

Chapter 1: Relational Database Concepts

Laboratory Activity 1:

Laboratory Title: Installing MySQL and Setting Up the Database

Chapter No. and Topic: Chapter 1 - Relational Database Concepts

Discussions:

This activity will guide students through installing MySQL on their system and setting up a basic library management system database.

Activity Description:

Install MySQL, create a new database, and establish connections using MySQL Workbench or command line.

Objectives:

- Install MySQL on a local machine.
- Set up a MySQL database for the Library Management System.

Materials:

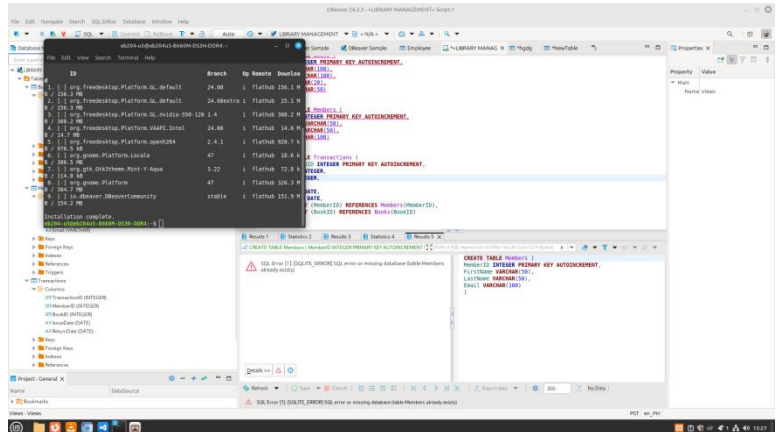
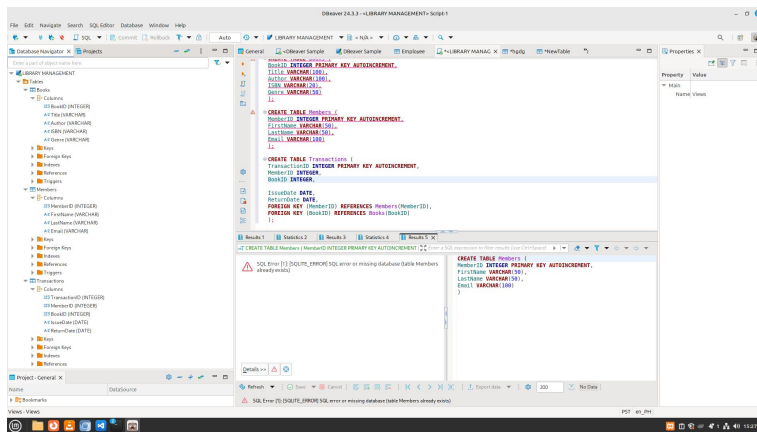
- MySQL Installer
- MySQL Workbench (or any preferred MySQL client)
- Laptop or computer with administrative rights

Procedure:

1. Download MySQL Installer from the official website.
2. Run the installer and follow the installation steps.
3. Once MySQL is installed, open MySQL Workbench.
4. Connect to MySQL using the root user.
5. Create a new database named `LibraryManagement`.
6. Verify that the database was created successfully.

Result:

A running MySQL instance with a database called LibraryManagement.



Additional Questions/Discussions:

- Why is MySQL popular for DBMS?

MySQL is open source, which means it is free to use and change, making it available to both individuals and enterprises. It is speed optimized and capable of handling massive datasets, making it excellent for high-traffic websites and apps. MySQL can handle both small and large-scale applications, ranging from basic websites to huge enterprise-level systems.

- What are the advantages of using MySQL for a library management system?

MySQL ensures that library records (books, borrowers, and transactions) are saved correctly and securely, in accordance with ACID standards. Transactions like book lending and returns can be conducted securely, preventing data loss or corruption.

Conclusions:

MySQL stands out as a robust and dependable Database Management System (DBMS) because of its open-source nature, high performance, scalability, and good data integrity. Its ability to successfully manage both small and large-scale applications makes it suitable for a wide range of use cases, from basic websites to enterprise-level systems. MySQL in a Library Management System ensures that key records like books, borrowers, and transactions are handled securely, accurately, and in accordance with ACID standards, preventing data loss and corruption. MySQL continues to be the favored choice for

developers and businesses looking to build powerful and efficient database-driven applications because to its speed, security, and scalability.

Laboratory Activity 2:

Laboratory Title: Creating Tables and Establishing Primary Keys

Chapter No. and Topic: Chapter 1 - Relational Database Concepts

Discussions:

This activity focuses on creating the main tables for the Library Management System, with primary keys for each table.

Activity Description:

Create tables such as Books, Members, and Transactions for the library system.

Objectives:

- Create tables for library management.
- Define primary keys for each table.

