1998 Paper 1 Question 5

Foundations of Computer Science

Discuss how lazy lists and mutable lists can be coded in ML. How do they compare with ML's built-in lists? Illustrate your answer by considering the operations of reversing a list and of concatenating two lists. Your discussion should mention the main programming hazards. [6 marks]

The function odds is to return the list of alternate elements of its input. For example, $\text{odds}[a, b, c, d, e] = [a, c, e]$ and $\text{odds}[a, b] = [a]$. Code odds using

(a) ordinary ML lists [3 marks]

(b) lazy lists [5 marks]

(c) mutable lists (as an imperative operation — so that odds has type 'a mlist -> unit for a suitable datatype 'a mlist of mutable lists, to be defined) [6 marks]