Foundations of Programming

(a) What are the principal characteristics of a linked list? [2 marks]

(b) Consider a stack that consists solely of characters. A linked list can be used to model such a stack and a programmer has embarked on a class ChLink which begins thus:

```java
class ChLink
{
    private char val;
    private ChLink next;

    public ChLink()
    {
        this.val = '\';
        this.next = null;
    }
}
```

The backstroke character ‘\’ is reserved and marks the bottom of the stack. Why does it have to be keyed in twice? [1 mark]

(c) Augment class ChLink with two methods push(char) which pushes a character onto the stack and a method pop() which returns the character at the top of the stack and, unless it is backstroke, removes that character from the stack. It is not possible to pop the bottom marker. [10 marks]

(d) Write a test program which uses class ChLink to verify that a sequence of square brackets is properly nested. The test program might begin thus:

```java
public class ChLinkEx
{
    public static void main(String[] args)
    {
        char[] chseq = {'[','[','[','A',']',']','[','A',']'};
        ChLink start = new ChLink();
        for (int i=0; i<chseq.length; i++)
            Opening brackets are pushed onto the stack. No other characters are pushed onto the stack but any closing bracket results in a pop and a suitable test. The test program should print either Full Match or Match Error without further explanation. Only class ChLinkEx need be written in this part.
    }
}
```

[7 marks]