Week 4 Practice Exercises

Objective

Correctly manage memory allocation and deallocation within the provided code files. You may need to modify the code by adding, removing, or adjusting how memory is handled.

Given:

- **Source files**: main.cpp, Library.cpp
- **Header files**: Library.h
- **Input files**: Books.txt

Requirements:

- Ensure that memory is allocated and deallocated properly without any leaks.
- Code should use dynamic memory allocation for managing book records.
- Do not change the input file.
- Avoid any changes between `<DO NOT CHANGE>` and `</DO NOT CHANGE>` comments.

Instructions:

A library's system manages a dynamic list of books. Each book's details (title, author, year, genre) are stored in dynamically allocated memory, and students must ensure that the program handles this memory correctly by releasing allocated memory when it is no longer needed. The intern responsible for the code left the system with memory leaks, and students are tasked with fixing the memory management issues.

Example of Memory Issues:

1. **Leaking memory**: Books that are dynamically allocated but not deallocated when removed from the list.
2. **Double free**: Attempting to free the same memory twice.
3. **Dereferencing invalid pointers**: Using pointers that reference freed memory.

Tasks:

- Identify parts of the code where memory allocation happens (e.g., `new` and `malloc`).
- Add the necessary deallocation (e.g., `delete` and `free`) where appropriate.
- In the `Book` class destructor, you should correctly deallocate the dynamically allocated memory.
- In the `Library` class destructor, you need to ensure all dynamically allocated `Book` objects are properly deleted.

- Similarly, in the `Library::removeBook()` method, you should ensure that deleted books are handled properly without leaving dangling pointers or memory leaks.
- This guided exercise ensures that you will fix memory management issues by modifying the areas indicated by the **TO DO** comments.

Submission format:

- b<studentID>.zip
    - Library.h
    - Library.cpp