COMPUTER SCIENCE-2010

Time allowed : 3hours]   *[Maximum Marks :70*

Instructions   *(i)*   **All** *questions are compulsory*
           (ii)   *Programming Language : C++*

1.   (a)   What is the difference between automatic type conversion and type casting? Also, give a suitable C++ code to illustrate both.   **2**

     (b)   Which C++ header file(s) will be essentially required to be included to run/execute the following C++ code?   **1**

```
void main ( )
{
        int Eno = 123, char EName[] = "Rehan Swarup";
        cout << setw(5) << Eno << setw(25) << EName << endl;
}
```

     (c)   Rewrite the following C++ program code after removing the syntax errors(s) (if any). Underline each correction.   **2**

```
include <iostream.h>
class TRAIN
{
        long TrainNo ;
       char Description[25] ;
 public
     void Entry ( )
     {
            cin >> Train No ; gets(Description) ;
     }
     void Display ( )
     {
            cout << TrainNo <<":" << Description << endl ;
     }
};
void main ( )
{
     TRAIN T ;
     Entry.T( ); Display. T( )
}
```

  (d) Find the output of the following program :   **3**

```cpp
 #include<iostream.h>
struct POINT
{ int X, Y, Z;};

void StepIn( POINT &P, int Step =1)
{
        P.X += Step ;
        P.Y -= Step ;
        P.Z += Step;
}

void StepOut (POINT &P, int Step = 1)
{
        P.X -= Step ;
        P.Y += Step ;
        P.Z -= Step;

}

void main()
{
        POINT P1={15,25,5}, P2={10,30,20};
        StepIn(P1);
        StepOut(P2,4);
        cout<<P1.X<<","<<P1.Y<<","<<P1.Z<<endl;
        cout<<P2.X<<","<<P2.Y<<","<<P2.Z<<endl;
        StepIn(P2,12);
        cout<<P2.X<<","<<P2.Y<<","<<P2.Z<<endl;
}
```

e)   Find the output of the following program ;   **2**

```cpp
#include<iostream.h>
#include <ctype.h>
void ChangeIt (char Text[ ], char C)
{
        for (int K=0;Text [K]!='\0' ;K++)
        {
                if (Text[K] >='F' && Text[K] <='L')
                        Text[K]=tolower(Text[K]);
                else if (Text[K]=='E' || Text[K]=='e')
                        Text[K]=C;
                else if (K%2==0)
                        Text[K]=toupper(Text[K]);
                else
```

```
                              Text[K]=Text[K-1];
                    }
          }

           void main( )
          {
                   char oldText[ ]= "pOwERALone" ;
                   ChangeIt (oldText,'%');
                   cout <<"New TEXT:"<<oldText<<end1;
          }
```

f) The following code is from a game .which generates a set of 4random numbers :Yallav is playing this game .help him to identify the correct option(s)out of the four choices given below as the possible set of such numbers generated from the program code so that he wins the game. Justify your answer.   **2**

```
#include <iostream.h>
#include <stdio.h>
const int LOW = 15 ;
void main( )
{
      randomize( ) ;
      int POINT =5, Number ;
       for (int I = 1 ; I <= 4 ; I ++)
       {
             Number = LOW + random(POINT) ;
             cout << Number << ":" ;
             POINT-- ;
       }
}
```

(i)   19:16:15:18:
(ii)   14:18: 15:16:
(iii)   19:16:14:18:
(iv)   19:16:15:16:

2. (a) What do you understand by Polymorphism ? Also, give an example in C++ to illustrate the same.   **2**

    (b) Answer the questions (i) and (ii) after going through the following class :
                                                                    2

```
class TEST
{
      int Regno, Max, Min, Score ;
   public :
      TEST( )                              //Function 1
```

```
        {
                Regno = 101 ; Max=100; Min = 40 ; score = 75 ;
        }
        TEST(int Pregno, int Pscore)            //Function 2
        {
                Regno = Pregno ; Max = 100 ; Min = 40 ; Score = Pscore ;
        }
        ~TEST( )                                //Function 3
        {
                cout << "TEST Over" << endl ;
        }
        void Display( )                         //Function 4
        {
                cout << Regno << ":" <<Max<< ":" << Min << endl ;
                cout << "[Score]" << Score << endl;
        }
    } ;
```

(i) As per Object Oriented Programming, which concept is illustrated by Function 1 and Function 2 together ?

