Assignment 4: Write SQL statements to CREATE a new database and tables that reflect the library schema you designed earlier. Use ALTER statements to modify the table structures and DROP statements to remove a redundant table.

Step 1: Create the Database

First, we **create a new database**:

sql

```
CREATE DATABASE LibrarySystem;

USE LibrarySystem;
```

Step 2: Create the Tables

Books Table

```
CREATE TABLE Books (
    book_id INT PRIMARY KEY AUTO_INCREMENT,
    title VARCHAR(255) NOT NULL,
    author VARCHAR(255) NOT NULL,
    isbn VARCHAR(13) NOT NULL UNIQUE,
    published_year YEAR NOT NULL,
    available_copies INT NOT NULL CHECK (available_copies >= 0),
    publisher_id INT,
    genre VARCHAR(100)
);
```

Members Table

```
CREATE TABLE Members (
    member_id INT PRIMARY KEY AUTO_INCREMENT,
    first_name VARCHAR(100) NOT NULL,
    last_name VARCHAR(100) NOT NULL,
    email VARCHAR(255) NOT NULL UNIQUE,
    phone VARCHAR(20),
    address VARCHAR(255),
    join_date DATE NOT NULL
);
```

Loans Table

```
CREATE TABLE Loans (
    loan_id INT PRIMARY KEY AUTO_INCREMENT,
    book_id INT NOT NULL,
    member_id INT NOT NULL,
    loan_date DATE NOT NULL,
    due_date DATE NOT NULL,
    return_date DATE,
    FOREIGN KEY (book_id) REFERENCES Books(book_id),
    FOREIGN KEY (member_id) REFERENCES Members(member_id)
);
```

Authors Table

```
CREATE TABLE Authors (
    author_id INT PRIMARY KEY AUTO_INCREMENT,
    name VARCHAR(255) NOT NULL UNIQUE,
    birthdate DATE
);
```

Genres Table

```
CREATE TABLE Genres (
    genre_id INT PRIMARY KEY AUTO_INCREMENT,
    genre_name VARCHAR(100) NOT NULL UNIQUE
);
```

Book Genres Table

```
CREATE TABLE BookGenres (
    book_id INT NOT NULL,
    genre_id INT NOT NULL,
    PRIMARY KEY (book_id, genre_id),
    FOREIGN KEY (book_id) REFERENCES Books(book_id),
    FOREIGN KEY (genre_id) REFERENCES Genres(genre_id)
);
```

Step 3: Modify Table Structures with ALTER Statements

Add a New Column to the Books Table

```
ALTER TABLE Books ADD COLUMN publisher VARCHAR(255);
```

Modify the Data Type of a Column in the Members Table

```
ALTER TABLE Members MODIFY COLUMN phone VARCHAR(20);
```

Add a Foreign Key Constraint to the Books Table for publisher_id

First, create the Publishers table:

```
CREATE TABLE Publishers (
    publisher_id INT PRIMARY KEY AUTO_INCREMENT,
    publisher_name VARCHAR(255) NOT NULL UNIQUE
);
```

Then, add the foreign key constraint:

```
ALTER TABLE Books ADD COLUMN publisher_id INT;

ALTER TABLE Books ADD CONSTRAINT fk_publisher FOREIGN KEY (publisher_id) REFERENCES Publishers(publisher_id);
```

Step 4: Remove a Redundant Table with DROP Statements

If the Genres table is considered redundant, we can drop it:

```
DROP TABLE Genres;
```

Additionally, if we decide to remove the genre column from the Books table due to the removal of the Genres table:

```
ALTER TABLE Books DROP COLUMN genre;
```

