

## CMPE 350 - Spring 2017

### PS 4 - 07.03.17

**1.46** Prove that the following languages are not regular. You may use the pumping lemma and the closure properties of the class of regular languages under union, intersection and complement.

b)  $L = \{0^m 1^n \mid m \neq n\}$

d)  $L = \{wtw \mid w, t \in \{0, 1\}^*\}$

**1.54** Consider the language  $F = \{a^i b^j c^k \mid i, j, k \geq 0 \text{ and if } i = 1, \text{ then } j = k\}$

a) Show that  $F$  is not regular.

**1.38** An all-NFA  $M$  is a 5-tuple  $(Q, \Sigma, \delta, q_0, F)$  that accepts  $x \in \Sigma^*$  if every possible state that  $M$  could be in after reading input  $x$  is a state from  $F$ . Note, in contrast, that an ordinary NFA accepts a string if some state among these possible states is an accept state. Prove that all-NFAs recognize the class of regular languages.

- TRUE or FALSE

1. If  $L_1 \cup L_2$  is regular and  $L_1$  is regular, then  $L_2$  is regular.
2. If  $L_1$  is regular and  $L_2 \subseteq L_1$ , then  $L_2$  is regular.
3. If  $L_1$  is regular and  $L_2$  is not regular, then  $L_1 \cup L_2$  is not regular.
4. If  $L_1$  is regular and  $L_1 \cup L_2$  is not regular, then  $L_2$  is not regular.
5. If  $L_1$  is regular and  $L_2$  is not regular, then  $L_1 \cap L_2$  is not regular.
6. If  $L_1$  is not regular and  $L_2$  is not regular, then  $L_1 \cup L_2$  is not regular.

- Some questions from old exams