(ii) What is Function 3 specifically referred as ? When do you think, Function 3 will be invoked/called?

c) Define a class ITEM in C++ with the following description :   **4**
    Private Members
    ➢ Code of type integer (Item Code)
    ➢ Iname of type string (Item Name)
    ➢ Price of type float (Price of each item)
    ➢ Qty of type integer (Quantity of item in stock)
    ➢ Offer of type float (Offer percentage on the item)
    ➢ A member function GetOffer( ) to calculate Offer percentage as per the following rule :

    If Qty <= 50   Offer is 0
    If 50 < Qty <= 100   Offer is 5
    If Qty >100   Offer is 10

    Public Members
    ➢ A function GetStock( ) to allow user to enter values for Code, Iname, Price, Qty and call function GetOffer( ) to calculate the offer.
    ➢ A function ShowItem( ) to allow user to view the content of all the data members.

(d) Answer the questions (i) to (iv) based on the following :   **4**

```
        class Chairperson
        {
                long CID ;              //Chairperson Identification Number
```

```cpp
                char CName[20] ;
        protected :
                char Description[40] ;
                void Allocate( ) ;
        public :
                Chairperson( ) ;
                void Assign( ) ;
                void Show( ) ;
        } ;

        class Director
        {
                int DID ;                //Director ID
                char Dname[20] ;
        protected :
                char Profile[30] ;
        public :
                Director( ) ;
                void Input( ) ;
                void output( ) ;
        } ;

        class Company : private Chairperson, public Director
        {
                int CID ;                //Company ID
                char City[20] , Country[20] ;
        public :
                Company( ) ;
                void Enter( ) ;
                void Display( ) ;
        } ;
```

(i)   Which type of Inheritance out of the following is specifically is illustrated in the above C++ code ?
(a) Single Level Inheritance   (b) Multi Level Inheritance
(c) Multiple Inheritance

(ii) Write the names of data members, which are accessible by objects of class type Company.

(iii) Write the name of all the member functions, which are accessible by objects of class type Company.

(iv) Write the names of all members, which are accessible from member functions of class Director.

3. (a) Write a function CHANGE( ) in C++, which accepts an array of integer and its size as parameters and divide all those array elements by 7 which are divisible by 7 and multiply other array elements by 3. **3**

Sample Input Date of the array

A[O]	A[1]	A[2]	A[3]	A[4]
21	12	35	42	18

Content of the array after calling CHANGE( ) function

A[O]	A[1]	A[2]	A[3]	A[4]
3	36	5	6	54

(b) An array p[50][60] is stored in the memory along the column with each of the element occupying 2bytes, find out the memory location for the element p[10][20], if the Base Address the array is 6800. **3**

(c) Write a complete program in C++ to implement a dynamically allocated Stack containing names of Countries. **4**

(d) Write a function int SKIPSUM(int A[] [3], int N, int M) in C++ to find and return the sum of elements from all alternate elements of a two-dimensional array starting from A[0][0]. **2**
[Hint: If the following is the content of the array

A[0][0]	A[0][0]	A[0][0]
4	5	1
A[0][0]	A[0][0]	A[0][0]
2	8	7
A[0][0]	A[0][0]	A[0][0]
9	6	3

The function SKIPSUM( ) should add elements A[0][0],A[0][2], A[1][1], A[2][0] and A[2][2].]

