Please fill in your Student Number and Name.

Student Number : _____

Name:

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Student Number:

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University of Cape Town ~ Department of Computer Science

Computer Science 1016S ~ 2008

Test 2

Question	Max	Mark	Internal	External
1	8			
2	14			
3	8			
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: UML [8]

a) Draw a UML class diagram to describe a file system in a computer, called *FileSystemElement*. A *FileSystemElement* is a concept which has a number of properties such as date, size, created date etc. It denotes either a *Directory* or a *File*. Also *Directory* can contain any number of *FileSystemElement*. A *File* has its own *Type* such as: *pdf* or *doc*.

Requirements: there should be at least 4 concrete classes, 1 abstract class and 1 interface with the following links: inheritance, aggregation and multiplicity. *FileSystemElement* has at least 3 attributes

Note: Words in italics are suggested class names. Please write <abstract> and <interface> under the corresponding class name.

To draw an inheritance link from a class: a line with a triangle pointing to the superclass

To draw a class implementing an interface: a dotted line with triangle pointing to the interface

Answer:

Question 2: Inheritance, Polymorphism and Interface [14]

Suppose an interface declares three methods. And suppose a class declares that it implements the interface, but in fact it only implements two out of the three methods. What happens when you try to compile the class? (The way to answer this question, of course, is to write an interface and a class.)

a) Write your code of the interface below: [2]

b) Write your code of the class below: [4]

c) What happens when you try to compile the class? [2]

d) Explain why we need the interface where the class has to implement the methods anyway? Provide a code fragment to illustrate your argument. [6]

Question 3: Data Structures [8]

Consider the following partial definition of a linked list. It includes just those details needed to answer the question.

```
public class LinkedList
{
    private class Node
    {
        private int data;
        private Node next;

        //Node constructors

    }//End of Node inner class

    private Node head;

    // LinkedList constructors and methods

    public int size()
    {
        // returns the size of the linked list
    }
    public boolean matches(LinkedList other)
    {
        // returns true if lists match
    }

}
```

Two `LinkedList` objects will be considered to match if they contain the same data in the same order. Fill in the body of the `matches` method below, which returns `true` if the calling object and the argument match and `false` otherwise. Your answer needs to show the following:

a) When lists do not match [2]

b) How to traverse the lists [4]

c) How to tell when the end of the lists has been reached [1]

d) Overall correctness of syntax and method [1]

You may assume that the two linked list objects are instances of the same class and that the argument is not null.

```
public boolean matches(LinkedList other)
{
```

```
}
```