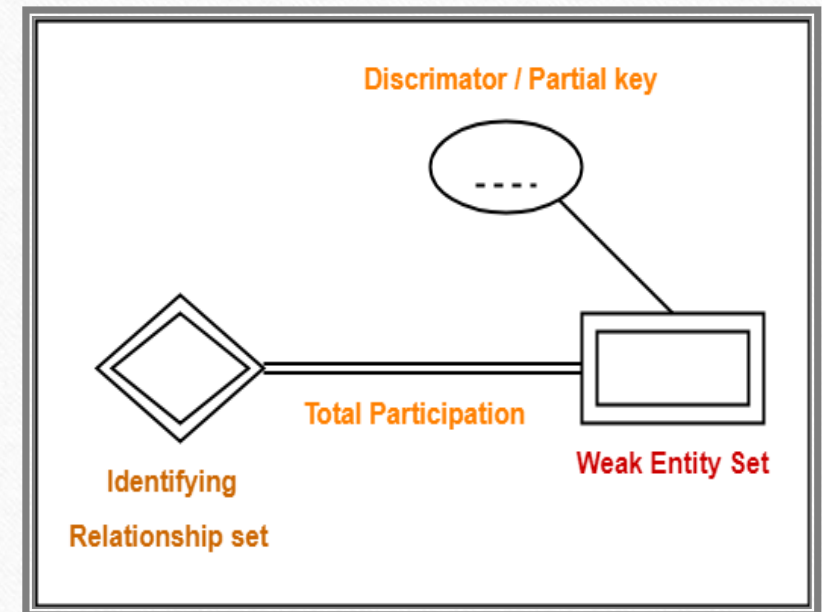


Entity Relationship Model

Part-2

Weak Entity Set

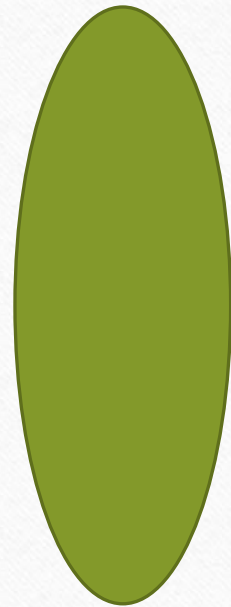
- Weak entity set: An entity set that does not have a primary key.
- Its existence depends on the existence of a strong entity set.
- The discriminator of a weak entity set is the set of attributes that distinguishes between all the entities of a weak entity set.
- Its primary key is created by combining the primary key of the strong entity set on which the weak entity set is existence dependent and the weak entity set's discriminator.
- We underline the discriminator attribute with a dashed line.



