

Enhanced Entity Relationship Modeling

Source:

Fundamentals of Database Systems, 5th ed.
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Chapter-4



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Extended Modeling Concepts

- ☐ Generalization and specialization: Sub-classing in conceptual model
 - ☐ Multiple Inheritance
 - ☐ Union
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- Can you give some examples of Generalization/Specializations

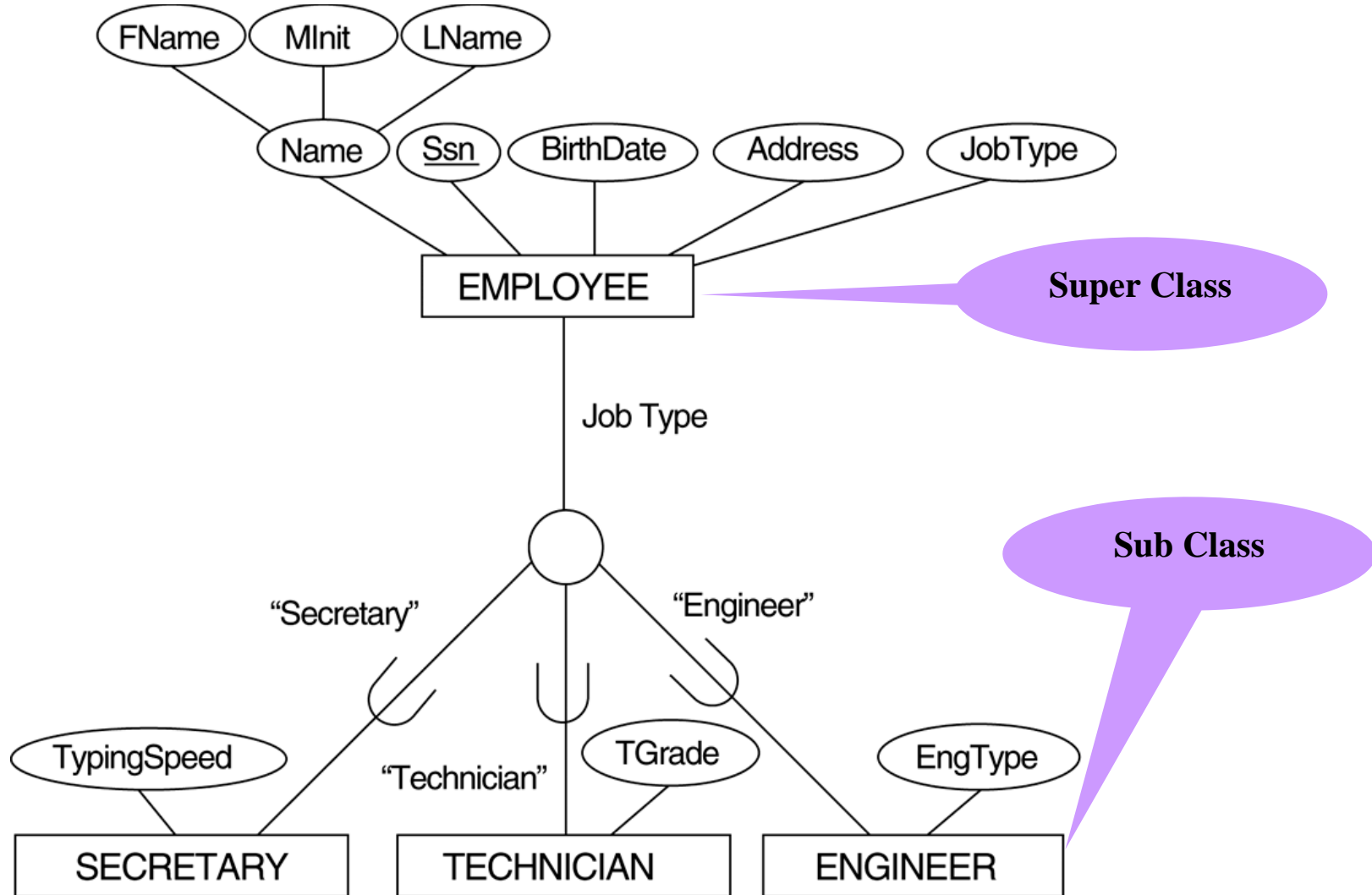
Examples: Generalization/Specializations

