CityLibrary Management System — Project Report

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Project Overview

This project focuses on building a real-world Library Management System using MySQL. It includes managing books, authors, physical copies, member registration, book loans, fines, and library events. Along the way, various database concepts like joins, procedures, triggers, functions, and transactions were applied.

Completed Goals

- • Database & Table Creation
- • Data Insertion
- • Basic SELECT Queries
- • Aggregation Queries
- • JOIN Queries
- • Subqueries & Set Operators
- • Window Functions
- • Stored Procedures & Functions
- • Triggers
- • Transactions & Views

Screenshots (To Be Added Manually)

```
mysql> SELECT * FROM events
    -> ORDER BY event_date ASC;
+----------+-----------------------------+------------+-----------------+--------------+------------------------------------+
| event_id | event_name                  | event_date | event_type      | max_attendees | description                       |
+----------+-----------------------------+------------+-----------------+--------------+------------------------------------+
|        2 | Children's Story Time       | 2025-11-12 | reading_program |           20 | Weekly story time for kids aged 3-7 |
|        7 | Poetry Writing Workshop      | 2025-11-14 | workshop        |           10 | Creative writing session           |
|        4 | Digital Literacy Workshop    | 2025-11-16 | workshop        |           12 | Learn basic computer skills        |
|        1 | Mystery Book Club - November | 2025-11-19 | book_club       |           15 | Monthly mystery book discussion    |
|        5 | Teen Summer Reading Program  | 2025-11-24 | reading_program |           25 | Summer reading challenge for teens |
|        6 | Classic Literature Book Club | 2025-11-29 | book_club       |           15 | Discussing Jane Austen novels      |
|        8 | Science Fiction Book Club    | 2025-12-04 | book_club       |           15 | Discussing 1984 by George Orwell   |
|        3 | Meet Author Stephen King     | 2025-12-09 | author_visit    |           50 | Q&A session with famous author     |
+----------+-----------------------------+------------+-----------------+--------------+------------------------------------+
8 rows in set (0.00 sec)

mysql> SELECT * FROM members
    -> WHERE membership_type = 'premium';
+-----------+------------+-----------+--------------------+----------+----------------+------------+-----------------+--------+
| member_id | first_name | last_name | email              | phone    | address        | join_date  | membership_type | status |
+-----------+------------+-----------+--------------------+----------+----------------+------------+-----------------+--------+
|         1 | Alice      | Johnson   | alice.j@email.com  | 555-0101 | 123 Main St    | 2024-10-05 | premium         | active |
|         5 | Emma       | Brown     | emma.b@email.com   | 555-0105 | 654 Maple Dr   | 2025-08-01 | premium         | active |
|         9 | Isabel     | Martinez  | isabel.m@email.com | 555-0109 | 369 Willow Pl  | 2024-11-24 | premium         | active |
|        12 | Leo        | Lee       | leo.lee@email.com  | 555-0112 | 963 Hickory Ave | 2025-02-12 | premium         | active |
|        15 | Olivia     | Harris    | olivia.h@email.com | 555-0115 | 486 Redwood Way | 2025-01-03 | premium         | active |
|        18 | Rachel     | Walker    | rachel.w@email.com | 555-0118 | 846 Fir Blvd   | 2024-08-26 | premium         | active |
+-----------+------------+-----------+--------------------+----------+----------------+------------+-----------------+--------+
```

```
mysql> SELECT COUNT(*) AS active_loans
    -> FROM loans
    -> WHERE status = 'active';
+--------------+
| active_loans |
+--------------+
|           15 |
+--------------+
1 row in set (0.00 sec)

mysql> SELECT COUNT(*) AS overdue_loans
    -> FROM loans
    -> WHERE return_date IS NULL
    ->   AND due_date < CURDATE();
+---------------+
| overdue_loans |
+---------------+
|             6 |
+---------------+
1 row in set (0.00 sec)

mysql> SELECT event_type, COUNT(*) AS total
    -> FROM events
    -> GROUP BY event_type;
+-----------------+-------+
| event_type      | total |
+-----------------+-------+
| book_club       |     3 |
| reading_program |     2 |
| author_visit    |     1 |
| workshop        |     2 |
+-----------------+-------+
```

```
mysql> SELECT l.loan_id, m.first_name, m.last_name, l.loan_date, l.due_date, l.status
    -> FROM loans l
    -> JOIN members m ON l.member_id = m.member_id;
+---------+------------+-----------+------------+------------+----------+
| loan_id | first_name | last_name | loan_date  | due_date   | status   |
+---------+------------+-----------+------------+------------+----------+
|       1 | Alice      | Johnson   | 2025-11-04 | 2025-11-18 | active   |
|      13 | Alice      | Johnson   | 2025-09-10 | 2025-09-24 | returned |
|       2 | Bob        | Smith     | 2025-10-30 | 2025-11-13 | active   |
|       8 | Bob        | Smith     | 2025-10-10 | 2025-10-24 | active   |
|      23 | Bob        | Smith     | 2025-07-12 | 2025-07-26 | returned |
|       3 | Carol      | Davis     | 2025-11-06 | 2025-11-20 | active   |
|      14 | Carol      | Davis     | 2025-09-20 | 2025-10-04 | returned |
