University No._____

THE UNIVERSITY OF HONG KONG

FACULTY OF ENGINEERING
DEPARTMENT OF COMPUTER SCIENCE

COMP1117C Computer Programming
CSIS1117C Computer Programming I

Date: 16 May 2014 **Time: 9:30am – 12:30pm**

Only approved calculators as announced by the Examinations Secretary can be used in this examination. It is the candidates' responsibility to ensure that their calculator operates satisfactorily, and candidates must record the name and type of the calculator used on the front page of the examination script.

Brand and type of calculator:_____

Instructions:

1. **Write your university number at the top of every odd numbered page.**
2. **Answer ALL questions in the space provided.**
3. **The total marks is 100.**

Section A. True or False. (10 marks) Write T or F in the square bracket. Each correct answer will be given 1 mark. One mark will be deducted for each wrong answer. The minimum score for this Section is 0 mark.

1. [ ] The opposite of "greater than" is "less than."
2. [ ] All `switch` statements can be converted into a nested `if-else` statement.
3. [ ] Functions may not have any `return` statements.
4. [ ] The body of a `do-while` loop may never be executed.
5. [ ] Private member functions cannot be overloaded.
6. [ ] A negative integer value cannot be assigned to a variable of type `unsigned`.
7. [ ] An array can always be assigned to a pointer variable.
8. [ ] The `double` value `0.1` is considered `true`.
9. [ ] A `break` statement can only appear in the body of a loop or a `switch` statement.
10. [ ] Public member functions cannot modify private data members of a class.

Section B. Multiple Choices. (20 marks) There may be more than one correct choice in the questions. The answer will only be considered correct if all correct choices are written down. Each question carries 2 marks. One mark will be deducted for each wrong answer. The minimum score for this Section is 0 mark.

1. What will be output by the following program fragment?

```
int a = 5, b = 10, c = 23;
if (a < b < c) cout << a << ' ' << b << ' ' << c;
if (b < a < c) cout << b << ' ' << a << ' ' << c;
```

(a) `5 10 23`
(b) `10 5 23`
(c) Nothing because of syntax error.
(d) None of the above. **Answer: [ ]**

2. Which of the following program fragment prints the value `5`?

(a) `int *p, k = 5; p = k; cout << *p;`
(b) `int *p, k = 5; p = &k; cout << *p;`
(c) `int *p, k = 5; *p = k; cout << *p;`
(d) `int *p, k = 5; *p = &k; cout << *p;` **Answer: [ ]**

3. Given the following declaration,

```
struct data {
      int  time[10];
      char name[30];
} *p, q;
```

which of the following statements is/are valid?

(a) `p = &q;`
(b) `p->time[0] = 'a';`
(c) `p->name = q.name;`
(d) `p = q`

Answer: [ ]

4. Which of the following is/are allowed in the last section of the `for`-statement?

(a) `++j`
(b) `i -= m`
(c) `cout << "Hello World!"`
(d) `c[k]`

Answer: [ ]

5. Which of the following declares a user-defined data type that is a pointer to a `float`?

(a) `float* float_ptr;`
(b) `typedef float *float_ptr;`
(c) `typedef float_ptr *float;`
(d) None of the above.

Answer: [ ]

6. What is the output from the following program?

```
string a = "test ", b = "again ";
cout << a + b + b + '!';
```

(a) `test again again !`
(b) `test again again`
(c) `test + again + again + !`
(d) Nothing because of syntax error.

Answer: [ ]

7. Consider the following nested loop,

```
for (int j = 9; j <= 100; j += 10)
      for (int k = 1; k <= 100; k++)
            cout << "Hello" << endl;
```

how many lines of `Hello` will be displayed?

(a) 900
(b) 890
(c) 1000
(d) None of the above.

Answer: [ ]

8. Given the following function and local variable declarations,

```
char y;
void func(int a, int b = 10);
int  func(char &c, int d = 0, char e = 'e');
```

which of the following is a correct function call?

(a) `func(y);`
(b) `func((int)y);`
(c) `func(y, y);`
(d) `func(y, y, y);` **Answer: [ ]**

9. Which of the following data types cannot be used in a `switch` controlling expression?

(a) `char`
(b) `double`
(c) `int`
(d) `long` **Answer: [ ]**

10. What will be output by the following statement?

```
cout << "\\\"a\txxn\n";
```

(a) `\"a  xxn`
(b) `"axxnn`
(c) `\"atxxn`
(d) Nothing because of syntax error. **Answer: [ ]**

Section C. Written Questions. (70 marks) The marks for each question is given after the question number inside a pair of square brackets.

1. [5] Complete the following C++ function which returns the position of the first occurrence of the character array `t` in the character array `x` (of length `n`). The function will return `-1` if `x` does not contain `t`. For example, if `x` contains `{'a', 'b', 'a', 'b'}` and `t` contains `'b'`, the function should return `1`.

```
int find(char x[], int n, char t) {
```

2. [5] Complete the following C++ function which reverses the contents of a given integer array x of n elements. For example, if x contains {1, 2, 3} before the call, it will contain {3, 2, 1} after the call.

```
void reverse(int x[], int n) {
```

3. [10] To sort an integer array in ascending order using selection sort; first find the largest element, then exchange it with the last element of the array. Repeat the steps to sort the remaining array with $n - 1$ elements. Complete the following **recursive** C++ function which sorts an integer array x of size n using selection sort:

```
void selection_sort(int x[], int n) {
```

4. Consider the following C++ function:

```
int   what(int x, int y) {
      if (x+y <= 1) return 3;
      else return what(x-1,y-2) + what(x-2,y-1);
}
```

(a) [5] What value will be returned by `what(3,3)`?

Answer:_____

(b) [5] What is the total number of calls to the function `what` in evaluating `what(3,3)`?

Answer:_____

5. [10] Given an integer array. Write a function to re-arrange the numbers such that all even numbers will be put before odd numbers, and the numbers are arranged in ascending order. For example, if the array contains `{5, 4, 8, 3, 1, 7, 6}`; after re-arranging, the array will contain `{4, 6, 8, 1, 3, 5, 7}`. [Hint: you may use the selection sort function from Q.3 to sort part of or the entire array.]

```
void re_arrange(int x[], int n) {
```

6. [15] A non-negative long integer can be represented by storing its digits in an `vector<int>`. The first element of the `vector` contains the rightmost digit. The next element contains the digit to the left of the rightmost digit and so on. For example, the integer `33224456789` will be represented by `{9, 8, 7, 6, 5, 4, 4, 2, 2, 3, 3}`. Write a C++ function `add_long` which returns the sum of two long integers passed as parameters.

7. [15] Write a C++ function that merges two integer arrays sorted in ascending order into a third array (also sorted in ascending order). Merging proceeds by first taking the first element from each source array and putting the smaller value into the target. Another element is taken from the array whose element has been put into the target and the process continues until elements of one of the arrays have been exhausted. The remaining elements in the other array will simply be copied into the target. The function takes the three arrays and the sizes of the two source arrays as parameters.

***** END OF PAPER *****