Experiment No. 3

Aim:- To study & implement the ER model for the database.

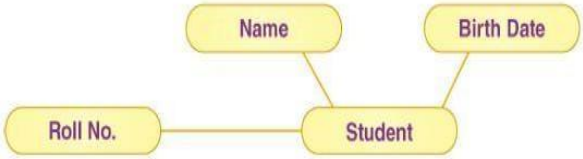
Software: ER Diagram Online Tool , DBDiagram

Theory:

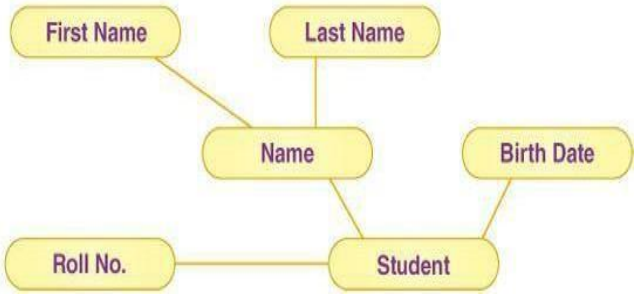
An **Entity-Relationship (ER) Diagram** is a visual representation of a database structure that illustrates entities, their attributes, and the relationships between them. It helps in designing a structured database by clearly defining how data elements interact. ER diagrams use standard symbols like rectangles for entities, ellipses for attributes, and diamonds for relationships. They are widely used in database modeling to ensure efficient data organization and integrity.

Entities: Represented as **rectangles**, these signify real-world objects (e.g., Employees, Departments, Projects).

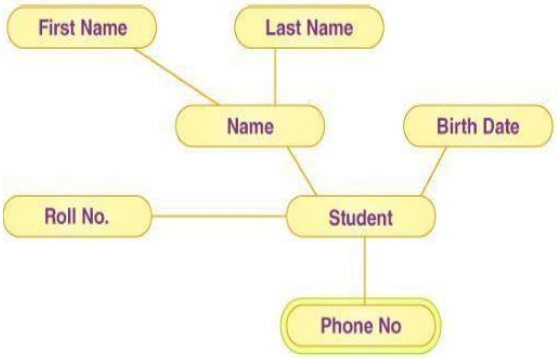
- **Attributes**: Represented as **ellipses**, describing properties of entities (e.g., Employee Name, Salary).



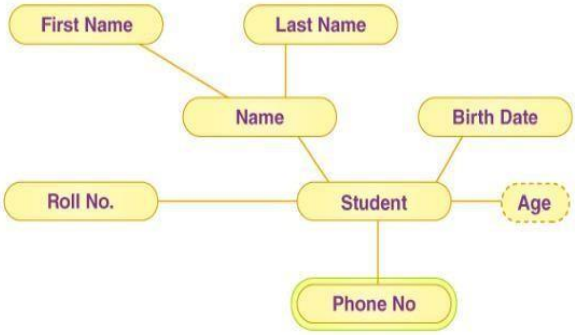
In case the attributes are composite, then these are separated further into a tree-like structure. The attribute of each node is then attached to it. To put it another way, composite attributes are basically represented by ellipses joined by an ellipse.



A double ellipse is used to represent multivalued attributes.



Dashed ellipses represent derived attributes.



Relationship

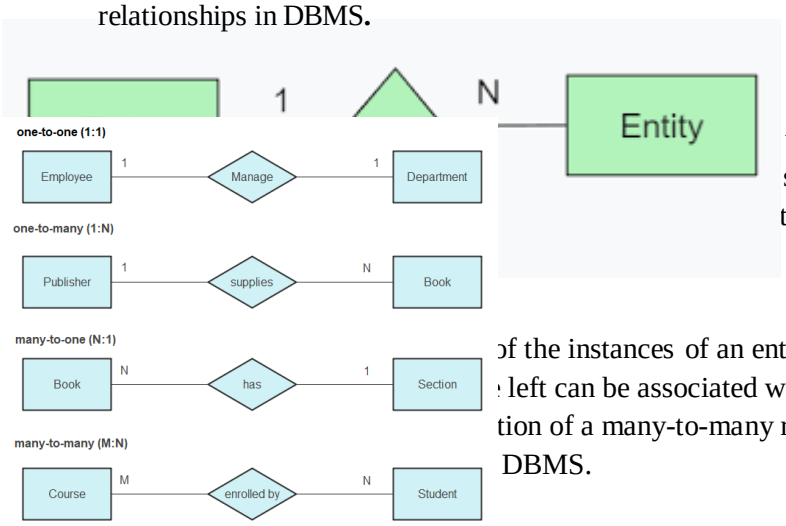
Different shaped boxes signify relationships. Inside the diamond box is written the name of the relationship. A line connects all the entities or rectangles that are involved in a relationship. For example, Tiffany works in the Biology department. It would be represented as follows:

Cardinality and Binary Relationship

The term “binary relationship” refers to a relationship in which two entities are involved. The number of instances of an entity from any relationship that can be connected or associated with the relation is known as cardinality.

