

Linnaeus University

Faculty of Technology – Department of Computer Science

2DV513 – Database Theory

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Database Theory Assignment 1

1. Movies DB.

- ❖ There are no actors in this database that have been in no movies.

Answer: False

Justification:

Firstly, we have many to many relationship ("Performs in"). between Actors and Movies entity sets Which means that when we have a relationship that is many to many the meaning is that more than 1 entity from one set is connected to more than 1 entity from the other set.

- ❖ There are some actors who have acted in more than ten movies.

Answer: Maybe

Justification:

As it has been covered in the above justification, when there is no arrow, it means that more than 1 entity from one set is connected to more than 1 entity from the other set. In this case, an actor can perform in more than ten movies. In this case, we have decided the answer is Maybe due to the reason that an actor can participate in more or less than 10 movies.

- ❖ Some actors have done a lead role in multiple movies.

Answer: True

Justification:

In this case, we have a many-to-one relationship here. That is, if we read it from the Actors entity set to the Movies entity set, each actor can have a lead role in zero, one, or many movies. Therefore, the above statement is true.

- ❖ A movie can have only a maximum of two lead actors.

Answer: False

Justification:

In this case, we have a many-to-one relationship ("Lead role") here. As a result, if we read it from the Movie's entity set to the Actors entity set, it means that each movie has at most 1 actor who has a lead role position.

- ❖ Every director has been an actor in some movie.

Answer: False

Justification:

The relationship ("Also a director") here is one-to-one from both sides. Consequently, since it has been said every director has been an actor in some movies, which means that many directors, based on the arrow, at most one director can also be an actor. In other words, if we consider the relation (Also a director) between two entity sets (Actors and Directors), it can be concluded that an actor who is also considered a director, should have a connection to the Directors entity sets. That is why the answer is false.

- ❖ No producer has ever been an actor.

Answer: False.

Justification:

If we look at the relation (“Actor, producer”) between Actors and Producers entity sets, it can be concluded that it is one-to-one. What can be understood here is that at most 1 Producer can also be an actor. Due to the reason that in the requirements it has been mentioned “No producer has ever”, it would make this statement false because it can be both zero and one.

- ❖ A producer cannot be an actor in some other movie.

Answer: False.

Justification:

As it has been mentioned in the previous justification, the relation is one-to-one. Therefore, there is a case when a producer can be an actor in some other movies.

- ❖ There are movies with more than a dozen actors.

Answer: True.

Justification:

Firstly, the relation is many to many. Therefore, it is logical to say that a movie can have a dozen actors. However, the exact count of the actors has not been specified.

- ❖ Some producers have been a director as well.

Answer: Maybe.

Justification:

A producer can be a director with the condition of being also an actor. Therefore, this statement could be true, and the relationship would be one-to-one. On the other hand, if we assume that a producer is not considered an actor, in this case, that product cannot be also a director.

- ❖ Most movies have one director and one producer.

Answer: False.

Justification:

Considering the relation (“Produces”) between Producers and Movies entity sets which is many to many, a movie can have many producers. On the other hand, what can be understood is that a movie can be directed by at most 1 director which will make this part of the statement true. However, based on the requirements, it has said that “one director and one producer”, it is pointing that most movies must have one director and one producer. As a result, it would make this statement false.

- ❖ Some movies have one director but several producers.

Answer: True.

Justification:

Let’s begin with the relation between Movies and directors’ entity sets. It is one too many. Also, if we read from directors to movies, it means that each director can direct 0,1, or many movies. Moving on, the other relation between Producer and Movies entity sets is many to many. As a result, a movie can have several producers. Since all the statements here are meeting the requirements, this statement is true.

- ❖ There are some actors who have done a lead role, directed a movie, and produced a movie.

Answer: True.

Justification:

Starting by the relation between movies and Actors' entity sets which are many to one, it is understandable that an actor can have zero, 1, or many lead roles in a movie. Based on the relation between the Actors, Directors, and Producer's entity sets, an actor can be also a director and producer.

