

Database Technology

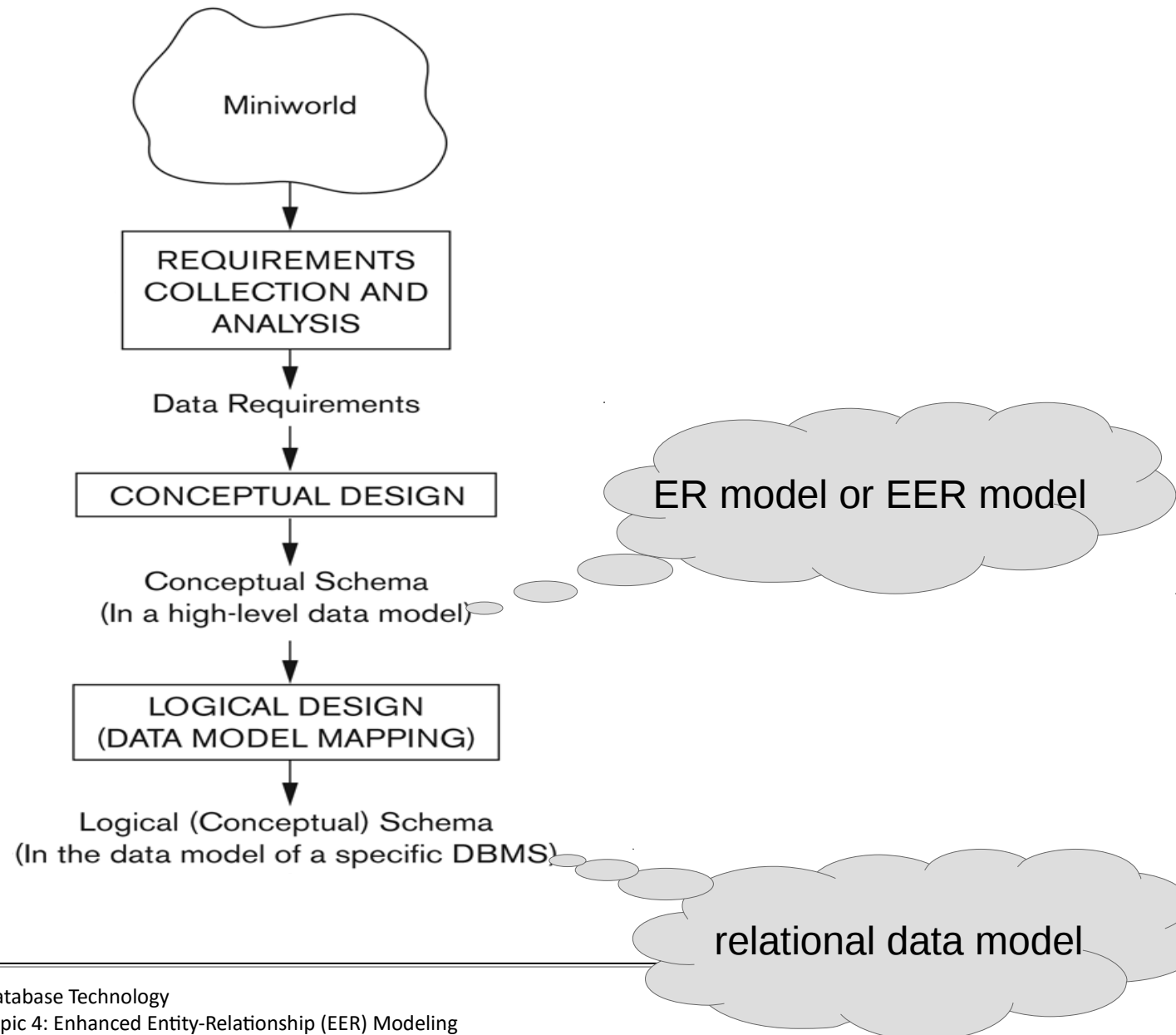
Topic 4: Enhanced Entity-Relationship (EER) Model

Topic 5: Mapping of EER Diagrams to Relational DBs

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Recall: DB Design Process





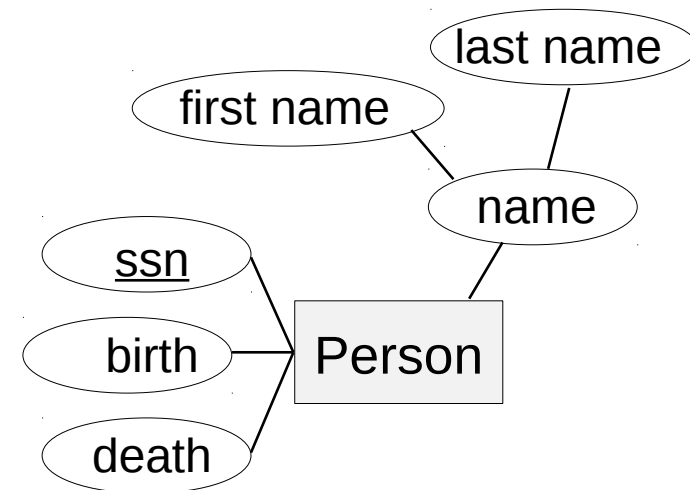
(E)ER Modeling

ER Concepts

Quiz

Consider the attribute name in the ER diagram given below.
How do we call such attributes?

