[This question paper contains 6 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 6501 **HC**

Unique Paper Code : 32341101

Name of the Paper : Programming Fundamentals using C++

Name of the Course : **B.Sc. (H) Computer Science**

Semester : I

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Question **1** is compulsory in **Section A**.
3. Attempt any **four** questions from **Section B**.
4. Parts of a question should be attempted together.

Section–A

1. (a) What is polymorphism in OOP? (2)

   (b) Why don't the constructors have return type? (2)

   (c) How do you overload '++' as post-increment operator? Give an example to illustrate overloading of '++' as post-increment operator. (4)

P.T.O.

The primary purpose of a constructor is to initialize the data members of an object to a valid initial state. It is not meant to return a value like other functions in C++. When an object is created, the constructor is responsible for setting up the object's initial state. The object is typically constructed in a pre-allocated memory space, and the constructor initializes the member variables within that memory space. The constructed object is then implicitly returned as the result of the object creation expression, making a separate return statement unnecessary.

(d) Find errors in the following code segments: (4)

i.
```
int func(int x,y)
{
int z;
cout << z;
}
```

ii.
```
class du
{
private:
…;
public:
void ~du(void);
};
```

(e) How do the properties of the following two derived classes A and P differ? (2)

i. `class A: private B{//…..};`
ii. `class P: public B{//…..};`

(f) What is 'this' pointer? Explain with an example. (2)

(g) Give output of the following code segments : (4)

i.
```
x=12;
  while(x>7){
        cout <<x<<endl;
  x-=2;}
```

ii.
```
for (int x = 20;x>=1; x--)
{
  for (int y = x; y>=1; y--)
  cout << " ";
  cout << x;
}
```

(h) When do we make a virtual function "pure"? What are the implications of making a function a pure virtual function? (3)

(i) How is a **structure** different from a **class** in C++? (2)

(j) What are inline functions? When will you make a function inline? (3)

(k) Which one of the following is a valid function declaration? Justify your answer. (2)

i. `int f1(int i=1,int j=2,int k)`
ii. `int f1(int i=1,int j,int k=2)`
iii. `int f1(int i ,int j=2,int k=3);`

(l) Explain the following string functions with suitable example : (3)

(i) compare()

(ii) find()

(iii) replace()

Section–B

2. (a) Write a C++ program to convert a two-dimensional array A[4][4], into a one-dimensional array B[16] that will have all the elements of A if they are stored hi row-major form. For example, if array A[4][4] is :

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

ThenB[16] is {1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16} (5)

(b) Assume a class D derived from a base class B. Class B is a friend of class A. Can class D access private data of class A? Justify your answer. (5)

3. (a) Identify error(s) in the following code : (3)

```
class Fun
{
    private:      int x;
    protected:    int y;
    public:       int z;
};
class Funny: public Fun
{
    private:      int u;
    protected:    int v;
    public:       int w;
};

int main()
{

    Fun fun;
    Funny funny;
    fun.x = 1;
    fun.y = 2;
    fun.z=3;
    funny.x=11;
    funny.y = 12;
    funny.z=13;
    funny.u=14;
    funny.v=15;
    funny.w=16;
}
```

No, the derived class D cannot directly access the private members of the friend class A through the inheritance relationship with the intermediate friend class B. In C++, friendship is not inherited, even though B is a friend of A.

(b) What is a copy constructor? Give an example of a copy constructor. (4)

(c) Give the output of the following program : (3)

```
int x=2, y;
int main()
{
    cout<<"x="<<x;
    cout<<"y="<<y;
    func();
    cout<<"x="<<x;
    cout<<"y="<<y;
    return 0;
}

void func()
{
  int  x=7;
  y=11;
  cout<<"x="<<x;
  cout<<"y="<<y;
}
```

4. (a) What is function overloading? Explain with the help of suitable example. (6)

(b) What is the sequence of constructors and destructors being called in the following multilevel inheritance : (4)

```
class A
{...};
class B:public A
{...};
class C:public B
{...};
class D:public C
{...};
```

the constructors are called in the order A -> B -> C -> D. The destructors are called in the reverse order, D -> C -> B -> A,

5. (a) Write a C++ program that reads a text file and creates another file that is identical to the first except that every sequence of consecutive blank spaces is replaced by a single space. (5)

(b) Write a recursive function to compute sum of first 10 natural numbers. (5)

6. (a) Create a class TwoDim which contains x and y coordinates as int. Define the following :

(i) default constructor to initialize data members to zero

(ii) parameterized constructor to initialize data members to values passed

(iii) function print() to print the coordinates of the class. (6)

(b) Explain the purpose of using the key word 'const' with data and function members of a class. (4)

7. (a) What are static variables and static functions? How are static variables initialized? What is the purpose of static variables and static functions? (5)

(b) Write a program to swap two numbers using pointers. (5)