Amicus International School, Bharuch

PROJECT REPORT ON

SOFTWARE FOR Library Management

Computer Science Project

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Certificate

This is to certify that **Dipam Sen** of Class XII-B, have successfully completed the investigatory project on the topic **Software for Library Management** under the guidance of Mrs. Arpita Bhoi during the academic year 2023-24 in the partial fulfillment of Practical Examination conducted by CBSE.

Signature of Internal Examiner	Signature of Principal	Signature of External Examiner

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- Dipam Sen

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Introduction

The Library Manager is designed to facilitate the process of book issuance and returns in a library environment. This application offers a solution for tracking transactions, simplifying administrative tasks, and presenting data in a clear manner. Users can efficiently manage the database by updating, creating, and removing records. The goal is to make the application mor accessible by streamlining library operations and transaction management.

Technologies Used

This project uses Python as the primary programming language for the frontend application. The project uses an MySQL database for the backend, for efficient data storage and retrieval.

Functional Requirements

The following are the functional requirements for a library management system:

- To list and search books by criteria
- To add, remove and update books
- To view information about patrons
- To issue books and return books
- To view and filter information about book issuance

Database Design

The database for our application is managed by MySQL - it comprises of 3 tables: `Books`, `Patrons`, and `Transactions`. The ERD (Entity Relationship Diagram) shows the various relations and fields in the database (See Figure 1).

Books

The `Books` table stores information on books, storing `isbn`, `title`, `author`, `quantity` and `genre`.

- `isbn`: The International Standard Book Number uniquely identifying each book.
- `title`: The title of the book.
- `author`: The author of the book.
- `quantity`: The number of available copies of the book.
- `genre`: The genre of the book.

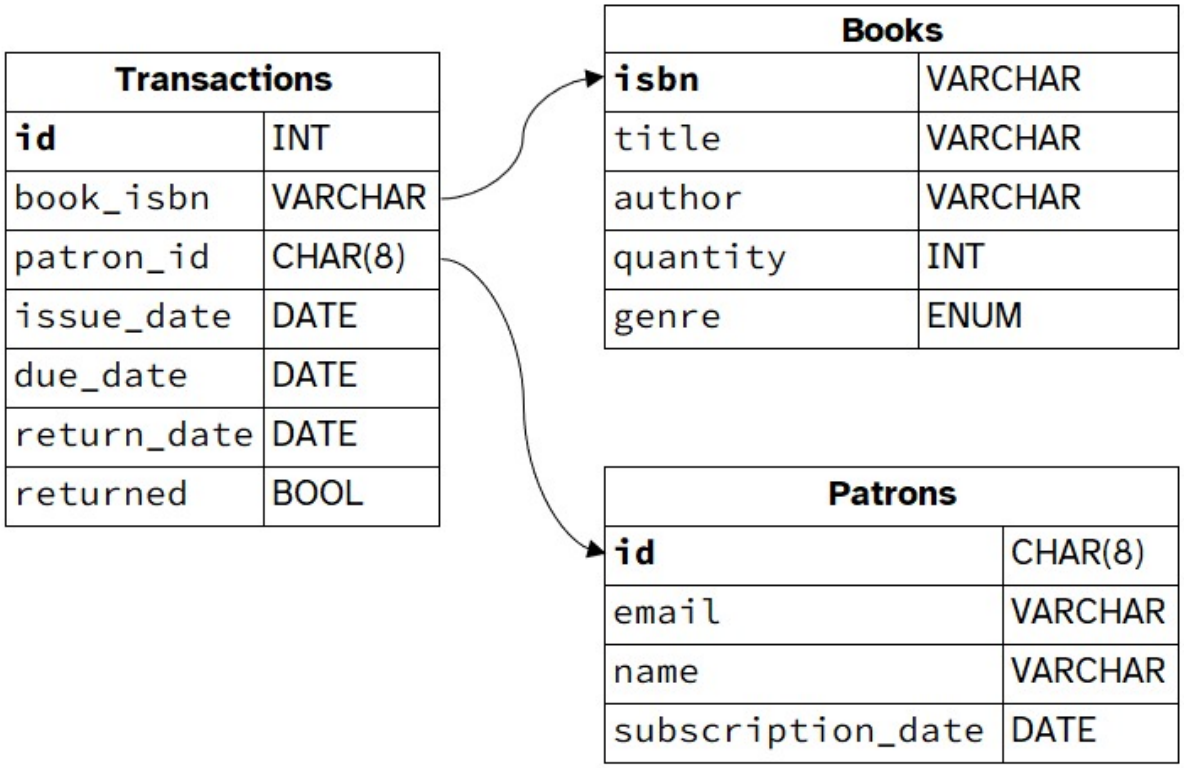


Figure 1: Database Entity Relationship diagram

Patrons

The `Patrons` table stores user info, about library patrons who can borrow and return books.

- `id`: A unique identifier for each patron.
- `email`: The email address of the patron.
- `name`: The name of the patron.
- `subscription_date`: The date when the patron subscribed to the library.

Transactions

The `Transactions` table keeps track of all issuings, with their date of issue and date of return. It helps manage the circulation of books, tracking their status and due dates, and allowing for reporting and analysis.

- `id`: A unique identifier for each transaction.
- `book_isbn`: A foreign key referencing the “books” table, specifying the ISBN of the book involved.
- `patron_id`: A foreign key referencing the “patrons” table, identifying the patron associated.
- `issue_date`: The date when the book was issued.
- `due_date`: The date when the book is expected to be returned.
- `return_date`: The date when the book was actually returned (if returned).
- `returned`: A boolean indicating whether the book has been returned (default is false).

