******* Test *******

UNIVERSITY OF LONDON

GOLDSMITHS COLLEGE

B. Sc. Examination 21 11 2002

COMPUTING AND INFORMATION SYSTEMS

CIS212(CS52006A)a Progrmming:Advanced Topics and Techniques

Duration: 40-45 minutes

Date and time: 21 11 2002

Answer ALL questions.
Full marks will be awarded for complete answers to THREE questions.
There are 60 marks available on this paper
Electronic calculators may be used. The make and model should be specified on the script and the calculator must not be programmed prior to the examination.

Question 1 (a) What do we normally mean by an *efficient* searching algorithm? [5]

(b) Discuss which of the following two methods is more efficient. Give your reason. [10]

Algorithm 1

```
1. SUM:=0, k:=1; read N;
2. repeat N times:
        SUM:=SUM+k;
        k:=k+1;
3. write SUM.
```

Algorithm 2

```
1. read N;
2. write N*(N+1)/2.
```

(c) Comment briefly on the inefficiency of the following recursive method and provide a better *iterative* alternative. [10]

```
public static int fibonacciTerm(int n) {
// ----------------------------------------
// Computes the nth term in the Fibonacci sequence.
// Precondition: n is a positive integer.
// Postcondition: Returns value of the nth
//                Fibonacci term.
// ----------------------------------------
  if (n<=2) {
     return 1;
  }
  else {
    return fibonacciTerm(n-1)+fibonacciTerm(n-2);
  } // end if
} // end fibonacciTerm
```

Question 2 (a) Consider the Java program below. Write what will be displayed on the screen after the execution of the main class C. [5]

```
class A {
  void green () {
    System.out.println("GREEN");
  }
}

class B extends A {
  void red () {
    System.out.print("RED + ");
    super.green();
  }

  void green () {
    System.out.print("GREEN + ");
    super.green();
  }
}

class C {
  public static void main (String [] args) {
    A a = new A ();
    B b = new B ();
    // a.green();
    b.red();
  }
}
```

(b) Draw a binery search tree to store the list of integers in the order given: (1,5,7,9,2,8) [5]

(c) What is the degree of the tree? [5]

Question 3 (a) Explain what is an event in Java. Provide an example of an event. [10]

(b) Given a `Node` class below:

```
import java.io.*;

public class Node {
  private Object item;
  private Node next;

  public Node(Object newItem) {
    item = newItem;
    next = null;
  } // Constructor

  public Node(Object newItem, Node nextNode) {
    item = newItem;
    next = nextNode;
  } // Constructor

public void setItem(Object newItem) {
    item = newItem;
  } // end setItem

  public Object getItem() {
    return item;
  } // end getItem

  public void setNext(Node nextNode) {
    next = nextNode;
  } // end nextNode

  public Node getNext() {
    return next;
  } // end getNext()

} // end class Node
```

Write a method that displays all the items in a list.
Hint: the method takes the head of a list as the input and display the item field of each node in the list. [10]