UNIVERSITY of INFORMATION TECHNOLOGY
Faculty of Information Systems

Chapter 3

# Database Design

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# CONTENT

1. Entity-Relationship data model
   a. Entities, Attributes, entity sets
   b. Relationship and relationship sets
   c. Key
   d. Relationship cardinality
   e. Extended Entity-relationship model
2. Entity- Relationship model to Relational model
   a. Converting Class Hierarchies
   b. Converting Entity set to tables
   c. Converting Relationships
   d. Normalization

Review

# Entity-Relationship data model

# Entity Relationship Data Model (ERD)

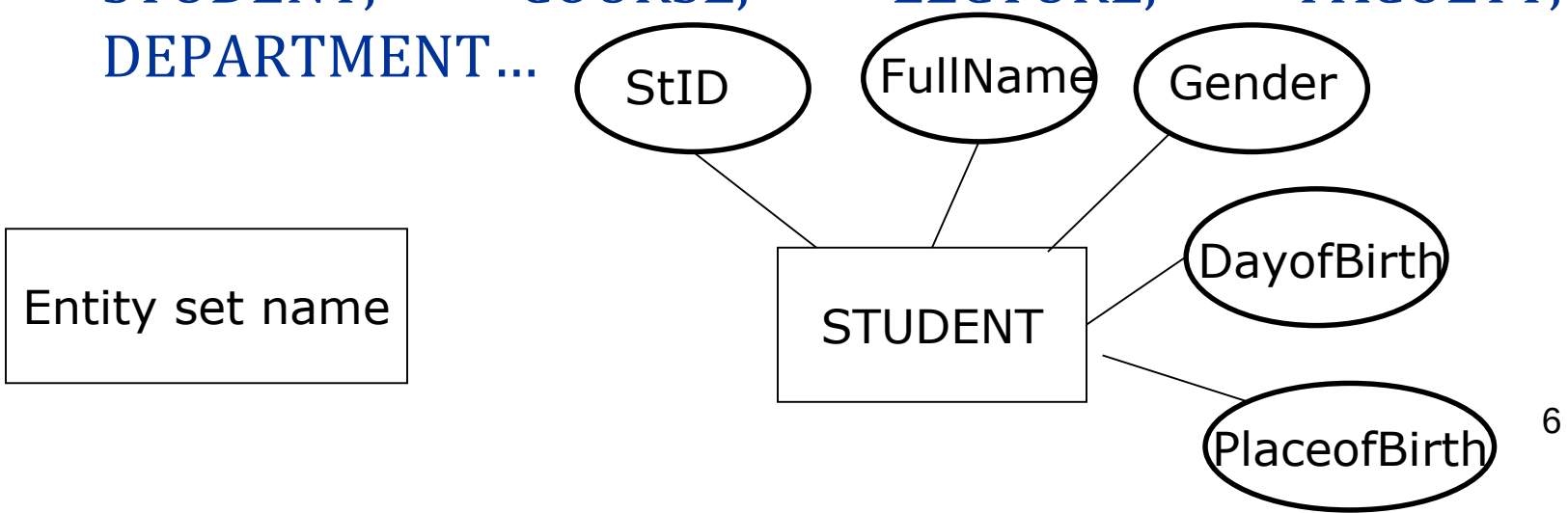
1. Entities, Attributes, entity sets
2. Relationship and relationship sets
3. Key
4. Participation constraints
5. Extended Entity-relationship model

# Entity Relationship Data Model (ERD)

- Entity Relationship Data Model (ERD) invented by Peter Pin_Shan CHEN in 1976.
- ERD decribes the data in a real-world enterprise in terms of objects and their relationships.
- ERD is used for database design in the logical design

# Entities, Attributes, entity sets

- Entity:
  - an object in the real world.
  - A Student with some attributes: (16520098, Nguyen Van Manh, 1.1.1990)
- Entity set:
  - a collection of entity.
  - STUDENT, COURSE, LECTURE, FACULTY, DEPARTMENT…

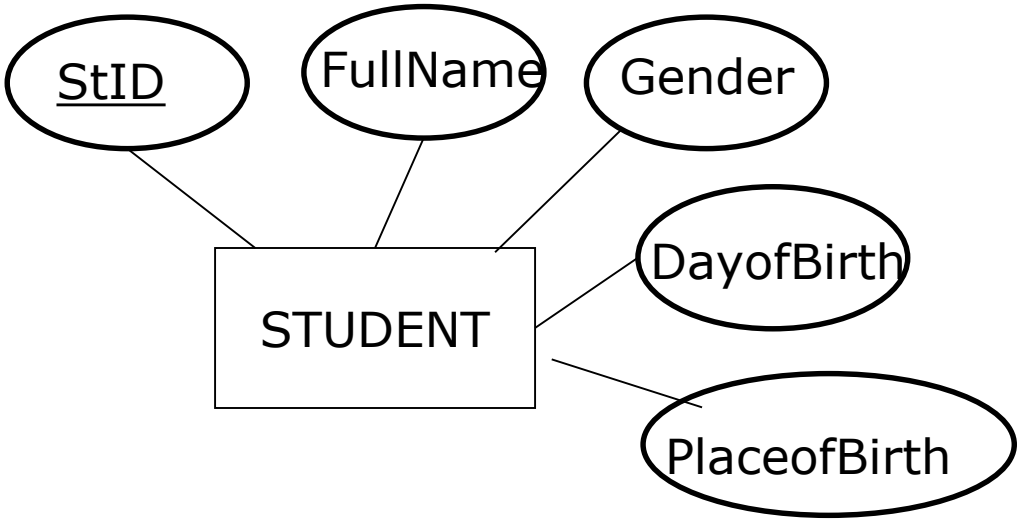


# Types of Attribute

- Simple
  - Unique value.
  - StudentID, NameofCourse, NumberofCredit,…
- Composite
  - The value of attribute can be devided into some various different parts
  - Example:
    - Address: (house number, Street, District, City, Country);
    - Name (FirstName, MidName, LastName).
- Multi-valued
  - The value of attribute can have various values for one entity
  - Example: Certificate
- Derived
  - The value of attribute can be calculated from other attributes

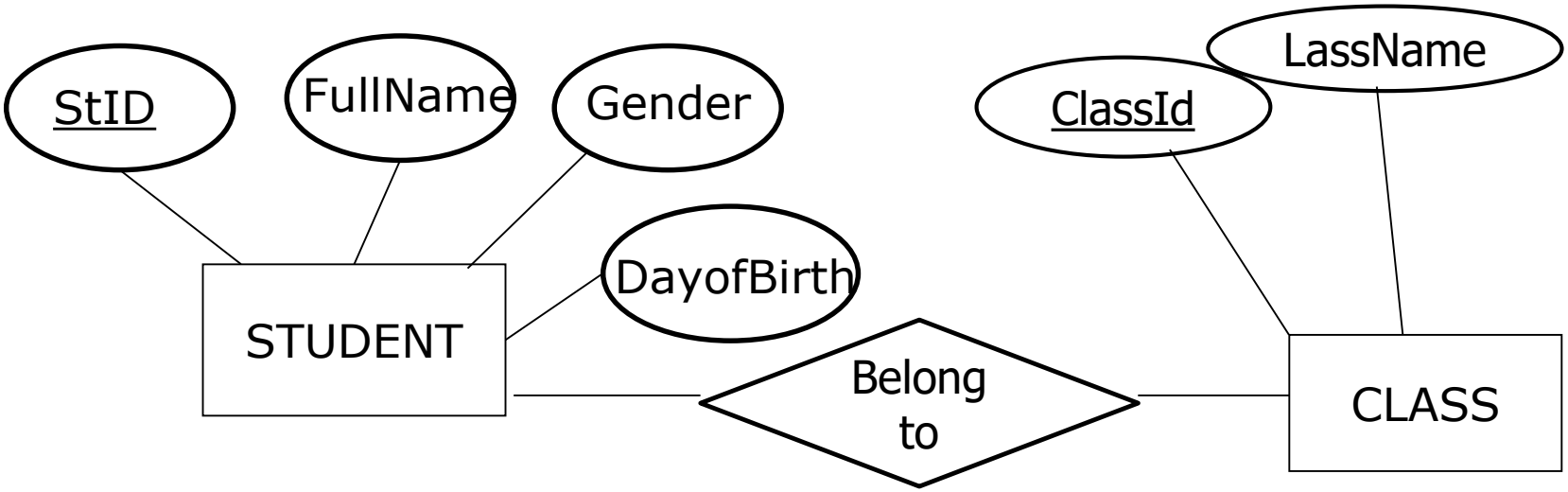
# Key of an entity set

- Key is a minimal set of attributes whose values uniquely identify an entity in the set
- Each student has an unique StudentID



