OOSD 3 Assignment 01 [25%]

Due Date: Sunday 20 February @ 11.59pm

Q1. [40 marks]
Given the class Book (on BrightSpace), write a java program that enables library members to find, loan and return books. As part of your solution, you must create two classes: *Library* and *Member* (have both classes in a single Java file).
The Library class should consist of:

1. An instance variable that is a collection used to store Book objects.
2. A method called *findBookIndex* that searches the Book collection for a book using the given an *ISBN* (String) as a parameter and returns the *index* (int) of the collection where the book is located or -1 if not found.
3. A method called *loanBook* which loans a Book by removing it from the collection using the given *index* (int) parameter and returns it (*Book*). It returns *null* if the book is not in the collection.
4. A method called *returnBook* which adds the given *Book* (parameter) back into the collection.
5. A *main* method which
    a. Creates a Library object, creates a Book with an *isbn* value of "Ab11228" and other parameters of your choice. Adds the book created to the library collection.
    b. Creates two Member objects and starts both threads.

The Member class should extend the Thread class and should consist of the following:

1. A *Library* instance variable and a String with a hardcoded *isbn* value of "Ab11228".
2. A *constructor* which should set the *Library* with the given value (parameter).
3. A method which (*what should this method be called?)*
    a. Calls *findBookIndex* (use the isbn declared above).
    b. Calls *loanBook* using the index returned in *a* (if not -1) to loan a book.
    c. *Sleeps* for 2000 milliseconds and then calls *returnBook*.

Q2 [30 Marks]
Implement three classes: Repository, Counter, and Publisher.

- The Repository class should store an integer.
- The Counter class should create a thread that starts counting from 0 (0, 1, 2, 3 ...) and stores each value in the Repository class.
- The Publisher class should create a thread that keeps reading the value in the Repository class and printing it.

Write a program that creates an instance of the Repository class and sets up a Counter and a Publisher object to operate on it.

Q3 [30 Marks]
Update the program from Question 2 to ensure that each number is printed exactly once, by adding suitable synchronisation.

There should also be a class with the main() method which creates instances of the three classes and starts the two threads. Note, there should only be one instance of the Repository class that is used by both Counter and Publisher.

Submission instructions
Submit the solution to Question 1 and 3 through Brightspace. Ensure variable and method names are meaningful and the code has sufficient comments (marks will be allocated to these).