

## 1999 Paper 6 Question 7

### Prolog for Artificial Intelligence

A ternary tree is constructed from 3-ary compound terms  $n(a, b, c)$  called nodes, where components  $a$ ,  $b$  and  $c$  are either nodes or integers. Assume that integer components are restricted to the values 0 and 1.

Write a Prolog program to return a list of all the 0's and a list of all the 1's in a given tree. For example, the goal `enum(n(n(0, 1, 0), 1, 0), X, Y)` should instantiate  $X$  to `[0, 0, 0]` and  $Y$  to `[1, 1]`. The program should use difference lists. [10 marks]

A terminal node of the ternary tree is said to be of *odd parity* if the number of its 1 components is an odd number. For example,  $n(1, 1, 1)$  is of odd parity, and  $n(1, 0, 1)$  is not of odd parity. Write a Prolog program to count the number of terminal nodes in a tree that have odd parity. For example, the goal `odd(n(n(0, 1, 0), 1, 0), X)` should instantiate  $X$  to 1. [10 marks]