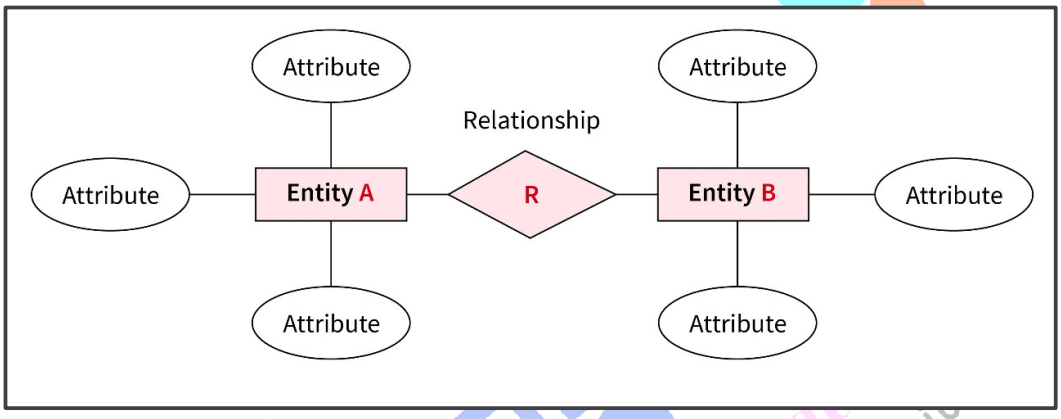
Module 10 - ER Model to Relational Model

What is the ER Model?

ER Model stands for **Entity-Relationship Model**. It is a **conceptual design** used to describe the structure of a database before implementing it.

- **Entities**: Things or objects (like Student, Course)
- **Attributes**: Properties of entities (like Name, Age)
- **Relationships**: Associations between entities (like a Student "enrolls in" a Course)

This model is typically drawn as an ER diagram to visualize how data is related.



What is the Relational Model?

The **Relational Model** is how data is stored in relational databases like MySQL, Oracle, or PostgreSQL. It uses **tables** to store data, with **rows** as records and **columns** as attributes.

To implement a database, the ER model needs to be **converted** into the relational model.

How to Convert ER Model to Relational Model

Here's how each part of the ER model is converted:

1. Entity to Table

- Each entity becomes a table.
- Each attribute becomes a column.
- Choose one attribute as the **primary key**.

Example:

- Entity: Student
- Attributes: RollNo, Name, Age

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Relational Table:
Student(RollNo, Name, Age)
Here, RollNo is the primary key.

2. Attributes
- **Simple Attributes**: Directly become columns.

Example: Name, Age
- **Composite Attributes**: Break them into smaller attributes.

Example: FullName → FirstName, LastName
- **Derived Attributes**: These are calculated and usually not stored.

Example: Age (can be derived from Date of Birth)

3. Relationship to Table or Foreign Key
How you handle relationships depends on their type.

Case 1: One-to-One (1:1)
Add a foreign key in either of the tables.
Example:
Student(RollNo, Name)
StudentIDCard(CardNo, IssueDate)
If one student has one ID card, you can add CardNo as a foreign key in the Student table.

Case 2: One-to-Many (1:N)
Add a foreign key in the table on the "many" side.
Example:
Department(DeptID, DeptName)
Professor(ProfID, Name, DeptID)
A department has many professors, so DeptID is added as a foreign key in the Professor table.

Case 3: Many-to-Many (M:N)
Create a new table for the relationship.
Example:
Student(RollNo, Name)
Course(CourseID, CourseName)
Enrolls(RollNo, CourseID, Date)
The "Enrolls" table includes the primary keys of both Student and Course as foreign keys, and together they form a composite key.

4. Multivalued Attributes
For attributes that can have multiple values, create a separate table.

Example:
Student(RollNo, Name)
StudentPhone(RollNo, Phone)
This way, each student can have multiple phone numbers.

Example

ER Model Description:

- Entities: Student and Course
- Attributes:
  - Student: RollNo (primary key), Name
  - Course: CourseID (primary key), CourseName
- Relationship: Enrolls (many-to-many), with attribute EnrollmentDate

Relational Tables:
1. Student(RollNo, Name)
2. Course(CourseID, CourseName)
3. Enrolls(RollNo, CourseID, EnrollmentDate)

In the Enrolls table:

- RollNo and CourseID are foreign keys
- Together they form the composite primary key

Assignment

Ques 1: Convert to Relational Table
Given Entity:
LibraryBook with attributes: BookID (primary key), Title, Author

Question: Write the relational table for this entity.

Ques 2: Identify the Entity, Attribute, and Relationship
Given:
A **Student** enrolls in a **Course**. Each Student has a **RollNo** and **Name**. Each Course has a **CourseID** and **CourseName**.
Questions:
1. What are the **entities** in this example?
2. What are the **attributes** of each entity?
3. What is the **relationship** between them?