C++ Assignments (Basic): Topics Part 1 : : Loops, functional-style

1. Write a program in C++ to print a rectangular form of “welcome” string as below.

```
W e l c o m e
e           m
l           o
c           c
o           l
m           e
e m o c l e W
```

2. Write a program in C++ to find Size of fundamental data types.
Sample Output:

```
Find Size of fundamental data types :
------------------------------------------
The sizeof(char) is : 1 bytes
The sizeof(short) is : 2 bytes
The sizeof(int) is : 4 bytes
The sizeof(long) is : 8 bytes
The sizeof(long long) is : 8 bytes
The sizeof(float) is : 4 bytes
The sizeof(double) is : 8 bytes
The sizeof(long double) is : 16 bytes
The sizeof(bool) is : 1 bytes
```

3. Write a program in C++ to check the upper and lower limits of integer.
Expected Output:

```
Check the upper and lower limits of integer :
--------------------------------------------------
The maximum limit of int data type : 2147483647
The minimum limit of int data type : -2147483648
The maximum limit of unsigned int data type : 4294967295
The maximum limit of long long data type : 9223372036854775807
The minimum limit of long long data type : -9223372036854775808
The maximum limit of unsigned long long data type : 18446744073709551615
The Bits contain in char data type : 8
The maximum limit of char data type : 127
The minimum limit of char data type : -128
The maximum limit of signed char data type : 127
The minimum limit of signed char data type : -128
The maximum limit of unsigned char data type : 255
The minimum limit of short data type : -32768
The maximum limit of short data type : 32767
The maximum limit of unsigned short data type : 65535
```

4. Write a program in C++ to calculate the volume of a sphere/ cube/ cylinder.
Sample output:

```
Calculate the volume of a sphere :
-------------------------------------
Input the radius of a sphere : 6
The volume of a sphere is : 904.32
```

```
Calculate the volume of a cube :
---------------------------------------
Input the side of a cube : 5
The volume of a cube is : 125

Calculate the volume of a cylinder :
-----------------------------------------
Input the radius of
the cylinder : 6
Input the height of the cylinder : 8
The volume of a cylinder is : 904.32
```

5. Write a program in C++ to find the Area and Perimeter of a Rectangle / Triangle using Heron's Formula.
   Sample Output:

```
Find the Area and Perimeter of a Rectangle :
-------------------------------------------------
Input the length of the rectangle : 10
Input the width of the rectangle : 15
The area of the rectangle is : 150
The perimeter of the rectangle is : 50
```

```
Find the area of any triangle using Heron's Formula :
----------------------------------------------------------
Input the length of 1st side of the triangle : 5
Input the length of 2nd side of the triangle : 5
Input the length of 3rd side of the triangle : 5
The area of the triangle is : 10.8253
```

6. Write a program in C++ to convert temperature in Celsius to Fahrenheit and vice-versa.

   Sample Output:

```
Convert temperature in Celsius to Fahrenheit :
---------------------------------------------------
Input the temperature in Celsius : 35
The temperature in Celsius : 35
The temperature in Fahrenheit : 95
```

```
Convert temperature in Fahrenheit to Celsius :
---------------------------------------------------
Input the temperature in
```

```
Fahrenheit : 95
The temperature in Fahrenheit : 95
The temperature in Celsius : 35
```

7. Write a program in C++ to find the third angle of a triangle.
   Sample Output:

   ```
   Find the third angle of a triangle :
   -----------------------------------------
   Input
   the 1st angle of the triangle : 30
   Input the 2nd angle of the triangle : 60
   The 3rd of the triangle is : 90
   ```

8. Write C++ program with Shakuntala Devi’s numbers:
   a. Find a number is Shakuntala Devi’s number of not.
   b. Print range of Shakuntala Devi’s numbers.

9. Implement following shapes, taking n as input :
   Example :

   ```
    Enter n value : 4
      *
     * *
    *  *  *
   *  *  *  *
    *  *  *
     *  *
       *


   ********
   ***  ***
   **    **
   *      *
   **    **
   ***  ***
   ********
   ```

10. Define a class student with the following specification

Private members of class student

admno integer

sname 20 character

eng. math, science float

total float

ctotal() a function to calculate eng + math + science with float return type.

