

Entity-Relationship Model

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Introduction

- **Data Model**

Data Model gives an idea that how the final system will look like after its complete implementation. It defines the data elements and the relationships between the data elements. Data Models are used to show how data is stored, connected, accessed and updated in the database management system.

- Some of the Data Models in DBMS are:

- Hierarchical Model
- Network Model
- **Entity-Relationship Model**
- **Relational Model**
- Object-Oriented Data Model
- Object-Relational Data Model
- Flat Data Model
- Semi-Structured Data Model
- Associative Data Model
- Context Data Model

ER Data Model

- The ER data model employs three basic concepts:
 - entity sets,
 - relationship sets,
 - attributes
- Entity : It can be a real-world object with an existence, For example, in a **College** database, the entities can be Professor, Students, Courses, etc.
- Relationship : It is an association among several entities
- Attribute : Entities has attributes, which can be considered as properties describing it, for example, for Professor entity, the attributes are **Professor_Name**, **Professor_Address**, **Professor_Salary**, etc. The attribute value gets stored in the database. An attribute can also be associated with a relationship set.

Types of DBMS Entities

1.Strong Entity:The strong entity has a primary key. Weak entities are dependent on strong entity. Its existence is not dependent on any other entity.

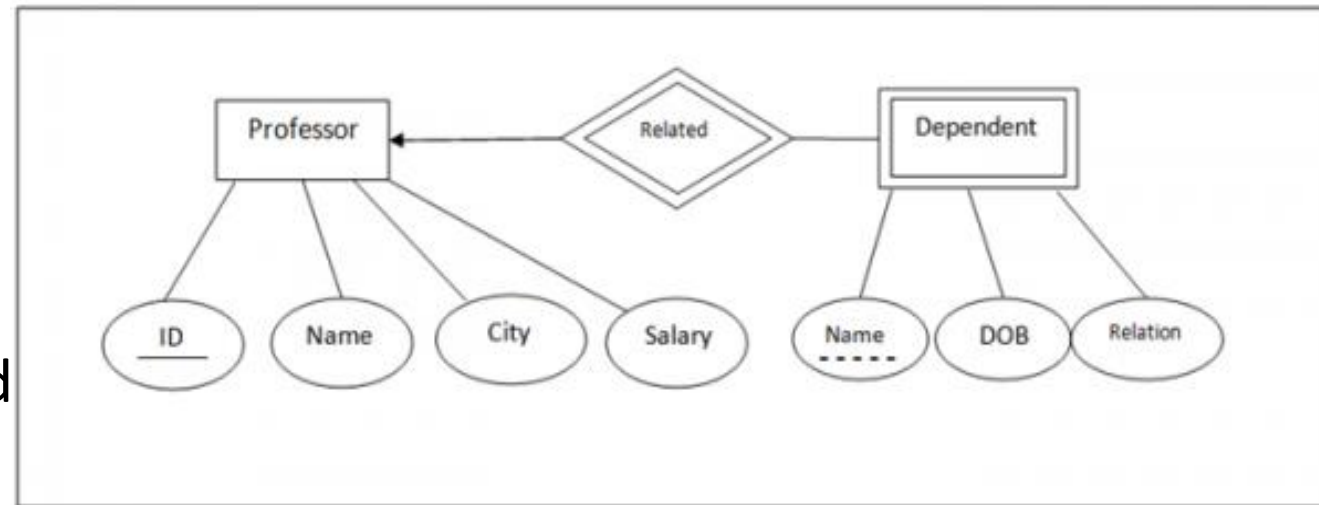


Eg:**Professor** is a strong entity here, and the primary key is **Professor_ID**.

