The Theory of Computation

Bernard M.E. Moret

Addison-Wesley-Longman, 1998

Solution Manual
Chapter 5, Problem 5.9

This is not really a problem, but rather a reason to go back through the definition of the various functions used in the arithmetization of Turing machines, so as to verify that all of the functions that appear in the definition of the composition of two Turing machines are in fact primitive recursive functions. Since in fact every single function defined throughout the arithmetization process is primitive recursive, with the single exception of the function stop (and of its three derivatives, the functions θ, out, and ϕ_{univ}), as the reader is invited to verify once again, the result follows.