1. What is an Entity-Relationship (ER) Diagram?

An Entity-Relationship Diagram (ERD) is a visual representation of the data and its relationships in a database system.

- It is part of ER modeling, introduced by Peter Chen (1976).
- ERD shows how entities (real-world objects like *Student, Course, Employee*) are related to each other.
- It helps in designing a database before its actual implementation.

Components of ER Diagram:

- Entity → Rectangles (e.g., *Student, Department*)
- Attributes → Ovals connected to entities (e.g., *Name, Age, RollNo*)
- Relationships → Diamonds (e.g., *Enrolled in, Manages*)
- Primary Key → Underlined attribute (e.g., *RollNo*)

2. What are Attributes in ER Model? Explain Multivalued and Derived attribute?

Attributes describe properties/characteristics of an entity or relationship.

Example:

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

Types of attributes:

- Simple Attribute → Cannot be divided further (e.g., *Age*).
- Composite Attribute → Can be split into smaller parts (e.g., *FullName* → *FirstName* + *LastName*).
- Multivalued Attribute → Can have multiple values for a single entity (e.g., *PhoneNumbers*).
- Derived Attribute → Value can be derived from other attributes (e.g., *Age* derived from *DateOfBirth*).

Multivalued Attribute

- An attribute that can have multiple values for a single entity.
- Represented by a double oval in ER diagram.

Example:

- For *Student*, the attribute PhoneNumber can have multiple values (home, mobile, office).

Derived Attribute

- An attribute whose value is derived/calculated from another attribute(s).
- Represented by a dashed oval in ER diagram.

Example:

- For *Employee*, attribute Age can be derived from DateOfBirth.