

Please read all of Chapter 7 (except for Section 8) and Section 9.1 of the textbook and then answer the following, trying not to look at your notes or at the textbook. Quiz #4, on Wednesday 18th October, will consist exclusively of questions taken from the Part 1 of this homework.

## Part I — Short Questions

### Question 1

What could be a decomposition of an attribute used to store an email address? When could that be useful?

### Question 2

Draw the ER diagram for a “Computer” entity that has one multivalued attribute “Operating\_System”, a composite attribute “Devices” (decomposed into “Keyboard” and “Mouse”) and an “Id” key attribute.

### Question 3

Name one difference between a primary key in the relational model, and a key attribute in the ER model.

### Question 4

What is the difference between an entity type and a weak entity type?

### Question 5

What is the degree of a relationship type?

### Question 6

What is a self-referencing, or recursive, relationship type? Give two examples.

### Question 7

What does it mean for a binary relationship type “Owner” between entity types “Person” and “Computer” to have a cardinality ratio  $M : N$ ?

### Question 8

What are the two possible structural constraints on a relationship type?

### Question 9

Under what condition(s) can an attribute of a binary relationship type be migrated to become an attribute of one of the participating entity type?

### Question 10

What is a partial key?

### Question 11

For the following binary relationships, suggest cardinality ratios based on the common-sense meaning of the entity types.

Entity 1	Cardinality Ratio	Entity 2
STUDENT		MAJOR
CAR		TAG
INSTRUCTOR		LECTURE
INSTRUCTOR		OFFICE
COMPUTER		OPERATING_SYSTEM

### Question 12

Give an example of a binary relationship type of cardinality  $1 : N$ .

**Question 13**

Draw an ER diagram with a single entity type, with two stored attributes and one derived attribute. In your answer, it should be clear that the value for the derived attribute will always be obtained from the value(s) for the other attribute(s).

**Question 14**

Draw an ER diagram expressing the total participation of an entity type “Burger” in a binary relation “Contains” between “Burger” and “Ingredient”. What would be the ratio of such a relation?

**Question 15**

Why do weak entity type have a total participation constraint?



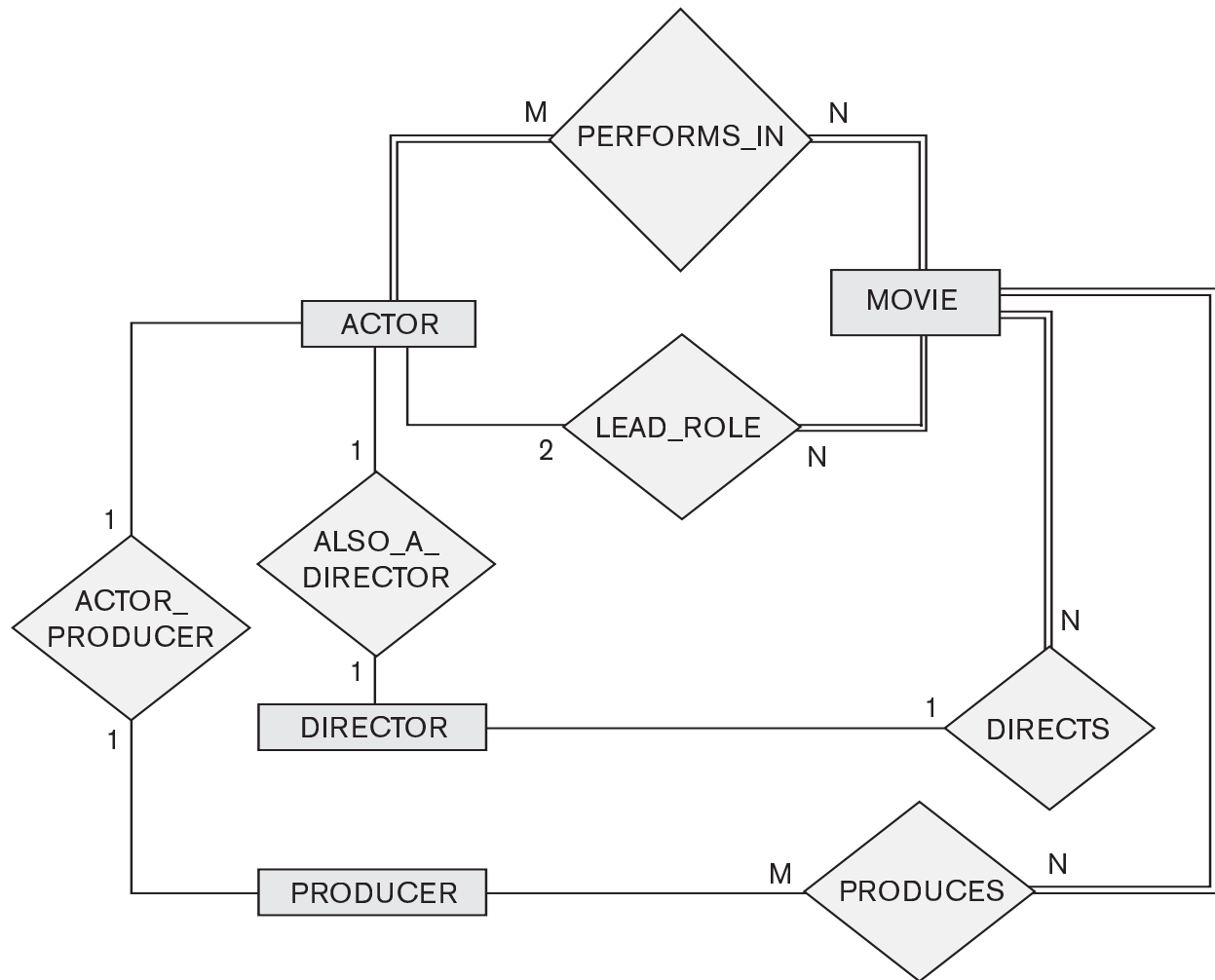


Figure 1: An ER diagram for a MOVIES database schema.

## Part II — Problem

This part will help you in assessing your level of understanding of this lecture, and give you an idea of the kind of problem you will be asked to solve during the exams. I'll assume that you will have successfully completed those three problems by the time Homework #5 is released (Wednesday 18th October), so don't wait and let me know if you had difficulties solving them.

### Problem 1

Consider the ER schema for the MOVIES database in Figure 1.

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* or *False*. Justify each answer.

- There are no actors in this database that have been in no movies.
- There might be actors who have acted in more than ten movies.
- Some actors could have done a lead role in multiple movies.

- (d) A movie can have only a maximum of two lead actors.
- (e) Every director have to have been an actor in some movie.
- (f) No producer has ever been an actor.
- (g) A producer cannot be an actor in some other movie.
- (h) There could be movies with more than a dozen actors.
- (i) Producers can be directors as well.
- (j) A movie can have one director and one producer.
- (k) A movie could have one director and several producers.
- (l) There could be some actors who have done a lead role, directed a movie, and produced some movie.
- (m) It is impossible for a director to play in the movie (s)he directed.

**Problem 2**

Draw the ER diagram for the following situation: A car-insurance company wants to have a database of accidents. An accident involves cars, drivers, and it has several aspects: the moment and place where it took place, the amount of damages, and a (unique) report number. A car has a license, a model, a year, and an owner. A driver has an id, an age, a name, and an address.

One of the interesting choice is: should “accident” be an entity type or a relationship type?

**Problem 3**

Apply the ER-to-Relation mapping to your ER diagram from the previous problem.