Materials:

- MySQL Workbench or SQL client

Procedure:

1. Open MySQL Workbench and connect to the LibraryManagement database.
2. Create the following tables:

sql

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```
CREATE TABLE Books (  
  
    BookID INT PRIMARY KEY AUTO_INCREMENT,  
  
    Title VARCHAR(100),  
  
    Author VARCHAR(100),  
  
    ISBN VARCHAR(20),  
  
    Genre VARCHAR(50)
```

```
);
```

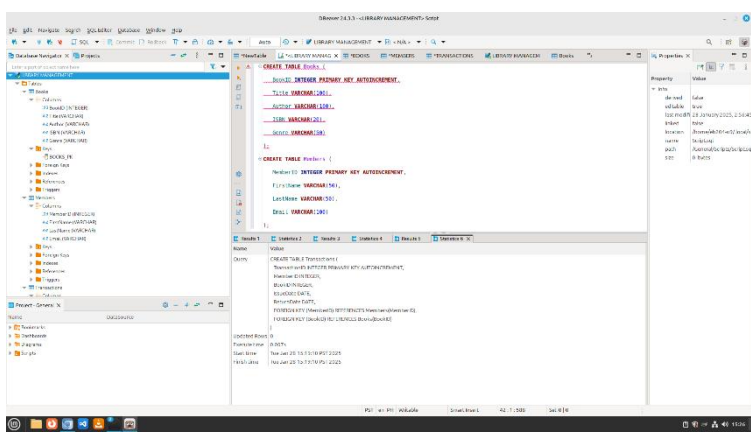
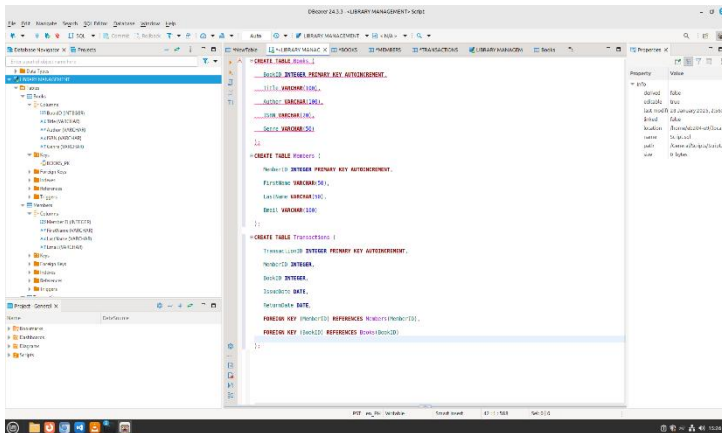
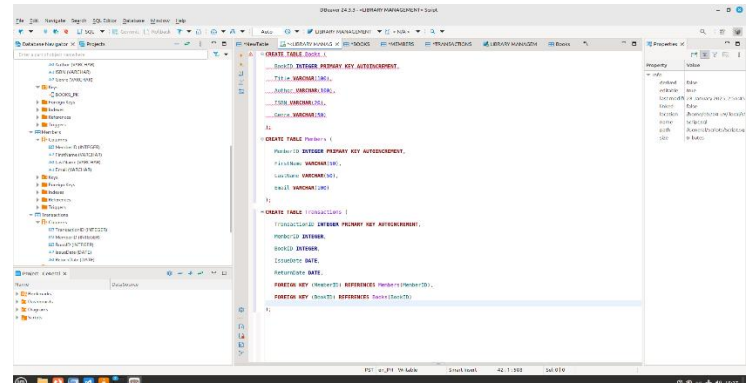
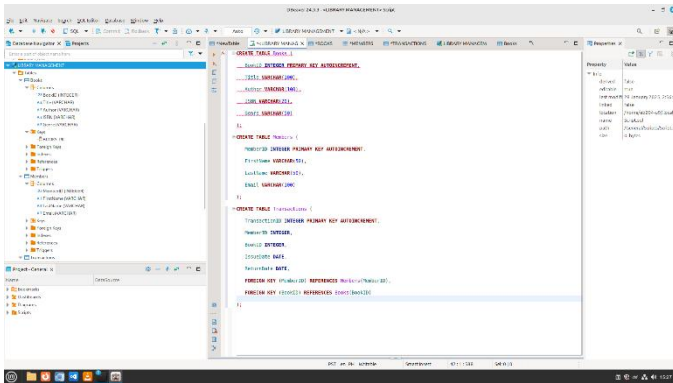
```
CREATE TABLE Members (  
    MemberID INT PRIMARY KEY AUTO_INCREMENT,  
    FirstName VARCHAR(50),  
    LastName VARCHAR(50),  
    Email VARCHAR(100)  
);
```

```
CREATE TABLE Transactions (  
    TransactionID INT PRIMARY KEY AUTO_INCREMENT,  
    MemberID INT,  
    BookID INT,  
    IssueDate DATE,  
    ReturnDate DATE,  
    FOREIGN KEY (MemberID) REFERENCES Members (MemberID),  
    FOREIGN KEY (BookID) REFERENCES Books (BookID)  
);
```

1. Verify the tables are created by running `SHOW TABLES;`.

Result:

Three tables (Books, Members, and Transactions) are created.



Additional Questions/Discussions:

- What is the importance of primary keys in a relational database?

A Primary Key (PK) is a critical component of relational databases that ensures data integrity, uniqueness, and rapid retrieval. Ensures that each row in a table is uniquely identifiable, preventing duplicate records.

Maintains data consistency by ensuring that no two rows contain the identical primary key

value. The database indexes automatically, which improves query performance and search efficiency.

- How do foreign keys maintain referential integrity?

Foreign keys maintain referential integrity by ensuring that child entries always refer to legitimate parent records. They avoid orphaned records, limit deletions, allow for cascading updates, and ensure data consistency across connected tables. Foreign keys are critical in relational database systems because they enforce these rules and ensure database accuracy and reliability.

Conclusions:

Primary and foreign keys are critical for ensuring data integrity, uniqueness, and relational consistency in a database. Primary keys ensure that each record is uniquely identified and increase query performance, whereas foreign keys maintain referential integrity by keeping relationships between tables. By preventing duplicate, orphaned, or incorrect data, these keys improve database dependability, security, and performance. They work together to create the foundation of structured, well-organized relational database systems, ensuring that data is managed and retrieved seamlessly.