- ❖ No movie has a director who also acted in that movie.

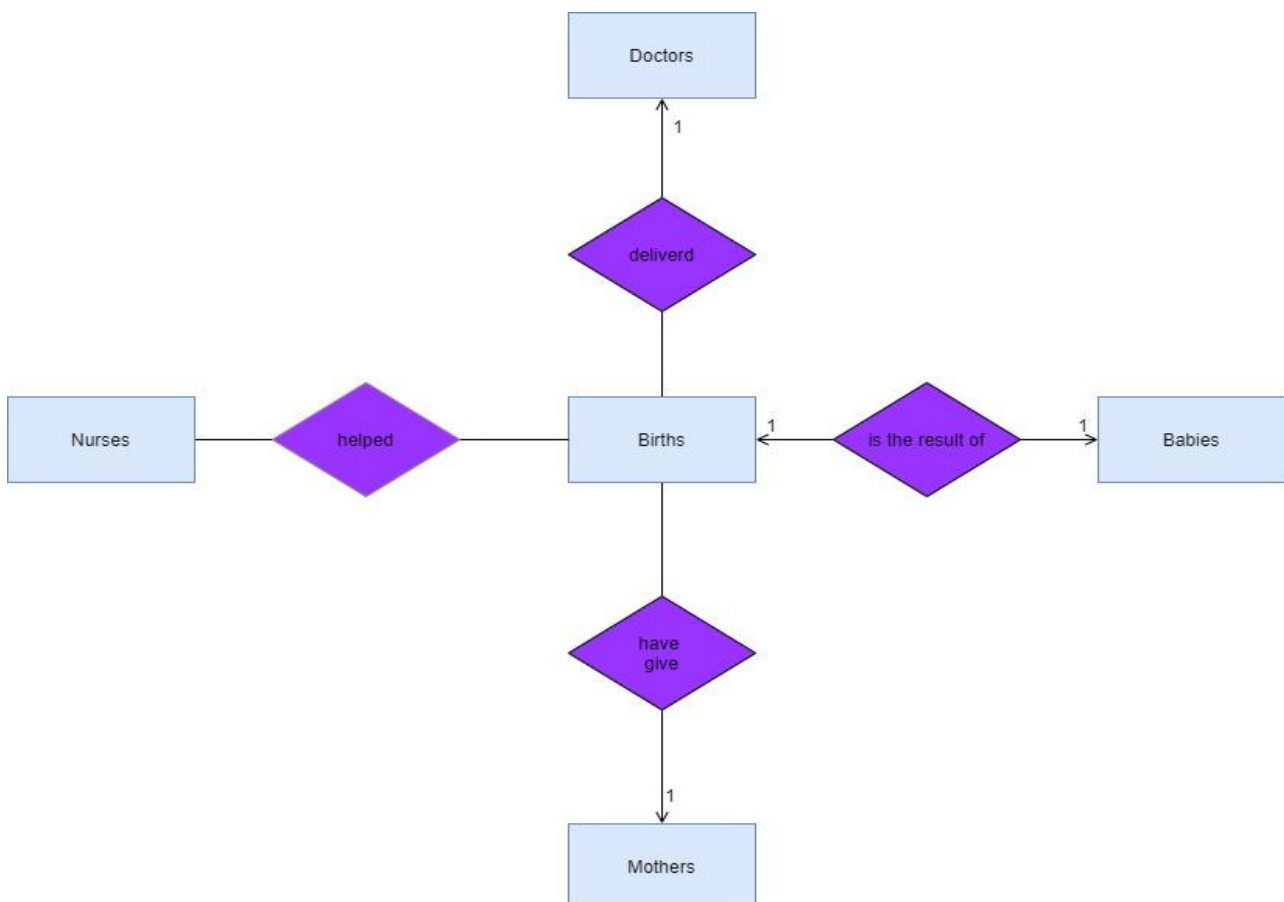
Answer: Maybe.

