



# CS F212 Database Systems

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# ER to Relational Mapping (Ch. 8 of T1)



## **Content**

1. *Mapping Regular Entity types*
2. *Mapping Weak Entity types*
3. *Mapping 1:1 Relationships*
4. *Mapping 1:N Relationships*
5. *Mapping N:M Relationships*
6. *Mapping Multivalued and Complex attributes*
7. *Mapping class hierarchies*

# Mapping entity types

## 1. Mapping of Regular Entity Types.

- ☐ For each regular (strong) entity type  $E$  in the ER schema, create a relation  $R$  that includes all the simple attributes of  $E$ .
- ☐ Choose one of the key attributes of  $E$  as the primary key for  $R$ .
- ☐ If the chosen key of  $E$  is composite, the set of simple attributes that form it will together form the primary key of  $R$ .

## 2. Mapping of Weak Entity Types

- ❑ For each weak entity type  $W$  in the ER schema with owner entity type  $E$ , create a relation  $R$  & include all simple attributes (or simple components of composite attributes) of  $W$  as attributes of  $R$ .
- ❑ Also, include as foreign key attributes of  $R$  the primary key attribute(s) of the relation(s) that correspond to the owner entity type(s).
- ❑ The primary key of  $R$  is the *combination* of the primary key(s) of the owner(s) and the partial key of the weak entity type  $W$ , if any.

# Mapping Relationship types



## 3. Mapping of Binary 1:1 Relation Types

For each binary 1:1 relationship type  $R$  in the ER schema, identify the relations  $S$  and  $T$  that correspond to the entity types participating in  $R$ .

There are three possible approaches:

- 1. Foreign Key approach:** Choose one of the relations-say S- and include a foreign key in S that refers to the primary key of T. It is better to choose an entity type with total participation in R in the role of S.
- 2. Merged relation option:** An alternate mapping of a 1:1 relationship type is possible by merging the two entity types and the relationship into a single relation. This may be appropriate when both participations are total.
- 3. Cross-reference or relationship relation option:** The third alternative is to set up a third relation R for the purpose of cross-referencing the primary keys of the two relations S and T representing the entity types.

## 4. Mapping of Binary 1:N Relationship Types.

- For each regular binary 1:N relationship type R, identify the relation S that represent the participating entity type at the N-side of the relationship type.
- Include as foreign key in S the primary key of the relation T that represents the other entity type participating in R.
- Include any simple attributes of the 1:N relation type as attributes of S.

## 5. Mapping of Binary M:N Relationship Types.

- ❑ For each regular binary M:N relationship type R, *create a new relation S* to represent R.
- ❑ Include as foreign key attributes in S the primary keys of the relations that represent the participating entity types; *their combination will form the primary key* of S.
- ❑ Also include any simple attributes of the M:N relationship type (or simple components of composite attributes) as attributes of S.



# Mapping Multivalued attributes



## 6. Mapping of Multivalued attributes.

- ❑ For each multivalued attribute  $A$ , create a new relation  $R$ .
- ❑ This relation  $R$  will include an attribute corresponding to  $A$ , plus the primary key attribute  $K$ -as a foreign key in  $R$ -of the relation that represents the entity type of relationship type that has  $A$  as an attribute.
- ❑ The primary key of  $R$  is the combination of  $A$  and  $K$ . If the multivalued attribute is composite, we include its simple components.

# Mapping n-ary relationships



## 7. Mapping of N-ary Relationship Types.

- ☐ For each n-ary relationship type R, where  $n > 2$ , create a new relationship S to represent R.
- ☐ Include as foreign key attributes in S the primary keys of the relations that represent the participating entity types.
- ☐ Also include any simple attributes of the n-ary relationship type (or simple components of composite attributes) as attributes of S.