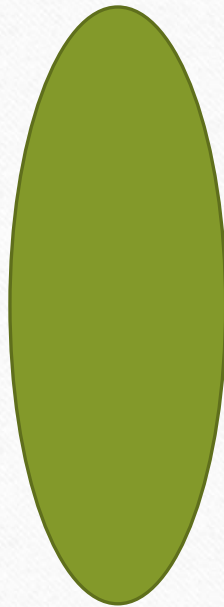
Example

Employee = {eid, name, age, department}

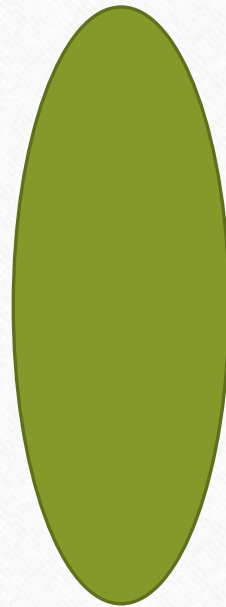
Dependent = {name, age, relation}



Employee

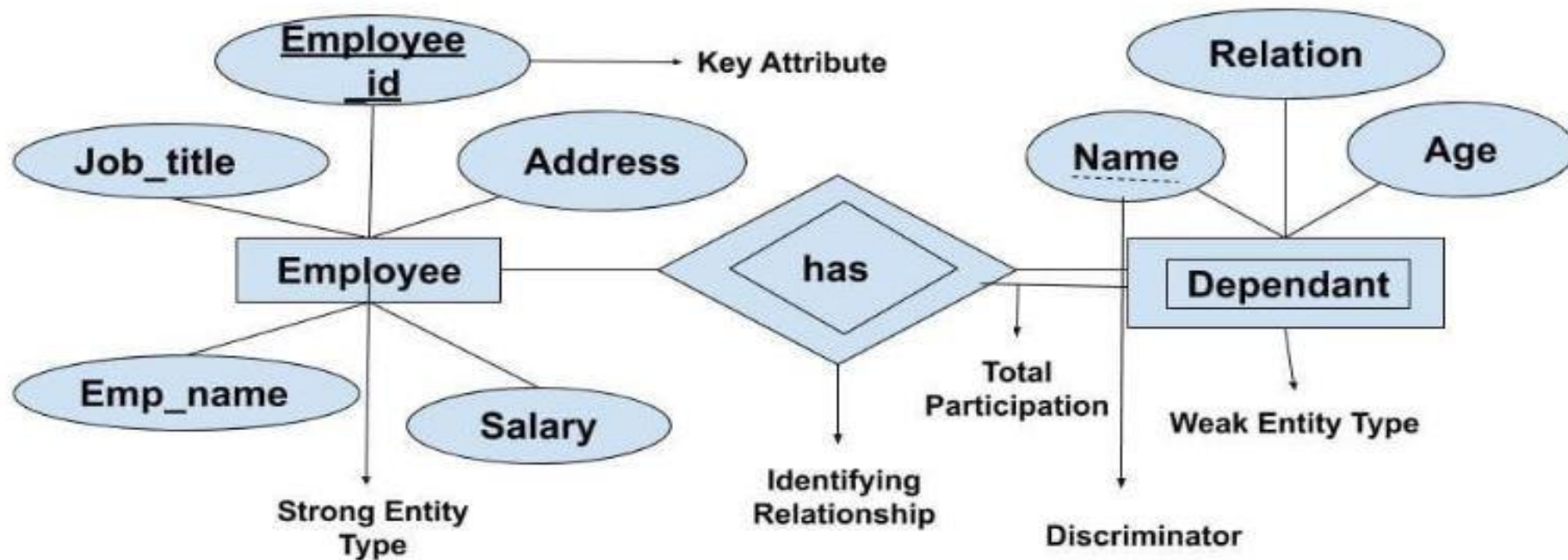


Identifying
relationship

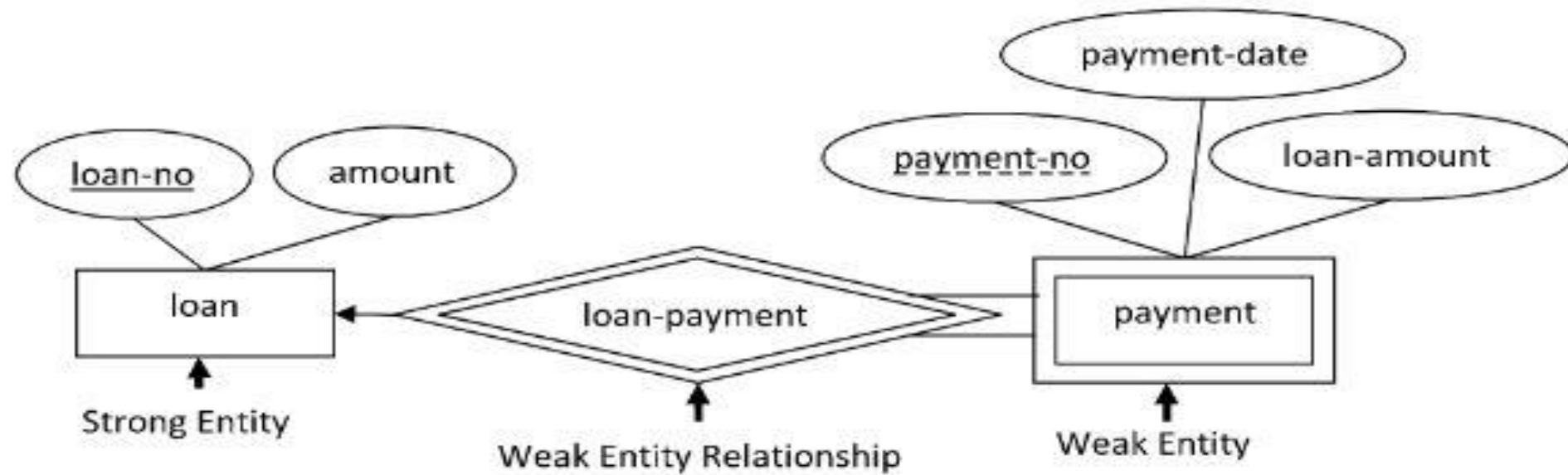


Dependent

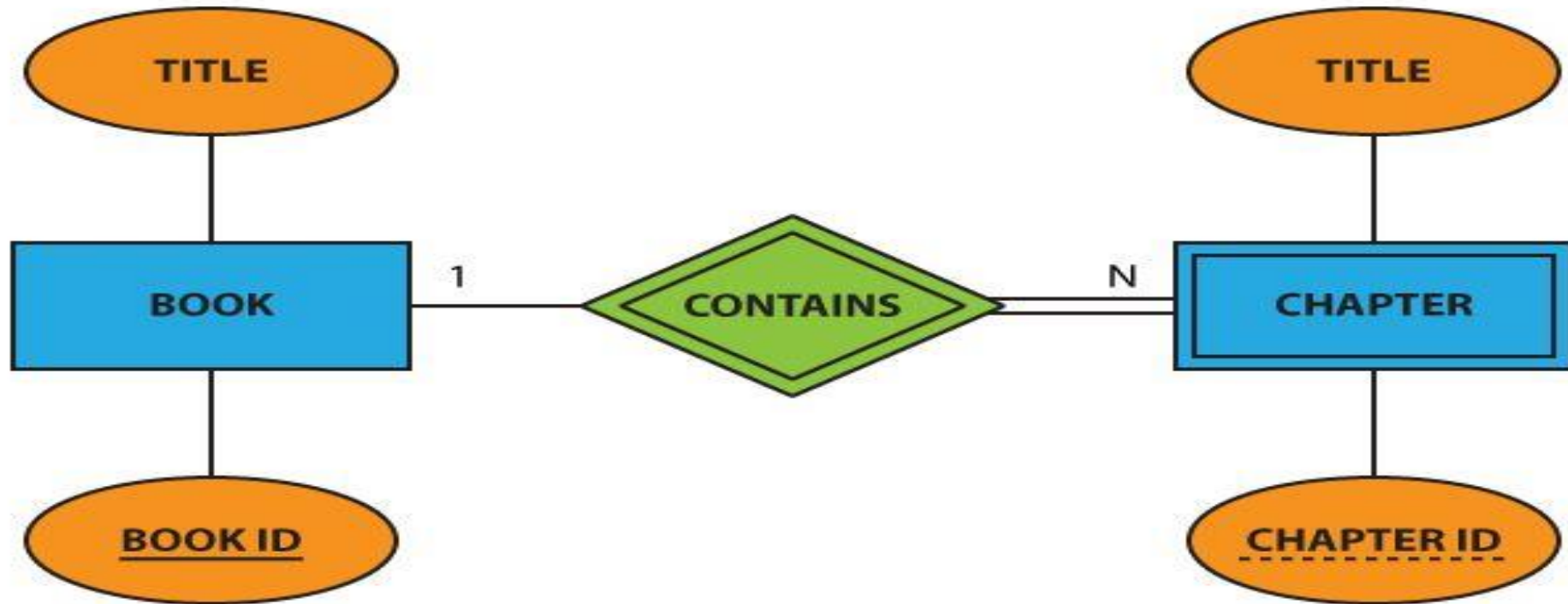
Weak Entity set examples contd.



Weak Entity set examples



Weak Entity set examples contd.



MCQ

-
- Weak entities and their identifying relationship in the ER diagrams are represented by
 - Oval shape with double line
 - Rectangle shape with double line
 - Square shape with double line
 - Diamond shape with double line

MCQ

-
- Weak entities and their identifying relationship in the ER diagrams are represented by
 - Oval shape with double line
 - Rectangle shape with double line
 - Square shape with double line
 - **Diamond shape with double line**

MCQ

-
- The entities that have key attributes to be distinct are considered as
 - Weak entity
 - Strong entity
 - Single entity
 - Foreign entity

MCQ

-
- The entities that have key attributes to be distinct are considered as
 - Weak entity
 - **Strong entity**
 - Single entity
 - Foreign entity

MCQ

-
- The parent entity type or identifying entity type are considered as other names of
 - Dominant entity type
 - Non dominant entity type
 - Composite entity type
 - Non foreign entity type

MCQ

-
- The parent entity type or identifying entity type are considered as other names of
 - **Dominant entity type**
 - Non dominant entity type
 - Composite entity type
 - Non foreign entity type

