KABARAK UNIVERSITY

EXAMINATIONS

2008/2009 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE

COURSE CODE: **COMP 212**

COURSE TITLE: **OBJECT ORIENTED PROGRAMMING**

STREAM: **Y2S1**

DAY: **THURSDAY**

TIME: **2.00 – 4.00 P.M.**

DATE: **26/03/2009**

INSTRUCTIONS:
Answer Attempt All Questions from Section A and any Two Questions from Section B.

PLEASE TURN OVER

SECTION A: ATTEMPT ALL QUESTIONS FROM THIS SECTION

Question 1 (15 Marks)

(a) Explain three reasons as to why object oriented programming is gaining more popularity as compared to procedural programming. **(3 Marks)**

(b) State whether each of the following is true or false, concerning object oriented programming.

(i) It's mandatory for a member function to be public in its class.

(ii) A difference between a usual member function and a static member function is that the former is called using an object's name while the later is called using the class's name.

(iii) A class must have a constructor explicitly defined by the programmer.

(iv) If class A inherits class B, and class A has a parameterized constructor, then B must have a constructor.

(v) If a protected member of a base class is publicly inherited, then it will be publicly available to objects of the derived class.

(vi) If we have objects declared as of type class **A**, then **A** is not an abstract class.

(vii) If a class **A** inherits from a class **B**, then a pointer declared in class **B** and pointing to an object of class **A** will call the version of a virtual function inherited from **B**.

(viii) It would be a programming syntax error to open a file and then fail to have a statement of closing it. **(4 marks)**

(c) (i) Explain the meaning of the term 'constructor'. **(1 Mark)**

(ii) Give any six rules for a valid constructor in C++. **(3 Marks)**

(d) Describe with an example why we need to use abstract base classes. **(4 Marks)**

Question 2 (15 Marks)

(a) Give three ways in which you use each of the following characters in C++.

(i) > (ii) * **(3 Marks)**

(b) Consider the following definition of three classes in C++.

```
class one
{
      int  oneA;
protected:
      int  oneB;
public:
      int  oneC;
};
```

```
class two: public one
{     int  twoA;
protected:
      int  twoB;
public:
      int  twoC;
};

class three: private two
{};
```

Required: Write down the members of classes 'two' and 'three' (including the inherited members) as well as their visibility levels. **(2 Marks)**

(c) Assume a class named **a** with a void member function named **b ( )**. Write appropriate statements to do the following. **(2 Marks)**

(i). To create an array instance of the class (use **c** as the instance name, and 20 as its size).
(ii). To call the member function **b ( )** for each of the 20 instances.

(d) For the following class, write statements to declare a pointer named **p** of type **a** (class name), and then invoke member function **b ( )** using the pointer. **(2 Marks)**

```
class a
{
public:
      int b(float c)
      {
            if (c>0)
                  return(1);
            else return(0);
      }
};
```

(e) Suppose you want to open a file named "myfile.doc" for reading. Give two ways of doing this (give the appropriate statements). **(2 Marks)**

(f) Assuming a class **a** that has one data member (integer **b**), fill in the blanks below.
(i). A parameterized constructor of **a** can be defined inside the class as _____.

(ii). The prototype of a copy constructor of **a** can be written in the class as _____.

(ii). The above copy constructor (in f(ii)) can be defined outside the class as _____.

(iii). The prototype of the destructor for **a** is _____. **(4 Marks)**

SECTION B: ATTEMPT <u>ANY TWO</u> QUESTIONS FROM THIS SECTION

<u>Question 3 (20 Marks)</u>

(a) Assume a class named **y**. Explain what the following statements mean.

(i) y x(7); (ii) y *z=&a; (iii) y(y); (iv) y compute(int); **(4 Marks)**

(b) (i) Explain the meaning of the term 'static member variable'. Why do we need to use static member variables when writing computer programs? **(2 Marks)**

(ii) List four rules of static member variables. **(2 Marks)**

(c) Consider the following classes.

```
class A
{
    char m;
}

class B: public A
{
    int n;
}
```

Assume that you want to modify the classes to include a parameterized constructor for each of the two classes. Write down the definitions of the two constructors. **(4 Marks)**

(d) A student wrote the following program. However, he made some programming errors. Explain briefly **six programming errors** that the student made. **(6 Marks)**

```
#include <iostream.h>

class A
{
    int xA;
protected:
    int yA;
public:
    int zA;
    void A(int m=0, int n, int l)   { xA=m; yA=n; zA=l;   }
};

class B:public A
{
```

```
public
      int zB;
};

void main()
{
      A a; B b; A *p;

      p=&a;
      p->xA=10;
      p->zA=40;

      p=&b;
      p->yA=20;
      p->zA=8;
      p->zB=5;
}
```

(e) Write down the output of the following program. **(2 Marks)**

```
#include <iostream.h>

class classX
{
public:
      void a()        {     cout<<"\na of classX";   }
      virtual void b(){     cout<<"\nb of classX";   }
 };
 class classY: public classX
 {
      void a()   {     cout<<"\na of classY";   }
      void b()   {     cout<<"\nb of classY";   }
 };
 void main()
 {
      classX x; classY y; classX *p;

      p=&x; p->a(); p->b();

      p=&y; p->a(); p->b();
  }
```

Question 4 (20 Marks)

(a) The following is a class for storing the **x** and the **y** co-ordinates of a point.

```
class point
{
    int x_cord, y_cord;
};
```

Assume you want to modify the class so as to have a member function named **add( )** which receives a point and returns a point whose dimensions are the dimensions of the calling point plus those of another point passed as a parameter.

(i) Write the prototype of the member function **add( )**. **(0.5 Marks)**

(ii) Write the definition of **add( )** when written outside the class. **(2.5 Marks)**

(iii). Write sample statements(s) to call **add( )** (assume a parameterized constructor exists). **(2 Marks)**

(b) Assume a class for storing the time (in minutes and seconds) as defined below.

```
class time
{
    int minutes, seconds.
};
```

Required

(i) Write down the prototypes of the following constructors for the class: a default constructor, a parameterized constructor and a copy constructor. **(1.5 Marks)**

(ii) Write the definitions of the above constructors when defined outside the class.

(4.5 Marks)

(c) Assume a file named 'c:\catalogue.txt' that stores codes, names and prices of items. Write code sections to

(i) Open the file and display all records from the file. **(4 Marks)**

(ii) Input a code and search for the appropriate item with that code from the file (display the name and price of the item). **(5 Marks)**

Question 5 (20 Marks)

An employee in a particular sales company is either full time or part time. Full time employees are grouped into two – administrators and salesmen.

Details stored for a full time employee include a unique employee code, the employee's name and his/her contacts, salary, title, total sales made in the month (only for salesmen), and the job group (only for administrators). The operations performed here include registering a new employee, and computing the net salary (Tax is 20% of salary, allowances is 30% of salary plus a sales commission of 5 % (only for salesmen)).

Details stored for a part time employee include a unique employee's code, his/her name and contacts, title, and the employee's hourly pay rate. The operations performed on a part time employee include registering a new employee, and computing the monthly income (input total hours worked).

Required: Write down definition of classes using inheritance for the above. **(20 Marks)**

Question 6 (20 Marks)

A shape can be a circle, a square, a rectangle or a triangle. The details stored include the area, the perimeter, the radius (only for a circle), the length (for a square), and the length and the height (for a triangle and a rectangle). The operations performed on a shape include inputting the details of each, computing the area and computing the perimeter.

Required: Write the definition of classes to demonstrate how you can implement this using polymorphism. **(20 marks)**