Justification:

A movie can be directed by at most 1 director, while a movie can have many actors. Since there is a relation between director and actor entity sets, an actor can also be a director. In conclusion, there is a possibility that a director can also be an actor in the same movie. Therefore, there is no definite answer (true, false).

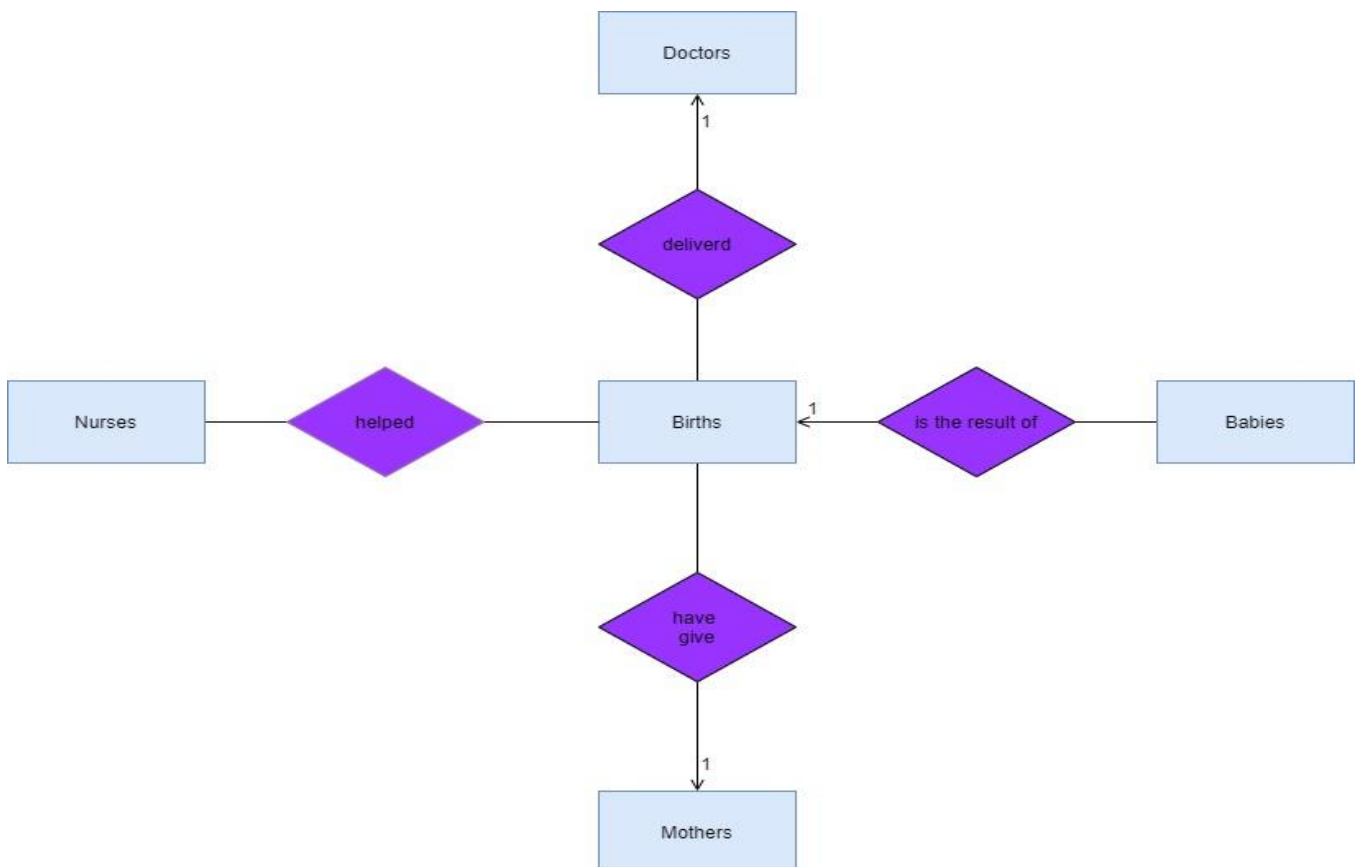
2. Births (DBS 2.2.6 and 2.2.7).

