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BLG311E – FORMAL LANGUAGES AND AUTOMATA

2016 FALL

QUIZ 3

Let $\mathbf{L} = \{\mathbf{w} \mid \mathbf{w} \in \{\mathbf{0}, \mathbf{1}\}^* \wedge \textbf{number of } \mathbf{0}'\textbf{s is greater than number of } \mathbf{1}'\mathbf{s}.\}$

For example: $\mathbf{0100}$, $\mathbf{001}, \mathbf{000} \in \mathbf{L}$ and 1001, 101 $\notin$ L.

Prove that L is non-regular language by using Pumping Lemma.

Solution:

- Assume $\mathbf{L}$ is regular. Then Pumping Lemma holds.
- Let $\mathbf{p}$ be the pumping length for **L** given by the lemma.
- We choose $\mathbf{s} = \mathbf{0^{p+1}1^p}$ (in L of length ≥ p)
- Consider all cases **s** can be divided into x, y, z.
  $\mathbf{s} = \mathbf{xyz}$, satisfying conditions $|\mathbf{y}| > \mathbf{0}$ and $|\mathbf{xy}| \leq \mathbf{p}$.
  For this **s**, it must be that $\mathbf{y} = \mathbf{0^k}$; this is the only case.
  We choose $\mathbf{i} = \mathbf{0}$, $\mathbf{xz}$ doesn't have more **0**'s than **1**'s, and so cannot be in $\mathbf{L}$.
- This is a contradiction.