OBJECTED ORIENTED PROGRAMMING
(CSEN 3003)

Time Allotted : 2½ hrs **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

(i) What happens if the following program is executed in C and C++?

```
#include <stdio.h>
int main(void)
{
    Int new=5;
    printf("%d", new);
}
```

(a) Error in C and successful execution in C++ (b) Error in both C and C++
(c) Error in C++ and successful execution in C (d) A successful run in both C and C++

(ii) What is an object in C++?
(a) it is a function of a class (b) it is an instance of a class
(c) it is data type of a class (d) it is part of the syntax of class

(iii) A programmer defines a class but fails to create an instance of that class. They try to call an instance method of the class directly. What will occur?
(a) Compilation Error (b) Runtime Error
(c) Logical Error (d) No Error

(iv) Which of the following is not correct for virtual function in C++?
(a) Must be declared in public section of class (b) Virtual function can be static
(c) Virtual function can be accessed using pointers or references (d) Virtual function can be defined in base class.

(v) What would be the result if a class implements two interfaces and both have a method with same name and signature?
(a) Runtime error (b) Compile time error
(c) Code runs successfully (d) First called method is executed successfully.

(vi) An abstract class is useful when
(a) no classes should be derived from it (b) there are multiple paths from one derived class to another
(c) no objects should be instantiated from it (d) you want to defer the declaration of the class.

(vii) Which of the following is NOT a correct method signature for a main method in Java?
(a) public void static main(String args[]) (b) static public void main(String[] args)
(c) public static void main(String [] args) (d) public static void main(Stringargs[])

(viii) What is the output of the following code?

```
String s1 = "Hello";
String s2 = "Hello";
System.out.println(s1 == s2);
```

(a) true (b)false (c) compilation error (d) runtime error

(ix) What do you mean by nameless objects?
(a) An object created by using the new keyword (b) An object of a superclass created in the subclass
(c) An object without having any name but having a reference (d) An object that has no reference.

(x) Runnable is a/an
(a) Class (b) Variable (c) Method (d) Interface

Fill in the blanks with the correct word

(xi) If the maximum subscript value of an array is 9, then the size of the array is _____.

(xii) Constructors are used to _____ the data members automatically, whenever an object of a class is instantiated.

(xiii) The _____ operator in Java is used for string concatenation.

(xiv) In C++, a class member can be accessed outside the class using the _____ operator, while in Java, it's **.** (dot operator).

(xv) The ability of one class to derive properties from another class is called _____.

Group - B

2. (a) Write the difference between Abstraction and encapsulation. *[(CO1)(Understand/LOCQ)]*

(b) Raising a number n to the power p is the same as multiplying n by itself p times. Write a function called power() that takes a double value for n and an integer value for and returns the result as a double value. Use a default argument of 2 for p, so that that argument, the number will be squared. Write a main() function that gets values from the user to test the function. *[(CO5)(Apply/IOCQ)]*

(c) Create a class called TIME that has separate data members for hours, minutes, and seconds. A member function should display the time in the format hh: mm: ss.Another member function should add two objects of type TIME passed as arguments. Write a program in C++ to do this. Write a main() that creates the objects of TIME and it'smethods. *[(CO5)(Apply/IOCQ)]*

2 + 5 + 5 = 12

3. (a) What will be the output of the following C++ code? Explain.

```
#include <iostream>
#include <string>
using namespace std;
int main()
{
        char s1[6] = "Hello";
        char s2[6] = "World";
        char s3[12] = s1 + " " + s2;
        cout<<s3;
        return 0;
}
```

[(CO1)(Understand/IOCQ)]

(b) Write three differences between pointers and references. *[(CO1)(Understand/IOCQ)]*

