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[This question paper contains 10 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 46 **I**

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. The question paper consists of **two** Sections. Section **A** is compulsory.
3. Attempt any **four** questions from Section **B.**

Section A

1 a) Write a single C++ statement to calculate following (assuming variables ***a***, ***b*** and ***c*** are already declared as integers): 2

$$c = \frac{\sqrt{a^2 + b^2}}{4a}$$

b) Consider three integer variables initialized as: ***x=1***, ***y=0***, and ***z=1***. What are the values of ***x***, ***y***, and ***z*** after executing the following code segment? 2

```
if(x>y&&x>z)
{
   y=x;
   z=x+1;
}
else if(x+y>=z)
{
   x++;
   z=x+1;
}
else y=z+x;
```

c) Given the following declarations: 2

```
int num=10;
int *val=&num;
```

What will be printed on execution of following statements (consider each part independent of other)?

(i) `cout<<*val;`

(ii) `cout<<(*val+1)*2;`

d) Find output of each of the following code segments: 2X4

(i)
```
String s1="Hello",s2="Beautiful world!!! ";
String s3="Be Happy";
String s=s1+"  "+s2+"  "+s3;
s.append(5,'! ');
cout<<s<<endl;
cout<<s.rfind("Be");
```

(ii)
```
void main()
{
     int val=1;
     do
     {
          val++;
          ++val;
      }while(val++>25);
      cout<<val;
 }
```

(iii)
```
int x=0,y=0,z=1;
if(z<x||y>=z&&z==1)
      if(z&&y)
            y=1;
      else
            x=1;
     cout<<x<<" "<<y<<" "<<z;
```


(iv)
```
class Base
{
   public:
      void print()
      {
          cout<<"\n Print Base Class";
      }
      virtual void show() = 0;
};

class Derived:public Base
{
   public:
     void print()
     {
        cout<<"\nPrint Derived Class";
     }

     void show()
     {
        cout<<"\n Show Derived Class";
     }
 };

void main()
{
   Base *Bptr;
   Derived D;
   Bptr = &D;
   Bptr->print();
   Bptr->show();
}
```

e) Find error(s) (if any) in each of the following code segments: 2+2

(i)
```
int func1(int *aa,int &bb)
{
      &bb=8;
      aa[0]=bb;
 }
```

(ii)
```
class Fun
{
      private:   int x;
      protected: int y;
      public:    int z;
};
```

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

void main()
{
     Fun fun;
     Funny funny;
     fun.z = 2;
     funny.y =12;
     funny.u= 5;
     funny.z=10;
 }
```

f) What is a copy constructor? Illustrate the use of copy constructor with the help of an example. 1+2

g) Give one word answer for the following: 4

(i) In the following declaration for the class **Test**, indicate scope of the variable ***x (private, public or protected).***

```
class Test
{   int x;
};
```

(ii) Consider the following code segment:

```
class base
{   public:
        int x;
        int y;
};
class derived : private base
{...};
```

Indicate access scope of variables x and y in the **derived** class.

(iii) Which type of class variable(s) can be accessed by a *static* member function of a class?

(iv) What do we call a class that has at least one pure virtual member function?

h) Write a function named **replace** with the following prototype: 4

```
String replace(String str1);
```

The function returns a new string obtained by substituting all the lower case letters by uppercase letters in the string ***str1*** passed to it as a parameter. For example, for the input string **"Hello World!!!"**. The function should output **"HELLO WORLD!!!"**

i) Write a function that returns the sum of first n terms of the following series: 4

$$\sum_{i=1}^{n} \frac{2}{i^2}$$

j) Given the following declaration: 2

```
float num = 576.21f;
```

What will be printed on executing the following **cout** statement?

