UNIVERSITY OF LONDON

GOLDSMITHS COLLEGE

Department of Computing

B. Sc. Examination 2015

IS52028B
Principles and Applications of Programming

Duration: 1 hour 30 minutes

Date and time:

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*There are a total of two questions in this paper **You should attempt all questions**.*

Full marks will be awarded for complete answers to a total of TWO questions. Each question carries 25 marks. The marks for each part of a question are indicated at the end of the part in [.] *brackets.*

There are 50 marks available on this paper.

THIS PAPER MUST NOT BE REMOVED
FROM THE EXAMINATION ROOM

Question 1

(a) i. What is the difference between the following two notions: an object in an object oriented language and a variable in a structured programming language? [2]

ii. Which of the following is/are advantage of using object oriented programming?

1. Code Reusability
2. Can create more than one instance of a class without interference
3. Platform independent
4. All of the above

[3]

iii. A sub-class is placed in the same package as its super-class. You want to allow the sub-class to access a method defined in the super-class. Which of the following is/are the correct access specifier(s) for this purpose?

1. public
2. protected
3. default
4. All of these

[3]

(b) i. What will be the output of the following program?

```
class A
{
       public static void main (String[] args)
      {
                  int x=0;
                  System.out.println(x++);
                  System.out.println(++x);
                  System.out.println(--x);
                  System.out.println(x--);
                  System.out.println(x);
       }
}
```

[4]

ii. What will be the output of the following code fragment?

```
System.out.println((int)1.5);
```

[2]

(c) Consider the following program:

```
public class Q1c
{
  private boolean b;
  private int n;

  public Q1c(){}

  public boolean getB()
  {
     return b;
  }

  public int getN()
  {
     return n;
  }

  public static void main(String[] args)
  {
    Q1c  q1c = new Q1c();
    System.out.println(q1c.getN());
    System.out.println(q1c.getB());
  }
}
```

Which of the following best describes what will happen?

i. It will compile with no errors and output:

0

false

ii. There will be a compilation error because the instance variables are not initialised

iii. The program will compile correctly but have a run time error because the instance variables have not been initialised

[3]

(d) Consider the following two classes, A and B:

```
public class A
{
  private int n = 51120;

  public int getN()
  {
    return n;
  }

  public static void main(String[] args)
  {
     A a = new A();
    System.out.println(a.getN());
  }
}
```

```
public class B
{
  private int n = 51120;

  public B (int number)
  {
     n = number;
  }

  public int getN()
  {
     return n;
  }

  public static void main(String[] args)
  {
     B b = new B();
     System.out.println(b.getN());
  }
}
```

i. One class will compile correctly and one will not. Identify which one of A and B produces a compilation error?

ii. Explain why one class compiles and why the other does not.

[4]

(e) Using the method -Math.random()-, write a complete Java program that generates a million random real numbers between 0 and 1 and prints out the largest. [4]

Question 2

(a) i. The concept of multiple inheritance is implemented in Java by

1. extending more then one class.
2. extending one class and implementing one or more interfaces
3. implementing two or more interfaces
4. Both 2 and 3

[3]

ii. For each of the following statements say whether it is true or false:

1. An abstract class can be instantiated
2. An abstract class cannot be instantiated
3. A class can implement any number of interfaces, but can only extend one abstract class
4. An abstract class can have concrete (ie non-abstract) methods

[3]

(b) Why will the class Q2b shown below give a compilation error?"

```
abstract class Dog
{
   public abstract String bark();
}

class Q2b
{
   public static void main(String[] args)
   {
      Dog d=new Dog();
   }
}
```

[3]

(c) Consider the following code:

```
public interface Q2c
{
          public boolean isEmpty();
          public void push(Object item);
          public Object top();
          public void pop();

          public String toString(int n, int[] a)
          {
                    String s = "";
                    for (int i=0; i<n; i++) s += a[i] + " ";
                    return s;
          }
}
```

Which one of the following will happen?

i. the Q2c interface produces a compilation error because the toString() method is not abstract

ii. the Q2c interface will compile correctly

iii. the Q2c interface will compile correctly but there will be a run-time error in any implementing classes because of the non-abstract toString() method

[5]

(d) i. Consider the following definition:

```
interface Animal
 {
     abstract int numberOfFeet();
 }
```

Define a (non-abstract) class Cat that implements Animal. [5]

ii. Suppose we have pet cats which are like cats but they also have a name.

1. Write a class for pet cats (include a constructor) and a method for getting the cat's name.
2. Write a method which has an ArrayList a of pet cats as its single parameter, and returns the pet cat in a with the longest name.

[6]