CMPS 222 Midterm 1 Sample Questions

1. Define encapsulation, abstraction and interfaces. Explain how these three concepts relate to classes and object-oriented programming.

2. Show all the output generated by making the function call $myfib(4)$ where $myfib$ is defined as:

```
int myfib(int n)
{
  if(n < 3)
  {
    printf("n=%d return 1\n", n);
    return 1;
  }
  else
  {
    int f1, f2;
    f1 = myfib(n-1);
    printf("n=%d f1=%d\n", n, f1);
    f2 = myfib(n-2);
    printf("n=%d f2=%d\n", n, f2);
    return f1+f2;
  }
}
```

3. You have a program with four variables: $p1, p2, v1, v2$. $p1$ and $p2$ are pointers while $v1$ and $v2$ are normal variables. Currently, the variables are stored in memory as shown in the following:

```
    Memory Address    20     24     28     32
                     ------------------------
                     |     |     |     |     |
    Value Stored     |  0  |  0  | 50  | 40  |
                     |_____|_____|_____|_____|

    Variable Name     p1     p2     v1     v2
```

   Show how each of the following lines of code would affect the above picture. Each of the lines of code is evaluated in the order presented (i.e. before (b) is executed, (a) has occurred).

   (a) p1 = &v1;

   (b) p2 = p1;

   (c) *p2 =99;

   (d) p2 = &v2;

   (e) What value would be printed on screen for the line printf("%d\n", *p2);

4. What are two differences between classes and structures?

5. You have the class EmployeeRecord with the member variables *name*, *ID*, *hours* and *rate*. You wish to add the input operator $>>$ to the class.

   (a) Show the operator's prototype that you would need to add to the class definition.
   (b) Show the body of the operator function

6. Define the following terms and state the purpose of using the item in your class code:

   (a) default constructor
   (b) member variable
   (c) dot operator

7. You wish to define a class called PhoneRecord that has member variables for a 10 digit phone number (e.g. area code+number), a 50 character name and a 10 character tag (e.g. "home", "cell", "office"). Write the class definition and the body of the default constructor for this class. You do not need to write the body of any other member functions in the class.

8. Identify the error in each of the following code snippets. Assume we have already defined a class called StudentRecord elsewhere in the program. The class has private member variables and two public member functions called: *get_student* and *print_student*.

   (a)
   ```
   int main()
   {
      StudentRecord s[10];

      for(int i = 0; i < 10; i++)
        s.[i]get_student();
      .
      .
      .
   }
   ```
   (b)
   ```
   int main()
   {
      StudentRecord stu();

      stu.get_student();
      stu.print_student();

      return 0;
   }
   ```
   (c)
   ```
   int main()
   {
      StudentRecord s1;

      s1.get_student();
      cout << "You entered the name " << s1.name << endl;
      cout << "The full record is:";
      s1.print_student();

      return 0;
   }
   ```

9. Find five errors in the following program. Identify the error and state why it is an error. You may identify more than five errors, but only the first five correct answers will be counted for credit on this problem.

```
1   #include <iostream>
2   using namespace std;
3
4   typedef int* IntPtr;
5
6   int main()
7   {
8     IntPtr a, size = 0;
9
10    a = new int[size];
11    cout << "Enter size of the array: ";
12    cin >> size;
13    while(size <= 0);
14    {
15      cout << "Invalid size. Enter size: ";
16      cin >> size;
17    }
18
19    if(a = 0)
20    {
21      cout << "No memory allocated.\n";
22    }
23    else
24    {
25      cout << "Enter values: ";
26      for(int i = 0; i < size; i++)
27        cin >> a[i];
28
29      cout << "You entered: ";
30      for(IntPtr i = *a; i < size; i++)
31        cout << i << " ";
32
33      delete a;
34    }
35
36    return 0;
37  }
```