REGENT UNIVERSITY

COLLEGE OF SCIENCE AND TECHNOLOGY

EXAMINATION PAPER

END OF SEMESTER EXAMINATIONS,
DECEMBER 2009

COURSE: OBJECT ORIENTED PROGRAMMING USING C++ (Afternoon, ISS)

COURSE CODE: SICS 1523

TIME: TWO HOURS

LECTURER: KENNETH K. AZUMAH

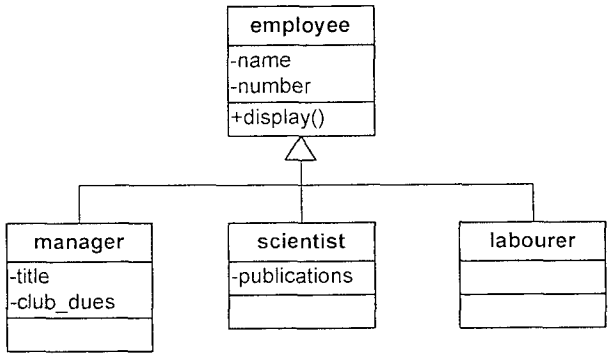
Please Read ALL Instructions

Section A [20 marks]

For each question, circle all answers that apply.

(Recommended Time: 20 minutes)

Use the diagram below in answering questions 1 – 4



1. The class structure above demonstrates
a. inheritance.
b. composition.
c. classes.
d. the "kind of" relationship.
e. reusability.

2. In the diagram above, the _____ class is _____ the _____ class(es).
a. scientist, the base class for, employee
b. labourer, derived from, employee
c. employee, composed of, manager, scientist, and labourer
d. employee, derived from, labourer
e. labourer, the same as, employee

3. An object of the scientist class contains instance data representing
a. the employee name, employee number, and number of publications.
b. only the number of publications.
c. only the employee name and employee number.
d. the title and golf club dues.
e. the location of the object.

4. From the manager class, you call the display() function in employee to
a. display all the data on a manager.
b. satisfy the formal requirements of the compiler.
c. display the manager's name and number.
d. display the manager's title and golf club dues.
e. let the compiler know you're dealing with an object derived from the employee class.

5. An abstract class is
a. one whose objects are identical to those of some derived class.
b. one from which no objects will be instantiated.
c. one that contains common elements of derived classes.
d. any base class.
e. any derived class.

6. Which of the following are true?
a. A derived class constructor is executed before the base class constructor.

b. A derived class constructor is executed after the base class constructor.
c. A derived class destructor is executed before the base class destructor.
d. A derived class destructor is executed after the base class destructor.
e. Derived and base class constructors are executed simultaneously.

7. For a derived class constructor with arguments to call a base class constructor, it must
a. make the call in the usual way from within its function body.
b. finish executing before calling the base class constructor.
c. use any arguments to itself in the call to the base class constructor.
d. place the call to the base class constructor on its initialization list.
e. make no explicit call, because the system will handle it automatically.

8. If there's a constructor with arguments in a derived class, then you must have
a. at least a no-argument constructor in the base class.
b. a constructor with the same number of arguments in the base class.
c. a no-argument derived class constructor (assuming you'll instantiate objects without arguments).
d. a no-argument base class constructor (assuming you'll instantiate objects without arguments).
e. instantiated objects of the base class.

9. The initializer list in a constructor typically
a. initializes variables of basic types in its own class.
b. calls a constructor in a base class.
c. initializes variables of basic types in a base class.
d. calls other constructors in its own class.
e. assigns values to existing variables.

10. Inheritance facilitates reusability because
a. child objects cannot be modified.
b. the base class need not be modified to derive a new class.
c. programming objects are more like real-world objects.
d. objects of the base class can be treated as objects of the derived class.
e. derived class objects inherit only the desirable features of the base class.

SECTION B [40 marks max]

Answer all questions in this section

Recommended time: 80 mins

1) Study the UML static class diagram below and answer the following questions:
   a) Convert the diagram into C++ code bearing in mind the following hints
      i. Let each constructor initialize its class. Choose your own initial values for the attributes.

[6 mks]

ii. The accessor and mutator operations (functions) in **Employee** should be implemented fully.

[10 mks]

iii. Implement accessor and mutator functions for the Lecturer and Technician classes

[4 mks]

iv. The operations (functions) in **Lecturer** and **Technician** may each have an empty function body.

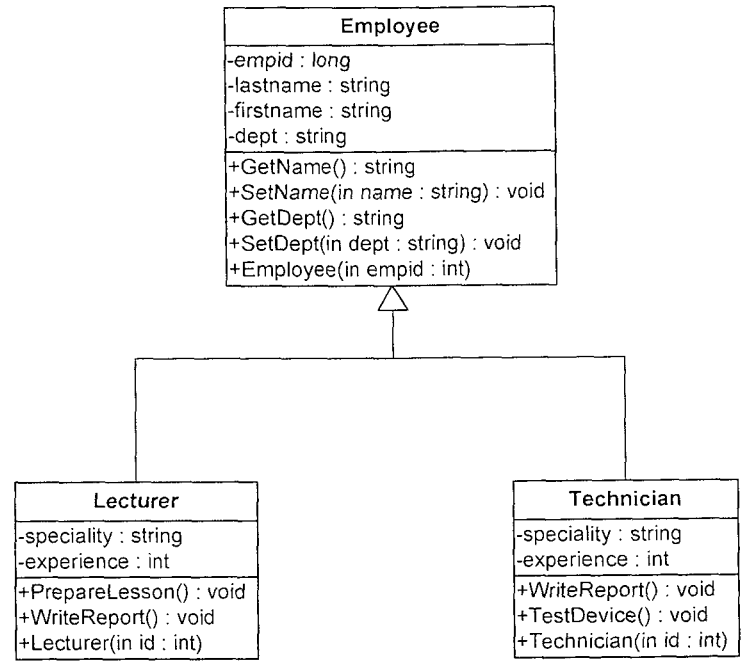
[6 mks]

b)

i. Which operation(s) in the **Lecturer** and **Technician** classes can be abstracted into the **Employee** class? **[2 mk]**

ii. What object-oriented property is being exhibited in the diagram? Explain.

[2 mks]



2) Operator Overloading [10 mks]

The Airtime object has hour and minute properties. Two Airtime objects can be added together to obtain another Airtime object. If the sum of the minute properties of the two objects exceeds 60, the hour should be increased by 1. (eg. [5 hours, 57min] + [5hours, 10min] = [11 hours, 7min].)

Consider the Airtime class below...

```
class Airtime{
      public:
      int hour;
      int min;
      Airtime(){
         hour=0;
         min=0;
      }
      Airtime(int x, int y){
        hour = x;
        min = y;
      }
      Airtime Add(Airtime airtime){
        Airtime c;
        c.hour = this->hour + airtime.hour;
        c.min = this->min + airtime.min;
        return c;
      }
};
```

Code Listing A

Use Code Listing A above to answer to following question:
In the Complex class above two Airtime objects C and D can be summed using the **Add** function thus:

```
Airtime Sum = C.Add(D);
```

Rewrite the **Add** function by overloading the '+' operator so that the two complex numbers can be summed using:

```
Airtime Sum = C + D;
```