1. **One-to-one** – The relationship is denoted as '1:1' when just one instance of the given entity is associated with it. Only one of the instances of each entity must be connected with the relationship, as seen in the image below. It is a representation of a one-to-one relationship. Click here to read more on one-to-one relationships in DBMS.

2. **One-to-many** – The relationship is denoted as '1:N' when more than one of the instances of an entity is linked with it. The following graphic shows that the relationship can be associated with only one instance of the entity on the left and several instances of the entity on the right. It is a representation of a one-to-many relationship. Click here to read more on one-to-many relationships in DBMS**.**



more than one of the instances of the
t the relationship can be associated
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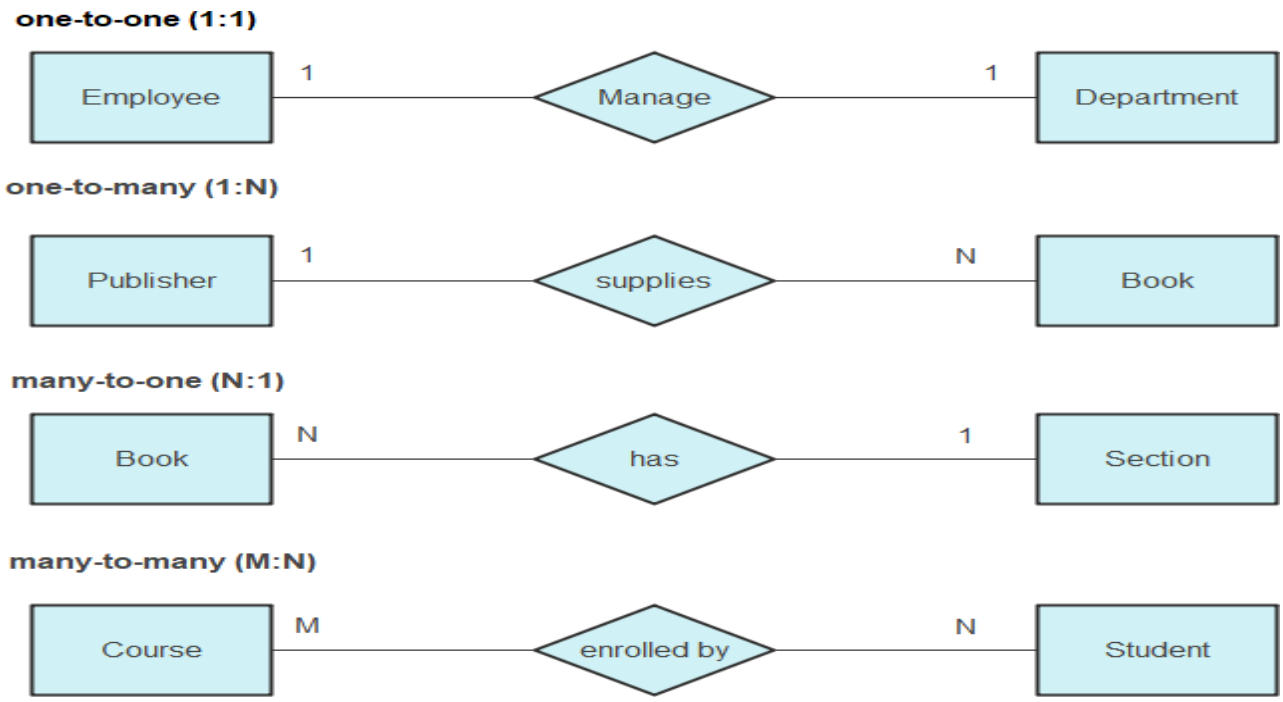
to read more on many-to-one

of the instances of an entity on the right and more than one
left can be associated with the relationship, as seen in the
tion of a many-to-many relationship. Click here to read more
DBMS.



Participation Constraints

1. **Partial Participation** – Not all instances of an entity are required to participate in the relationship.