- ☐ Faculty is special entity type of employee, where as employee is general entity type of faculty.
 - ☐ Capital is special type of more general type City.
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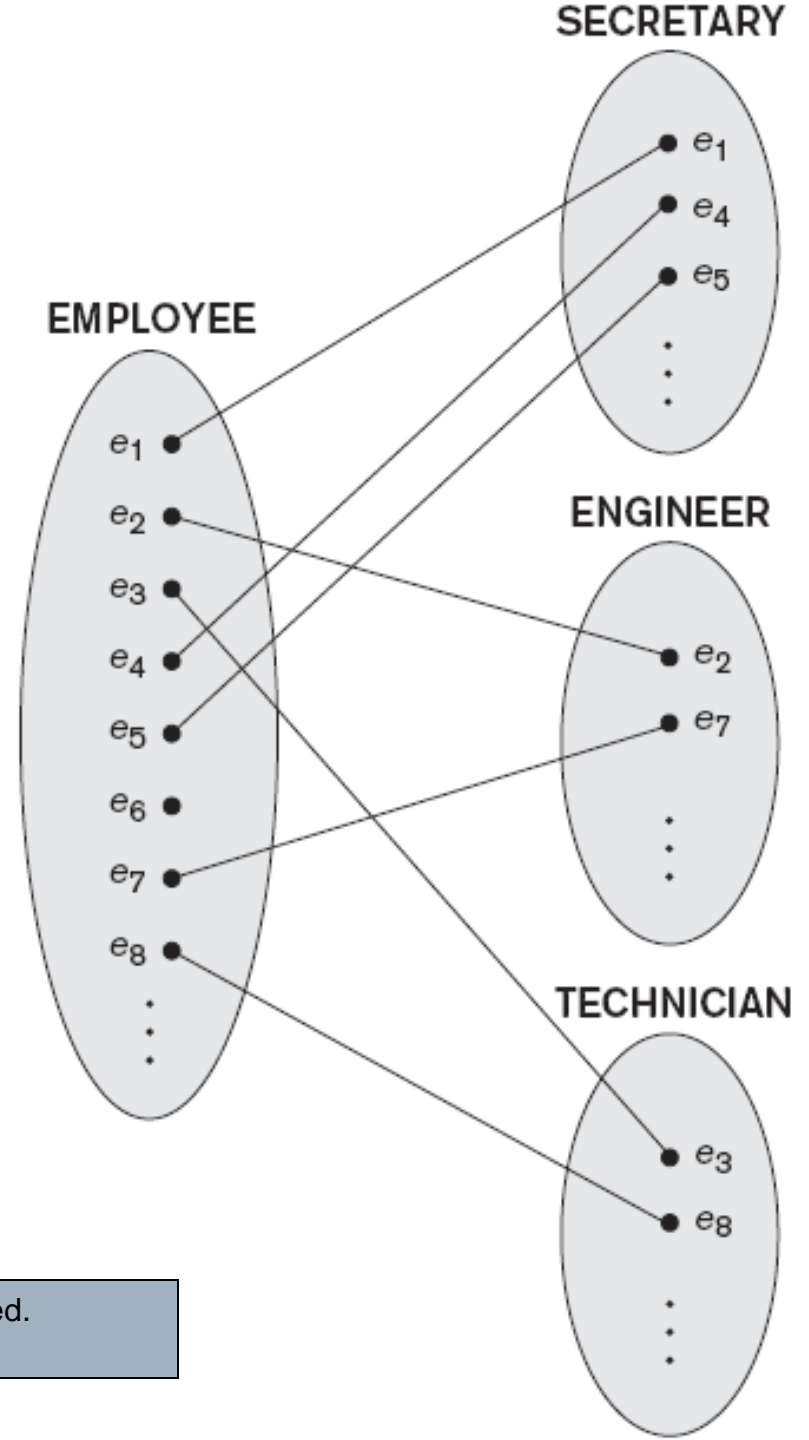
Subclasses, Superclasses, and Inheritance