Public member function of class student

Takedata() Function to accept values for admno, sname, eng, science and invoke ctotal() to calculate total.

Showdata() Function to display all the data members on the screen.

11. Define a class in C++ with following description:

Private Members

A data member Flight number 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
more than 1000 and <=2000	1100
more than 2000	2200

Public Members

A function FEEDINFO() to allow user to enter values for Flight Number, Destination, Distance & call function CALFUEL() to calculate the quantity of Fuel

A function SHOWINFO() to allow user to view the content of all the data members

12. Define a class BOOK with the following specifications :

Private members of the class BOOK are

BOOK NO integer type

BOOKTITLE 20 characters

PRICE float (price per copy)

TOTAL_COST() A function to calculate the total cost for N number of copies where N is passed to the function as argument.

Public members of the class BOOK are

INPUT() function to read BOOK_NO. BOOKTITLE, PRICE

PURCHASE() function to ask the user to input the number of copies to be

purchased. It invokes TOTAL_COST() and prints the total cost to be paid by the user.
Note : You are also required to give detailed function definitions.

13. Define a class REPORT with the following specification:

Private members :

adno 4 digit admission number
name 20 characters
marks an array of 5 floating point values
average average marks obtained
GETAVG() a function to compute the average obtained in five subject

Public members:

READINFO() function to accept values for adno, name, marks. Invoke the function GETAVG()
DISPLAYINFO() function to display all data members of report on the screen.
You should give function definitions.

14. Write the definition for a class called **Rectangle** that has floating point data members length and width. The class has the following member functions:

void setlength(float) to set the length data member
void setwidth(float) to set the width data member
float perimeter() to calculate and return the perimeter of the rectangle
float area() to calculate and return the area of the rectangle
void show() to display the length and width of the rectangle
int sameArea(Rectangle) that has one parameter of type Rectangle. sameArea returns 1 if the two Rectangles have the same area, and returns 0 if they don't.

1. Write the definitions for each of the above member functions.
2. Write main function to create two rectangle objects. Set the length and width of the first rectangle to 5 and 2.5. Set the length and width of the second rectangle to 5 and 18.9. Display each rectangle and its area and perimeter.
3. Check whether the two Rectangles have the same area and print a message indicating the result. Set the length and width of the first rectangle to 15 and 6.3. Display each Rectangle and its area and perimeter again. Again, check whether the two Rectangles have the same area and print a message indicating the result.

15. Write the definition for a class called **time** that has hours and minutes as integer. The class has the following member functions:

void settime(int, int) to set the specified value in object
void showtime() to display time object

time sum(time) to sum two time object & return time
1. Write the definitions for each of the above member functions.
2. Write main function to create three time objects. Set the value in two objects and call sum() to calculate sum and assign it in third object. Display all time objects.

16. Answer the questions (i) and (iii) after going through the following class:

```
class Seminar
{
    int time;
public:
    Seminar()        //Function 1
    {
        time = 30;
        cout << "Seminar starts now" << endl;
    }
    void lecture()        //Function 2
    {
        cout << "Lectures in the seminar on" << endl;
    }
    Seminar(int duration)        //Function 3
    {
        time = duration;
        cout << "Seminar starts now" << endl;
    }
    ~Seminar()        //Function 4
    {
        cout << "Thanks" << endl;
    }
};
```

i. Write statements in C++ that would execute Function 1 and Function 3 of class Seminar.

ii. In Object Oriented Programming, what is Function 4 referred as and when does it get invoked/called?

iii. In Object Oriented Programming, which concept is illustrated by Function 1 and Function 3 together?

17. Answer the questions (i) and (ii) after going through the following class:

```
class Test
{
    char paper[20];
    int marks;
public:
    Test ()    // Function 1
    {
        strcpy (paper, "Computer");
        marks = 0;
    }
    Test (char p[])    // Function 2
    {
        strcpy(paper, p);
        marks = 0;
    }
    Test (int m)    // Function 3
    {
        strcpy(paper,"Computer");
        marks = m;
    }
    Test (char p[], int m)    // Function 4
    {
        strcpy (paper, p);
        marks = m;
    }
};
```

i. Write statements in C++ that would execute Function 1, Function 2, Function 3 and Function 4 of class Test.

ii. Which feature of Object Oriented Programming is demonstrated using Function 1, Function 2, Function 3 and Function 4 together in the above class Test?