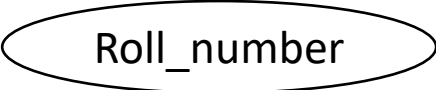
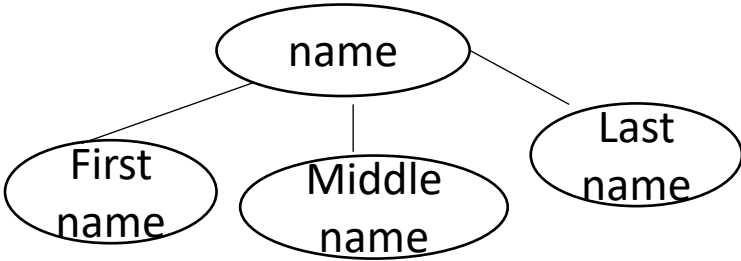
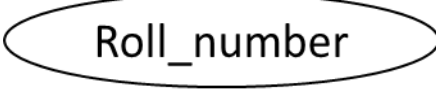
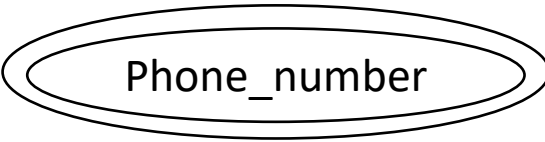
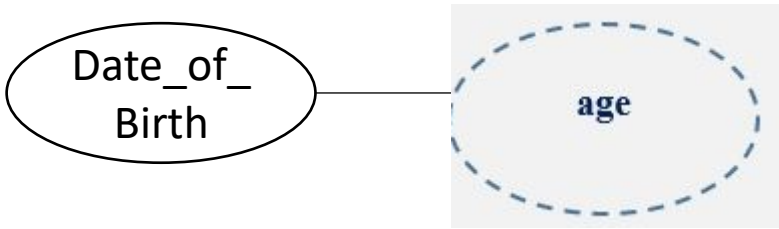
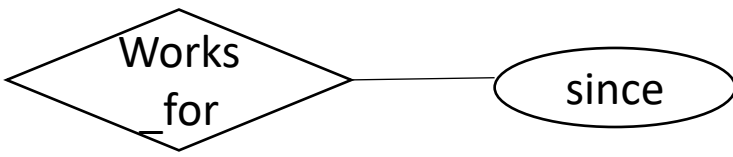
2.Weak Entity: The weak entity in DBMS do not have a primary key and are dependent on the parent entity. It mainly depends on other entities. The Strong Entity is Professor, whereas

Dependent is a Weak Entity.

ID is the primary key (represented with a line) and Name in Dependent entity is called Partial Key (represented with a dotted line).



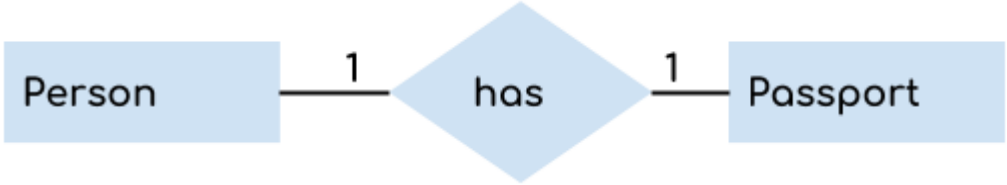



Types of Attributes:

Attribute	Example	Representation in ERD
Simple Attribute	Aadharcard_Number, Roll_Number	
Composite Attribute:	Address, Name(First, middle, lastname)	
Single-value attributes	Aadharcard_Number, Roll_Number	
Multi-valued attributes	Phone_Number, Email-id	
Derived Attribute: can be computed from other attributes	Age from Date_of_Birth	
Descriptive Attribute: attribute of a relationship	Since attribute on works_for relationship between two entity employee and department	

- **Keys:**Keys play an important role in the relational database.
- It is used to uniquely identify any record or row of data from the table. It is also used to establish and identify relationships between tables.