- ❑ Subclass is specialized case of super-class, therefore it is also called specialization
 - ❑ Superclass is more general case of sub-class, therefore it is called generalization
 - ❑ The phenomenon of deriving sub-class from super-class is called inheritance.
 - ❑ This is also called as **IS-A** type of relationship, for example: SECRETARY **IS-A** EMPLOYEE, TECHNICIAN **IS-A** EMPLOYEE
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Specialization/Generalization



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- Instances of a specialization.



Interpretation of class/sub-class relationship

- ❑ A subclass entity type has all the attributes of super-class entity type
 - ❑ That is an entity (instance) of sub-class type, will have union of attributes of superclass type and sub-class type
 - ❑ The term “class” here should be interpreted as “entity class” (recall: class is “object class” in OOP)
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Constraints and Characteristics specialization and Generalization

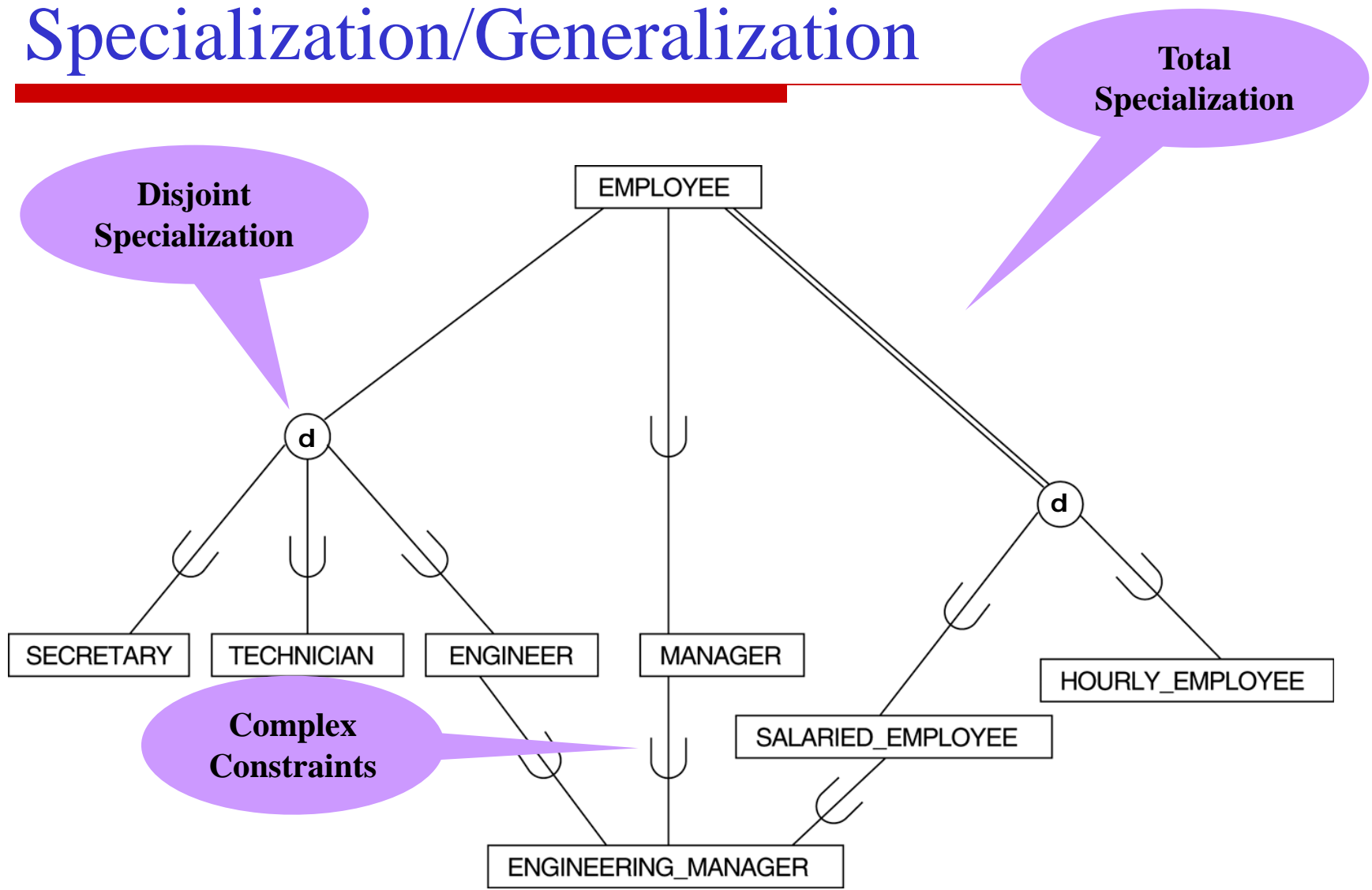
□ Predicate Constraints

- For example SECRETARY subclass by the predicate **JobType**=“**Secretary**”.
- So all the entities (instances) having this **JobType** will be of type Secretary subclass.

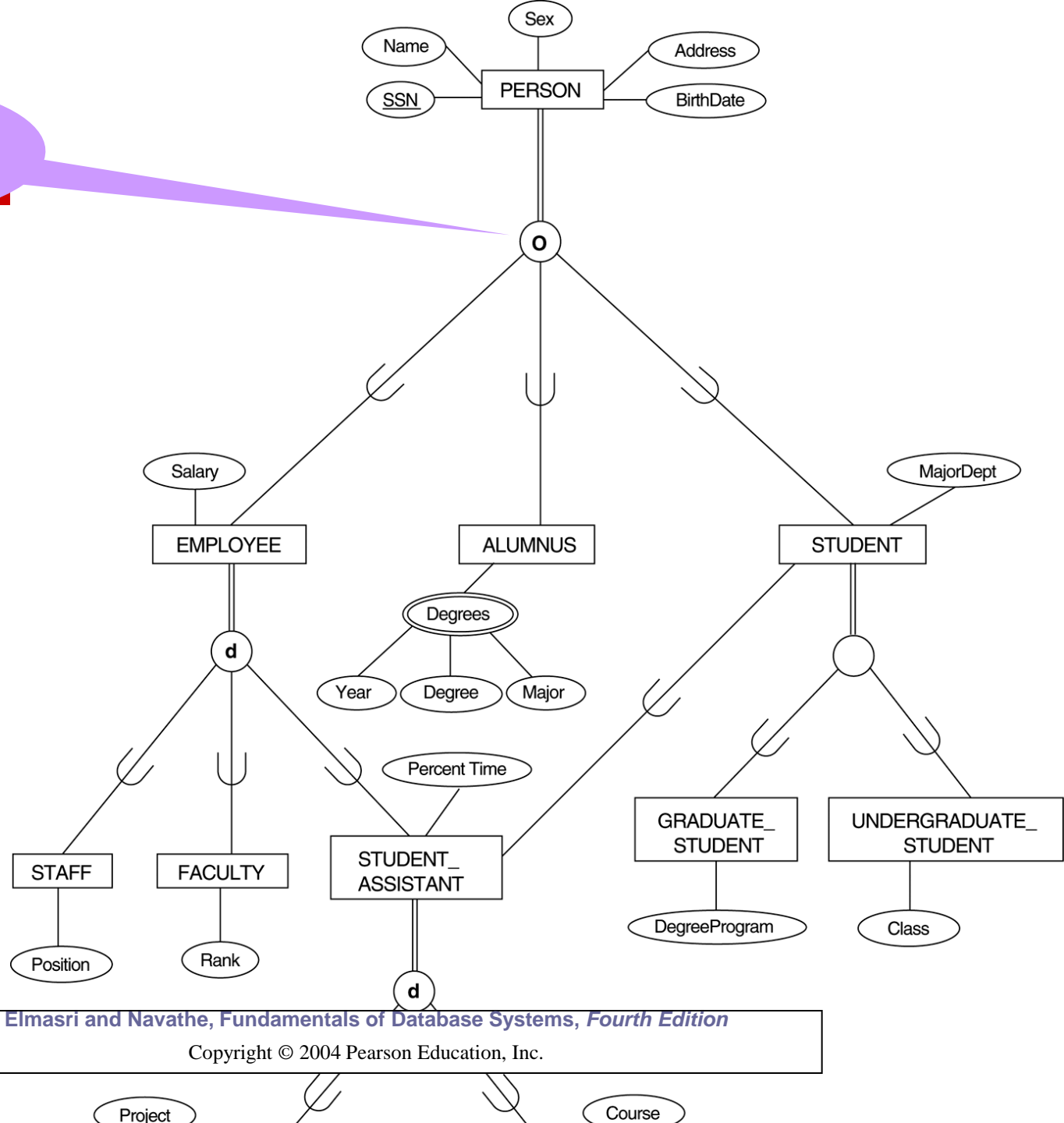
□ Disjointness constraints.

