Subject: OBJECT ORIENTED PROGRAMMING WITH C++

Time: 3 Hours **Max. Marks: 100**

DECEMBER 2010

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after half an hour of the commencement of the examination.**
- **Out of the remaining EIGHT Questions, answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or the best alternative in the following: (2×10)

a. Which of the following is a major feature of object-oriented programming?

(A) Operators **(B)** Encapsulation
(C) Statements **(D)** Variables

b. Given:

```
struct  A {
        int x, y;
} *s;
```

Which of the following is the correct way to access x?

(A) s.x **(B)** s -> x
(C) S.X **(D)** S -> X

c. Which of the following is a valid syntax for default parameters?

(A) int fn(int a, b = 2, c) **(B)** int fn(int a = 1, b, c)
(C) int fn(int a, b = 2, c = 3) **(D)** int fn(int a = 1, b, c = 3)

d. Which of the following is invoked during the creation of an object?

(A) A constructor **(B)** A destructor
(C) A virtual function **(D)** An overloaded function

e. If class A is derived from class B and class B is derived from class C, then such an inheritance is known as

(A) Multiple inheritance **(B)** Single inheritance
(C) Multiple level inheritance **(D)** Protected inheritance

f. A function defined as *void fn(int a) = 0;* is known as

(A) Virtual function **(B)** Static function
(C) Pure virtual function **(D)** Inline function

g. The duplication of inherited members due to multiple paths can be avoided by inheriting the common base class as

(A) Protected **(B)** virtual
(C) private **(D)** Public

h. Which of the following is not a keyword associated with exception handling?

(A) Catch **(B)** Try
(C) throw **(D)** Throwing

i. The benefit in using the _____ lies in the fact that it helps in creating concise code avoiding definition of several overloaded functions.

(A) Header files **(B)** Class
(C) Exceptions **(D)** Templates

j. For some manipulators, it is required to include the following header file in the program:

(A) iomanip **(B)** conio
(C) fstream **(D)** string

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. Briefly explain three main features of object oriented programming. **(6)**

b. Write a program to get an integer value from the user and then display "Welcome" those many times on the screen. **(5)**

c. What is the output of the following code segment? Justify your answer. **(5)**

```
for ( int i = 0; i < 5 ; i ++)
 {
        for ( int j=0; j < 5; j ++ )
        {
                cout << (i * j % 10);
        }
        cout << endl;
}
```

Q.3 a. Write a program to read marks obtained in 5 different subjects by 20 students of a class. After reading the data, calculate and display the percentage of marks obtained by the students of the class along with their roll numbers and names. Define an appropriate array of structures to store the data of the class. **(12)**

b. What will be the output of the following code segment? Justify your answer.

```
int main()
{
```

```
    int i = 10, *pi;
    pi = &i;
    cout << i << " " << *pi << endl;
    *pi = 20;
    cout << i << " " << *pi << endl;
    return 0;
}
```
(4)

Q.4 a. Design a class *Person* that contains appropriate members for storing name (as first name, middle initial and last name), age, address and telephone number. Write a member function readInfo() to read values into these data members. Write another member function printInfo() that prints a person's data in nicely formatted form. **(7)**

b. What are static data members of a class? How are they different from instance members of the class? **(5)**

c. Differentiate between parameter passing by value and passing by reference. Classify whether the following entities are passed by value or by reference: **(4)**
(i) an array (ii) an object
(iii) a structure (iv) a floating point number

Q.5 a. Write a class to represent complex numbers (numbers having the real part and the imaginary part). Also add the following member functions to the class:
(i) constructor to the initialize the members of the class
(ii) to display the complex number
(iii) overload + operator to add two complex numbers **(2+[2×3]=8)**

b. What is a destructor? What rules are applied when a destructor is defined? **(5)**

c. What are copy constructors? **(3)**

Q.6 a. Explain with the help of example, the use of *private*, *public* and *protected* access modifiers. **(9)**

b. What is multiple inheritance? Describe its syntax. **(3)**

c. What will be the output of the following code segment? Justify your answer.

```
class A {
    public:
        A()     {cout << "\nIn A";              }
        ~A()    {cout << "\nDestroying A";     }
    };

class B {
    public:
        B()     {   cout << "\nIn B";           }
        ~B()    {   cout << "\nDestroying B";   }
        };

class C : public A, public B  {
```

```
    public:
        C()     {   cout << "\nIn C";              }
        ~C()    {   cout << "\nDestroying C";     }
};
void main()
{
        C c;
 }
```
(4)

Q.7 a. What is the use of multiple catch blocks with a try block? **(3)**

b. Explain, with the help of an example, what is *rethrowing* an exception? **(4)**

c. Define a base class *Base* having a function with the name *display*. The *display* function should display a message "In display of base class" when invoked. Also define a derived class *Derived* of *Base*. Add a *display* function to *Derived* to display a message "In display of derived class" when invoked. Write the main() function to show the concept of dynamic polymorphism. **(9)**

Q.8 a. What is the need of templates? Briefly explain the different types of templates available in C++. **(6)**

b. Mention what is wrong in the following template definition and then rewrite them to make them legal. **(4)**

(i) template <class A, B, class C>
class testClass { … };

(ii) template <class A, typename B >
A testFunction(A a, B b) { … }

c. Write a function template to search for a number in an array. Both the number and the array are passed as arguments to the function. The function should return the position of the number in the array if the number is present in the array, else it should return -1. Also write the statements to show how the function will be called from the main() function. **(6)**

Q.9 a. What do you understand by streams in C++? List the four pre-defined streams in C++. **(4)**

b. Using the functions of *cout*, write the statements to:

(i) display the floating point numbers in fixed form
(ii) display two significant digits after the decimal for floating point numbers
(iii) display the leading positive sign for integers
(iv) display the data in column width of 30 **(4)**

c. Write a program to open an existing file, count the number of characters in the file and then display it on the screen. **(8)**