

Assignment

Objective

This assignment will help you master the following C# concepts:

1. Enums and FlagEnums
2. Indexers
3. Interfaces
4. IComparer
5. IComparable

You'll apply these concepts in a practical project that solves a real-world scenario.

Problem Statement

You'll build a small library management system that allows users to borrow books. The system will support filtering books by genre, availability, and other criteria using Enums, FlagEnums, Indexers, Interfaces, IComparer, and IComparable.

Requirements

1. **Enums:**
 - Define an enum called `Genre` to represent book genres (e.g., Fiction, NonFiction, Mystery, ScienceFiction, Biography).
2. **FlagEnums:**
 - Define a `BookAvailability` FlagEnum to indicate if a book is Borrowable, Reserved, or OutOfStock. Books can have multiple status flags.
3. **Class Design with Indexers:**
 - Create a `Library` class to store a collection of books.

- Implement an indexer in the `Library` class to retrieve books by their unique identifier.
4. **Interfaces:**
 - Create an interface `IBorrowable` that defines methods for borrowing and returning books.
 - Implement a `Book` class that implements `IBorrowable`.
 5. **IComparer and IComparable:**
 - Implement `IComparable` in the `Book` class to sort books by title.
 - Create a `GenreComparer` class implementing `IComparer` to sort books by genre.
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Assignment Task

1. **Create the Enums:**
 - Define `Genre` and `BookAvailability`.
2. **Implement the Book Class:**
 - Include the properties, methods, and interfaces as described.
3. **Implement the Library Class:**
 - Add books to the library and use the indexer to retrieve them.
4. **Sort Books:**
 - Use `IComparable` to sort books by title.
 - Use `GenreComparer` to sort books by genre.
5. **Demonstrate Functionality:**
 - Create a console application.
 - Add books to the library.
 - Retrieve and display a book using its ID.

- Sort and display books by title and genre.
 - Borrow and return books, showing how the availability changes.
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Example Output

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Adding books to library...
Retrieving book by ID: B001
Title: The Great Gatsby, Genre: Fiction, Availability: Borrowable

Borrowing book...
Updated Availability: Reserved

Returning book...
Updated Availability: Borrowable

Sorting books by title...
- The Great Gatsby
- To Kill a Mockingbird

Sorting books by genre...
- Biography: Becoming
- Fiction: The Great Gatsby
```

Evaluation Criteria

- Correct usage of Enums and FlagEnums.
- Proper implementation of Indexers.
- Effective use of Interfaces, IComparer, and IComparable.
- Code readability and comments.
- Meeting the functionality requirements.