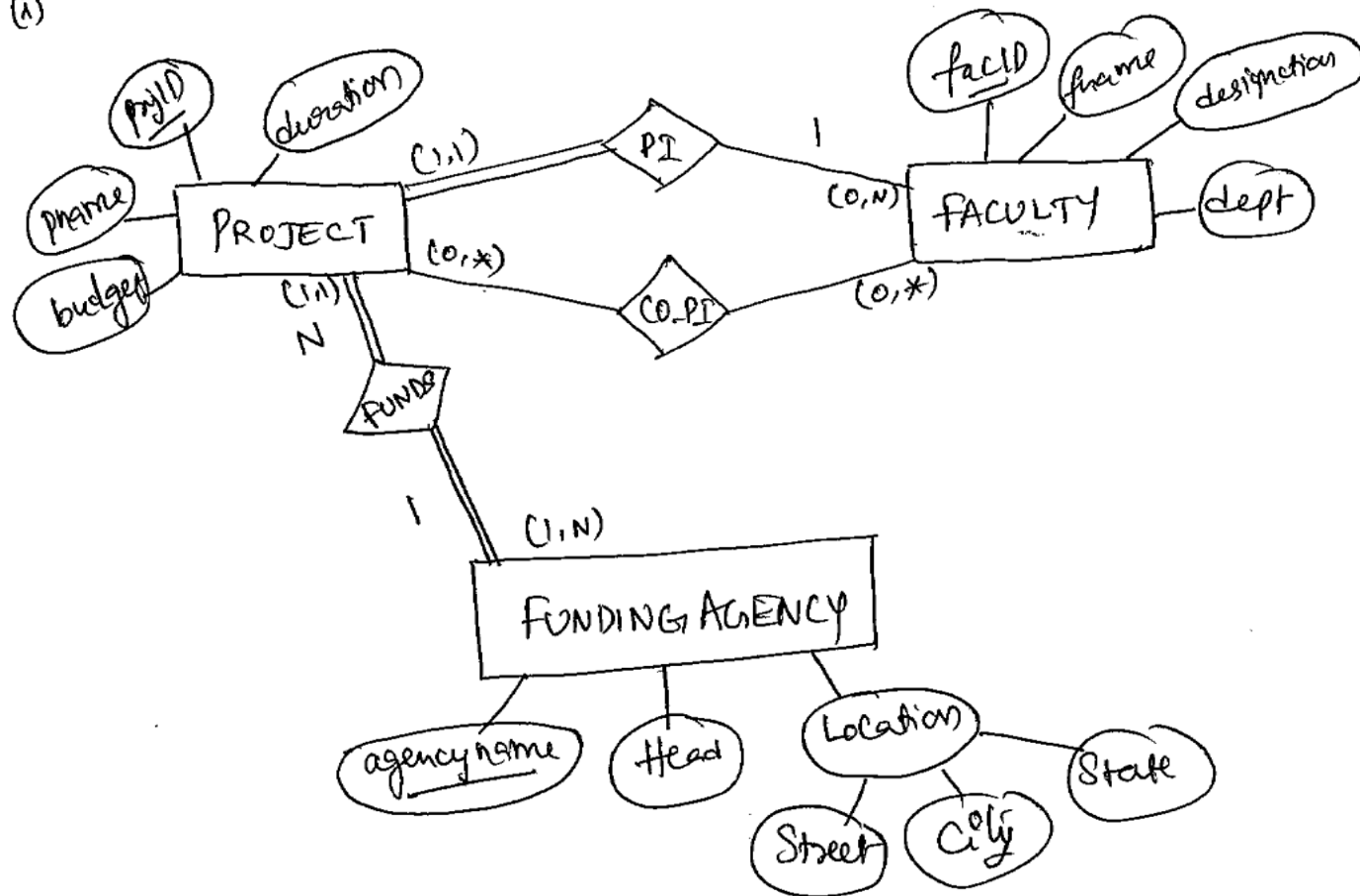
# Mapping n-ary relationships



**Example:** The relationship type SUPPY in the ER on the next slide.

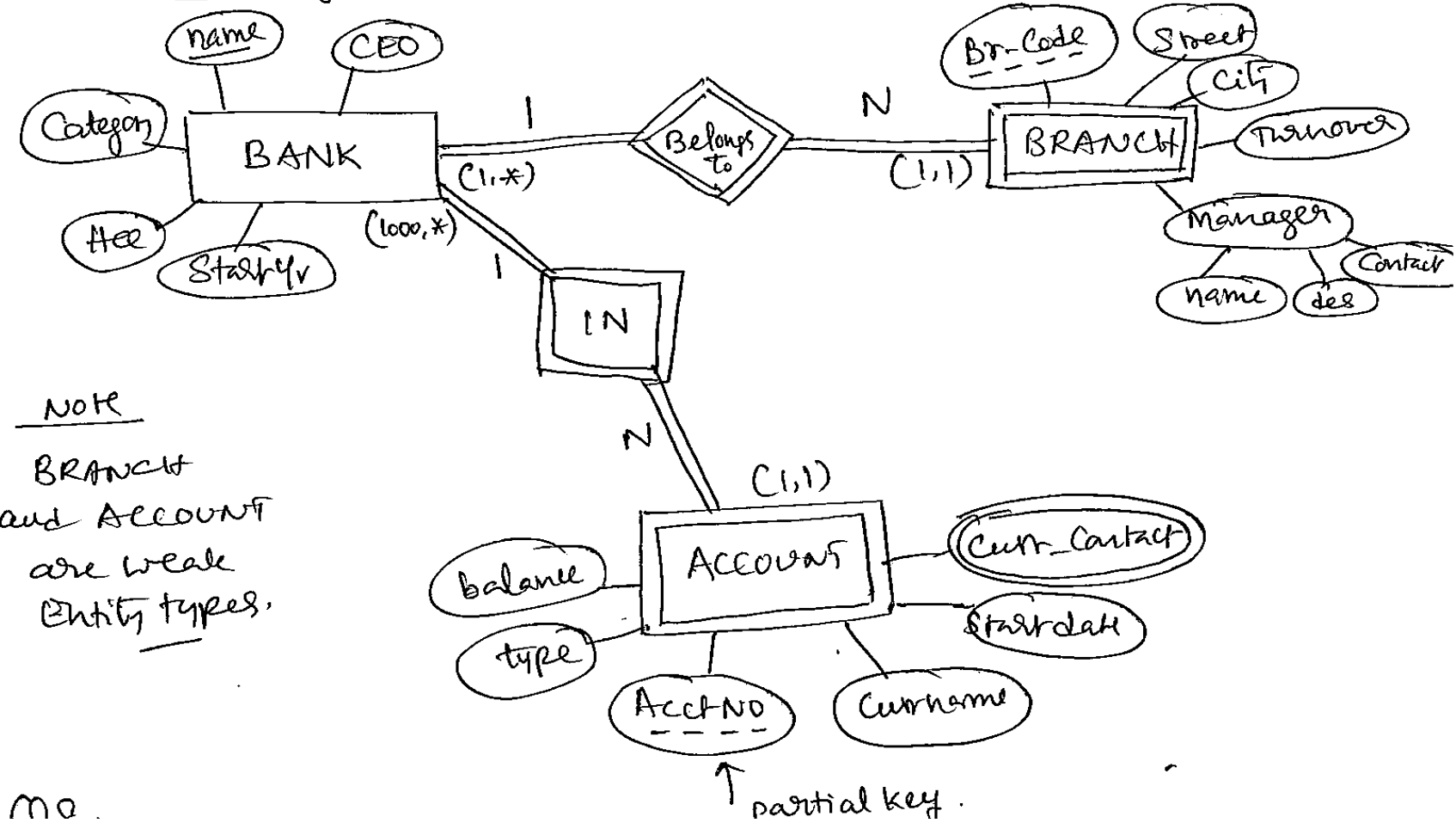
- ❖ This can be mapped to the relation SUPPLY shown in the relational schema, whose primary key is the combination of the three foreign keys {SNAME, PARTNO, PROJNAME}

Q1. (a)



[4 Marks]

Q 7. ER Diagram



NOTE  
BRANCH  
and ACCOUNT  
are weak  
Entity types,

mo.

