1994 Paper 5 Question 6

Programming Language Compilation

Suggest how you would represent Lambda-expressions in a form suitable for a simple Lambda-evaluator in which the environment is represented as a linked list of name–value pairs. [5 marks]

Outline the design of the evaluator, paying particular attention to the treatment of bound variables, abstractions and applications. [5 marks]

Augment your evaluator to cope with sufficient expression operators, including a built-in version of the Y operator so that when the evaluator is given the abstract syntax tree for

$$Y\ (\lambda f.\lambda n.\ n{=}0\ \text{->}\ 1,\ n{*}f(n{-}1))\ 5$$

it will yield 120. [10 marks]