University of Cape Town ~ Department of Computer Science

Computer Science 1016S ~ 2008

Test 1

Question	Max	Mark	Internal	External
1	18			
2	12			
TOTAL	**30**			

Marks   : 30
Time   : 40 minutes
Instructions:

   a) Answer all questions.
   b) Write your answers in the space provided.
   c) Show all calculations where applicable.

Program: The questions in this test are all based on the program listed below. Study it carefully.

```java
import java.io.*;
   import java.util.Scanner;

    public class Test1 {
        public static void main(String[] args) throws
PictureException, FileNotFoundException {

          Scanner scan = null;
          PrintWriter pw = null;

          scan = new Scanner(new FileInputStream("file1.txt"));
          pw = new PrintWriter(new FileOutputStream("file2.txt"));

          int level = scan.nextInt();
          pw.println(Picture2(level,""));

          pw.close();
          scan.close();
      }

       public static String Line(int n)
       {
               //code hidden

       }


       public static String Picture2(int n,String offset) throws
PictureException
      {
          String thisLine = offset+Line(n)+'\n';
          if (n<0)
             throw new PictureException("Can't draw a picture of
negative size!");
          else if (n==0)
             return "";
          else if (n==1)
             return thisLine;
          else
            return thisLine+Picture2(n-2,offset+" ")+thisLine;

      }
    }
```

Question 1: File I/O and Exceptions [18]

a) Rewrite the main method so that **all** the **checked exceptions** it generates are caught and handled sensibly.

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

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```
}                                                              [7]
```

b) What will happen if the program is run and `file1.txt` does not exist in the current directory?

_____

_____[1]

c) What will happen if `file2.txt` does not exist in the current directory?

_____

_____[1]

3

d) Explain what will happen if the program is run when `file1.txt` contains the text:

   `hello`

   _____

   _____

   [2]

e) Give an example of the use of an **anonymous object** in the program above.

   _____

   _____

   [1]

f) How would you alter the program above so that it always generates a `StackOverflowException`?

   _____

   _____

   _____[2]

g) What is the difference between Unicode and ASCII?

   _____

   _____

   _____[3]

h) Who invented the Linux operating system? (circle the correct answer):

   a. Mark Shuttleworth

   b. Linus Torvalds

   c. John von Neumann

   d. Microsoft Corporation

   [1]

Question 2: Recursion [12]

a) For different values of the parameter n, the method `Line` produces output as follows

    Line(1) returns "1"

    Line(2) returns "22"

    Line(3) returns "313"

    Line(4) returns "4224"

    Line(5) returns "53135"

etc. Write **a recursive definition** for the method `Line(int n)`. (Note: no marks will be given for an iterative solution.)

```
public static String Line(int n) {
```
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```
}
```
[5]

b) If, before the program is run, the files contain the following text:

`file1.txt:`   `file2.txt:`

5   57

4

3

write down the **exact** contents of each of these files after the program is run.

_____

`file1.txt:`   `file2.txt:`

_____   _____

_____   _____

_____   _____

_____   _____

_____   _____

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_____   _____

[4]

5

c) Explain clearly why the **recursive definition** of a method `Line(int n).` is likely to run slower on a computer than an iterative definition of the same function.

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[3]