- Every baby is the result of a unique birth, and every birth is of a unique baby.
- In addition to (1), every baby has a unique mother.
- In addition to (1) and (2), for every birth there is a unique doctor.



❖ In each case, what design flaws do you see?

1. When it comes to the relation between the nurse and the births, it has not been specifically determined that what multiplicity has been used in this relation. Therefore, the current relationship is many to many.
 2. If we look at the diagram, if we start reading the ER model from babies to births and births to mothers, since we are only having four binary relationships between the entity sets, it has made some parts unclear. For example, if there was a relation between mothers to babies (direct connection), it would have made this model clearer since we could have said this mother has this baby.
 3. Based on our model, the relation between births and mothers is many to one (only one). Moving on, based on the multiplicity, a mother cannot have more than one baby (twins).
- ❖ Suppose we change our viewpoint to allow a birth to involve more than one baby born to one mother. How would you represent the fact that every baby still has a unique mother?



❖ Justifications:

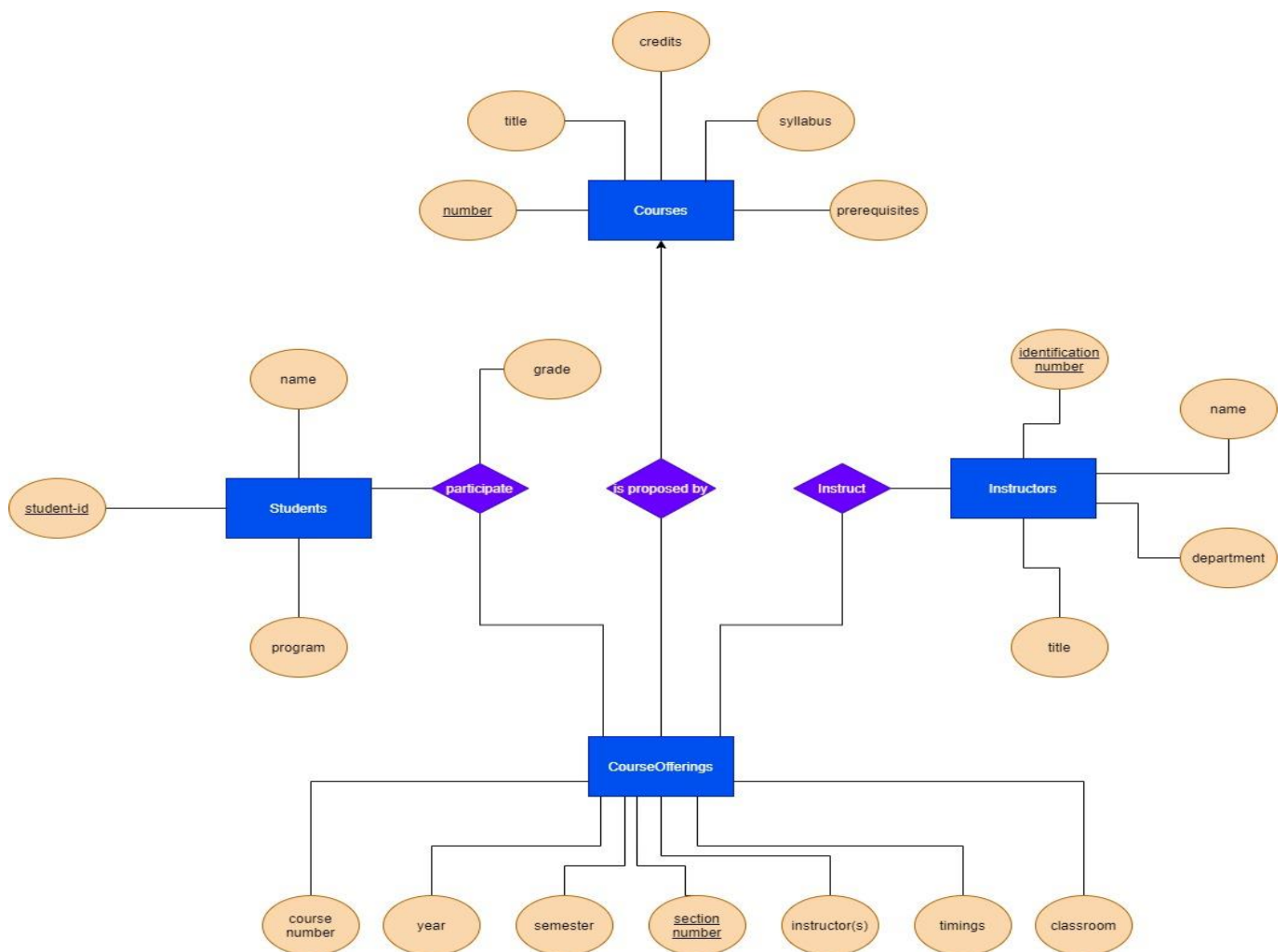
1. Regarding the relation between births and babies, based on the new model, each mother can give birth to one and more than one baby. As a result, by looking at the multiplicities, a mother is designated with a rounded arrow. Consequently, no matter how many babies are born, the mother will remain unique since it is many to one (only one).

