2015

Object Oriented Programming
(CSEN 6142)

Time Allotted : 3 hrs   Full Marks : 70

Figures out of the right margin indicate full marks.

**Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.**

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following: 10 x 1=10

(i) If X is a class with n virtual functions, then the class Y inherited in several steps from X but always with single inheritance will have:
(a) Always n virtual functions
(b) n or more virtual functions
(c) 'm' virtual functions where 'm' depends on how far down Y is from X
(d) none of the above.

(ii) The return type of ostream::operator<<(int) is
(a) int   (b) void
(c) ostream   (d) none of the above.

(iii) If 'f' is a virtual function in a class X, then:
(a) 'f' must return an int
(b) 'f' must be overridden in all classes inherited from X
(c) There cannot be any non-virtual function named 'f' with identical signature
(d) None of the above.

(iv) Suppose X is a class with an overloaded operator function '+'. Let x, y, z be pre constructed instances of X. Then the statement X=x+y+z; will mak atleast_____calls to the null constructor of X.
(a) 0   (b) 1   (c) 2   (d) 3.

(v) Which of the following is most true for a "virtual function table
(a) It is a static member of a class
(b) The first entry of the table is always the constructor of the class
(c) All the entries are "pointers to functions"
(d) Both a) and b) above.

(vi) If a class X has a single constructor that is protected, then :
(a) There will be syntax error reported by a C++ compiler
(b) No instance of X or its derived classes will be possible

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(c) No instances of X will be possible but it is possible to derive Y from X and create an instance of Y

(d) None of the above.

(vii) While reading a file if end-of-file is encountered then what value does the object of ifstream return

    (a) 0   (b) -1   (c) Non-zero value(true)   (d) 1.

(viii) Which of the following are provided in Standard Template Library?

    (a) list   (b) graph

    (c) stack   (d) tree.

(ix) Given int *arr_ptr= new int[5]; What is the correct syntax for releasing this allocated memory size of 5 integers

    (a) delete arr_ptr   (b) delete arr_ptr [ ]

    (c) delete [ ] arr_ptr   (d) delete arr_ptr[5].

(x) Pick out the correct statement.

    (a) A friend function may be a member of another class.

    (b) A friend function may not be a member of another class.

    (c) A friend function may or may not be a member of another class.

    (d) None of the mentioned

Group – B

2.(a) Write a class Str with member function rev-str() that reverses a string. Overload rev-str() so that it can be either called with one 'Str' object or two 'Str' objects. When called with one object, have that object contain the reversed string. Return the reversed string in second argument when two objects used.

(b) atof(const char *s), atoi(const char *) and atol(const char*) are C++ standard library functions return numeric value of the string pointed to by s . Can you use a single overloaded function here? If yes show how. If no why not?

(c) What are the advantages and disadvantages of inline functions?

(d) Is a scope resolution operator used while defining a friend function? Give reasons for your answer.

$$8 + 1 + 2 + 1 = 12$$

3.(a) Find the error in the following program and make changes to rectify the error :

```
#include <iostream>
using namespace std;
    class Room{
        int width,height;
        void setValue(int w,int h){
```

```
                width= w; height = h;  }
                };
        int main(){
                Room objRoom;
                objRoom.width= 12;
                return 0;
        }
```

(b) Write a class matrix that has 3x3 matrix member. Member functions should consist of matrixTranspose that returns the matrix object in another matrix object. Write a code fragment to print the value of the transpose of a matrix 'm'.

$4 + 8 = 12$

Group – C

4.(a) Briefly describe the concept of operator overloading in C++?

(b) Given a class Complex for Complex numbers (with both real and imaginary as doubles). Implement + , * operator functions and the modulus function.

$2 + 10 = 12$

5. Declare and implement a C++ class to hold a linked list of elements that are integers There must be the 4 methods in your linked list class to do the following operations:
    (i) Add an element at the start of the list.
    (ii) Add an element at the end of the list.
    (iii) Append a list at the end of another list
    (iv) To clear list and reclaim memory

$(2+2+3+3+2) = 12$

Group – D

6.(a) Briefly discuss with examples, how virtual functions can be implemented in an OOPI like C++.

(b) How is virtual function call to code binding done, for arrays of objects?

$5 + 7 = 12$

7. Given following code:
```
        #include<iostream.h>
        #include<stdio.h>
        class base{
            protected :
                    int i, j;
            public:
                    base(int c, int d){printf("In base Constructor\n"); i=c; j=d; }
            ~base(){ printf("in base destructor\n");}
            void set(int a, int b){i=a; j=b;}
```

```
        void show(){cout << i<< " "<< j<<'\n'; }
        };
        class derived1: private base {
                int k;
                void setk(){ set(2,3); k=i * j;}
        public:
                derived1(int a,int b): base(a,b){printf("in derived1 constr\n");     }
                ~derived1(){printf("in derived1 destructor\n");}
                int getk(){return k;}
                void showk(){ show();setk();cout <<"K="<< k <<'\n'; }
        };
        class derived2 : public derived1{
                int m;
                void setm(){derived1 ob(7,7) ; ob.showk();m=2*ob.getk();}
        public:
                derived2(int p int q):derived1(p, q){printf("in derived2 constr\n");     }
                ~derived2(){printf("in derived2 destructor\n");}
                void showm(){ setm();cout<<"m= " << m<<'\n'; }
        };
        int main()
        {
                derived1 ob1(0,0);
                derived2 ob2(1,1);
                ob1.set(1,2);
                ob1.setk();
                ob1.showk();
                ob2.setm();
                ob2.showm();
                ob2.showk();
                return 0;
        }
```

(i) Which statements will show syntax error in this code?

(ii) Why will there be those errors? Explain.

(iii) By removing those statements ,walk through the program explaining at each statement what is getting done

(iv) What will the output look like?

$$2 + 3 + 4 + 3 = 12$$

Group – E

Suppose X is an abstract base class and we have a container X *, to hold a heterogeneous collection of objects of classes derived from X. What must we do to ensure the destruction of the container object destroys all its contents to the deepest level?

(b) Suppose Zoo is a container class for Animal *, What could be the methods of Zoo and Animal such that with a single C++ statement, it is possible to "feed" all the animals of the Zoo.

$$8 + 4 = 12$$

9.(a) Open 2 files as output and write some lines of text into them. Next open them one after the other as input and read line by line followed by write to the terminal line by line.

(b) What value does ofstream object return if error occurs in the file operation?

(c) What is wrong with this fragment? Show one way to fix it.

```
try{
..............
    throw(10);
}
catch(int*p){
.................
}
```

What catch expression catches all types of exceptions?

$$8 + 1 + (1+2) = 12$$