

THEORY OF COMPUTATION - HOMEWORK 3

Assigned 2018.11.20. Submission deadline 2018.12.04 (for only those who want their homework to be marked).

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**Problems**

1. Consider the following context-free grammar  $G$ :

$$Y \rightarrow XYX \mid Z$$

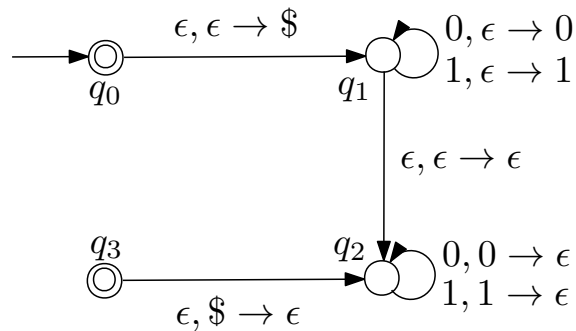
$$Z \rightarrow aTb \mid bTa$$

$$T \rightarrow XTX \mid X \mid \epsilon$$

$$X \rightarrow a \mid b$$

Provide the formal definition of  $G = (V, \Sigma, R, S)$  (i.e. specifying  $V, \Sigma, R, S$ ). Then give 3 strings in  $L(G)$  and 3 strings not in  $L(G)$ .

2. Consider the following pushdown automaton  $\mathbf{G}$ . Provide the formal definition of  $\mathbf{G} = (Q, \Sigma, \Gamma, \delta, q_0, Q_a)$  (i.e. specifying  $Q, \Sigma, \Gamma, \delta, q_0, Q_a$ ). Then give 3 strings in  $L(\mathbf{G})$ , and describe what kind of strings  $\mathbf{G}$  accepts.



**G**

3. Let the alphabet be  $\Sigma = \{0, 1\}$ , and consider a language  $L = \{w \in \Sigma^* \mid \#0(w) > \#1(w)\}$ , where  $\#0(w)$  means the number of 0's in  $w$  and  $\#1(w)$  means the number of 1's in  $w$ . Design a pushdown automaton  $\mathbf{G}$  to accept the language  $L$ .

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