Functional Decomposition

The application is decomposed into smaller components, which include:

- functionality for querying the database
- general utility functions
- the main program (driver)

All database queries are isolated inside a separate file, **`database.py`**.

```
# database.py

def IssueBook(isbn, patron_id):
  ...

def ReturnBook(isbn, patron_id):
  ...

def ViewTransactions():
  ...

...
```

Listing 1: Function decomposition of database functions

These functions use the `mysql.connecter` library to connect to the MySQL database and query the database.

The main frontend code is present inside **`main.py`**, which creates a menu based UI (within the terminal) for interacting with these database functions.

```python
# main.py

print("Welcome to the Library Manager!!")
print("(1) ADMIN")
print("(2) USER")
choice = int(input("Enter your choice: "))

if choice == 1:
  # admin
  input("Enter password")
  ...
elif choice == 2:
  # patron
  input("Enter patron ID")
  ...
```

Listing 2: Frontend code for interacting with the database

Inside each if block, we list all possible options for the user and once again ask for the choice, which then continuously prompts the user for nested choices. At the innermost level, the database functions are called.

```python
# main.py
while True:
  opt = int(input("\tEnter your choice: "))
  ...
  elif opt == 5: # return book
    ISBN = input("\t\tISBN : ")
    ID = input("\t\tID of the patron: ")
    db.ReturnBook(ISBN, ID)
    print("\t\tBook returned successfully!")
```

Listing 3: Calling database functions in the frontend

Control Flow of the Application

Initially on running the app, it provides with two options — to use the application as an **Admin** or an **User** (Patron). The major functionality of an app is only accessible to the admin for obvious reasons, and the user can only perform a few READ operations.

The admin operations are:

- Add/Remove/Edit a Book
- Add/Remove/Edit a Patron
- View Books/Patrons
- Search Books
- Issue/Return a Book
- View all Transactions
- View pending Transactions

Most of these functions just perform simple CRUD[1] operations using SQL queries and return the output (if any). The custom functionality which is implemented specifically for this project is the Issue/Return workflow.

Issuing a Book

The `IssueBook()` function takes in two arguments - `isbn` and `patron_id`. The steps of the Issue workflow are:

- Constraints
  1. `isbn` must link to a specific `Book`
  2. `patron_id` must link to a specific `Patron`
  3. `Patron` must not currently have 3 unreturned books
  4. `Patron` must not currently have this book

[1]Create, Read, Update, Delete

- Actions
  1. Update `quantity` of `Book` to `quantity - 1`
  2. Create a `Transaction` linking the `Patron` and the `Book`, with the current date as `issue_date`, and with a 7 day time interval, a `return_date`.
  3. Commit to the Database.

Returning a Book

Similar to the Issue Book workflow, the `ReturnBook()` function also takes in arguments - `isbn` and `patron_id`.

- Constraints
  1. `isbn` must link to a specific `Book`
  2. `patron_id` must link to a specific `Patron`
  3. `Patron` must currently have this book - i.e. There should be one `Transaction` such that it is associated with this `Patron` and this `Book`, and has `returned` set to `FALSE`.
- Actions
  1. Update `returned = TRUE` and `return_date` to current date of `Transaction`.
  2. Update `quantity` of `Book` to `quantity + 1`
  3. Commit to the Database.

