Assignment - Design and query data with PostgreSQL database

#### **Note:** Continue working on the Project of Assignment 1 and Assignment 2 (which do init the Project, implement the Authentication and Authorization)

## 1. Design Task: System Design for an Online Library (Design Focus)

**Problem:** You are tasked with designing a software system for an online library. The system must allow users to:

* Search for books by title, author, or genre.
* Borrow books, with the borrowing history stored for each user.
* Provide an analytics dashboard for admins to see popular genres and most-borrowed books.

**Requirements:**

* Choose the database type(s) (SQL, OLAP or OLTP) suitable for each functionality.
* Sketch a basic architecture (frontend, backend, database, and external services).
* List the key tables or collections needed, such as Users, Books, and BorrowingHistory.

## 2. Coding Task: Implement a REST API in Node.js

**Problem:** Create a simple REST API using Node.js and Express for managing books in the library system. Implement the following endpoints:

* **GET /books:** Fetch all books in the library.
* **POST /books:** Add a new book to the library.
* **GET /books/:id:** Fetch details of a specific book by ID.

**Steps:**

* Use an in-memory array or a basic SQLite/PostgreSQL database to store books.
* Each book should have properties: id, title, author, genre, and publishedYear.

**Example:**

// Sample Book Object

{

id: 1,

title: "The Great Gatsby",

author: "F. Scott Fitzgerald",

genre: "Fiction",

publishedYear: 1925

}

## 3. SQL Query and Indexing Task: Optimize Queries for the BorrowingHistory Table

**Scenario:** You have a BorrowingHistory table in your library system with the following schema:

| **Column** | **Type** | **Description** |
| --- | --- | --- |
| BorrowingID | INT (Primary Key) | Unique ID for each borrowing transaction. |
| UserID | INT | The ID of the user who borrowed the book. |
| BookID | INT | The ID of the borrowed book. |
| BorrowedDate | DATE | The date when the book was borrowed. |
| ReturnedDate | DATE | The date when the book was returned. |

**Tasks:**

1. Write an SQL query to fetch the top 5 most borrowed books in the last 6 months. Then expose and respond to them with analytics APIs (ex. GET /analytics/books/most-borrowed)
2. Create an index on the table to optimize queries for finding all borrowing transactions of a specific user (UserID).