Assignment on
Classes and Objects + Inheritance

1. Descriptive Question

(i) Differentiate between members, which are present within the private visibility mode with those which are present within the public visibility mode. ***(CBSE 2011)***

(ii) What is the difference between the members in private visibility mode and the members in public visibility mode inside a class? Also give a suitable C++ code to illustrate both. ***(CBSE 2012)***

(iii) Write any two differences between constructor and destructor. Write the function headers for constructor and destructor of a class *Member*. ***(CBSE 2013)***

(iv) Write 4 characteristics of a constructor function used in a class. ***(CBSE 2014)***

(v) Define a class? How it is different from a structure?

(vi) Define data hiding, data encapsulation, inheritance, and abstraction?

(vii) What is a copy constructor? State when a copy constructor is invoked?

2. Finding Errors

Rewrite each of the following programs after removing the syntactical error(s), if any:

(i)
```
#include <iostream.h>
struct Pixels
{     int color, style; }
void ShowPoint(Pixels P)
{     cout<<P.color, P.style<<endl;}

void main()
{     Pixels Point1 = (5, 3);
      ShowPoint (Point1)
      Pixels Point2 = Point1
      color.Point1 += 2;
      ShowPoint(Point2);
}
```

(ii)
```
#include <iostream.h>
void main()
{ struct movie
  { char movie_name[20];
    char movie_type;
    int ticket_cost = 100;
  } MOVIE;
  gets(movie_name);
  gets(movie_type);
}
```

(iii)
```
#include [iostream.h]
class PAYITNOW
{  int charge;
  PUBLIC:
   void Raise() {cin>>charge;}
   void Show() {cout<<charge;}
};
```

```
void main()
{     PAYITNOW P;
      P.Raise();
      Show();
}
```

(iv)
```
#include [iostream.h]
typedef char Text(80);
void main()
{  Text T="Indian";
   int Count = strlen(T);
   cout<<T<<'has'<<Count<<'characters'<<endl;
}
```
(CBSE 2011)

(v)
```
#include <iostream.h>
class BOOK
{     long BId, Qty;
  Public:
      void Purchase() {cin>>BId>>Qty;}
   void Sale
   {  cout<<setw(5)<<BId<<"Old:"<<Qty<<endl;
      cout<<"New:"<<--Qty<<endl;
   }
};
void main()
{  BOOK B;
   B.Purchase();
   Sale();
   B.Sale()
}
```
(CBSE 2012)

3. Finding Output

(i)
```
class state
{     char*state_name;
      int size;
   public:
      state() {size=0; state_name = new char[size+1];}
      state (char *s)
      {     size = strlen(s);
            state_name = new char[size+1];
            strcpy(state_name,s);
      }
      void display() { cout<<state_name<<endl;}
      void replace (state &a, state &b)
      {     size = a.size + b.size;
            delete state_name;
            state_name = new char[size+1];
            strcpy(state_name, b.state_name);
            strcat(state_name, a.state_name);
      }
};
```

```
void main()
{     char *temp = "Delhi";
      state state1(temp), state2("Nagpur"), state3("Mumbai"), S1, S2;
      S1.replace(state1, state2);
      S2.replace(S1, state3);
      S1.display(); S2.display();
}
```

(ii)
```
#include <iostream.h>
class TRAIN
{
      int Tno, TripNo, PersonCount;
  public:
   TRAIN(int Tmno=1){Tno=Tmno;TripNo=0;PersonCount=0;}
   void Trip(int TC=100){TripNo++;PersonCount+=TC;}
   void Show(){cout<<Tno<<":"<<TripNo<<":"<<PersonCount<<endl;}
};
void main()
{
   TRAIN T(10), N;
   N.Trip();
   T.Show();
   T.Trip(70);
   N.Trip(40);
   N.Show();
   T.Show();
}
```
(CBSE 2012)

(iii)
```
#include <iostream.h>
class Aroundus
{
      int Place, Humidity, Temp;
  public:
      Aroundus(int P=2) {Place=P; Humidity=60; Temp=20;}
   void Hot(int T) {Temp += T;}
   void Humid(int H) {Humidity += H;}
   void JustSee()
   {
      cout<<Place<<":"<<Temp<<"&"<<Humidity<<"%"<<endl;
   }
};
void main()
{  Aroundus A, B(5);
   A.Hot(10);
   A.JustSee();
   B.Humid(15);
   B.Hot(2);
   B.JustSee();
   A.Humid(5);
   A.JustSee();
}
```
(CBSE 2013)

