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CSC:341 Spring 2024

Lab #6B

Due: March 2, 2024

Please do today's set of lab exercises by hand and with your peers. Don't worry about turning anything in. I ask only that you try to get some valuable practice out of each exercise. (We will be doing buttloads and buttloads of TM nonsense for the next 10 weeks.)

#1

Try exercises 3.2 (a), (b), and (c) in the back of Sipser §3.

This is an important skill, but tedious. Do as few or as many as you like (there are more).

#2

Let the language L be defined by

$$L = \{a^i b^j c^k \mid i + j = k\}$$

Here's a high-level sketch of a 3-tape TM that solves it. Call these 3 tapes the *input tape*, *work tape A*, *work tape B*, and *work tape C*.

1. Write all a's onto work tape A.
2. Write all b's onto work tape B.
3. Write all c's onto work tape C.
4. Reposition all heads back to leftmost position.
5. Transition work tape A and work tape C right in tandem until you reach a blank symbol on work tape 0.
6. Do the same for work tape B and C. If both reach the $\square$ symbol at the same time, accept. If one reaches a $\square$ symbol before the other, reject.

Give an *implementation-level* or *formal* level description (your choice) of such a TM. Make sure to be clear about what Q and Γ you will need or want, then briefly describe how the machine should behave on a single step of each state.