MCQ

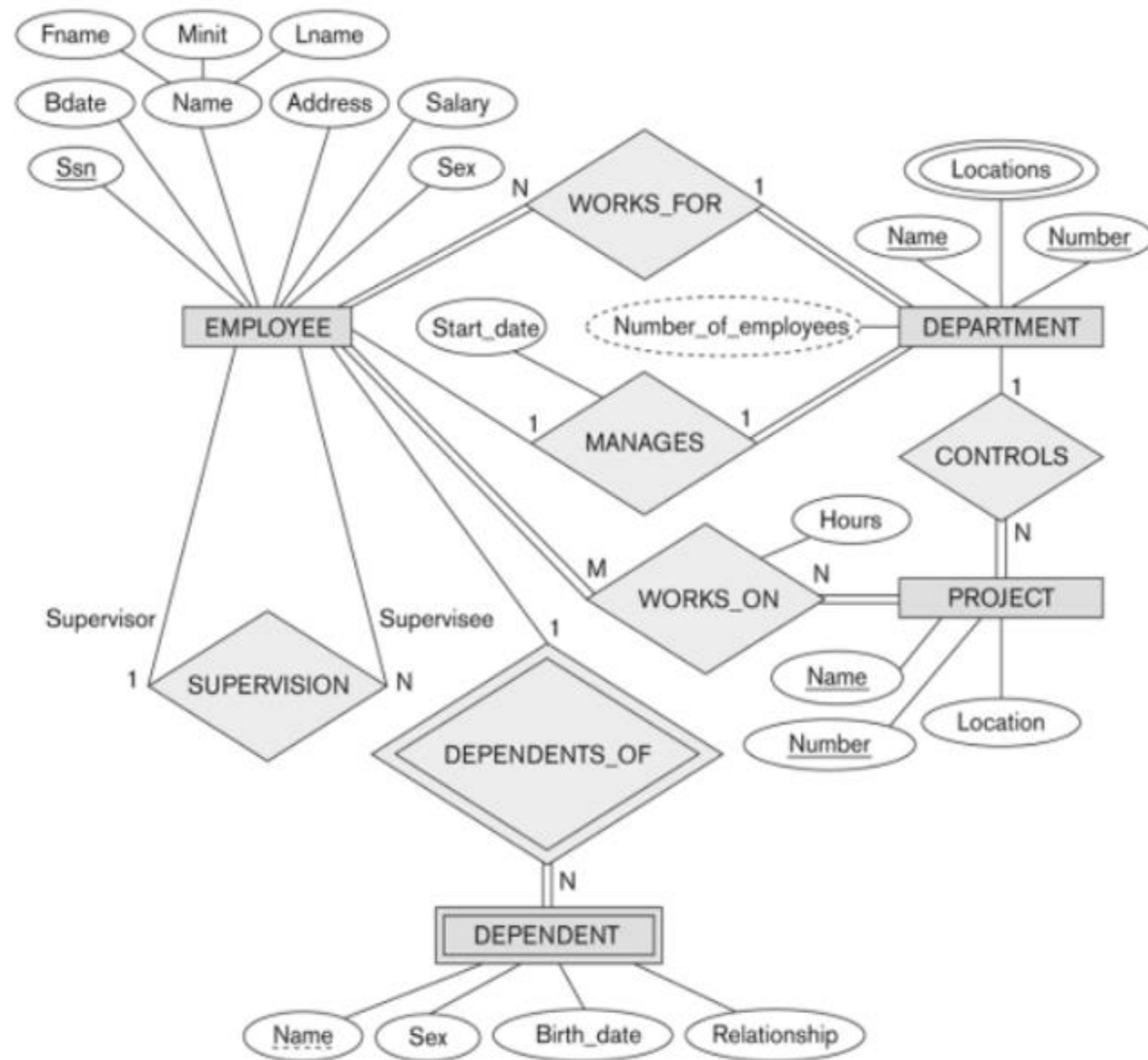
-
- The set of key attributes that identify weak entities related to owner entity is classified as
 - Structural key
 - Partial key
 - String key
 - Foreign key

MCQ

-
- The set of key attributes that identify weak entities related to owner entity is classified as
 - Structural key
 - **Partial key**
 - String key
 - Foreign key

Steps in Designing an Entity-Relationship Schema

1. Identify entity types (entity type vs. attribute)
2. Identify relationship types
3. Identify and associate attributes with entity and relationship types
4. Determine attribute domains.
5. Determine primary key attributes for entity types
6. Associate (refined) cardinality ratio(s) with relationship types
7. **Design generalization/specialization hierarchies including constraints (includes natural language statements as well)**



