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Design and Implement a Relational Database for a Library Management System First report submission – 15 days

Database Design

The Library Management System database will consist of the following tables:

Member:

- MemberID (Primary Key)
- FirstName
- LastName
- Email
- PhoneNo
- Address

Category:

- CategoryID (Primary Key)
- CategoryName

Book:

- BookID (Primary Key)
- Title
- Author
- Publisher
- PublishYear
- ISBN
- CategoryID (Foreign Key referencing Category table)

Borrowing:

- BorrowingID (Primary Key)
- MemberID (Foreign Key referencing Member table)
- BookID (Foreign Key referencing Book table)
- CheckoutDate
- DueDate
- ReturnDate

Entity Relationship Diagram (ERD)

Entity Relationship Diagram (ERD) for the Library Management System database:



The key relationships in the database are:

- One-to-Many relationship between Member and Borrowing: A member can have multiple borrowing records, but each borrowing record is associated with a single member.
- Many-to-One relationship between Borrowing and Book: A book can be borrowed by multiple members, but each borrowing record is associated with a single book.
- Many-to-One relationship between Book and Category: A book belongs to a single category, but a category can have multiple books.

Example :

Member Table:

MemberID	FirstName	LastName	Email	PhoneNo	Address
1	John	Doe	john@email.com	555-1234	123 Main St, Anytown USA
2	Jane	Smith	jane@email.com	555-5678	456 Oak Rd, Anytown USA
3	Bob	Johnson	bob@email.com	555-9012	789 Elm St, Anytown USA
4	Emily	Davis	emily@email.com	555-3456	321 Pine Ave, Anytown USA

Category Table:

CategoryID	CategoryName
1	Fiction
2	Fantasy
3	Fantasy/Adventure

Book Table:

BookID	Title	Author	Publisher	PublishYear	ISBN	CategoryID
1	To Kill a Mockingbird	Harper Lee	Grand Central	1960	978-0-44-673201-1	1
2	The Great Gatsby	F. Scott Fitzgerald	Scribner	1925	978-0-7432-7356-51	
3	Harry Potter and the Sorcerer's Stone	J.K. Rowling	Scholastic	1997	978-0-590-35342-6	2
4	The Lord of the Rings	J.R.R. Tolkien	Houghton Mifflin	1954-1955	978-0-618-64015-4	3
5	Pride and Prejudice	Jane Austen	Penguin Classics	1813	978-0-14-143951-4	1

Borrowing Table:

BorrowingID	MemberID	BookID	CheckoutDate	DueDate	ReturnDate
1	1	1	2023-04-01	2023-04-15	2023-04-14
2	2	2	2023-05-01	2023-05-15	2023-05-12
3	3	3	2023-06-01	2023-06-15	NULL
4	1	4	2023-07-01	2023-07-15	2023-07-14
5	2	5	2023-08-01	2023-08-15	NULL

SQL QURIES

-- Create the database

```
CREATE DATABASE library_management;  
USE library_management;
```

-- Create the Member table

```
CREATE TABLE Member (
```

```
MemberID INT PRIMARY KEY,  
FirstName VARCHAR(50) NOT NULL,  
LastName VARCHAR(50) NOT NULL,  
Email VARCHAR(100) NOT NULL,  
PhoneNo VARCHAR(20) NOT NULL,  
Address VARCHAR(200) NOT NULL  
);
```

```
-- Create the Category table  
CREATE TABLE Category (  
    CategoryID INT PRIMARY KEY,  
    CategoryName VARCHAR(50) NOT NULL  
);
```

```
-- Create the Book table  
CREATE TABLE Book (  
    BookID INT PRIMARY KEY,  
    Title VARCHAR(100) NOT NULL,  
    Author VARCHAR(100) NOT NULL,  
    Publisher VARCHAR(100) NOT NULL,  
    PublishYear INT NOT NULL,  
    ISBN VARCHAR(20) NOT NULL,  
    CategoryID INT NOT NULL,  
    FOREIGN KEY (CategoryID) REFERENCES Category(CategoryID)  
);
```

```
-- Create the Borrowing table  
CREATE TABLE Borrowing (  
    BorrowingID INT PRIMARY KEY,  
    MemberID INT NOT NULL,  
    BookID INT NOT NULL,  
    CheckoutDate DATE NOT NULL,  
    DueDate DATE NOT NULL,  
    ReturnDate DATE,  
    FOREIGN KEY (MemberID) REFERENCES Member(MemberID),  
    FOREIGN KEY (BookID) REFERENCES Book(BookID)  
);
```

```
-- Insert sample data into the Member table  
INSERT INTO Member (MemberID, FirstName, LastName, Email, PhoneNo, Address) VALUES  
(1, 'John', 'Doe', 'john@email.com', '555-1234', '123 Main St, Anytown USA'),  
(2, 'Jane', 'Smith', 'jane@email.com', '555-5678', '456 Oak Rd, Anytown USA'),  
(3, 'Bob', 'Johnson', 'bob@email.com', '555-9012', '789 Elm St, Anytown USA'),  
(4, 'Emily', 'Davis', 'emily@email.com', '555-3456', '321 Pine Ave, Anytown USA');
```

-- Insert sample data into the Category table

```
INSERT INTO Category (CategoryID, CategoryName) VALUES
```

```
(1, 'Fiction'),
```

```
(2, 'Fantasy'),
```

```
(3, 'Fantasy/Adventure');
```

-- Insert sample data into the Book table

```
INSERT INTO Book (BookID, Title, Author, Publisher, PublishYear, ISBN, CategoryID) VALUES
```

```
(1, 'To Kill a Mockingbird', 'Harper Lee', 'Grand Central', 1960, '978-0-44-673201-1', 1),
```

```
(2, 'The Great Gatsby', 'F. Scott Fitzgerald', 'Scribner', 1925, '978-0-7432-7356-5', 1),
```

```
(3, 'Harry Potter and the Sorcerer's Stone', 'J.K. Rowling', 'Scholastic', 1997, '978-0-590-35342-6', 2),
```

```
(4, 'The Lord of the Rings', 'J.R.R. Tolkien', 'Houghton Mifflin', 1954, '978-0-618-64015-4', 3),
```

```
(5, 'Pride and Prejudice', 'Jane Austen', 'Penguin Classics', 1813, '978-0-14-143951-4', 1);
```

-- Insert sample data into the Borrowing table

```
INSERT INTO Borrowing (BorrowingID, MemberID, BookID, CheckoutDate, DueDate, ReturnDate) VALUES
```

```
(1, 1, 1, '2023-04-01', '2023-04-15', '2023-04-14'),
```

```
(2, 2, 2, '2023-05-01', '2023-05-15', '2023-05-12'),
```

```
(3, 3, 3, '2023-06-01', '2023-06-15', NULL),
```

```
(4, 1, 4, '2023-07-01', '2023-07-15', '2023-07-14'),
```

```
(5, 2, 5, '2023-08-01', '2023-08-15', NULL);
```

Conclusion :

The library management system database design includes four main tables: Member, Category, Book, and Borrowing. The relationships between these tables allow for efficient management of library operations, such as tracking member information, book details, and borrowing history.

The sample data provided covers various scenarios, including on-time returns, overdue books, and currently checked-out books. We can use this database structure and sample data as a starting point for your library management system implementation.