CSI 32 Midterm Exam Fall 2020
2 hours

Part I
Answer True/False and Multiple choice questions

1. Which of the following is a compilation error?
(a) Neglecting to declare a local variable in a function before it is used.
(b) Using a triple equals sign instead of a double equals sign in the condition of an `if` statement.
(c) Omitting the left and right parentheses for the condition of an `if` statement.
(d) All of these.

2. Each class you create becomes a new _____ you can use to declare variables and create objects.
(a) variable
(b) object
(c) type
(d) access modifier

3. Which of the following statements is *true*?
(a) The compiler knows about fundamental types that are "built into" C++.
(b) A new type that you create is known as a user-defined type.
(c) New classes, when packaged properly, can be reused by other programmers.
(d) All of these are true.

4. C++ Standard Library function `getline`, from the `<string>` header, reads characters up to, but not including, a(n)_____ (which is discarded), then places the characters in a `string`.
(a) tab
(b) period
(c) new line
(d) \

5. A member-function call can supply _____ that help the function perform its task.
(a) classes
(b) arguments
(c) frameworks
(d) things

6. Which of the following statements is *true*?
(a) A class's body is enclosed in an opening left brace and a closing right brace.
(b) A class definition terminates with a required semicolon.
(c) Typically, each class definition is placed in a separate header with the `.h` filename extension.
(d) All of these are true.

7. The return type _____ indicates that when a function completes its task, it does not return (i.e., give back) any information to its calling function.
(a) void
(b) null
(c) virtual
(d) nullptr

8. A member function that does not, and should not, modify the object on which it's called is declared with _____ to the right of its parameter list.
(a) immutable
(b) firm
(c) const
(d) final

9. The compiler will *implicitly* create a default constructor if:
(a) The class does not contain any data members.
(b) The class does not define any constructors.
(c) The programmer specifically requests that the compiler do so.
(d) The class already defines a default constructor.

10. Having a loop within a loop is known as:
(a) Recursion.
(b) Doubling up.
(c) Stacking.
(d) Nesting.

Part II

Do all the problems.

1. Consider the following code fragment. It has 3 syntax errors and a logical error.
Find all the errors and fix them.

```
// finds the sum of all positive integers up to n, i.e. 1+2+ … +n
int sum(int n); // prototype

sum(int n) {

     if (n == 0) { return 0 }

     else {
          return n + sum(n);
     }
```

2. Consider the following code fragment. What is the output of the program? What happens at each iteration of the for loop?

```
#include <iostream>

using namespace std;

int f(int x, int y);  // function prototype

int y{20};

int main(){

     int x{1};

     for (int y = 20; y > 0; y -= 5){

          cout << f(x,y) << endl;
          x++;
     }
}

int f(int x, int y) {

     return x * y + ::y;

}
```

3. Given the function below, re-write it as a template function.

```
double average(double a[], int size) {
     // returns the average of values in the built-in array a

     if (size > 0) {

          double s=0;

          for (int i = 0; i < size; i++) {

               s += a[i];
          }

          return s / static_cast<double>(size);

     }

     else {

          throw invalid_argument("The size of the array should be a
positive integer value.");
     }

}
```

4. Below you will find the iterative procedure that finds the smallest value in a built-in array. Re-write it as a recursive procedure.

```
double average(double a[], int size) {
     // returns the average of values in the built-in array a

     if (size > 0) {

          double s=0;

          for (int i = 0; i < size; i++) {

               s += a[i];
          }

          return s / static_cast<double>(size);

     }

     else {

          throw invalid_argument("The size of the array should be a
positive integer value.");
     }

}
```

5. For the program below, state the scope of each of the elements listed under it (*global namespace scope* or *block scope*)

```
#include <iostream>

using namespace std;

int f(int x, int y);  // function prototype

int y{20};

int main(){

     int x{1};

     for (int y = 20; y > 0; y -= 5){

          cout << f(x,y) << endl;
          x++;
     }
}

int f(int x, int y) {

     return x * y + ::y;

}
```

(a) variable `x` in function `main`
(b) variable `y` in in the `for` loop
(c) the function `f`
(d) variable `y` defined before function `main`

6. Draw the pictorial memory representation after each of the statements below. Assume that the address of array `A` is 1264, the address of `a` is 450 and the address of `b` is 124.

```
     int A[] = { 12, 18, 23, 56, 75 };
     int* p1, * p2;
     int a{ 22 }, b{ 45 };

     p1 = A;
     p2 = &b;
     *p1 = *p2;
     p1 += 2;
     *p1 = 2*a;
     p2 = p1;
     --p2;
     cout << *p1 + *p2;
```

What value will be displayed?

Part III

Define a Television class TV.

Internally, you should have the following list of attributes:

- brand (type string)
- model (type stinrg)
- powerOn (type bool)
- volume (type int, the values are from 0 to MAX_VOLUME)
- muted (type bool)
- channel (type int, the values are from 2 to MAX_CHANNEL)
- prevChannel (type int, the values are from 2 to MAX_CHANNEL)

and the following member functions:

- togglePower()
- volumeUp(int)
- volumeDown(int)
- toggleMute()
- channelUp()
- channelDown()
- setChannel(int) // don’t forget to check that the int is “legal”, present a behavior if it is not
- jumpPrevChan()