Source Code

main.py

```
from tkinter import simpledialog
import time
import database as db
from tabulate import tabulate


def validate_date(date):
  # yyyy-mm-dd
  try:
    time.strptime(date, "%Y-%m-%d")
    return True
  except ValueError:
    return False


def triminput(*args, **kwargs):
  return input(*args, **kwargs).strip()

def numinput(*args, **kwargs):
  while True:
    try:
      return int(input(*args, **kwargs))
    except ValueError:
      print("Invalid input! Please enter a number.")


print("Welcome to the Library Manager!!")
print()
print("ACCESS TO : ")
print("(1) ADMIN")
print("(2) USER")
print()
choice = numinput("Enter your choice: ")
print()


if choice >= 1 and choice <= 2:
  if choice == 1:
    pwd = simpledialog.askstring("Password", "Enter your password:",
show="*")
    if pwd == "admin123123" or pwd == "libraryroot123":
      print("Recognised as admin....")
      print("Accessing administrative functions.....")
      print()
      time.sleep(2)
      while True:
        print("\t(1) Book functions")
```

```
        print("\t(2) Patron functions")
        print("\t(3) Transactions and Returns")
        print("\t(4) Exit")

        acc = numinput("\tPLEASE ENTER THE OPTION NUMBER : ")
        if acc >= 1 and acc <= 4:
          if acc == 1:
            print("\tAccessing........")
            time.sleep(2)

            while True:  #
              print("\t\t**** BOOK FUNCTIONS ****")
              print("\t\t OPTIONS : ")
              print("\t\t(1) Add a book")
              print("\t\t(2) Remove a book")
              print("\t\t(3) Update a book")
              print("\t\t(4) Issue a Book")
              print("\t\t(5) Return a Book")
              print("\t\t(6) Search a Book")
              print("\t\t(7) View all books")
              print("\t\t(8) Go back to main menu")
              print("\t\t(9) Exit")

              opt = numinput("\t\tPLEASE ENTER THE OPTION NUMBER : ")
              if opt >= 1 and opt <= 9:
                if opt == 1:
                  nISBN = triminput("\t\tISBN : ")
                  nTITLE = triminput("\t\tTITLE : ")
                  nAUTHOR = triminput("\t\tAUTHOR : ")
                  nGENRE = triminput("\t\tGENRE (Fiction/Non-Fiction): ")
                  Quantity = numinput("\t\tQUANTITY : ")
                  out = db.AddBook(Quantity, nTITLE, nAUTHOR, nISBN, nGENRE)
                  if out != 1:
                    print("\t\tBook added successfully!")
                elif opt == 2:
                  ISBN = triminput("\t\tISBN : ")
                  out = db.RemoveBook(ISBN)
                  if out != 1:
                    print("\t\tBook removed successfully!")
                elif opt == 3:
                  ISBN = triminput("\t\tISBN : ")
                  out = db.EditBook(ISBN)
                  if out != 1:
                    print("\t\tBook updated successfully!")
                elif opt == 4:
                  ISBN = triminput("\t\tISBN : ")
                  ID = triminput("\t\tID of the patron: ")
                  out = db.IssueBook(ISBN, ID)
                  if out != 1:
                    print("\t\tBook issued successfully!")
                elif opt == 5:
```

```
                    ISBN = triminput("\t\tISBN : ")
                    ID = triminput("\t\tID of the patron: ")
                    out = db.ReturnBook(ISBN, ID)
                    if out != 1:
                      print("\t\tBook returned successfully!")
                  elif opt == 6:
                    while True:
                      print("\t\t\t OPTIONS :")
                      print("\t\t\t(1) By ISBN number")
                      print("\t\t\t(2) By Author")
                      print("\t\t\t(3) By Title")
                      print("\t\t\t(4) By Genre")
                      print("\t\t\t(5) Return to previous menu")
                      print("\t\t\t(6) Exit")

                      x = numinput("\t\t\tPLEASE ENTER THE OPTION NUMBER : ")
                      if x >= 1 and x <= 6:
                        if x == 1:
                          ISBN = triminput("\t\t\t\tISBN : ")
                          res = db.SearchBookByISBN(ISBN)
                          if res != 1:
                            data, columns = res
                            print(tabulate(data, headers=columns,
tablefmt="pretty"))
                          else:
                            print("\t\t\t\tBook not found!")

                        elif x == 2:
                          Author = triminput("\t\t\t\tAuthor : ")
                          res = db.SearchBookByAuthor(Author)
                          if res != 1:
                            data, columns = res
                            print(tabulate(data, headers=columns,
tablefmt="pretty"))
                          else:
                            print("\t\t\t\tBook not found!")

                        elif x == 3:
                          Title = triminput("\t\t\t\tTitle : ")
                          res = db.SearchBookByTitle(Title)
                          if res != 1:
                            data, columns = res
                            print(tabulate(data, headers=columns,
tablefmt="pretty"))
                          else:
                            print("\t\t\t\tBook not found!")
                            break
                        elif x == 4:
                          Genre = triminput("\t\t\t\tGenre : ")
                          res = db.SearchBookByGenre(Genre)
                          if res != 1:
```

```
                        data, columns = res
                        print(tabulate(data, headers=columns,
tablefmt="pretty"))
                      else:
                        print("\t\t\t\tBook not found!")
                        break
                    elif x == 5:
                      break
                    elif x == 6:
                      exit()
                  else:
                    print("\t\t\tIncorrect option entered!")
              elif opt == 7:
                db.ViewBooks()
              elif opt == 8:
                break
              elif opt == 9:
                exit()
            else:
              print("\t\t\Incorrect option entered!")
        elif acc == 2:
          print("\tAccessing........")
          time.sleep(2)

          while True:
            print("\t\t**** PATRON FUNCTIONS ****")
            print("\t\t OPTIONS : ")
            print("\t\t(1) Add Patron")
            print("\t\t(2) Remove Patron")
            print("\t\t(3) Update Patron")
            print("\t\t(4) Search Patron")
            print("\t\t(5) View Patrons")
            print("\t\t(6) Go back to main menu")
            print("\t\t(7) Exit")
            opt = numinput("\t\tPLEASE ENTER THE OPTION NUMBER : ")
            if opt >= 1 and opt <= 7:
              if opt == 1:
                ID = triminput("\t\tID : ")
                Email = triminput("\t\tEmail : ")
                Patron_Name = triminput("\t\tPatron Name : ")
                Subcription_Date = triminput("\t\tEnter Date(YYYY-MM-DD) :
")
                if not validate_date(Subcription_Date):
                  print("\t\t\tIncorrect date entered!")
                  break
                db.AddPatron(ID, Email, Patron_Name, Subcription_Date)
              elif opt == 2:
                ID = triminput("\t\tID : ")
                db.RemovePatron(ID)
              elif opt == 3:
                ID = triminput("\t\tID : ")
```

```
                    db.EditPatron(ID)
                elif opt == 4:
                    while True:
                        print("\t\t\t OPTIONS :")
                        print("\t\t\t(1) By ID")
                        print("\t\t\t(2) By Name")
                        print("\t\t\t(3) Return to previous menu")
                        print("\t\t\t(4) Exit")
                        x = numinput("\t\t\tPLEASE ENTER THE OPTION NUMBER : ")
                        if x >= 1 and x <= 4:
                            if x == 1:
                                ID = triminput("\t\t\tID : ")
                                res = db.SearchPatronByID(ID)
                                if res != 1:
                                    data, columns = res
                                    print(tabulate(data, headers=columns,
tablefmt="pretty"))
                                else:
                                    print("\t\t\t\tPatron not found!")
                                    break
                            elif x == 2:
                                Name = triminput("\t\t\tName : ")
                                res = db.SearchPatronByName(Name)
                                if res != 1:
                                    data, columns = res
                                    print(tabulate(data, headers=columns,
tablefmt="pretty"))
                                else:
                                    print("\t\t\t\tPatron not found!")
                                    break
                            elif x == 3:
                                break
                            elif x == 4:
                                exit()
                        else:
                            print("Incorrect option entered!")
                elif opt == 5:
                    db.ViewPatrons()
                elif opt == 6:
                    break
                elif opt == 7:
                    exit()
                else:
                    print("Incorrect option entered!")
            elif acc == 3:
                print("\tAccessing........")
                time.sleep(2)

                while True:
                    print("\t\t**** TRANSACTIONS ****")
                    print("\t\t OPTIONS : ")
```

```
            print("\t\t(1) View Transactions")
            print("\t\t(2) View all pending returns")
            print("\t\t(3) Return to previous menu")
            print("\t\t(4) Exit")

            opt = numinput("\t\tPLEASE ENTER THE OPTION NUMBER : ")
            if opt >= 1 and opt <= 4:
              if opt == 1:
                db.ViewTransactions()
              elif opt == 2:
                db.ViewTransactionsPending()
              elif opt == 3:
                break
              elif opt == 4:
                exit()
            else:
              print("Incorrect option entered!")
        elif acc == 4:
          exit()
      else:
        print("Incorrect option entered!")
  else:
    print("Wrong Password !!")
    exit()
elif choice == 2:
  ID = simpledialog.askstring("ID", "Enter your Patron ID:")
  if db.SearchPatronByID(ID) == 1:
    print("Patron ID not found !!")
    exit()
  else:
    print("Recognised as our registered patron....")
    print("Accessing patron functions.....")
    print()
    time.sleep(2)
    while True:
      print("\tOPTIONS :")
      print("\t(1) Search a book")
      print("\t(2) View all books")
      print("\t(3) View my issued books")
      print("\t(4) Exit")
      acc = numinput("\tPLEASE ENTER THE OPTION NUMBER : ")
      if acc >= 1 and acc <= 4:
        if acc == 1:
          while True:
            print("\t\t OPTIONS :")
            print("\t\t(1) By ISBN number")
            print("\t\t(2) By Author")
            print("\t\t(3) By Title")
            print("\t\t(4) By Genre")
            print("\t\t(5) Return to previous menu")
            print("\t\t(6) Exit")
```

```
            x = numinput("\t\t\tPLEASE ENTER THE OPTION NUMBER : ")
            if x >= 1 and x <= 6:
              if x == 1:
                ISBN = triminput("\t\t\tISBN : ")
                res = db.SearchBookByISBN(ISBN)
                if res != 1:
                  data, columns = res
                  print(tabulate(data, headers=columns, tablefmt="psql"))
                else:
                  print("\t\t\t\tBook not found!")
                  break
              elif x == 2:
                Author = triminput("\t\t\tAuthor : ")
                res = db.SearchBookByAuthor(Author)
                if res != 1:
                  data, columns = res
                  print(tabulate(data, headers=columns, tablefmt="pretty"))
                else:
                  print("\t\t\t\tBook not found!")
                  break
              elif x == 3:
                Title = triminput("\t\t\tTitle : ")
                res = db.SearchBookByTitle(Title)
                if res != 1:
                  data, columns = res
                  print(tabulate(data, headers=columns, tablefmt="pretty"))
                else:
                  print("\t\t\t\tBook not found!")
                  break
              elif x == 4:
                Genre = triminput("\t\t\tGenre : ")
                res = db.SearchBookByGenre(Genre)
                if res != 1:
                  data, columns = res
                  print(tabulate(data, headers=columns, tablefmt="pretty"))
                else:
                  db.SearchBookByAuthor(Author)
              elif x == 5:
                break
              elif x == 6:
                exit()
        elif acc == 2:
          db.ViewBooks()
        elif acc == 3:
          query = """SELECT
            b.title "Book",
            p.name "Issued by",
            t.issue_date "Issued On",
            t.due_date "Due Date",
            IFNULL(t.return_date, \'Not Returned\') \'Returned On\'
          FROM transactions t
```

```
            JOIN books b ON t.book_isbn = b.isbn
            JOIN patrons p ON p.id = t.patron_id
            WHERE t.patron_id = %s"""
            res = db.Query(query, (ID,))
            if res != 1:
              data, columns = res
              print(tabulate(data, headers=columns, tablefmt="pretty",
stralign="center"))
            else:
              print("\t\t\t\tNo books issued!")
          elif acc == 4:
            exit()
        else:
          print("Incorrect option entered!")
else:
  print("Incorrect option entered!")
```