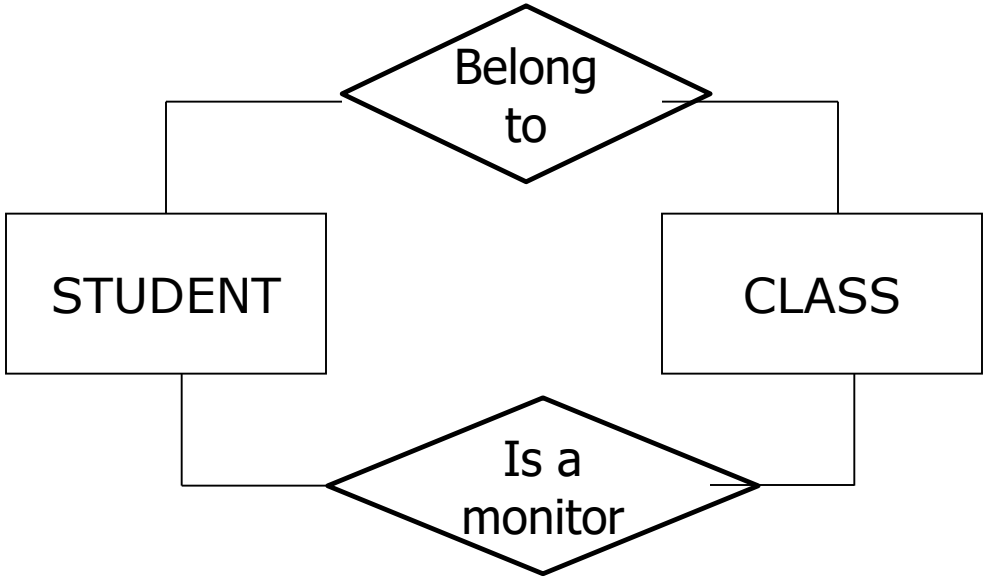
# Relationship Sets

- A relationship is an association among 2 or more entities. Ex: Student A belongs to the class named IS2016
- A set of similar relationship is a relationship set

