BITS Pilani, Dubai Campus
Dubai International Academic City, Dubai

II Year CS
First Semester, 2012-2013

No of questions : 11
No of Pages : 3

Comprehensive Examination (Closed Book)

Course No: CS F213 | **Course Title: Object Oriented Programming**
Date: 08th Jan 2013 | **Weightage: 30%**
Duration: 3 hrs | **Max. Marks: 30**

1. Answer the following questions as stated against each question. **[1M]**

   a) For the following class definition

```
class Aaa implements Cloneable {
 int x;
 String y;
 public Aaa clone() {
     try {
         Aaa cloned = super.clone();
     } catch (CloneNotSupportedException e) { return null; }
 }
}
```

   Error (if any) with reason: _____

   b) Find the output of the following Java Program (`prog2.java`) **[1M]**

```
public class prog2 {
   public static void main(String[] args) {
      int[] x = { 10, 3, 3, -2, 1, -2, 5, 10, 4, 6 };
      int n = x.length;
      for (int i=0; i <= n-1; i++ ) {
        int temp = x[i];
        boolean flag = false;
        for (int j=0; j <= n-1; j++) {
          if (i==j) continue;
          if ( temp == x[j] ) { flag = true; break; }
        }
        if (!flag ) System.out.println(x[i]);
      }
   } // of main
}//of class prog2
```

   In a single sentence describe what does the program do?

2. Thread.sleep(DELAY) must be enclosed in a try catch block. Justify **[1M]**

3. In the Object Oriented Programming paradigm briefly explain the characteristics of the objects i) State, ii) Behaviour. Give examples for the same **[1M]**

P.T.O

4. Briefly explain the different types of multiplicities represented in Aggregation relationship between classes? **[2M]**

5. Explain the Context and Solution for the Adapter Pattern **[2M]**

6. Write a complete Java program that reads a String from the keyboard as input and prints the abbreviated string (the first letter of each word which begins with capital) as follows.
   Eg. Input String: Birla Institute of Technology and Science **[3M]**
   Output: BITS

7. Write a complete Java program the compute the binomial co-efficient (i.e n choose r) nCr using the following formula.
   $$nCr = \frac{n(n-1)(n-2)..(n-(r-1))}{k(k-1)(k-2)..1}$$
   (Read both *n* and *r* from the keyboard) **[3M]**

8. Define a class `BookInfo` which contains private members `name` (String), `author` (String) : `author` is the author of the book named `name`, `cost` (type double) : `cost` is the cost of the book named `name`
   Define another class `BookInfoList`, which has a member `list` (of type **ArrayList** to hold a list of `BookInfo` objects).
   Provide a member functions in the class `BookList`

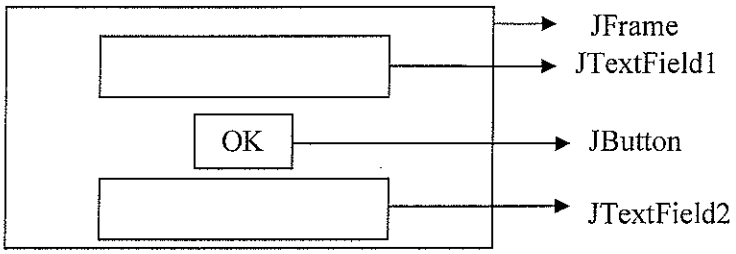
```
public void add(String book, String author, double cost);
// add book info to the list
public void displayBookInfo(String author);
//displays all the books and its cost, by the author name)
```

   Write a main program to do the following in an object of type BookInfoList.
   a) Add the following books to the list
      "book1", "abc", 10
      "book2", "def", 20
   b) display all book by author "abc" **[4M]**

9. Create an base class called `CelestialBody`, which has a member `name` (`String`), `mass` (`double`) and `volume` (`double`) with method, `about()`.
   Create the following subclasses of the class `CelestialBody`.
   a) subclass `Star` has additional member `state` (`String`), `amountHelium` (`double`), `amountHydrogen` (`double`)
   b) subclass `Planet` has additional member `category` (`String`), `hasSatellite` (`boolean`)
   c) subclass `Satellite` has additional member `planet(Planet)`

Provide the class definitions for the all the classes `CelestialBody`, `Star` `Planet` and `Satellite` with appropriate constructors and the implementation of the method `about()` **[4M]**

10. Write a complete Java program using Swing GUI functions to read an integer no in JTextField1 and display a random no in the range 0 to n-1 in another JTextField2 when OK JButton is clicked. **[4M]**



