

## Series 3 (6.10.2011)

Submission: **15:00, October, 13, 2011**, into the boxes next to the room I-21. Write every solution on the separate paper (format A4)! Don't forget to sign your solutions.

It is not sufficient to answer a single number or yes/not. Answers always have to be justified.

**Exercise 1.** Design deterministic FA for following languages. (It is sufficient to give graphical representation of the DFA):

- a)  $\{a, b, aab, bba\}$ ,
- b)  $\{x01 \mid x \in \Sigma_{Bool}^*\}$ ,
- c)  $\{abxab \mid x \in \{a, b\}^*\}$ ,
- d)  $\{xabxy \mid x, y \in \{a, b, c\}^*\}$ .

**Exercise 2.** Design deterministic FA which recognizes language  $L = \{x1y \mid x, y \in \{0, 1\}^*\}$ . For every state  $q$  describe the  $KL[q]$  and prove your claims.

**Exercise 3.** Draw curves which produce turtle reading (interpreting) words  $w_0, w_1, w_2, w_3$  where

$$\begin{aligned}w_0 &= \mathbf{F}-\mathbf{F}-\mathbf{F}-\mathbf{F}, \\w_i &= \phi(w_{i-1}), \\ \phi(\mathbf{F}) &= \mathbf{F}-\mathbf{F}+\mathbf{F}-\mathbf{F}-\mathbf{F}, \\ \phi(-) &= -, \\ \phi(+) &= +.\end{aligned}$$

Turtle is robot heading in some direction. It can process word over the alphabet  $\{F, +, -\}$ . The word reads from left to right, one symbol after the another. The meaning of symbols is as follows:

- F** move forward (according to the heading) one length unit and at the same time draw a line,
- +** turn right  $90^\circ$ ,
- turn left  $90^\circ$ .