

3rd SEMESTER B-TECH EXAMINATION - 2007
OBJECT ORIENTED PROGRAMMING USING C++

Full Marks-70

Time:3 Hours

Question No. 1 which is compulsory and any five questions from the rest.

The figures in the right-hand margin indicate marks for the questions.

1. Answer the following questions:

- (a) What is a C++ template?
- (b) What's the best way to declare and define global variables?
- (c) What is inheritance and what are the different types of inheritance available in C++?
- (d) What is a constructor? What is a default constructor?
- (e) What is the difference between `char a[]="string";` and `char*p="string";`?
- (f) How do you decide which integer type to use?
- (g) How do you declare an array of N pointers to functions returning pointers to functions returning pointers to characters?
- (h) What is "abstraction" and why do we use it?
- (i) What is an "invariant"?
- (j) What is the difference among public, protected and private members of a class?

2.

- (a) How does an inline function differ from a preprocessor macro? (2)
- (b) How is polymorphism achieved at compile time and run time? Give an example of program that uses polymorphism. (3)
- (c) Define a class for a complex number. Write a program to read and print the complex number. (5)

3.

- (a) The voltage gain of an amplifier is given by the formula (5)

$$\text{Volatage_gain} = \left[\frac{275}{\sqrt{23^2 + (0.5f)^2}} \right]^n$$

where f is the frequency in Hertz and n is the number of stages in the amplifier. Write a complete C++ program that asks the user to input values for n and t, calculates the value of the voltage gain using the formula and produces the following display on the terminal screen:

At a frequency of X hertz, the voltage gain is Y

Where X is replaced by the frequency and Y is replaced by the voltage gain.

- (b) Write a function that returns the mean of the n elements of an array of type double. (5)

4.

- (a) List the three ways of passing a parameter (or return value) in C++. For each indicate:

- Whether the method makes a copy of the object passed.
- Whether the method allows passing of const objects.
- Whether the method supports polymorphism and virtual dispatch.
- Whether the method allows implicit type conversions to be performed. (5)

- (b) Write a template function “max” that returns the largest element in an array of N elements. You can assume that N>1. Select a reasonable and simple interface.

(5)

5.

- (a) What does the reference operator do? What is the difference between passing an argument by reference and passing it by value? (4)

- (b) Consider the following class Foo,(for which one constructor is written). Write a destructor, a copy constructor and an assignment operator that would be appropriate for the class. (6)

Class Foo

```
{
Public:
int *p;
    Foo(void)
    {
    p=new int[10];
    for(int k=0;k<10;k+=1)
        {
        P[k]=k;
        }
    }
}
```

6.

- (a) Declare a C++ structure to contain the following five pieces of information about cars on a used car lot:

- (1) the manufacture of the car,
- (2) the model name of the car,
- (3) the number of miles on the odometer,
- (4) the asking price for the car. (4)

- (b) Write a template function alloc that takes two parameters:

n : the size of the array to allocate

val: a value of type T

The alloc function should allocate an array of type T with n elements and set all elements in the array to the value val. A pointer to the array is returned.

(6)

7.

- (a) Give two different ways that an alias can be created for an integer variable *i* in a C++ program. (4)
- (b) Write a program that uses a 2-dimensional *m* x *n* double array *a*. Declare the variable and write the C++ code required to allocate and deallocate the array (assume that *m* and *n* are declared and their values are known). (6)

8.

- (a) Distinguish between virtual member functions and non-virtual member functions. (2.5)
- (b) Why are internal data members of a base class declared protected instead of private? (2.5)
- (c) Define the terms static scoping and dynamic scoping and give a very simple example of each. (2.5)
- (d) Explain what the following three lines “do” when executed? (2.5)
- ```
Tmp =new int(10);
*Tmp=65;
Delete[] Tmp;
```

---X---