Notation: Represented by a **single line** between the entity and the relationship in an ER diagram.

2. **Total Participation** – Every instance of an entity must be associated with at least one instance of the related entity.

Notation: Represented by a **double line** between the entity and the relationship in an ER diagram.

Participation in Enrolled relationship set: **Partial** Course
Total Student

Pros and Cons of ER Diagram

Pros

Clear Representation of Data

- ER diagrams provide a visual structure of the database, making it easy to understand relationships between entities.

Helps in Database Design

- They assist developers in designing efficient and well-structured databases, reducing redundancy and ensuring normalization.

Improves Communication

- ER diagrams serve as a common language between stakeholders (developers, database administrators, and business analysts).

Cons

Complexity in Large Databases

- For large-scale systems, ER diagrams can become too complex, making them difficult to read and manage.

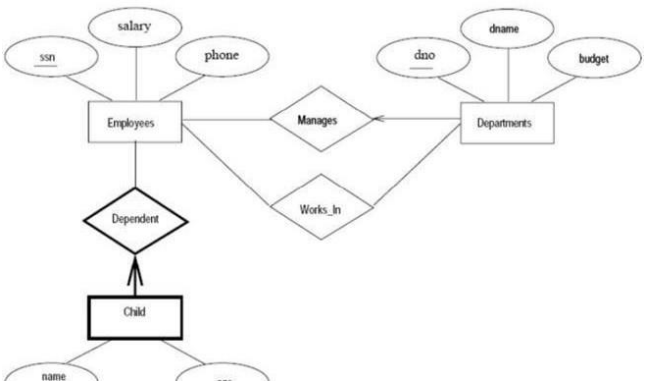
Lack of Implementation Details

- ER diagrams focus on the conceptual model and do not cover technical aspects like indexes, constraints, and performance optimizations.

No Standard Notation

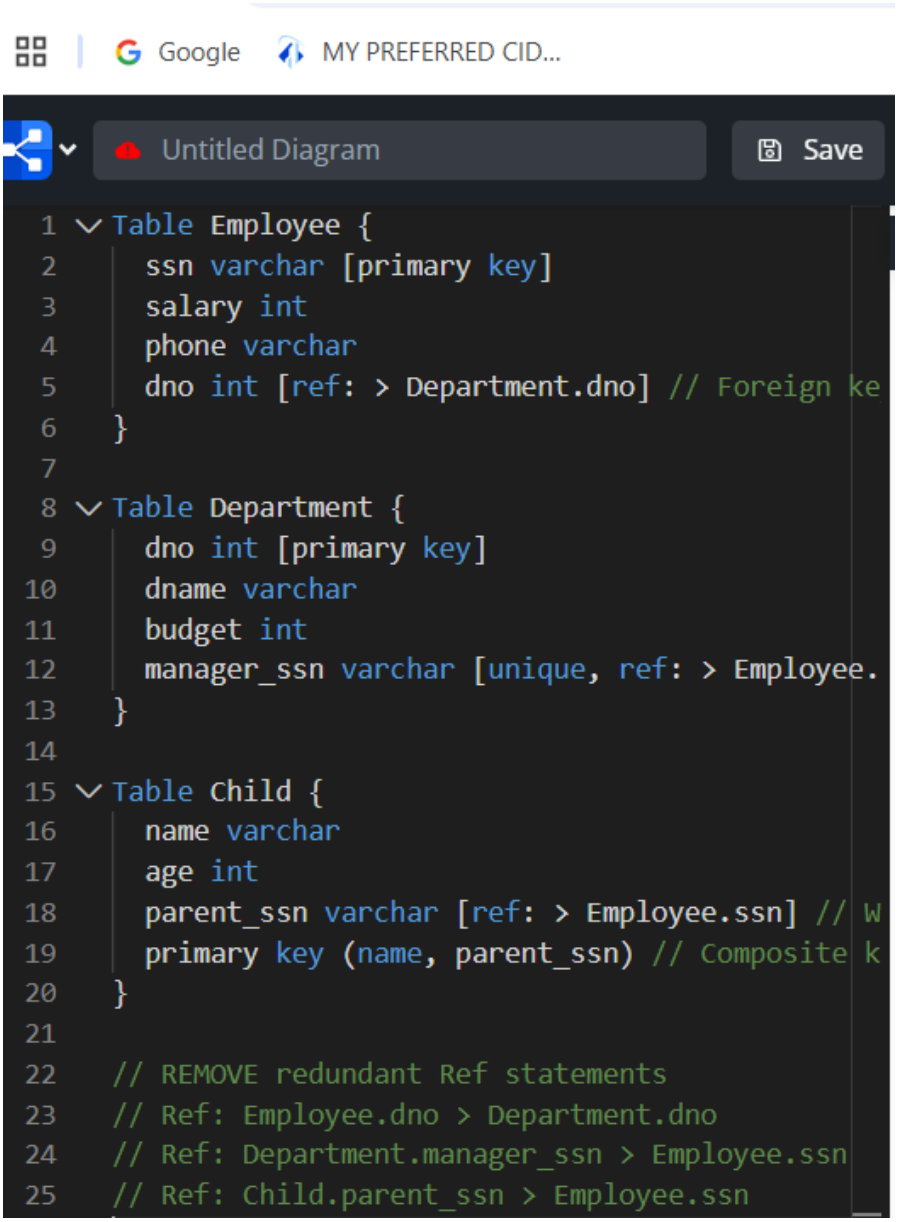
- Different notations exist (Chen, Crow's Foot, UML), leading to inconsistencies in interpretation.