- Entity (instance) can be member of at most one of the subclasses of the specialization.
 - If the subclasses are not constrained to be disjoint, then it is **overlap**
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Specialization/Generalization

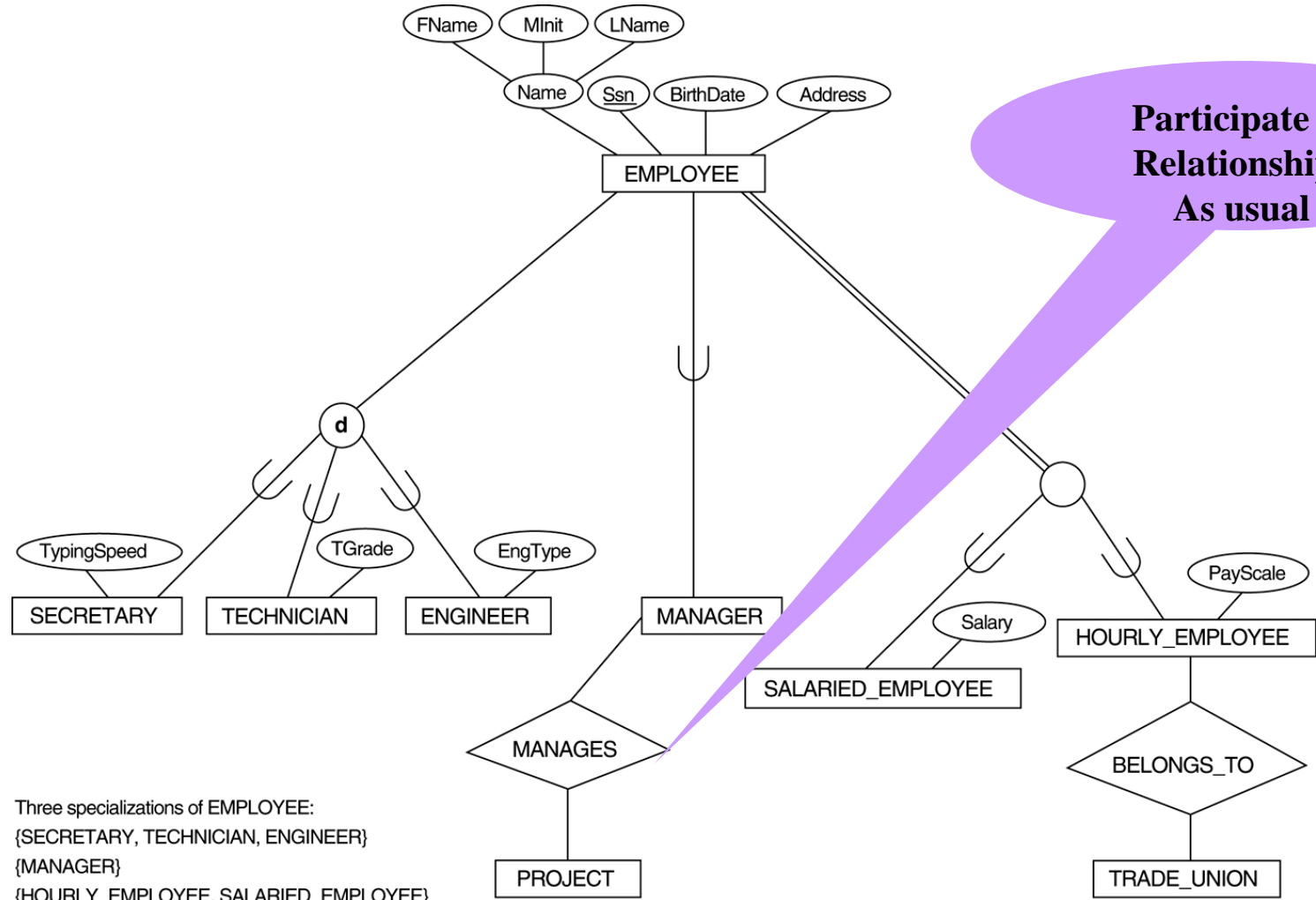


Overlap Specialization



Constraints and Characteristics specialization and Generalization

- **Completeness** constraints
 - Which may be **total** or **partial**
 - Total specialization constraint specifies that every entity in the super-class must be member of at-least one sub-class. For example Employee needs to be either Salaried or Hourly
