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Assignment Number 01

Foundations of Computer Science & Computational Thinking

Assignment Title

Design and Simulate a Real-World Process Using Flowcharts and Pseudocode

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Section – E

Introduction

Problem Statement - Library Book Borrowing System

A library borrowing system allows users to borrow and return books efficiently.

The system checks member credentials, verifies book availability, and updates the library database accordingly. It helps automate the book lending process, maintain accurate records, and ensure that borrowing limits and due dates are properly managed.

This program will help to understand the algorithms and logical thinking by using concepts like decomposition, abstraction, pattern recognition to also apply in real world to solve problems, flowchart and pseudocode to plan systems effectively.

PROBLEM ANALYSIS

Problem Statement :- Library Book Borrowing System

- a) **Abstraction** – focusing only on essential elements while ignoring the non-essential ones.

- System verifies member status
- User searches for a book
- System checks if the book is available
- If available → issue book and update records
- Log in with member ID
- If not available → display “Book not available”

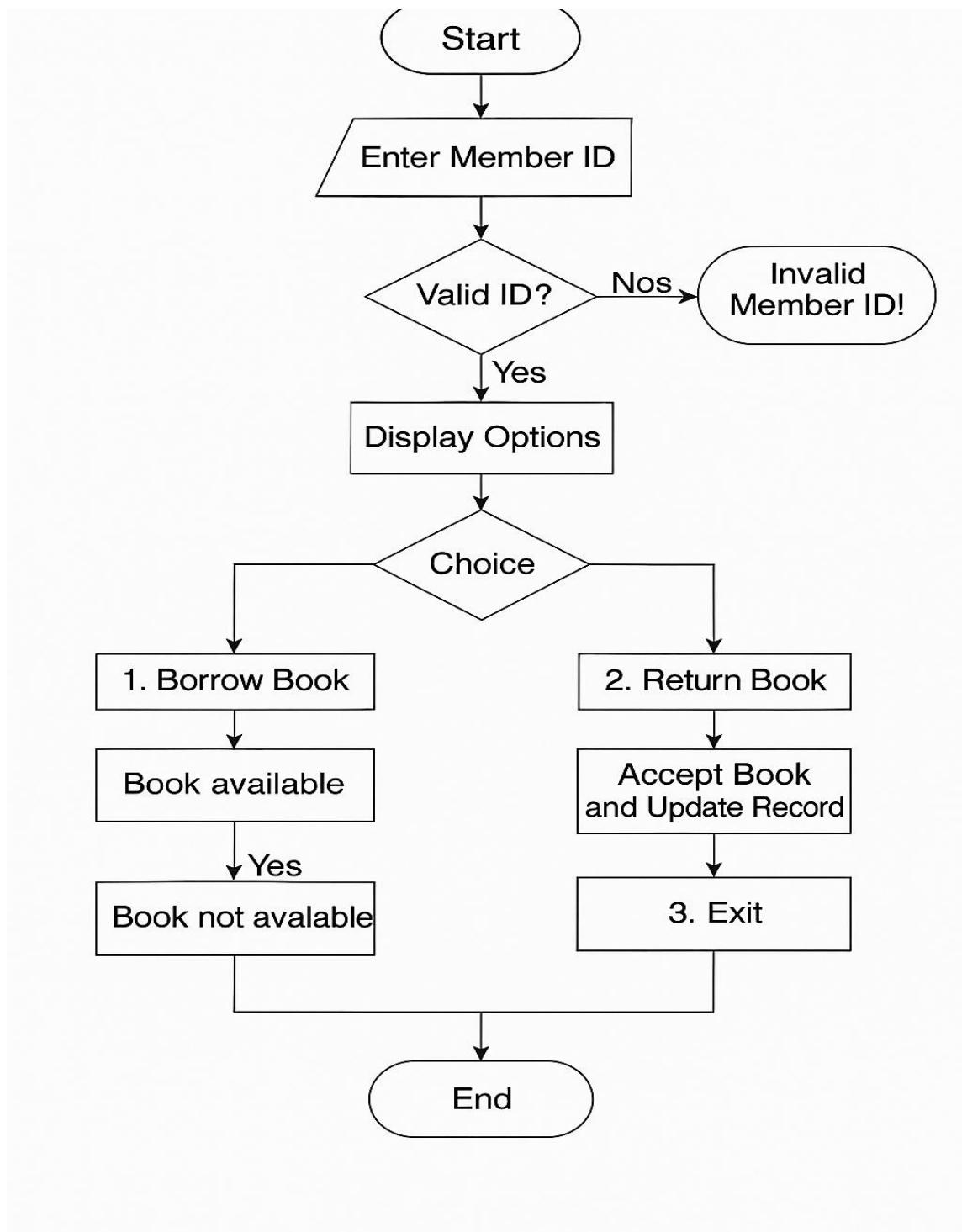
- b) **Decomposition** – breaking the problem into smaller components.