EER Model

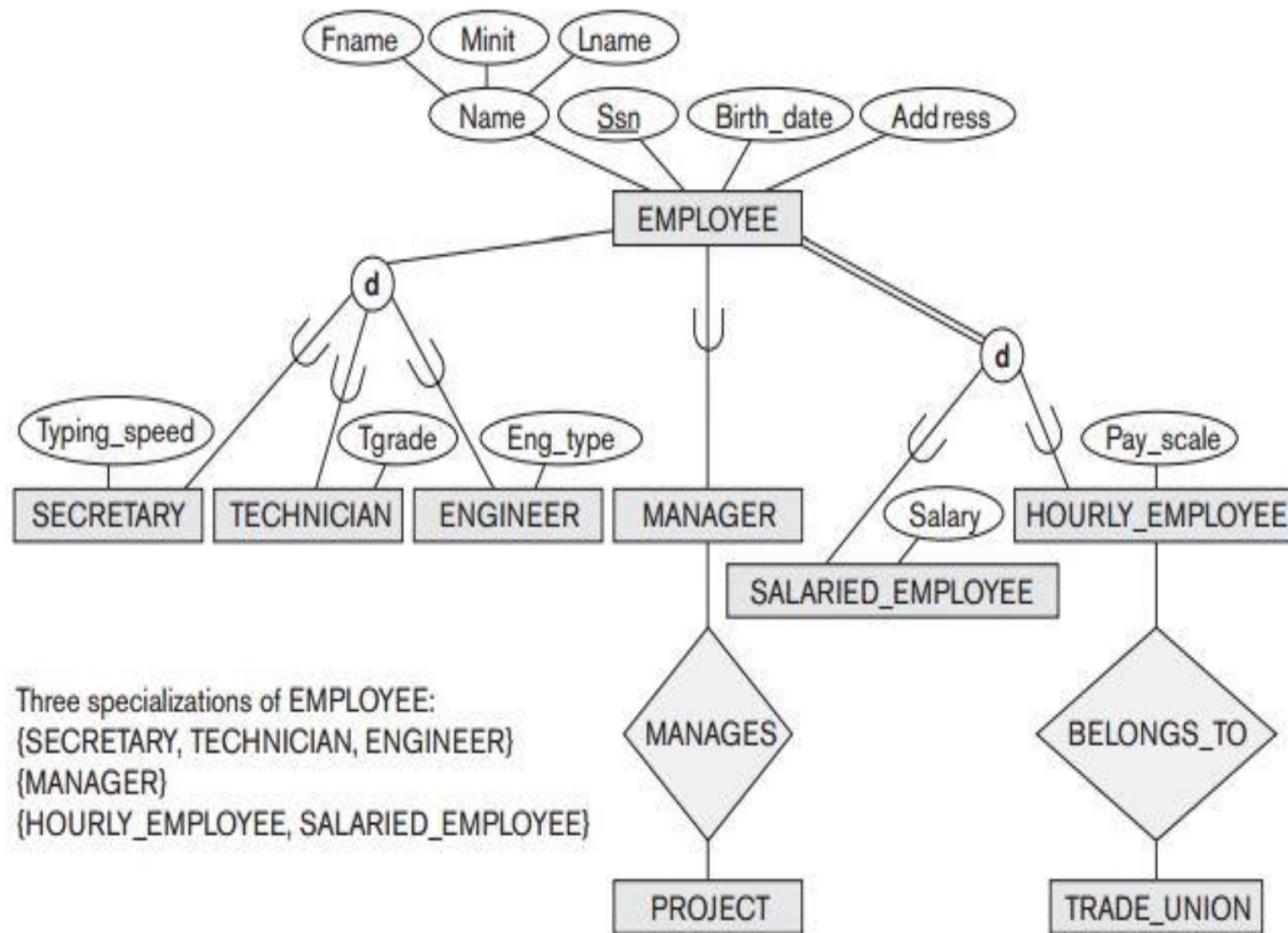
- EER stands for Extended/Enhance ER model
- Enhanced entity-relationship diagrams are advanced database diagrams very similar to regular ER diagrams which represents requirements and complexities of complex databases.
- Why to go for EER model?
 - The additional EER concepts are used to model applications more accurately and more completely.
 - EER includes some object oriented concepts such as inheritance.

Extended Features of ER Model

-
- Specialization
 - Generalization
 - Inheritance

Subclasses and Superclasses (1)

- An entity type may have additional meaningful subgroupings of its entities
 - Example: EMPLOYEE may be further grouped into:
 - SECRETARY, ENGINEER, TECHNICIAN, ...
 - Based on the EMPLOYEE's Job
 - MANAGER
 - EMPLOYEES who are managers
 - SALARIED_EMPLOYEE, HOURLY_EMPLOYEE
 - Based on the EMPLOYEE's method of pay
- EER diagrams extend ER diagrams to represent these additional subgroupings, called subclasses or subtypes



How Can you categorize employees of BU

- Professors, Data Entry operators, clerks, gardeners, drivers (job type)
- Deans(only deans manages schools)
- Permanent and contract employees (job agreement)

Subclasses and Superclasses (2)

- These are also called **IS-A** relationships
 - SECRETARY **IS-A** EMPLOYEE, TECHNICIAN **IS-A** EMPLOYEE,
- **Note:** An entity that is member of a subclass represents the same real-world entity as some member of the superclass:
 - The subclass member is the same entity in a distinct specific role
 - An entity cannot exist in the database merely by being a member of a subclass; it must also be a member of the superclass

Subclasses and Superclasses (2)

- A member of the superclass can be optionally included as a member of any number of its subclasses
- Examples:
 - A salaried employee who is also an engineer belongs to the two subclasses:
 - ENGINEER, and
 - SALARIED_EMPLOYEE
 - A salaried employee who is also an engineering manager belongs to the three subclasses:
 - MANAGER,
 - ENGINEER, and
 - SALARIED_EMPLOYEE
- It is not necessary that every entity in a superclass be a member of some subclass

