This question paper contains 5 printed pages.

5125 *Your Roll No.* .....

B.Sc. (Prog.) / II **B**

Paper 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.)

Attempt all questions.
Parts of a question must be attempted together.

1(a) Why do we need the preprocessor directive # include <iostream.h> 1

1(b) Distinguish between a structure and a class in C++. 3

1(c) Give the output: 2

```
void change1(int *x)
{
   *x=*x+1;
}

void change2(int &x)
{
   x=x+1;
}

int main()
{
   int y=10;
   change1(&y);
   cout<<"y="<<y;
   change2(y);
   cout<<"y="<<y;
   return 0;
}
```

2(a) Give the output of the following code: 2

```
for(int m=0; m<5;m++
{
cout<<m;
}
```

Turn over

2(b) Given the statement

```
const int size=5;
```

Can we declare an array as follows, give reason.

```
int x[size];
```

2(c) Given

```
int y[5];
int *p=y;
```

Is the following legal? Give reason.

```
p[3]=10;
```

2(d) Given the array declaration

```
int x[10];
```

What does *(x+3) mean?

2(e) When the following code segment is executed, what will be the output?

```
int x=1, y=0;
y=x++;
cout<<"x="<<x<<" y="<<y;
```

2(f) Give the output of the following code segment:

```
char c='a';
switch(c)
{
     case 'a': cout<<"A";
     case 'b': cout<<"B"; break;
     default:  cout<<"C";
}
```

3(a) Consider the following code:

```
class B{ };
class D1 :public B{};
class D2 :public B{};
class D3 :public D1, public D2{};
```

How can we prevent the creation of two copies of the base class B in a D3 object.

3(b) Write a C++ function to check if the string is a palindrome. Return 1 if yes else return 0. The prototype is

int isPalindrome (char *s);

4(a) Give the output of the following code:

```
void divide(double a,double b)
{
try
{
     if(b==0) throw a;
```

```
            cout<<"\nResult is "<<a/b;
        }
        catch(double)
        {
            cout<<"\nCan't divide by zero, enter again";
        }
        }

        int main()
        {
            divide(10,0);
            divide(10,2);
            return 0;
        }
```

4(b) Under what circumstances is catch(. . .) used? 2

4(c) What will be output when main() is executed. Justify your answer. 3

```
class A
{
 public :
 A()
 {
  cout<<"Constructing A";
 }
 ~A()
 {
  cout<<"Destructing A";
 }
};
class B:public A
{
public :
 B()
 {
 cout<<"Constructing B";
 }
  ~B()
 {
 cout<<"Destructing B";
 }
};
class C:public B
{
 public :
  C()
  {
```

```
    cout<<"Constructing C";
    }
    ~C()
    {
    cout<<"Destructing C";
    }
};

int main()
{
C ob;
return 0;
}
```

4(d) Virtual functions are used to achieve late binding. Explain with relation to run time polymorphism. Give example. 3

5 Create a class Complex having real and imaginary part of a complex number as data members. Declare and define a method of the Complex class to overload postfix increment operator using friend function. The postfix operator should increment both real and imaginary part with 1. 1 + 3

6(a) What is a stack? What is the advantage of implementing a stack using a linked list over an array. 1+2

6(b) Convert the following infix expression to postfix, where $ is the exponent operation. Show the stack operations: 3

(A + B) * (C – D) $ E * F

6(c) Convert the following postfix expression into an equivalent infix expression: 2+2

A B C + * C B A - + *

Evaluate the expression using A=1, B=2, C=3

7(a) Declare a class to implement a queue of roll numbers using a singly linked list. 2

7(b) Give the declaration and definition of the following methods of the above defined class 3+3

i) Append a roll number to the queue
ii) Delete a roll number from the queue

8(a) Give the recursive definition of a function to compute the factorial of a number. 3

8(b) Mention a disadvantage of using recursion over iteration. 2

9(a) Write a non-recursive function for binary search. 3

9(b) For an ordered list of input numbers, compare the complexity of linear and binary search. 2

10(a) Apply insertion sort for sorting the following data in ascending order. Show the outcome after each pass. 4

9 7 11 8 5 6 4

10(b) Give the preorder and postorder traversal of the following tree 4