❖ Conclusion:

Since in the requirements it has mentioned that “a birth to involve more than one baby born to one mother”, not only the new model will correspond to this condition, but it will also remain true that each baby still has a unique mother.

3. The registrar's office (DSC 6.2).

❖ E/R diagram:



Justification:

- ◆ By looking at the relationship between course offerings and courses entity sets, the relation is many to one. Generally, a course can be offered and studied in different semesters and forms. As a result, we can have a variety of instances based on one course. Consequently, due to the above explanation, the relation between course offerings and courses is many to one.
- ◆ Considering the relation between the students and course offerings entity sets, the relation is many to many. Therefore, each student can participate in many course offerings. On the other hand, many course offerings can have many students enrolled in that course offering.
- ◆ The relation between the course offerings and the instructor's entity sets is many to many. Therefore, some course offerings can be instructed by many instructors and some instructors can instruct some course offerings.
- ◆ Grades entity set:

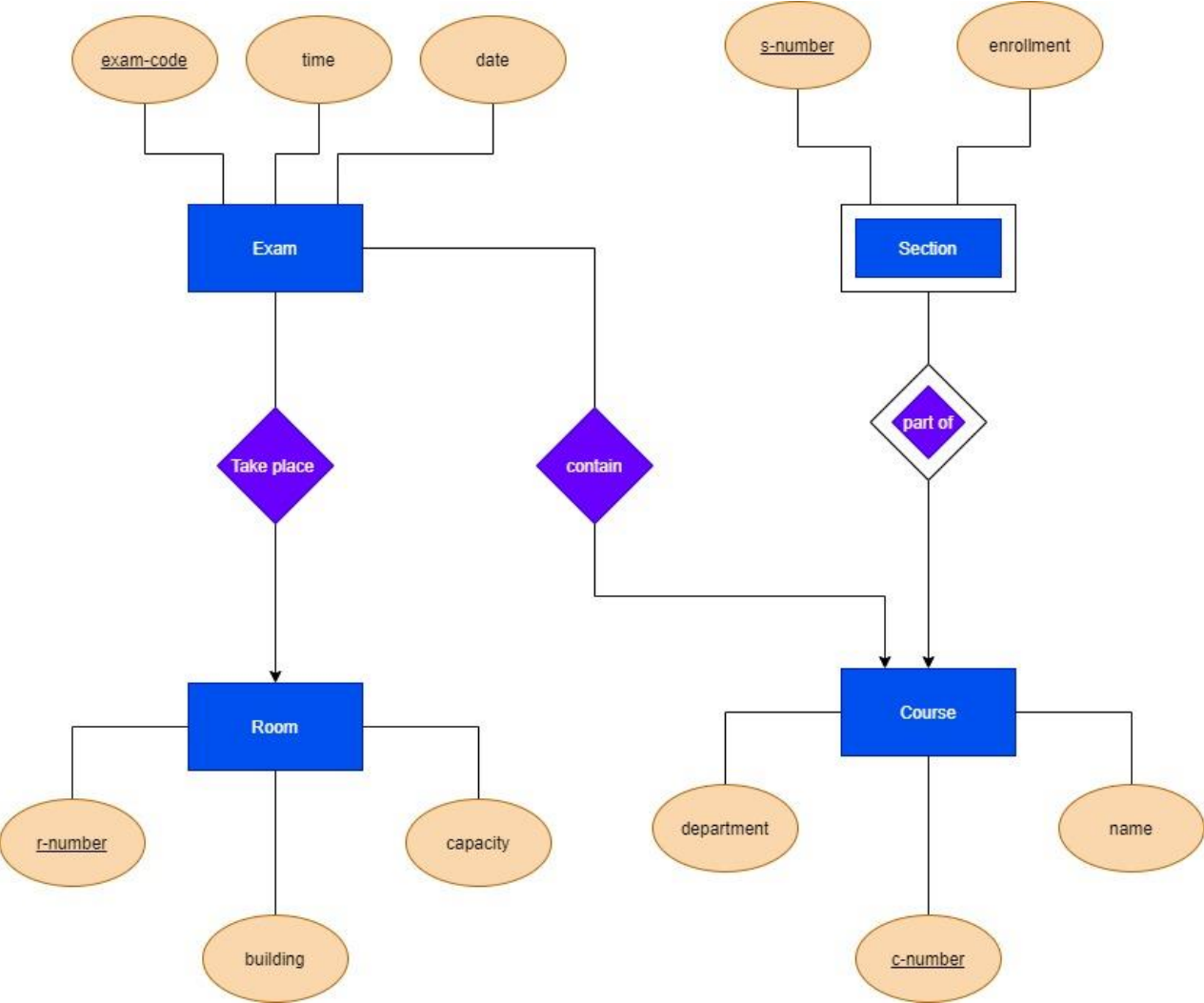
In our model, we have handled the grade of a student by using an attribute on the relationship (“participate”). Also, not many attributes are needed for the grade attribute such as score, or bonus points. However, the usage of the grade attribute here is that grade is a function of both the students and the course offerings, not just one of them.

◆ Student enrollment:

Based on the above model. The relation is many to many between students and course offerings entity sets. Generally, when there is no sign of any arrows, what can be understood is that zero is not considered here. Therefore, handling the student’s enrollment has been covered in the above E/R diagram.