database.py

```
import mysql.connector
from tabulate import tabulate

db = mysql.connector.connect(
  user="root", host="localhost", passwd="password", database="library"
)
cursor = db.cursor()
cursor.execute("USE library")


# Try to execute SQL command
def TrySQLCommand(query, values=None):
  cursor.execute(query, values)
  result = cursor.fetchall()
  if cursor.rowcount == 0:
    raise ValueError("No matching records found.")
  return result, [desc[0] for desc in cursor.description]


# check for valid ISBN number
def ValidateISBN(isbn):
  # Remove hyphens and spaces
  isbn = isbn.replace("-", "").replace(" ", "")

  # ISBN-10
  if len(isbn) == 10:
    if not isbn[:-1].isdigit():
      return False
    if isbn[-1].upper() == "X":
      isbn_sum = (
        sum(int(digit) * (i + 1) for i, digit in enumerate(isbn[:-1])) + 10
      )
    else:
      isbn_sum = sum(int(digit) * (i + 1) for i, digit in enumerate(isbn))
    return isbn if isbn_sum % 11 == 0 else False

  # ISBN-13
  elif len(isbn) == 13:
    if not isbn.isdigit():
      return False
    isbn_sum = sum(
      int(digit) * (1 if i % 2 == 0 else 3) for i, digit in enumerate(isbn)
    )
    return isbn if isbn_sum % 10 == 0 else False

  return False


# Edit Books Table Functions
# Replace Books
```

```
def ReplaceBook(oISBN, nQuantity, nTITLE, nAUTHOR, nISBN, nGenre):
  if ValidateISBN(nISBN) == False:
    print("INVALID ISBN NUMBER!!")
    return 1
  try:
    deletebook = "DELETE FROM books WHERE ISBN= %s"
    cursor.execute(deletebook, (oISBN,))
  except ValueError:
    db.rollback()
    return 1
  newbooks = "INSERT INTO books (quantity, title, author, isbn, genre)
VALUES(%s, %s, %s, %s, %s)"
  cursor.execute(newbooks, (nQuantity, nTITLE, nAUTHOR, nISBN, nGenre))
  db.commit()


# Add Books
def AddBook(nQuantity, nTITLE, nAUTHOR, nISBN, nGenre):
  vISBN = ValidateISBN(nISBN)
  if vISBN == False:
    print("INVALID ISBN NUMBER!!")
    return 1
  try:
    newbooks = "INSERT INTO books(quantity, title, author, isbn, genre)
VALUES(%s, %s, %s, %s, %s)"
    cursor.execute(newbooks, (nQuantity, nTITLE, nAUTHOR, vISBN, nGenre))
    db.commit()
  except ValueError:
    db.rollback()
    return 1


# Remove Books
def RemoveBook(ISBN):
  vISBN = ValidateISBN(ISBN)
  if vISBN == False:
    print("INVALID ISBN NUMBER!!")
    return 1
  try:
    deletebook = "DELETE FROM books WHERE isbn= %s;"
    cursor.execute(deletebook, (vISBN,))
    db.commit()
  except ValueError:
    print("ISBN number not found. Check and Try Again!")
    db.rollback()
    return 1


# Searching Books
# By ISBN
def SearchBookByISBN(ISBN):
```

```
  try:
    SearchBook = "SELECT * FROM books WHERE isbn= %s;"
    return TrySQLCommand(SearchBook, (ISBN,))
  except ValueError:
    db.rollback()
    return 1


# By Author
def SearchBookByAuthor(Author):
  try:
    SearchBook = "SELECT * FROM books WHERE author LIKE %s"
    return TrySQLCommand(SearchBook, ("%" + Author + "%",))
  except ValueError:
    db.rollback()
    return 1


# By Title
def SearchBookByTitle(Title):
  try:
    SearchBook = "SELECT * FROM books WHERE title LIKE %s"
    return TrySQLCommand(SearchBook, ("%" + Title + "%",))
  except ValueError:
    db.rollback()
    return 1


# By Genre
def SearchBookByGenre(Genre):
  try:
    SearchBook = "SELECT * FROM books WHERE genre LIKE %s"
    return TrySQLCommand(SearchBook, (Genre,))
  except ValueError:
    db.rollback()
    return 1


def EditBook(ISBN):
  Search, columns = SearchBookByISBN(ISBN)
  if Search == 1:
    return 1
  else:
    print(
      tabulate(
        Search,
        headers=columns,
        tablefmt="pretty",
      )
    )
    print("OPTIONS : ")
```

```
    print("(1) ---> ISBN number")
    print("(2) ---> Book Author")
    print("(3) ---> Book Title")
    print("(4) ---> Quantity")
    print("(5) ---> Genre")
    print("(6) ---> Remove book")
    option = int(input("Enter OPTION NUMBER of what you want to edit : "))
    if option >= 1 and option <= 6:
      if option == 1:
        id = input("ENTER THE NEW ISBN NUMBER OF BOOK : ")
        vID = ValidateISBN(id)
        if ISBN != id and vID:
          query = "UPDATE books SET isbn= %s WHERE isbn=%s"
          cursor.execute(
            query,
            (
              vID,
              ISBN,
            ),
          )
          db.commit()
        else:
          print("Failed to edit! Try again!")
          db.rollback()
          return 1
      elif option == 2:
        Author = input("ENTER THE NEW AUTHOR NAME OF THE BOOK : ")
        cursor.execute(
          "UPDATE books SET author=%s WHERE isbn=%s",
          (
            Author,
            ISBN,
          ),
        )
        db.commit()
      elif option == 3:
        Title = input("ENTER THE NEW TITLE OF BOOK : ")
        cursor.execute(
          "UPDATE books SET title=%s WHERE isbn=%s",
          (
            Title,
            ISBN,
          ),
        )
        db.commit()
      elif option == 4:
        quantity = input("ENTER THE QUANTITY OF BOOK AVAILABLE : ")
        query = "UPDATE books SET quantity= %s WHERE isbn=%s"
        cursor.execute(
          query,
          (
```

```
            quantity,
            ISBN,
          ),
        )
        db.commit()
      elif option == 5:
        genre = input("ENTER THE NEW GENRE OF BOOK : ")
        query = "UPDATE books SET genre= %s WHERE isbn=%s"
        cursor.execute(
          query,
          (
            genre,
            ISBN,
          ),
        )
        db.commit()
      elif option == 6:
        RemoveBook(ISBN)


# Issue Books to Patron and updating the return status
def IssueBook(ISBN, ID):
  if SearchBookByISBN(ISBN) == 1:
    print("ISBN number not found. Check and Try Again!")
    return 1
  if SearchPatronByID(ID) == 1:
    print("Patron ID not found. Check and Try Again!")
    return 1
  # check if patron has less than 3 unreturned books
  check1 = (
    "SELECT COUNT(*) FROM transactions WHERE patron_id = %s AND returned IS
FALSE"
  )
  cursor.execute(check1, (ID,))
  if cursor.fetchone()[0] >= 3:
    print("PATRON HAS ALREADY ISSUED 3 BOOKS!")
    return 1

  # check if patron currently has this book
  check2 = "SELECT * FROM transactions WHERE patron_id = %s AND book_isbn =
%s AND returned IS FALSE"
  cursor.execute(check2, (ID, ISBN))
  cursor.fetchall()
  if cursor.rowcount > 0:
    print("PATRON HAS ALREADY ISSUED THIS BOOK!")
    return 1

  query = "UPDATE books SET quantity = quantity - 1 WHERE isbn = %s AND
quantity >= 1"
  cursor.execute(query, (ISBN,))
  if cursor.rowcount == 1:
```

```
    try:
      issue = "INSERT INTO transactions (book_isbn, patron_id, issue_date,
due_date) VALUES (%s, %s, CURDATE(), DATE(CURDATE() + 7))"
      cursor.execute(issue, (ISBN, ID))
      db.commit()
      print("Book issued successfully!")
    except:
      db.rollback()
      print("Book issue failed!")
      return 1
  else:
    db.rollback()
    print(
      "BOOK ISSUE COULD NOT BE COMPLETED AS BOOK OUT OF STOCK! \nPLEASE
CHOOSE ANOTHER BOOK AND TRY AGAIN!"
    )
    return 1


def ReturnBook(ISBN, ID):
  if ValidateISBN(ISBN) == False:
    print("INVALID ISBN NUMBER!!")
    return 1
  if SearchBookByISBN(ISBN) == 1:
    print("ISBN number not found. Check and Try Again!")
    return 1
  if SearchPatronByID(ID) == 1:
    print("Patron ID not found. Check and Try Again!")
    return 1
  trans = "UPDATE transactions SET return_date = CURDATE(), returned = TRUE
WHERE book_isbn = %s AND patron_id = %s AND return_date IS NULL AND returned
= FALSE"
  cursor.execute(trans, (ISBN, ID))
  if cursor.rowcount == 0:
    print("No book issued to this patron with this ISBN number!")
    return 1

  db.commit()

  query = "UPDATE books SET quantity = quantity + 1 WHERE ISBN = %s"
  cursor.execute(query, (ISBN,))
  db.commit()

  print("Book returned successfully!")


def AddPatron(ID, Email, Patron_Name, Subcription_Date):
  newpatron = (
    "INSERT INTO patrons (id, email, name, subscription_date) VALUES(%s,%s,
%s,%s)"
  )
```

```
  cursor.execute(
    newpatron,
    (
      ID,
      Email,
      Patron_Name,
      Subcription_Date,
    ),
  )
  db.commit()


def RemovePatron(ID):
  try:
    deletepatron = "DELETE FROM patrons WHERE id= %s;"
    TrySQLCommand(deletepatron, (ID,))
  except ValueError:
    db.rollback()
    return 1
  db.commit()


def EditPatron(ID):
  Search = SearchPatronByID(ID)
  if Search == 1:
    return 1
  else:
    print(
      tabulate(
        Search,
        headers=["ID", "Email", "Name", "Subscription Date"],
        tablefmt="pretty",
      )
    )
    print("OPTIONS : ")
    print("(1) ---> Patron ID number")
    print("(2) ---> Patron Email")
    print("(3) ---> Patron Name")
    print("(4) ---> Renew Patron Subcription Date")
    print("(5) ---> Remove Patron")
    option = int(input("Enter OPTION NUMBER of what you want to edit : "))
    if option >= 1 and option <= 5:
      if option == 1:
        id = input("ENTER THE NEW 8-DIGIT UNIQUE ID OF PATRON : ")
        if ID != id and len(id) == 8:
          query = "UPDATE patron SET id= %s WHERE id=%s"
          cursor.execute(
            query,
            (
              id,
              ID,
```

```
            ),
          )
          db.commit()
        else:
          print("Failed to edit! Try again!")
          db.rollback()
          return 1
      elif option == 2:
        Email = input("ENTER THE NEW EMAIL OF PATRON : ")
        if "@" in Email and "." in Email:
          cursor.execute(
            "UPDATE patron SET email= %s WHERE id= %s",
            (
              Email,
              ID,
            ),
          )
          db.commit()
        else:
          print("Enter a VALID EMAIL and Try Again!")
          db.rollback()
          return 1
      elif option == 3:
        Name = input("ENTER THE NEW NAME OF PATRON : ")
        cursor.execute(
          "UPDATE patrons SET name= %s WHERE id= %s",
          (
            Name,
            ID,
          ),
        )
        db.commit()
      elif option == 4:
        query = "UPDATE patrons SET subscription_date=DATE(NOW()) WHERE
id=%s"
        cursor.execute(query, (ID,))
        db.commit()
      elif option == 5:
        RemovePatron(ID)


def SearchPatronByID(ID):
  try:
    SearchPatron = "SELECT * FROM patrons WHERE id= %s"
    return TrySQLCommand(SearchPatron, (ID,))
  except ValueError:
    db.rollback()
    return 1


def SearchPatronByName(Patron_Name):
```