ER Diagram:

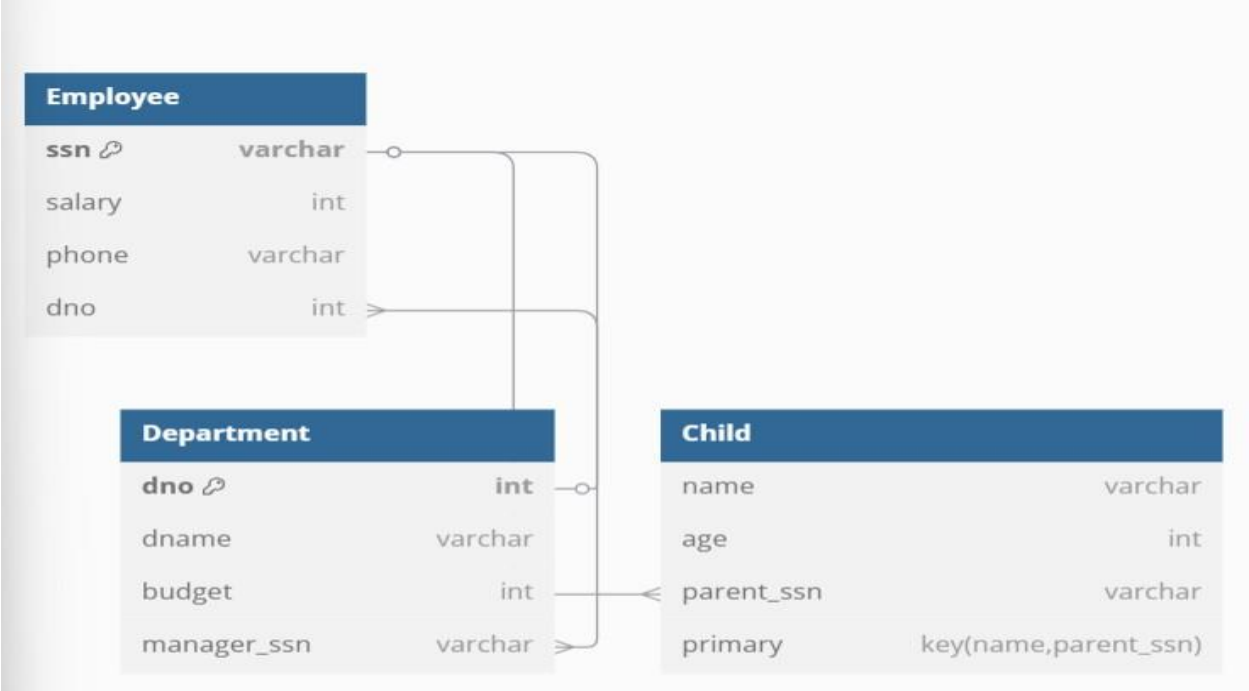


Example:
A company database needs to store information about employees (identified by ssn, with salary and phone as attributes), departments (identified by dno, with dname and budget as attributes), and children of employees (with name and age as attributes). Employees work in departments; each department is managed by an employee; a child must be identified uniquely by name when the parent (who is an employee; assume that only one parent works for the company) is known.

Code:-



ER Diagram:-



Conclusion:- Hence we have successfully learned to study & implement the ER model for the database.