OBJECT 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) Which of the following cannot be declared static in c++?
(a) Class   (b) Object   (c) Function   (d) Variable

(ii) Which operator cannot be overloaded?
(a) + operator   (b) * operator   (c) >> operator   (d) Ternary operator.

(iii) Default access method of a class member in C++ is
(a) public   (b) private   (c) protected   (d) default

(iv) Which of the following is the correct syntax of including a user defined header files in C++?
(a) #include [userdefined]   (b) #include "userdefined.h"
(c) #include <userdefined.h>   (d) #include <userdefined>

(v) In Java What is the default priority of a newly created thread.
(a) MIN_PRIORITY (which is defined as 1 in the Thread class.)
(b) NORM_PRIORITY (which is defined as 5 in the Thread class.)
(c) MAX_PRIORITY (which is defined as 10 in the Thread class.)
(d) A thread inherits the priority of its parent thread.

(vi) Student s[10];
Student is the name of a class. How many times destructor will be invoked?
(a) Once   (b) Ten times
(c) Will not be invoked   (d) None of the above

(vii) Which of the following relationship is known as inheritance relation?
(a) Is-a relationship   (b) Has-a relationship
(c) Association relationship   (d) Aggregation relationship.

(viii) What is the use of final keyword in Java?
(a) When a class is made final, a subclass of it cannot be created
(b) When a method is final, it cannot be overridden
(c) When a variable is final, it can be assigned value only once
(d) All of the above

(ix)   What will be the output of following code snnipet?

```java
class variable_scope
 {
     public static void main(String args[])
     {
       int x;
       x = 5;
       {
       int y = 6;
       System.out.print(x + " " + y);
       }
       System.out.println(x + " " + y);
     }
 }
```

(a) Compilation error   (b) Run time error
(c) 5 6 5 6   (d) 5 6 5

(x)   Which of these statements is incorrect about Thread?
         (a) start() method is used to begin execution of the thread
         (b) run() method is used to begin execution of a thread before start() method in special cases
         (c) A thread can be formed by implementing Runnable interface only
         (d) A thread can be formed by a class that extends Thread.

Fill in the blanks with the correct word

(xi)   _____ data types are those that are not composed of other data types.

(xii)   Virtual function cannot be _____member of the class.

(xiii)   After handling the exception, handler code given in the catch block, the control goes to _____.

(xiv)   _____ returns the size of a variable in bytes in C++.

(xv)   Among AWT and Swing _____is platform independent.

Group - B

2.   (a)
```cpp
#include <iostream>
using namespace std;
class test {
   string x,y;
public:
test() { cout <<"default "<<endl;  }
test(string a="Best of luck") {
     x=a;
     cout <<a;
   }
};
int main() {
   test test1;
   test test2("Honesty is best policy");
}
```

Take a look at the constructors of the above code and identify what could be wrong in the program. Find out the cause of the error and rectify it by writing the corrected code. *[(CO1)(Analyse/IOCQ)]*

(b) Write a code to give an example of a nameless object and depict how nameless objects are useful. *[(CO5) (Remember/LOCQ)]*

(c) Why cannot we pass an object by value to a copy constructor? Though the concept of "friend" in C++ is useful, why should a programmer limit the use of "friend"?
[(CO6)(Apply/IOCQ)]

(2 + 2) + 3 + (2.5 + 2.5) = 12

3. (a) What is Object? What is the difference between array of objects and array of pointers to objects? Explain with example. *[(CO1)(Understand/LOCQ)]*

(b) Write a c++ program to show order of construction and destruction of global   object, static object, nameless object, object declared in main function, object declared in f() which is invoked from main(), object declared in a block of code.
[(CO1)(Understand/IOCQ)]

(c) What is the output of the following code snippet? Justify your answer.

```cpp
#include <iostream>
using namespace std;
int x=40;
int& setx(){ return x; }
int main(){
setx() = 22;
cout << "x=" << x<< endl;
return 0;
}
```
[(CO5)(Apply/IOCQ)]

