CM1603 - Database Systems

Week 04| Extended Entity Relationship Diagrams

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Learning Outcomes

- Covers LO1 for Module - Describe and evaluate underlying theory and principles of relational database management systems (RDBMS).
- Covers LO2 for Module – Analyses and apply database design and modelling methods for a given business case study
- On completion of this lecture, students are expected to be able to:
  - Identify Specialization
  - Identify Generalization
  - Draw a complete E-ER diagram

Lesson Outline

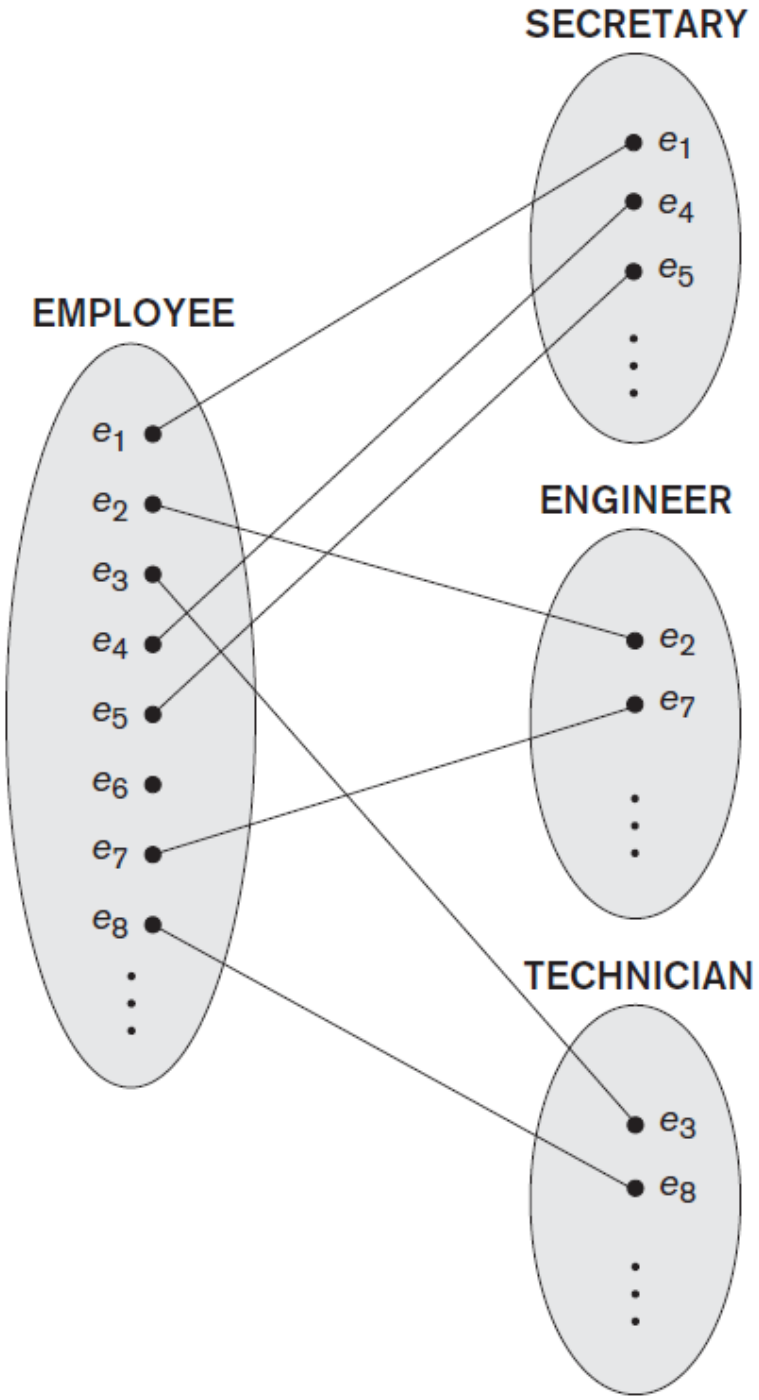
- Extended Entity Relationship Diagram
- Super class / Sub class relationship
- Inheritance
- Specialization / Generalization
- Participation Constraint
- Disjoint Constraint

Extended Entity Relationship (EER) Diagram

- Includes all modeling concepts of basic ERD.
- Additional concepts:
  - super class / super classes
  - specialization / generalization
  - attribute and relationship inheritance
- EER includes some object-oriented concepts, such as inheritance.
- EER model = ER model + hierarchical relationships.

Class Hierarchy

- **Super class (Super type)**
  - An entity type that includes one or more distinct subgroupings of its occurrences, which require to be represented in a data model.
  - Has distinct subclasses.
- **Subclass (Sub type)**
  - A distinct subgrouping of occurrences of an entity type, which require to be represented in a data model.