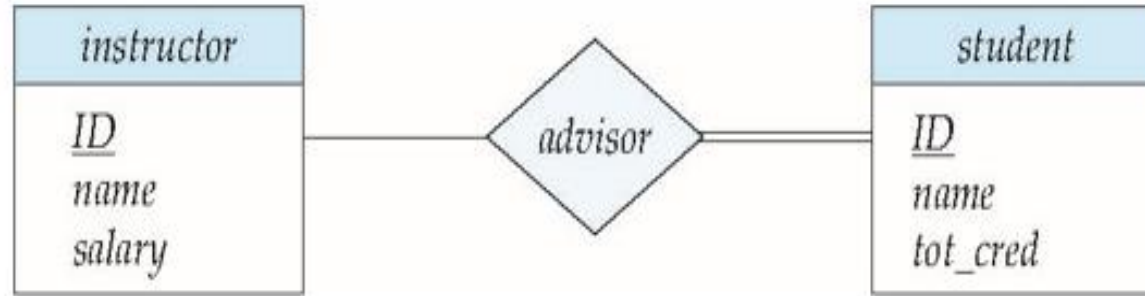
Type of Key	Definition	Example
Primary Key	It is used to identify one and only one instance of an entity uniquely.	EMPLOYEE_ID
Candidate Key	It is an attribute or set of an attribute which can uniquely identify a tuple. The remaining attributes except for primary key are considered as a candidate key. The candidate keys are as strong as the primary key.	Aadhar_Number, Passport_Number
Super Key	It is a set of an attribute which can uniquely identify a tuple. Super key is a superset of a candidate key.	EMPLOYEE-ID, (EMPLOYEE_ID, EMPLOYEE-NAME),
Foreign Key	Foreign keys are the column of the table which is used to point to the primary key of another table.	In EMPLOYEE table, Department_Id is the foreign key, and both the tables(EMPLOYEE and DEPARTMENT table) are related.
Surrogate Key	An artificial key which aims to uniquely identify each record is called a surrogate key. These kind of key are unique because they are created when you don't have any natural primary key.	Sr. No.

- Types of Relationship

Type of Relationship	Example
One to One Relationship	
One to Many Relationship	
Many to One Relationship	
Many to Many Relationship	

Total and Partial Participation

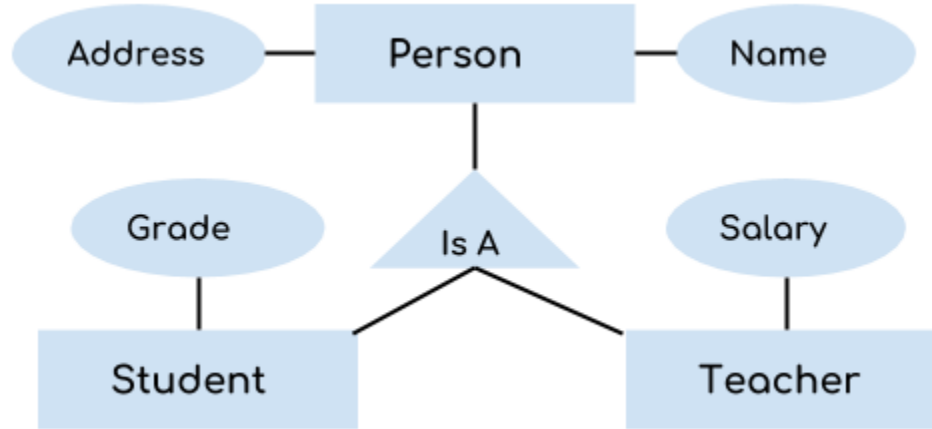
- **Total participation** (indicated by double line): every entity in the entity set participates in at least one relationship in the relationship set



