OOPS WITH JAVA

" LIBRARY MANAGEMENT SYSTEM USING JDBC CONNECTIVITY "

NALINI M

231401068

CSBS 'B'

Code – using JDBC and SQL :

SQL :

```
- - Users Table
CREATE TABLE Users (
    UserID INT AUTO_INCREMENT PRIMARY KEY,
    Name VARCHAR(100) NOT NULL,
    Email VARCHAR(100) UNIQUE NOT NULL,
    Phone VARCHAR(15),
    Role ENUM('Student', 'Faculty', 'Admin') NOT NULL,
    PasswordHash VARCHAR(255) NOT NULL
);

-- Books Table
CREATE TABLE Books (
    BookID INT AUTO_INCREMENT PRIMARY KEY,
    Title VARCHAR(200) NOT NULL,
    Author VARCHAR(100) NOT NULL,
    ISBN VARCHAR(13) UNIQUE NOT NULL,
    Publisher VARCHAR(100),
    YearPublished YEAR,
    CopiesAvailable INT DEFAULT 0
);

-- Transactions Table
CREATE TABLE Transactions (
    TransactionID INT AUTO_INCREMENT PRIMARY KEY,
    UserID INT NOT NULL,
    BookID INT NOT NULL,
    IssueDate DATE NOT NULL,
    DueDate DATE NOT NULL,
```

```
    ReturnDate DATE,
    FineAmount DECIMAL(10, 2) DEFAULT 0.00,
    Status ENUM('Issued', 'Returned') DEFAULT 'Issued',
    FOREIGN KEY (UserID) REFERENCES Users(UserID),
    FOREIGN KEY (BookID) REFERENCES Books(BookID)
);

-- Notifications Table
CREATE TABLE Notifications (
    NotificationID INT AUTO_INCREMENT PRIMARY KEY,
    UserID INT NOT NULL,
    Message TEXT NOT NULL,
    SentDate TIMESTAMP DEFAULT CURRENT_TIMESTAMP,
    IsRead BOOLEAN DEFAULT FALSE,
    FOREIGN KEY (UserID) REFERENCES Users(UserID)
);

-- Book Requests Table
CREATE TABLE BookRequests (
    RequestID INT AUTO_INCREMENT PRIMARY KEY,
    UserID INT NOT NULL,
    BookID INT NOT NULL,
    RequestDate TIMESTAMP DEFAULT CURRENT_TIMESTAMP,
    Status ENUM('Pending', 'Approved', 'Rejected') DEFAULT 'Pending',
    FOREIGN KEY (UserID) REFERENCES Users(UserID),
    FOREIGN KEY (BookID) REFERENCES Books(BookID)
);
```

