**Assignment – A Community Library**

A community library lends books, DVDs, musical instruments and other resources to patrons in the community. Patrons borrow library resources, return them, and pay late fees if they are overdue. You will create the UML class diagram and code for the lending functionality of a community library.

A library resource has a title, a catalog ID, check-out date, and check-in date. When a resource is borrowed, the check-out date is recorded. When a resource is returned, the check-in date is recorded. When all resources are returned, fees are calculated. A book is a library resource. It has a title, author name, year of publication and it could be either an eBook or a standard paper book. For simplicity, assume only one author. A DVD is a library resource. It has a title and release year. A musical instrument is a library resource and has a name.

A patron has an id, a full name, a list of library resources, and a record of late fees. A patron can borrow resources, and return resources. When a patron borrows a library resource, the check-out date should be the date the item was borrowed. When a patron returns a library resource, the check-in date should be the date the item was returned. A report will be generated for all resources borrowed. A report will be generated for all fees due.

Patrons can borrow up to 5 resources at a time. For simplicity, assume patrons borrow all resources at once and return all resources at once.

Late fees for library resources are calculated as follows.

* For a standard book: Patrons can borrow a standard book for up to 21 days. Returns after 21 days are late. Late fees are calculated as follows – 15 cents per day to a maximum of $6.00 per book.
* For an electronic book: Patrons can borrow an electronic book for up to 7 days. Returns after 7 days are late. Late fees are calculated as follows – 30 cents per day to a maximum of $12.00 per electronic book.
* For a DVD: Patrons can borrow a DVD for up to 14 days. Returns after 14 days are late. Late fees are calculated as follows – 25 cents per day to a maximum of $9.00 per DVD.
* For a musical instrument: Patrons can borrow a musical instrument for up to 5 days. Returns after 5 days are late. Late fees are calculated as follows – 50 cents per day to a maximum of $15.00 per musical instrument.
* For all other library resources (the default case): Patrons can borrow up to 28 days. Returns after 28 days are late. Late fees are calculated as follows – 10 cents per day to a maximum of $5.00 per resource.

Create the UML class diagram first, then code it.

Data is based on the lending policy of the Toronto Public Library, with exceptions:

<https://www.torontopubliclibrary.ca/using-the-library/borrowing-materials/>

**Implementation Detail:**

To simulate the passage of time, we will make use of system clock functions found in the system library **chrono**, and make use of the difftime() function found in the system library **time.h**. The check out date will be of type time\_t, the check in date will be of type time\_t, and difftime() will determine the difference between the two in seconds. The current time can be found as follows:

#include <chrono>

auto end = std::chrono::system\_clock::now();

time\_t date = std::chrono::system\_clock::to\_time\_t(end);

The time difference can be found as follows, where we interpret 1 second as equal to 1 day:

#include <time.h>

time\_t checkOutDate; //Set checkOutDate = date at check out

time\_t checkInDate; //Set checkInDate = date at check in

double days = difftime(checkInDate, checkOutDate); //The passage of time in days

**The main() Function**

The main() function is provided for you in the file CommunityLibrary.cpp. It creates two patrons, has them borrow resources one at a time, then reports on these resources, has them sleep for 3 seconds (meaning 3 days), then has them return their resources all at once, then produces a report on any fees.

**The Patron**

On borrowing resources, the patron will be asked:

Which resource do you want to borrow (1.Book, 2.DVD, 3.Musical Instrument, 0.Quit):

If the resource is a book, the following series of questions will be asked:

Enter the title:

Enter the author:

Enter the year of publication:

Enter the ID number:

What type of book (1.eBook, 2.Paper Book):

If the resource is a DVD, the following series of questions will be asked:

Enter the title:

Enter the release year:

Enter the ID number:

If the resource is a musical instrument, the following series of questions will be asked:

Enter the name:

Enter the ID number:

On borrowing a resource, the patron software will generate a time stamp to record the check-out date for that resource.

The patron will continue to borrow resources until instructed to quit. Ensure the patron cannot borrow more than five resources. If the patron has borrowed five resources, the software will print the following to the screen:

You have borrowed the maximum number of resources.

When reporting on the resources borrowed, the patron software will print the following for each resource:

<fullName> with patron ID <patronID> has borrowed <title> with catalog ID <catalogID>.

When the patron returns all resources, the patron software will generate a time stamp for each resource returned and calculate the fee for each resource. The sum of the fees is stored.

When reporting on the fees, the patron software will print the following:

<fullName> with id <patronID> has <lateFees> in late fees."