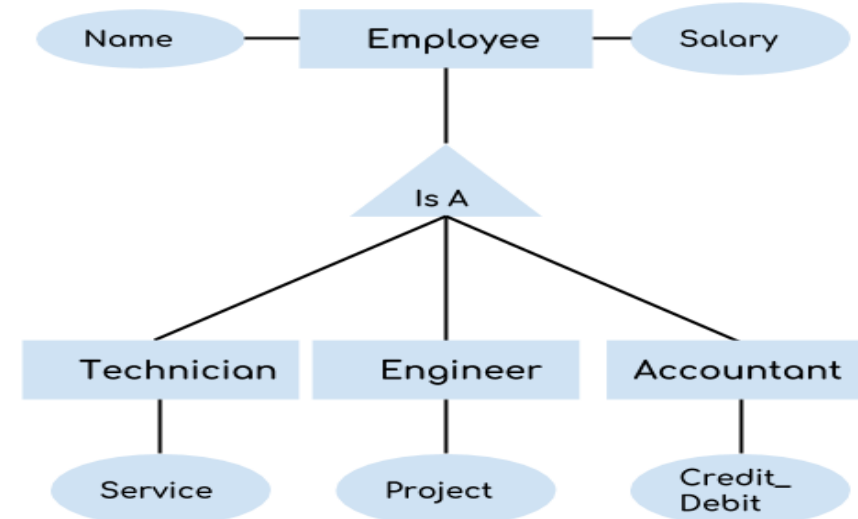
- participation of student in advisor relation is total
- every student must have an associated instructor
- **Partial participation**: some entities may not participate in any relationship in the relationship set
- Example: participation of instructor in advisor is partial

Extended ER Diagram(EER)

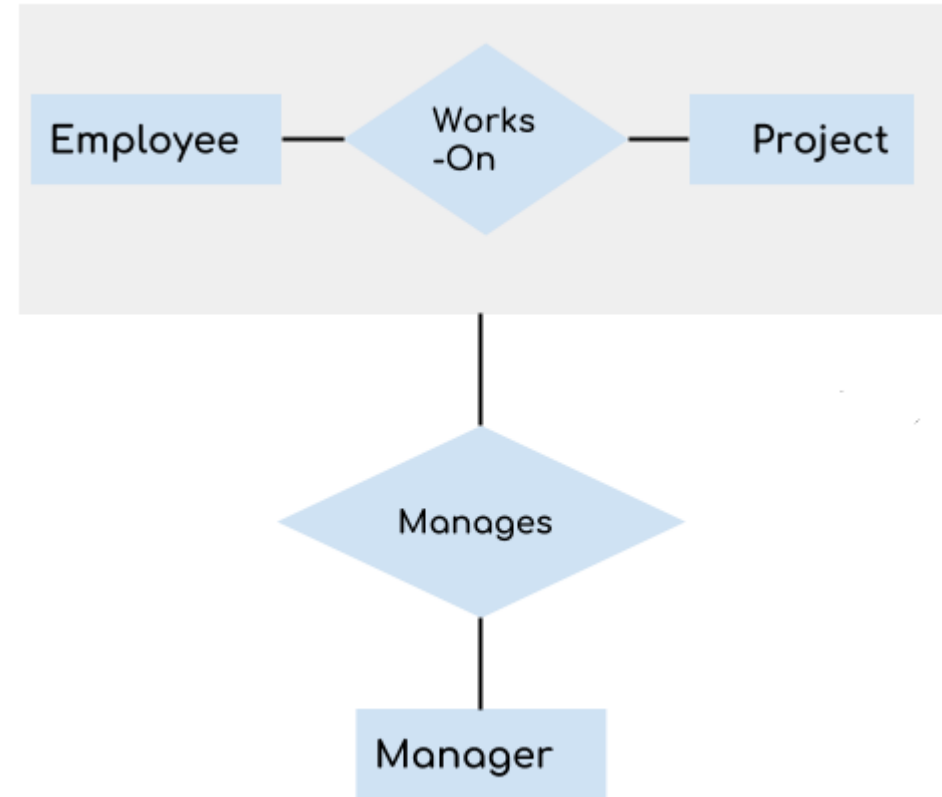
Generalization : A **bottom-up** design process – combine a number of entity sets that share the same features into a higher-level entity set



Specialization : A **Top-down** design process; we designate sub-groupings within an entity set that are distinctive from other entities in the set. These sub-groupings become lower-level entity sets that have attributes or participate in relationships that do not apply to the higher-level entity set.



Aggregation is a process in which a single entity alone is not able to make sense in a relationship so the relationship of two entities acts as one entity



Example:ER Diagram for Hospital Management System