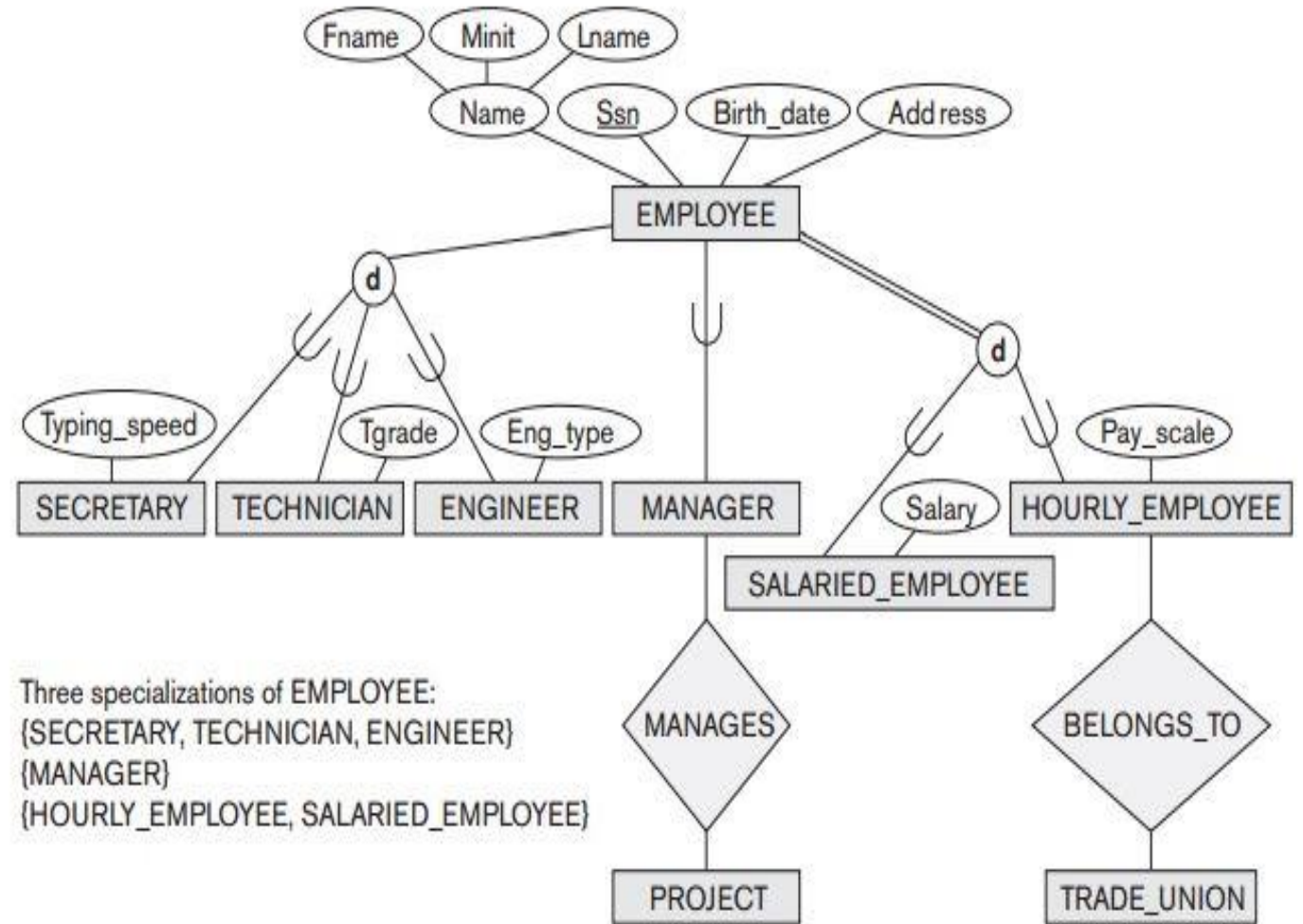
Specialization

- **Top-down design process:** We designate sub grouping within an entity set that are distinctive from other entities in the set.
- The subgrouping become lower level entity sets that have attributes or participate in relationships that do not apply to the higher level entity set
- Depicted by a **triangle component labelled ISA.**
- **Attribute inheritance:** A lower level entity set inherits all the attributes and relationship participation of the linked higher entity set.

Specialization Example

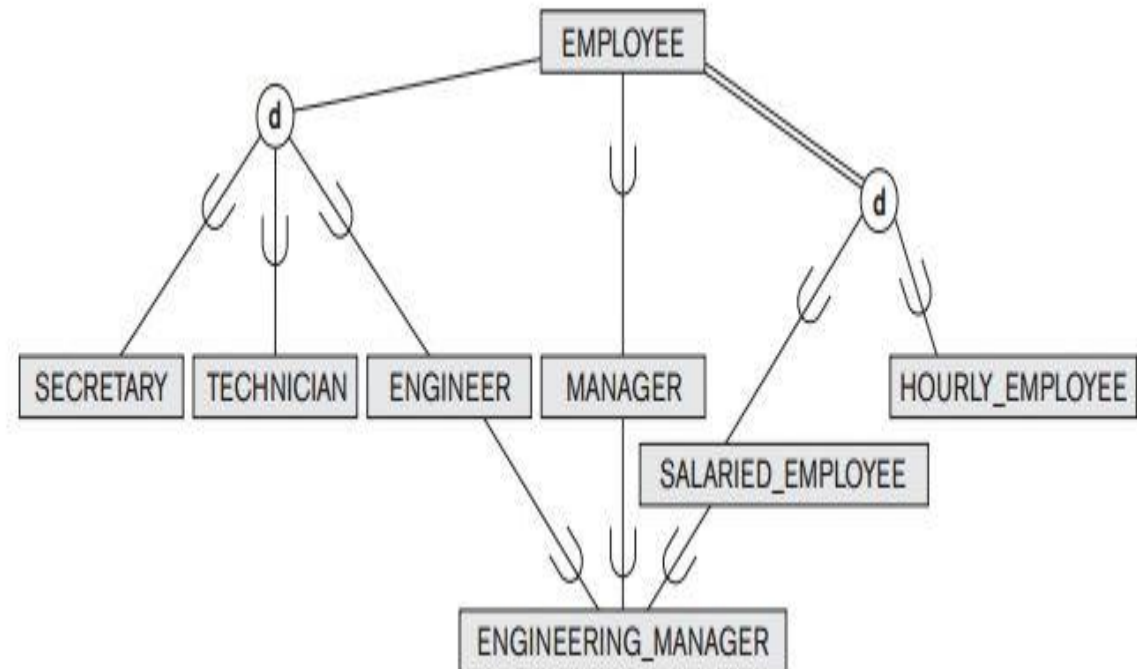
The distinguished feature for specialization are:

- The job the employee performs.
- the person is a temporary (limited-term) employee or a permanent employee