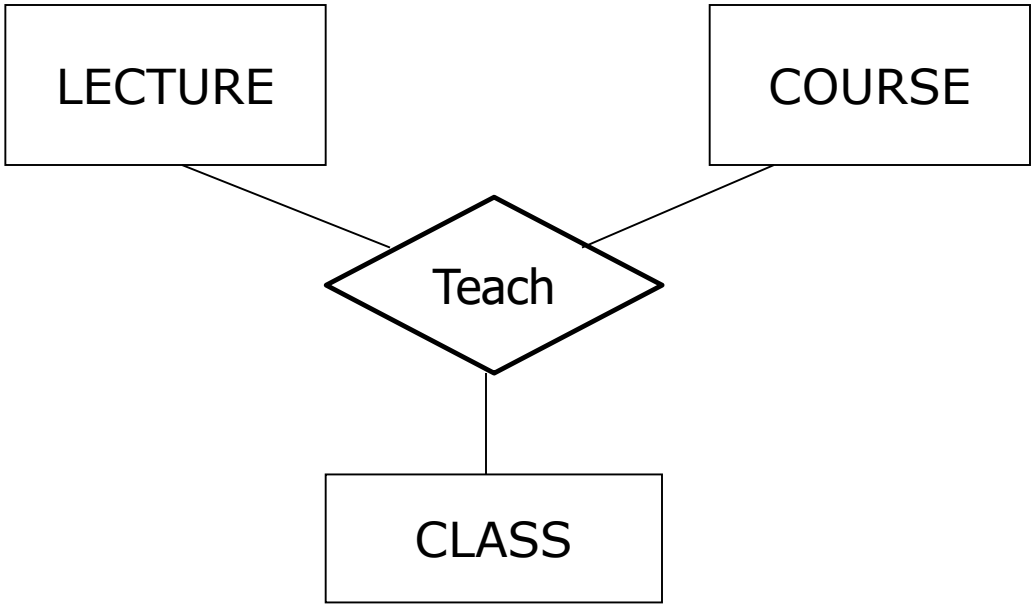


# Relationship Sets

- Among entities may have more than one relationship set

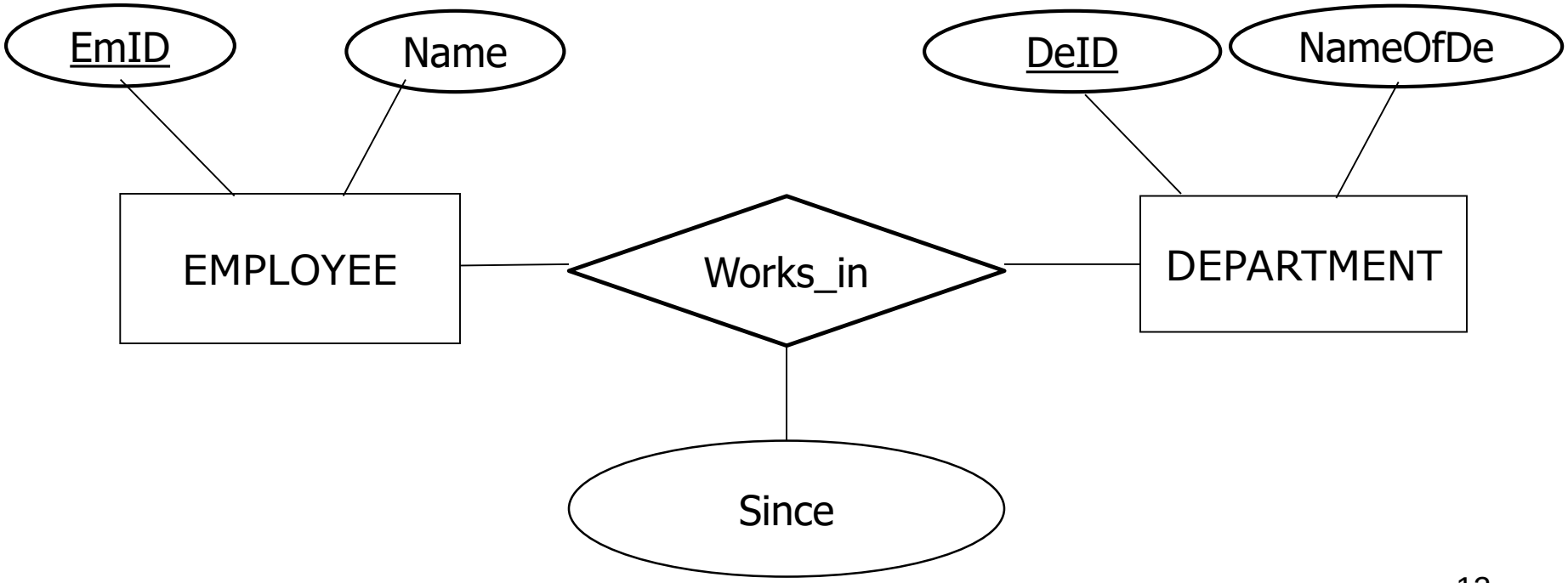


# Relationship Sets

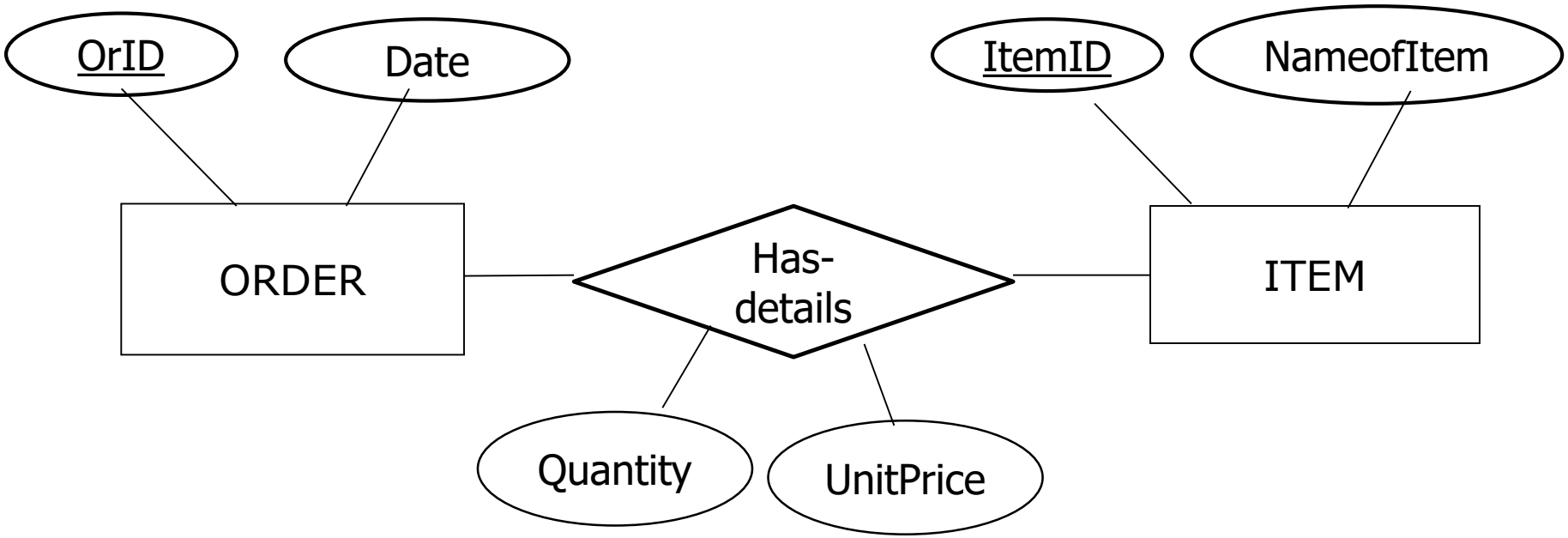


# Attribute of relationship set

- To record the information about the relationship

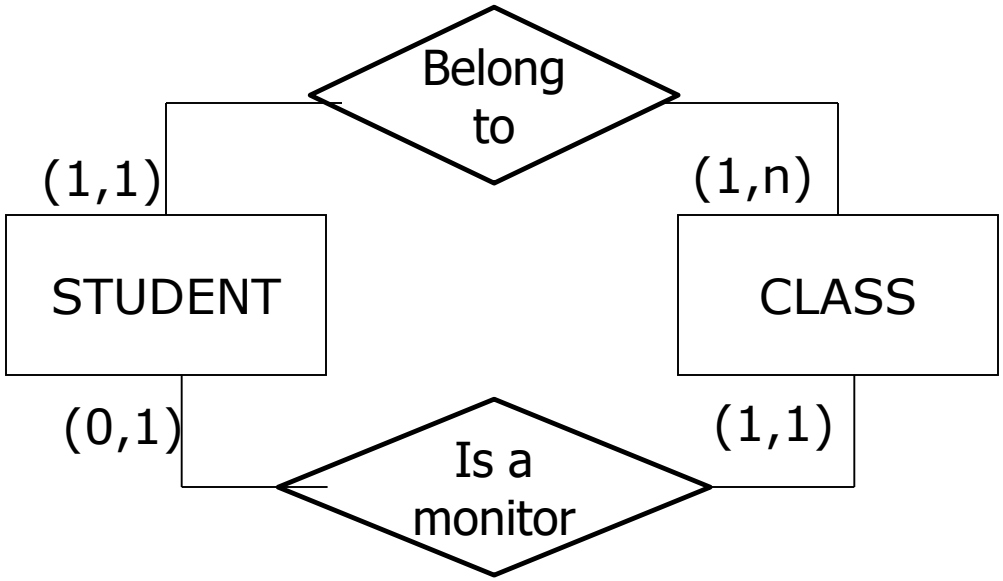


# Attribute of relationship set

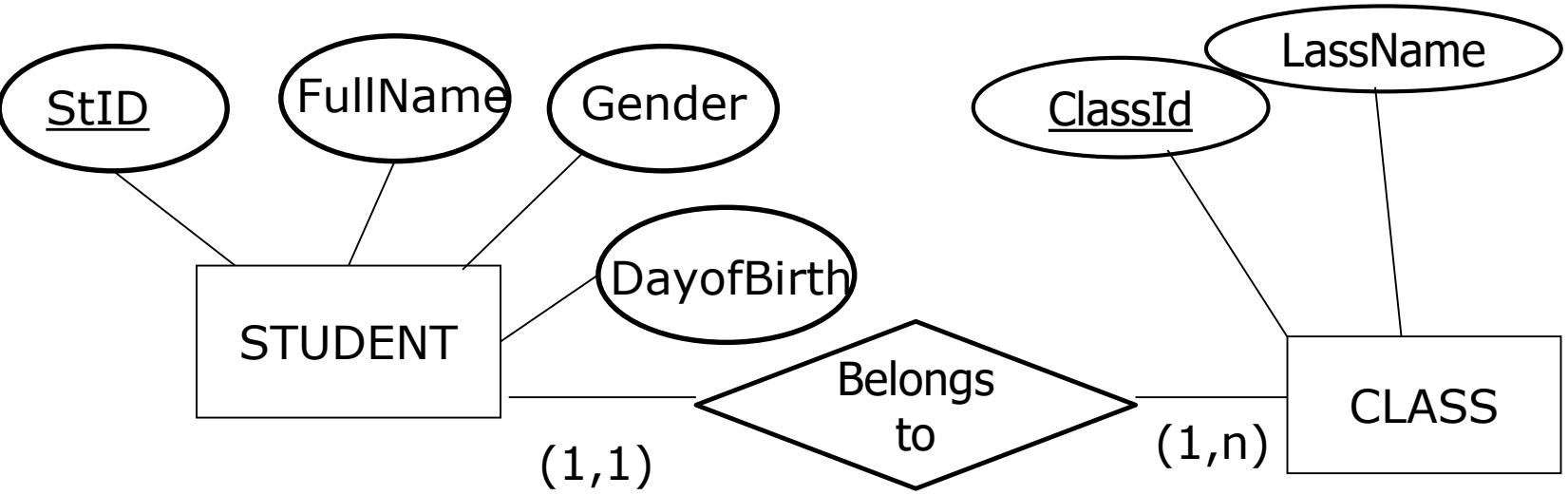