11. Assume that `LightSource` class has been provided with the following methods.

```
String getName(); //get the name of the Light source
void setName(); // set the name of the Light source
boolean getState(); // state of the Light source
void setState(Boolean state);//set the state of the Light
  source
```

Using the singleton design pattern write class definition for `SingleLightSource` which creates a single instance of `LightSource` and provides implementations of the above methods.
(Note: These should invoke the corresponding methods of the class `LightSource`.) **[4M]**

BITS Pilani, Dubai Campus
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II Year CS
First Semester, 2012-2013

No of questions : 5
No of Pages : 2

Test 2 (Open Book)

Course No: CS F213 | **Course Title: Object Oriented Programming**
Date: 13th Dec 2012 | **Weightage: 20%**
Duration: 50 minutes | **Max. Marks: 20**

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1. Answer the following questions as stated against each question. **[2x1M = 2M]**

a)
```
class  AA { }
class BB extends AA {}
class CC extends BB {}

public class gx {
   public static void main(String[] args) {
      AA a = new AA();
      BB b = new CC();
      System.out.println(a.getClass().getName());
      System.out.println(b.getClass().getName());
      boolean x = a instanceof AA;
      boolean y = a instanceof CC;

      System.out.println(x);
      System.out.println(y);
   }
}
```

Find the output: `AA, CC, true, false.`

b) Write the difference between Layout Managers : GridLayout and BoxLayout

GridLayout: Components are layed out in the form of a matrix (x rows and y columns), all component have the same size.

BoxLayout: Components are layed out from left to right (horizontal), or top to bottom (vertical).

2. Complete the implementation of the `equals` method for the class `ABC` shown below **[3M]**

```
class ABC {
  int x, y;
  String name;
  public boolean equals (Object  o) {
     /* Complete the implementation */
       ABC other = (ABC)o;
       return ( (x == other.x) && (y == other.y) &&
                name.equals(other.name) );
  } // of equals

}//of class ABC
```

P.T.O

3. A class `Book` has members `title` (`String`), `publisher` (`Publisher`), and `cost` (`double`). The class `Publisher` has members `name` (`String`), and `place` (`String`). Show the implementation of the shallow copy and deep copy of the class Book. **[5M]**

```
class Publisher implements Cloneable {
        String name;
        String place;
        public Object clone() {
                try {
                        return super.clone();
                } catch (CloneNotSupportedException e) {
                        return null;
                }
        }
}
class Book implements Cloneable {
        String title;
        Publisher pub;
        public Object clone() {
                try {
                        Book b = (Book)super.clone();
                        b.pub = (Publisher)pub.clone();
                } catch (CloneNotSupportedException e) {
                        return null;
                }
        }
}
```

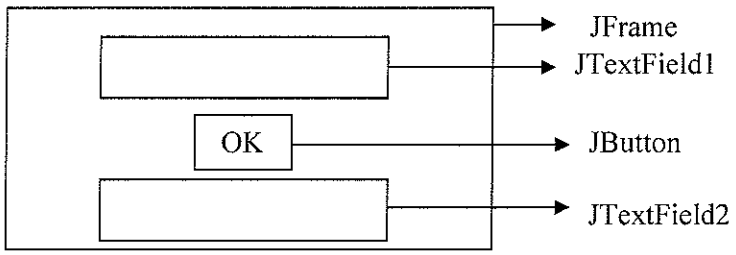
4. A class `Counter` contains a integer variable `value`, and a method `decrementBy(int v)`. Multiple threads use an object of class `Counter`. Explain the potential problem faced by the threads and its solution using java language feature to circumvent the problem. (no code is necessary) **[5M]**

Problem: The class counter and hence the variable value are shared data which are accessed by different threads simultaneously. The can cause inconsistently in data. For e.g if the current value is x, after decrement by a thread, the value need not be 4. This is because other threads could have decremented the value due to concurrent execution. This causes corruption of shared data.

