Problem Statement: Library Management System

Objective:

To develop a Library Management System using Python that allows for efficient management of library resources including books, members, and transactions, without employing any graphical user interface (GUI) libraries.

Description:

The system should be a console-based application that provides functionalities for librarians and members. The functionalities include adding, updating, and removing books; registering and managing members; and recording the borrowing and returning of books.

Functional Requirements:

1. **Book Management**:
   ○ Add a new book with details such as title, author, genre, and unique book ID.
   ○ Remove a book using the book ID.
   ○ Update details of existing books.
   ○ Display the list of all available books with their details.
2. **Member Management**:
   ○ Register a new member with details like name, address, phone number, and unique member ID.
   ○ Remove a member using the member ID.
   ○ Update details of existing members.
   ○ Display the list of all registered members.
3. **Transaction Management**:
   ○ Record the borrowing of books by members, including book ID, member ID, and borrowing date.
   ○ Record the returning of books, updating the system to reflect the book's availability.
   ○ Maintain a record of all borrowed and returned books.

Non-Functional Requirements:

1. **Data Persistence**:
   - Ensure that all data (books, members, transactions) is stored persistently using text files or CSV files.
2. **Error Handling**:
   - Implement appropriate error handling for invalid inputs and operations.
3. **Usability**:
   - Design a user-friendly console interface that guides the user through different functionalities with clear prompts and messages.

Constraints:

- The system should not use any GUI libraries such as Tkinter or PyQt.
- The system should be developed using Python 3.x.

Expected Outcome:

- A fully functional console-based library management system that allows librarians to manage books and members efficiently.
- A system that accurately records borrowing and returning transactions, ensuring data consistency and integrity.

O/P:

Library Management System
1. Add Book
2. Remove Book
3. Update Book
4. List Books
5. Add Member

6. Remove Member
7. Update Member
8. List Members
9. Borrow Book
10. Return Book
11. List Transactions
12. Exit
Enter your choice: 1
Enter Book ID: 1
Enter Book Title: lion and mouse
Enter Book Author: premchand
Enter Book Genre: tathagat
Book 'lion and mouse' added successfully.

Library Management System
1. Add Book
2. Remove Book
3. Update Book
4. List Books
5. Add Member
6. Remove Member
7. Update Member
8. List Members
9. Borrow Book
10. Return Book
11. List Transactions
12. Exit
Enter your choice: 4

ID: 1, Title: lion and mouse, Author: premchand, Genre: tathagat, Available: True

Library Management System
1. Add Book
2. Remove Book
3. Update Book
4. List Books
5. Add Member
6. Remove Member
7. Update Member
8. List Members
9. Borrow Book
10. Return Book
11. List Transactions
12. Exit
Enter your choice: 1
Enter Book ID: 2
Enter Book Title: lion and mouse
Enter Book Author: premchand
Enter Book Genre: tathagat
Book 'lion and mouse' added successfully.

Library Management System
1. Add Book
2. Remove Book
3. Update Book
4. List Books
5. Add Member

6. Remove Member
7. Update Member
8. List Members
9. Borrow Book
10. Return Book
11. List Transactions
12. Exit
Enter your choice: 4
ID: 1, Title: lion and mouse, Author: premchand, Genre: tathagat, Available: True
ID: 2, Title: lion and mouse, Author: premchand, Genre: tathagat, Available: True

Library Management System
1. Add Book
2. Remove Book
3. Update Book
4. List Books
5. Add Member
6. Remove Member
7. Update Member
8. List Members
9. Borrow Book
10. Return Book
11. List Transactions
12. Exit
Enter your choice: 9
Enter Book ID: 1
Enter Member ID: 4

Invalid book or member ID.

Library Management System
1. Add Book
2. Remove Book
3. Update Book
4. List Books
5. Add Member
6. Remove Member
7. Update Member
8. List Members
9. Borrow Book
10. Return Book
11. List Transactions
12. Exit
Enter your choice: 5
Enter Member ID: 1
Enter Name: ram
Enter Address: rewa
Enter Phone Number: 5365432343
Member 'ram' added successfully.