# Relationship cardinality

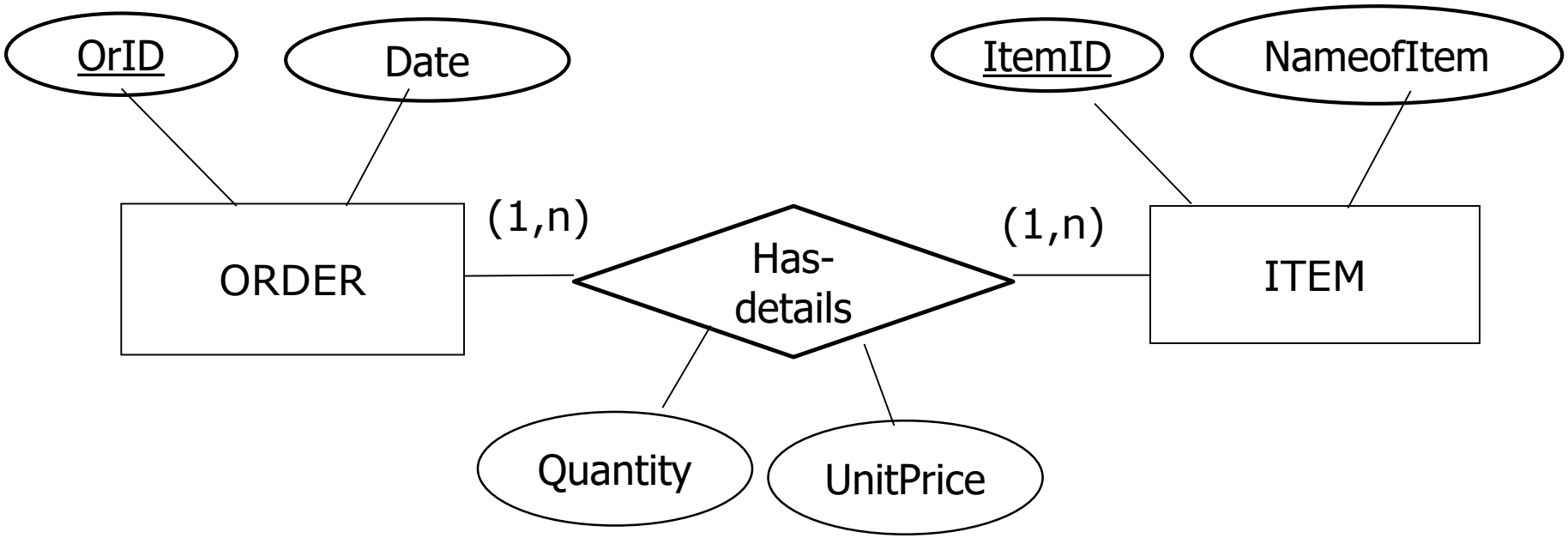
- Shows the minimum and maximum entities associate with relationship.
- (min, max)



# Relationship cardinality



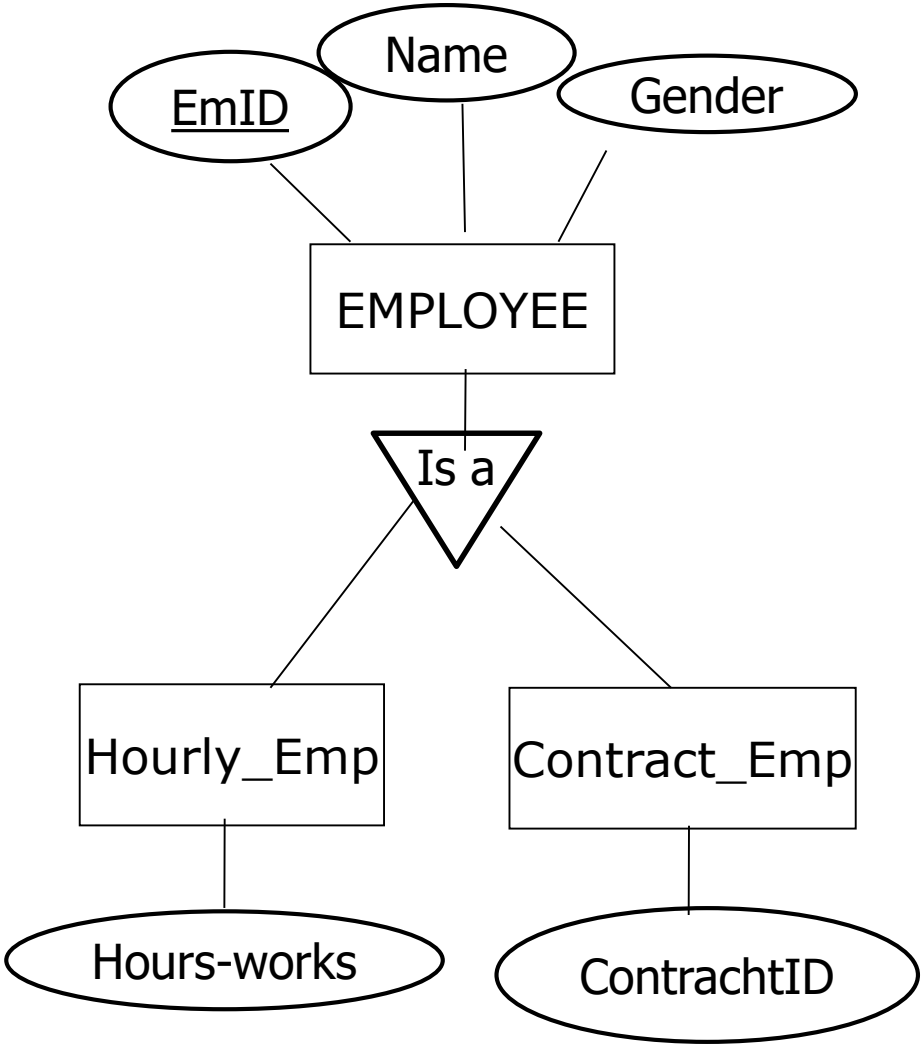
# Relationship cardinality



# Extended Entity-relationship model

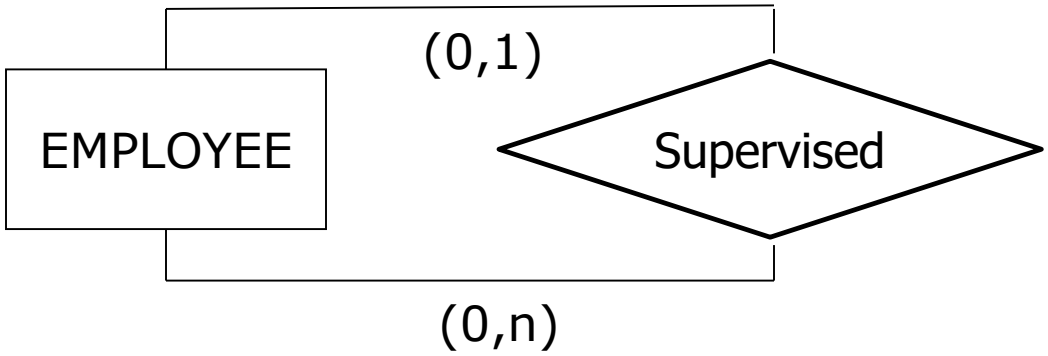
- Generalization and Specialization
- Recursive Relationship
- Weak entity
- Extended relationship

