COMPUTER SCIENCE TRIPOS Part IA – 2010 – Paper 1

1 Foundations of Computer Science (LCP)

This question has been translated from Standard ML to OCaml

(*a*) Give an OCaml datatype declaration suitable for representing lazy lists, possibly of infinite length. [2 marks]

(*b*) Code the OCaml function `interleave`, which takes two lazy lists and generates a lazy list containing each of their elements. [2 marks]

(*c*) Code an OCaml function that applies a given function to every element of a lazy list, returning a lazy list of the results (analogously to the function `map`). [3 marks]

(*d*) Code the OCaml function `iterates` which, given a function f and some value x, generates a lazy list containing all the values of the form $f^n(x)$ (that is, $f(\cdots f(x)\cdots)$ with n applications of f) for $n \geq 0$. [3 marks]

(*e*) Code the OCaml function `iterates2` which, given functions f and g and values x and y, generates a lazy list containing all the values of the form $(f^m(x), g^n(y))$ for m, $n \geq 0$. [10 marks]

All OCaml code must be explained clearly and should be free of needless complexity.