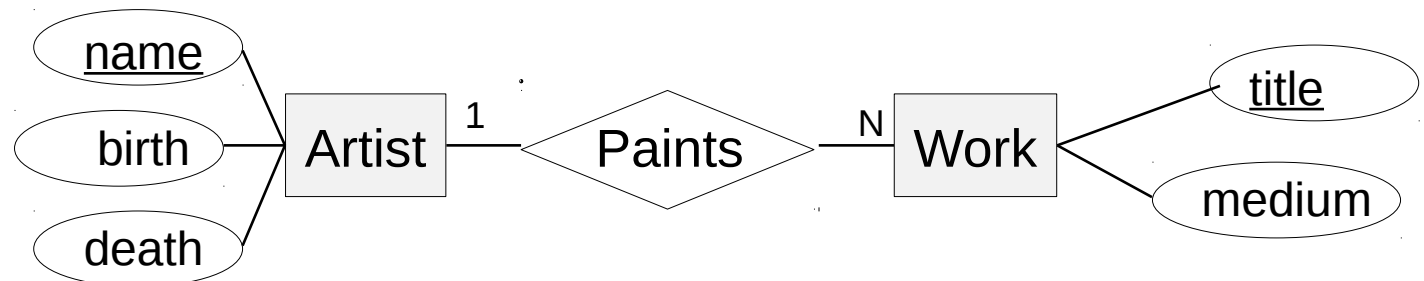
- A. multi-valued attributes
- B. derived attributes
- C. composite attributes
- D. key attribute attributes
- E. foreign key attributes



Quiz

Assume that Alicia is an artist. Based on the given ER diagram, which of the following statements is *wrong*?

- A. Alicia may have painted five different works using the same medium.
- B. Alicia may have painted three works, each of them together with another artists.
- C. Alicia may not have painted any work at all.



