



# Assignment Project Exam Help

## Entity-Relationship Model – Part 2

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## Entity-Relationship (ER) Model

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- Originally proposed by Peter Chen in 1976.
- Shortly after its introduction, the ER model became the most popular

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## Entity-Relationship (ER) Model

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Data in the ER model is represented as **ips** with **attributes**.

- (2) **Data integrity**

For the ER model, **keys** are for entity/  
**cardinality/participation constraints** for relationship types.

- (3) **Data manipulation:**

**No standard data manipulation operations** are associated with the ER model.



## Entity-Relationship (ER) Model

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- Comparing key concepts in the relational data model and the ER model:

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Domain	
Superkey/primary key/	
Tuple	
Relation	En
Relation schema	Entity type/Relationship type

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## Entity-Relationship (ER) Model

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- ER diagrams: diagrammatic notation associated with the ER model.

- They are relatively simple;



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- There are a number of ER diagrammatic notation closely follow the one used by Chen and its variation

- **Attributes** are represented as *oval*
- **Key attributes** are *underlined*;
- **Entity types** are represented as *rectangles*;
- **Relationship types** are represented as *diamonds*.

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## Entities and Attributes

- **Entities:** “Things” in the real world (with independent existence).
  - e.g., an individual person

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• **At**

- **Composite** versus **simple** (atomic)
- **Single-valued** versus **multivalued**
- **Stored** versus **derived** attributes
- **NULL** values
- **Complex** (nesting of composite and multivalued) attributes
- **Domains of attributes:** For each attribute, a domain is associated, i.e., a set of permitted values for an attribute.



## Entity Types and Entity Sets

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- An **entity type** defines a collection (or set) of entities that have the same attributes.

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- A database at any point in time.

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## Relationship Types and Relationship Sets

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- A **relationship type** is an association between two or more entity types, and can have attributes as well.

(We also say: such entity types **participate in** a relationship type)

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- **Degree of relationship type:** the number can have binary, ternary, ..., n-ary.
- A **relationship set** is the set of associations between entity types that participate in the relationship type.







## Keys

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- The definitions for **superkey/primary key/candidate key** of an entity type is the same as for a relation schema.

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- A **candidate key** of an entity type is a minimal (in terms of number of attributes) superkey.

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- For an entity type, several candidate keys in conceptual design, one of the candidate keys is the **primary key** of the entity type.

- A **primary key** of a relationship type is the combination of primary keys of the entity types that participate in the relationship type.



## Constraints on Relationships

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- Below are useful constraints in describing binary relationship types:

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can participate in.

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Participation constraints (total, partial)

- Specifies whether the existence of any entity depends on its being related to another entity via the relationship type.



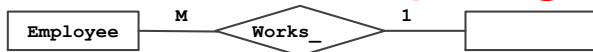
## Constraints on Relationships - Cardinality Ratios

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M d a

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**Meaning:** An employee can work for at most one department and a department can have several employees.

### One-To-One

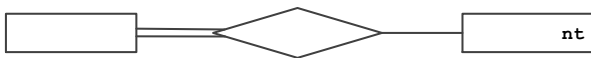


**Meaning:** An employee can work for at most one department, and a department can have at most one employee.

## Constraints on Relationships - Participation constraints

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• Total



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d

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• partial (default)

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**Meaning:** An employee may or may not work for a department and each department may or may not have employees.



## Constraints on Relationships - Cardinality Limits

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- Instead of cardinality ratios or participation constraints, more precise

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**Meaning:** An employee must work for exactly one department and each department must have one or more employees.



## Recursive Relationships

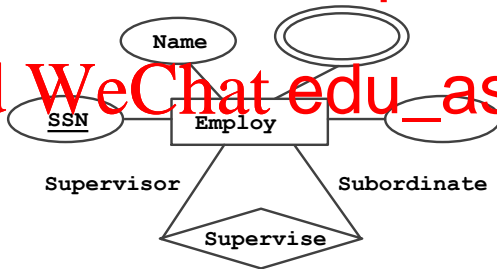
- Recursive relationships

Same entity type can participate more than once in a relationship type in different roles, e.g., marriage between persons and parent-child between p

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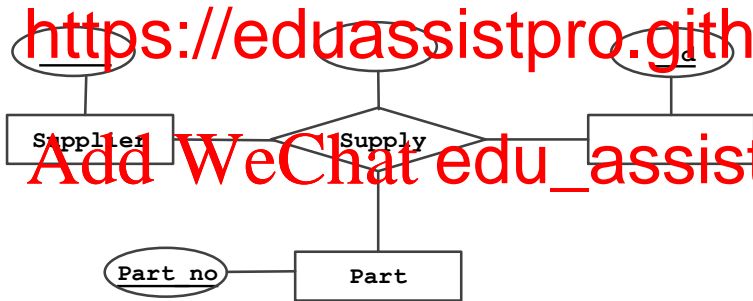




## Higher-Degree Relationship Types

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- We may use higher-degree relationship types to model more complicated relationships, i.e., involving multiple entity types.



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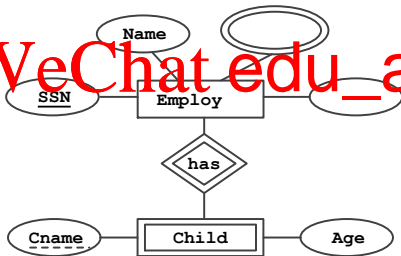


## Weak Entity Types

- A **weak entity type** is an entity type that does not have sufficient attributes to form a primary key.
- Its existence depends on the existence of an identifying entity type,

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## Design Choices for the ER Model

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- It is possible to define entities and their relationships in a number of different ways

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- Should a concept be modeled as a **ternary relationship type** or **several binary relationship types**?

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