# Mapping class hierarchies

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***We have 4 different approaches:***

***A: Multiple relations : super class and sub classes  
(used for all specializations)***

***B. Multiple relations: subclass relations only  
(best suited for disjoint specialization )***

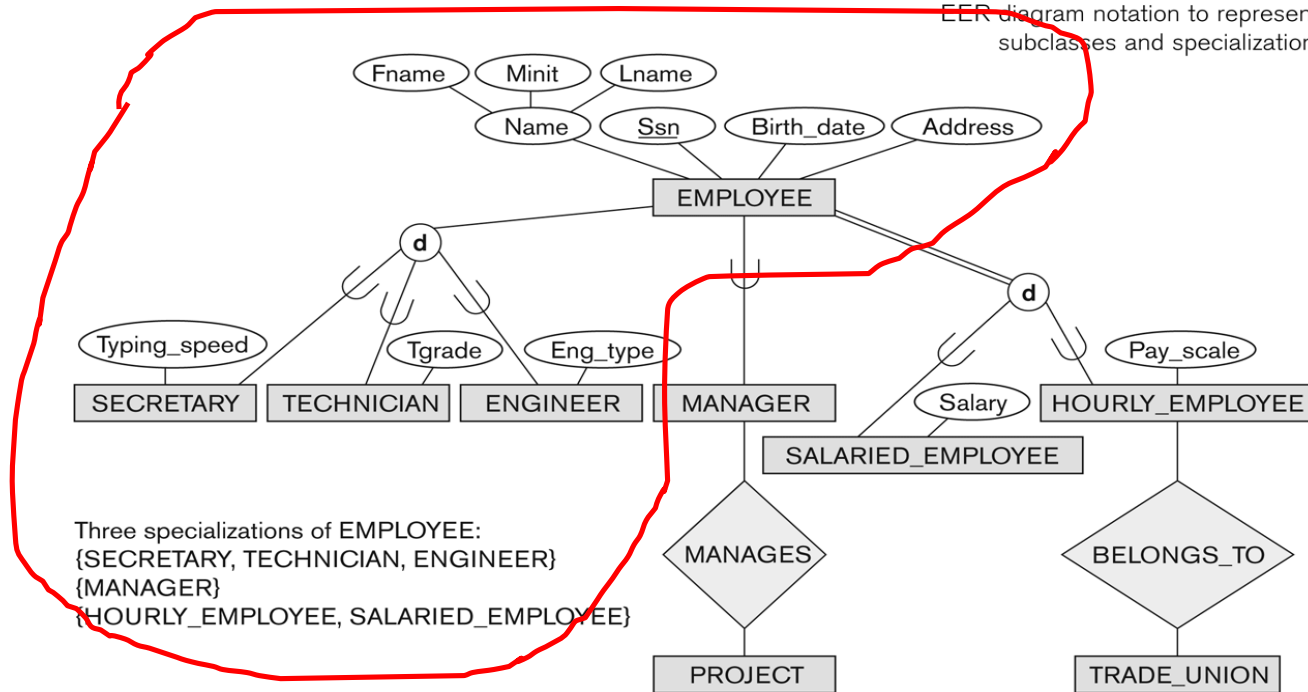
***C. Single relation with type attribute  
(best for disjoint and with few specific attributes)***

***D. Single relation with multiple type attributes  
(best for overlapping sub-classing and can work for the other case as well).***