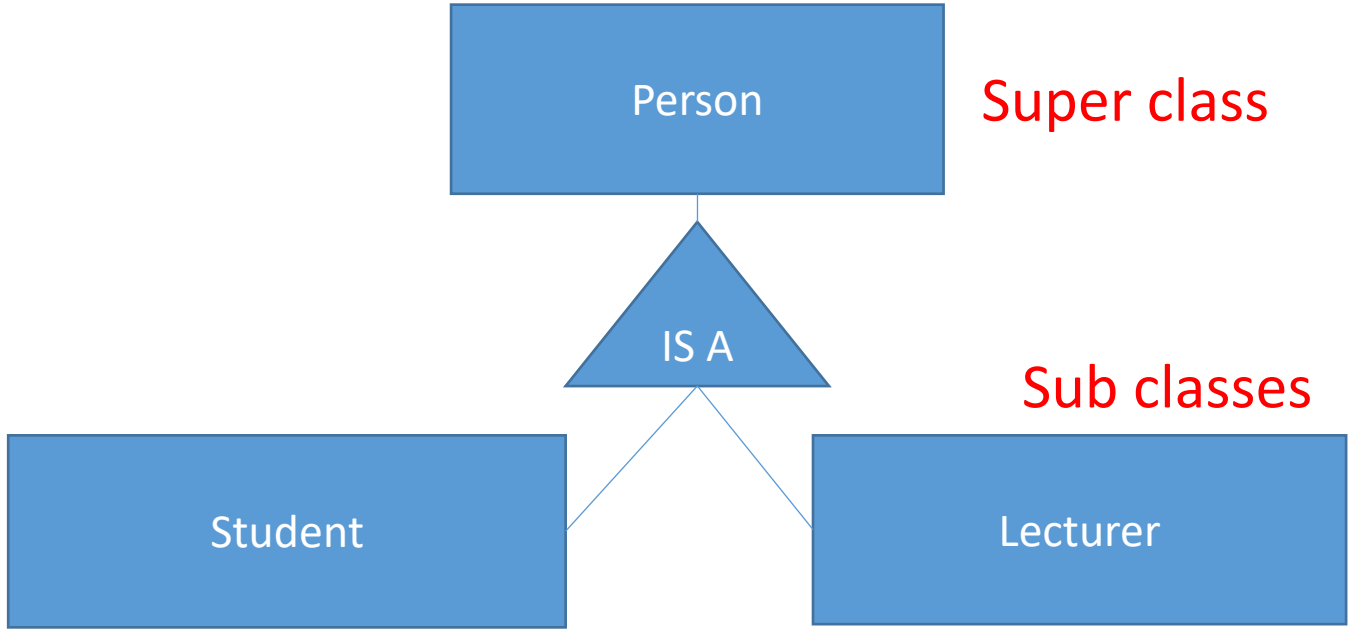


Superclass /Subclass Relationships

- The relationship between a superclass and any one of its subclasses.
- Often referred to as an “IS-A” relationship.
- Each member of a subclass is also a member of the superclass.
- The entity in the subclass is the same entity in the superclass but has a distinct role.
- Sub class inherits all the attributes and relationship types of the super class.
- Superclass/subclass relationship is 1:1 (One to one)
- Superclass may contain overlapping or distinct subclasses.
- Not all members of a superclass need be a member of a subclass.

Inheritance

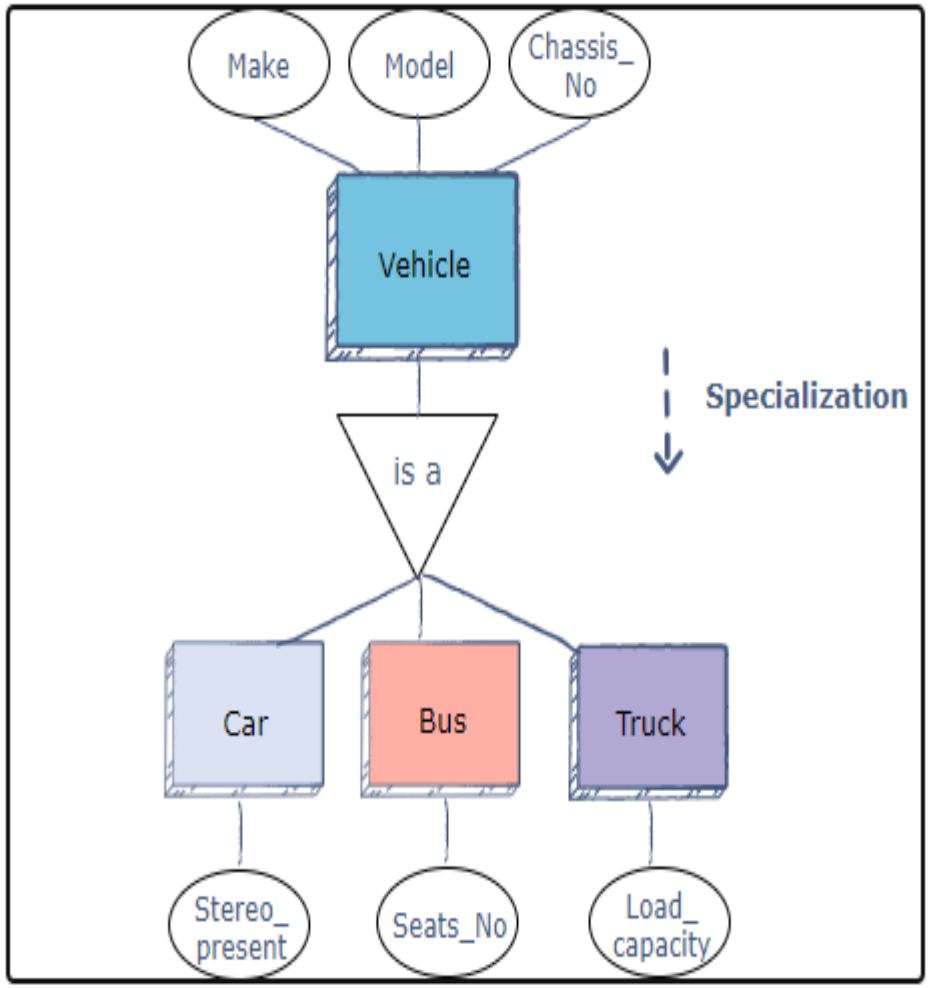
- Inheritance enables to share attributes between objects such that a subclass inherits attributes from its super class.
  - Generalization
  - Specialization



