Industry Problem Statement

Library Book Issue & Fine Management System (Python)

Business Background

A library wants to build a Python-based internal system to manage:

- Library members
- Book issuing and returns
- Due-date tracking
- Fine calculation for late returns

The system should simulate a **real-world library management workflow**, implemented incrementally using clean and maintainable coding practices.

Task 1: Capture Library Member Details (Input Validation)

Objective

Collect and validate member information.

Requirements

Write a program to accept:

- Member ID
- Member Name
- Membership Type (Student / Faculty / External)

Business Rules

- Member name must contain only alphabets
- Membership type must be valid

Expected Outcome

Validated library member record.

Task 2: Capture Book Details

Objective

Record book information.

Requirements

Accept:

- Book ID
- Book Title
- Author Name

Business Rules

- Book title must not be empty
- Author name must contain only alphabets

Expected Outcome

Validated book record.

Task 3: Book Availability Check

Objective

Ensure book can be issued.

Requirements

- Accept available quantity of the book

Business Rules

- Quantity must be **greater than 0**

Expected Outcome

Confirmation that the book is available for issue.

Task 4: Issue Book to Member

Objective

Issue a book and record issue details.

Requirements

- Accept issue date
- Set due date automatically

Business Rules

- Loan period = **14 days**

Expected Outcome

Book successfully issued with due date assigned.

Task 5: Return Book Entry

Objective

Record book return details.

Requirements

- Accept return date

Expected Outcome

Return date recorded for fine calculation.

Task 6: Overdue Days Calculation

Objective

Calculate late return duration.

Formula

```
Overdue Days = Return Date − Due Date
```

Business Rules

- If returned on or before due date → overdue days = 0

Expected Outcome

Accurate overdue days count.

Task 7: Fine Calculation

Objective

Calculate fine for late returns.

Rules

- Fine = ₹5 per overdue day

Formula

```
Fine = Overdue Days × ₹5
```

Expected Outcome

Correct fine amount (₹0 if no delay).

Task 8: Book Stock Update

Objective

Update book availability after return.

Requirements

- Increment available quantity after return

Expected Outcome

Correct book stock maintained.

Task 9: Issue & Return Summary (Procedural)

Objective

Generate a transaction summary.

Summary Should Include

- Member ID & Name
- Book Title
- Issue Date
- Due Date
- Return Date
- Fine Amount

Task 10: Store Transaction Records

Objective

Simulate library transaction database.

Requirements

- Store issue/return records in a list of dictionaries

Task 11: LibraryMember Class Design (OOP)

Objective

Model library member as an object.

Create class `LibraryMember` with:

Attributes

- member_id
- name
- membership_type
- issued_books

Task 12: Book Issue Method

Objective

Encapsulate book issuing logic.

Method

- issue_book()

Task 13: Book Return Method

Objective

Encapsulate return logic.

Method

- return_book()

Task 14: Fine Calculation Method

Objective

Encapsulate fine calculation.

Method

- calculate_fine()

Task 15: Final Member Transaction Report

Objective

Generate a professional transaction report.

Output Format (Example)

```
Member ID    : M112
Name         : Priya Sharma
Book Title   : Data Structures in Python
Issue Date   : 01-Mar-2025
Due Date     : 15-Mar-2025
Return Date : 20-Mar-2025
Fine Amount : ₹25
Status       : Returned
```