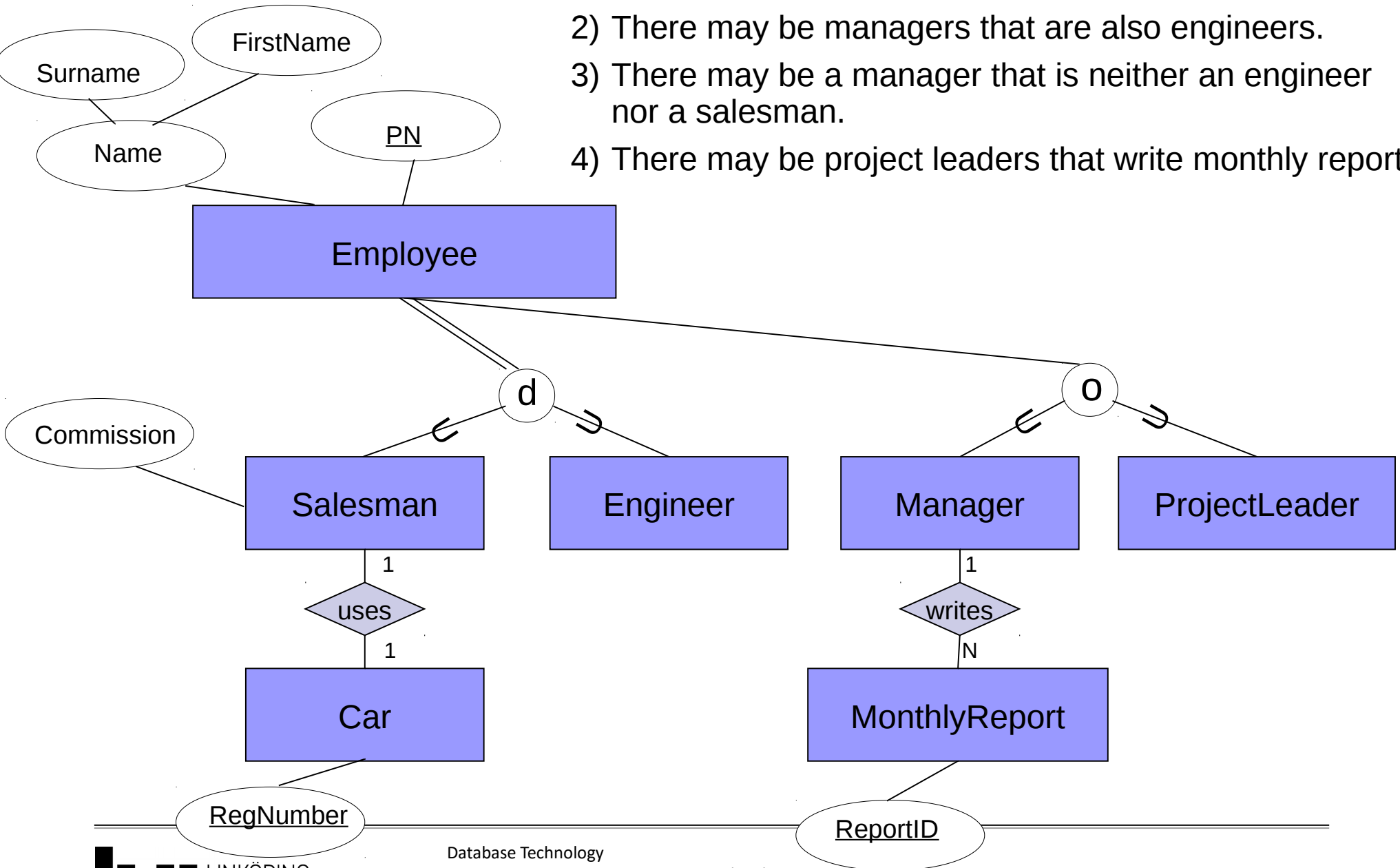
(E)ER Modeling

EER Concepts

Quiz

One of the following statements is *not* correct. Which one?

- 1) Every engineer has a personal number (PN).
- 2) There may be managers that are also engineers.
- 3) There may be a manager that is neither an engineer nor a salesman.
- 4) There may be project leaders that write monthly reports.



(E)ER Modeling

Example

Example

A taxi company needs to model their activities.

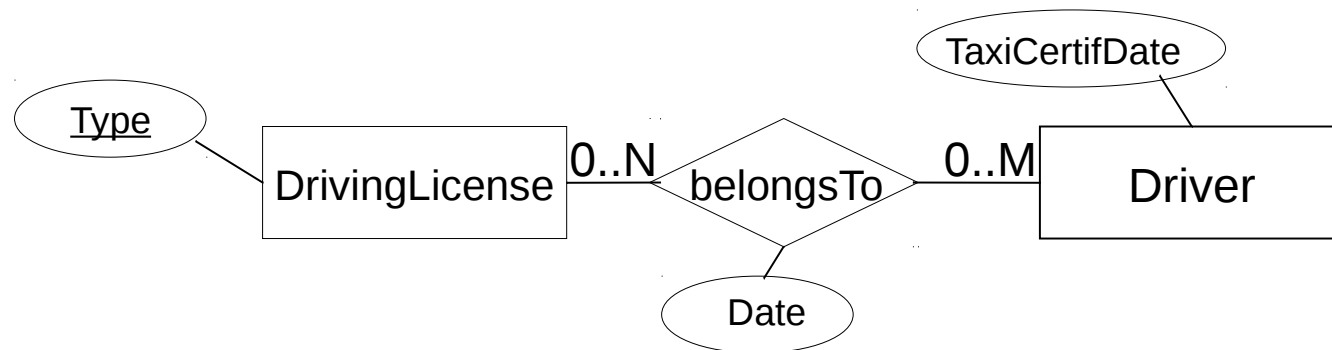
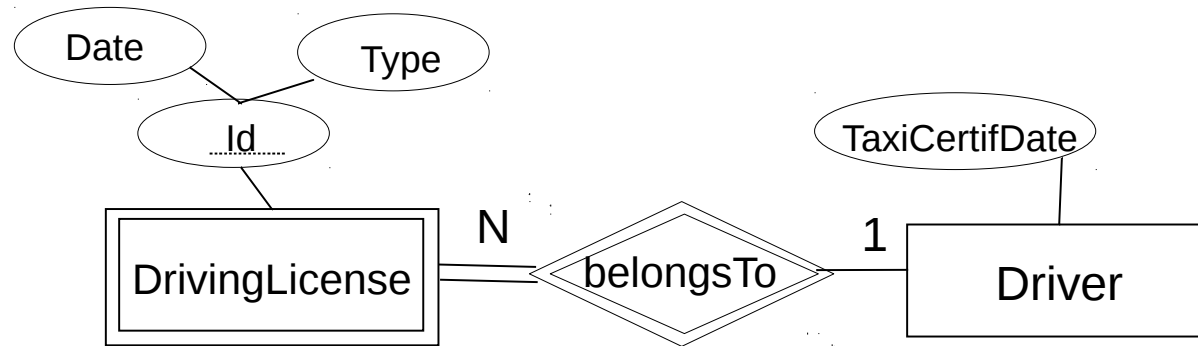
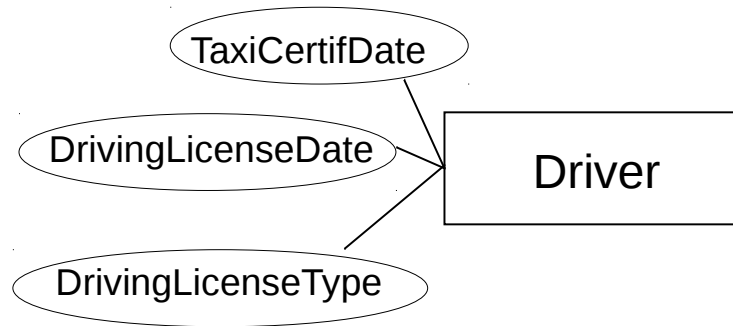
There are two types of **employees** in the company: **drivers** and **operators**. For drivers it is interesting to know the **date of issue** and **type** of the driving license, and the **date of issue** of the taxi driver's certificate. For all employees it is interesting to know their **personal number**, **address** and the available **phone numbers**.

