

**University of Swaziland
Faculty of Science and Engineering
Department of Electrical and Electronic Engineering**

Main Examination 2014

Title of Paper: Programming Techniques II

Course Number: EE272

Time Allowed: 3 hrs

Instructions:

1. There are five (5) questions in this paper. Answer question 1 and any other three (3) questions.
2. Each question carries 25 marks.

This paper should not be opened until permission has been given by the invigilator.

This paper contains ten (10) pages including this page.

Question 1

- a) Define encapsulation. [2]
- b) How does overriding relate to polymorphism? [3]
- c) Explain the difference between the use of the dot selection operator (.) and the arrow member selection operator (->). [2]
- d) What is a friend function of a class? [2]
- e) What is a static class member? [2]
- f) Why is it that static class members do not have the *this* pointer? [2]
- g) Discuss four restrictions on operator overloading in C++. [4]
- h) Explain why a class might provide a *set* and *get* functions for a data member? [2]
- i) Explain the following terms used in programming:
- Coupling [2]
- Cohesion [2]
- Abstraction [2]

Question 2

Analyse the following two programs and determine their outputs.

a)

[15]

```
#include <iostream>
using namespace std;
class poly
{
    protected:
        int width, height;
    public:
        void set_values(int a, int b)
        {
            width = a; height = b;
        }
};
class Coutput
{
    public:
        void output(int i);
};
void Coutput::output(int i)
{
    cout << i;
}
class rect:public poly, public Coutput
{
    public:
        int area()
        {
            return(width * height);
        }
};
```

```

    }
};
class tri:public poly, public Coutput
{
    public:
    int area()
    {
        return(width * height / 2);
    }
};
int main()
{
    rect rect;
    tri trgl;
    rect.set_values(3, 4);
    trgl.set_values(4, 5);
    rect.output(rect.area());
    trgl.output(trgl.area());
    return 0;
}

```

b)

[10]

```

#include <iostream>
using namespace std;
class Box
{
    double width;
    public:
    friend void printWidth( Box box );
    void setWidth( double wid );
}

```

```
};  
void Box::setWidth( double wid )  
{  
    width = wid;  
}  
void printWidth( Box box )  
{  
    box.width = box.width * 2;  
    cout << "Width of box : " << box.width << endl;  
}  
int main( )  
{  
    Box box;  
    box.setWidth(10.0);  
    printWidth( box );  
    return 0;  
}
```

Question 3

Choose the correct letter for the answer in each of the following options. Each correct answer or choice carries [1] mark.

A. What should be the name of constructor?

- a) same as object b) same as member c) same as class d) none of the mentioned

B. What is it that a derived class does not inherit from the base class?

- a) constructor and destructor
b) friends
c) operator = () members
d) all of the mentioned

C. The process of building new classes from existing one is called _____.

- a) Polymorphism
b) Structure
c) Inheritance
d) Cascading

D. How many specifiers are present in access specifiers in class?

- a) 1 b) 2 c) 3 d) 4

E. Which of the following operators can't be overloaded?

- a) :: b) + c) - d) []

F. Pick out the correct statement.

- a) A derived class's constructor cannot explicitly invokes its base class's constructor.
b) A derived class's destructor cannot invoke its base class's destructor.
c) A derived class's destructor can invoke its base class's destructor.
d) None of the mentioned

G. Pick out the correct statement about override.

- a) Overriding refers to a derived class function that has the same name and signature as a base class virtual function.
b) Overriding has different names.
c) both a & b
d) None of the mentioned

H. A function call mechanism that passes arguments to a function by passing a copy of the values of the arguments is _____

- a) call by name
- b) call by value
- c) call by reference
- d) call by value result

I. In C++, dynamic memory allocation is accomplished with the operator _____

- a) new
- b) this
- c) malloc()
- d) delete

J. The address of a variable temp of type float is:

- a) *temp
- b) &temp
- c) float& temp
- d) float temp&

K. *this* pointer

- a) implicitly points to an object.
- b) can be explicitly used in a class.
- c) can be used to return an object.
- d) All of the above.