Java :

```
import javax.swing.*;

import java.awt.*;

import java.awt.event.ActionEvent;

import java.awt.event.ActionListener;

import java.sql.*;

import java.util.ArrayList;


public class LibraryManagementSystem {

   // Database connection details

   private static final String DB_URL = "jdbc:mysql://localhost:3306/library_db"; // Replace with your database URL

   private static final String DB_USER = "your_username";                    // Replace with your database username

   private static final String DB_PASSWORD = "your_password";                    // Replace with your database password


   public static void main(String[] args) {

      SwingUtilities.invokeLater(() -> {

         JFrame frame = new JFrame("Smart Library Management System");

         frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

         frame.setSize(600, 400);


         // Main Panel

         JPanel panel = new JPanel(new BorderLayout());

         frame.add(panel);


         // Menu

         String[] menuOptions = {"View Books", "Add Book"};

         JComboBox<String> menu = new JComboBox<>(menuOptions);

         panel.add(menu, BorderLayout.NORTH);
```

```
        // Content Panel
        JPanel contentPanel = new JPanel();
        panel.add(contentPanel, BorderLayout.CENTER);

        menu.addActionListener(e -> {
            String selectedOption = (String) menu.getSelectedItem();
            contentPanel.removeAll();

            if ("View Books".equals(selectedOption)) {
                showBooks(contentPanel);
            } else if ("Add Book".equals(selectedOption)) {
                addBook(contentPanel);
            }

            contentPanel.revalidate();
            contentPanel.repaint();
        });

        // Initial View
        showBooks(contentPanel);

        frame.setVisible(true);
    });
}

// Database Connection
private static Connection createConnection() {
    try {
        return DriverManager.getConnection(DB_URL, DB_USER, DB_PASSWORD);
```

```
        } catch (SQLException e) {
            JOptionPane.showMessageDialog(null, "Error connecting to database: " +
e.getMessage());
            return null;
        }
    }

    // View Books
    private static void showBooks(JPanel panel) {
        panel.setLayout(new BorderLayout());

        JTextArea textArea = new JTextArea();
        textArea.setEditable(false);
        panel.add(new JScrollPane(textArea), BorderLayout.CENTER);

        Connection connection = createConnection();
        if (connection != null) {
            try (Statement stmt = connection.createStatement()) {
                ResultSet rs = stmt.executeQuery("SELECT * FROM Books;");
                StringBuilder books = new StringBuilder("Available Books:\n\n");
                while (rs.next()) {
                    books.append("Title: ").append(rs.getString("Title"))
                            .append(" | Author: ").append(rs.getString("Author"))
                            .append(" | Copies Available: ").append(rs.getInt("CopiesAvailable"))
                            .append("\n");
                }
                textArea.setText(books.toString());
                connection.close();
            } catch (SQLException e) {
                textArea.setText("Error fetching books: " + e.getMessage());
            }
```

```
        } else {
            textArea.setText("No books found!");
        }
    }

    // Add Book
    private static void addBook(JPanel panel) {
        panel.setLayout(new GridLayout(7, 2));

        JTextField titleField = new JTextField();
        JTextField authorField = new JTextField();
        JTextField isbnField = new JTextField();
        JTextField publisherField = new JTextField();
        JTextField yearField = new JTextField();
        JTextField copiesField = new JTextField();

        panel.add(new JLabel("Book Title:"));
        panel.add(titleField);

        panel.add(new JLabel("Author:"));
        panel.add(authorField);

        panel.add(new JLabel("ISBN:"));
        panel.add(isbnField);

        panel.add(new JLabel("Publisher:"));
        panel.add(publisherField);

        panel.add(new JLabel("Year Published:"));
        panel.add(yearField);
```

```
        panel.add(new JLabel("Copies Available:"));
        panel.add(copiesField);

        JButton addButton = new JButton("Add Book");
        panel.add(new JLabel());
        panel.add(addButton);

        addButton.addActionListener(new ActionListener() {
            @Override
            public void actionPerformed(ActionEvent e) {
                String title = titleField.getText();
                String author = authorField.getText();
                String isbn = isbnField.getText();
                String publisher = publisherField.getText();
                int year = Integer.parseInt(yearField.getText());
                int copies = Integer.parseInt(copiesField.getText());

                Connection connection = createConnection();
                if (connection != null) {
                    try (PreparedStatement pstmt = connection.prepareStatement(
                            "INSERT INTO Books (Title, Author, ISBN, Publisher, YearPublished,
CopiesAvailable) " +
                                    "VALUES (?, ?, ?, ?, ?, ?)")) {
                        pstmt.setString(1, title);
                        pstmt.setString(2, author);
                        pstmt.setString(3, isbn);
                        pstmt.setString(4, publisher);
                        pstmt.setInt(5, year);
                        pstmt.setInt(6, copies);
```

```
                    pstmt.executeUpdate();
                    JOptionPane.showMessageDialog(null, "Book added successfully!");
                    connection.close();
                } catch (SQLException ex) {
                    JOptionPane.showMessageDialog(null, "Error adding book: " +
ex.getMessage());
                }
            }
        }
    });
  }
}
```