(iv)
```
#include <iostream.h>
class Player
{
   int Score, Level;
   char Game;
  public:
   Player(char GGame='A')
   {  Score=0; Level=1; Game=GGame;}
   void Start(int SC);
   void Next();
   void Disp()
   {
      cout<<Game<<"@"<<Level<<endl;
      cout<<Score<<endl;
   }
};
void main()
{
   Player P, Q('B');
   P.Disp();
   Q.Start(75);
   Q.Next();
   P.Start(120);
   Q.Disp();
   P.Disp();
}
void Player::Next()
{
      Game = (Game == 'A')?'B':'A';
}
void Player::Start(int SC)
{
      Score += SC;
      if (Score>=100)
      Level=3;
   else if (Score>=50)
      Level=2;
   else
      Level=1;
}
```
(CBSE 2014)

4. Questions based on given class

(i) Answer the questions (a) and (b) after going through the following class: *(CBSE 2012)*

```
class Tour
{
   int LocationCode; char Location[20]; float Charges;
  public:
   Tour()                                //Function 1
   {
         LocationCode=1; strcpy(Location,"PURI"); Charges=1200;
   }
```

```
    void TourPlan(float C)        //Function 2
    {
          cout<<PlaceCode<<":"<<Place<<":"<<Charges<<endl;
          Charges += 100;
    }
    Tour (int LC, char L[], float C)    //Function 3
    {
          LocationCode=LC; strcpy(Location, L); Charges = C;
    }
    ~Tour()                             //Function 4
    {
          cout<<"Tour Plan cancelled";
    }
};
```

(a) In Object Oriented Programming, what are Function 1 and Function 3 combined together referred as?

(b) In Object oriented Programming, which concept is illustrated by Function 4? When is this function called/invoked?

(ii) Answer the questions (a) and (b) after going through the following class: *(CBSE 2013)*

```
class Motor
{     int MotorNo, Track;
   public:
      Motor();           //Function 1
      Motor(int MN);     //Function 2
      Motor(Motor &m);   //Function 3
      void Allocate();   //Function 4
      void Move();       //Function 5
};
void main()
{  Motor M;
         .
         .
}
```

(a) Out of the following, which of the options is correct for calling Function 2?

Option 1 – Motor N(M);

Option 2 – Motor P(10);

(b) Name the feature of Object Oriented Programming, which is illustrated by Function 1, Function 2 and Function 3 combined together.

(iii) Answer the questions (a) and (b) after going through the following class: *(CBSE 2014)*

```
class Health
{
      int PId, DId;
   public:
      Health(int PPId);  //Function 1
```

```
        Health();          //Function 2
        Health(Health &H); //Function 3
        void Entry();      //Function 4
        void Display();  //Function 5
};
void main()
{  Health H(20);          //Statement 1
}
```

(a) Which of the function out of Function 1, 2, 3, 4, or 5 will get executed when the statement 1 is executed in the above code?

(b) Write a statement to declare a new object G with reference to an existing object H using Function 3.

5. Define classes

(i) Define a class Candidate with the following specifications: *(CBSE 2011)*

Private members:

- A data member RNo (Registration Number) of type long
- A data member Name of type string
- A data member Score of type float
- A data member Remarks of type string
- A member function AssignRem() to assign remarks as per the Score obtained by a candidate. Score range and the respective Remarks are shown as follows:

Score	**Remarks**
>=50	Selected
Less than 50	Not selected

Public members:

- A function ENTER() to allow the user to enter values for RNo, name, Score & call function AssignRem() to assign the Remarks.
- A function DISPLAY() to allow the user to view the contents of all the data members.

(ii) Define a class SUPPLY with the following specifications: *(CBSE 2012)*

Private members:

- Code of type int
- FoodName of type string
- Sticker of type string
- FoodType of type string
- A member function GetType() to assign the following values for FoodType as per the given Sticker:

Sticker	**FoodType**
GREEN	Vegetarian
YELLOW	Contains Egg
RED	Non-Vegetarian

Public members:

- A function FoodIn() to allow the user to enter values for Code, FoodName, Sticker and call function GetType() to assign respective FoodType.
- A function FoodOut() to allow the user to view the content of all the data members.

(iii) Define a class Tourist with the following specifications: *(CBSE 2013)*

Data members:

- Carno – To store Car No
- Origin – To store Place name
- Destination – To store Place name
- Type – To store Car type such as 'E' for economy
- Distance – To store the distance in Km
- Charge – To store the Car Fare

Mamber Functions:

- A constructor to initialize Type as 'E' and Fare as 250
- A function CalcCharge() to calculate fare as per the following criteria:

Type	**Charge**
'E'	16*Distance
'A'	22*Distance
'L'	30*Distance

- A function ENTER() to allow the user to enter values for CarNo, Origin, Destination, Type, and Distance. Also, this function should call CalcCharge() to calculate Fare.
- A function Show() to display the content of all the data members on screen.