The company owns a number of **cars**. For each car there is a need to know its **type**, **year of manufacturing**, **number of places** in the car and **date of the last service**.

The company wants to have a record of car **trips**. A taxi may be picked on a street or ordered through an **operator** who assigns the order to a certain **driver** and a **car**. **Departure** and **destination addresses** together with **times** should also be recorded.

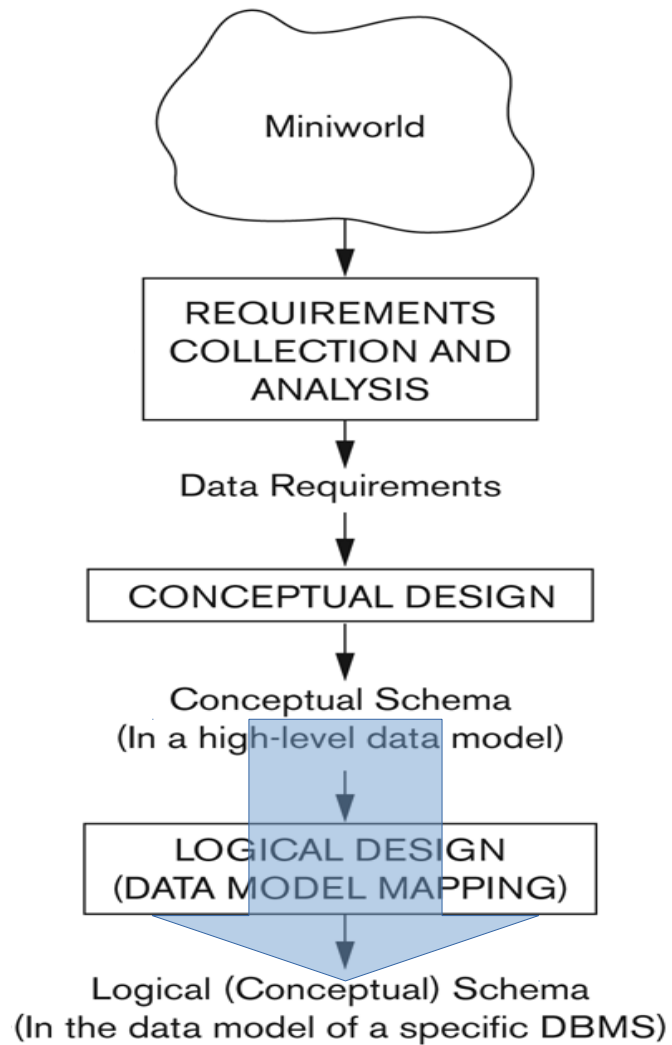
Example (cont'd)

A driver may have many driving licenses (types)