Full SQL Script

Here is the complete script combining all the steps:

```
-- Create the database
CREATE DATABASE LibrarySystem;
USE LibrarySystem;

-- Create tables
CREATE TABLE Books (
    book_id INT PRIMARY KEY AUTO_INCREMENT,
    title VARCHAR(255) NOT NULL,
    author VARCHAR(255) NOT NULL,
```

```
    isbn VARCHAR(13) NOT NULL UNIQUE,
    published_year YEAR NOT NULL,
    available_copies INT NOT NULL CHECK (available_copies >= 0),
    publisher_id INT,
    genre VARCHAR(100)
);

CREATE TABLE Members (
    member_id INT PRIMARY KEY AUTO_INCREMENT,
    first_name VARCHAR(100) NOT NULL,
    last_name VARCHAR(100) NOT NULL,
    email VARCHAR(255) NOT NULL UNIQUE,
    phone VARCHAR(20),
    address VARCHAR(255),
    join_date DATE NOT NULL
);

CREATE TABLE Loans (
    loan_id INT PRIMARY KEY AUTO_INCREMENT,
    book_id INT NOT NULL,
    member_id INT NOT NULL,
    loan_date DATE NOT NULL,
    due_date DATE NOT NULL,
    return_date DATE,
    FOREIGN KEY (book_id) REFERENCES Books(book_id),
    FOREIGN KEY (member_id) REFERENCES Members(member_id)
);

CREATE TABLE Authors (
    author_id INT PRIMARY KEY AUTO_INCREMENT,
    name VARCHAR(255) NOT NULL UNIQUE,
    birthdate DATE
);
```

```
CREATE TABLE Genres (
    genre_id INT PRIMARY KEY AUTO_INCREMENT,
    genre_name VARCHAR(100) NOT NULL UNIQUE
);

CREATE TABLE BookGenres (
    book_id INT NOT NULL,
    genre_id INT NOT NULL,
    PRIMARY KEY (book_id, genre_id),
    FOREIGN KEY (book_id) REFERENCES Books(book_id),
    FOREIGN KEY (genre_id) REFERENCES Genres(genre_id)
);

-- Modify table structures
ALTER TABLE Books ADD COLUMN publisher VARCHAR(255);
ALTER TABLE Members MODIFY COLUMN phone VARCHAR(20);

-- Create and add foreign key constraint to Publishers table
CREATE TABLE Publishers (
    publisher_id INT PRIMARY KEY AUTO_INCREMENT,
    publisher_name VARCHAR(255) NOT NULL UNIQUE
);

ALTER TABLE Books ADD COLUMN publisher_id INT;
ALTER TABLE Books ADD CONSTRAINT fk_publisher FOREIGN KEY (publisher_id) REFERENCES Publishers(publisher_id);

-- Drop redundant table and adjust Books table
DROP TABLE Genres;
        ALTER TABLE Books DROP COLUMN genre;
```

Full SQL Script

Here is the complete script combining all the steps:

```
-- Create the database
CREATE DATABASE LibrarySystem;
USE LibrarySystem;

-- Create tables
CREATE TABLE Books (
    book_id INT PRIMARY KEY AUTO_INCREMENT,
    title VARCHAR(255) NOT NULL,
    author VARCHAR(255) NOT NULL,
    isbn VARCHAR(13) NOT NULL UNIQUE,
    published_year YEAR NOT NULL,
    available_copies INT NOT NULL CHECK (available_copies >= 0),
    publisher_id INT,
    genre VARCHAR(100)
);

CREATE TABLE Members (
    member_id INT PRIMARY KEY AUTO_INCREMENT,
    first_name VARCHAR(100) NOT NULL,
    last_name VARCHAR(100) NOT NULL,
    email VARCHAR(255) NOT NULL UNIQUE,
    phone VARCHAR(20),
    address VARCHAR(255),
    join_date DATE NOT NULL
);

CREATE TABLE Loans (
    loan_id INT PRIMARY KEY AUTO_INCREMENT,
    book_id INT NOT NULL,
    member_id INT NOT NULL,
    loan_date DATE NOT NULL,
```

```
    due_date DATE NOT NULL,
    return_date DATE,
    FOREIGN KEY (book_id) REFERENCES Books(book_id),
    FOREIGN KEY (member_id) REFERENCES Members(member_id)
);

CREATE TABLE Authors (
    author_id INT PRIMARY KEY AUTO_INCREMENT,
    name VARCHAR(255) NOT NULL UNIQUE,
    birthdate DATE
);

CREATE TABLE BookAuthors (
    book_id INT NOT NULL,
    author_id INT NOT NULL,
    PRIMARY KEY (book_id, author_id),
    FOREIGN KEY (book_id) REFERENCES Books(book_id),
    FOREIGN KEY (author_id) REFERENCES Authors(author_id)
);

CREATE TABLE Genres (
    genre_id INT PRIMARY KEY AUTO_INCREMENT,
    genre_name VARCHAR(100) NOT NULL UNIQUE
);

CREATE TABLE BookGenres (
    book_id INT NOT NULL,
    genre_id INT NOT NULL,
    PRIMARY KEY (book_id, genre_id),
    FOREIGN KEY (book_id) REFERENCES Books(book_id),
    FOREIGN KEY (genre_id) REFERENCES Genres(genre_id)
);
```

-- Modify table structures

```
ALTER TABLE Books ADD COLUMN publisher VARCHAR(255);
ALTER TABLE Members MODIFY COLUMN phone VARCHAR(20);
```

-- Create and add foreign key constraint to Publishers table

```
CREATE TABLE Publishers (
    publisher_id INT PRIMARY KEY AUTO_INCREMENT,
    publisher_name VARCHAR(255) NOT NULL UNIQUE
);

ALTER TABLE Books ADD COLUMN publisher_id INT;
ALTER TABLE Books ADD CONSTRAINT fk_publisher FOREIGN KEY (publisher_id) REFERENCES Publishers(publisher_id);
```

-- Drop redundant table and adjust Books table

```
DROP TABLE Genres;
ALTER TABLE Books DROP COLUMN genre;
```