What is specialization?

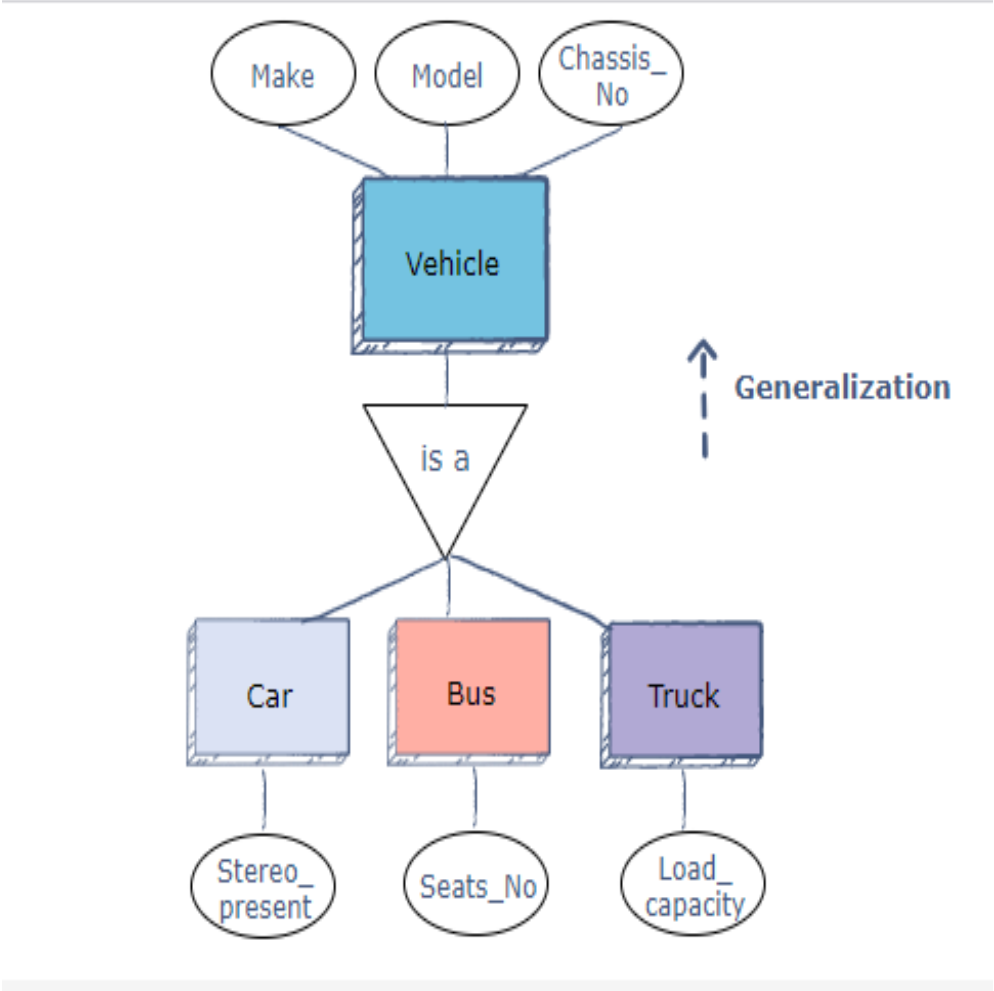
- Process of maximizing differences between members of an entity by identifying their distinguishing characteristics.

- **Specialization** is a top-down approach in which a higher-level entity is divided into multiple specialized lower-level entities.



What is Generalization ?

- Process of minimizing differences between entities by identifying their common characteristics.
- **Generalization** is a bottom-up approach in which multiple lower-level entities are combined to form a single higher-level entity. Generalization is usually used to find common attributes among entities to form a generalized entity.



Participation Constraints

- Determines whether every member in the superclass must participate as a member of a subclass.

- **Total Specialization (Mandatory)**
  - every entity in a super class must be a member of some subclass in some specialization.

- **Partial Specialization (Optional)**
  - allows an entity of a superclass need not belong to any of its subclasses.