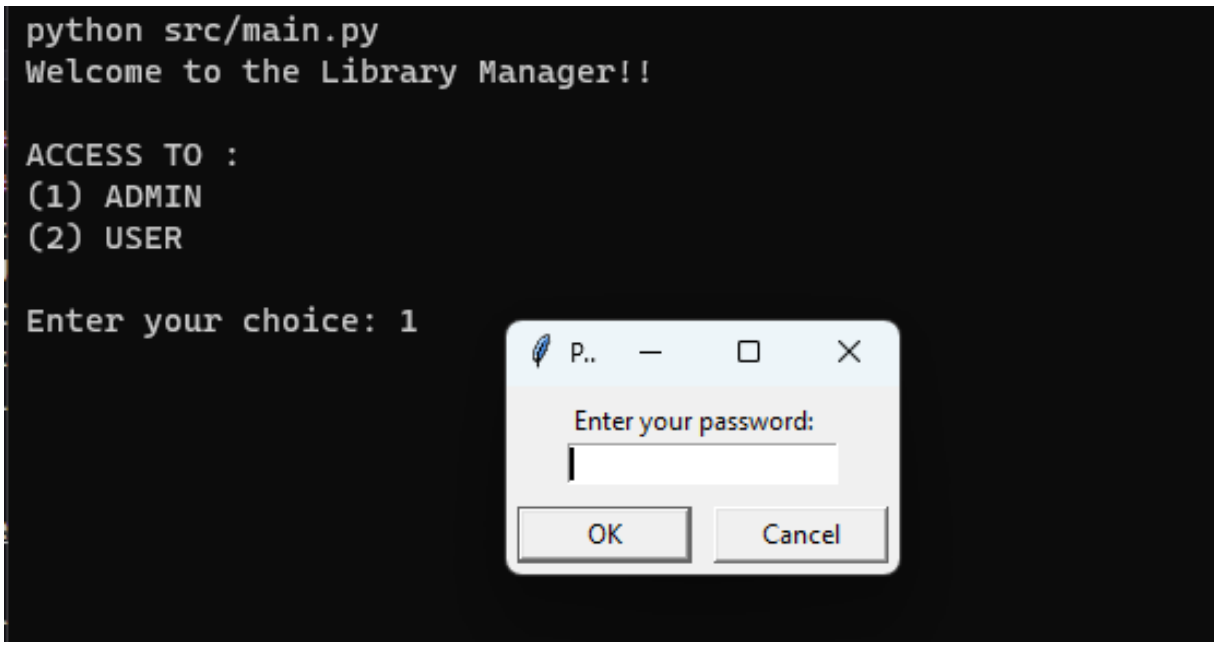
```
  try:
    SearchPatron = "SELECT * FROM patrons WHERE name LIKE %s"
    return TrySQLCommand(SearchPatron, ("%" + Patron_Name + "%",))
  except ValueError:
    db.rollback()
    return 1


def ViewTransactions():
  query = 'SELECT t.id "ID", b.title "Book", p.name "Issued By", t.issue_date
"Issued On", t.due_date "Due On", IFNULL(t.return_date, "Not Returned")
"Returned On" FROM transactions t JOIN books b ON t.book_isbn = b.isbn JOIN
patrons p ON t.patron_id = p.id ORDER BY t.book_isbn, t.issue_date;'
  cursor.execute(query)
  # Fetch column names
  columns = [desc[0] for desc in cursor.description]
  # Fetch data
  data = cursor.fetchall()
  # Print tabulated data
  print(tabulate(data, headers=columns, tablefmt="pretty"))


def ViewTransactionsPending():
  query = 'SELECT t.id "ID", b.title "Book", p.name "Issued By", t.issue_date
"Issued On", t.due_date "Due On", IFNULL(t.return_date, "Not Returned")
"Returned On" FROM transactions t JOIN books b ON t.book_isbn = b.isbn JOIN
patrons p ON t.patron_id = p.id WHERE t.returned = FALSE ORDER BY
t.book_isbn, t.issue_date ;'
  cursor.execute(query)
  columns = [desc[0] for desc in cursor.description]
  data = cursor.fetchall()
  print(tabulate(data, headers=columns, tablefmt="pretty"))


def ViewPatrons():
  query = """SELECT patrons.id "ID", name "Name", email "Email ID",
subscription_date "Subscribed on", COUNT(transactions.id) "Unreturned Books"
FROM patrons
LEFT JOIN transactions ON patrons.id = transactions.patron_id AND
transactions.returned = false
GROUP BY patrons.id, email, name, subscription_date;"""
  cursor.execute(query)
  columns = [desc[0] for desc in cursor.description]
  data = cursor.fetchall()
  print(tabulate(data, headers=columns, tablefmt="pretty"))


def ViewBooks():
  query = "SELECT * FROM books"
  cursor.execute(query)
  columns = [desc[0] for desc in cursor.description]
```

