1995 Paper 11 Question 10

Computation Theory

Explain what is meant by a *primitive recursive* function and by a *partial recursive* function. [6 marks]

Show that the function giving the next state of a register machine in terms of the current state is primitive recursive. (You may assume the existence of primitive recursive functions for coding any n-element list of numbers $(x_1, \ldots, x_n)$ as a number $[x_1, \ldots, x_n]$ (for each n), and for extracting the head x_1 and the (coded) tail $[x_2, \ldots, x_n]$ from such a coded list.) [8 marks]

Deduce that every register machine computable partial function is partial recursive. [5 marks]

Is the converse true? [1 mark]