(e) Evaluate the following postfix notation of expression :
(Show status of Stack after each operation) **2**

    False, True, NOT, OR, True, False, AND, OR

4. (a) Observe the program segment given below carefully and fill in the blanks marked as Statement 1 and Statement 2 using tellg ( ) and skeep ( ) functions for performing the required task. **1**

```
#include <fstream. h>
class c1ient
{
      long Cno ; char Name [20], Email [30] ;
   public :
      //Function to allow user to enter the cno,Nme , Email
      void Enter ( ) ;
      // Function to allow user to enter (modify) Email
      void modify ( ) ;
      long ReturnCno( ) { return Cno ; }
} ;

void changeEmail ( )
{      Client C ;
      fstream F ;
      F. open ("INFO.DAT" , ios :: binary |ios :: in|ios :: out) ;
      long Cnoc ; //Client's no. whose Email needs to be changed
      cin >> Cnoc ;
      while (F. read (( char*) &C, sizeof (C)))
      {
              if (Cnoc = = C.Returncno( ))
              {
                      C.Modify( ) ;
                                        //Statement 1
                      int Pos = _____//To find the current position of
                                        //file pointer
                                        //statement 2
                      _____ //To move the file pointer to write
                                        //the modified record back into the
                                        //file for the desired cnoc
                      F.write ((char*) &C, sizeof(C));
              }
      }
      F.close( ) ;
}
```

b) Write a function in C++ to count the words "this" and "these" present in a text
    file "ARTICLE.TXT".   **2**
    [Note that the words "this" and "these" are complete words]

c) Write a function in C++ to search and display the details of all flights, whose
    destination is "Mumbai" from "FLIGHT.DAT". Assuming the binary file is
    containing objects of class.   **3**
     class FLIGHT
    {
          int Fno;   //Flight Number

```
        char From[20] ;                    //Flight Starting point
        char To[20] ;                      //Flight Destination
    public :
        char* GetFrom( ) {return From ;}
        char* GetTo( ) {return To ;}
        void Enter( ) {cin >> Fno ; gets (From) ;gets(To) ; }
        void Display( ) { cout << Fno<< ":" << From << ":" << To << endl ;}
    };
```

5. (a) What do you understand by Candidate Keys in a table ? Give a suitable example
       of Candidate keys from a table containing some meaningful data.   **2**
   (b) Consider the following tables STORE and SUPPLIERS and answer (b1) and
       (b2) parts of this question.   **4**

Table: STORE

ltem No	Item	Scode	Qty	Rate	LastBuy
2005	Sharpener Chlassic	23	60	8	31-jun-09
2003	Ball	22	50	25	01-Feb-10
2002	Gel Pen Premium	21	150	12	24-Feb-10
2006	Gel Pen Classic	21	250	20	11-Mar-09
2001	Eraser Small	22	220	6	19-Jan-09
2004	Eraser Big	22	110	8	02-Dec-09
2009	Ball Pen 0.5	21	180	18	03-Nov-09

Table :SUPPLIERS

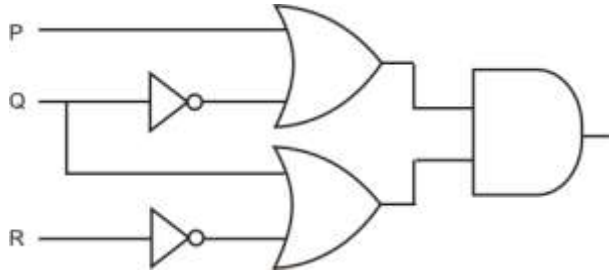| scode	Sname
21	Premium Stationers
23	Soft Plastics
22	Tera Supply

(b1) Write SQL commands for the following statements :
   (i)   To display details of all the items in the Store table in ascending order of
         LastBuy.
   (ii) To display ItemNo and Item name of those items from Store table Whose Rate
         is more than 15 Rupees.
   (iii) To display the details of those items whose Suppliers code (Scode) is 22 or
         Quantity in Store (Qty) is more than 110 from the table Store.
   (iv) To display Minimum Rate of items for each Supplier individually as per
         Scode from the table Store.