Translating an EER Diagram into a Relational Database

Recall: DB Design Process



Algorithm/Procedure for ER Diagrams

Step 1: Convert all regular entity types

Step 2: Convert all weak entity types

Step 3: Convert all 1:1 relationship types

Step 4: Convert all 1:N relationship types

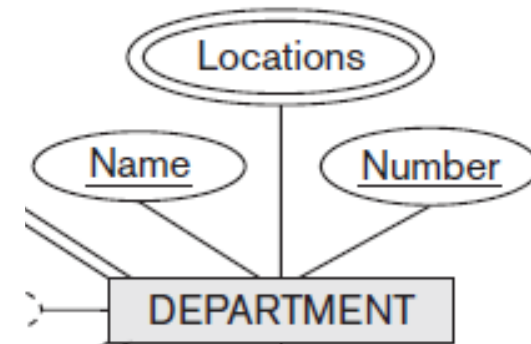
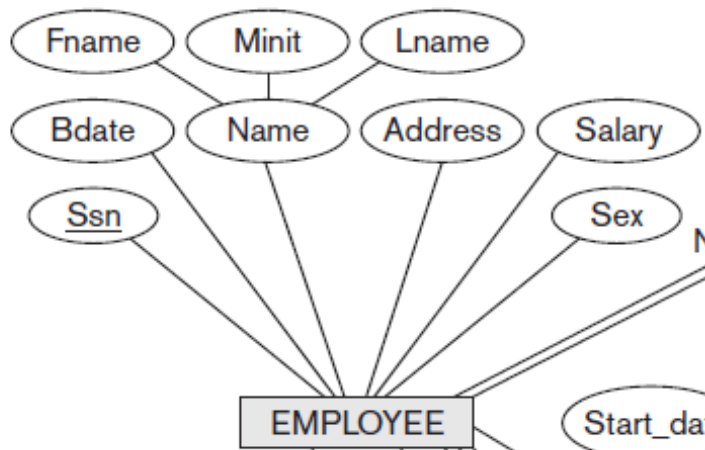
Step 5: Convert all remaining relationship types
(N:M, ternary, 4-ary, ...)

Step 6: Convert all multivalued attributes

Algorithm/Procedure for ER Diagrams

Step 1: Convert all regular entity types

- new relation, flatten composite attributes, ignore multivalued attributes



EMPLOYEE

Fname	Minit	Lname	<u>Ssn</u>	Bdate	Address	Sex	Salary
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DEPARTMENT

Dname	<u>Dnumber</u>
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Algorithm/Procedure for ER Diagrams

Step 1: Convert all regular entity types

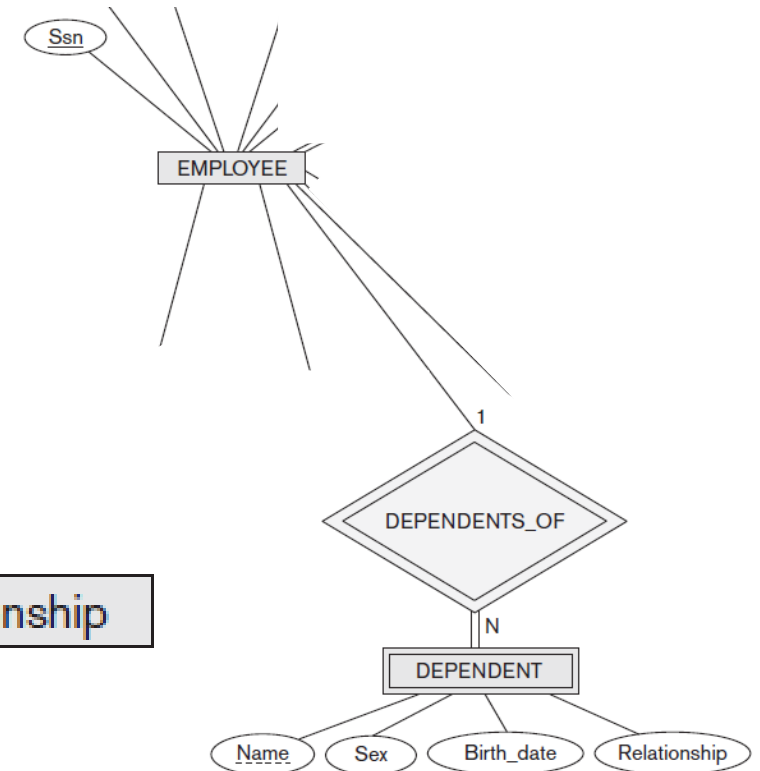
- new relation, flatten composite attributes, ignore multivalued attributes

Step 2: Convert all weak entity types

- new relation, attributes as above, include identifying relationship type(s)

DEPENDENT

<u>Essn</u>	<u>Dependent_name</u>	Sex	Bdate	Relationship
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Algorithm/Procedure for ER Diagrams

