ENSF 480 – Fall 2021
Principles of Software Design

Quiz 1 Solutions

Question 1 - 7 points

In the following space answer three questions as follows:

- Question 1 - Rewrite the COMPLETE implementation of Student's constructor.
- Question 2 - Is anything wrong with the destructor of class Human? Explain very clearly the **details** of your answer.
- Question 3 - Is anything wrong with the member function Human::display, which the redefinition in class Student is not called when is needed. explain the **details** very clearly.

Here are the possible answers.

Answer for first question:

```
Student::Student(const char* student_name, const char* student_phone):
Human(student_name),
phone_number(new char[strlen (student_phone)+1])
{
   if (phone_number== nullptr){
       cout << "Memory not available..." ;
       exit(1);
   }

    strcpy(phone_number, student_phone);
}
```

Answer for second question:

The problem with this code is that destructor of Human is not declared virtual. This will cause an issue in some cases. For example, if program uses a pointer of type Human to create an object of type Student, the compiler considers early binding (considers the created object as Human. In other words, it only calls the destructor of Human, and destructor of Student will not be called. As a result it can cause a memory leak.

Answer for third question:

Function display is not declared virtual. Therefore, due to early biding, it calls the Parent's display, not the Student's display.

Question 2 - 8 points

In the following space, write the complete implementation of any missing functions or overloaded operators which is needed to get the main function of this program work, with no compilation or runtime issues. You don't need to rewrite or write any function or operator that is not needed to have the given main function work. Also, you don't need to rewire any part of the given intVector.h file.

```
IntVector::IntVector(const IntVector& src):sizeM(src.sizM), arrayM(new int[sizeM]{
    if (arrayM == nullptr){
       cout << "No memory ... << endl: // or any message
       exit(1);
    }

    // using for loop or while loop or …
    for(int i = 0; i<sizeM; i++)
       arrayM[i] = src.arrayM[i];
}

int& IntVector::at(int index) const{
    if(index < 0) {
      cout << " index must be greater than or equal zero. ";
      exit(1);
    }
    return arrayM[index];
}

IntVector::operator int*() {
    return arrayM;
}

ostream& operator << (ostream& os, const IntVector& v){

    for(int i=0; i < v.sizeM; i++) os << v.arrayM[i] << "  ";
    return os;
}
```

Multiple Choice Questions – Answers are Highlighted in red

Question 3 – 1point

A public static data member in a C++ class:

A) Must be declared globally outside the class definition

B) Will be initialised to zero automatically

C) will be allocated on the static area of memory

D) A and B are both the only correct answers

E) B and C are the only correct answers

F) A and C are the only correct answers

G) A, B, and C are all correct answers

Question 4 – 1point

Consider the definition of the class String in C++ and assume all member functions are properly defined:

```
class String {
public:
    String(int a = 0);
    String(const char* b);
private:
    int length;
    char* storage;
};
```

Which of the following statements is a **valid** statement?

A) String s1(50);

B) String s2 = 100;

C) String s3;

D) String s4 = "123";

E) B and C are only the valid statements

F) A, B, and C are the only valid statements

G) A, B, C, D, are all valid

Question 5 – 1point

The following C++ operators are known as unary operators (select the best answer):

sizeof ++ -- !

sizeof ++ -- /

[ ] ! ++ -- +

sizeof [ ] ! ++ --

Question 6 – 1point

Consider the following C++ code:

class A{
int a;
public:
int bar();
};
	class B{
	int b;
	friend class A;
	public:
	int fun();
	};
		class C {
		friend class B;
		int c;
		public:
		int foo() ;
		};

Which one of the following statements is correct?

Class A can have access to all data members in class B and class B can have access to all data members in class C.

Class A can have access to all data members in B and class B can have access to all data members in class A and C.

Class B can have access to all data members in A and class C can have access to all data members in B.

Class B can have access to all data members in A and class C can have access to all data members in class A and B.

None of the above is correct.

Question 7 – 1point

Which one of the following statements is correct? Select the best answer.

A) An abstract class is a class that contains a virtual function.

B) An abstract class is a class that contains at least one pure virtual function.

C) An abstract class is class that is derived from a virtual base class

D) A, and B are correct answers

E) All of the above are correct answers

F) None of the above is a correct answer

Question 8 – 1point

Which one of the following statements is correct about a static member function in a C++ class? **Select the best answer.**

A) A static member function can be called even without existence of a class object.

B) A static member function doesn't have direct access to the class private data members

C) A static member function does not have a 'this pointer'

D) A and B are the only correct answers

E) A and C are the only correct answers

F) B and C are the only correct answers

G) A, B, and C are all correct answers

Question 9 – 1point

Class A is a subclass of B, and B is subclass of C and C is subclass of D. If all of these classes have their own ctor and dtor, and if an object of D goes out of scope what is the order of calls to the destructors of these classes:

The dtor (destructor) of classes will be called in this order: D, C, B, A

The dtor (destructor) of classes will be called in this order: A, B, C, D

Only dtor (destructor) of D will be called

None of the above