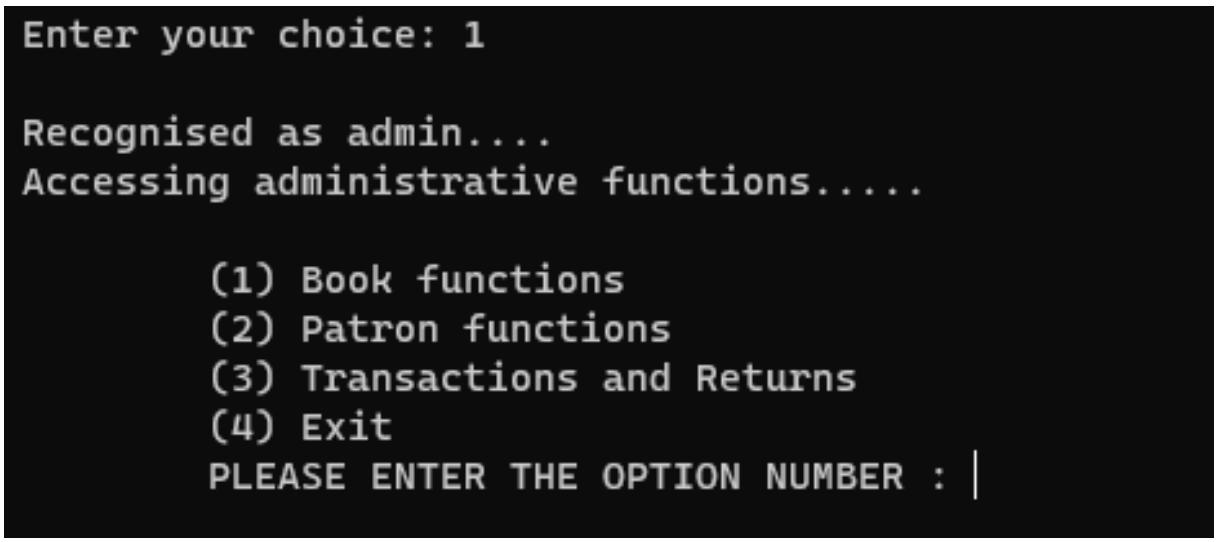
```
  data = cursor.fetchall()
  print(tabulate(data, headers=columns, tablefmt="pretty"))


def Query(query, values=None):
  cursor.execute(query, values)
  data = cursor.fetchall()
  return data, [desc[0] for desc in cursor.description]
```