(1 + 4) + 5 + 2 = 12

Group - C

4. (a) Write a C++ program to overload ++ operator on a class Distance with data member feet and inch. Implement both pre increment and post increment. Read input and display output by overloading >> and << operator respectively. *[(CO1)(Analyse/HOCQ)]*

(b) What is virtual class? With an example explain the significance of virtual class.
[(CO5)(Apply/LOCQ)]

8 + (2 + 2) = 12

5. (a) What is vTable and vPTR? Write a C++ code to explain significance of them to implement runtime polymorphism. *[(CO5)(Analyse/HOCQ)]*

(b) Create a generic class d_Stack to implement push(),pop() and display() member function for integer float and char data types to operate on stack. Define push function outside the class definition. *[(CO5)(Remember/LOCQ)]*

(c) Write a programme to implement divide-by-zero exception, where exception is thrown as object. *[(CO1)(Apply/IOCQ)]*

(2 + 4) + 3 + 3 = 12

Group - D

6. (a) What is the significance of Java garbage collector and how it is implemented in java?
[(CO2)(Analyse/LOCQ)]

(b) Define a class Shape and then find out the whole surface area and volume of a parallelepiped, cylinder and sphere using
(i) Method overloading, (ii) Inheritance. *[(CO5)(Remember/LOCQ)]*

(c)   Give an example code to explain run time polymorphism in Java.   *[(CO2)(Apply/IOCQ)]*

3 + (3 + 3) + 3 = 12

7. (a)   What role does JVM play to make Java a platform independent language?
            [(CO1)(Analyse/IOCQ)]
    (b)   What is the keyword "this" used for in java? Given an example.   *[(CO5)(Remember/LOCQ)]*
    (c)   Why are abstract classes needed? What is the need of abstract methods in abstract class? Can abstract class have objects?   *[(CO6)(Apply/IOCQ)]*

3 + 3 + (2 + 2 + 2) = 12

Group - E

8. (a)   Create two user defined exceptions viz. TooHot and TooCold. Write a Java program and throw TooHot if the temperature exceeds 40 degrees and throw TooCold if the temperature be less than 20 degrees.   *[(CO3)(Remember/IOCQ)]*
    (b)   What are the differences between an interface and an abstract class?
            [(CO5)(Understand/IOCQ)]
    (c)   What is the default type of variables in an interface?
            Consider the following Java program:

```java
interface MyInterface { int a=10; void display();}
class Test2023 implements MyInterface
{
  public void display() {
    a=20;
    System.out.println("Value of a is " + a);
  }
   public static void main(String args[]) {
     MyInterface ref=new Test2023();
     ref.display();
  }
}
```

Have the variables been declared and used properly in the above program? If you find any discrepancy point it out and suggest a fix.   *[(CO5)(Apply/IOCQ)]*

4 + 3+ (2 + 3) = 12

9. (a)   Explain with example the difference between throw and throws ?   *[(CO3)(Analyse/IOCQ)]*
    (b)   Draw and describe Applet Life cycle.   *[(CO4)(Remember/LOCQ)]*
    (c)   Write a java swing program where there will be two button with label Red and Blue and there are two text fields. When red button will be clicked "This is red colour" will be shown in text field. When Blue button will be clicked, "This is blue colour" will be shown in another text field.   *[(CO2)(Apply/LOCQ)]*

4 + 4 + 4 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	36.4	49	14.6

Course Outcome (CO):

After the completion of the course students will be able to

CSEN3003.1.   Understand the principles of object-oriented programming.
CSEN3003.2.   Compare the relative merits of C++ and Java as object-oriented programming languages.
CSEN3003.3.   Understand the importance of error management and incorporate exception- handling in object-orientedprograms.
CSEN3003.4.   Apply multithreading techniques to improve performance.
CSEN3003.5.   Apply the features of C++ and Java supporting object-oriented programming to develop modular applications.
CSEN3003.6.   Analyse problems and estimate when object-oriented programming is an appropriate methodology to design and develop object-oriented software using C++ and Java.

LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.