## A: Multiple relations : super class and sub classes

Figure 4.1

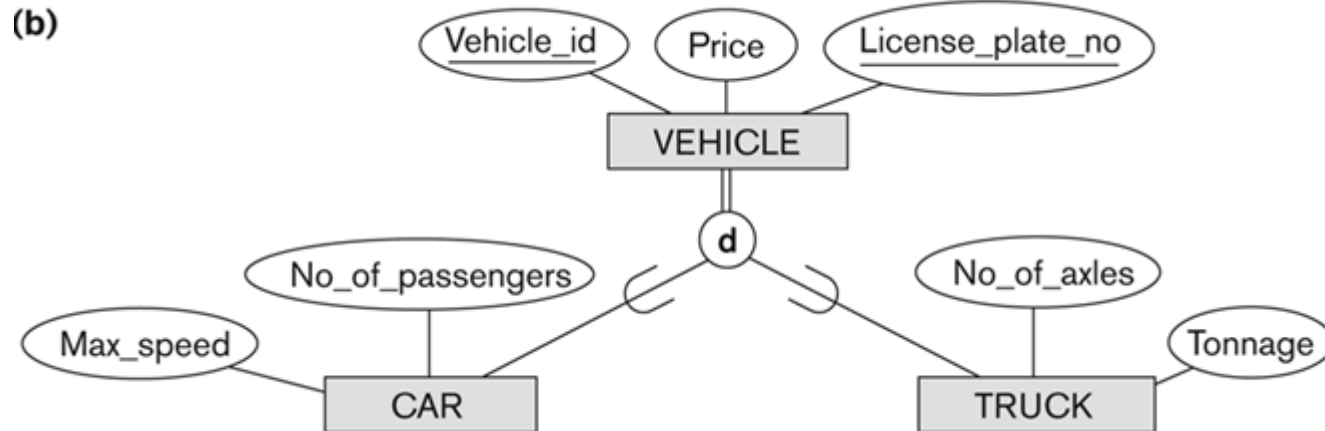
EER diagram notation to represent subclasses and specialization.



(a) EMPLOYEE



## B. Multiple relations: subclass relations only



(b) CAR

<u>Vehicle_id</u>	License_plate_no	Price	Max_speed	No_of_passengers
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TRUCK

<u>Vehicle_id</u>	License_plate_no	Price	No_of_axles	Tonnage
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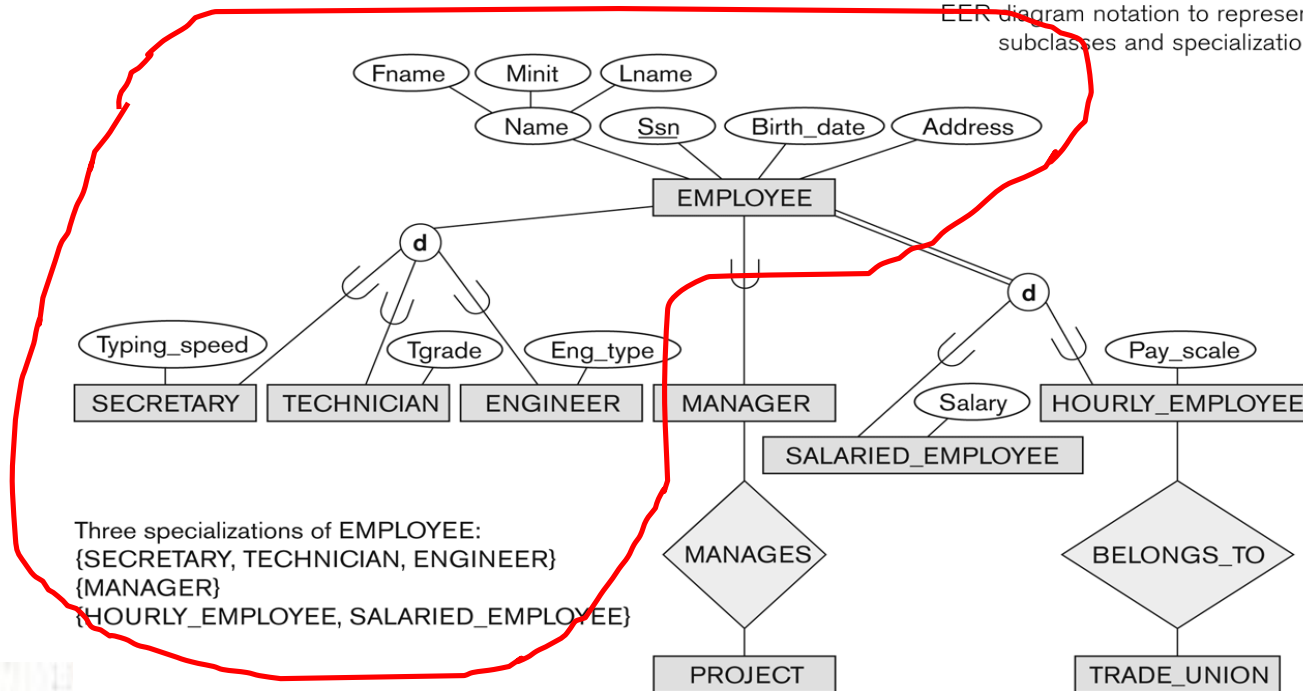


