Object-Oriented Programming

(BS-IT-F13 Morning & Afternoon)

Lab # 11

**Important Instructions:**

* Indent your code properly.
* Use meaningful variable and function names. Follow the naming conventions.
* Make sure that there are no **dangling pointers** and **memory leaks** in your program.

***Note:*** *The declaration and implementation of each class that you implement should be in separate .h and .cpp files.*

**Task # 1.1**

In this task, you are required to implement the following inheritance hierarchy:



Declare and implement the *abstract* class Media. This class will have a protected member variable **title** (of string type) to store the title of the media item. Apart from the overloaded constructor, Media class will have a *pure virtual function* display().

Inherit two classes from the Media class, namely: Book and Magazine.

The Book class will have two strings to store the **author name** and **ISBN** of the book. Apart from the overloaded constructor, this class will implement the display() function which will display all attributes of a Book on screen in a neat and readable way.

The Magazine class will have a string to store the **month name** and an integer to store the **year of publication** of the magazine. Apart from the overloaded constructor, this class will also implement the display() function which will display all attributes of a Magazine on screen in a neat and readable way.

Now, implement a main function which should ask the user how many Media items the user wants to create, and store the value entered by the user in an integer variable **n**. Then, your program will dynamically allocate an array of Media\* of size **n**.

After that, your program will ask the user to create **n** Media items. The user should be asked to enter 1 if he/she wants to create a Book and 2 if he/she wants to create a Magazine. Once the choice has been entered, your program should ask the user for all the attributes necessary for creating that item (Book or Magazine). Then, that item should be dynamically allocated and its address should be stored in the array of **Media\***.

Once all Media items have been created, your program should traverse the array of **Media\*** to display the details of each item on screen.

At the end, your program should properly deallocate all the dynamically allocated memory.

**Task # 1.2**

In order to accomplish this task, you will firstly need to implement a public member function int getYear() in the Magazine class.

Modify the program that you wrote in Task # 1.1 and implement a global function:

void searchByYear (Media\*\*, int)

which takes the array of Media\* and its size as parameters. This function should ask the user to enter a year, then it should search the array for all **magazines** of that year and display their details on screen.

Now, call the above function from the main function to search the array of **Media\*** once all media items have been created.

**Task # 1.3**

Add another class CD to the inheritance hierarchy. The CD class will have an integer member variable to store the its **capacity** in MBs. Apart from the overloaded constructor, this class will also implement the **display()** function which will display all attributes of a CD on screen in a neat and readable way.

Also modify the main function to allow the user to create a CD by entering the option 3.

**Task # 1.4**

Add a Shelf class to store a list/collection of Media items. It will have the following declaration:

class Shelf

{

private:

Media\*\* items;

int maxSize;

int currSize;

public:

Shelf (int);

void insert (Media\*);

void displayContents ();

~Shelf();

};

The overloaded constructor will take an integer value as argument and initialize the maxSize to that value, and initialize currSize to 0. Constructor will also dynamically allocate an array of Media\* through the member variable items.

The member function insert(Media\*) will take a Media\* as parameter, and store that pointer into the next available index in the items array (use the member variable currSize to determine the next available index in the array). This function will also increment currSize to indicate the updated size of the array.

The member function displayContents() will display the details of all the items that are currently stored in the items array. This will be accomplished, simply, by calling the display member function on each Media item stored in the items array.

The destructor of the Shelf class will deallocate the dynamically allocated array which was allocated by the constructor.

Now, implement a main function which should ask the user how many Media items the user wants to create, and declares a Shelf object to store those many items. After that the user should be asked to create those many Media items. After the creation of each Media item (Book, Magazine, or CD), it should be inserted into the Shelf. Once all items have been inserted, their details should be displayed by calling the displayContents() function.