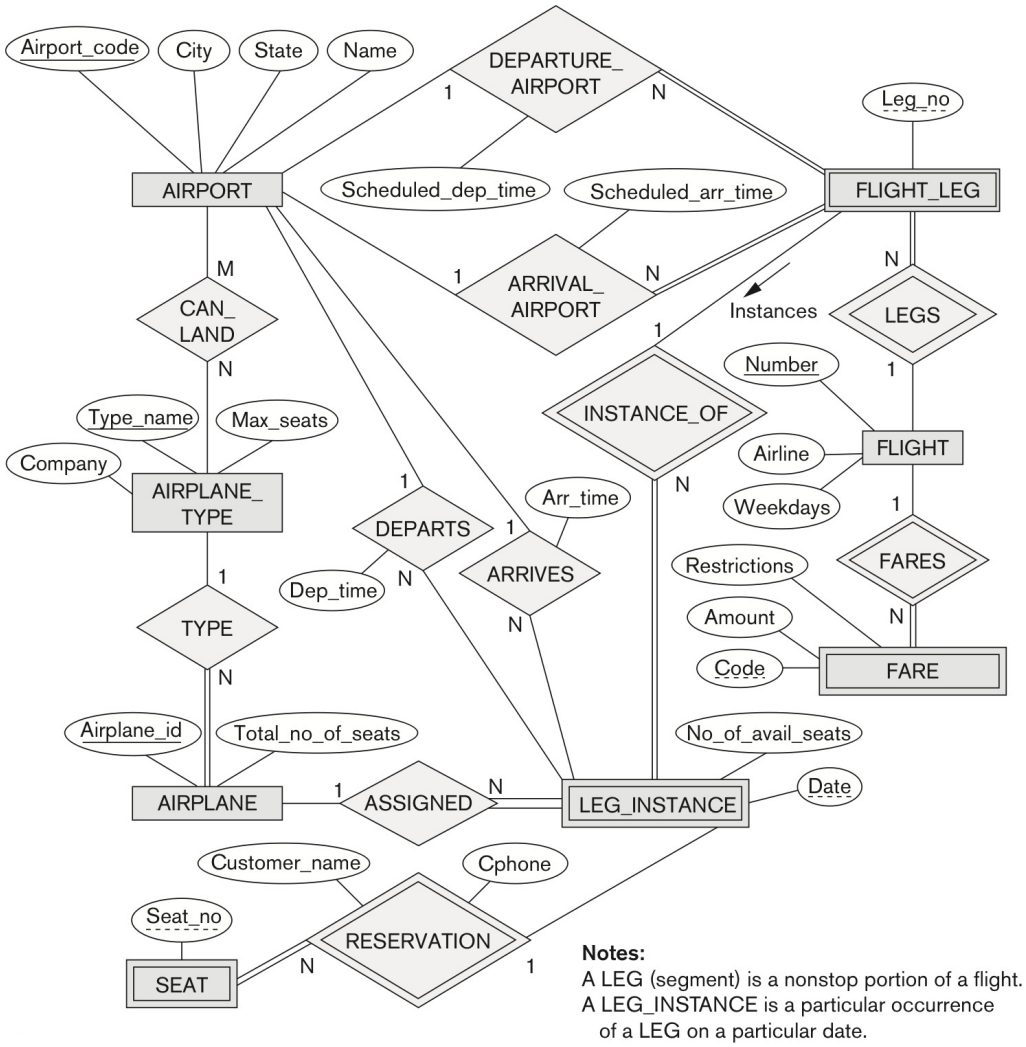

Figure 3.21 An ER diagram for an AIRLINE database schema

4. Consider the ER diagram in Figure 3.23. Assume that an employee may work in up to two departments or may not be assigned to any department. Assume that each department must have one and may have up to three phone numbers. Supply (min,max) constraints on this diagram.
   Under what conditions would be relationship HAS_PHONE be redundant in this exemple?
   Assuming the following additional conditions:
   - Each department can have anywhere between 1 and 10 employees.
   - Each phone is used by one, and only one, department.
   - Each phone is assigned to at least one, and may be assigned to up to 10 employees.
   - Each employee is assigned at least one, but no more than 6 phones.