Library Management System
1. Add Book
2. Remove Book
3. Update Book
4. List Books
5. Add Member
6. Remove Member

7. Update Member
8. List Members
9. Borrow Book
10. Return Book
11. List Transactions
12. Exit
Enter your choice: 8
ID: 1, Name: ram, Address: rewa, Phone: 5365432343

Library Management System
1. Add Book
2. Remove Book
3. Update Book
4. List Books
5. Add Member
6. Remove Member
7. Update Member
8. List Members
9. Borrow Book
10. Return Book
11. List Transactions
12. Exit
Enter your choice: 9
Enter Book ID: 1
Enter Member ID: 1
Book 'lion and mouse' borrowed by ram.

Library Management System
1. Add Book

2. Remove Book

3. Update Book

4. List Books

5. Add Member

6. Remove Member

7. Update Member

8. List Members

9. Borrow Book

10. Return Book

11. List Transactions

12. Exit

Enter your choice: 9

Enter Book ID: 1

Enter Member ID: 1

Book 'lion and mouse' is not available.

Library Management System

1. Add Book

2. Remove Book

3. Update Book

4. List Books

5. Add Member

6. Remove Member

7. Update Member

8. List Members

9. Borrow Book

10. Return Book

11. List Transactions

12. Exit

Enter your choice: 4
ID: 1, Title: lion and mouse, Author: premchand, Genre: tathagat, Available: False
ID: 2, Title: lion and mouse, Author: premchand, Genre: tathagat, Available: True

Library Management System
1. Add Book
2. Remove Book
3. Update Book
4. List Books
5. Add Member
6. Remove Member
7. Update Member
8. List Members
9. Borrow Book
10. Return Book
11. List Transactions
12. Exit
Enter your choice: 5
Enter Member ID: 2
Enter Name: syam
Enter Address: hp
Enter Phone Number: 4345775656465
Member 'syam' added successfully.

Library Management System
1. Add Book
2. Remove Book

3. Update Book

4. List Books

5. Add Member

6. Remove Member

7. Update Member

8. List Members

9. Borrow Book

10. Return Book

11. List Transactions

12. Exit

Enter your choice: 8

ID: 1, Name: ram, Address: rewa, Phone: 5365432343

ID: 2, Name: syam, Address: hp, Phone: 4345775656465

Library Management System

1. Add Book

2. Remove Book

3. Update Book

4. List Books

5. Add Member

6. Remove Member

7. Update Member

8. List Members

9. Borrow Book

10. Return Book

11. List Transactions

12. Exit

Enter your choice: 9

Enter Book ID: 1
Enter Member ID: 2
Book 'lion and mouse' is not available.

Library Management System
1. Add Book
2. Remove Book
3. Update Book
4. List Books
5. Add Member
6. Remove Member
7. Update Member
8. List Members
9. Borrow Book
10. Return Book
11. List Transactions
12. Exit
Enter your choice: 9
Enter Book ID: 2
Enter Member ID: 2
Book 'lion and mouse' borrowed by syam.

Library Management System
1. Add Book
2. Remove Book
3. Update Book
4. List Books
5. Add Member
6. Remove Member

7. Update Member
8. List Members
9. Borrow Book
10. Return Book
11. List Transactions
12. Exit
Enter your choice: 10
Enter Book ID: 1
Enter Member ID: 1
Book 'lion and mouse' returned by ram.

Library Management System
1. Add Book
2. Remove Book
3. Update Book
4. List Books
5. Add Member
6. Remove Member
7. Update Member
8. List Members
9. Borrow Book
10. Return Book
11. List Transactions
12. Exit
Enter your choice: 3
Enter Book ID: 1
Enter new Title (leave blank to keep current):
Enter new Author (leave blank to keep current):
Enter new Genre (leave blank to keep current):

Book 1 updated successfully.

Library Management System
1. Add Book
2. Remove Book
3. Update Book
4. List Books
5. Add Member
6. Remove Member
7. Update Member
8. List Members
9. Borrow Book
10. Return Book
11. List Transactions
12. Exit
Enter your choice: 6
Enter Member ID: 2
Member removed successfully.