Solution: Ensure that the threads are access the shared data only one at a time. i.e only one thread is allowed to access the shared data at a time. The other thread which tries to access the data will be put on hold, till the current thread which access the data is done with the work. This ensures mutual exclusion. This is done using locks in java. Each thread works are follows

lock ..
Access shared data
Unlock

5. Write a Java program using Swing GUI functions to read an integer no in JTextField1 and display whether its prime or not in another JTextField2 when OK JButton is clicked. **[5M]**




```
import java.awt.*;
import java.awt.event.*;
import javax.swing.*;

public class GTest2 {
  public static void main(String[] args) {
    JFrame frame = new JFrame("Prime_GUI");
    frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    final int FIELD_WIDTH = 20;
    final JTextField numField = new JTextField(FIELD_WIDTH);
    final JTextField resField = new JTextField(FIELD_WIDTH);
    JButton checkPrimeButton  = new JButton("OK");
    checkPrimeButton.addActionListener(new
      ActionListener() {
        public void actionPerformed(ActionEvent event){
          int num = Integer.parseInt(numField.getText());
          boolean flag = true;
          int endNo = num - 1;
          for (int i=2; i <= endNo; i++ ) {
            if ( num % i == 0) {flag = false; break;}
          }
          resField.setText("Prime = " + flag);
        }
      });

    frame.setLayout(new FlowLayout());
    frame.add(numField);
    frame.add(checkPrimeButton);
    frame.add(resField);
    frame.setVisible(true);
  }
}
```

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BITS Pilani, Dubai Campus
Dubai International Academic City, Dubai

II Year CS
First Semester, 2012-2013

No of questions : 5
No of Pages : 2

Test 1 (Closed Book)

Course No: CS F213 — **Course Title: Object Oriented Programming**
Date: 21th Oct 2012 — **Weightage: 20%**
Duration: 50 minutes — **Max. Marks: 20**

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1. Answer the following questions as stated against each question. **[3x1M = 3M]**

a)
```
//Filename: aaa.java
public class aaa {
  public static void main(String[] args) {
    int[] a  = { 10, 20, 30};
    int b = a[a.length] * 2;
    System.out.println(b);
  }
}
```
Error (if any) with reason: _____

b)
```
//FileName: ccc.java
abstract class bbb {
  String var;
  public bbb() {}
  public void display(){System.out.println(var); }
}
public class ccc {
  public static void main(String[] args) {
    bbb b = new bbb();
  }
}
```
Error(if any) with reason:_____

c) Using _____ object-orientated principle _____ can be changed without altering the usage of the class. (Fill in the blanks)

2. Find the output of the following Java Program (`prog2.java`) **[2M]**

```
public class prog2 {
  public static void main(String[] args) {
    int[] x = { 10, 3, -2, 4 };
    int n = x.length;
    int[] y = new int[n];

    for (int i=0; i <= n-2; i++ ) {
      y[i+1] = x[i];
    }
    y[0] = x[n-1];
    for(int z: y) {System.out.println(z);}
  } // of main
}//of class prog2
```

P.T.O

3. Write a complete Java program that generates the first 'n' Fibonacci numbers and stores the generated numbers in an array. The parameter 'n' is read as input from the keyboard. (Note: the array size is not known at the compile time, and should be based on the parameter 'n') **[5M]**
Fibonnacci nos: 1, 1, 2, 3, 5, 8, 13, 21, 33.....

4. Define a class `FlightDest` which contains the `flightNo` and `destination` (both of type strings and accessible only within the class `FlightDest`).
Define another class `FlightInfo`, which holds a member `flightDestList` (of type **ArrayList** to hold a list of `FlightDest` objects).
Also provide the class with member functions having the following signatures.

```
public FlightInfo();//initialize the FlightInfo class
public void addFlightDestPair(String fNo, String dest);
//adds the pair (fNo, dest ) to the flightDestList
```

(Note: PI provide only the class definitions for `FlightDest` and `FlightInfo` only, **no need** of writing the main method to use the above classes) **[5M]**

5. Create an abstract class called `Animal`, which has a member "`name`" of type string, with abstract methods, `about()`, `live()`, `eat()`.
Further create 2 subclasses `DomesticAnimal` and `WildAnimal` which overload the corresponding methods and display appropriate messages as shown in the table.

Class	Method	Message
Domestic Animal	`about()`	I am a domestic animal know as <name>
	`live()`	I live along with humans
	`eat()`	I eat yummy food with humans
Wild Animal	`about()`	I am a wild animal know as <name>
	`live()`	I live in the wild forest
	`eat()`	I eat wild food

(Note: PI provide only the required class definitions only, **no need** of writing the main method to use the above classes) **[5M]**

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BITS PILANI, DUBAI CAMPUS
FIRST SEMESTER 2012 – 2013
SECOND YEAR (CS)
QUIZ 2

No of Questions: 08
No of Pages : 2

Course Code: CS F213
Course Title: Object Oriented Programming
Duration: 20 minutes

Date: 19.11.12
Max Marks: 05
Weightage: 5%

Name: ..... **ID No:** ..... **Sec / Prog:** .....

Instructions: Write your answers in the blank space provided after each question. Make suitable assumptions if not explicitly mentioned.

