2003 Paper 1 Question 5

Foundations of Computer Science

(a) Describe how lazy lists can be implemented using ML. [2 marks]

(b) Code a function to concatenate two lazy lists, by analogy to the 'append' function for ordinary ML lists. Describe what happens if your function is applied to a pair of infinite lists. [3 marks]

(c) Code a function to combine two lazy lists, interleaving the elements of each. [3 marks]

(d) Code the lazy list whose elements are all ordinary lists of zeroes and ones, namely $[], [0], [1], [0, 0], [0, 1], [1, 0], [1, 1], [0, 0, 0], \ldots$. [6 marks]

(e) A *palindrome* is a list that equals its own reverse. Code the lazy list whose elements are all palindromes of 0s and 1s, namely $[], [0], [1], [0, 0], [0, 0, 0], [0, 1, 0], [1, 1], [1, 0, 1], [1, 1, 1], [0, 0, 0, 0], \ldots$. You may take the reversal function `rev` as given. [6 marks]