B.Sc. Prog. / II   **AS**

CS-201 : PROGRAMMING AND DATA STRUCTURE

(Admissions of 2005 and onwards)

Time : 3 hours   *Maximum Marks* : 75

*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

All questions are compulsory.
Answer parts of a question together.

1. Give the outputs for the following programs:

   (*a*)   void main ( )
   {

        int a=50, b=10, c;

        if (!a > = 40)

          b=30;

        c=200;

        cout< < "b="< <b< <", c="< <c;

   }   1

(b) void main ( )

```
{
    int x, y, m, n;
    m=10;
    n=15;
    x=++m;
    y=n++;
    cout << "x=" << x << endl;
    cout << "m=" << m << endl;
    cout << "y=" << y << endl;
    cout << "n=" << n;
}
```
2

(c) void main ( )

```
{
    int arr [ ]={0, 1, 2, 3, 4};
    int *ptr;
    for (ptr=arr+4;  ptr>=arr; ptr ..)
        cout<<*ptr <<endl;
}
```
2

2. (a) Write a C++ function which accepts two strings as arguments and returns the concatenation of first character of first string and last character of second string. (example : if the two strings are *Delhi* and University, then the result is DY.) 3

(b) Give the outputs for the following code segments / programs:

(i) int a=10;

```
void check ()
{
  int a=5;
  cout <<  a  << endl;
  cout  << :: a  << endl;
}
```
　　　　　2

(ii)
```
for (i=1;  i<3;  i++)
    for (j=4;  j>=i;  j..)
        cout<<"A";
    cout<<endl;
```
　　　　　2

(iii)
```
void main ( )
{
  int n=1;
  cout<< "The numbers are:";
  do
    {
      cout<<n<< "\t";
      n++;
    } while  (n<=10);
}
```
　　　　　2

3. Give the output of the following code segments:

(a)
```
class shared
{
    static int a; int b;
    public:
        void set (int i, int j)
        {
            a=i;
            b=j;
        }
        void show ( )
        {
            cout << "a=" <<a<< b=" <<b<<
                                        end1;
        }
};
void main ( )
{
    shared x, y;
    x. set (10, 10)
    x. show ( );
    y. set (20, 20);
    y. show ( );
    x. show ( );
}
```

How many copies of data members 'a' and 'b' will be maintained for this program?   4

(*b*) void chk (int test)

```
{
try  {
      if (test) throw test;
      else throw "value is zero";
}
catch (int i)
{
   cout << "caught exception:"<<i<<endl;
}
catch (const char *str)
{
   cout << "caught a string:";
   cout <<str<< endl;
}
}
int main ( )
{
   cout << "Start\n";
   chk (1);
   chk (2);
   chk (0);
   chk (3);
   cout << "End";
     return 0;
}
```

3

(c) class base
     {
     public:
       virtual void fn ( )
       {
       cout << " In Base \n";
       }
     };
     class derived1 : public base
     {
     public:
       void fn ()
       {
           cout << "In dl \n";
       }
     };
     class derived2 : public base
     {
     public:
       void fn ()
       {
         cout << "In d2 \n";
       }
     };
     void main ()
     {
       base *p, b;
       d1 x;
       d2 y;

```
        p=&b;
        p→fn();

        p=&x;
        p→fn();

        p=&y;
        p→fn();
}                                                    3
```

4. (a) Explain 'this' pointer with the help of an example.
                                                     2

   (b) Can we use 'this' pointer in friend function? Give
       reason to support your answer.   2

   (c) c=(a > b) ? a : b;

       What will be the output of c when a=10 and
       b=20?   2

5. (a) Illustrate the use of pure virtual function with the
       help of an example.   3

(b) What will be output on execution of main( )?

```
class Base1
{ public:
        Base1 ()
        {cout << "Constructing Base1 \n"; }
        ~Base1 ( )
        {cout << "Destructing Base1 \n";}
};


class Base2
{ public:
        Base2 ()
        {cout << "Constructing Base2 \n";}
        ~Base2 ()
        {cout << "Destructing Base2 \n"; }
};
class Derived : public Base1, public Base2
{ public:
        Derived ( )
        {cout << "Constructing Derived \n";}
        ~Derived ()
        {cout << "Destructing Derived \n";}
};
void main ()
{
  Derived  d;
}                                              4
```

6. Answer all parts of this question in a single program.

   (a) Define a class Student having two private data members internal_marks and external_marks.   2

   (b) Define a parametrized constructor which accepts both the internal_marks and external_marks of the student and updates the corresponding private members.   2

   (c) Overload the '+' operator as follows: if S1 and S2 are two students then S1+S2 adds external_marks of S1 and S2 and returns their sum.   3

7. (a) Convert the following infix expression to postfix expression:

$$A\$B * C-D+E/F/(G+H)$$

Show the stack operations. ($ stands for exponent.)   3

   (b) Evaluate the following postfix expression using stack (A=3, B=2, C=1, D=4):

$$AB+CD-*$$ 3

   (c) Mention two applications/uses of stacks.   2

8. (a) Write a recursive program to implement Binary search.   3

(b) Observe the following operations on a linear queue of array size 4:

1 insert(10)

2 insert(20)

3 delete()

4 insert(40)

5 delete()

6 delete()

7 delete()

How does queue appear—

(i) after step 4?

(ii) after step 7?   2

(c) Give one advantage of using linked list over arrays.   2

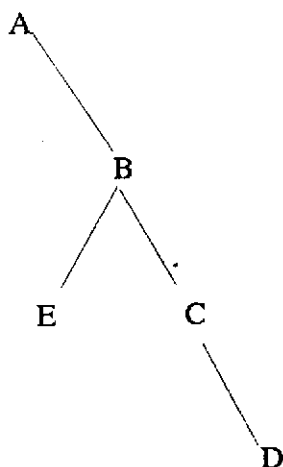9. (a) Write functions to perform the following on a singly linked list:

(i) Search an element in the list.

(ii) Delete first element of the list.   4+2

(b) Give the Preorder, Inorder, Postorder traversals of the following tree rooted at A: 6

(c) Apply Bubble Sort on the following array of integers showing outcome after each iteration. Sort in ascending order.

$$15, \ 12, \ 14, \ 16, \ 10, \ 3$$

What is the complexity of Bubble Sort?   4