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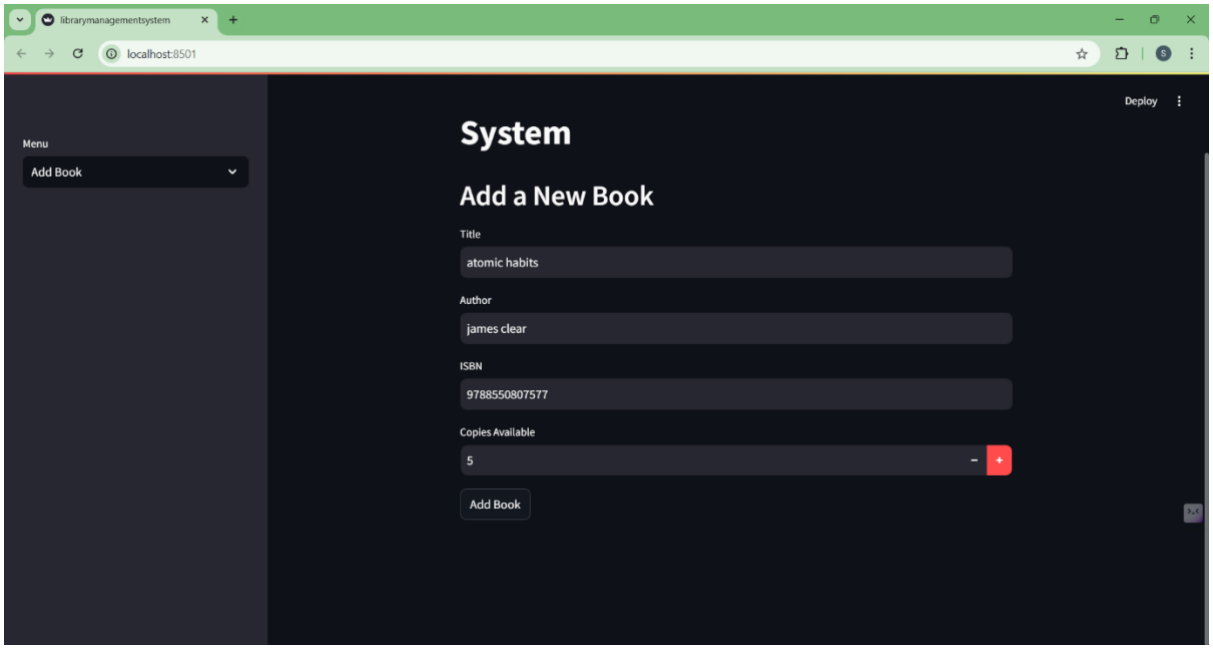
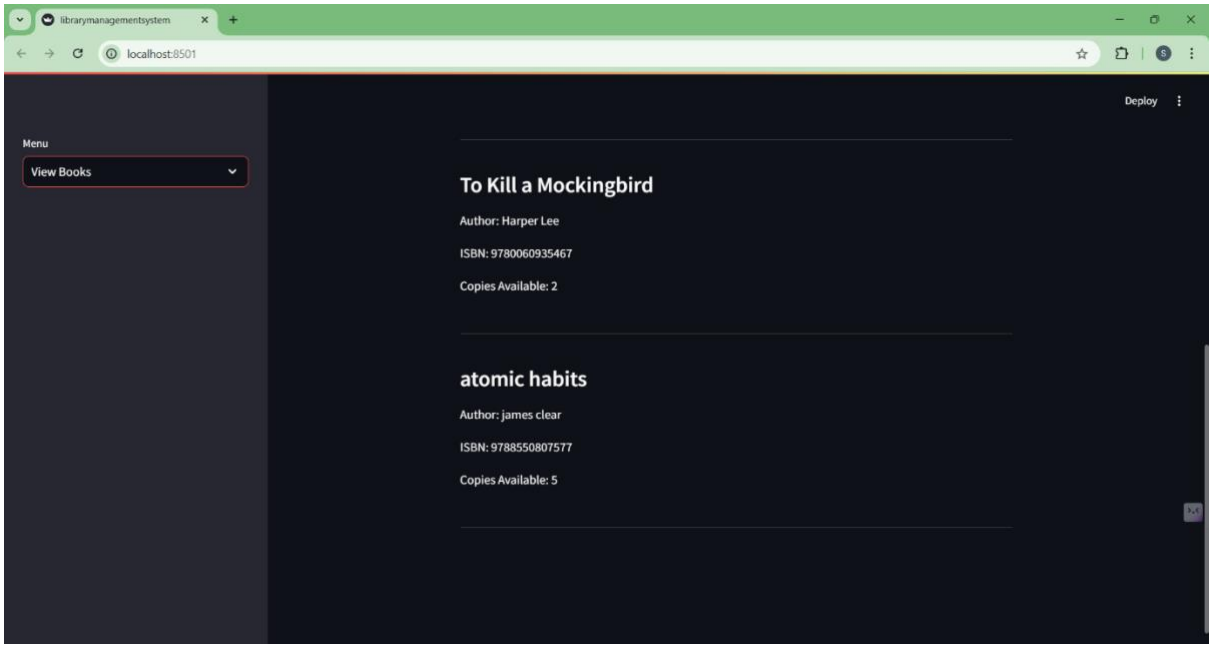
Project output screenshots :