Disjoint Constraint

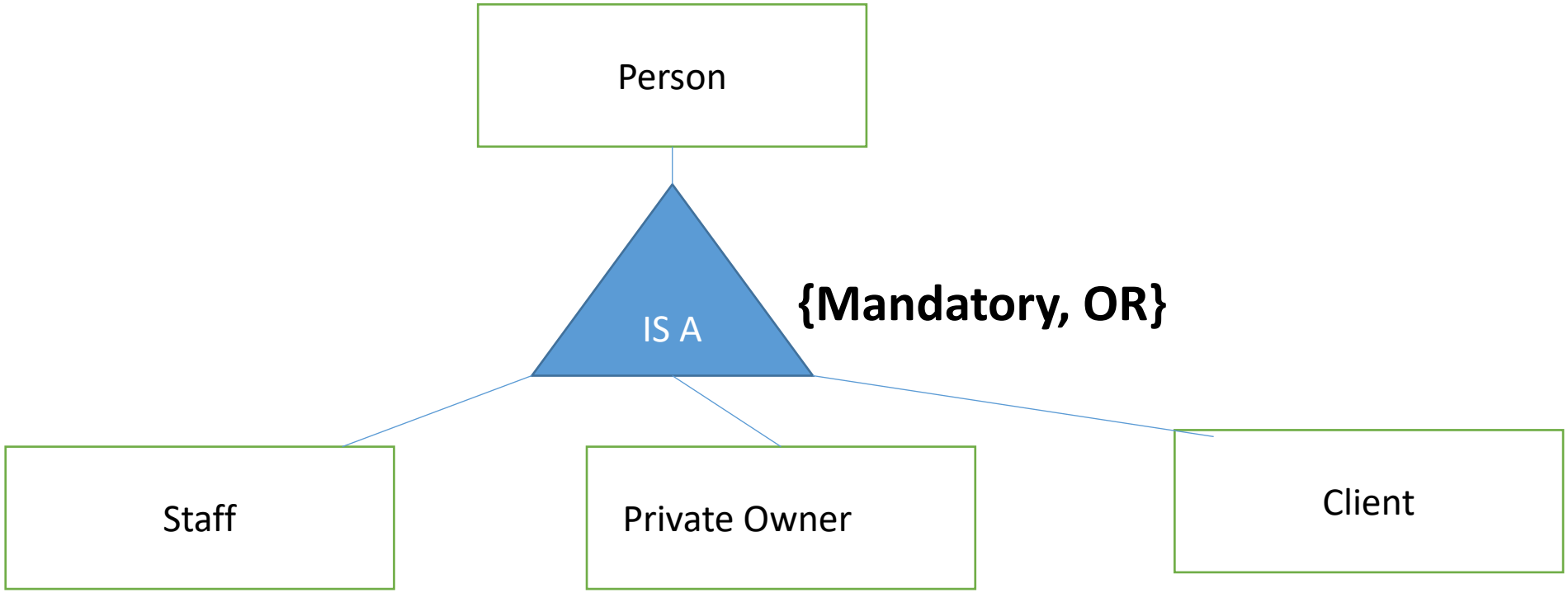
- Describes the relationship between members of the subclasses and indicates whether it is possible for a member of a superclass to be a member of one, or more than one, subclass.

- There are two types of constraints:
  - Disjoint (**OR**): In one sub classes
  - Overlap (**AND**): In many sub classes

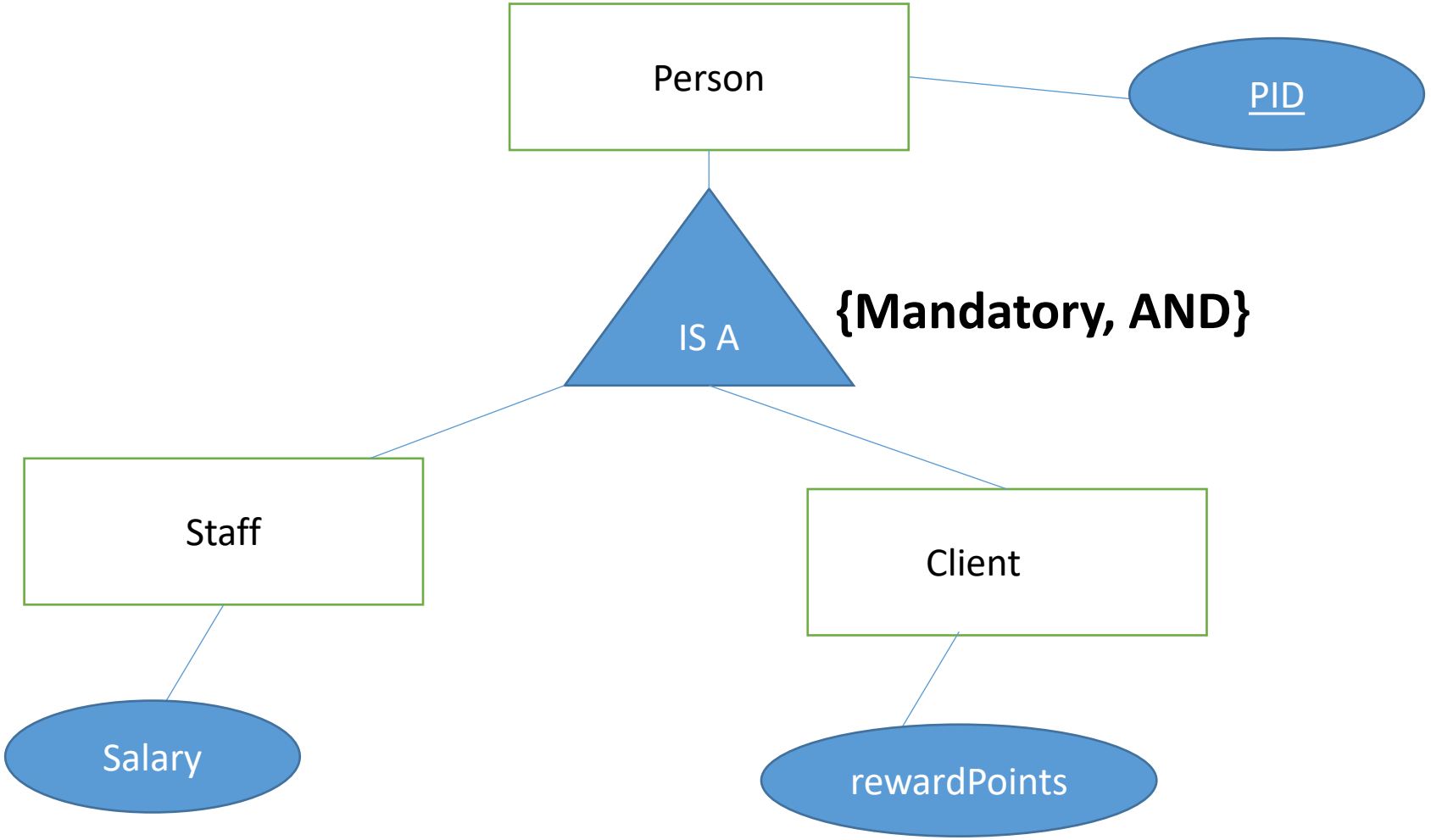
Four types of specialisation and generalisation