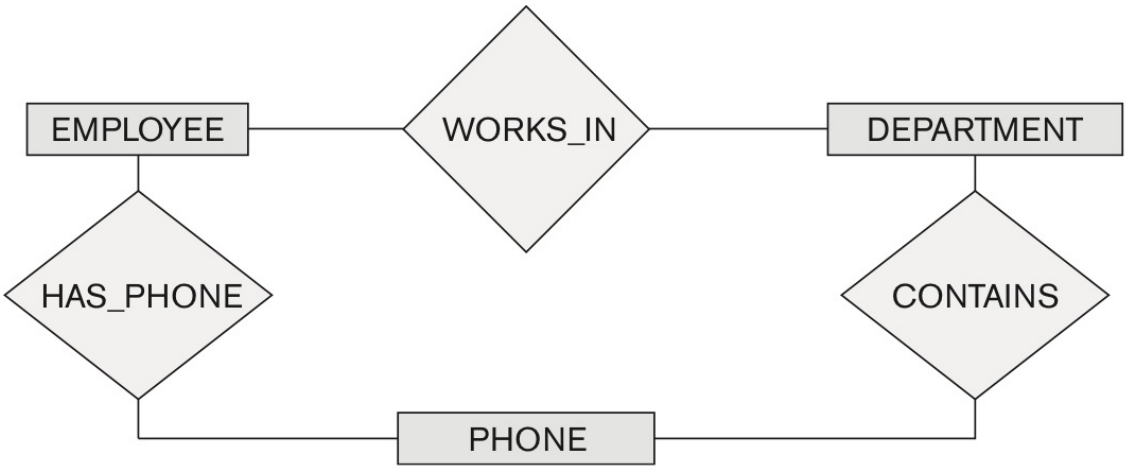

Figure 3.23 Part of an ER diagram for a COMPANY database

5. Consider the ER diagram shown in Figure 3.22 for part of a BANK database. Each bank can have multiple branches, and each branch can have multiple accounts and loans.
   a. List the strong (nonweak) entities in the ER diagram.
   b. Is there weak entity? If so, give its name, partial key, and identifying relationship.

c. List concisely the user requirements that led to this ER schema design.

d. Suppose that every customer must have at least one account but is restricted to at most two loans at a time, and a bank branch cannot have more than 1.000 loans. Represent this constraints in the Er diagram.