4. Classroom scheduling (DSC 6.6).

❖ E/R diagram:



Assumptions:

1. Exam and Room:

The relation here is many to one. Therefore, if we read it from the Exam entity set to the Room, it would be each exam take a place in at most 1 Room. Because we have assumed that an exam will occur in one room. On the other hand, inside a room, 0, 1 or many exams can take a place.

2. Course and Exam:

Considering the relation, in this case, it is many to one. As a result, each exam belongs to at most one course. On the other hand, each course can have 0, 1, or many exams.

3. Section and Course:

Firstly, we have a weak entity set here. Consequently, a course is thought of to be able to have 0, or many sections. However, a section is required to have at least one course which will be considered as its weak entity.

Explain what application characteristics would influence a decision to include or not include each of the additional entity sets:

While constructing the above model, the entire latest entity sets (Room, Course, and section) that were built from the attributes which belonged to the exam entity have been included in the model. The primary point in the above E/R diagram is to not be considered extremely dependent on the course's particular information. considering the course entity set, it can happen that some courses may not contain any exams. A key advantage of the identifier is that they are exclusive, and the entity sets are connected to them. However, when it comes to the functionality, each control dissimilar data. As a result, it has the ability for later modification. Also, it will not cause any disturbance for the other entities. Moving on if we considered that the entity set "course" does not have its attributes. Consequently, if we add them to the exam entity set, then it causes misunderstandings and it would make it hard to uphold the data on courses.