# Generalization and Specialization



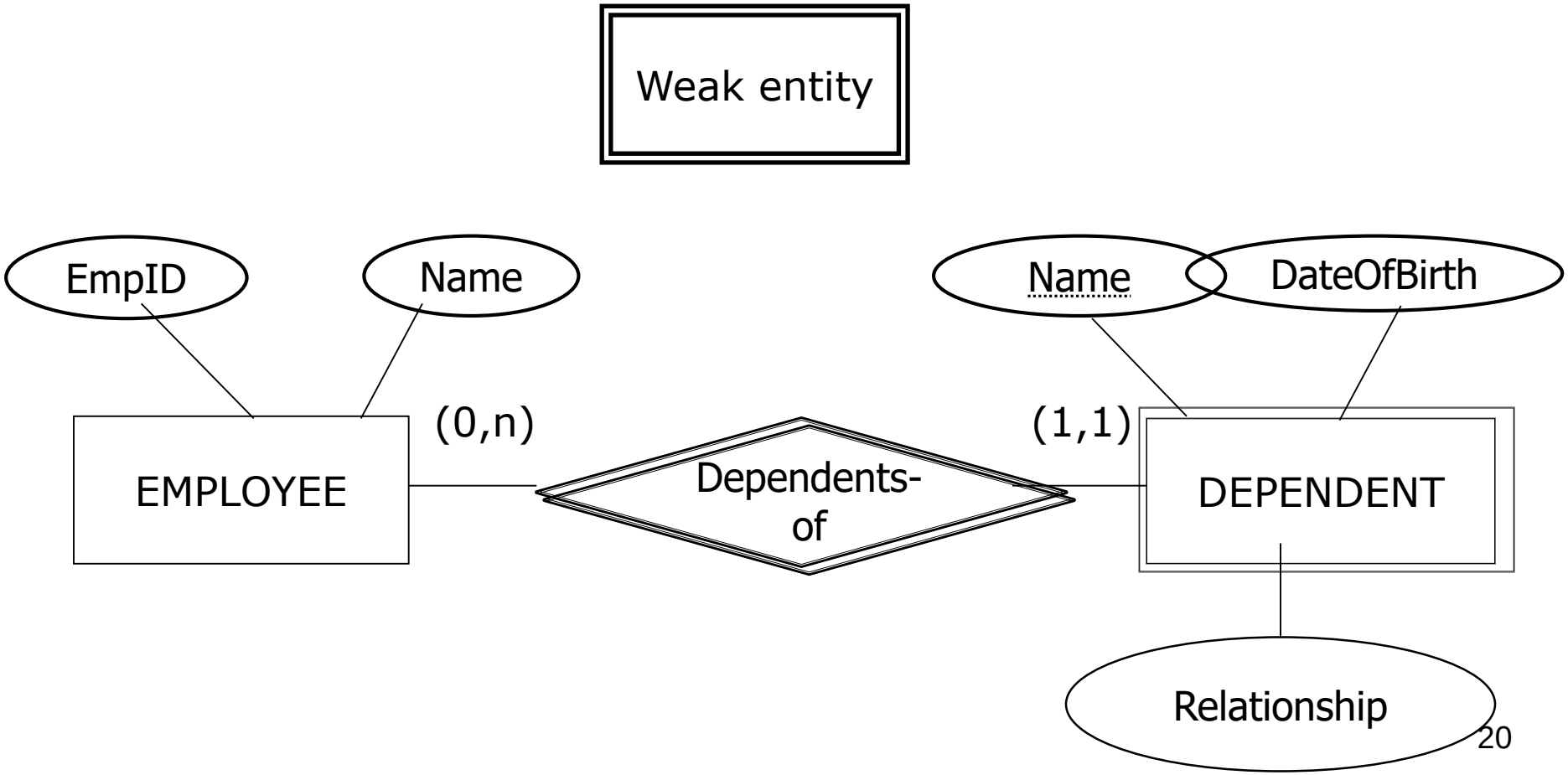
# Recursive Relationship

- Relationship with the same entity.

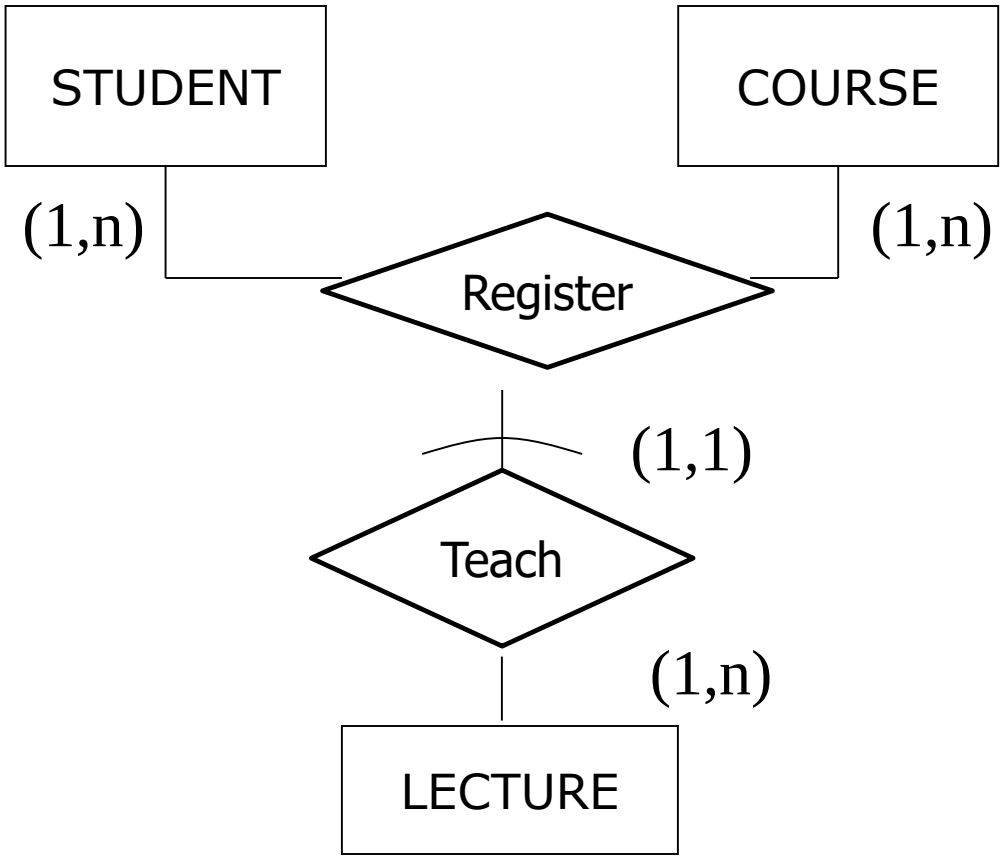


# Weak entity

- Entity has no key.
- It depeds on other entity



# Extended relationship




QUESTIONS
ANSWERS

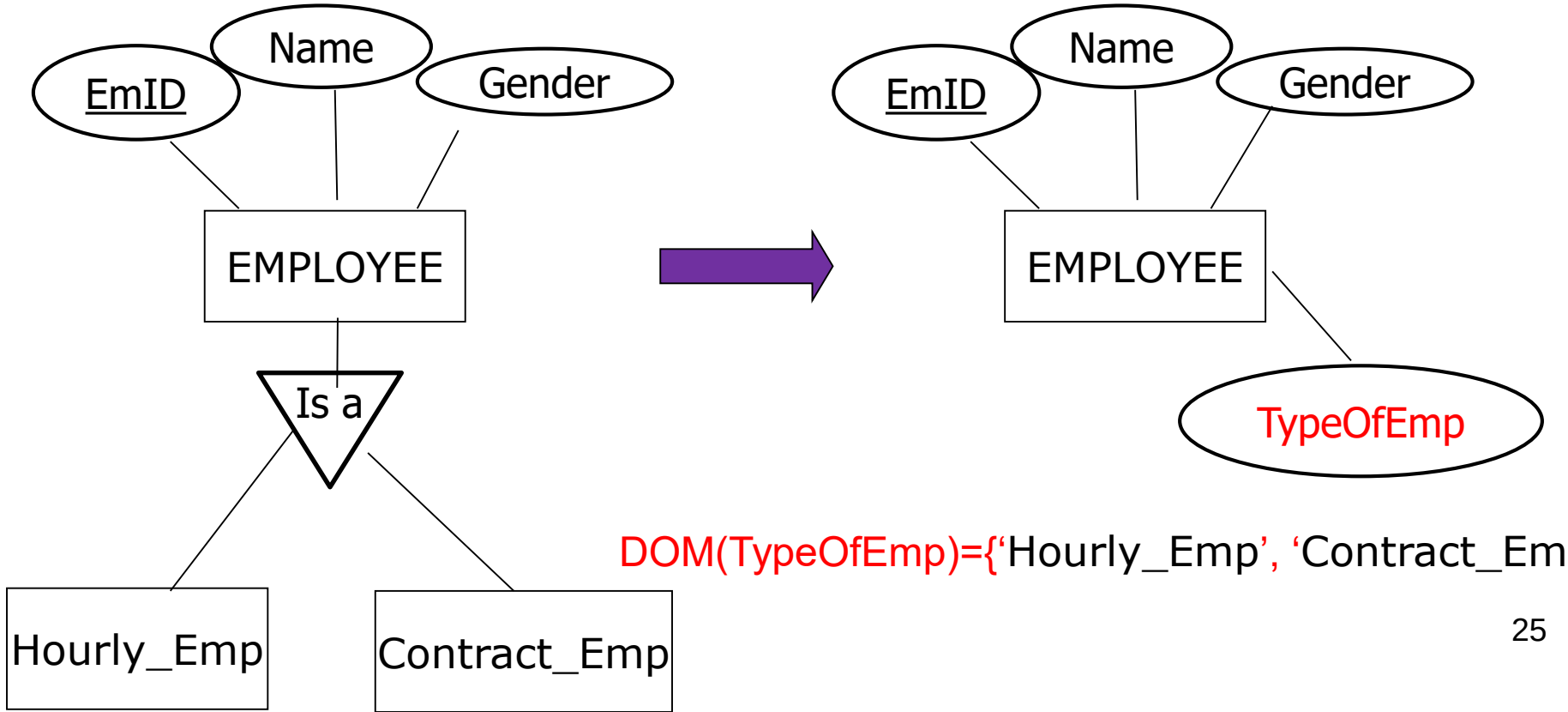
# Converting Entity-Relationship data model to Relational data model