## C. Single relation with type attribute



**Figure 4.1**

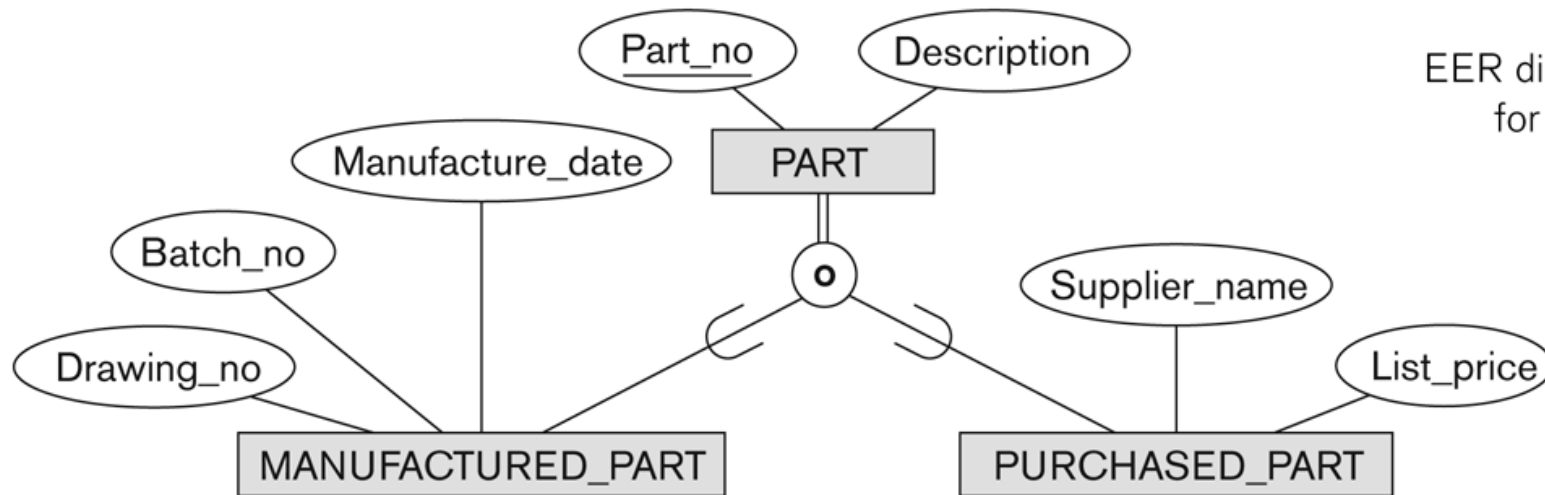
EER diagram notation to represent subclasses and specialization.



(c) EMPLOYEE

<u>Ssn</u>	Fname	Minit	Lname	Birth_date	Address	Job_type	Typing_speed	Tgrade	Eng_type
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## D. Single relation with multiple type attributes



**Figure 4.5**  
EER diagram notation  
for an overlapping  
(nondisjoint)  
specialization.

(d) PART

<u>Part_no</u>	Description	Mflag	Drawing_no	Manufacture_date	Batch_no	Pflag	Supplier_name	List_price
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## ***Summary***

- ✓ *ER to Relational Mapping*
- ✓ *Mapping Entity types*
- ✓ *Mapping Relationships*
- ✓ *Mapping class hierarchies*