- Input: Member ID, book title/ID.
- Verification: Validate member and check borrowing limit.
- Search: Locate book in catalog.
- Borrowing: Issue book and update records.
- Return: Accept returned book and update status.
- Error Handling: Display messages for invalid input, unavailable books, or exceeded limits.

- c) **Pattern recognition** – looking for similarities and repeated patterns to predict the solution to the problem.

- Repeated user verification for each transaction.
- Similar checks for borrowing and returning actions.
- Updating database consistently for every change.

Design – Flowchart and pseudocode



Pseudocode

```
BEGIN LIBRARY_SYSTEM

    SET max_books ← 3
    SET borrowed_books ← 0
    SET books_available ← ["Book1", "Book2", "Book3"]

    DISPLAY "Enter Member ID"
    INPUT member_id

    IF is_valid_member(member_id) = TRUE THEN
        DISPLAY "1. Borrow Book"
        DISPLAY "2. Return Book"
        DISPLAY "3. Exit"
        INPUT choice

        IF choice = 1 THEN
            IF borrowed_books < max_books THEN
                DISPLAY "Enter Book Name to Borrow: "
                INPUT book_name

                IF book_name IN books_available THEN
                    REMOVE book_name FROM books_available
                    borrowed_books ← borrowed_books + 1
                    DISPLAY "Book issued successfully!"
                ELSE
                    DISPLAY "Book not available."
                ENDIF
            ELSE
                DISPLAY "Member ID invalid or system full."
```

```

        DISPLAY "Borrowing limit reached!"

        ENDIF

    ELSE IF choice = 2 THEN

        DISPLAY "Enter Book Name to Return: "

        INPUT book_name

        ADD book_name TO books_available

        borrowed_books ← borrowed_books - 1

        DISPLAY "Book returned successfully!"

    ELSE IF choice = 3 THEN

        DISPLAY "Thank you! Visit again."

    ELSE

        DISPLAY "Invalid choice."

    ENDIF

    ELSE

        DISPLAY "Invalid Member ID!"

    ENDIF

END
-----


FUNCTION is_valid_member(member_id)

    SET valid_member_ids ← ["KRMU1", "KRMU2", "KRMU3"]

    IF member_id IN valid_member_ids THEN

        RETURN TRUE

    ELSE

        RETURN FALSE

    ENDIF

END FUNCTION

```

Implementation of code with outputs

```
def library_system():
    max_books = 3
    borrowed_books = 0
    books_available = ["Book1", "Book2", "Book3"]

    member_id = input("Enter Member ID: ")

    if is_valid_member(member_id):
        print("1. Borrow Book")
        print("2. Return Book")
        print("3. Exit")

        choice = int(input("Enter your choice: "))

        if choice == 1:
            if borrowed_books < max_books:
                book_name = input("Enter Book Name to Borrow: ")

                if book_name in books_available:
                    books_available.remove(book_name)
                    borrowed_books += 1
                    print("Book issued successfully!")
                else:
                    print("Book not available.")
            else:
                print("Borrowing limit reached!")

        elif choice == 2:
            book_name = input("Enter Book Name to Return: ")
            books_available.append(book_name)
            borrowed_books -= 1
            print("Book returned successfully!")

        elif choice == 3:
            print("Thank you! Visit again.")

    else:
        print("Invalid choice.")
```

```
else:  
    print("Invalid Member ID!")  
  
def is_valid_member(member_id):  
    valid_member_ids = ["KRMU1", "KRMU2", "KRMU3"]  
    return member_id in valid_member_ids  
  
library_system()
```

PROBLEMS 135 OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
PS C:\Users\Dell\OneDrive\Desktop\python> & C:/Users/Dell/AppData/Roaming/Python/3.9/site-packages/BookBorrowing.py
Enter Member ID: M001
1. Borrow Book
2. Return Book
3. Exit
Enter your choice: 1
Enter Book Name to Borrow: Book2
Book issued successfully!
PS C:\Users\Dell\OneDrive\Desktop\python>
PS C:\Users\Dell\OneDrive\Desktop\python>
```

PROBLEMS 135 OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
PS C:\Users\Dell\OneDrive\Desktop\python> & C:/Users/Dell/AppData/Roaming/Python/3.9/site-packages/BookBorrowing.py
Enter Member ID: M12
Invalid Member ID!
PS C:\Users\Dell\OneDrive\Desktop\python>
```

PROBLEMS 135 OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
PS C:\Users\Dell\OneDrive\Desktop\python> & C:/Users/Dell/AppData/Roaming/Python/3.9/site-packages/BookBorrowing.py
Enter Member ID: M003
1. Borrow Book
2. Return Book
3. Exit
Enter your choice: 2
Enter Book Name to Return: Book2
Book returned successfully!
PS C:\Users\Dell\OneDrive\Desktop\python>
```