# Converting Entity-Relationship data model to Relational data model

1. Converting Class Hierarchies
2. Converting Entity set
3. Converting Relationships
4. Normalization

# Converting Class Hierarchies

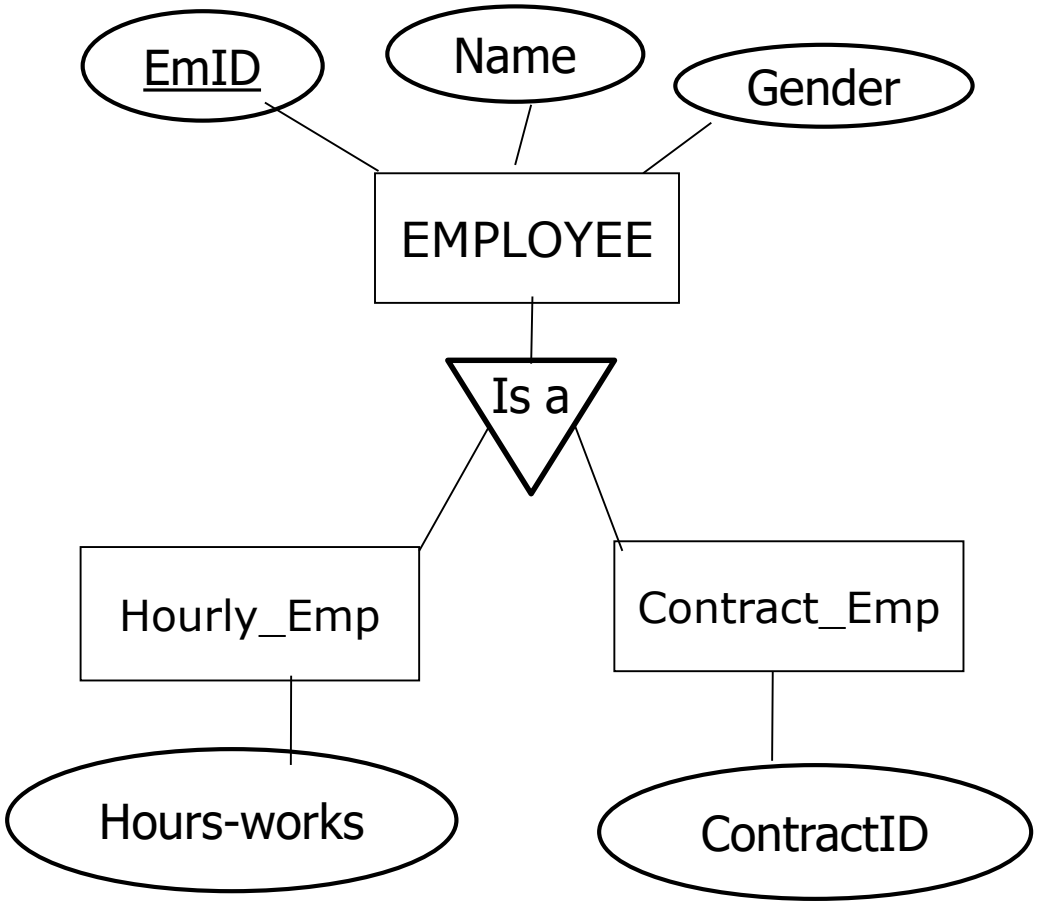
1. Specialization entities do not have their own attributes
   - Adding Type attribute to the Generalization entity
   - Adding constrains for the value of Type attribute




DOM(TypeOfEmp)={'Hourly_Emp', 'Contract_Emp'}

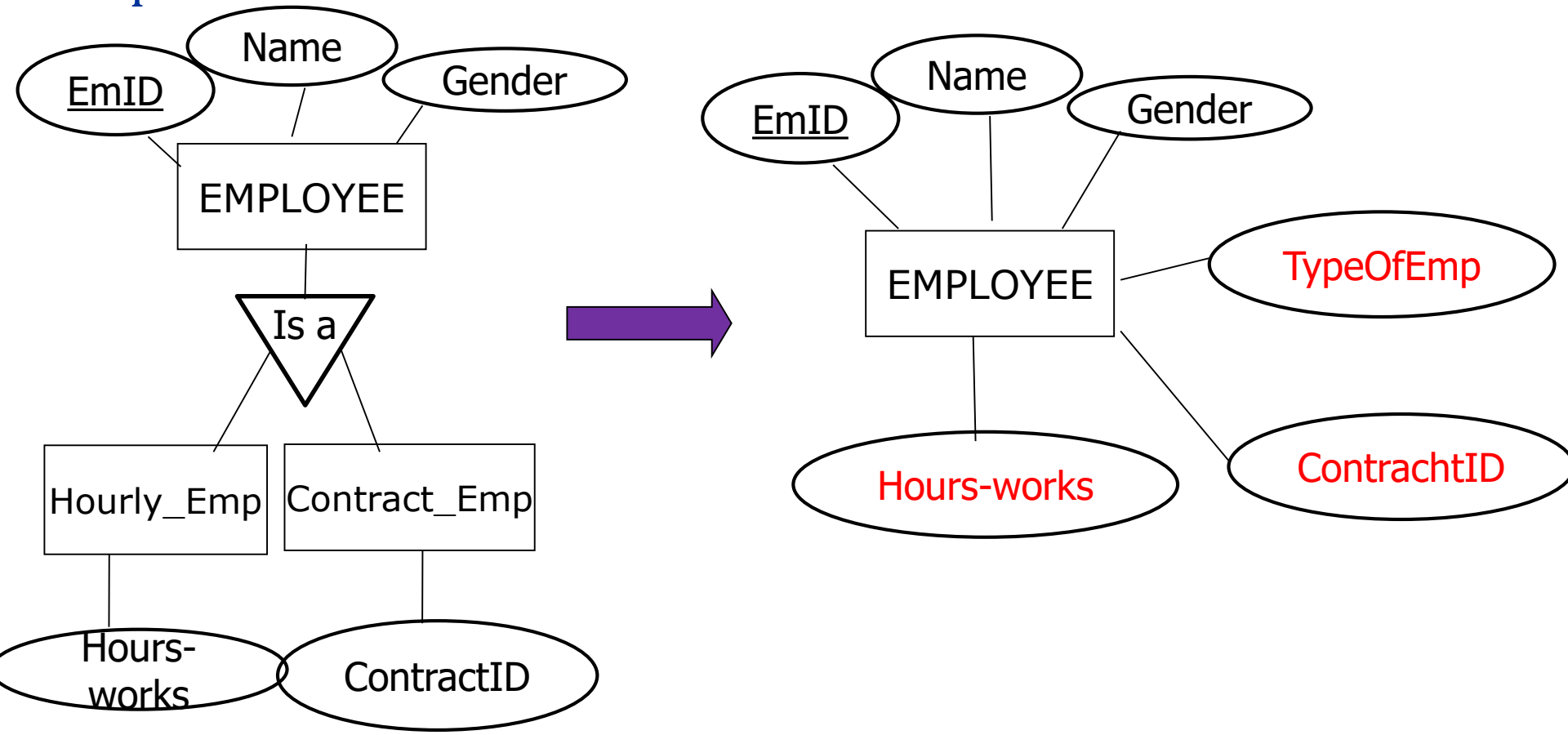
# Converting Class Hierarchies

1. Specialization entities have a few attributes
   - Adding to the Generalization entity: Type attribute, specialization attributes
   - Adding constrains for: the value of Type attribute, specialization attributes