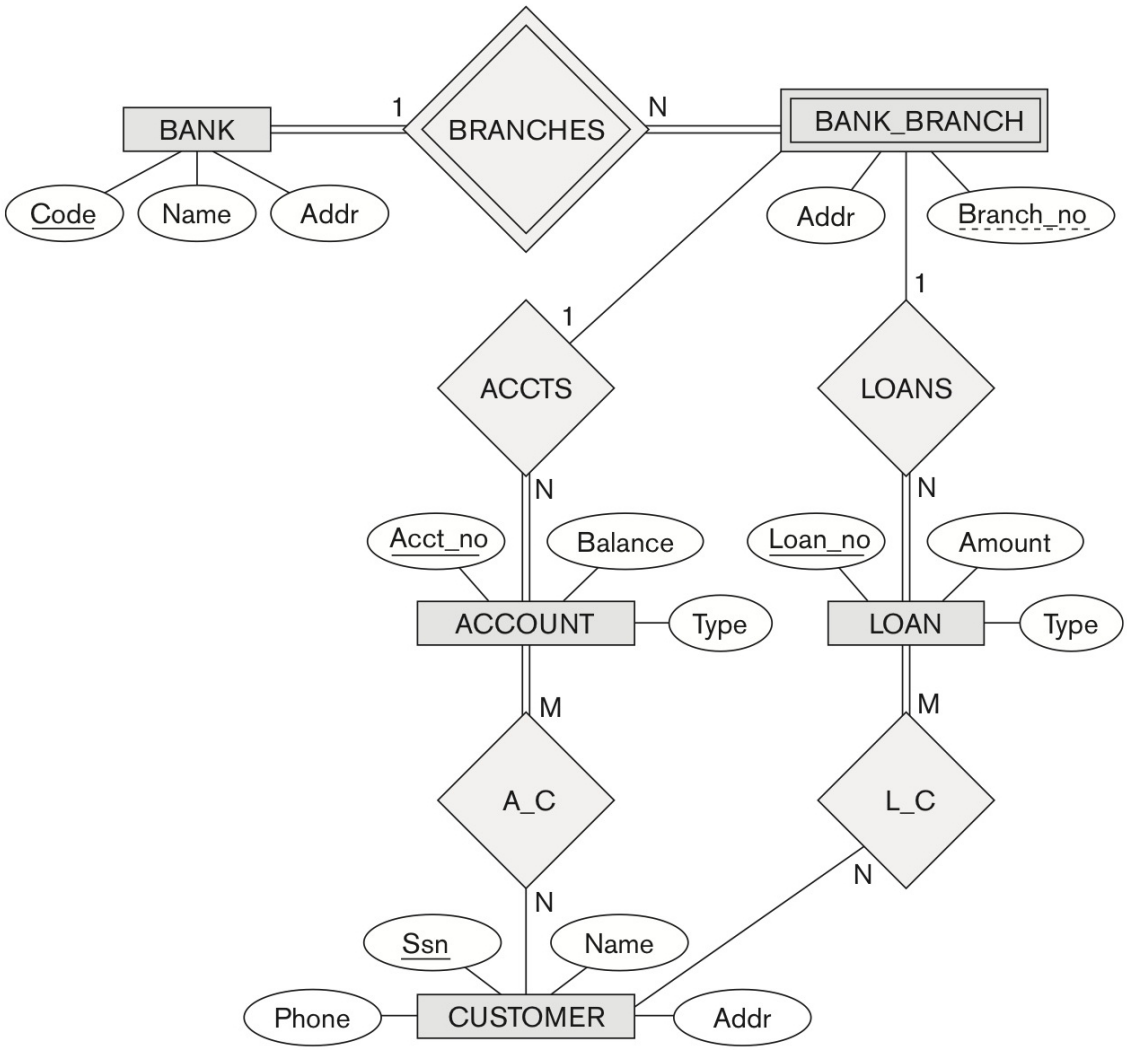

Figure 3.22 An ER diagram for a BANK database schema.

6. Consider the ER diagram in Figure 3.24. Assume that a course may or may not use a textbook, but 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. If we add the relationship ADOPTS, to indicate the text book(s) that an instructor uses for a course, should it be a binary relationship between INSTRUCTOR and TEXT.

   Assuming the following additional assumptions:

   - Each course is taught by exactlty 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 text exists:
     - It is used in some course,
     - Hence it is adopted by some instructor who teaches that course.
   - An instructor is considered to adopt a text if it is used in some course taught by that instructor.

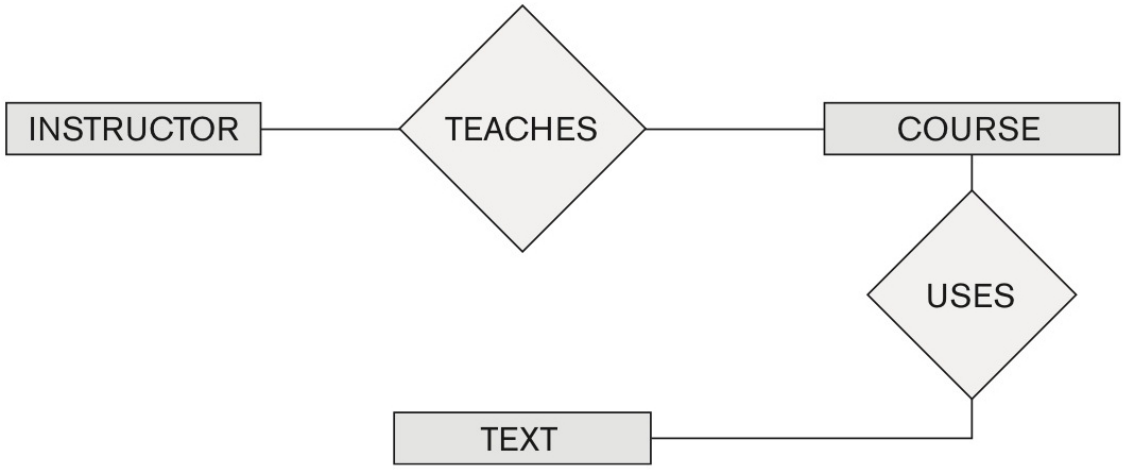

Figure 3.24 Part of an ER diagram for a COURSES database.

7. Cardinality ratios often dictate the detailed design of a database. The cardinality ratio depends on the real-world meaning of the entities involved and is defined by the specific application. For he following binary relationships, suggest cardinality ratios based on the common-sense meaning of the entities. Clearly assumptions you make.

Entity 1	Cardinality Ratio	Entity 2
STUDENT		SOCIAL_SECURITY_CARD
STUDENT		TEACHER
CLASSROOM		WALL
COUNTRY		CURRENT_PRESIDENT
COURSE		TEXTBOOK
STUDENT		CLASS
INSTRUCTOR		OFFICE

8. Consider the ER schema for the MOVIES database in Figure 3.25.
   Assume that MOVIES is a populated database. ACTOR is used as a generic term and includes actresses. Given the constraints shown in the ER schema, respond to the following statements with True, False, or Maybe. Assign a response of Maybe to statements that, although not explicity shown to be True, cannot be proven False based on the schema as shown. Justify each answer.

