

Roll No.

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Candidates must write the Code on  
the title page of the answer-book.

- Please check that this question paper contains **16** printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains **7** questions.
- **Please write down the Serial Number of the question before attempting it.**
- 15 minutes time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the student will read the question paper only and will not write any answer on the answer script during this period.

## **COMPUTER SCIENCE**

**Time allowed : 3 hours****Maximum Marks : 70*****Instructions :***

- (i) **All questions are compulsory.**
  - (ii) **Programming Language : C++**
- 
1. (a) What is the difference between call by value and call by reference ? 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 Rno=24; char Name[]="Amen Singhania";
    cout<<setw(10)<<Rno<<setw(20)<<Name<<endl;
}
```

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

```
include <iostream.h>
class FLIGHT
{
    long FlightCode;
    char Description[25];
public
    void AddInfo()
    {
        cin>>FlightCode; gets>Description);
    }
    void ShowInfo()
    {
        cout<<FlightCode<<" :"<<Description<<endl;
    }
};
void main()
{
    FLIGHT F;
    AddInfo.F(); ShowInfo.F();
}
```

(d) Find the output of the following program :

3

```
#include <iostream.h>

struct THREE_D
{ int X,Y,Z;};

void MoveIn(THREE_D &T, int Step=1)
{
    T.X+=Step;
    T.Y-=Step;
    T.Z+=Step;
}

void MoveOut(THREE_D &T, int Step=1)
{
    T.X-=Step;
    T.Y+=Step;
    T.Z-=Step;
}

void main()
{
    THREE_D T1={10,20,5},T2={30,10,40};
    MoveIn(T1);
    MoveOut(T2,5);
    cout<<T1.X<<" , "<<T1.Y<<" , "<<T1.Z<<endl;
    cout<<T2.X<<" , "<<T2.Y<<" , "<<T2.Z<<endl;
    MoveIn(T2,10);
    cout<<T2.X<<" , "<<T2.Y<<" , "<<T2.Z<<endl;
}
```

(e) Find the output of the following program :

2

```
#include <iostream.h>
#include <ctype.h>
void MyCode(char Msg[], char CH)
{
    for (int Cnt=0;Msg[Cnt]!='\0';Cnt++)
    {
        if (Msg[Cnt]>='B' && Msg[Cnt]<='G')
            Msg[Cnt]=tolower(Msg[Cnt]);
        else
            if (Msg[Cnt]=='A' || Msg[Cnt]=='a')
                Msg[Cnt]=CH;
            else
                if (Cnt%2==0)
                    Msg[Cnt]=toupper(Msg[Cnt]);
                else
                    Msg[Cnt]=Msg[Cnt-1];
    }
}
void main()
{
    char MyText[]="ApEACeDriVE";
    MyCode(MyText, '@');
    cout<<"NEW TEXT:"<<MyText<<endl;
}
```

- (f) The following code is from a game, which generates a set of 4 random numbers. Praful 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 <stdlib.h>
const int LOW=25;
void main()
{
    randomize();
    int POINT=5,Number;
    for (int I=1;I<=4;I++)
    {
        Number=LOW+random(POINT);
        cout<<Number<<" :";
        POINT--;
    }
}
```

- (i) 29:26:25:28:
- (ii) 24:28:25:26:
- (iii) 29:26:24:28:
- (iv) 29:26:25:26:

2. (a) What do you understand by Data Encapsulation and Data Hiding ? Also, give an example in C++ to illustrate both.

2

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

2

```
class Exam
{
    int Rno,MaxMarks,MinMarks,Marks;
public:
    Exam() //Module 1
    {
        Rno=101;MaxMarks=100;MinMarks=40;Marks=75;
    }
    Exam(int Prno,int Pmarks) //Module 2
    {
        Rno=Prno;MaxMarks=100;MinMarks=40;Marks=Pmarks;
    }
    ~Exam() //Module 3
    {
        cout<<"Exam Over"<<endl;
    }
    void Show() //Module 4
    {
        cout<<Rno<<":"<<MaxMarks<<":"<<MinMarks<<endl;
        cout<<" [Marks Got]"<<Marks<<endl;
    }
};
```

- (i) As per Object Oriented Programming, which concept is illustrated by **Module 1** and **Module 2** together ?
- (ii) What is **Module 3** referred as ? When do you think, **Module 3** will be invoked/called ?