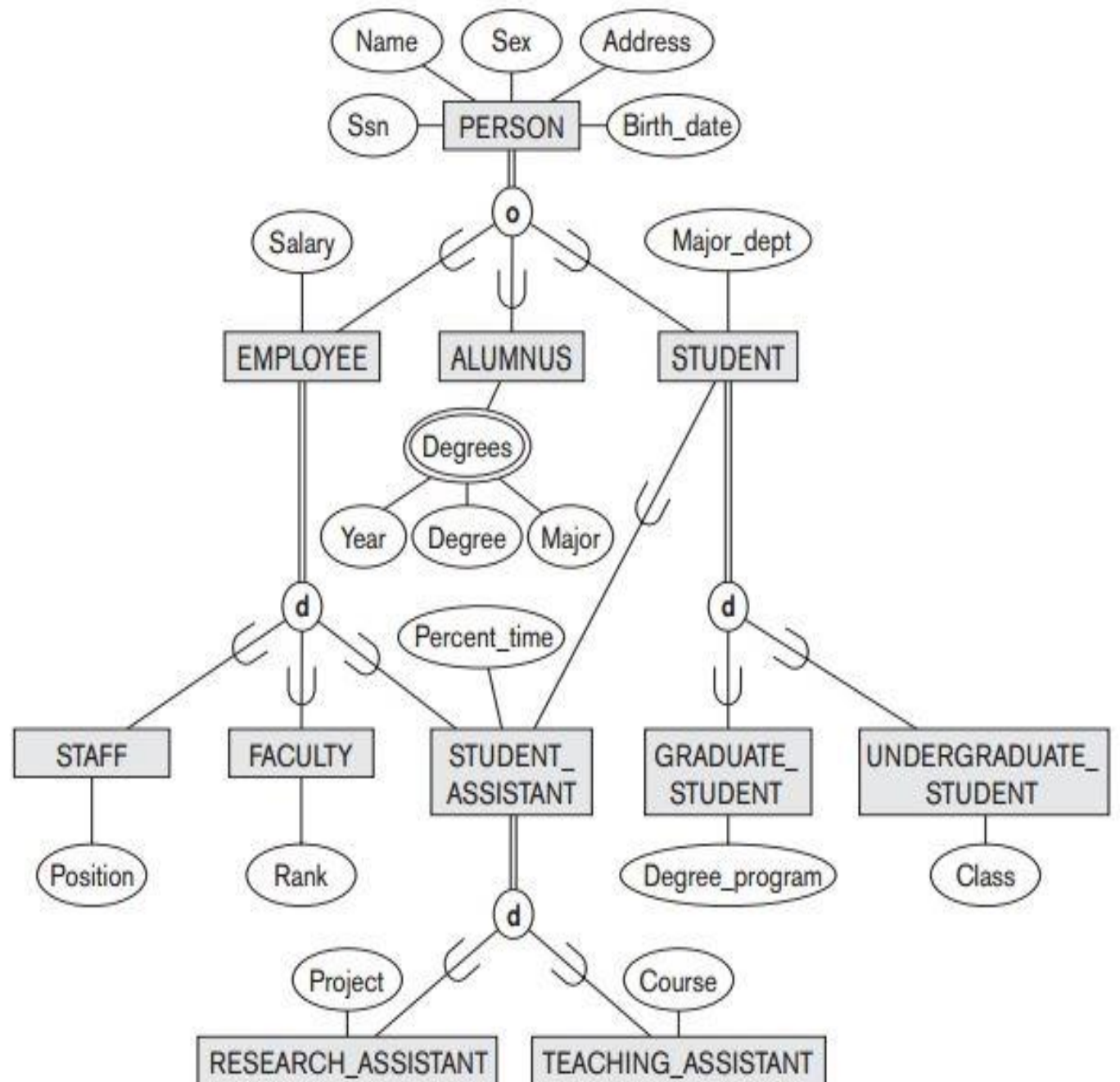
Specialization Lattice

- A **specialization hierarchy** has the constraint that every subclass participates *as a subclass* in *only one* class/subclass relationship
- For a **specialization lattice**, a subclass can be a subclass in *more than one* class/subclass relationship.



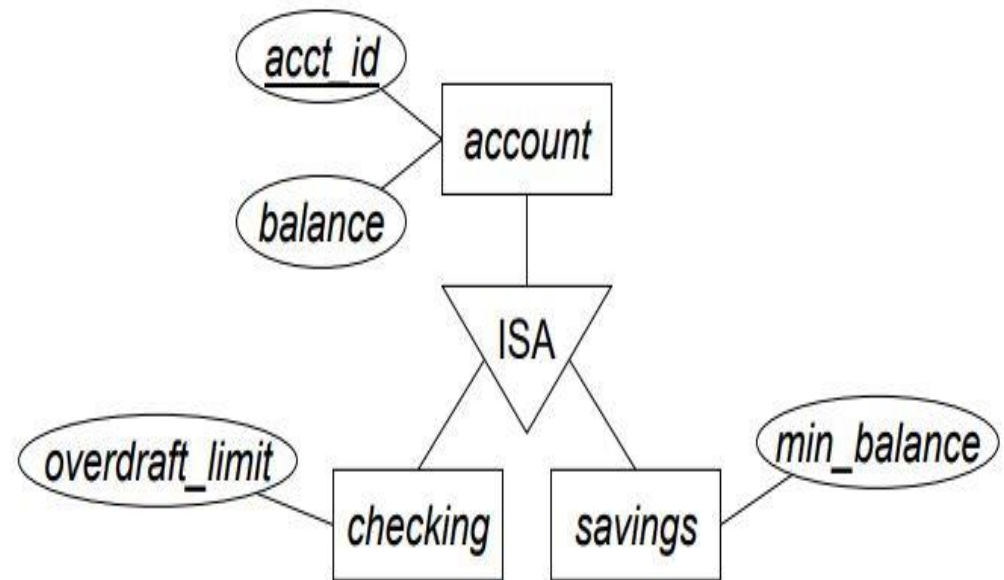
A specialization lattice with shared subclass
ENGINEERING_MANAGER

A Specialization Lattice with multiple Inheritance for a university database



Generalization

- A bottom up design process: Combine a number of entity sets that share the same features into a higher level entity set.
- The term generalization and specialization are used interchangeably.
- The ISA relationship can also be referred to as “superclass-subclass” relationship.



Inheritance

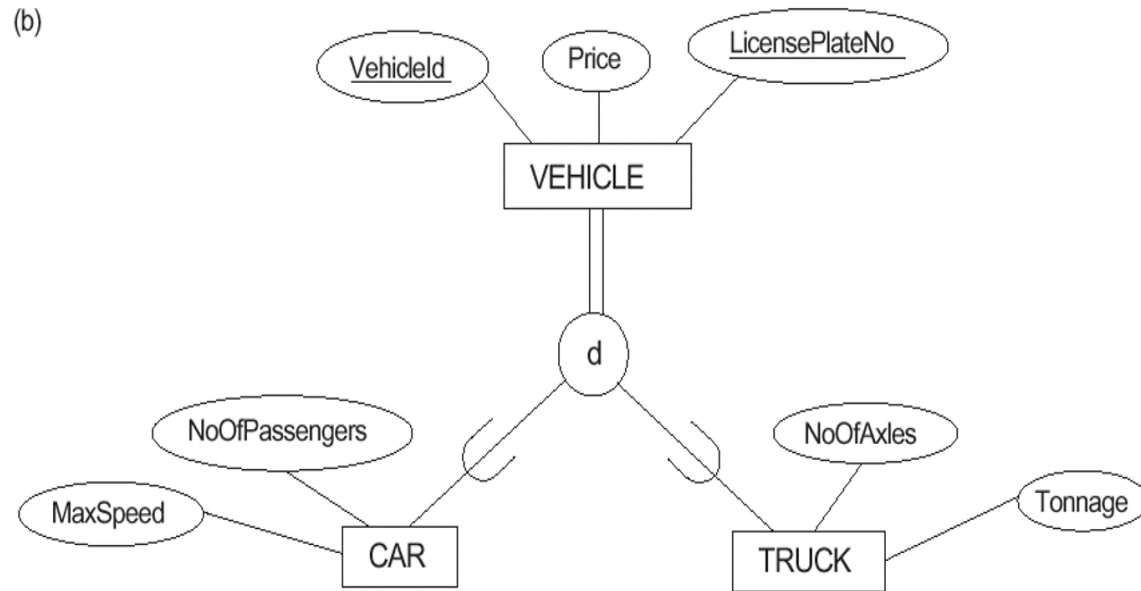
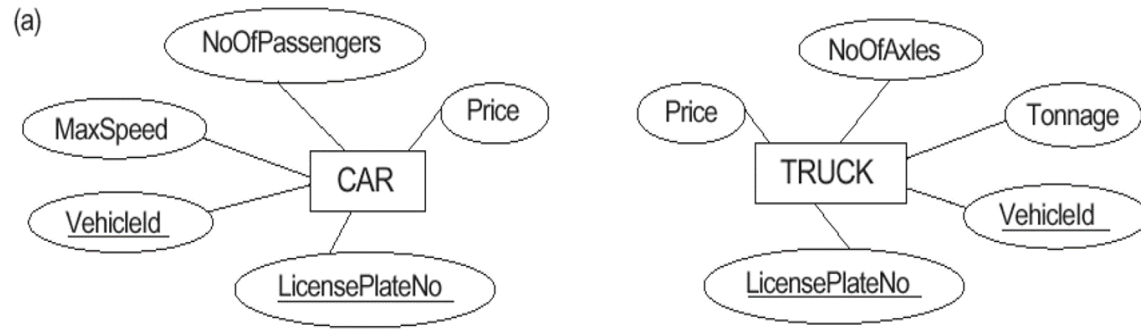
- Attributes of higher-level entity-sets are inherited by lower-level entity-sets
- Relationships involving at higher level is also inherited by lower level elements
- When entity-sets inherit from one super class
 - Entity sets form a hierarchy
- When entity-sets inherit from multiple super classes
 - Entity-sets form a lattice