 - Shown by double line in EER diagram
 - If it is not total then it is partial: For example Employee may not be any of Secretary, Technician or Engineer
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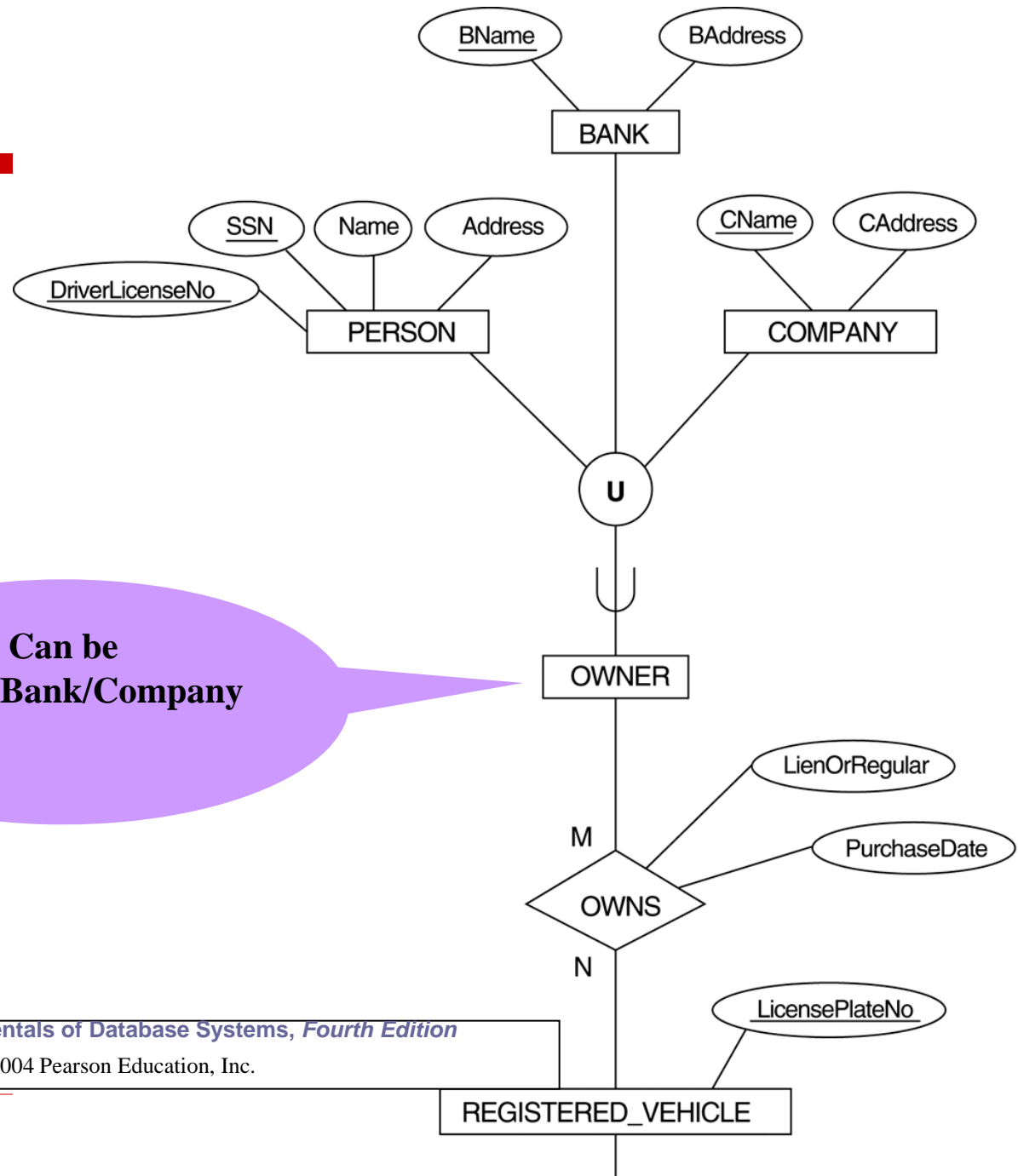
Multiple Inheritance

- ❑ “**Student-Assistant**” in one of the diagram shown previous slides, is a combination of Student and an Employee – multiple inheritance
 - ❑ Note that entity type (or entity class) “**Student-Assistant**” inherits person attributes twice in *inheritance lattice* – should be inherited once only
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Union types

