City Library Management System (SQL Project)

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Project Overview:

This project focuses on the development of a relational database system for a city library. It includes the creation of structured tables that handle members, books, loans, fines, events, and other administrative activities. The goal was to simulate real-world library operations by implementing data integrity rules, relational constraints, and different types of SQL queries ranging from simple data retrieval to advanced analytical reporting. Through this project, practical experience was gained in designing and managing complete database workflows.

Goals Completed:

Goal	Task	Status
1	Create Database Schema	Completed
2	Insert Sample Data	Completed
3	Basic Queries	Completed
4	Aggregation Queries	Completed
5	Multi-Table Joins	Completed
6	Subqueries & CTEs	Completed
7	Set Operations	Completed
8	Window Functions	Completed
9	Stored Procedures (Bonus)	Completed
10	Triggers (Bonus)	Completed
11	Index Optimization (Bonus)	Completed
12	Transaction Management (Bonus)	Completed

Challenges Faced & Solutions:

• Ensuring referential integrity required careful ordering of table creation. → Solved by structuring schema based on foreign key dependencies.
• While creating triggers and procedures, delimiter conflicts occurred. → Resolved by applying proper DELIMITER syntax in MySQL.
• Performance issues appeared during complex joins. → Improved query efficiency using indexing and EXPLAIN plan analysis.

What I Learned:

• How relational databases are structured and optimized in real-world use cases.
• Writing efficient SQL queries using joins, grouping, filtering, and window functions.
• Creating stored procedures and triggers to automate tasks within a database.
• Using indexes to significantly improve search and reporting performance.

Conclusion:

This project provided hands-on experience with database design and query optimization. It strengthened understanding of how structured data systems operate and how SQL can be used to manage, retrieve, and analyze information effectively. The project successfully demonstrates full-cycle database development and real-life application logic.