```
cout<<"The tax is"<<setw(8)
    << setprecision(6)<<num;
```

Section B

2 a) Rewrite the following code segment using a ***switch*** statement: 2

```
if(ch=='A'||ch == 'a')
        countA++;
elseif(ch=='B'||ch=='b')
        countB++;
elseif(ch=='C'||ch=='c')
        countC++;
else
        cout<<"Error-Not A, B, or C \n";
```

b) Consider three integer variables to be initialized as: ***x=4, y=7*** and ***z=-4***. What are the values of ***x, y*** and ***z*** after evaluation of each of the following expressions (consider each part independent of other)? 4

(i) `x++ + y - z--`
(ii) `++x + 2`
(iii) `x-1 + y++ + ++z`
(iv) `++z + ++y + x--`

c) Assume that you are provided a function named ***fact*** to find the factorial of any number (passed to it as a parameter) with the following prototype: 4

```
int fact(int num);
```

Using this ***fact*** function, write a program to print the factorial of first ***n*** even numbers.

3 a) Find output of the following code segment: 4

```
void main()
{
    int i,j;
    for(i=10; i>=0; i--)
    {
        cout<<" \n ";
        for(j=i; j>=0; j--)
        {
          cout<<j;
          if(j==5) break;
        }
    }
}
```

b) Assuming you are given with two 2-Dimensional matrices $A_{n\times n}$ and $B_{n\times p}$. Write program segments to perform the following matrix operations: 3+3

(i) A×B (Multiplication of two matrices)
(ii) A^T (Transpose of the square matrix)

4 a) Find output of the following code segment: 2

```
void main()
{
     int arr[]={1, 2, 3, 4, 5, 6, 7, 8, 9};
     int *ptr1, *ptr2;
     ptr1=arr;
     ptr2=ptr1+2;
     cout<<ptr2-ptr1;
}
```


b) Find error(s) in the following code segment: 3

```
class X
{
     private:
          int i,j;
          X() { i=1; j=1;}
     virtual void show()=0;
     public:
            void print()
             {
                  cout<<i<<" "<<j;
             }
    }
class Y: public X
{
        int k;
      public:
        void print()
        {
              cout<<k;
        }

        Y()
        {i=j=k=2;}

};
void main()
{ Y w;
  w.print();
}
```

c) Write a program that reads a text file, say, ***Test.txt*** and prints the total number of vowels in it. 5

5 a) Find output of the following: 2

```
class polygon
{
    protected:
       int width,height;
    public:
       void set_values(int a, int b)
       {
          width=a; height=b;
       }
};
class output1
{
```

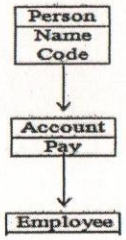
```
    public:
       void output(int i);
};

void output1::output(int i)
{
      cout<<i<<endl;
}

class rectangle:public polygon,public outpu
t1
{
 public:
     int area()
     {
        return(width * height);
     }
};
class triangle:public polygon,public output
1
{
 public:
      int area()
      {
        return (width*height/2);
      }
};
void main()
{
      rectangle rect;
      triangle trgl;
      rect.set_values(4, 5);
      trgl.set_values(4, 5);
      rect.output(rect.area());
      trgl.output(trgl.area());
}
```

b) Name the header files for the following operations: 2

(i) Console input and output.
(ii) Using formatting functions like ***setw()***

c) Declare the classes ***Person***, ***Account*** and ***Employee*** having inheritance hierarchy shown in the figure below. Create the required objects to demonstrate runtime polymorphism for the following operations: 6

(i) Accept the information of an employee.
(ii) Display information of an employee.



6 a) Rectify the error (if any) in each of the following statements: 4

(i) `cout>>put(c);`
(ii) `cin<<get(c);`
(iii) `cout.get(c);`
(iv) `cin.put(c);`

b) Define a function ***mysqr*** with the following prototype: 2+4

```
int mysqr(int n);
```

Write a program to compute the square of a number using this function. The input value **n** given to this function must be tested for validity and if found negative, this program should raise an exception that must be caught.

7 a) Write C++ declarations/definitions for the following: 4

(i) A function ***func1*** accepting a reference to a floating point number, a string and an array of integers. It returns a pointer to a character.
(ii) A two dimensional integer array **A** of size 3 rows and 4 columns with each of its elements initialized to zero.
(iii) Initialize a static member ***x*** of a class ***Test*** to 100.
(iv) A parameterized constructor for a class ***Test1*** having three integer arguments ***x***, ***y*** and ***z***, where, ***y*** is a default argument.

b) Create a class **`Location`** consisting of data members **`longitude`** and **`latitude`**. Write the following member functions for this class: 2+4

(i) A parameterized constructor to initialize the data members.
(ii) A function for overloading + operator to add two **`Location`** objects.