Library Management System
1. Add Book
2. Remove Book
3. Update Book
4. List Books
5. Add Member
6. Remove Member
7. Update Member
8. List Members
9. Borrow Book

10. Return Book
11. List Transactions
12. Exit
Enter your choice: 8
ID: 1, Name: ram, Address: rewa, Phone: 5365432343

Library Management System
1. Add Book
2. Remove Book
3. Update Book
4. List Books
5. Add Member
6. Remove Member
7. Update Member
8. List Members
9. Borrow Book
10. Return Book
11. List Transactions
12. Exit
Enter your choice: 2
Enter Book ID: 2
Book removed successfully.

Library Management System
1. Add Book
2. Remove Book
3. Update Book
4. List Books
5. Add Member

6. Remove Member
7. Update Member
8. List Members
9. Borrow Book
10. Return Book
11. List Transactions
12. Exit
Enter your choice: 7
Enter Member ID: 1
Enter new Name (leave blank to keep current): ganesh
Enter new Address (leave blank to keep current):
shimala
Enter new Phone Number (leave blank to keep current):
655768688
Member 1 updated successfully.

Library Management System
1. Add Book
2. Remove Book
3. Update Book
4. List Books
5. Add Member
6. Remove Member
7. Update Member
8. List Members
9. Borrow Book
10. Return Book
11. List Transactions
12. Exit

Enter your choice: 8
ID: 1, Name: ganesh, Address: shimala, Phone: 655768688

Library Management System
1. Add Book
2. Remove Book
3. Update Book
4. List Books
5. Add Member
6. Remove Member
7. Update Member
8. List Members
9. Borrow Book
10. Return Book
11. List Transactions
12. Exit
Enter your choice: 11
Transaction ID: 1, Book ID: 1, Member ID: 1, Type: Borrow, Date: 2024-11-27
Transaction ID: 2, Book ID: 2, Member ID: 2, Type: Borrow, Date: 2024-11-27
Transaction ID: 3, Book ID: 1, Member ID: 1, Type: Return, Date: 2024-11-27

Library Management System
1. Add Book
2. Remove Book
3. Update Book

4. List Books

5. Add Member

6. Remove Member

7. Update Member

8. List Members

9. Borrow Book

10. Return Book

11. List Transactions

12. Exit

Enter your choice: 12

Exiting the system.

Note: Use datetime.now().strftime('%Y-%m-%d') function and import from datetime import datetime for current datetime.

Hints:

1.

```python
# Function to load books data from 'books.txt' file
def load_books():
    books = {}
    if os.path.exists('books.txt'):  # Check if the file exists
        with open('books.txt', 'r') as file:
            for line in file:
                fields = line.strip().split(',')  # Split line by
commas
                book_id, title, author, genre, is_available = fields
                books[book_id] = {'title': title, 'author': author,
'genre': genre, 'is_available': is_available == 'True'}
    return books
```

2.
```python
# Function to save books data to 'books.txt' file
def save_books(books):
    with open('books.txt', 'w') as file:
```

```python
        for book_id, details in books.items():

file.write(f"{book_id},{details['title']},{details['author']},{details[
'genre']},{details['is_available']}\n")
```

3.

```python
# Function to remove a book by ID
def remove_book(books, book_id):
    if book_id in books:
        del books[book_id]
        save_books(books)
        print("Book removed successfully.")
    else:
        print("Book not found.")
```

4.

```python
# Function to list all available books
def list_books(books):
    if not books:
        print("No books available.")
    else:
        for book_id, details in books.items():
            print(f"ID: {book_id}, Title: {details['title']}, Author:
{details['author']}, Genre: {details['genre']}, Available:
{details['is_available']}")
```

5.

```python
# Function to record a book borrowing transaction
def borrow_book(books, members, transactions, book_id, member_id):
    if book_id in books and member_id in members:
        book = books[book_id]
        member = members[member_id]
        if book['is_available']:
            transaction_id = str(len(transactions) + 1)
            transaction = {'transaction_id': transaction_id, 'book_id':
book_id, 'member_id': member_id, 'transaction_type': 'Borrow', 'date':
datetime.now().strftime('%Y-%m-%d')}
            transactions.append(transaction)
            book['is_available'] = False
```

```python
            save_books(books)
            save_transactions(transactions)
            print(f"Book '{book['title']}' borrowed by
{member['name']}.")
        else:
            print(f"Book '{book['title']}' is not available.")
    else:
        print("Invalid book or member ID.")
```