1. Give 2 key differences between abstract classes and interfaces **[1.0M]**

2. The ability to select different methods based on the type of object is known as ___ **[0.5M]**

a) Inheritance
b) Polymorphism
c) Multiple Inheritance
d) Both a and c
e) All of the above

3. For the java program `bbb.java`, which of the following is true? **[0.5M]**

```
interface canDo { void doIt(); }
class MyClass implements canDo {
  public void doIt() { System.out.println("ok"); }
}
public class bbb {
   public static void main(String[] args) {
      MyClass c1 = new MyClass();
      c1.doIt();
   }
}
```

a) Complier error because it should have been `class MyClass extends canDo`
b) Complier error because `c1.doIt();` should not be invoked
c) Complier error because `void doIt();` should have been `public void doIt();`
d) None of the above.

4. Fill in the implementation of `compareTo()` method **[1.0M]**

```
class Book implements Comparable<Book> {
   String name;
   double cost;
   public int compareTo( Book other) {
         // fill in the implementation to compare by cost




   }
}
```

5. Explain the distinction between Unchecked Exception and Checked Exception **[1.0M]**

6. Find the output of the following Java program **[1.0M]**

```
public class ddd {
   public static void main(String[] args) {
      try {
        func(5, 10);
        func(6, 3);
        func(4, 12);
        System.out.println("Done 1");
      } catch (Exception ex) {
          System.out.println(ex.getMessage());
      }
      System.out.println("Done 2");
   }

   static void func(int i, int limit) throws Exception {
      if (i > limit) {
         throw new IllegalArgumentException( i + " > " + limit);
      }
      System.out.println("OK " + i );
   }
}
```

Output:_____

Explanation: _____

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BITS PILANI, DUBAI CAMPUS
FIRST SEMESTER 2012 – 2013
SECOND YEAR (CS)
QUIZ 1

No of Questions: 08
No of Pages : 2

Course Code: CS F213
Course Title: Object Oriented Programming
Duration: 20 minutes

Date: 04.10.12
Max Marks: 05
Weightage: 5%

Name: ..... **ID No:** ..... **Sec / Prog:** .....

Instructions: Write your answers in the blank space provided after each question. Make suitable assumptions if not explicitly mentioned.

1. _____ operator is used to create an object of a class **[0.5M]**

2. Find the error (if any) in the Java Program which is saved in the file "abc.java". **[0.5M]**

```
public class HelloWorld {
   public static void main(String[] args) {
         System.out.println("Hello World");
   }
}
```

Error (Yes/No): _____
Reason: _____

3. Will this class definition give a compile time error, if so why. **[0.5M]**

```
public class AAA {
   int x = 0;
   public static void func1(int y) { x = y; }
}
```

Error (Yes/No): _____
Reason: _____

4. Find the error if any in the Java program **[0.5M]**

```
class CCC {
   private int num = 0;
   public CCC(int n) { num = n; }
}
public class CCC_Tester {
   public static void main(String[] args) {
         CCC c = new CCC(10);
         System.out.println(c.num);
   }
}
```

Error (Yes/No): _____
Reason: _____

5. Find the output of the following Java program **[0.5M]**

```
public class Test {
   public static void main(String[] args) {
         String s1 = "Object Oriented Programming";
         int x = 0;
         for (int i=0; i < s1.length(); i++) {
               if ( s1.charAt(i) == 'e') { x++; }
         }
         System.out.println(x);
   }
}
```

Output: _____

6. Find the output of the program **[0.5M]**

```
class SomeClass {
   static int val = 0;
   public SomeClass(int v) { val += v; }
   public void display() { System.out.println(val); }
}
public class SomeClassTester {
   public static void main(String[] args) {
         SomeClass a = new SomeClass(10);
         System.out.println(a.val);
         SomeClass b = new SomeClass(20);
         System.out.println(b.val);
   }
}
```

Output: _____

7. The method `setValB(int valB)` is written with the objective of assigning the value passed as the parameter to the field `int valB` in the class. **[1.0M]**

```
class BBB {
   int valB = 0;
   public void setB(int valB) { valB = valB; }
}
```

Will the objective be met (Yes/No) :_____
Justification: _____
Code Modification (if any) required to meet the objective: (only the modified line)

_____

8. Find the output of the following Java program **[1.0M]**

```
public class AAA {
   public static void main(String[] args) {
         int x = 4672, y = 0;
         for (;x!=0;) {
               y += x%10;
               x /= 10;
               System.out.println(y);
         }
   }
}
```

Output:_____

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