(c) Write a C++ code to implement the following scenario.
Each of the two classes named "CSE_faculty" and "ECE_faculty", has one public member "name" and one private member "highest degree". Write a function that compares the highest degree of a "CSE_faculty" and an "ECE_faculty" and if they are the same, "CSE_faculty_name and ECE_faculty_name have same qualification" would be printed, where "CSE_faculty_name" and "ECE_faculty_name" are the name of the CSE_faculty and ECE_faculty, respectively. You can give any name as you please.
Please explain your code. *[(CO1)(Understand/IOCQ)]*

(1 + 2) + 3 + (4 + 2) = 12

Group - C

4. (a) Some of the most commonly used binary operators in C++ are the arithmetic operators e.g. plus (+), minus (-), multiplication (*), and division (/). There are different ways to overload these operators: putting as member, declaring as friend or the non-member way. Which approach is more appropriate? Justify your answer with code excerpts. *[(CO2)(Analyse/HOCQ)]*

(b) With an example explain how the throw keyword can be used to specify a list of exceptions that can be thrown by a method. In this context also explain the syntax and usage of empty throw. *[(CO3)(Remember/LOCQ)]*

(c)
```
#include <iostream>
using namespace std;
namespace sample1
{
   int rel = 300;
}
namespace sample2
{
   int rel=400;
}
int main(){}
```
What are the different ways you can specify which namespace to use when printing the value of the variable "rel" in main method. *[(CO5)(Apply/LOCQ)]*

5 + (2 + 2) + 3 = 12

5. (a) Write a code in C++ to implement post-increment operator and << operator. Using your code, what will be the output of the following input? Suppose the class name is Test.

```
Test t(10);
Test t2=t++;
cout<<"t="<<t<<endl<<"t2="<<t2<<endl;
```

[(CO5)(Understand/LOCQ)]

(b) Write a class template in C++ to implement stack and in main function, show how your code is working with different data types. *[(CO5)(Apply/LOCQ)]*

(3 + 3 + 2) + 4 = 12

Group - D

6. (a) Explain the concept of Garbage Collection and its importance in memory management Java. *[(CO3)(Understand/IOCQ)]*
   (b) Is it recommended to manually invoke the garbage collector, or should we rely solely on automatic garbage collection? *[(CO3)(Understand/IOCQ)]*

6 + 6 = 12

7. (a) ls it possible in Java to implement multiple inheritance? Explain with an example how a derived class can inherit from more than one base classes. *[CO5(Understand/LOCQ)]*
   (b) Write down the differences between interfaces and abstract classes. *[CO5(Analyze/IOCQ)]*
   (c) What is an abstract method? How is it implemented in Java? *[CO4(Understand/LOCQ)]*

5 + 4 + 3 = 12

Group - E

8. (a) Write a sample Java code to demonstrate about ArrayIndexOutOfBoundsException, ArithmeticException, NullPointerException exceptions. *[CO3 (Apply/IOCQ)]*
   (b) Create a package shape containing classes Circle, Triangle and Rectangle. Every class of this package should contain two methods, viz., area and perimeter. Write a sample Java code that can import shape package and use the methods to calculate area and perimeter of the respective shape. *[CO6 (Apply/HOCQ)]*

6 + 6 = 12

9. (a) Explain how an event delegation model works. Write a Java swing program to explain the said concept. *[CO6 (Understand/IOCQ)]*
   (b) What happens if an exception occurs in a thread and is not caught? How can we handle exceptions in multi-threaded environments? *[CO5 (Remember/IOCQ)]*
   (c) Consider the following Java program:

```
 import java.util.*;
interface Department {
    String depName="CSE";
    void display();
}
class TestDepartment implements Department{
   public void display() {
      depName="CSE(AIML)";
      System.out.println("Department name is" + depName);
   }
   public static void main(String args []) {
      Department ref = new TestDepartment ();
                        ref.display();
   }
}
```

Is there any error in the code? If yes fix the error. *[CO2 (Apply/IOCQ)]*

(4 + 4) + (2 + 2) = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	30.2	58.3	11.5