

UNIVERSITY OF LONDON

GOLDSMITHS COLLEGE

B. Sc. Examination 2005

COMPUTER SCIENCE

**IS51008A(CIS109) Introduction to Java and
Object-Oriented Programming**

Duration: 3 hours

Date and time:

There are six questions on the paper. Please answer four questions. You may answer more questions, but only the best four count towards your final mark.

Calculators are not allowed.

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

QUESTION 1

- (a) (i) Explain the term *indentation* and why it is good to indent your programs properly.
(ii) What is the purpose of comments in a program and how are comments written in Java?
(iii) Briefly explain why the following program will has a compilation error:

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

- (iv) What is the output of the following Java program:

```
class f
{
    public static void main(String [ ] args)
    {
        System.out.println(1+2*3);
    }
}
```

Justify your answer.

[9 Marks]

- (b) (i) By considering the following program, explain the behaviour of the *for* loop and the purpose of its components.

```
class G
{
    public static void main(String [ ] args)
    {
        for (int i=0;i<3;i=i+1) System.out.println(i);
    }
}
```

- (ii) Rewrite program *G* above using a *while* loop.

[8 Marks]

- (c) Write a method which sorts an array of *ints* into descending order and discuss the time complexity of your method.

[8 Marks]

QUESTION 2

- (a) (i) Given that the ASCII code for the character `a` is 97, what is the ASCII code for the character `c`?
- (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) 101);
    }
}
```

- (iv) Assuming the following program is stored in a file called *one.java*, what is its output?

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

[9 Marks]

- (b) (i) Explain what the following program does. Why is it `System.out.println(n-1)` and not `System.out.println(n)`?

```

import java.io.*;
class two
{
    public static void main(String args[]) throws Exception
    {
        FileReader f = new FileReader(args[0]);
        int x=1,n=0;
        while (x!=-1)
        {
            x=f.read();
            n=n+1;
        }
        System.out.println(n-1);
    }
}

```

(ii) Explain what the following program does:

```

import java.io.*;
class three
{
    public static void main(String args[]) throws Exception
    {
        FileReader f = new FileReader(args[0]);
        int x=1;
        while (x!=-1)
        {
            x=f.read();
            if (x!=97 && x!=-1)System.out.println((char) x);
        }
    }
}

```

[8 Marks]

(c) Write a complete Java program which takes a file name from the command line and prints out the number of occurrences of each letter in the file. You should distinguish between upper and lower case letters.

[8 Marks]

QUESTION 3

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

```
public class pair
{
    Object first;
    Object second;
    pair (Object x, Object y)
    {
        first=x;
        second=y;
    }
    public String toString()
    {
        return "(" + first + "," + second + ")";
    }
    public static void main(String [ ] args)
    {
        pair a = new pair(new Integer(1),new Integer(2));
        System.out.println(a);
    }
}
```

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

```
public class triple extends pair
{
    Object third;
    public triple (Object x,Object y, Object z)
    {
        super(x,y);
        third=z;
    }
    public String toString()
    {
        return super.toString()+" "+ third;
    }
    public static void main(String [ ] args)
    {
        triple a = new triple("hello","my","friend");
        System.out.println(a);
    }
}
```

[9 Marks]

- (b) (i) The following program has a compilation error. What is it? Explain why it occurs.

```
public class two extends pair
{
    public two(Object x,Object y)
    {
        super(x,y);
    }

    public int add()
    {
        return first+second;
    }
}
```

- (ii) Rewrite the method `add` so that it will correctly add `first` and `second` for instances where `first` and `second` are of type `Integer`.

[8 Marks]

- (c) Write a new class `four` which consists of two `pairs`. You should include a constructor which has four parameters all of type `Object` and a `toString()` method. Your `toString()` method should be such that the following program prints `((hello,how),(are,you))`.

```
public test
{
    public static void main(String[] args)
    {
        four f=new four("hello","how","are","you");
        System.out.println(f);
    }
}
```

[8 Marks]

QUESTION 4

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

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

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

```
class b
{
    public static void main(String [] args)
    {
        int[] a=new int[5];
        for(int i=0;i<5;i++)a[i]=i+1;
        for(int i=0;i<5;i++)System.out.println(a[i]%2);
    }
}
```

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

```
class b
{
    public static void main(String [] args)
    {
        int t=0;
        for(int i=0;i<5;i++)
        {
            for(int j=0;j<5;j++) t=t+i;
        }
        System.out.println(t);
    }
}
```

[9 Marks]

- (b) (i) Give a boolean expression which evaluates to **true** if the variable x has the value 1 and which evaluates to **false** otherwise.

- (ii) Give a boolean expression which evaluates to **true** if the variable **x** has the value 1 or the value 2 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 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.

[8 Marks]

- (c) Write a method whose heading is

```
static String reverse(String s)
```

which reverses a String.

For example, `reverse("cat")` should return `"tac"`.

[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 doesn't 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) (i) Briefly describe the differences between arrays and Vectors.
(ii) Write Java code to produce a Vector v with two elements. The zeroth element of v is the String, "hello" and the next element of v is the Vector with only one element, the String "hello".

[8 Marks]

- (c) Assuming there is large list of words in a file called `dictionary` (one word per line). Write a complete Java Program `check` that acts as a spell checker.

`java check catapult`
should check whether the word `catapul` occurs in the dictionary. It should print `yes` if it finds the word and `no` if it doesn't.

[8 Marks]

QUESTION 6

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

```
public class A
{
    public static void f(String s)
    {
        try
        {
            Integer.parseInt(s);
            System.out.println("apple");
        }
        catch(Exception e)
        {
            System.out.println("orange");
        }
    }

    public static void main(String[] args)
    {
        f("hello");
    }
}
```

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

```
public class A
{
    public static void main(String[] args)
    {
        int a=3;
        int b=4;
        a=b;
        b=a;
        System.out.println(b);
    }
}
```

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

```
public class A
{
    public static void main(String[] args)
    {
        int a=3;
        int b=4;
        int c=b;
        b=a;a=c;
        System.out.println(a+" "+b);
    }
}
```

[9 Marks]

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

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

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

(ii) Write a recursive method `static int mult(int n,int m)` which returns n times m. Your method must not contain a `*`.

[8 Marks]

(c) (i) Define a class `Date` consisting of a `Day`, `Month` and `Year`. Write an instance method for the `Date` class which returns true if *this* date comes before the other `Date` which is supplied as a parameter to the method.

(ii) Writing an expression which evaluates whether the 3rd February 1983 comes before a date `d`.

[8 Marks]