db.sql

```sql
DROP DATABASE IF EXISTS library;

CREATE DATABASE library;

USE library;

CREATE TABLE books (
  isbn VARCHAR(13) NOT NULL PRIMARY KEY,
  title VARCHAR(50) NOT NULL,
  author VARCHAR(50) NOT NULL,
  quantity INT NOT NULL,
  genre ENUM("Fiction", "Non-Fiction") NOT NULL
);

CREATE TABLE patrons (
  id CHAR(8) NOT NULL PRIMARY KEY,
  email VARCHAR(50) NOT NULL,
  name VARCHAR(30) NOT NULL,
  subscription_date DATE NOT NULL,
  CONSTRAINT id_length CHECK (LENGTH(TRIM(id)) = 8),
  CONSTRAINT valid_email CHECK (email LIKE '%@%.%')
);

CREATE TABLE transactions (
  id INT NOT NULL PRIMARY KEY AUTO_INCREMENT,
  book_isbn VARCHAR(13) NOT NULL,
  patron_id CHAR(8) NOT NULL,
  issue_date DATE NOT NULL,
  due_date DATE NOT NULL,
  return_date DATE,
  returned BOOLEAN NOT NULL DEFAULT FALSE,
  FOREIGN KEY (book_isbn) REFERENCES books(isbn) ON DELETE CASCADE,
  FOREIGN KEY (patron_id) REFERENCES patrons(id) ON DELETE CASCADE
);
```

