

OBJECT ORIENTED PROGRAMMING (CSE2203)

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 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
- (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) In C++, argv[0] prints the
- (a) command with which the program is invoked.  
(b) first argument string present in the command line.  
(c) first character of the first argument string present in the command line.  
(d) first character of the command with which the program is invoked.
- (iv) Which is the correct example of a unary operator?
- (a) & (b) ==  
(c) - (d) /
- (v) 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
- (vi) Which of the following statements is correct?
- (a) Base class pointer cannot point to derived class. (b) Derived class pointer cannot point to base class.  
(c) Pointer to derived class cannot be created. (d) Pointer to base class cannot be created.
- (vii) Which access specifier in Java allows visibility to subclasses outside the package?
- (a) private (b) protected  
(c) abstract (d) extern
- (viii) Which of the following is true for an abstract class in Java?
- (a) It must contain only abstract methods (b) It can be instantiated  
(c) It can contain both abstract and concrete methods (d) It cannot have any constructors
- (ix) 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.

- (x) What is the output of following code snippet:
- ```
public class Test {
    public static void main(String[] args) {
        try {
            int x = 10/0;
            System.out.println("A");
        }
        catch(ArithmeticException e) {
            System.out.println("B");
        }
        finally {
            System.out.println("C");
        }
    }
}
```
- (a) A B C
(b) B C
(c) C
(d) Runtime error

Fill in the blanks with the correct word

- (xi) _____ returns the size of a variable in bytes.
- (xii) If the maximum subscript value of an array is 9, then the size of the array is _____.
- (xiii) A final class _____ (can/cannot) extend other classes.
- (xiv) In Java, the _____ loop checks the condition after executing the loop body.
- (xv) The _____ method in Java is automatically called when an object is garbage collected.

Group - B

2. (a) Create a class Stack to implement Stack data structure with constructors & destructors. Define suitable member functions for insertion & deletion of elements to and from the Stack. Write a program in C++ to do this by clearly specifying the overflow and underflow conditions. [[CO5](Apply/IOCQ)]
- (b) Explain Deep copy and Shallow copy with the example of Stack. [[CO5](Analyze/HOCQ)]
- 8 + 4 = 12**
3. (a) What are the features of Object-oriented programming? [[CO1](Understand/LOCQ)]
- (b) Write a class (named Complex) consisting of two member variables to represent real part and imaginary part of a complex number and it has three member functions: **void getData()**: to take input at runtime for data members.
void showData(): to display the complex number.
Complex addComplex(Complex):
to add two complex numbers and return the result through the object. [[CO5](Apply/IOCQ)]
- (c) Explain constructor overloading with meaningful code. [[CO1](Apply/LOCQ)]
- 3 + 6 + 3 = 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. [[C03](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.

[[C03](Understand/IOCQ)]

3 + 2 + (3 + 4) = 12

5. (a) Write two problems you faced that were solved by writing a function template. Why would you use templates over macros? [[C03](Understand/IOCQ)]

(b) Write a function template in C++ that will find an item in an array of a given size. [[C03](Understand/IOCQ)]

(c) What will be the output of the following C++ code if we give input as 65 as age? Explain your output.

```
#include<iostream>
#include<exception>
using namespace std;
class userdefined:public exception
{
    public:
    const char * what() const throw(){ return "out of range";}
};
int main(){
    int age;
    cin>>age;
    try{
        if(age>60)
            throw userdefined();
    }
    catch(userdefined & obj)
    {
        cout<<obj.what();
    }
    return 0;
}
```

[[C03](Understand/IOCQ)]

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

Group - D

6. (a) In Java, what are the key differences between public, protected, and default (no specifier) access specifiers? [[C01](Understand/IOCQ)]

(b) In Java, encapsulation is achieved by bundling data and methods to operate as a single unit called class - Explain with example. [[C01](Understand/IOCQ)]

(2 + 2 + 2) + 6 = 12

7. (a) Explain the use of packages in Java. [[C02](Understand/LOCQ)]

(b) Provide an example demonstrating how to create and use a package in a Java program. [[C02](Apply/IOCQ)]

(c) What is the purpose of the super keyword in Java? Provide an example to demonstrate the use of super keyword.

[[C01](Understand/IOCQ)]

3 + 3 + (3 + 3) = 12

Group - E

8. (a) Write the uses of finally block in Java.
Write and explain the output of the following program.
- ```
public class Test
{
 public static void main(String[] args)
 {
 try
 {
 System.out.printf("1");
 int data = 5 / 0;
 }
 catch(ArithmeticException e)
 {
 System.out.printf("2");
 System.exit(0);
 }
 finally
 {
 System.out.printf("3");
 }
 System.out.printf("4");
 }
}
```
- [[C05](Demonstrate/IOCQ)]*
- (b) In a class named Semester\_answer, there will be name, roll, and no\_of\_ questions\_attempted as instance variables and calculate\_marks method as an instance method. In your semester exam, if a student answers more than four questions, a user-defined exception will be thrown “Marks of one question not to be added” inside the calculate\_marks method. Write a Java code to implement this scenario.
- [[C05](Demonstrate/IOCQ)]*  
**(2 + 3 + 1) + 6 = 12**
9. (a) Is it possible in Java to implement multiple inheritance? Explain with an example how a derived class can inherit from more than one base classes.
- [C05 (Understand/LOCQ)]*
- (b) Write down the differences between interfaces and abstract classes.
- [C05 (Analyze/IOCQ)]*
- (c) What is an abstract method? How is it implemented in Java?
- [C04 (Understand/LOCQ)]*  
**5 + 4 + 3=12**
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| Cognition Level         | LOCQ | IOCQ | HOCQ |
|-------------------------|------|------|------|
| Percentage distribution | 17.7 | 78.1 | 4.2  |