Step 1: Convert all regular entity types

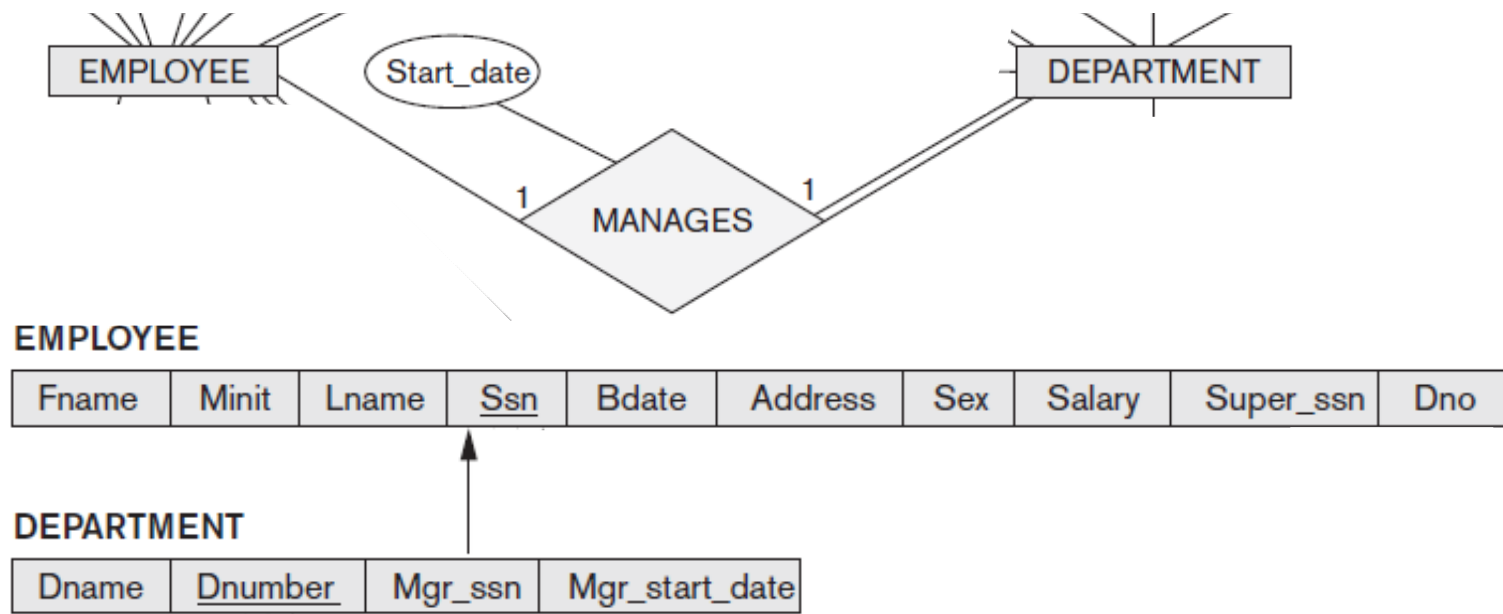
- new relation, flatten composite attributes, ignore multivalued attributes

Step 2: Convert all weak entity types

- new relation, attributes as above, include identifying relationship type(s)

Step 3: Convert all 1:1 relationship types

- foreign key into either relation, include attributes of the relationship



Algorithm/Procedure for ER Diagrams

Step 1: Convert all regular entity types

- new relation, flatten composite attributes, ignore multivalued attributes

Step 2: Convert all weak entity types

- new relation, attributes as above, include identifying relationship type(s)

Step 3: Convert all 1:1 relationship types

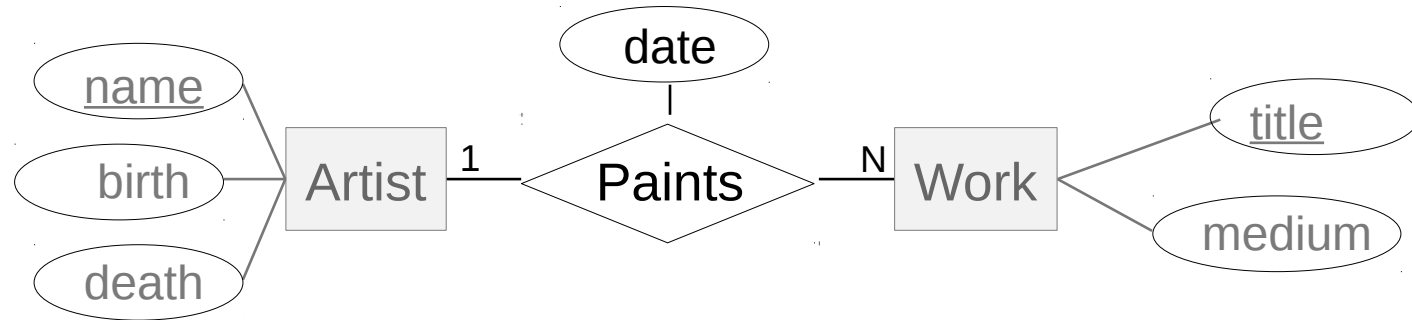
- foreign key into either relation, include attributes of the relationship

Step 4: Convert all 1:N relationship types

- see quiz ...