Screenshots





```
**** BOOK FUNCTIONS ****
 OPTIONS :
(1) Add a book
(2) Remove a book
(3) Update a book
(4) Issue a Book
(5) Return a Book
(6) Search a Book
(7) View all books
(8) Go back to main menu
(9) Exit
PLEASE ENTER THE OPTION NUMBER : 6
         OPTIONS :
        (1) By ISBN number
        (2) By Author
        (3) By Title
        (4) By Genre
        (5) Return to previous menu
        (6) Exit
        PLEASE ENTER THE OPTION NUMBER : 2
                Author : Lee
+---------------+-----------------------+------------+----------+---------+
|     isbn      |         title         |   author   | quantity |  genre  |
+---------------+-----------------------+------------+----------+---------+
| 9780099549482 | To Kill A Mockingbird | Harper Lee |    4     | Fiction |
+---------------+-----------------------+------------+----------+---------+
```

```
**** BOOK FUNCTIONS ****
 OPTIONS :
(1) Add a book
(2) Remove a book
(3) Update a book
(4) Issue a Book
(5) Return a Book
(6) Search a Book
(7) View all books
(8) Go back to main menu
(9) Exit
PLEASE ENTER THE OPTION NUMBER : 7
+---------------+-----------------------------------+------------------+----------+---------+
|     isbn      |               title               |      author      | quantity |  genre  |
+---------------+-----------------------------------+------------------+----------+---------+
| 9780007525508 |             The Hobbit            |  J.R.R. Tolkien  |    3     | Fiction |
| 9780099549482 |        To Kill A Mockingbird      |    Harper Lee    |    4     | Fiction |
| 9780140430721 |         Pride and Prejudice       |   Jane Austen    |    19    | Fiction |
| 9780439362139 | Harry Potter and the Sorcerer's Stone |   J.K. Rowling   |    5     | Fiction |
| 9780743297332 |         The Sun Also Rises        | Ernest Hemingway |    4     | Fiction |
+---------------+-----------------------------------+------------------+----------+---------+
```

```
              **** TRANSACTIONS ****
               OPTIONS :
              (1) View Transactions
              (2) View all pending returns
              (3) Return to previous menu
              (4) Exit
              PLEASE ENTER THE OPTION NUMBER : 1
+----+--------------------------------------+-------------+------------+------------+--------------+
| ID |                 Book                 |  Issued By  | Issued On  |   Due On   | Returned On  |
+----+--------------------------------------+-------------+------------+------------+--------------+
| 2  |         To Kill A Mockingbird        | Jane Smith  | 2023-08-02 | 2023-08-09 |  2023-08-14  |
| 5  |         To Kill A Mockingbird        |  John Doe   | 2023-08-05 | 2023-08-12 | Not Returned |
| 7  |         To Kill A Mockingbird        | Jane Smith  | 2023-08-13 | 2023-08-20 | Not Returned |
| 8  |          Pride and Prejudice         |  John Doe   | 2023-08-13 | 2023-08-20 | Not Returned |
| 9  | Harry Potter and the Sorcerer's Stone |  John Doe   | 2023-08-13 | 2023-08-20 | Not Returned |
| 1  |          The Sun Also Rises          |  John Doe   | 2023-08-01 | 2023-08-08 |  2023-08-13  |
| 4  |          The Sun Also Rises          | Emily Brown | 2023-08-04 | 2023-08-11 |  2023-08-10  |
+----+--------------------------------------+-------------+------------+------------+--------------+
```

```
Recognised as our registered patron....
Accessing patron functions.....

        OPTIONS :
        (1) Search a book
        (2) View all books
        (3) View my issued books
        (4) Exit
        PLEASE ENTER THE OPTION NUMBER :
```

```
        OPTIONS :
        (1) Search a book
        (2) View all books
        (3) View my issued books
        (4) Exit
        PLEASE ENTER THE OPTION NUMBER : 3
+----------------------+------------+------------+------------+--------------+
|         Book         | Issued by  | Issued On  |  Due Date  | Returned On  |
+----------------------+------------+------------+------------+--------------+
| To Kill A Mockingbird | Jane Smith | 2023-08-02 | 2023-08-09 |  2023-08-14  |
| To Kill A Mockingbird | Jane Smith | 2023-08-13 | 2023-08-20 | Not Returned |
+----------------------+------------+------------+------------+--------------+
```

Bibliography

[1] “MySQL 8.1 Reference.” https://dev.mysql.com/doc/refman/8.1/en/

[2] “MySQL Connector/Python Developer's Guide.” https://dev.mysql.com/doc/connector-python/en/