(b2) Give the output of the following SQL queries:
   (i)   SELECT COUNT (DISTINCT Scode) FROM Store;
   (ii) SELECT Rate*Qty FROM Store WHERE ItemNO = 2004;
   (iii) SELECT Item, Sname FROM Store S, Suppliers P WHERE S.Scode =
         P.Scode AND Item No = 2006 ;

(iv) SELECT MAX (LastBuy) FROM Store ;

6. (a) Verify the following algebraically. **2**
   (A'+B').(A+B) = A'.B'+A.B'

   (b) Write the equivalent Boolean Expression for the following Logic circuit : **2**

   (c) Write the POS form of Boolean function H, which is represented in a truth table as follows : **1**

X	Y	Z	H
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

   (d) Reduce the following Boolean expression using *K*-map :
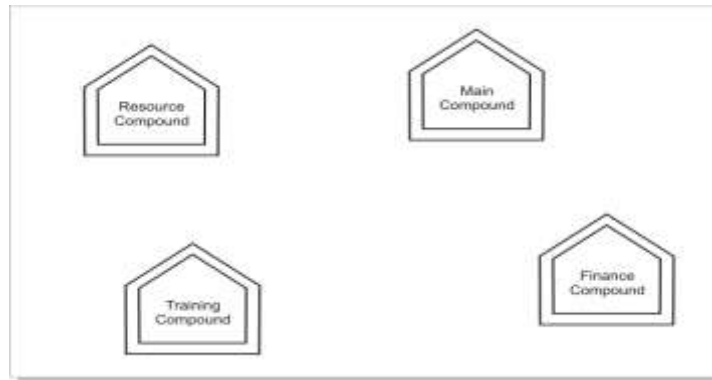   F (U,V,W,Z)= (3,5,7,10,11,13,15,) **3**

7. (a) What was the role of ARPANET in Computer Network ? **1**

   (b) Which of the following is not a unit for data transfer rate ? **1**
   (i) bps (ii) abps (iii) gbps (iv) kbps

   (c) What is the difference between Trojan Horse and Virus in terms of computers? **1**

   (d) What term we use for a software/hardware device, which is used to block, unauthorized access while permitting authorized communications. This term is also used for a device or set of devices configured to permit, deny, encrypt, or proxy all (in and out)computer traffic between different security domains based upon a set of rules and other criteria. **1**

(e) "Learn Together" is an educational NGO. It is setting up its new campus at Jabalpur for its webbased activities. The campus has 4 compounds as shown in the diagram below: **4**

Center to center distance between various Compounds as per architectural drawings(in meter) is as follows:

Main Compound to Resource Compound	110 m
Main Compound to Training Compound	115 m
Main Compound to Finance Compound	35m
Resource Compound to Training Compound	25 m
Resource Compound to Finance Compound	135 m
Training Compound to Finance Compound	100m

Expected Number of Computer in each Compound is as follows:

Main Compound	5
Resource Compound	15
Training Compound	150
Account Compound	20

(e1)   Suggest a cable layout of connection between the compounds.

(e2)   Suggest the most suitable place (i.e., compound) to house the server for this NGO. Also provide a suitable reason for your suggestion.

(e3)   Suggest the placement of the following devices with justification:
        (i) Repeater
        (ii) Hub/switch

(e4)   The NGO is planning to connect its International office situated in Mumbai, which out of following wired communication link, you will suggest for a very speed connectivity ?:
        (i)   Telephone Analog Line
        (ii)   Optical Fiber

          (iii)   Ethernet Cable

(f)   Write the full of the following: **1**
           (f1) GNU
           (f2) XML

(g)   Write one advantages of each for open Sources and Proprietary software.**1**