

## OBJECT ORIENTED PROGRAMMING WITH JAVA (IOT2203)

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) In Java, which operator or method is used to compare the contents of two strings?  
(a) = (b) ==  
(c) != (d) equals()
- (ii) Consider the following code  
package B;  
public class A {  
    int getSquare (int i) {  
        return i \* i;  
    }  
}  
Referring to the above, what classes can access method getSquare ( ) in class A?  
(a) Class A.  
(b) Class A and all other classes in package B only.  
(c) Class A, all subclasses of A in package B only.  
(d) Class A all non-subclasses of A in package B only.
- (iii) Constant that cannot be changed are declared using the keyword  
(a) final (b) static  
(c) absatract (d) immutable
- (iv) Which of the following is used for implementing inheritance through class?  
(a) inherited (b) using  
(c) extends (d) implements
- (v) Which of these is correct way of calling a constructor having no parameters, of superclass A by subclass B?  
(a) super(void); (b) superclass.();  
(c) super.A(); (d) super();

- (vi) Which of the following is not true about an interface  
 (a) it can be partially implemented by a class  
 (b) it can be implemented by an interface  
 (c) it can be implemented by several classes  
 (d) a particular class can implement several interfaces
- (vii) A monitor called "m" has two threads waiting with the same priority. One of the threads is "thread3". How can you inform "thread3" so that it alone moves from the Waiting state to the Ready state?  
 (a) thread3.notify( ) (b) m.notify(thread3)  
 (c) thread3.start( ) (d) notify(thread3)
- (viii) Which of the following are not a method of the Thread class?  
 (a) yield() (b) sleep(long msec)  
 (c) go() (d) stop()
- (ix) Which UML diagram represents the dynamic behaviour of a system by showing objects and the messages they exchange over time?  
 (a) Class diagram (b) Object diagram  
 (c) Sequence diagram (d) State diagram
- (x) What is the key difference between aggregation and composition?  
 (a) Aggregation represents a strong relationship, whereas composition represents a weak relationship.  
 (b) Aggregation is a whole-part relationship, whereas composition is not.  
 (c) In composition, the lifetime of the part depends on the whole, whereas in aggregation, it does not.  
 (d) Aggregation allows access modifiers, while composition does not.

*Fill in the blanks with the correct word*

- (xi) \_\_\_\_\_Qualifier declares a class variable that is to be shared among all instances
- (xii) A try statement must always have a \_\_\_\_\_associated with it.
- (xiii) Java byte code output from the JDK compiler will be placed into a file with \_\_\_\_\_extension.
- (xiv) \_\_\_\_\_ is a declaration that a variable can be accessed by multiple threads.
- (xv) A \_\_\_\_\_ diagram represents the static structure of a system, including classes and their relationships.

## Group - B

2. (a) The  $\sin(x)$  can be calculated approximately by summing the terms of the infinite series, where  $x$  is expressed in radians as follows: (Note :  $\pi = 1800$ )

$$\sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} \dots$$

Write a program in java that will read a value  $x$  (in degree) and then calculate  $\sin(x)$  by summing up the successive terms in the series until the difference between magnitude of two consecutive terms become very small (Like  $10^{-5}$ ).

[[CO1] (Evaluate/HOCQ)]

- (b) Which method can be used to set the length of the buffer within a StringBuffer object? *[[CO1,CO2] (Remember/LOCQ)]*
- (c) Why is Java called a fully object-oriented language but not a pure (or true) object oriented language? *[[CO1] (Analyse/IOCQ)]*  
**7 + 3 + 2 = 12**
3. (a) A circular prime is a prime number that remains prime under cyclic shifts of its digits. When the leftmost digit is removed and replaced at the end of the remaining string of digits, the generated number is still prime. The process is repeated until the original number is reached again. EXAMPLE: 131 311 113 So, 131 is a circular prime. Write a program to check whether a number is a circular prime or not. *[[CO1,CO2] (Evaluate/HOCQ)]*
- (b) Given that b is a Boolean variable, what's the value of (b || ! b)? *[[CO1] (Analyze /IOCQ)]*
- (c) "String is immutable". State whether the statement is true or false. Justify with an example. *[[CO1](Apply/IOCQ)]*  
**7 + 2 + 3 = 12**

### Group - C

4. (a) What are inner class and anonymous class? State one application of anonymous classes. *[[CO2] (Remember/LOCQ)]*
- (b) If a class is declared without any access modifiers, where may the class be accessed? *[[CO2] (Analyse/IOCQ)]*
- (c) Create a class containing an inner class that itself contains an inner class. Repeat this using static inner class. What are the names of the .class files produced by the compiler? *[[CO2] (Apply/IOCQ)]*  
**5 + 2 + 5 = 12**
5. (a) Can a Java class be private in a package? What are the access modifiers applicable to classes and instance variable in Java? *[[CO2] (Remember/LOCQ)]*
- (b) How do we design a package? How do we add a class or an interface to a package and use it from other package Illustrate with an example. *[[CO2] (Analyze/IOCQ)]*
- (c) In general which catch statement should come first? The one that catches the subclass or the one that catches the superclass? Why? *[[CO2] (Analyze/IOCQ)]*  
**5 + 5 + 2 = 12**

### Group - D

6. (a) Differentiate between HashMap and Hashtable. *[[CO3] (Remember/LOCQ)]*
- (b) Write a Generic Method that can perform the searching a data of a list. *[[CO3] (Apply/IOCQ)]*
- (c) Write a program that uses a StringTokenizer to tokenize a line of text input by the user and places each token in a TreeSet. Print the elements of the TreeSet. *[[CO3] (Apply/IOCQ)]*  
**3 + 4 + 5 = 12**
7. (a) Differentiate between ArrayList and LinkedList. *[[CO3] (Understand/LOCQ)]*

- (b) Write a Generic Method that can perform the sorting of any type of data. [[CO3) (Apply/IOCQ)]
- (c) Write the following methods that return a lambda expression performing a specified action: **isPrime()**: The lambda expression must return true if a number is prime or false if it is composite. [[CO2) (Apply/IOCQ)]
- 3 + 4 + 5 = 12**

### Group - E

8. (a) Evaluate the importance of UML Sequence Diagrams in modeling Java-based systems. Explain with an example for a login system. [[CO6)(Apply/HOCQ)]
- (b) Analyze how polymorphism and dynamic method dispatch in Java improve code flexibility and reusability. [[CO2,CO6)(Analyse/LOCQ)]
- 6 + 6 = 12**
9. (a) Discuss how the Separation of Concerns principle can be applied in a Java-based MVC (Model-View-Controller) architecture. [[CO6)(Evaluate/HOCQ)]
- (b) Write the difference between Abstraction and encapsulation. [[CO2)(Remember/LOCQ)]
- (c) What is state diagram? What is the purpose of the state diagram? [[CO6)(Understand/IOCQ)]
- 6 + 3 + 3 = 12**

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	29.17	43.75	27.08