# Converting Class Hierarchies

## 2. Specialization entities have a few attributes

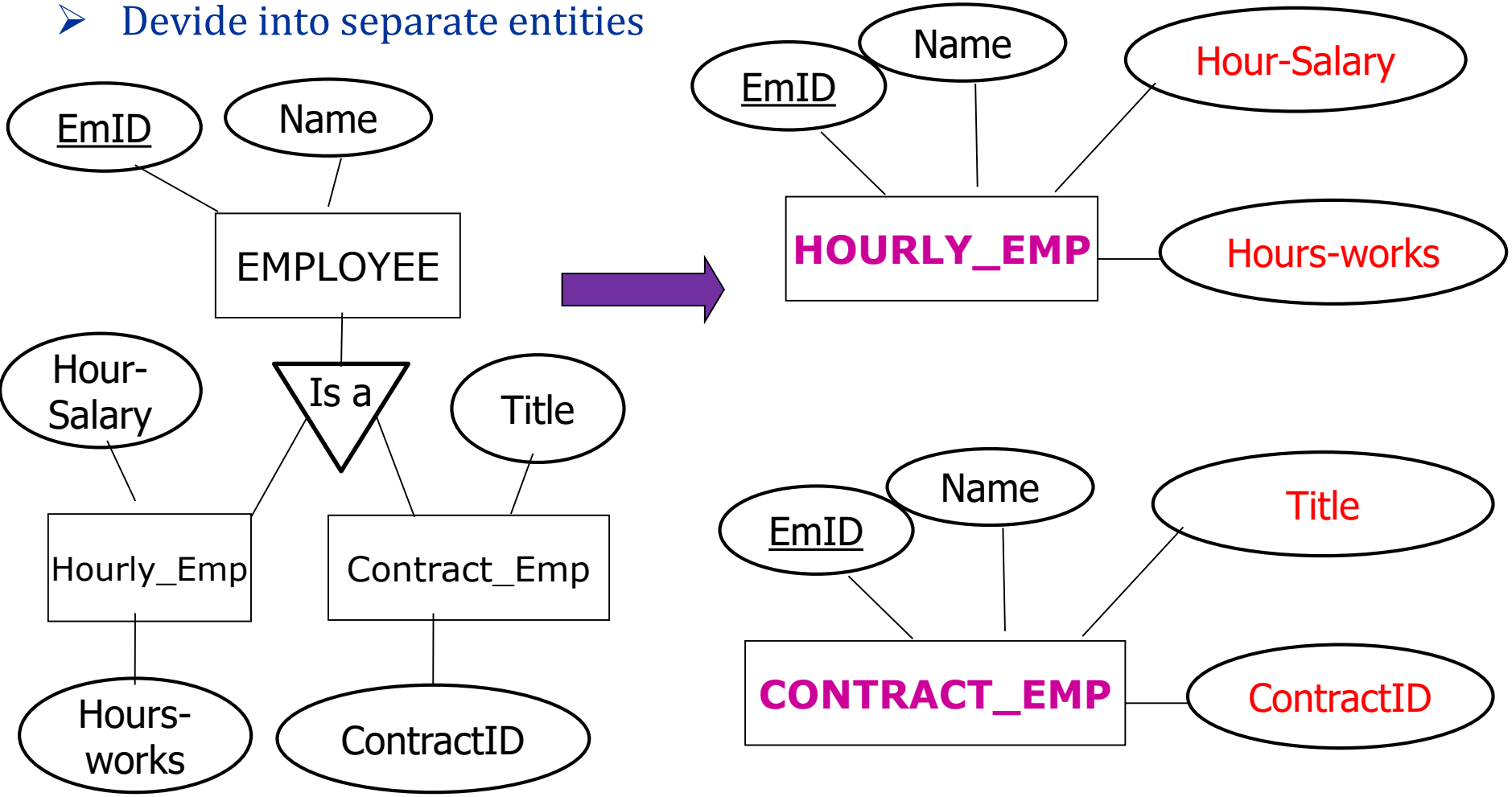



1. DOM(TypeOfEmp)={'Hourly_Emp', 'Contract_Emp'}
2. If TypeOfEmp=Hourly_Emp then Hours-works is enabled and ContractID is disabled
3. If TypeOfEmp=Contract_Emp then Hours-works is disabled and ContractID is enabled

# Converting Class Hierarchies

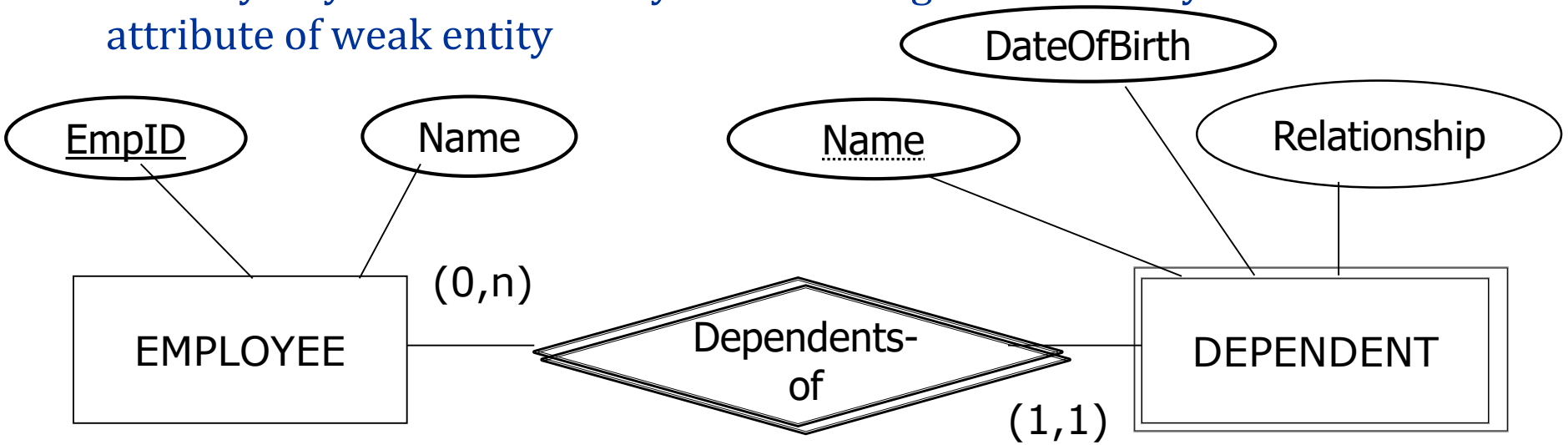
## 3. Specialization entities have a lot of attributes