- Mandatory, OR
- Mandatory, AND
- Optional, OR
- Optional, AND

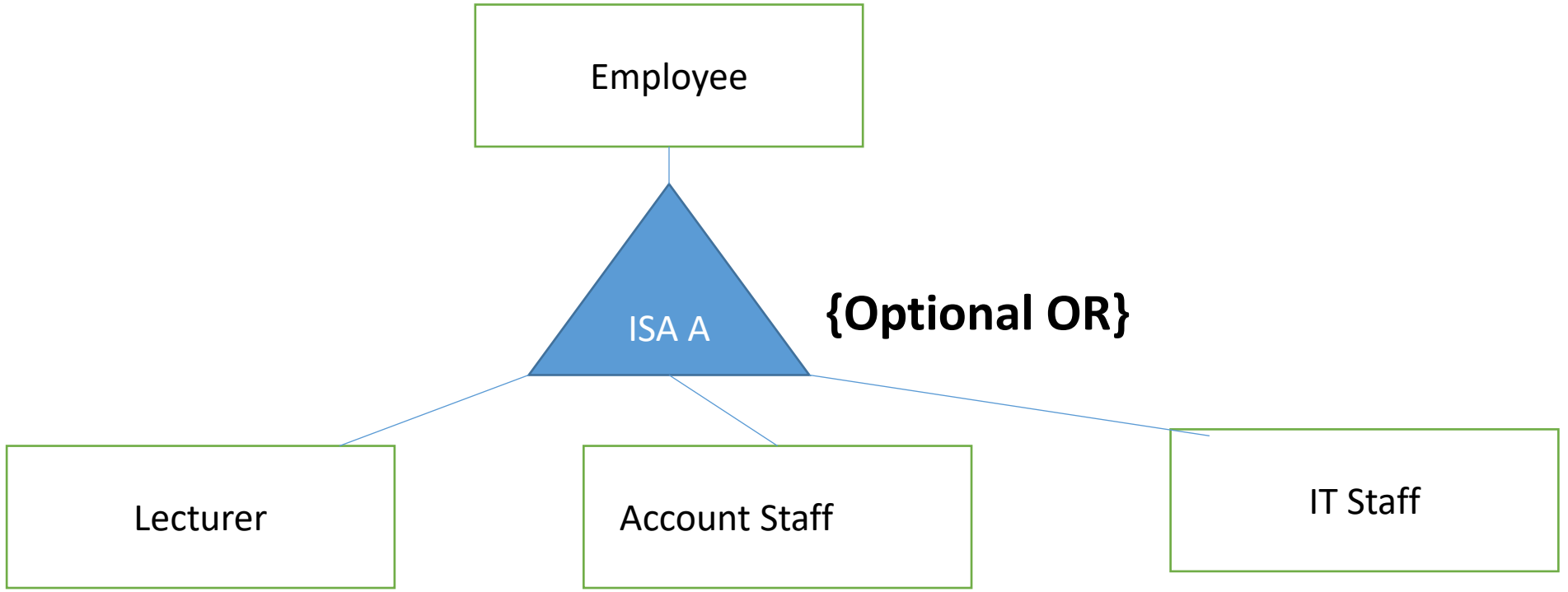
Mandatory, OR



