

COSC 312

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Homework Assignment 5

1. a) $\{w \mid w \text{ starts and ends with different symbols.}\}$

$S \rightarrow 0A1 \mid 1A0$

$A \rightarrow 0A \mid 1A \mid \epsilon$

b) $\{w \mid \text{the length of } w \text{ is an integer multiple of } 3\}$

$S \rightarrow ASAA \mid AASA \mid SAAA \mid AAAS \mid \epsilon$

$A \rightarrow 0 \mid 1 \mid S$

c) $\{ww^R \mid \text{i.e., a word followed by that word reversed.}\}$

$S \rightarrow 0S0 \mid 1S1 \mid \epsilon$

2. a) The language L has an equal number of 01 and 10 substrings or $\{0^n 1^n \mid n \geq 0\}$.

b) Assume that G is regular and let p be the pumping length of A . Choose $s = 0^n 1^n \in G$ so that $0^n 1^n > p$. According to the Pumping Lemma, $s = xyz$, such that for all $i \geq 0$, there is $xy^i z \in G$. By Condition 1 of the pumping lemma, we should have $|xy| \leq p$. However, y would either have to come from the 0^n or 1^n sections (x or z), but regardless, there would be an uneven number of 1s or 0s. Hence, s cannot be pumped and due to this contradiction, G is not regular.

$\rightarrow S \rightarrow E, Z$

$E \rightarrow A, C$

$A \rightarrow 01B, 0A, \epsilon$

$B \rightarrow 1B, 10A$

$C \rightarrow 10D, 1C, \epsilon$

$D \rightarrow 01C, 0D$

$Z \rightarrow 0Z1, \epsilon$