Constraints on Specialization/Generalization: Membership Constraints

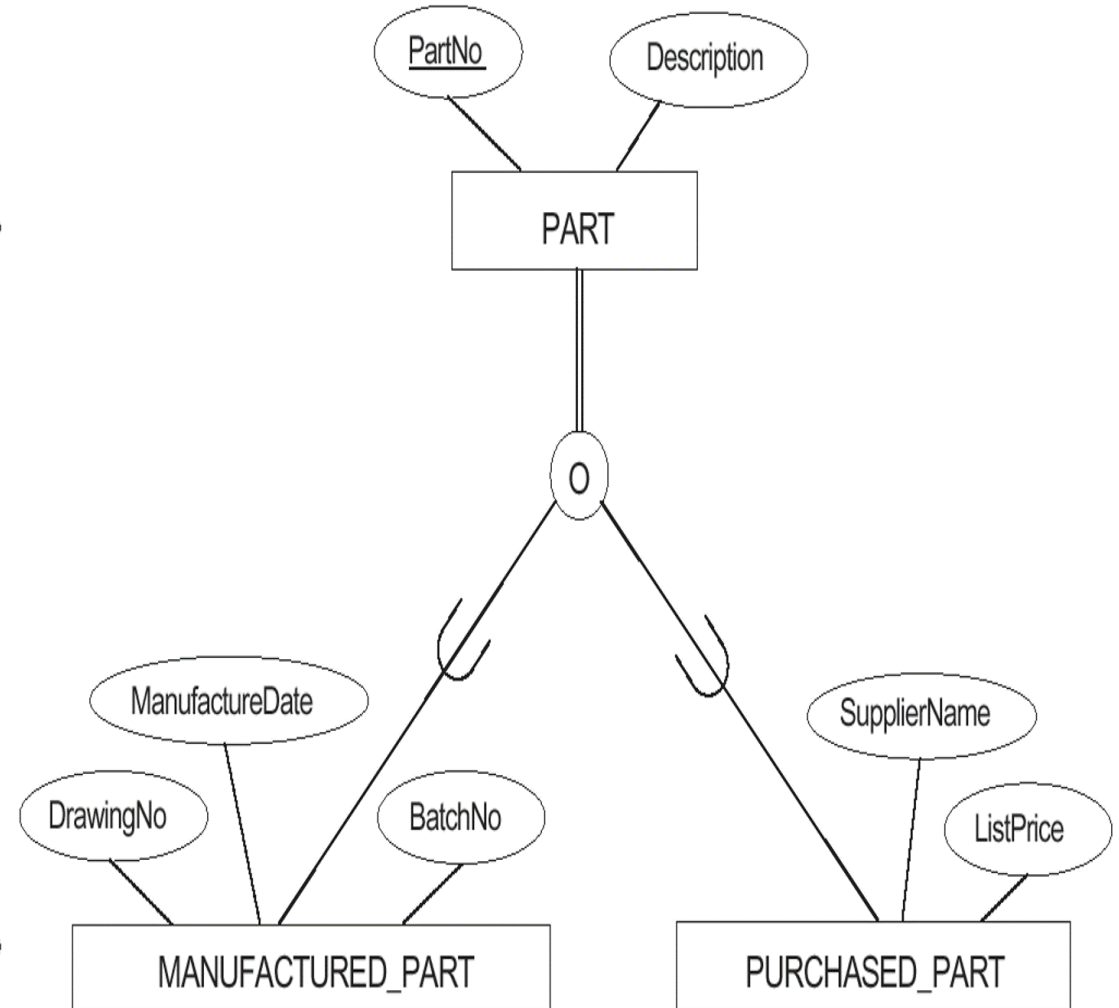
- **Predicate defined subclasses:** The subclass is defined through a predicate on the attributes of the superclass
- **Attribute defined subclasses**
 - The subclasses in the specialization are all defined by the same attribute of the superclass. E.g.- Based on account type, it can be divided into saving and checking account.
- **User defined subclasses**
 - Membership in the subclasses is determined at the insertion operation level. E.g.- Team formed to create specific task

Constraints on Specialization/Generalization: Disjointness Constraints

- **Disjoint (d)**
 - The subclasses must have disjoint sets of entities
- **Overlap (o)**
 - The subclasses may have overlapping sets of entities



Disjoint Example



Overlapping Example

Constraints on Specialization/Generalization: Completeness Constraints

- **Partial**
 - An entity may not belong to any of the subclasses (single-line)
- **Total**
 - Every entity in the superclass must be a member of some subclass (double-edge)

Constraints on Specialization/Generalization:

- **Hence we have four types of Specialization/Generalization:**
- Disjoint, total
- Disjoint partial
- Overlapping , total
- Overlapping, partial
- **Note: Generalization usually is total because the superclass is derived from the subclass.**

