清華大學 電機工程學系
105 學年度第二學期
EE-2310 計算機程式設計 (Introduction to Programming) 期末考試題
本試題－共計兩頁，七大題，總分 100 分
Closed-Book Examination (考試日期: June 12, 2017)

1. (20%) Answer the following questions briefly.
   (a) In C++, when a local variable inside a function has the same name as a global variable, then, will the local variable shadow the global variable or the global variable shadow the local variable? (5%) ➔ The local variable will shadow the global variable
   (b) There access control levels in C++ for a member defined in a class, including *public* and *private*. What is the other level? (5%) ➔ protected
   (c) For a C++ class named *myclass*, what is the name of its destructor function? (5%) ➔ *~myclass();*
   (d) Suppose that a *float* type of variable occupies 4 bytes and a *double* type of variable occupies 8 bytes in the memory, then what is the memory size of an object declared using the following *union* definition. For example, if one declares an object in his/her program "*WageInfo* X;". Then, what is the memory size of object *X*? (5%) ➔ 8 bytes (i.e., the max of all members)

```
union WageInfo
{
        double      hourlyRate;
        float       annualSalary;
};
```

2. (20%) Answer the following questions briefly.
   (a) In C++, what is the result of the following code, assuming that the address of variable *num* is 0x28fef825? (5%) ➔ 0x28fef825

```
int num = 25;
cout << &num;
```

   (b) Write a statement that sets an integer pointer for a dynamically allocated integer array of 100 elements. (5%)

```
int *ptr;
ptr = new int[100];
```

   (c) In a class with a **static member** as shown below, it needs to be re-defined outside of its class definition. Complete the following statement. (5%)

```
class X{
    public:
        static int IamStatic;
};
int X::IamStatic = 100; // define the value of a static member IamStatic
```

   (d) In the following operator overloading function for class *OpClass*. There are two operands, one is now specified as *r*. What is the other one? (Hint: You can simply show the name of its pointer). (5%) ➔ *this*

```
OpClass OpClass::operator+(OpClass r)
```

3. (20%) Answer the following questions briefly.
   (a) In C++, if class *Child* is a derived class of class *P*, using public inheritance. Is it true that *Child* inherits all members of class *P*? (5%) ➔No. Just protected and public members. (只要回答 NO 就給分)
   (b) In C++, *overriding* is a different concept than *overloading*. Explain what overriding means. (5%) ➔Overiding in a derived class is to **re-define a member function** inherited from the base class (差不多就給分)
   (c) What is the execution result of the following program segment in C++? (5%) ➔ Have a nice day

```
string str("Have a day");
str.insert(7, "nice ");
```

cout << str;

(d) In a C++ statement, we wish to create a file, named *outFile*, for output purpose in binary mode. What kind of flag we should use to fill in the missing blank? (5%)

ofstream outFile("myfile.bin", ios::binary);

4. (10%) Consider the following data structure, *old_school*, defined by keyword ***struct*** in C++.

(a) What is the access level (i.e., private or public) of data members *a* and *b*? (5%) ➔ public

(b) This structure definition is not valid. Point out the mistake it has committed. (5%)

```
struct old_school
{
    int   a=0; // This is a mistake, member in a class cannot be initialized like this
    float b;
};
```

5. (10%) Consider the problem when dealing with the **2-dimensional array** in C++.

(a) Declare a 2-dimensional ROWSxCOLS integer array, name *A*, in C++, where ROWS and COLS are pre-defined macros using directives as the following. (5%) ➔ *int A[ROWS][COLS];*

```
#define ROWS 10;
#define COLS 10;
```

(b) Write a complete subroutine, named *InitAll*(), to initialize every element in a given 2-dimensional array to 100. Please ensure that a main function can call this subroutine by the following statement. Note, you also need to specify the argument of your subroutine clearly. (5%)

```
void InitAll(int A[][COLS]) // The argument could have a different name from A
{                           // It is okay if you use a different return type than void
    for (int i=0; i<ROWS; i++){
        for(int j=0; j<COLS; j++){   A[i][j]=100;      }
    }
}
```

6. (10%) Consider the usage of class **vector** provided by Standard Template Library, STL.

(a) What statement can you use to declare an integer array? Please name is *Score*. (5%) ➔ vector<int> *Score;*

(b) What statement can you use to insert one element (with the value of 100) to the end of the array *Score*? (5%) ➔ *Score.push_back(100);*

7. (10%) Consider the following program segment that specifies an array of **5 objects of a special type called *Square***. Each object of *Square* maintains a data member *side*. Fill out the two missing blanks so that we can see the listed execution results.

```
#include <iostream>
using namespace std;
class Square
{
    private:
        int side;
    public:
        Square (int s = 1)  { side = s; }
        int getSide()  { return side; }
};
main()
{
    Square  S_array[5] = {1, 2, 3, 4, 5}
    for(int i=0; i<5; i++){
        int x = S_array[i].getSide();
        cout << x*x << endl;
    }
}
```

```
Execution Results:
1
4
9
16
25
```