Computer Programming Language

【Fall Semester, 2014】

Final Examination

Name：_____

ID Number：_____

Problem 1：	10 points	_____
Problem 2：	10 points	_____
Problem 3：	10 points	_____
Problem 4：	10 points	_____
Problem 5：	10 points	_____
Problem 6：	10 points	_____
Problem 7：	10 points	_____
Problem 8：	10 points	_____
Problem 9：	10 points	_____
Problem 10：	10 points	_____

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Total Points： 100 points _____

Problem 1: (10 points)

Explain briefly the following terms:

(1) public _____

_____

(2) random file access _____

_____

(3) delete _____

_____

(4) constructor _____

_____

(5) friend _____

_____

Problem 2: (10 points)

What are the values of the variables A, B, C, D, E after executing the following statements?

```
int x[10] = {15,12,19,12,13,52,21,25,77,35};
int A,B,C,D,E;
int *p;
A = x[0];
B = x[7];
C = *x + 3;
D = *(x + 5);
p = &x[0];
p++;
E = *(p + 4);
```

_____

Answer： A = _____; B = _____; C = _____; D = _____; E = _____;

_____

Problem 3: (10 points)

What is the output by the following program?

```
#include <iostream>
#include <string>
using namespace std;

void main()
{

    string str1 = "Programming ";
    string str2 = "Fun!";
    string str3 = "C++ ";
    string str4;

    str4 = str1;
    cout << "str4 : " << str4 << endl;

    str4 = str3 + str1;
    cout << "str3 + str1 : " << str4 << endl;

    cout << "str4.length() :  " << str4.length() << endl;

    if (str1 < str3)
        cout << "String Comparison : " << "Smaller" << endl;
    else
        cout << "String Comparison : " << "Greater" << endl;

    str4 = str3 + str1 + str2;
    cout << "Insert String : " << str4.insert(16, "Is ");

}
```

Answer: (Use the backside of this page if additional writing space is needed.)

Problem 4: (10 points)

What is the output by the following program?

```
#include <iostream>

using std::cout;
using std::endl;

class M {

  public:
    M( int );
    int mystery( int );
  private:
    int data;
    int number;
};

M::M( int q = 0 )
{
  data = q;
  number = 2;
}

int M::mystery( int q )
{
  number++;
  data = number + q;
  return data;
}

int main()
{
  M mObject( 4 );
  M *mPtr = &mObject;
  cout << "(1) " << mObject.mystery( 10 ) << endl;
  cout << "(2) " << mPtr->mystery( 15 ) << endl;
  cout << "(3) " << mObject.mystery( 20 ) << endl;
  cout << "(4) " << mPtr->mystery( 25 ) << endl;
  cout << "(5) " << mObject.mystery( 10 ) << endl;
  return 0;
}
```

Answer: (Use the backside of this page if additional writing space is needed.)

Problem 5: (10 points)

The sine of *x* can be calculated approximately by summing the first *n* terms of the infinite series

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + ...$$

Where *x* is expressed in radians (*Note*: π radian = 180°). Write a program that will read in a value for *x* and then calculate its sine. Sum the first *n* terms, where *n* is a positive integer that is read into the program along with the numerical value for *x*.

Answer: (Use the backside of this page if additional writing space is needed.)

Problem 6: (10 points)

Write a program to read the following text file (File name: PROGRAMMING.TXT) and compute the numbers of vowels (a, e, i, o, u) in the file. Output the results on the screen.

```
Computer programming (often shortened to programming or
coding) is the process of writing, testing, debugging /
troubleshooting, and maintaining the source code of computer
programs. This source code is written in a programming language.
The code may be a modification of an existing source or
something completely new. The purpose of programming is to
create a program that exhibits a certain desired behavior
(customization). The process of writing source code often
requires expertise in many different subjects, including
knowledge of the application domain, specialized algorithms and
formal logic.
```

Answer: (Use the backside of this page if additional writing space is needed.)

Problem 7: (10 points)

Please write a program to simulate the process of tossing two fair dice using random number generator. Run the simulation for 100000 times and show the accumulated frequency of each number, from 2 to 12, on the screen.

Hint: You may need to use the functions srand() and rand() in your program.

Answer: (Use the backside of this page if additional writing space is needed.)

Problem 8: (10 points)

Write a function named ***strLength*****(** char str[ ] **)** that determines and returns the length of a string without using the string class. Write a simple main() function to test the ***strLength*****(** char str[ ] **)** function 5 times using strings input to the program.

Answer: (Use the backside of this page if additional writing space is needed.)

Problem 9: (10 points)

Make a class defining a polynomial of second degree:

$$\mathrm{y} = \mathrm{A}x^2 + Bx + C$$

The coefficients *A*, *B*, *C* should be private. The class should have a constructor to set the default values of *A*=1, *B*=2, *C*=1. The class should also contain the following member functions:

1. A function that sets the coefficients to desired values.
2. A function that tells how many roots there are and returns the roots (if any)

Write a program to test an object of this class.

Answer: (Use the backside of this page if additional writing space is needed.)

Problem 10: (10 points)

Create a base class named ***Rectangle*** containing ***length*** and ***width*** data members. From this class, derive a class named ***Box*** with another data member named ***depth***. The member functions of the base ***Rectangle*** class should consist of a constructor and an ***area()*** function. The derived ***Box*** class should have a constructor, a ***volume()*** function, and an override function named ***area()*** that returns the surface area of the box.

Answer: (Use the backside of this page if additional writing space is needed.)