Student

mobilenumber

Part-time
student

Full-time
student

prepaid

Post paid

artist

player

singer

actor

batsman

bowler

Batch_2019_cse

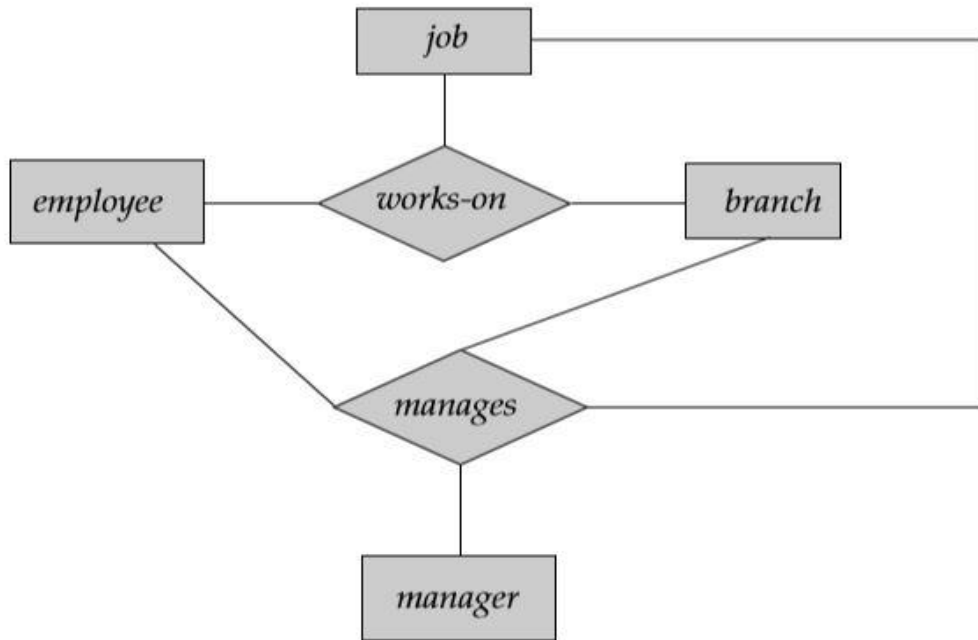
eb01

eb14

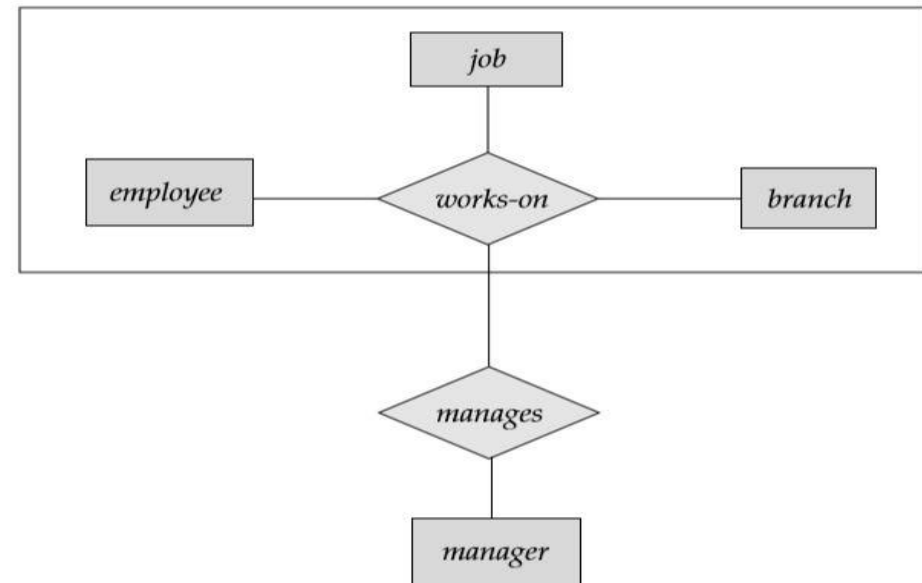
Aggregation

- An ER diagram is not capable of representing relationship between an entity and a relationship which may be required in some scenarios.
- In those cases, a relationship with its corresponding entities is aggregated into a higher level entity.
- Aggregation is an abstraction through which relationships are treated as higher level entities.
- It is used to express relationships among relationships.

Aggregation Contd.



Without Aggregation



With Aggregation

MCQ

-
- The entity set person is classified as student and employee. This process is called _____
 - a) Generalization
 - b) Specialization
 - c) Inheritance
 - d) Constraint generalization

MCQ

-
- The entity set person is classified as student and employee. This process is called _____
 - a) Generalization
 - b) **Specialization**
 - c) Inheritance
 - d) Constraint generalization

MCQ

-
- Which relationship is used to represent a specialization entity?
 - a) ISA
 - b) AIS
 - c) ONIS
 - d) WHOIS

MCQ

-
- Which relationship is used to represent a specialization entity?
 - a) **ISA**
 - b) AIS
 - c) ONIS
 - d) WHOIS

MCQ

-
- There are similarities between the instructor entity set and the secretary entity set in the sense that they have several attributes that are conceptually the same across the two entity sets: namely, the identifier, name, and salary attributes. This process is called
 - a) Commonality
 - b) Specialization
 - c) Generalization
 - d) Similarity

MCQ

-
- There are similarities between the instructor entity set and the secretary entity set in the sense that they have several attributes that are conceptually the same across the two entity sets: namely, the identifier, name, and salary attributes. This process is called
 - a) Commonality
 - b) Specialization
 - c) **Generalization**
 - d) Similarity

MCQ

-
- The completeness constraint may be one of the following: Total generalization or specialization, Partial generalization or specialization. Which is the default?
 - a) Total
 - b) Partial
 - c) Should be specified
 - d) Cannot be determined

MCQ

-
- The completeness constraint may be one of the following: Total generalization or specialization, Partial generalization or specialization. Which is the default?
 - a) Total
 - b) **Partial**
 - c) Should be specified
 - d) Cannot be determined

MCQ

-
- Consider the employee work-team example, and assume that certain employees participate in more than one work team. A given employee may therefore appear in more than one of the team entity sets that are lower level entity sets of employee. Thus, the generalization is _____
 - a) Overlapping
 - b) Disjointness
 - c) Uniqueness
 - d) Relational

MCQ

-
- Consider the employee work-team example, and assume that certain employees participate in more than one work team. A given employee may therefore appear in more than one of the team entity sets that are lower level entity sets of employee. Thus, the generalization is _____
 - a) **Overlapping**
 - b) Disjointness
 - c) Uniqueness
 - d) Relational

References

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- <http://www.engineering-bachelors-degree.com/database-software/uncategorized/extended-e-r-features/>
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