School for Computer Science and Information Technology

Machines and their languages (G51MAL) Spring 2004

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Solutions to 6th Coursework

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1. 01

$$\begin{aligned}(q_0, \mathtt{01}, \#) &\vdash (q_1, \mathtt{1}, 0\#)\\ &\vdash (q_1, \epsilon, \#)\\ &\vdash (q_0, \epsilon, \#)\end{aligned}$$

0110

$$\begin{aligned}(q_0, \mathtt{0110}, \#) &\vdash (q_1, \mathtt{110}, 0\#)\\ &\vdash (q_1, \mathtt{10}, \#)\\ &\vdash (q_0, \mathtt{10}, \#)\\ &\vdash (q_1, \mathtt{0}, 1\#)\\ &\vdash (q_1, \epsilon, \#)\\ &\vdash (q_0, \epsilon, \#)\end{aligned}$$

00

$$\begin{aligned}(q_0, \mathtt{00}, \#) &\vdash (q_1, \mathtt{0}, 0\#)\\ &\vdash (q_1, \epsilon, 00\#)\end{aligned}$$

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$$(q_0, \epsilon, \#)$$

2. $$\mathtt{01}, \mathtt{0110}, \epsilon \in L(P)$$
$$\mathtt{00} \notin L(P)$$

3. $L(P)$: words with the same number of 0s and 1s. I.e.

$$L(P) = \{w \in \{\mathtt{0}, \mathtt{1}\}^* \mid \#_{\mathtt{0}}(w) = \#_{\mathtt{1}}(w)$$

where $\#_{\mathtt{0}}, \#_{\mathtt{1}} \in \Sigma^* \to \mathbb{N}$ are functions which counts the number of 0s, 1s occuring in a word.

4. A PDA is deterministic if there is never a choice between two possible IDs. More formally

$$|\delta(q, x, z)| + |\delta(q, \epsilon, z)| \leq 1$$

Indeed, P is deterministic.