CSCI 2400 – Models of Computation, Section 3

Homework 9

Return by: Friday, December 8

1. Prove that the following problem is undecidable. Given any Turing machine M, a symbol a, and string w, determine whether or not the symbol a is ever written on the tape when M is applied to input w. (Hint: reduce the halting problem to this problem.)

2. Prove that the following problem is undecidable. Determine whether or not an arbitrary Turing machine halts on all input. (Hint: reduce the halting problem to this problem.)

3. Let $b(n)$ be the maximum number of head moves made by any n-state Turing machine that halts when started with a blank tape. Show that $b(n)$ is not computable. (Hint: look at Example 12.3, page 319.)

4. Show that the following problem is undecidable. For two recursively enumerable languages L_1 and L_2, determine whether $L_1 \subseteq L_2$. (Hint: use the result of Theorem 12.3, page 322.)

5. Let $A = 001, 0011, 11, 101$ and $B = 01, 111, 111, 010$.
(a) Does the pair A, B have a PC-solution?
(b) Does it have an MPC-solution?