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END OF SEMESTER EXAM **JUNE 2022 SESSION** **OBJECT ORIENTED PROGRAMMING**
Level: I Academic year: 2021/2022 Speciality: Software Engineering Duration: 02H

Problem 1: (3 + 2 = 5 marks)

1. Given a class StackQueue which contains two members: An integer **nature** and an element of type array of integers. The class has to enable the simulation of a stack or a queue of integers following the value of nature (when nature=0 it is a stack and when nature = 1 it is a queue). The member functions of the class are: add, delete, obtainValue, isEmpty. Give an implementation of this class
2. Each program below has an error (compilation or runtime). Identify the error and indicate how to correct the error.

```
class A {
        int * something;
    public:
        A () {something = new int(42);}
        ~A () {delete something;}
};
Int main (int argc, char **argv){
        A x;
        A y = x
}
```

```
class First {
        First (int k) {cout << k;}
    public:
        First () {};
};
class Second: public First {
    public:
        Second (int k): First (k) {}
};
int main (){
        Second x(3);
}
```

Problem 2: (7 marks)

We want to create and manipulate a **class Vector**. The data members of this class include:

- ✓ The number of elements of a vector: **Nbelt**,
- ✓ A one dimensional array containing the elements (integers) of the vector: **Tab**.

The constants Min=1 and Max = 100 defines the minimum and maximum sizes of the array Tab.

1. Write the constructor and destructor which takes as argument (the number of elements of the vector having a default value ==1). The constructor has to verify the validity of this parameter (between max and min) and initialize the elements of the vector to 0.
2. Give two member functions. One for reading and the other for writing the vector.
3. Define the unary **operator +** for addition of two vectors. We should be able to do V3 = V1+V2 with this operator. In the case where V1 and V2 don't have the same number of elements, an error message has to be displayed.
4. Define a unary **operator -** to carry out the difference between two vectors.
5. We desire to define the multiplication **operator *** to do multiplication of a real by a vector. Can we define this operator by a method of the class vector? Justify your answer. Using a friend function, define the **operator *** used to carry out the multiplication of a real by the vector. The result is a vector whose elements are equal to the product of a real by the elements of the vector from origin.
6. The **class Point** is derived from the class Vector. In addition to the properties inherited, a Point possess a static member Nbpoint which contains the number of instances effectively alive from the class (updates are done at the level of the constructor and destructor). Define a class Point and give a constructor and destructor for this class (note that a point contains a vector of two elements).