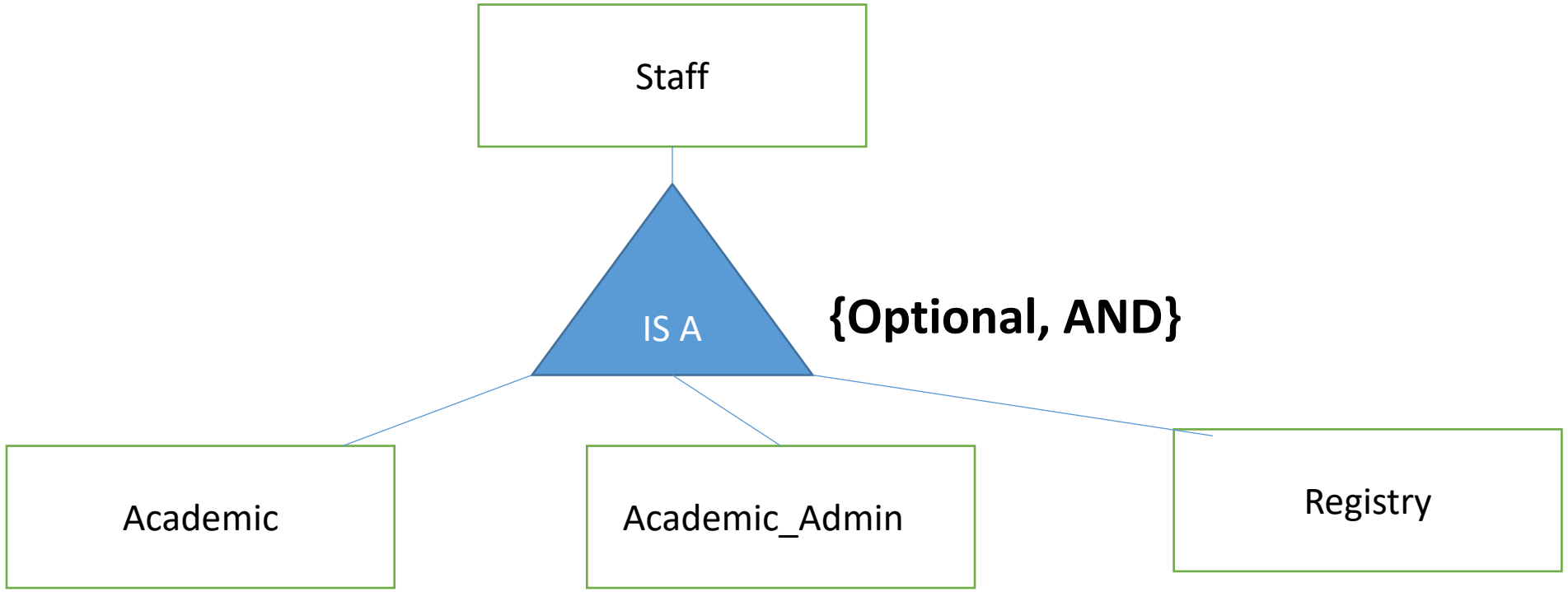
Mandatory, AND



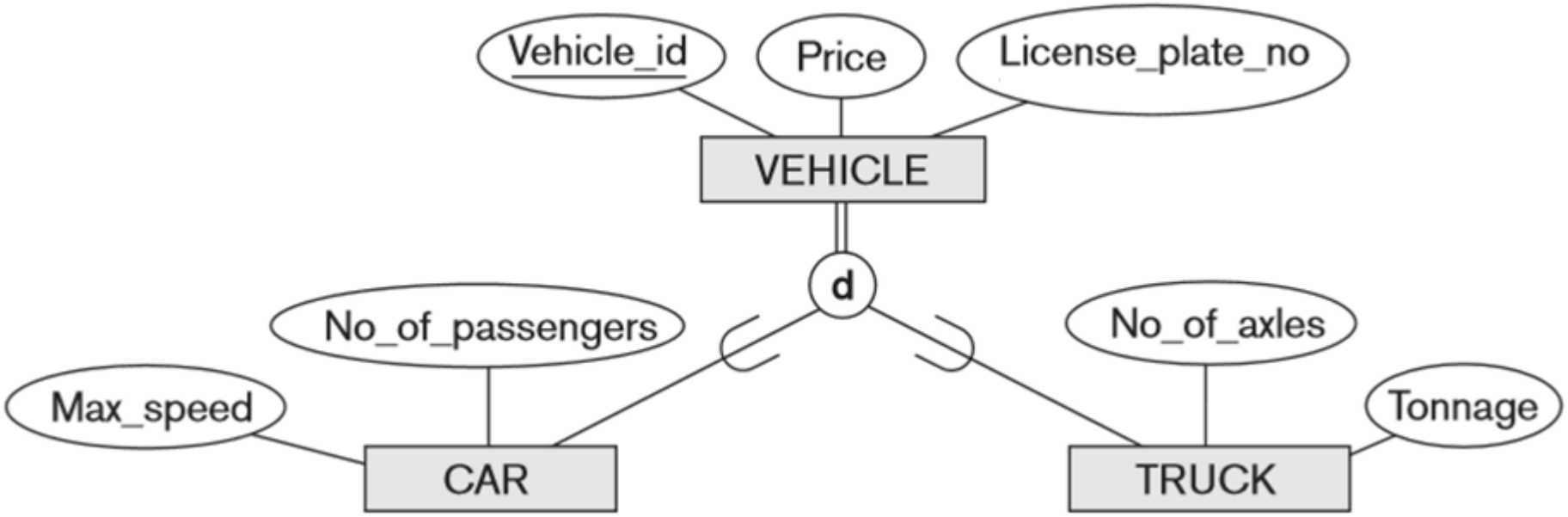
Optional, OR



Optional , AND



More examples



