University of Cape Town ~ Department of Computer Science

Computer Science 1016S ~ 2009

Test 1

Question	Max	Mark	Internal	External
1	10			
2	17			
3	3			
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.

Question 1 [10 marks]

Examine the Java application listed below.

```
public class PrintoutDemo
{
    public static void main(String[] args)
    {
        Printout(1358);
    }

    public static void Printout(int n)
    {
        Printout(n/10);
        System.out.println(n%10);
    }
}
```

This recursive program should print out the digits of a number one to a new line.
For the number 1358 the output should be:

1
3
5
8

However, when executed, this program produces the following error:
`Exception in thread "main" java.lang.StackOverflowError`

a) Explain what a `StackOverflowError` is and why this type of error can occur in recursive functions. [3]

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b) Is a `java.lang.StackOverflowError` a checked or unchecked exception?
Explain your answer. [2]

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c) Rewrite the function Printout so that the program above produces the correct
output for any input parameter n. [2]

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d) Now write the RECURSIVE function `Calculate` so it so it returns the value of the following series to n terms: $1 + 2*3 + 3*4 + 4*5 + \ldots$
The first term in the series (the 1) is term_1. [3]

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Question 2 [17 marks]

Examine the Java application listed below.

```java
import java.*;
public class Mystery
{
    public static void main (String [] args)
            throws FileNotFoundException
    {
        Scanner a = new Scanner (new FileInputStream
                        ("myfile1.txt"));
        PrintWriter b = new PrintWriter(new
                    FileOutputStream("myfile2.txt"));

        a.useDelimiter("a"); // For input, the String
        //delimiter changed from a blank char to an 'a'

        while (a.hasNext())
            b.print(a.next() + "?");

        a.close();
        b.close();
    }
}
```

a) Before the program is run, the file "myfile1.txt" contains the lines:

Pat ate pears

And the file "myfile2.txt" contains the lines:

34 15 178 34
10 33 67
29

Write down the **exact** contents of each of these files after the program is run.
Blanks should be clearly indicated   [6]

myfile1.txt:_____

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myfile2.txt:_____

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b) Explain why it is a good idea to include the following lines in the program
above:
```
a.close();
b.close();
```
[3]

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c) Rewrite the program above so that it sums up all the numbers in the file
"myfile2.txt" and prints the result to the screen. [5]

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d) Explain what is incorrect about the following code **and** how you could correct it:

[3]

```
try {
      Scanner s = new Scanner (new FileInputStream
                                  ("data2.txt"));

}

catch(IOException e){
      System.out.println("An IOException occurred:" +
                                      e.getMessage());
}
catch(FileNotFoundException e)
{
      System.out.println("The file does not exist or could not
                        be opened:" + e.getMessage());
}
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Question 3 [3 marks]

Examine the program below:

```
public class OutputMysteryDemo
{
    public static void main(String[] args)
    {
        try {
            exerciseMethod(4);
        }
        catch(Exception e) {
            System.out.println("Caught in main.");
        }
        finally {
            System.out.println("Main Finally Finished.");
        }
    }

    public static void exerciseMethod(int n)
                            throws Exception
    {
        try {
            if (n > 0)
                throw new Exception( );
            else if (n < 0)
                throw new NegativeNumberException( );
            else
                System.out.println("No Exception.");

            System.out.println("Still in sampleMethod.");
        }
        catch(NegativeNumberException e) {
            System.out.println("Caught in sampleMethod.");
        }
        finally {
            System.out.println("In Exercise finally block.");
        }

        System.out.println("After Exercise finally block.");
    }
}
```

a) Write down the exact output of this program.   [3]

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