(iv) Define a class CABS in C++ with the following specifications: *(CBSE 2014)*

Data members:

- CNo – To store Cab No.
- Type – To store character 'A', 'B', or 'C' as City Type
- PKM – To store per Kilo Meter charges
- Dis – To store distance travelled (in KM)

Mamber Functions:

- A constructor function to initialize Type as 'A' and CNo as '1111'
- A function Charges() to assign PKM as per the following table:

Type	**PKM**
'A'	25
'B'	20
'C'	15

- A function Register() to allow the administrator to enter values for CNo, and Type. Also, this function should call Charges() to assign PKM charges.
- A function ShowCab() to allow the user to enter the value of Distance and display CNo, Type, PKM, PKM*Distance (as Amount) on screen.

(v) Define a class TravelPlan in C++ with the following descriptions:

Private members:

- PlanCode of type long
- Place of type character array (string)

- No_of_Travellers of type integer
- No_of_Buses of type integer

Public Members:

1. A constructor to assign initial values of PlanCode as 1001, Place as "Agra", No_of_Travellers as 5, No_of_buses as 1.
2. A function NewPlan() which allows the user to enter PlanCode, Place, and No_of_Travellers. Also assign the value to No_of_Buses as per the following conditions:

No_of_travellers	No_of_Buses
Less than 20	1
20-39	2
40 or more	3

(vi) Declare a class TEST with the following descriptions:

Private members:

- TestCode of type integer
- Description of type string
- NoCandidate of type integer
- CenterReqd (No. of centers required) of type integer
- A member function CALCNTR() to calculate and return the no. of centers as (NoCandidate/100+1)

Public members:

- A function SCHEDULE() to allow user to enter values for TestCode, Description, and NoCandidate and call function CALCNTR() to calculate the number of centres.
- A function DISPTEST() to allow the user to view the contents of all the data members.

(vii) Declare a class FLIGHT with the following descriptions:

Private members:

- A data member FlightNumber of type integer
- A data member Destination of type string
- A data member Distance of type float
- A data member Fuel of type float
- A member function CALFUEL() to calculate the value of fuel as per the following criteria:

Distance	Fuel
<=1000	500
>= 1000 and <= 2000	1100
> 2000	2200

Public members:

- A function FEEDINFO() to allow user to enter values for Flight Number, Destination, Distance and call function CALFUEL() to calculate the quantity of Fuel.
- A function SHOWINFO() to allow the user to view the contents of all the data members.

6. Inheritance

(i) Answer the questions (a) to (d) based on the following:

```
class CUSTOMER
{
        int Cust_no;
        char Cust_Name[20];
    protected:
        void Register();
```

```
      public:
         CUSTOMER();
         void Status();
};
class SALESMAN
{
         int Salesman_no;
         char Salesman_Name[20];
      protected:
         float Salary;
      public:
         SALESMAN();
         void Enter();
         void Show();
};
class SHOP : private CUSTOMER , public SALESMAN
{        char Voucher_No[10];
         char Sales_Date[8];
      public:
         SHOP();
         void Sales_Entry();
         void Sales_Detail();
};
```

a. Write the names of data members which are accessible from objects belonging to class CUSTOMER.
b. Write the names of all the member functions which are accessible from objects belonging to class SALESMAN.
c. Write the names of all the members which are accessible from member functions of class SHOP.
d. How many bytes will be required by an object belonging to class SHOP?

(ii) Consider the following class declaration and answer the questions that follow:

```
class Mydata
{ protected:
       int data;
   public:
      void get_mydata(int);
      void manip_data(int);
      void show_data(int);
};
void mydata1 : private Mydata
{  protected:
      int data1;
   public:
      void get_mydata1(int);
      void show_data1(int);
};
void person : public mydata1
{   public:
      void show_data2()
};
```

a. Name all the base classes and their derived classes.
b. Name data and functions inherited by class person.
c. Name the data and function members which can be accessed by the objects of class 'person'.
d. Name the class(es) in which data1 can be accessed.

(iii) Consider the following class declaration and answer the questions:

```
class zoo
{     char location[20];
   protected:
      int no_of_animals;
   public:
      void inputdata(char, int);
      void outputdata();
};
class animal : protected zoo
{     int tail;
   protected:
      int legs;
   public:
      void readdata(int, int);
      void writedata();
};
class carnivorous:private animal
{     int paw_size;
    public:
      void fetchdata(int);
      void displaydata();
};
```

a. Name the base class and the derived class of the class animal.
b. Name the data member(s) that can be accessed from function displaydata().
c. Name the data member(s) that can be accessed by an object of carnivorous class.
d. Is the member function outputdata() accessible to the objects of animal class?