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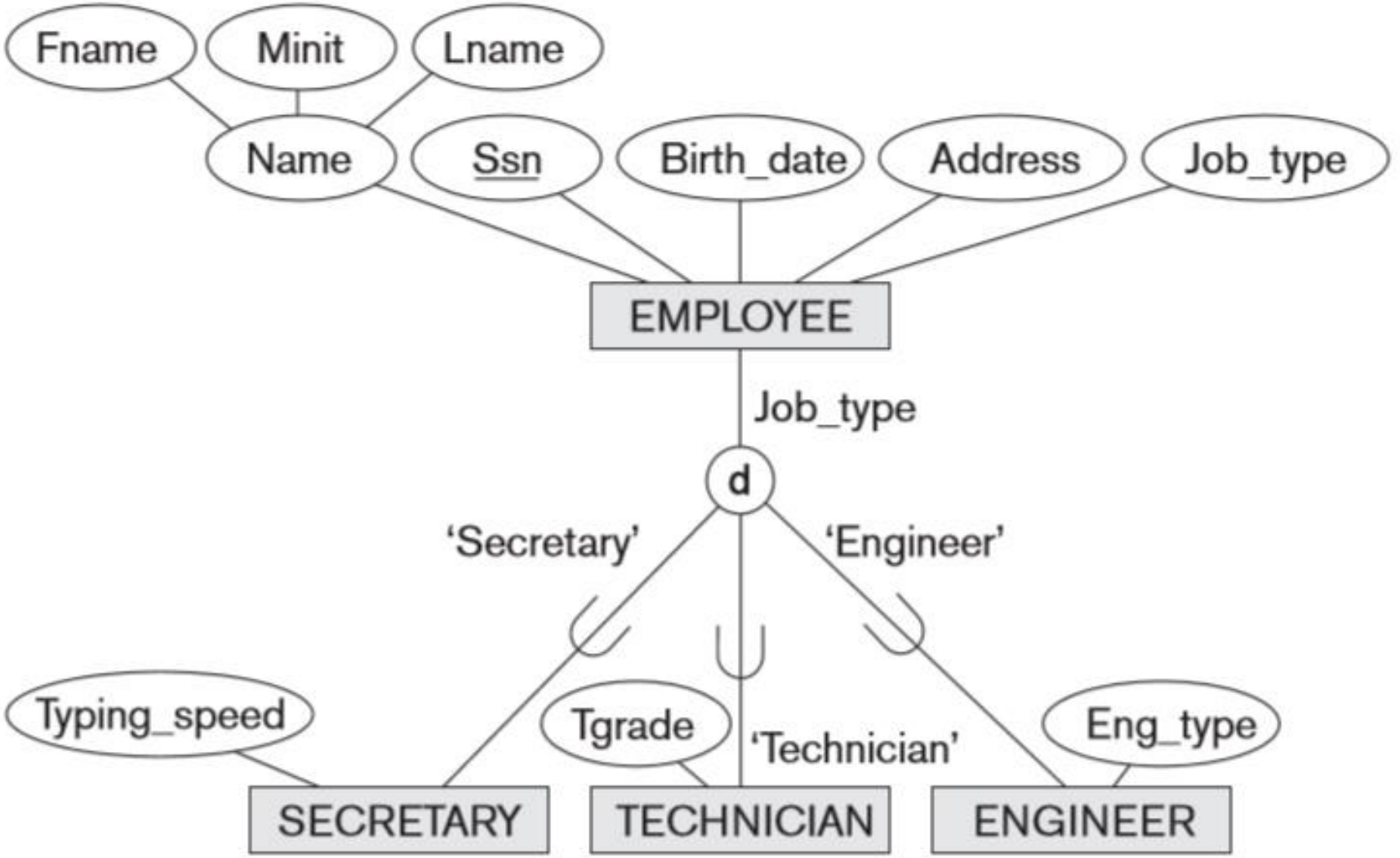
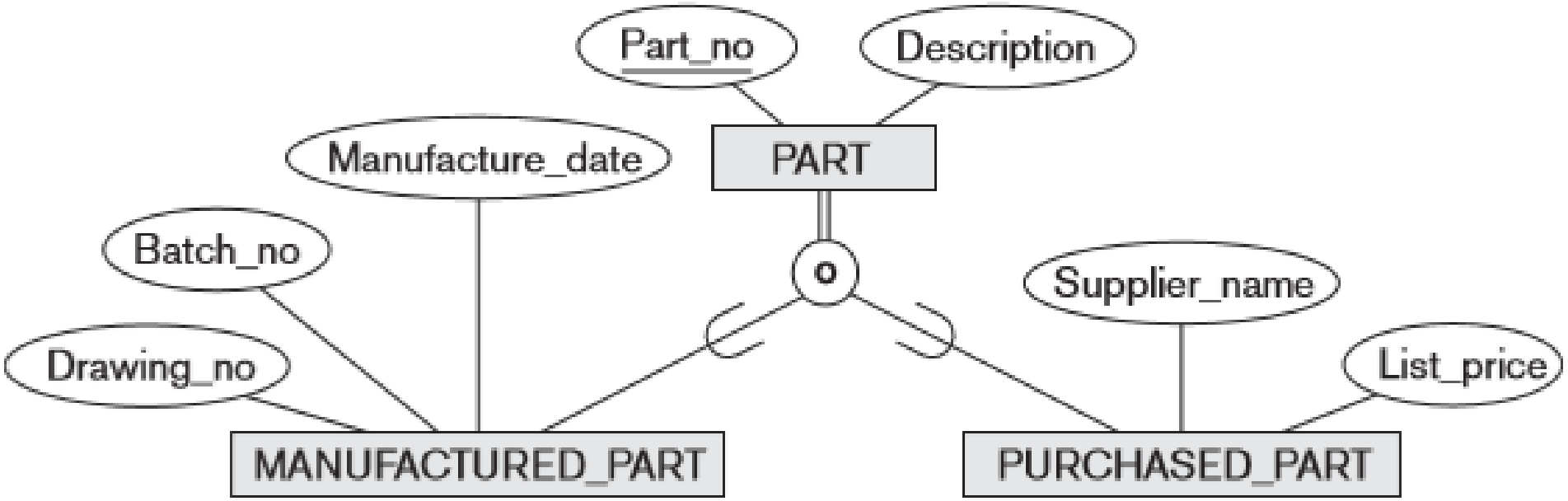
