Library Database Management Conceptual Modeling

1. Introduction

Project Overview

The Library Database Management System (LDBMS) is developed to increase the productivity and organization of library management. The system will manage book and digital media management, membership management, borrowing processes, and reporting. By implementing a structured and automated process, the LDBMS will improve user experience, reduce administrative tasks, and ensure accurate record-keeping, providing a more accessible and easier-to-use library system.

Scope

The LDBMS will cover:

- Management of library inventory, including books, digital media, and magazines.
- Tracking of client memberships, borrowing limits, and fees.
- Implementation of borrowing, returning, and reservation functionalities.
- Generation of various reports related to borrowing trends, overdue items, and revenue collection.

Glossary

- **LDBMS**: Library Management System
- **ISBN**: International Standard Book Number
- **UUID**: Universally unique identifier
- **Client**: A registered library member
- **Items**: Books, digital media, and magazines available for borrowing
- **Books and digital media** have the same attributes/ similar attributes
- **Digital media** can be music CDs, audio books, movies, video games, and shows

2. ER Modeling Components

Entity	Attributes
Users	Username (Primary Key), Role, Password, Deleted
Client	ClientId (Primary Key), Username (Foreign Key), Name, Phone Number, Membership Type, Borrow Limit, Late Fee Rate, Account Status

Library Admin	AdminId (Primary Key), Username (Foreign Key), Name, Phone Number, Account Status
Item	Item Id (Primary Key), Title, Rarity, Availability Status, Max Borrow Days, Renewal Allowed
Item Genre	Item Id (Foreign Key), Genre Id (Foreign Key)
Genre	Gene Id, Name
Book	Item Id(Foreign Key), ISBN, Author, Publication Year
Digital Media	Item Id (Foreign Key), Type, Creator, Genre
Magazine	ID (Primary Key), Issue Number, Publication Date, Latest
Borrowing	Transaction Id (Primary Key), Client ID (Foreign Key), Item ID (Foreign Key), Borrow Date, Due Date, Return Date
Reservation	Reservation Id (Primary Key), Client Id (Foreign Key), Item Id (Foreign Key), Reservation Date
Fees	Fee Id (Primary Key), Transaction Id (Foreign Key), Amount, Due Date, Payment Status

3. Entity Relations

USER to CLIENT (1:1) & USER to LIBRARY_ADMIN (1:1): A user can be either a client or a library admin, so this relation is one to one.

ITEM to BOOK (1:1) & ITEM to DIGITAL_MEDIA (1:1) & ITEM to MAGAZINE (1:1): An item can either be a book, digital media or magazine, so this is a one-to-one relationship.

ITEM to ITEM_GENRE (1:N): An item can belong to one or more genres, so this relation is one to many.

GENRE to ITEM_GENRE (1:N): A genre can be associated with multiple items, so this relation is one to many.

CLIENT to BORROWING (1:N): A client can borrow many items, and each borrowing transaction involves one client making this a one-to-many relation.

ITEM to BORROWING (1:N): An item can be borrowed many times, and each borrowing transaction involves one item, making this a one to many relation.

CLIENT to RESERVATION (1:N): A client can make multiple reservations for different items, making this a one to many relation.

ITEM to RESERVATION (1:N): An item can be reserved multiple times by different clients, making this a one-to-many

BORROWING to FEES (1:N): Each borrowing transaction can incur multiple fees (e.g., late fees), so is a one-to-many relationship.

CLIENT to FEES (1:N): A client can incur multiple fees and each fee is linked to a specific borrowing transaction so this is a one-to-many relationship.

LIBRARY_ADMIN to ITEM (N:M): A library admin can manage multiple items (books, magazines, etc.), and an item can be managed by many library admins so this is a many to many relation.

LIBRARY_ADMIN to CLIENT (N:M): A library admin can manage multiple clients (books, magazines, etc.), and a client can be managed by many library admins so this is a many to many relation

4. ER Model