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 C++ code will give error on compilation?

==========code 1==========

```
#include <iostream>
using namespace std;
int main(int argc, char const *argv[])
{
cout<<"Hello World";
return 0;
}
```

==========

==========code 2==========

```
#include <iostream>
int main(int argc, char const *argv[])
{
std::cout<<"Hello World";
return 0;
}
```

==========

(a) Code 1 only (b) Neither code 1 nor code 2
(c) Both code 1 and code 2 (d) Code 2 only.

(ii) What is the value of p in the following C++ code snippet?

```
#include <iostream>
using namespace std;
int main()
{
int p;
 bool a = true;
bool b = false;
int x = 10;
int y = 5;
p = ((x | y) + (a + b));
cout << p;
return 0;
}
```

(a) 12 (b) 0 (c) 2 (d) 16

(iii) What is a pure virtual function?
(a) A virtual function defined inside the base class
(b) A virtual function that has no definition relative to the base class
(c) A virtual function that is defined inside both the base and the derived class
(d) Any function that is made virtual.

(iv) Which of the following operators cannot be overloaded?
(a) ^ (b) == (c) . (d) !

(v) 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

(vi) What will happen if a method is declared as 'final' in Java?
(a) It cannot be overridden
(b) It cannot be inherited
(c) It can be overridden
(d) It cannot be called from subclass.

(vii) Which is true?
(a) "X extends Y" is correct if an only if X is a class and Y is an interface
(b) "X extends Y" is correct if an only if X is an interface and Y is a class
(c) "X extends Y" is correct if X and Y are either both classes and both interfaces
(d) "X extends Y" is correct for all combinations of X and Y being classes and / or interfaces.

(viii) What is NullPoionterException?
(a) A NullPoionterExceptionis thrown when calling the instance method of a null object or modifying/accessing field of a null object
(b) A NullPointerException is thrown when object is set as null
(c) An NullPointerException is thrown when object property is set as null
(d) None of the above.

(ix) What is the general syntax for accessing the namespace variable?
(a) namespace::operator
(b) namespace, operator
(c) namespace $operator
(d) namespace #operator

(x) Which principle of OOP allows for the same function to be used in different ways based on the argument(s) of the function?
(a) Polymorphism
(b) Abstraction
(c) Encapsulation
(d) Inheritance.

Fill in the blanks with the correct word

(xi) _____ returns the size of a variable in bytes.

(xii) _____ operator is used to free the memory allocated using new operator.

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

(xiv) In Java, the _____ loop checks the condition after executing the loop body.

(xv) Java uses _____ to handle runtime errors and exceptions.

Group - B

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

(b) Discuss memory requirements for the class, object, data members, member function, and static class members. *[(CO1)(Analyse/IOCQ)]*

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

```
#include <iostream>
using namespace std;
int x=40;
int& setx(){ return x; }
int main(){
setx() = 22;
cout<< "x=" << x<<endl;
return 0;
}
```

[(CO5)(Analyse/IOCQ)]

(1 + 4) + 5 + 2 = 12

3. (a) What is the difference between a pass-by valueand a pass-by referencein C++? Explain with examples. *[(CO1)(Understand/LOCQ)]*

(b) Write a program to declare a void pointer, assign the address of an integer to it, and then print the value. *[(CO1)(Understand/IOCQ)]*

(c) The methods in line number 2 and 3 are special functions. What are they called and what should these methods be typically used for?

```
class Sample {
        Sample();
        ~Sample();
};
```

[(CO1)(Understand/LOCQ)]

4 + 4 + 4 = 12

Group - C

4. (a)

```
#include <iostream>
#include <string>
using namespace std;
class A
{
```

```
        float d;
public:
        virtual void func(){
         cout<<"Hello this is class A\n";
        }
};
class B: public A
{
        int a = 15;
public:
        void func(){
         cout<<"Hello this is class B\n";
        }
};
```

Write the main function of the above program to show an example of runtime polymorphism. *[(CO3)(Understand/IOCQ)]*

(b) Correct the statement: If a class is derived privately from a base class then no members of the base class is inherited. *[(CO3)(Understand/IOCQ)]*

(c)
```
#include<iostream>
 using namespace std;
 class B1{
        public:
            B1() { cout<<"Constructor of B1"<<endl; }
            ~B1() { cout<<"Destructor of B1"<<endl; }
 };
 class B2{
        public:
            B2() { cout<<"Constructor of B2"<<endl; }
            ~B2() { cout<<"Destructor of B2"<<endl; }
 };
 class D:public B1, public B2{
        public:
            D():B2(), B1() { cout<<"Constructor of D"<<endl; }
            ~D() { cout<<"Destructor of D"<<endl; }
 };
 int main(){
        D obj;
        return 0;
 }
```

What will be the output of the above program? Explain your output.

[(CO3)(Understand/IOCQ)]

3 + 2 + (3 + 4) = 12

5. (a) Create an user defined exception "test" with a character pointer as member variable, parameterised constructor and the what method.
Read the following code snippet and complete it such that:
If the input is "123", the exception "test" will be thrown with the input "123", caught and the error message "Entered Number"will be shown via calling"what()" function of the test class.

```
int main() {
   char * input = new char[100];
   cout <<"Enter input" <<endl;
   cin>>input;
}
```

[(CO6)(Analysis and Design/HOCQ)]

(b) Write a function template for adding two inputs. Specialize the template such that for string input, it appends the given string inputs. *[(CO5)(Demonstrate/IOCQ)]*

6 + 6 = 12

Group - D

6. (a) Is the Java compiler platform-independent? Justify your answer. *[(CO1)(Understand/LOCQ)]*
(b) Compare Java's primitive data types with reference data types. *[(CO1)(Compare/IOCQ)]*
(c) What are the key differences between function overloading and function overriding in Java? *[(CO5)(Apply/IOCQ)]*

3 + 3 + 6 =12

7. (a) Write True or False: For a class in Java to be abstract, the class must contain an abstract method. *[(CO1)(Understand/LOCQ)]*
(b) Write an example Java code showing the use of an abstract class. Also, write the output of the program. *[(CO1)(Understand/LOCQ)]*
(c) Can we instantiate an abstract class? If yes, write the syntax to do it. If no, explain your answer. *[(CO1)(Understand/LOCQ)]*
(d) Which object-oriented paradigm concept is/are satisfied using an abstract class? *[(CO1)(Understand/LOCQ)]*

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

Group - E

8. (a) What is the difference of use of default and protected access specifier? *[(CO4)(Understand/LOCQ)]*

(b) Write a Java program to do the following:
Create three threads named one, two, and three in the main thread. Each thread will print multiples of 3, 4, and 5, respectively. The main thread waits for the child threads to join it. *[(CO4)(Remember/LOCQ)]*

(c) Write a Java program to implement a JApplet to do the following:
There is an input textfield taking any string as input from the user. Your program will convert lowercase letters to uppercase and vice versa and show that in the output textfield. For example, if AbCd is given as input, aBcD will be shown as the output. *[(CO4)(Apply/IOCQ)]*

2 + 4 + 6 = 12

9. (a) What are exceptions? Explain the user defined exceptions and system defined exceptions with suitable examples. *[CO3 (Understand/LOCQ)]*

(b) How do we define try and catch block? Is it essential to catch all types of exceptions? Explain. *[CO3(Analyze/IOCQ)]*

(c) Briefly explain the use of "this" and "super" keywords. *[CO5(Remember/LOCQ)]*

(2 + 4) + 3 + 3 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	45	49	6