L. Data members which are *static*

- a) cannot be assigned a value
- b) can only be used in *static* functions
- c) cannot be defined in a *Union*
- d) can be accessed outside the class

M. In access control in a protected derivation, visibility modes will change as follows:

- a) private, public and protected become protected
- b) only public becomes protected.
- c) public and protected become protected.
- d) only private becomes protected.

N. To access the public function *fbase()* in the base class, a statement in a derived class function *fder()* uses the statement.

- a) *fbase()*;
- b) *fder()*;
- c) *base::fbase()*;
- d) *der::fder()*;

O. If we store the address of a derived class object into a variable whose type is a pointer to the base class, then the object, when accessed using this pointer.

- a) Continues to act like a derived class object.
- b) Continues to act like a derived class object if virtual functions are called.
- c) Acts like a base class object.
- d) Acts like a base class, if virtual functions are called.

P. Which of the following ways are legal to access a class data member using *this* pointer?

- a) *this.x* b) **this.x* c) **(this.x)* d) *(*this).x*

Q. The following can be declared as friend in a class

- a) an object b) a class c) a public data member d) a private data member

R. Which of the following statements are true in C++?

- a) Classes cannot have data as public members.
b) Structures cannot have functions as members.
c) Class members are public by default.
d) None of these.

S. A static function

- a) should be called when an object is destroyed.
b) is closely connected with an individual object of a class.
c) can be called using the class name and function name.
d) is used when a dummy object must be created.

T. A pure virtual function is a virtual function that

- a) has no body b) returns nothing c) is used in base class d) both (a) and (c)

U. If there is a pointer *p* to object of a base class and it contains the address of an object of a derived class and both classes contain a virtual member function *abc()*, then the statement *p->abc()*; will cause the version of *abc()* in the _____ class to be executed.

- a) Base Class
b) Derived class
c) Produces compile time error
d) Produces runtime error

V. Runtime polymorphism is achieved by _____

- a) friend function b) virtual function c) operator overloading d) function overloading

W. Data members which are *static*

- a) cannot be assigned a value
b) can only be used in *static* functions
c) cannot be defined in a *Union*
d) can be accessed outside the class

X. Use of virtual functions implies

- a) overloading. b) overriding. c) static binding. d) dynamic binding.

Y. A friend function to a class, C cannot access

- a) private data members and member functions.
b) public data members and member functions.
c) protected data members and member functions.
d) the data members of the derived class of C.

Question 4

Write a complete C++ program to do the following:

- *Student* is a base class, having two data members: *entryno* and *name*; *entryno* is an integer and *name* is of type characters, 20 characters long. The value of *entryno* is 1 for Science student and 2 for Arts student, otherwise it is an error.
- *Science* and *Arts* are two derived classes, having respectively data items *marks* for science and *marks* for arts.
- Read appropriate data from the keyboard for 3 science and 2 arts students.
- The two derived classes have member function *display* which is used to display *entryno*, *name*, *marks* for science students first and then for arts students.

- i) Write the C++ interface. [5]
- ii) Write the C++ implementation. [15]
- iii) Write a C++ program that tests the created class. [5]

Question 5

- a) Find the errors in the following class and explain how to correct them: [4]

```
class Example
{
public:
    Example( int y = 10 )
        : data( y )
    {
        // empty body
    } // end Example constructor

    int getIncrementedData() const
    {
        return ++data;
    } // end function getIncrementedData

    static int getCount()
    {
        cout << "Data is " << data << endl;
        return count;
    } // end function getCount

private:
    int data;
    static int count;
}; // end class Example
```

- b) Explain the multiple meanings of the operators << and >>. [4]
- c) List five common examples of exceptions. [5]
- d) What does the statement throw; do? [2]
- e) State which of the following are true and which are false. If false, explain why. [10]
- i) The template parameters of a function-template definition are used to specify the types of the arguments to the function, to specify the return type of the function and to declare variables within the function.
 - ii) Keywords typename and class as used with a template type parameter specifically mean “any user-defined class type.”
 - iii) A function template can be overloaded by another function template with the same function name.
 - iv) Template parameter names among template definitions must be unique.
 - v) Each member-function definition outside a class template must begin with a template header.