

**OBJECT ORIENTED PROGRAMMING WITH JAVA  
(MCAP 1201)**

**Time Allotted : 3 hrs**

**Full Marks : 70**

*Figures out of the right margin indicate full marks.*

*Candidates are required to answer Group A and  
any 5 (five) from Group B to E, taking at least one from each group.*

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

**Group - A  
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) `double x = 0;`  
`x = (check ( ).equals ("1")) ? getSales ( ) : nextStore ( );`  
What datatype could be returned by method `check ( )` as shown above?  
(a) int                      (b) boolean                      (c) String                      (d) byte.
- (ii) Which one of the following is NOT a valid `java.lang.String` declaration?  
(a) `String myString = new String ("Hello");`  
(b) `String myString = new String (5);`  
(c) `String cde = "cde";`  
(d) `String myString = new String ( ).`
- (iii) Which one of the following describes the difference between `StringBuffer` and `String`?  
(a) `StringBuffer` is used only to buffer data from an input or output stream.  
(b) `StringBuffer` allows text to be changed after instantiation.  
(c) `StringBuffer` holds zero length Strings.  
(d) `StringBuffer` supports Unicode.
- (iv) What will be the output of the following code segment (assuming that the object 'ct' gets stored in the address location 2345)?  
`class ClassTest {`  
`public String toString ( ){`  
`return "ClassTest";`  
`}`

```

    public static void main (String [ ] args){
        ClassTest ct = new ClassTest ( );
        System.out.println (ct);
    }
}

```

- (a) ClassTest@2345                      (b) Error  
(c) ClassTest                              (d) ct.

- (v) Which statement about static inner classes is true?  
(a) Static inner classes may access any of the enclosing class members.  
(b) Static inner classes may not be instantiated outside of the enclosing class.  
(c) Static inner classes do not have a reference to the enclosing class.  
(d) Static inner classes are created when the enclosing class is loaded.

(vi) class A {  
int i, j, k;  
public A(int ii) { i = ii; }  
public A() {  
k = 1;  
}  
}

Referring to the above segment of code, what code instantiates an object of class A?

- (a) new A(this);                              (b) A a = new A(3);  
(c) A(3) a;                                    (d) A a = new A(4,8).

- (vii) Consider the following code

```

package B;
public class A {
    int getSquare (int i) {
        return i * i;
    }
}

```

Referring to the above code segment, 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.

x-y coordinate pairs for the four endpoints of the Quadrilateral. Write a program that instantiates objects of your classes and outputs each object's area (except Quadrilateral).

**(3 + 1) + 8 = 12**

### Group – E

8. (a) What is the difference between a thread created as a subclass of Thread and one created as an implementation of Runnable? What is the trade-off between extending the Thread class and implementing the Runnable interface, while creating a thread?  
(b) What are the different ways of synchronizing threads? Illustrate with an example.  
(c) "Vector objects cannot store primitive type data directly."- How do you handle this limitation with wrapper classes?

**(2 + 1) + 5 + 4 = 12**

9. (a) Suppose you've defined an exception called NotANumberException( ). Now suppose that NotAPositiveNumberException extends NotANumberException. Will

```

    catch (NotANumberException) {
        System.out.println("Caught a NotANumberException");
    }

```

catch a NotAPositiveNumberException?

Now you have the following catch clause and throw a NotAPositiveNumberException. What happens?

```

    catch (NotANumberException) {
        System.out.println("Caught a NotANumberException");
    }
    catch (NotAPositiveNumberException) {
        System.out.println("Caught a NotAPositiveNumberException");
    }

```

- (b) Write a program that stores names of some countries and their capitals. The program prints the name of the capital when the name of a country is entered by the user and vice-versa. The program should throw a user defined exception called NoMatchFoundException, if the country or the capital entered by the user is not found.

**4 + 8 = 12**

- (viii) How can you have a "try" block that invokes methods that throw two different exceptions?  
 (a) Catch one exception in a "catch" block and the other in a "finally" block.  
 (b) Setup nested "catch" blocks for each exception.  
 (c) Catch one exception in a "catch" block and the other via the return value.  
 (d) Include a "catch" block for each exception.
- (ix) Which code declares class A to belong to the mypackage.financial package?  
 (a) package mypackage; package financial;  
 (b) import mypackage.\*;  
 (c) package mypackage.financial.A; mypackage.financial;  
 (d) package.
- (x) Which of the following is used as a part of method signature in Java?  
 (a) throw                      (c) throws                      (b) try                      (d) finally.

### Group - B

2. (a) Distinguish between the state and behaviour of an object with proper example.  
 (b) What are byte codes? How are they different from machine codes?  
 (c) Describe the JVM heap structure.

**4 + 4 + 4 = 12**

3. (a) An election is contested by 5 candidates. The candidates are numbered 1-5 and the voting is done by marking the candidate number on the ballot paper. Write a program to read the ballots and count the votes casted for each candidate using an array variable count. In case, a number read is outside the range 1 – 5, the ballot should be considered as a 'spoilt ballot' and the program should also count the number of spoilt ballots.  
 (b) Write a program to sort several strings passed at the command line. Sorting should be according to the length of the strings.

**6 + 6 = 12**

### Group - C

4. (a) "In Java, the variables are initialized before any method is called even constructor" – Explain the statement with an example.

- (b) "Java does not support destructors" – Justify the statement.
- (c) What are constructors? What is meant by constructor overloading? Explain with an example.

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

5. (a) What is a singleton class? Write a program to define and use a singleton class.
- (b) Write a program to:
- Set up an instance of a Person class. Prompt the user to type in the name, age and gender. Then set the attributes of a Person instance to these values and print them out.
  - Make use of the getUpperAgeLimit ( ) method to test the age typed in by the user is a valid one. If it is not valid, output an error message and stop the program.
  - Output the attributes of this instance in the following form – John Smith is a man. Or, Joan Smith is a woman. Or, Jim Smith is a boy. Or, Jane Smith is a girl. A boy or a girl is anyone aged 17 or less.
  - Set up two instances of the Person class and give them suitable attributes. Output the information in the form – John Smith is younger than Dave Jones.

$$(1 + 4) + 7 = 12$$

#### Group - D

6. (a) What are the different types of class relationships? Explain with proper examples. Which among these leads to inheritance?
- (b) In what order are constructors invoked along the inheritance chain, when a derived class object is created? Explain with an example.
- (c) "Methods declared as 'final' sometimes provide a performance enhancement" – Justify the statement.

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

7. (a) "Packages are used to keep the class name space compartmentalized" - Explain. What is the significance of compiling a Java program with the -d option?
- (b) Write an inheritance hierarchy for classes Quadrilateral, Trapezoid, Parallelogram and Square. Use Quadrilateral as the super class of the hierarchy. Specify the instance variables and methods for each class. The private instance variables of Quadrilateral should be the