18. Consider the definition of the following class:

```
class Sample
{
private:
    int x;
    double y;
public :
    Sample(); //Constructor 1
    Sample(int); //Constructor 2
    Sample(int, int); //Constructor 3
    Sample(int, double); //Constructor 4
};
```

i. Write the definition of the constructor 1 so that the private member variables are initialized to 0.

ii. Write the definition of the constructor 2 so that the private member variable x is initialized according to the value of the parameter, and the private member variable y is initialized to 0.

iii. Write the definition of the constructors 3 and 4 so that the private member variables are initialized according to the values of the parameters.

19. A common place to buy candy is from a machine. The machine sells candies, chips, gum, and cookies. You have been asked to write a program for this candy machine.

The program should do the following:
1. Show the customer the different products sold by the candy machine.
2. Let the customer make the selection.
3. Show the customer the cost of the item selected.
4. Accept money from the customer.
5. Release the item.

The machine has two main components: a built-in cash register and several dispensers to hold and release the products.

Define class cashRegister in C++ with the following descriptions :
Private Members:
cashOnHand of type integer
Public Members:
A default constructor cashRegister() sets the cash in the register to 500.
A constructor cashRegister(int) sets the cash in the register to a specific amount.
A function getCurrentBalance() which returns value of cashOnHand
A function acceptAmount(int) to receive the amount deposited by the customer and update the amount in the register

Define class dispenserType in C++ with the following descriptions :
Private Members:
numberOfItems of type integer
cost of type integer
Public Members:
A default constructor dispenserType () sets the cost and number of items in the dispenser to 50 each.
A constructor dispenserType (int,int) sets the cost and number of items in the dispenser to the values specified by the user.
A function getNoOfItems() to return the value of numberOfItems.
A function getCost() to return the value of cost.
A function makeSale() to reduce the number of items by 1.

When the program executes, it must do the following:
1. Show the different products sold by the candy machine.
2. Show how to select a particular product.
Once the user has made the appropriate selection, the candy machine must act accordingly. If the user has opted to buy a product and that product is available, the candy machine should show the cost of the product and ask the user to deposit the money. If the amount deposited is at least the cost of the item, the candy machine should sell the item and display an appropriate message.
Divide this program into three functions: showSelection, sellProduct, and main.
The function sellProduct must have access to the dispenser holding the product (to decrement the number of items in the dispenser by 1 and to show the cost of the

item) as well as the cash register (to update the cash). Therefore, this function has two parameters: one corresponding to the dispenser and the other corresponding to the cash register.

Assignments (Basic) Topics Part 4 : : Operator Overloading

Question 20:

Overload operators-member-functions as shown in example below for binary-plus:

```
////////////////////////////////////
class MyType{
public:
    void operator + (int arg) {
        cout<<"void operator + (int arg): arg = "<< arg <<"\n";
    }
    void operator + (MyType & secondOperand) {
        cout<<"void operator + (MyType & secondOperand): "<< "\n";
    }
};



int operator < ( MyType & lhs, MyType &rhs) {
    cout<<"int operator < ( MyType & lhs, MyType &rhs).\n";
    return 0;
}

int main(){
    MyType obj1, obj2;

    //addition
    obj1 + 1;
    cout<<"---------------------------\n";
    obj1 + obj2;
    cout<<"---------------------------\n";
}
```

////////////////////////////////////

Binary Arithmetic Operators to overload:

1. Binary-plus {already provided above }.
2. Binary-minus (-)
3. Binary-multiply (*)
4. Binary-division (/)
5. Binary-modulus (%)

Comparison operators :

6. less-than (<) {already provided above }.
7. less-than or equal-to (<=)
8. greater-than (>)
9. greater-than or equal-to (>=)
10. equal-to (==)
11. Not-equal-to (!=)

Bitwise operators to overload:

1. cascading output operator (<<).
2. cascading input operator (>>).
3. Address-of operator(&).