Quiz

Consider the given ER diagram and relational DB schema



Artist(name,birth,death), Work(title,medium)

The Paints relationship can be represented by:

- A. introducing a third schema: Paints(name,title,date)
- B. extending the Work schema to be Work(title,medium,name,date)
- C. extending the Artist schema to be Artist(name,birth,death,title,date)
- D. either A or B above
- E. any of A, B, or C above

Algorithm/Procedure for ER Diagrams

Step 1: Convert all regular entity types

- new relation, flatten composite attributes, ignore multivalued attributes

Step 2: Convert all weak entity types

- new relation, attributes as above, include identifying relationship type(s)

Step 3: Convert all 1:1 relationship types

- foreign key into either relation, include attributes of the relationship

Step 4: Convert all 1:N relationship types

- foreign key into *N*-side relation, include attributes of the relationship

Algorithm/Procedure for ER Diagrams

Step 1: Convert all regular entity types

- new relation, flatten composite attributes, ignore multivalued attributes

Step 2: Convert all weak entity types

- new relation, attributes as above, include identifying relationship type(s)

Step 3: Convert all 1:1 relationship types

- foreign key into either relation, include attributes of the relationship

Step 4: Convert all 1:N relationship types

- foreign key into *N*-side relation, include attributes of the relationship

Step 5: Convert all remaining relationship types (N:M, ternary, 4-ary, ...)

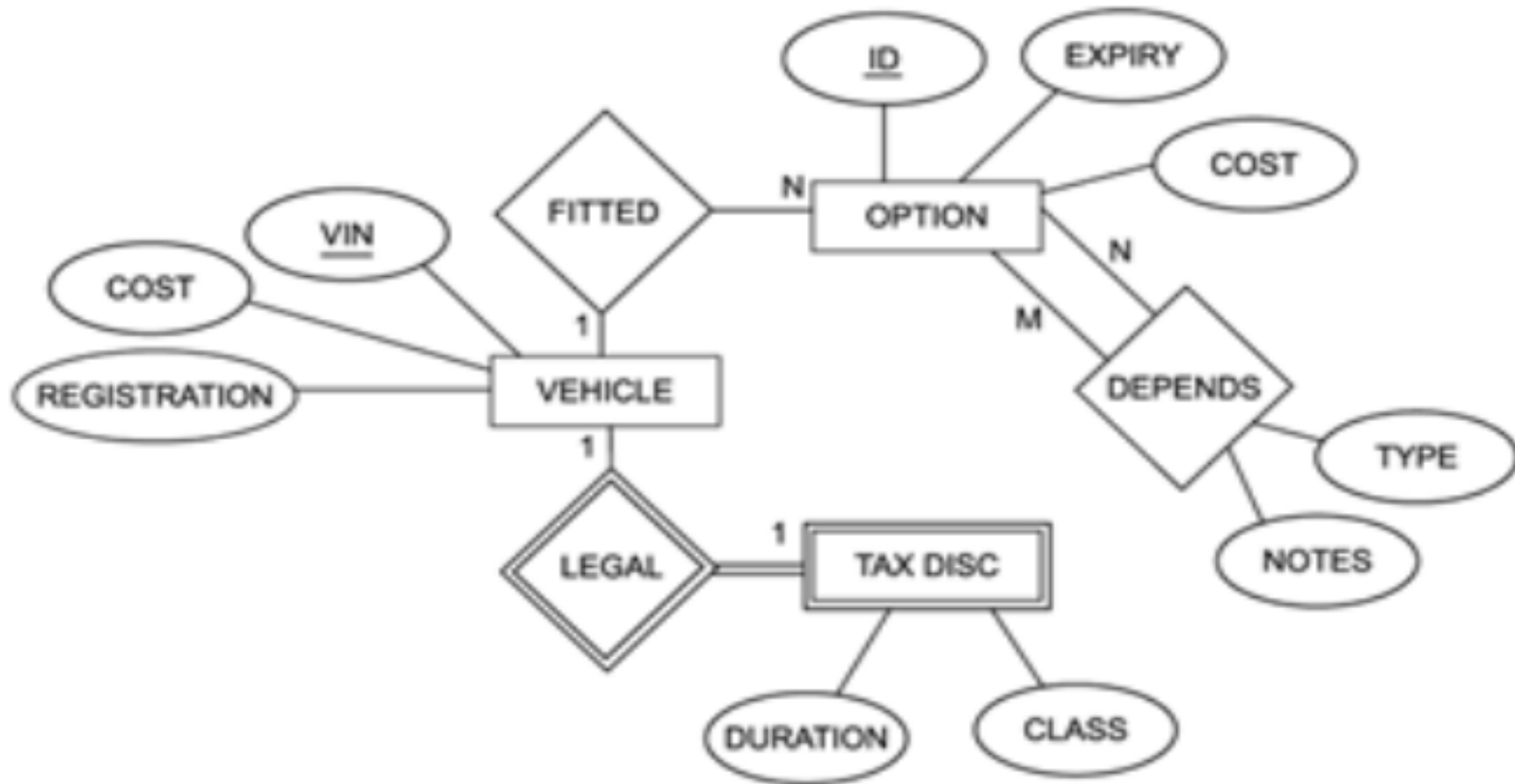
- new relation with foreign keys, include attributes of the relationship

