1998 Paper 3 Question 9

Computation Theory

What is meant by saying that a model for computation offers unlimited data storage but is restricted to finite logic? [3 marks]

How would you record the *configuration* during computation within such a model? Illustrate your answer by considering both Turing machines and register machines. [5 marks]

Suppose you are given a k-symbol Turing machine having searching states. Show how to represent the transition from the configuration at time t to the configuration at time $t + 1$ by a system of arithmetic equations. Hence show that any Turing machine computation may be simulated by a register machine having a suitable program. [12 marks]