Logical operators to overload:

1. && .
2. || .
3. ! .
4. ~

In-place operators to overload:

1. Arithmetic binary :   +=, -=, *=, /=, %= .
2. Cascading : <<=, >>= .

C++ keyword operators to overload:

1. new .
2. delete .
3. new[] .
4. delete [].

//////////////////////////////////

List of operators that can be overloaded are:

+	–	*	?	%	?	&	|	~
!	=	<	>	+=	-=	*=	?=	%=
?=	&=	|=	<<	>>	<<=	>>=	==	!=
<=	>=	&&	||	++	—	,	->*	->
( )	[ ]	new	delete	new[]	delete[]			

Question 21:

Implement below String operations of “MyString” class in C++ using operator-overloading :-

- concatenation.
- length
- Copy
- Compare
- Reverse
- Convert
- Trim
- Strip
- Sub-String
- Tokenization
- character find & replacement
- search

Part 5 : Assignments (Basic : Inheritance)

Question 22. Consider the following declaration and answer the questions given below :

```
class PPP
{
    int H:
  protected :
    int S;
  public :
    void input (int);
    void out();
};

class QQQ : private PPP
{
    int T;
  protected :
    int U;
  public :
    void indata(int, int);
    void outdata();
};

class RRR : public QQQ
{
    int M;
  public :
    void disp();
};
```

i. Name the base class and derived class of the class **QQQ**.
ii. Name the data member(s) that can be accessed from function **disp()**.
iii. Name the member function(s), which can be accessed from the objects of class **RRR**.
iv. Is the member function **out()** accessible by the object of the class **QQQ?**

Question 23. Answer the questions (i) to (iv) based on the following:

```
class Publisher
{
    char pub[12];
    double turnover;
  protected:
    void register();
  public:
    Publisher();
    void enter();
    void display();
};
```

```
class Branch
{
    char city[20];
  protected:
    float employees;
  public:
    Branch();
    void haveit();
    void giveit();
};

class Author : private Branch, public Publisher
{
    int acode;
    char aname[20];
    float amount;
  public:
    Author();
    void start();
    void show();
};
```

i. Write the names of data members, which are accessible from objects belonging to class **Author**.
ii. Write the names of all the member functions which are accessible from objects belonging to class **Branch**.
iii. Write the names of all the members which are accessible from member functions of class **Author**.
iv. How many bytes will be required by an object belonging to class **Author**?

Question 24. Consider the following declarations and answer the question given below :

```
class Vehicle
{
  private:
    int wheels;
  protected :
    int passenger:
  public :
    void inputdata(int, int);
    void outputdata();
};

class Heavyvehicle : protected Vehicle
{
    int diesel_petrol;
  protected :
    int load;
  public:
    void readdata(int, int);
    void writedata();
};

class Bus : private Heavyvehicle
{
    char make[20];
  public :
    void fetchdata(char);
    void displaydata();
};
```

(i) Name the base class and derived class of the class **Heavyvehicle**.

(ii) Name the data member(s) that can be accessed from function **displaydata()**.

(iii) Name the data member's that can be accessed by an object of **Bus** class.

(iv) Is the member function **outputdata()** accessible to the objects of **Heavyvehicle** class.

Question 25. Answer the questions (i) to (iv) based on the following code :

```
class Drug
{
    char category[10];
    char date_of_manufacture[10];
    char company[20];
  public:
    Drug();
    void enterdrugdetails();
    void showdrugdetails();
};

class Tablet : public Drug
{
  protected:
    char tablet_name[30];
    char volume_label[20];
  public:
    float price;
    Tablet();
    void entertabletdetails();
    void showtabletdetails ();
};

class PainReliever : public Tablet
{
    int dosage_units;
    char side_effects[20];
    int use_within_days;
  public:
    PainReliever();
    void enterdetails();
    void showdetails();
};
```

(i) How many bytes will be required by an object of class **Drug** and an object of class **PainReliever** respectively ?
(ii) Write names of all the data members which are accessible from the object of class **PainReliever**.
(iii) Write names of all the members accessible from member functions of class **Tablet**.
(iv) Write names of all the member functions which are accessible from objects of class **PainReliever**.