清華大學 電機工程學系
106 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，九大題，總分 100 分
Closed-Book Examination (考試日期: June 21, 2018)

1. (20%) Answer the following questions.

(a) Use one C statement to declare a **2-dimensional array** of 2x2 integers, named *Scores*, and initialize it with the following contents, assuming the row-major order. (5%) ➔ *int Score*[2][2] = {{1, 2}, {3, 4}};

Row 0 ➔	**1**	**2**
Row 1 ➔	**3**	**4**

(b) A class *B* is a derived class of class *Parent* by a statement shown below. If class *Parent* has a protected member, *p_data*, a public member function, *get_data*(), and a private data, *secret_data*. Then, what members of class *Parent* will be inherited by class *B*? (5%) ➔ *p_data* and *get_data*()

class *B*: public *Parent* {…};

(c) Show the content of C-string *numStr* after the execution of the following code segment. (5%) ➔ 101

```
char numStr[4];
itoa(5, numStr, 2);
```

(d) What will be displayed after the execution of the following code segment? (5%)

```
int value = 123;
cout << left << setw(5) << setfill ('*');
cout << value;
```

➔ 123**

2. (10%) Answer the following questions briefly.

(a) Are the following two C++ statements legal? (Simply answer YES or NO). ➔ NO (&value is pointer of *float* not *int*)

```
float value;    int *pointer = &value;
```

(b) Show how to declare a dynamically allocated integer array for 100 elements. Use "*ptr_array*" as the pointer variable for the array created as shown below. (5%)

```
int *ptr_array = Blank to be filled in;
```

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

3. (10%) Fill in the two blanks (i.e., *BlankA* and *BlankB*) in the following member function for a class, *complex*, used to overload operator "<<", while supporting cascaded output.

```
BlankA    BlankB<<(ostream& os, complex &x) { … };
```

```
ostream&  operator<<(ostream& os, complex &x) { … };
```

4. (10%) Consider the usage of class **vector** provided by Standard Template Library, STL.

(a) What statement can you use to declare a **vector** of double-precision real numbers? Please name it as *A*. (5%)
➔ vector<double> *A;*

(b) Assume that this vector has been initialized with some values. Write a program segment to add them up. Assume that a variable, named *sum*, has been declared and initialized to 0. Use it to store the final result. (5%)
➔ *for(int i=0; i<A.size(); i++){ sum = sum + A[i]; }*

5. (10%) What will be displayed on the screen after the execution of the two following code segments, respectively.

(a) Code Segment 1. (5%)

```
char s[15] = "Abracadabra";
char *found = strstr(s,"dab");
```

cout << found;

➔ dabra

(b) Code Segment 2. (5%)

char world[1000]="Welcome! to the world of Programing in C++…";

char *token = strtok(world, " !");

cout << token;

➔ Welcome

6. (10%) Consider the following **recursive problems**.

(a) Give a recursive formula for computing *n*!. (5%) ➔ *n*! = (*n*-1)! * *n*.

(b) Consider the famous **Hanoi Tower** problem discussed in class. If the computational complexity of moving n disks from peg 1 to peg 3 via peg 2 is denoted as T(n). Please give the recursive formula in terms of T(n) and T(n-1). (5%) ➔ T(n) = 2T(n-1) + 1.

7. (10%) Answer the following questions related to **file IOs**.

(a) What should be put in as the second argument in the following "file stream creating function", if the file is to be created for output in the binary mode? (5%)

fstream *cio_yours*("yourfile", ios::binary | ios::out);

(b) Let A is an array with two elements of *double*. Use one statement to write this entire array to file "yourfile" in the binary mode.

***cio_yours*.write((char*)(A), sizeof(double)*2);**

8. (10%) Consider the following *selection sort program.*

```
for(int i=0; i<n; i++) {
    int smallest = i;
    for(int j=i; j<n; j++){  if(A[j]<A[smallest]) smallest = j; }
    if(smallest != i){
        int tmp = A[i];
        A[i] = A[smallest];
        A[smallest] = tmp;
    }
}
```

(a) Complete the code. (Note that there might be several lines of code to be filled in). (5%)

(b) What is the average asymptotic computational complexity of this program, for *n* elements? (Use big-O Notation). (5%) ➔ $O(n^2)$

9. (10%) Complete the following **recursive** function used to perform **binary search**. The arguments used are as follows: *A* is the integer array where the search is performed, *left* and *right* are the left and right indexes of the range of search, and *x* is the value of the target element under search.

```
int recursive_binary_search(int *A, int left, int right, int x)
{
   if(left>right) return(-1);
   int m = (left+right)/2;
   if(A[m]==x) return(m);
   if(x > A[m])
      recursive_binary_search(A, m+1, right, x);
   else
      recursive_binary_search(A, left, m-1, x);
}
```