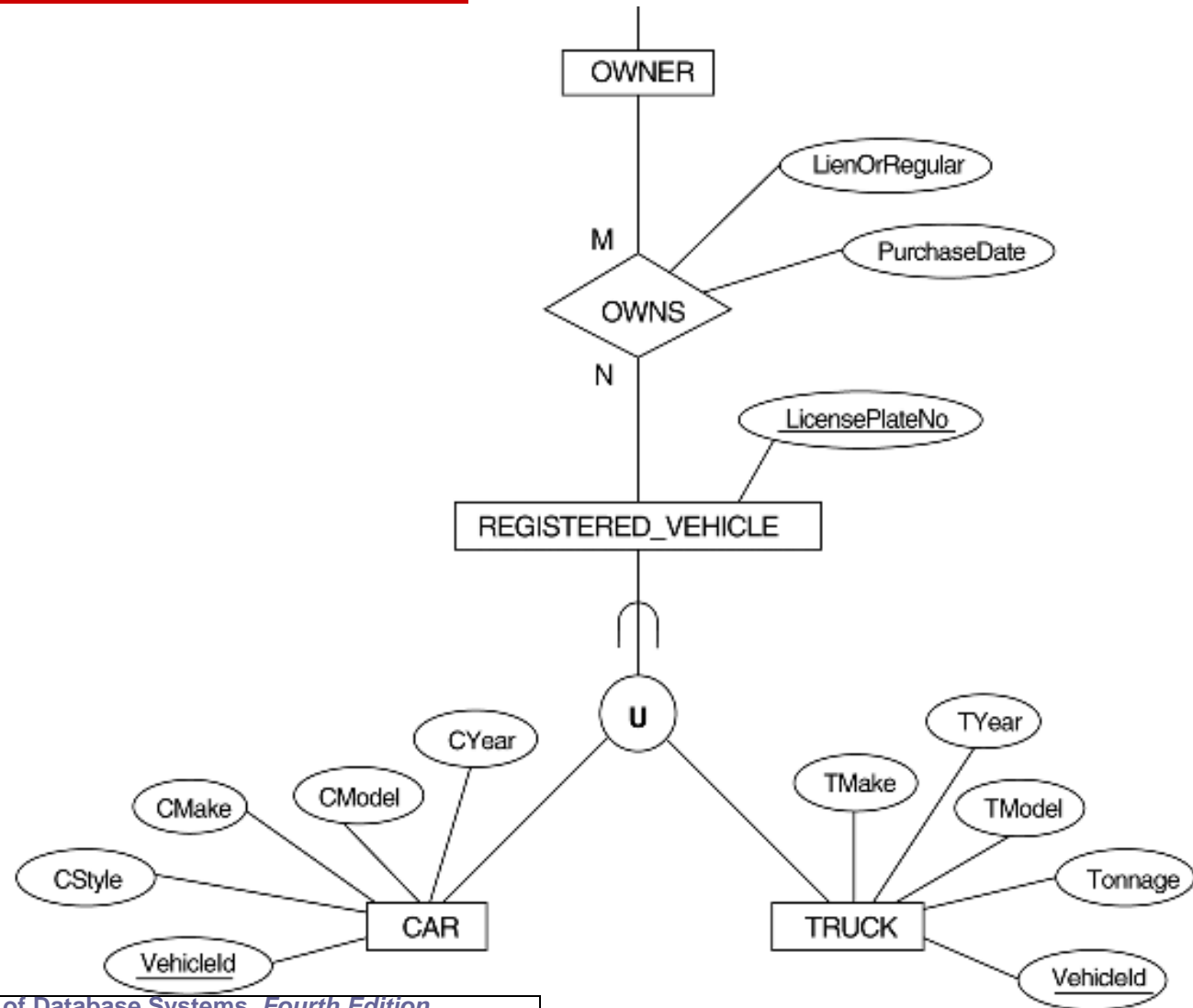
- ❑ Libray Members entity is UNION of Student, Faculty, and Staff entities
 - ❑ In Vehicle Registration; owner could be a Person or a Company, or a Bank; in other words Vehicle Owner entity is union of Person, Company, and Bank entities
 - ❑ Not very common kind of relationship.
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Union



Can be
Person/Bank/Company

Union



UNION and Multiple Inheritance

- Multiple Inheritance means- subclass has multiple super-classes and entity belonging to a subclass belongs to all super classes
 - Is a combination of all super-class entities
 - For example Engineering_Manager is all; Engineer, Manager, and Salaried_Employee

 - Where as, UNIONS is (Attributes of sub-class entity are combined by OR), For example Library Member is Either Faculty, or Student, or Staff. Or a Vehicle Owner either could be a Person or a Company!
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UNION and Sub-class

- Union may look like reverse of Sub-class;
 - Employee is union of all type of employees.
 - Library Members are UNION of Faculty, Student, and Staff ?
 - Objects in collection are objects of subclass of a single super class.
 - Contrary
 - There can be employees that do not belong to any class
 - There can be faulty who are not member of Library
 - Objects in collection are not objects of subclass of a single super class.
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