(c) Define a class STOCK in C++ with following description :

4

#### Private Members

- ICode of type integer (Item Code)
- Item of type string (Item Name)
- Price of type float (Price of each item)
- Qty of type integer (Quantity in stock)
- Discount of type float (Discount percentage on the item)
- A member function FindDisc() to calculate discount as per the following rule :

If Qty<=50              Discount is 0

If 50<Qty<=100        Discount is 5

If Qty>100              Discount is 10

#### Public Members

- A function Buy() to allow user to enter values for ICode, Item, Price, Qty and call function FindDisc() to calculate the Discount.
- A function ShowAll() 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 Director
{
    long DID;           //Director Identification Number
    char Name[20];
protected:
    char Description[40];
    void Allocate();
public:
    Director();
    void Assign();
    void Show();
};

class Factory:public Director
{
    int FID;           //Factory ID
    char Address[20];
protected:
    int NOE;           //No. of Employees
public:
    Factory();
    void Input();
    void Output();
};

class ShowRoom:private Factory
{
    int SID;           //Showroom ID
    char City[20];
public:
    ShowRoom();
    void Enter();
    void Display();
};

```

- (i) Which type of inheritance out of the following is illustrated in the above C++ code ?
- Single Level Inheritance
  - Multi Level Inheritance
  - Multiple Inheritance
- (ii) Write the names of data members, which are accessible by objects of class type ShowRoom.
- (iii) Write the names of all member functions which are accessible by objects of class type ShowRoom.
- (iv) Write the names of all members, which are accessible from member functions of class Factory.
3. (a) Write a function REASSIGN() in C++, which accepts an array of integers and its size as parameters and divide all those array elements by 5 which are divisible by 5 and multiply other array elements by 2.

Sample Input Data of the array

| A[0] | A[1] | A[2] | A[3] | A[4] |
|------|------|------|------|------|
| 20   | 12   | 15   | 60   | 32   |

Content of the array after calling REASSIGN() function

| A[0] | A[1] | A[2] | A[3] | A[4] |
|------|------|------|------|------|
| 4    | 24   | 3    | 12   | 64   |

- (b) An array T[90][100] is stored in the memory along the column with each of the elements occupying 4 bytes. Find out the memory location for the element T[10][40], if the Base Address of the array is 7200.
- (c) Write a complete program in C++ to implement a dynamically allocated Queue containing names of Cities.

- (d) Write a function `int ALTERSUM(int B[][][5], 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  $B[0][0]$ . 2

Hint :

If the following is the content of the array

| <b>B[0][0]</b> | <b>B[0][1]</b> | <b>B[0][2]</b> |
|----------------|----------------|----------------|
| 4              | 5              | 1              |
| <b>B[1][0]</b> | <b>B[1][1]</b> | <b>B[1][2]</b> |
| 2              | 8              | 7              |
| <b>B[2][0]</b> | <b>B[2][1]</b> | <b>B[2][2]</b> |
| 9              | 6              | 3              |

The function should add elements  $B[0][0]$ ,  $B[0][2]$ ,  $B[1][1]$ ,  $B[2][0]$  and  $B[2][2]$ .

- (e) Evaluate the following postfix notation of expression : 2

(Show status of Stack after each operation)

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

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

```
#include <fstream.h>
class Customer
{
    long Cno; char Name[20], Mobile[12];
public:
    //Function to allow user to enter the Cno, Name, Mobile
    void Enter();
    //Function to allow user to enter (modify) mobile number
    void Modify();
    //Function to return value of Cno
    long GetCno() {return Cno;}
};
```

```
void ChangeMobile()
{
    Customer C;
    fstream F;
    F.open("CONTACT.DAT", ios::binary|ios::in|ios::out);
    long Cnoc; //Customer no. whose mobile number needs to be changed
    cin>>Cnoc;
    while (F.read((char*)&C,sizeof(C)))
    {
        if (Cnoc==C.GetCno())
        {
            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 onto the file
            //for the desired Cnoc
            F.write((char*)&C,sizeof(C));
        }
    }
    F.close();
}
```

- (e1) Suggest a cable layout of connections between the buildings.
- (e2) Suggest the most suitable place (i.e. building) 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 Delhi. Which out of the following wired communication links, will you suggest for a very high speed connectivity ?
- (i) Telephone Analog Line
  - (ii) Optical Fiber
  - (iii) Ethernet Cable
- (f) Write the full forms of the following : 1
- (f1) FTP
  - (f2) FSF
- (g) Name any two common Web browsers. 1