UNIVERSITY OF LONDON

GOLDSMITHS COLLEGE

B. Sc. Examination 2006

COMPUTER SCIENCE

IS51008A(CIS109)   Introduction to Java and
Object–Oriented Programming

Duration: 3 hours

Date and time:

_____

There are six questions in this paper. You should answer no more than FOUR questions. Full marks will be awarded for complete answers to a total of FOUR 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 100 marks available on this paper.

No calculators should be used.

**THIS EXAMINATION PAPER MUST NOT BE REMOVED
FROM THE EXAMINATION ROOM**

QUESTION 1

(a) (i) Write three assignment statements whose effect is to swap the contents of variables
x and y.

(ii) Briefly explain why the following program has a compilation error:

```
class f
{
    int x=false;
}
```

(iii) What is the output of the following Java program?

```
class f
{
    public static void main(String [ ]  args)
    {
     System.out.println(7+2*3);
    }
}
```

Justify your answer.

[**9 Marks**]

(b) (i) What is the output of the following?

```
class H
{
    public static void main(String [ ]  args)
    {
        i=0;
        while (i<5) {System.out.println(i);i=i+1;}
    }
}
```

(ii) Rewrite program H above using a *for* loop.

[**8 Marks**]

(c) Write a method which sorts an array of `int`s into ascending order and discuss the time
complexity of your method.

[**8 Marks**]

QUESTION 2

(a) (i) Given that the ASCII code for the character **b** is 98, what is the ASCII code for the character **a**?

    (ii) What is the output of the following Java program?

```
class ascii
{
        public static void main(String[] args)
        {
            System.out.print((int) 'a');
        }
}
```

    (iii) What is the output of the following Java program?

```
class ascii
{
        public static void main(String[] args)
        {
            System.out.print((char) 98);
        }
}
```

    (iv) What does the following program do?

```
import java.io.*;
class one
{
        public static void main(String args[]) throws Exception
        {
                FileReader f =  new FileReader("aaa");
                int x; x=f.read(); x=f.read();
                System.out.print((char)x);
        }
}
```

[**9 Marks**]

(b) Write two fragments of code that illustrate how to output the contents of a file

    (i) by reading it character by character.

    (ii) by reading it line by line.

[**8 Marks**]

(c) Write a method which prints out the number of occurrences of each letter in a file called "aaa". You should distinguish between upper and lower case letters.

[**8 Marks**]

QUESTION 3

(a) Define a class called *Date* which has three fields *day*, *month* and *year* all of type *int* and one constructor with three *int* paramenters.

[**9 Marks**]

(b) Write two instance methods, *isEqual* and *isBefore* for the class *Date*. Both methods should have one parameter *d* of type *Date*. The method *isEqual* should return *true* if this date is equal to *d* and *false* otherwise. The method *isBefore* should return *true* if this date is before *d* and *false* otherwise.

[**8 Marks**]

(c) Define a class called *Person* consisting of a name which is of type *String* and a date of birth which is of type *Date*. Write a constructor with two parameters (one of type *String* and the other of type *Date*) for *Person* and an instance method *isYounger*, with one parameter *p* of type *Person*, for checking whether this person is younger than *p*. (You should use the *isBefore* method of the last question.)

[**8 Marks**]

QUESTION 4

(a) (i) Give a boolean expression which evaluates to `true` if the variable `x` has the value 3 and which evaluates to `false` otherwise.

   (ii) Give a boolean expression which evaluates to `true` if the variable `x` has the value 7 or the value 9 and which evaluates to `false` otherwise.

 (iii) Give a boolean expression which evaluates to `true` if the variable `x` has the value 1 and the variable `y` has the value 2 and the variable `z` is even and which evaluates to `false` otherwise.

 (iv) Give a boolean expression which evaluates to `true` if the variables `x`, `y` and `z` all have the same value and which evaluates to `false` otherwise.

[**9 Marks**]

(b) (i) Here is the body of a method:

```
{
     return 3;
}
```

What is its return type?

 (ii) Here is the body of a method:

```
{
        int x;
        if (x==k) return "hello"+" world";
        else return "";
}
```

What is its return type?

(iii) Here is the body of a method:

```
{
        System.out.println(3);
}
```

What is its return type?

(iv) Here is the body of a method:

```
{
        return("hello".charAt(2));
}
```

What is its return type?

[**8 Marks**]

(c) Write a method whose heading is `static Vector convert(Object [ ] a)` which given an array of Objects, returns a Vector of the same Objects in the same order.

[**8 Marks**]

QUESTION 5

(a) (i) Explain briefly the purpose of packages in Java.

(ii) Explain briefly the purpose of the `import` statement in Java.

(iii) Rewrite the following Java class so it does not have any `import` statements.

```
import java.io.*;
class Echo
{
    public static void main(String[] args) throws IOException
    {
      BufferedReader in =
      BufferedReader(new InputStreamReader(System.in));
      String s =in.readLine();
      System.out.println(s);
    }
}
```

[**9 Marks**]

(b) Given the class *C* defined as follows

```
class C
{
      int f()
      {
          return 5;
      }
}
```

Define a class *D* which extends *C* and which has one method which *overrides f* and another which *overloads f*.

[**8 Marks**]

(c) (i) The class *Object* has one constructor with no parameters. How would you declare a variable, *v*, of type *Object* and then assign a value to variable, *v*, by using the constructor of the class *Object*?

(ii) Define a class called *Array* with one field of type *array of Object* and one instance method *toString()* which returns a String containing the elements of the array separated by commas. Do not define a constructor for the class *Array*.

[**8 Marks**]

QUESTION 6

(a) (i) What is the output of the following program?

```java
public class A
{
   public static void main(String[] args)
   {
    try
     {
        Integer.parseInt("rabbit");
        System.out.println("cat");
     }
     catch(Exception e)
     {
        System.out.println("fish");
     }
   }
}
```

(ii) There will be an error when we compile the program below. What is it? Give two different ways of correcting it.

```java
import java.io.*;
public class cat1
{
      public static void main(String[] args)
      {
         FileReader f =new FileReader("words");
      }
}
```

[**9 Marks**]

(b) (i) What is the output of the following program?

```java
public class A
{
   int f(int n)
   {
     if (n==0) return 1;
     else return n*f(n-1);
   }

   public static void main(String[] args)
```

```
        {
         System.out.println(f(3));
        }
     }
```

(ii) Write a recursive method `static int fibonacci(int n)` which returns the nth fibonacci number.

[**8 Marks**]

(c) Using exceptions, write a method `static boolean find(String f)` which returns *true* if the file whose name is f is found and *false* if it is not found.

[**8 Marks**]