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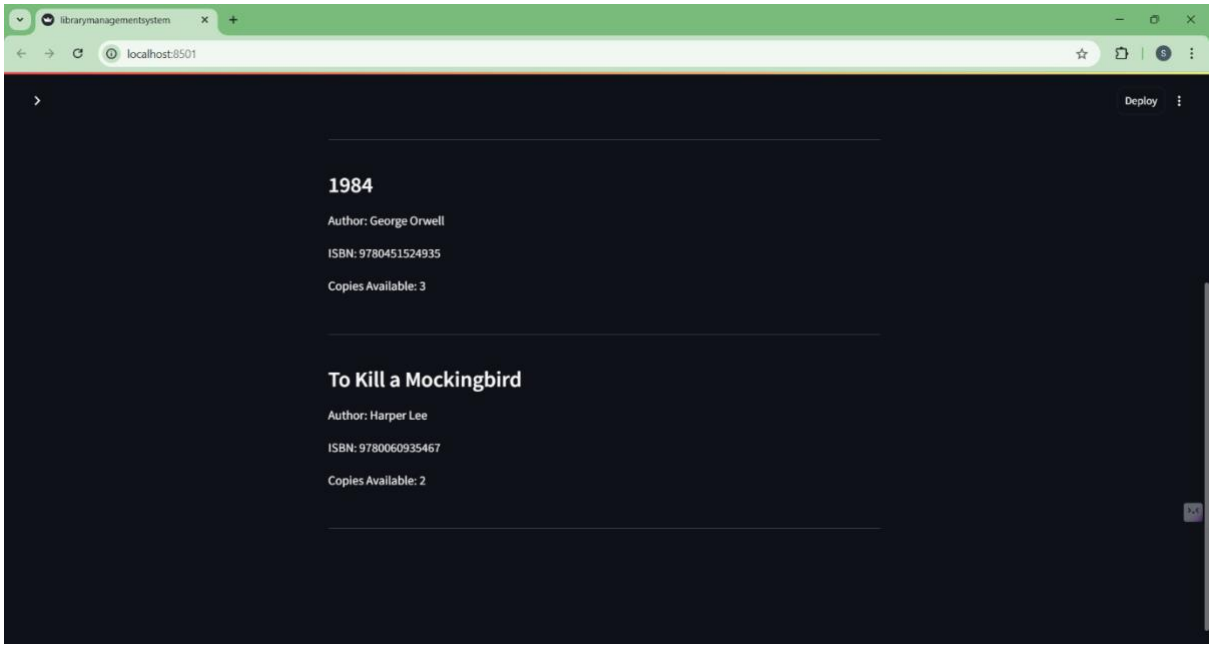
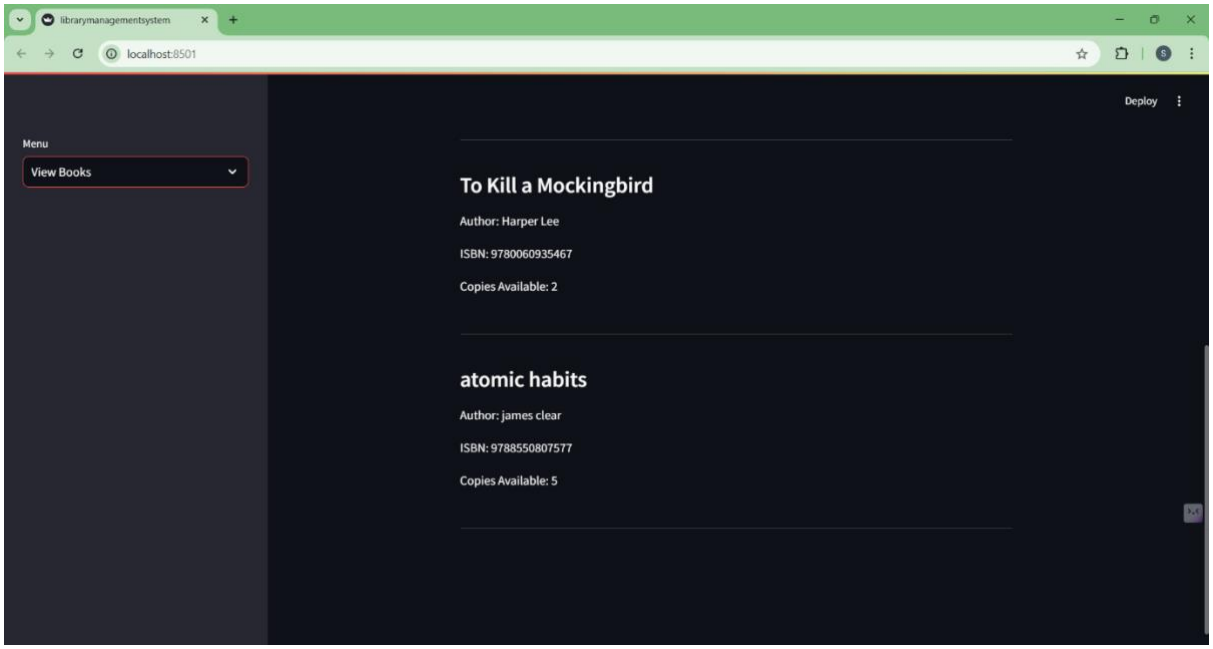

librarymanagementsystem
localhost:8501
Deploy
1984
Author: George Orwell
ISBN: 9780451524935
Copies Available: 3
To Kill a Mockingbird
Author: Harper Lee
ISBN: 9780060935467
Copies Available: 2


librarymanagementsystem
localhost:8501
Deploy
Menu
View Books
To Kill a Mockingbird
Author: Harper Lee
ISBN: 9780060935467
Copies Available: 2
atomic habits
Author: james clear
ISBN: 9788550807577
Copies Available: 5

CONCLUSION:

The Library Management System streamlines library operations by providing a robust database design that supports key functionalities such as book borrowing, user management, and fine calculation. The implementation ensures data consistency, reduces manual workload, and enhances user satisfaction. By integrating relational database technology, the system can handle a large volume of data efficiently and adapt to future requirements.

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