National Tsing Hua University, Taiwan
EE-2310 計算機程式設計 (Introduction to Programming)
(Closed-Book) Midterm Exam., Fall Semester, 2018 (Nov. 15, 2018)

1. (20%) Answer the following questions briefly.
   (a) In C++, one plans to compute the division of two unsigned integers, A, B, and denote the result of the Quotient as Q and the remainder as R. In other words, A/B = Q + R. Show two C++ statements, one for calculating Q and the other for calculating R, respectively. (5%)
   (b) The ASCII code for char 'A' is 65. Fill in the blank in the following C++ statement so that the information printed on the screen in 'A'. (5%)
   cout << *blank to be filled in* <char>(65);
   (c) What is the values of *x* and *y* after the following statements are executed? (5%)
   int x=2, y=3; x = x+--y;
   (d) The statement about function *scanf* is not correct in the following C-stype program segment. It attempts to extract a number embedded in a string from a data file called "*data.txt*", and store the result into a variable *num*. Please fix the wrong statement. (Note that, the message in "*data.txt*" is "We have 90 students in this class\n", then the content of *num* will be equal to 90 after the execution of this program segment). (5%)
   ```
   int num;
   FILE *in_fptr = fopen("data.txt", "r");
   fscanf(in_fptr, "We have %d students in this class\n", num); // This statement is wrong, and to be fixed…
   ```
2. (10%) Answer the following two questions about *string declaration and assignment*.
   (a) Use 2 statements to declare a string in C-style, named *c_string* with a capacity of 100 characters, and set its content to "Good day!". Hint: you may need to call a function *strcpy*(). (5%)
   (b) Use 2 statements to declare a string in C++-style, named *cpp_string*, and set its content to "Have a nice day!". (5%)
3. (20%) Answer the following questions briefly.
   (a) In C++, derive a Boolean expression that evaluates to *true* when the content of *x* is larger than 10 and smaller than or equal to 100. (Note: you may need to use 2 relational operators and 1 logical operator). (5%)
   (b) In C++, one can allocate the memory of an integer array, namely *A*, dynamically with a size defined by a variable, say *size*, by the following statement. What is the keyword that should be filled in to the missing *Blank*? (5%)
   Int *A = *Blank* int[size];
   (c) In C++, a function definition should clearly define the following information, including *name*, *parameter list*, *body*, and *what else*? (5%)
   (d) In C++, what is the final result of variable *ans* after the execution of the following statements? (5%)
   int *ans*;
   ans = (51<9) ? 1 : 100;
4. (10%) Consider the different meanings of operator ">>" in different situations.
   (a) In C++, use one statement to get a real number from the keyboard and store it in a variable called *x*. Assume that *x* has been previously declared. (5%)
   (b) The following code segment can print out the binary pattern of a number. Complete it by filling out the underlined part denoted as *Blank A*. (Note that you may now need to use ">>" with a different meaning as a *right-shift operator* that shifts the binary pattern of a variable to the right for a number of bits). (5%)

```
char ch = 'a';
printf("The binary representation for %c is: ", ch);
for(int i=7; i>=0; i--){
        cout << ( Blank A & 1);
}
cout << endl;
```

5. (10%) Complete the following segment by filling out *Blank A* and *Blank B*.

```
switch (level)
{
  case   ': cout <<   ndergraduate";
             Blank A;
  case   ': cout <<   raduate";
             Blank A;
  Blank B: cout <<   ot a legal level";
}
```

6. (10%) Consider the scope and lifetime of a variable in C or C++.
   (a) Is it true that a variable once declared outside of any function body will be treated as a *global variable* and can be seen by any function in the same source code file? (Simply answer TRUE or FALSE). (5%)
   (b) Convert the following variable *count* into *static variable* (which means that its content can be retained between consecutive calls to its host function. For example, after calling the following function for the 5th time will print out a message "Count is now: 5" on the screen of your computer's monitor. (5%)

```
void add_one_to_a_local_yet_static_variable()
{
    int count=0; // to be modified and converted into a static variable
    count++;
    cout << "count is now: " << count << endl;
}
```

7. (10%) Consider the call-by-reference concept in C++.
   (a) What are the results of variables *x* and *y* at the end of the execution of the following segment. (5%)

```
int x=100;   int& y;
y=x;
y=10;
```

   (b) Show a statement that can be used to swap the contents of two variables *p* and *q* by calling a subroutine (or function) shown below. (Note that: this is about how to make a function call when the parameters are of reference type). (5%)

```
cpp_swap(int& i, int& j)
{    int tmp;    tmp=i;    i=j;   j=tmp;    }
```

8. (10%) Consider the following program with command-line arguments:

```
   Blank A   <iostream>          // Line 1
main(int argc, char *argv)       // Line 2
{
    int    i=0;
    for(i=0; i<argc; i++)    cout << argv[i] << endl;
}
```

   (a) What should be filled in for *Blank A*? (5%)
   (b) There is an error in Line 2. Try to fix it. (5%)