Library Management System - Database Design

1. Entities and Relationships

Entities:

- Books

- Authors

- Members

- Loans

Relationships:

- A book can have multiple authors (many-to-many)

- A member can borrow many books (one-to-many)

- A book can be loaned multiple times

2. SQL Script to Create Tables

```sql
CREATE DATABASE LibraryDB;
USE LibraryDB;

CREATE TABLE Authors (
    AuthorID INT AUTO_INCREMENT PRIMARY KEY,
    Name VARCHAR(100) NOT NULL
);

CREATE TABLE Books (
    BookID INT AUTO_INCREMENT PRIMARY KEY,
    Title VARCHAR(255) NOT NULL,
    Genre VARCHAR(100),
    PublishedYear INT
);

CREATE TABLE BookAuthor (
    BookID INT,
    AuthorID INT,
    PRIMARY KEY (BookID, AuthorID),
    FOREIGN KEY (BookID) REFERENCES Books(BookID),
    FOREIGN KEY (AuthorID) REFERENCES Authors(AuthorID)
);
```

```
CREATE TABLE Members (
    MemberID INT AUTO_INCREMENT PRIMARY KEY,
    Name VARCHAR(100) NOT NULL,
    Email VARCHAR(100) UNIQUE NOT NULL
);

CREATE TABLE Loans (
    LoanID INT AUTO_INCREMENT PRIMARY KEY,
    MemberID INT,
    BookID INT,
    LoanDate DATE,
    ReturnDate DATE,
    FOREIGN KEY (MemberID) REFERENCES Members(MemberID),
    FOREIGN KEY (BookID) REFERENCES Books(BookID)
);
```

3. Interview Questions and Answers

Q: What is normalization?

A: Normalization is the process of organizing data to reduce redundancy and improve data integrity.

Q: Explain primary vs foreign key.

A: Primary Key uniquely identifies each record, Foreign Key refers to the primary key in another table.

Q: What are constraints?

A: Rules applied to columns like NOT NULL, UNIQUE, CHECK, PRIMARY KEY, and FOREIGN KEY.

Q: What is a surrogate key?

A: A system-generated key (like AUTO_INCREMENT) used to uniquely identify records.

Q: How do you avoid data redundancy?

A: By using normalization to split data into logical tables and linking them with keys.

Q: What is ER diagram?

A: A visual representation of database entities and their relationships.

Q: What are the types of relationships in DBMS?

A: One-to-One, One-to-Many, and Many-to-Many.

Q: Explain the purpose of AUTO_INCREMENT.

A: It automatically generates a unique value for the primary key.

Q: What is the default storage engine in MySQL?

A: InnoDB.

Q: What is a composite key?

A: A combination of two or more columns used together as a primary key.