Part2: Queues and Stacks - Library Book Management System

Problem Definition

Design a system to manage a library's books and borrowing operations using stacks and queues. The stack is used for organizing the "recently returned books" section, while the queue is used to manage a "borrow request queue" for users waiting to borrow popular books.

Requirements

Features to Implement:

1. **Add New Book:** Add a book to the library's inventory.
2. **Borrow Book:** Allow a user to borrow a book if available.
    - If the book is currently unavailable, the user is added to the borrow request queue.
3. **Return Book:**
    - Returned books are placed in the "recently returned" stack.
4. **Process Borrow Requests:**
    - When a book becomes available, process the next user in the borrow request queue.
5. **View Recently Returned Books:**
    - Display books in the "recently returned" stack.
6. **Display Borrow Request Queue:**
    - Show the current queue of users waiting for books.
7. **Search for a Book:**
    - Check if a book is available in the library's inventory.

Guidelines

Core Concepts to Implement:

1. **Stack for Recently Returned Books:**
   - Use a stack to store books that have been recently returned.
   - Allow users to browse the stack to pick books from this section.
2. **Queue for Borrow Requests:**
   - Use a queue to manage users waiting for a specific book.
3. **Book Structure:**
   - Each book is represented as a structure containing:
     - Book ID
     - Book title
     - Author name
     - Availability status (Boolean)
4. **User Structure:**
   - Each user in the queue has:
     - User ID
     - Name
     - Requested book ID
5. **Functions Needed:**
   - **AddBook:** Add a new book to the library.
   - **BorrowBook:** Borrow a book or add the user to the request queue.
   - **ReturnBook:** Return a book and add it to the "recently returned" stack.
   - **ProcessRequests:** Check if requested books are available and process the queue.
   - **DisplayStack:** Show books in the "recently returned" stack.
   - **DisplayQueue:** Show users in the borrow request queue.
   - **SearchBook:** Find a book in the inventory.
6. **Dynamic Memory Allocation:**
   - Use malloc to dynamically manage books and users.
7. **Error Handling:**
   - Handle cases where a book is not available or when the queue is empty.

Project Structure

1. **Header File (library.h)**
   - Define the book and user structures.
   - Prototypes for stack and queue operations.
2. **Stack Implementation (stack.c)**
   - Implement stack operations.
3. **Queue Implementation (queue.c)**
   - Implement queue operations.
4. **Main Program (library.c)**
   - Manage the library system functionality.
   - Provide a menu interface for user actions.

Notes:

- The submission deadline for both parts of the project is **December 13, 2024, at 23:59**.
- The deadline for filling out the group list is **December 1, 2024**.
- Project presentations will take place during the last week of this semester:
  - **December 15, 2024**: Groups G3 and G4
  - **December 18, 2024**: Groups G1 and G2

- Any group whose members' names are not listed by the specified deadline or fails to submit the project by the deadline will not be allowed to present, and they will receive a grade of 0.
- All group members must be present during the project presentation.
- Any absence will result in a deduction of points unless justified with valid documentation.

Send your project via email (khelkhalkenza88@gmail.com) with the subject:
ACAD-B-GroupNumber-SubGroupNumebr(as it is in the list)

GOOD LUCK!