Step 6: Convert all multivalued attributes

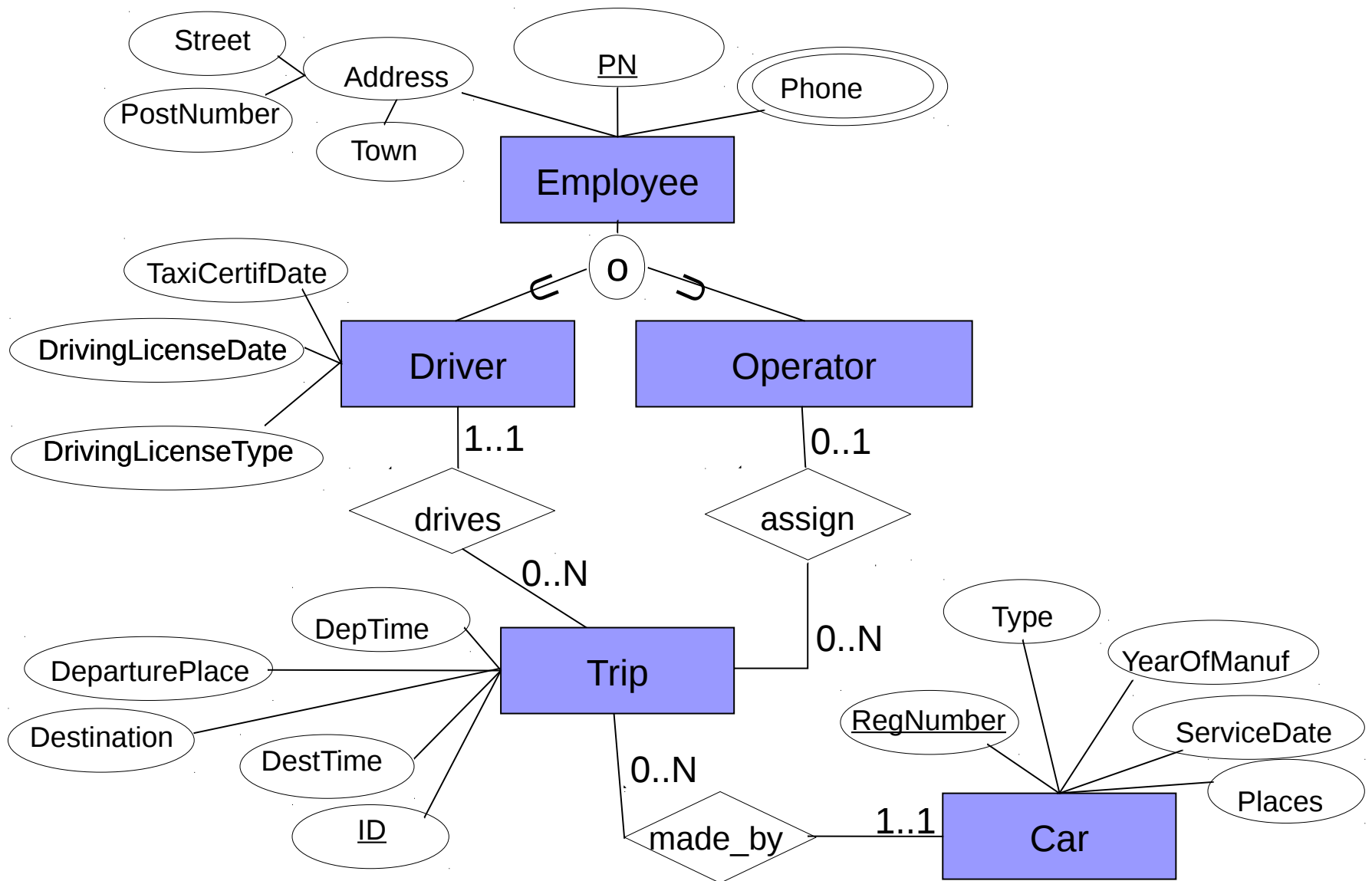
- new relation with foreign keys

Example

Translate the following ER Diagram into a relational database schema.



Example 2



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