

## LP2A Initiation to Object Oriented Programming Written Exam - Spring 2022

### 1. Theoretical questions (4 pts)

- A. What is encapsulation? Why is it interesting to use it in a OOP point of view?
- B. What is Polymorphism? Explain why is it a relevant feature for OOP?

### 2. Exercise #1: Watch the screen ! (6 pts)

```
import java.util.ArrayList;

class A {

    public void affiche ()
    {

System.out.println("I'm a A");
    }

}

class B extends A {}

class C extends A
{
    public void affiche ()
    {

System.out.println("I'm a C");
    }

}

class D extends C
{
    public void affiche ()
    {

System.out.println("I'm a D");
    }

}

class E extends B {}
class F extends C {}

public class MainPoly {

    public static void main
    (String arg[])
    {
        ArrayList<A> store =
        new ArrayList<A>();

        A a = new A();
        a.affiche();
        store.add(a);

        B b = new B();
        b.affiche();
        store.add(b);

        a=b;
        a.affiche();

        C c = new C();
        c.affiche();
        store.add(c);

        a = c;
        a.affiche();

        D d = new D();
        d.affiche();
        store.add(d);
    }
}
```

```

a = d ;
a.affiche();

c = d ;
c.affiche();
store.add(c);

E e = new E();
e.affiche();
store.add(e);

b = e ;
b.affiche();

F f = new F();
f.affiche();
store.add(f);

a = f ;

store.add(a);
c = f ;
c.affiche();

System.out.println("\rIn
Loop");
for (A unA: store)
{
    unA.affiche();
}
}
}

```

### 3. Exercise #2: Back to the Library (10 pts)

We want to develop an application for classifying the 4K-Bluray Disks, CD, BOOK, etc. for a library.

Question #1: First of all we need to define the Items that will be stored in the Library. An Item is defined by its name, a type, its author and a boolean which will represent the availability of the item in the library. Write this class (and the associated classes if any).

Question #2: In the first question, we defined for each Item a type. However, it seems more convenient for future development to have one class for each type. How can you change the previous classes to fit this requirement? Write the classes devoted to each type.

Question #3: Now let's talk about the Borrower of the Item. We need basically two classes: one for defining what is a borrower (name, first name, liste of item borrowed...) and one for storing all the customers of the library. In this last, we need obviously to add/remove borrower and a possibility to print out on the screen the list of the borrowers.

Question #4: We can now build up the library class. In this class we need to add/remove items, to display all the media still in the library and a method, which is taking a borrower as a parameter and will ask him/her, for each item if he/she want to borrow it. Obviously, each time an item is borrowed it must be removed from the library and added to the borrower list of items.

Question #5: Sketch the class diagram representing the developed classes and write a main class that put everything in practice.