1996 Paper 10 Question 10

Computation Theory

Show how to code the program and initial data for an n-register machine into natural numbers p and d. In what sense do the codes p and d determine a unique computation? [9 marks]

Using your codes establish a precise statement of the Halting Problem for Register Machines. [3 marks]

Assume that the Halting Problem is in general undecidable. Prove that it cannot be decided whether a general program p terminates when the initial data is zero in every register. [8 marks]