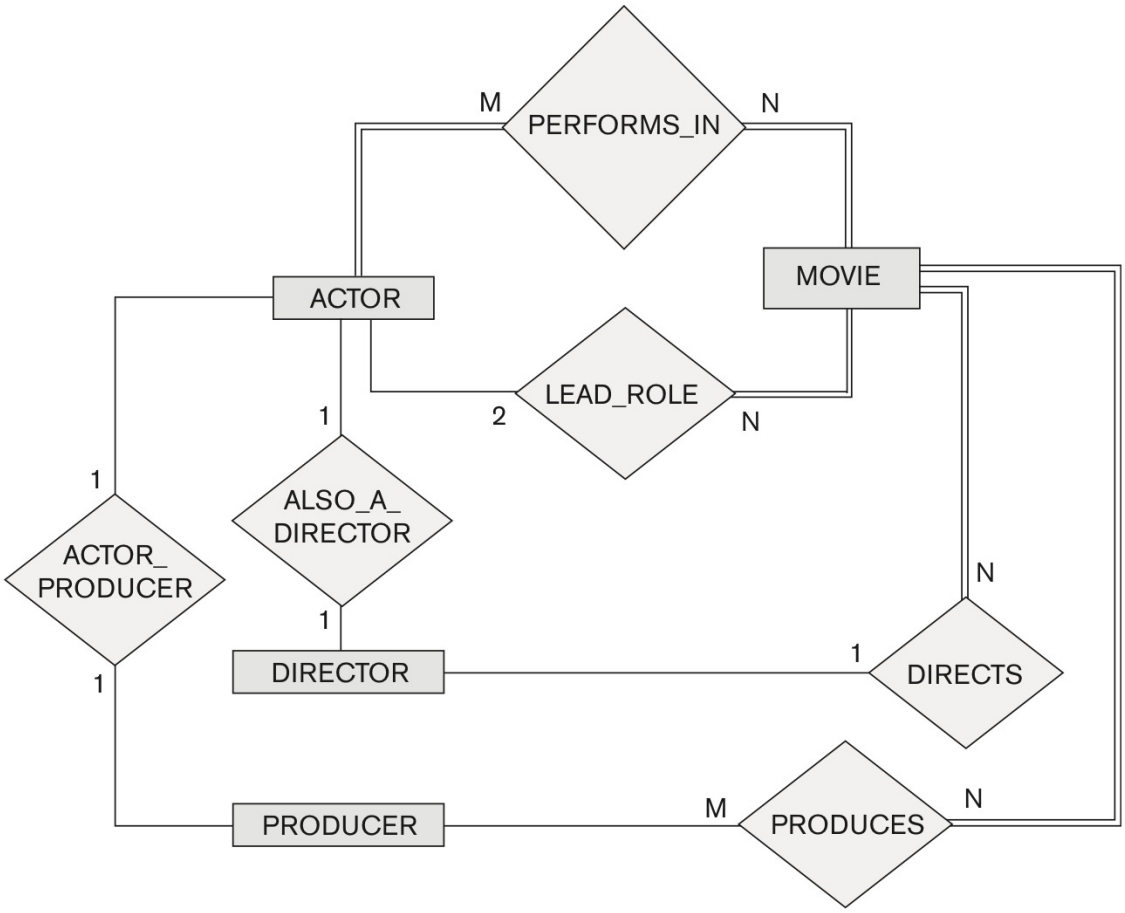

Figure 3.25 An ER diagram for a MOVIES database schema.

a. There are no actors in this database that have been in no movies.
b. There are some actors who have acted in more than ten movies.
c. Some actors have done a lead role in multiple movies.
d. A movie can have only a maximum of two lead actors.
e. Every director has been an actor in some movie.
f. No producer has ever been an actor.
g. There are movies with more than a dozen actors.
h. Some producers have been a director as well.
i. Most movies have one director but several producers.
j. There are some actors who have done a lead role, directed a movie, and produced a movie.

9. Given the ER schema for the movies database in Figure 3.25, draw instances for each entity: MOVIE, ACTOR, PRODUCER, DIRECTOR involved; make up instances of the relationships as they exist in reality for those movies.