- Devide into separate entities



# Converting Entity set

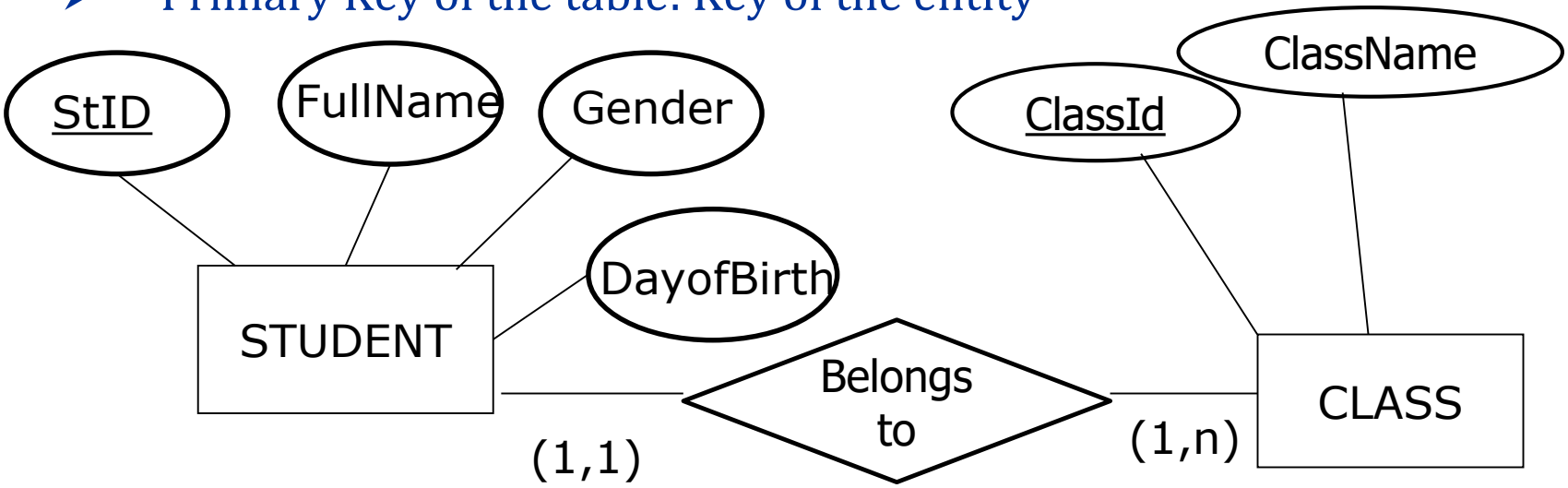
1. Weak Entity
   - Name of the table: Name of the entity
   - Atrributes of the table: Key of the strong related entity, and atrributes of the weak entity
   - Primary Key of the table: Key of the strong related entity and the difference attribute of weak entity




DEPENDENT(**EmpID, Name,** DateOfBirth, Relationship)

# Converting Entity set

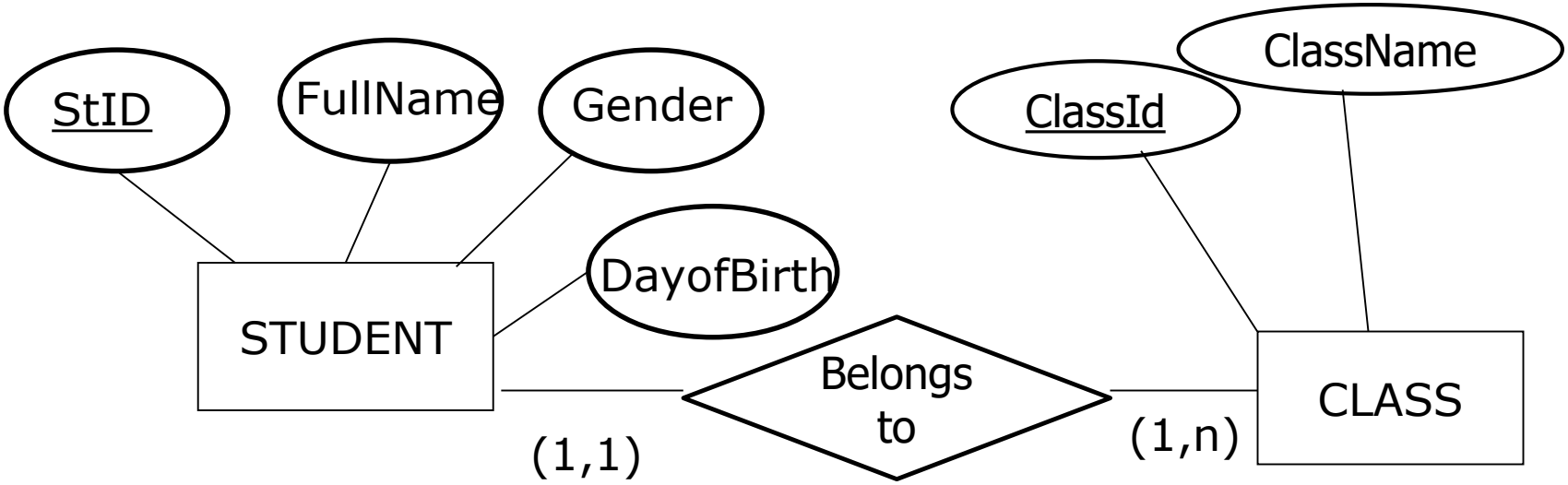
2. Entity set
   - Name of the table: Name of the entity
   - Atrributes of the table: Atrributes of the entity
   - Primary Key of the table: Key of the entity




1. STUDENT(**StID**, FullName, Gender, DayOfBirth)
2. CLASS (**ClassID**, ClassName)

# Converting Relationships

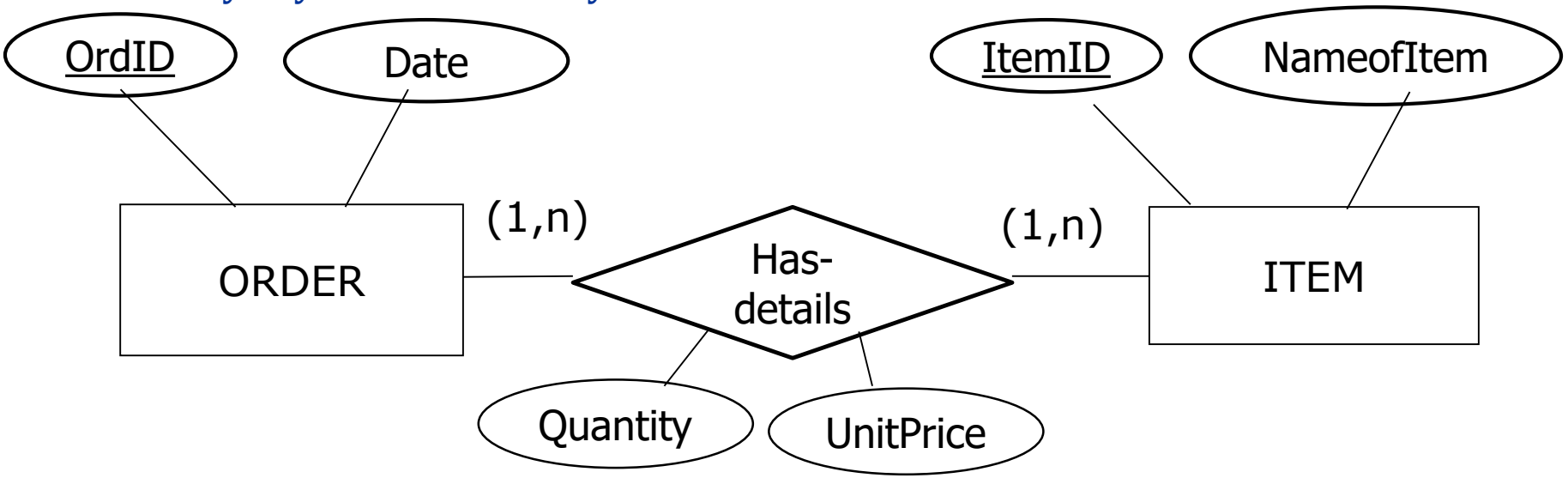
1. (1, 1) and (1,n) relatioship
   - Do not become a new table
   - Add key of the (1,n) entity to the table represented the (1,1) entity.




1. STUDENT(**StID**, FullName, Gender, DayOfBirth, **ClassID**)
2. CLASS (**ClassID**, ClassName)

# Converting Relationships

2. (1, n) and (1,n) relatioship
   - Do become a new table
   - Attributes of the new table: keys of related entities and attributes of the relationship
   - Primary key of the table: Key of related entities.




ORDER_ITEM (**OrdID, ItemID**, Quantity, UnitPrice)


QUESTIONS
ANSWERS

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