(iv) Find the output of the following program:

```
#include <iostream.h>
#include <conio.h>
class base
{   private:
      int x;
      float y;
    public:
      base()
      {     cout<<"\nbase CC"; }

      void show()
      { cout<<"\n I am base"; }

      ~base()
      {     cout<<"\nbase DC"; }
};
```

```
class der1 : public base
{   private:
      int x;
      float y;
      base ob;
    public:
      void show()
      { cout<<"\n I am derived1"; }
      der1()
      {     cout<<"\nder1 CC";   }
      ~der1()
       {    cout<<"\nder1 DC";   }
};

class der2 : public der1
{  private:
      int x;
      float y;
      der1 od1;
   public:
      void show()
      { cout<<"\n I am derived2"; }
      der2()
      {     cout<<"\nder2 CC";   }

      ~der2()
     {      cout<<"\nder2 DC";   }
};
void main()
{     der2 d2;
      d2.show();
      d2.der1::show();
      d2.base::show();
}
```

(v) Answer the questions (a) to (d) based on the following: ***(CBSE 2011)***

```
class Student
{
      int RNo;
      char name[20];
      float marks;
  protected:
      void Result();
  public:
      Student();
      void Register(); void Display();
};
class Faculty
{
      long FCode;
      char FName[20];
```

```
  protected:
      float pay;
  public:
      Faculty();
      void Enter();
      void show();
};
class Course:public Student, private Faculty
{
      long CCode[10]; char courseName[50];
      char StartDate[8], EndDate[8];
  public:
      Course();
      void Commence();
      void CDetail();
};
```

a. Which type of inheritance is illustrated in the above C++ code?
b. Write the names of all the data member(s), which is/are accessible from member function Commerce of class Course.
c. Write the names of member functions, which are accessible from objects of class Course.
d. Write the names of all the members, which are accessible from objects of class Faculty.

(vi) Answer the questions (a) to (d) based on the following: ***(CBSE 2012)***

```
class ORGANIZATION
{
      char Address[20];
      double Budget, Income;
  protected:
      void Compute();
  public:
      ORGANIZATION();
      void Get();
      void show();
};
class WORKAREA: public ORGANIZATION
{
      char Address[20];
      int Staff;
  protected:
      double Pay;
      void Calculate();
  public:
      WORKAREA();
      void Enter();
      void Display();
};
class SHOWROOM:private ORGANIZATION
{
      char Address[20];
      float Area; double Sale;
  public:
```

```
        SHOWROOM();
        void Enter();
        void Show();
};
```

a. Name the type of inheritance is illustrated in the above C++ code?
b. Write the names of data members, which are accessible from member functions of class SHOWROOM.
c. Write the names of all the member functions, which are accessible from objects belonging to class WORKAREA.
d. Write the names of all the members, which are accessible from objects of class SHOWROOM.

(vii) Answer the questions (a) to (d) based on the following: ***(CBSE 2013)***

```
class Student
{
        int Class, Rno;
        char Section;
  protected:
        char SName[20];
  public:
        Student();
        void Stentry();
        void Stdisplay();
};
class Score: private Student
{
        float Marks[5];
  protected:
        char Grade[5];
  public:
        Score();
        void Sentry();
        void Sdisplay();
};
class Report:public Score
{
        float Total, Avg;
  public:
        char OverallGrade, Remarks[20];
        Report();
        void REvaluate();
        void RPrint();
};
```

a. Which type of inheritance is shown in the above example?
b. Write the names of those data members, which can be directly accessed from the objects of class Report.
c. Write the names of those member functions, which can be directly accessed from the objects of class Report.
d. Write the names of those data members, which can be directly accessed from the Sentry() function of class Score.

(viii) Answer the questions (a) to (d) based on the following: ***(CBSE 2014)***

```
class Campus
{     long Id;
      char City[20];
  protected:
      char Country[20];
  public:
      Campus();
      void Register();
      void Display();
};
class Dept: private Campus
{
      long DCode[10];
      char HOD[20];
  protected:
      double Budget;
  public:
      Dept();
      void Enter();
      void Show();
};
class Applicant:public Dept
{
      long RegNo;
      char Name[20];
  public:
      Applicant();
      void Enrol();
      void View();
};
```

a. Which type of inheritance is shown in the above example?
b. Write the names of those member functions, which are directly accessed from the objects of class Applicant.
c. Write the names of those data members, which can be directly accessible from the member functions of class Applicant.
d. Is it possible to directly call the function Display() of class University from an object of class Dept? (Answer as Yes or No).