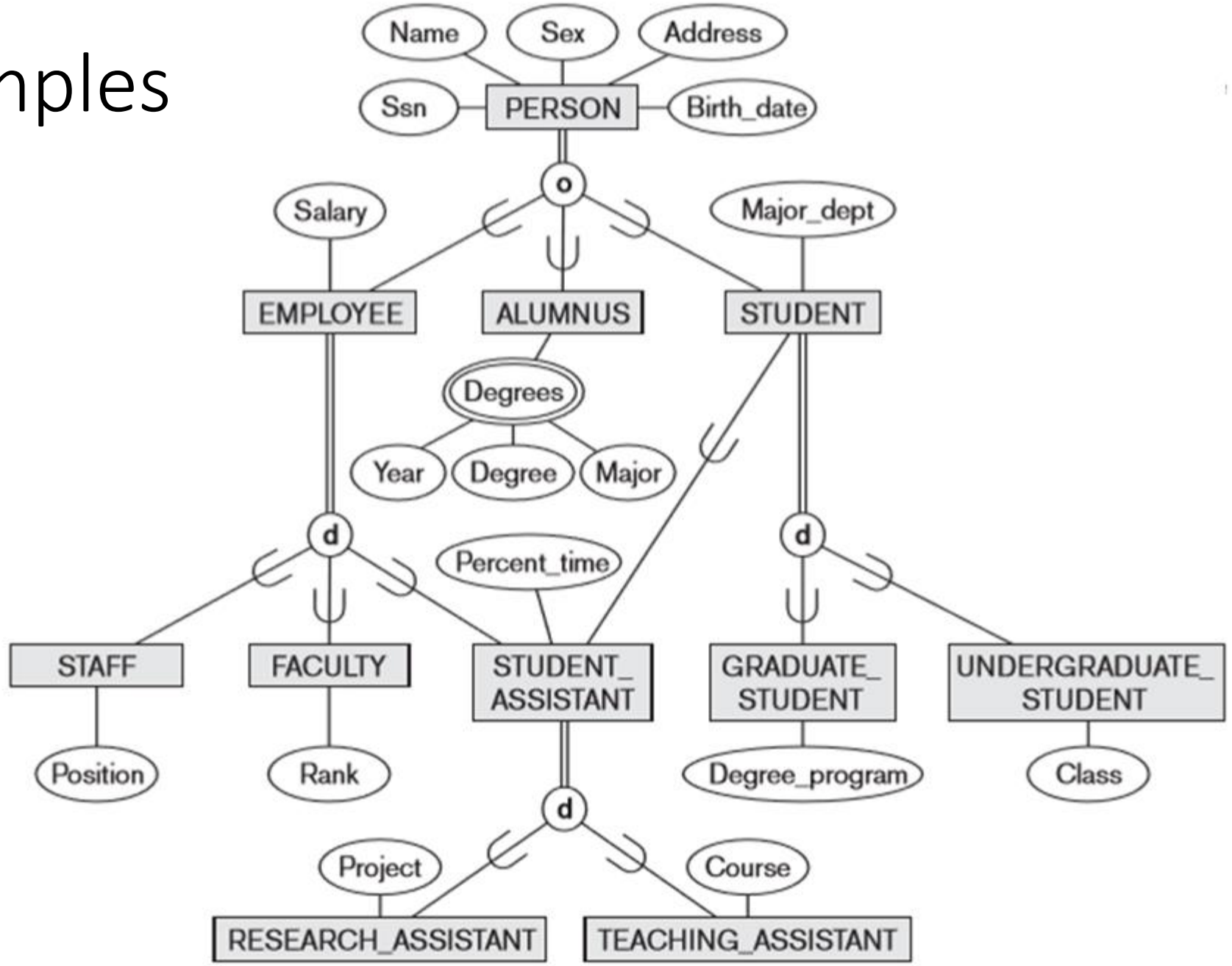


More examples



More examples



Thank you

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