

Please read Sections 7–7.7, 7.9–7.10 and 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 7th March, will consist of questions taken or inspired from Part I and Part II of this homework.

Part I — Questions

1. What could be the decomposition of an attribute used to store an email address? When could that be useful?
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.
3. Name one difference between a primary key in the relational model, and a key attribute in the ER model.
4. What is the difference between an entity type and a weak entity type?
5. What is the degree of a relationship type?
6. What is a self-referencing, or recursive, relationship type? Give two examples.
7. What does it mean for a binary relationship type “Owner” between entity types “Person” and “Computer” to have a cardinality ration $M : N$?
8. What are the two possible structural constraints on a relationship type?
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?
10. What is a partial key?
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

12. Give an example of a binary relationship type of cardinality $1 : N$.
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).
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?
15. Why do weak entity type have a total participation constraint?

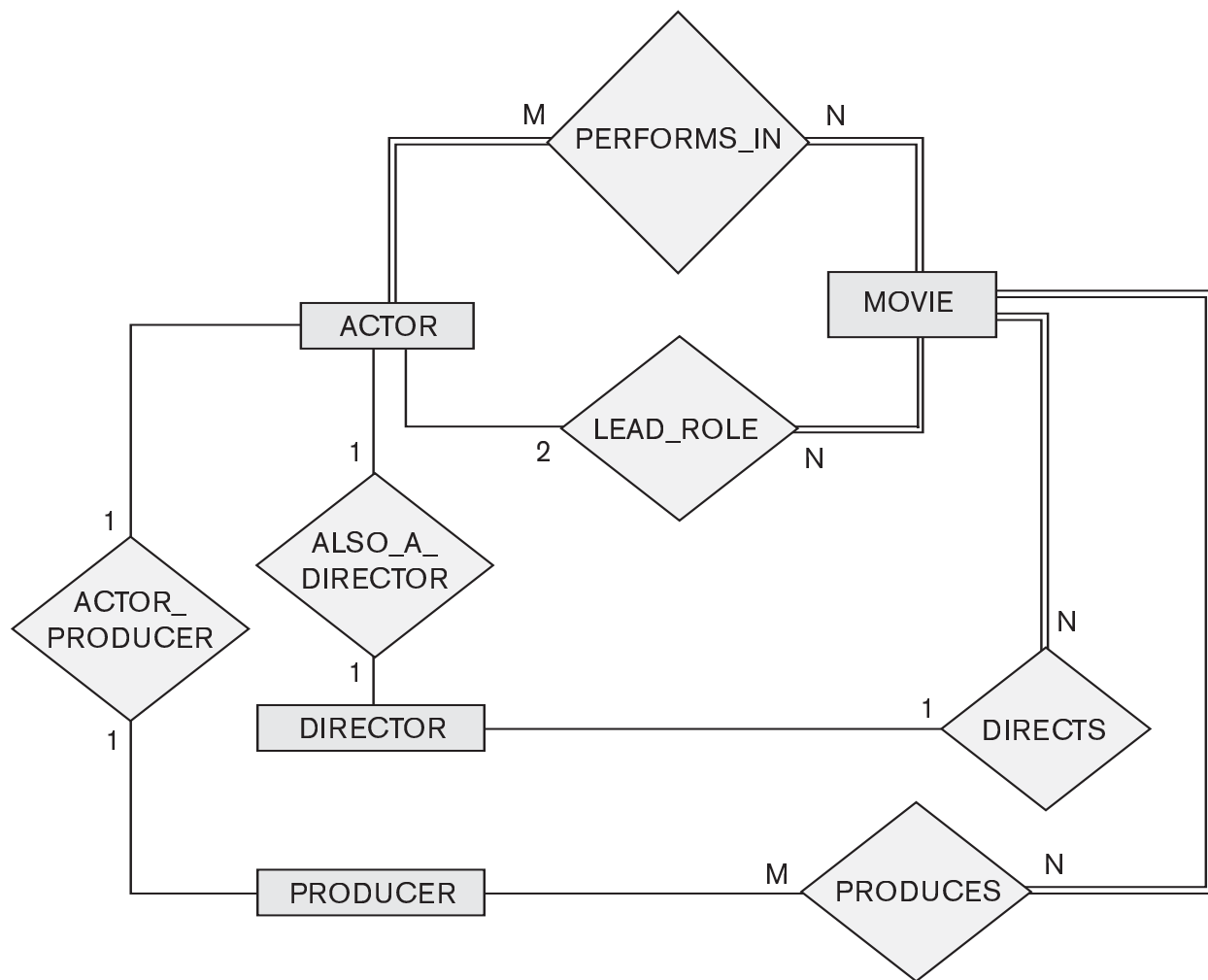


Figure 1: An ER diagram for a MOVIES database schema.

Part II — Problems

The three exercises from this homework requires some time to be completed. The first one will help you to become better at reading ER diagrams, the second will ask you to design one, and the last one will ask you to apply the algorithm to your ER diagram to obtain a relational model. These three exercises are similar to what you will be asked to do during the second exam.

I'll assume that you will have successfully completed them by the time Homework #5 is released (Wednesday 7th March), 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 gender-netral term. Given the constraints shown in the ER schema, respond to the following statements with *True* or *False*. Justify each answer.

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

4. A movie can have only a maximum of two lead actors.
5. Every director have to have been an actor in some movie.
6. No producer has ever been an actor.
7. A producer cannot be an actor in some other movie.
8. There could be movies with more than a dozen actors.
9. Producers can be directors as well.
10. A movie can have one director and one producer.
11. A movie can have one director and several producers.
12. There could be some actors who have done a lead role, directed a movie, and produced some movie.
13. 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.

