

## CSCI 338: Quiz 4 (due: Friday, March 26, 8:00pm)

Your Name:

This is an open-book quiz (not an attendance counting), so you should try your best. After you finish, upload a pdf file on D2L under Quiz-4. A solution will be posted on D2L after the deadline.

### Problem 1

On March 19, we covered an undecidability proof for  $REGULAR_{TM}$ , where we construct a TM  $M_2$  with the property that either  $L(M_2) = \Sigma^*$  or  $L(M_2) = \{0^n 1^n | n \geq 0\}$  — depending on whether  $M$  accepts  $w$  or not. (This is basically Theorem 5.2 in the textbook.) On the other hand, notice that in these two cases  $L(M_2)$  have overlaps (as  $\{0^n 1^n\} \subset \Sigma^*$ ).

In this quiz, you are asked to write a new undecidability proof for  $REGULAR_{TM}$  such that in the two cases (i.e., when  $M$  accepts  $w$ , and when  $M$  doesn't accept  $w$ ), the corresponding two languages  $L(M_2)$  do not overlap at all.

IDEA: First identify a language  $\Sigma$  which is regular and  $\Sigma \cap \{0^n 1^n\} = \emptyset$ .

I will choose  $\{1^+\}$ , which can be generated as  $S \rightarrow 1S/1$ , which is certainly regular.