|       9 | David      | Wilson    | 2025-10-15 | 2025-10-29 | active   |
|      24 | David      | Wilson    | 2025-07-02 | 2025-07-16 | returned |
|       4 | Emma       | Brown     | 2025-11-02 | 2025-11-16 | active   |
|      15 | Emma       | Brown     | 2025-09-25 | 2025-10-09 | returned |
|      10 | Frank      | Miller    | 2025-09-30 | 2025-10-14 | active   |
|      25 | Frank      | Miller    | 2025-06-22 | 2025-07-06 | returned |
|       5 | Grace      | Taylor    | 2025-11-07 | 2025-11-21 | active   |
|      16 | Grace      | Taylor    | 2025-09-15 | 2025-09-29 | returned |
|      11 | Henry      | Anderson  | 2025-10-05 | 2025-10-19 | active   |
|      26 | Henry      | Anderson  | 2025-06-12 | 2025-06-26 | returned |
|       6 | Isabel     | Martinez  | 2025-11-01 | 2025-11-15 | active   |
|      17 | Isabel     | Martinez  | 2025-08-31 | 2025-09-14 | returned |
|      12 | Jack       | Garcia    | 2025-10-18 | 2025-11-01 | active   |
|       7 | Karen      | Rodriguez | 2025-11-05 | 2025-11-19 | active   |
```

```
mysql> SELECT title
    -> FROM books
    -> WHERE book_id IN (
    ->     SELECT bc.book_id
    ->     FROM book_copies bc
    ->     JOIN loans l ON bc.copy_id = l.copy_id
    ->     WHERE l.status = 'active'
    -> );
+------------------------------------------+
| title                                    |
+------------------------------------------+
| Harry Potter and the Philosopher's Stone |
| 1984                                     |
| Norwegian Wood                           |
| Beloved                                  |
| Murder on the Orient Express             |
| Animal Farm                              |
| Love in the Time of Cholera              |
| Pride and Prejudice                      |
| One Hundred Years of Solitude            |
| Things Fall Apart                        |
| The Shining                              |
| Harry Potter and the Chamber of Secrets  |
| Paula                                    |
| And Then There Were None                 |
| The Stand                                |
+------------------------------------------+
```

```
mysql> SELECT
    ->     a.author_name,
    ->     b.title,
    ->     ROW_NUMBER() OVER (PARTITION BY b.author_id ORDER BY b.publication_year) AS book_order
    -> FROM books b
    -> LEFT JOIN authors a ON b.author_id = a.author_id;
+-------------------------+------------------------------------------+------------+
| author_name             | title                                    | book_order |
+-------------------------+------------------------------------------+------------+
| NULL                    | Where the Wild Things Are                |          1 |
| NULL                    | The Very Hungry Caterpillar              |          2 |
| NULL                    | A Brief History of Time                  |          3 |
| NULL                    | Sapiens: A Brief History of Humankind    |          4 |
| NULL                    | Educated                                 |          5 |
| J.K. Rowling            | Harry Potter and the Philosopher's Stone |          1 |
| J.K. Rowling            | Harry Potter and the Chamber of Secrets  |          2 |
| George Orwell           | Animal Farm                              |          1 |
| George Orwell           | 1984                                     |          2 |
| Jane Austen             | Pride and Prejudice                      |          1 |
| Jane Austen             | Emma                                     |          2 |
| Haruki Murakami         | Norwegian Wood                           |          1 |
| Haruki Murakami         | Kafka on the Shore                       |          2 |
| Gabriel García Márquez  | One Hundred Years of Solitude            |          1 |
| Gabriel García Márquez  | Love in the Time of Cholera              |          2 |
| Toni Morrison           | The Bluest Eye                           |          1 |
| Toni Morrison           | Beloved                                  |          2 |
| Chinua Achebe           | Things Fall Apart                        |          1 |
| Chinua Achebe           | No Longer at Ease                        |          2 |
| Isabel Allende          | The House of the Spirits                 |          1 |
| Isabel Allende          | Paula                                    |          2 |
| Agatha Christie         | Murder on the Orient Express             |          1 |
```

Challenges Faced

Delimiter Errors in Procedures: Resolved by pasting blocks fully and using DELIMITER $$ syntax.

Function Creation Error: Added READS SQL DATA for MySQL binary logging requirement.

Trigger Logic: Ensured proper BEFORE/AFTER usage to avoid constraints issues.

Real Data Modeling: Created meaningful dataset to test overdue, fines, event capacity etc.

What I Learned

- • Designing relational schema with proper foreign keys.
- • Implementing stored procedures and functions.
- • Using triggers for automation in database.
- • Working with window functions for analytics.
- • Handling transactions for safe commit and rollback.

How to Run

1. Install MySQL 8+

2. Import database and tables

3. Insert sample data

4. Use database "city_library"

5. Test using SELECT queries

Conclusion

This project helped me gain practical hands-on understanding of SQL, DBMS concepts, and real-world business logic implementation.