Series 10 (24.11.2011)

Submission: **15:00, November, 24, 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.

For every machine describe strategy how it works. Draw its diagram or write a transition function.

Exercise 1. Design TM which for any input word x executes exactly $2^{|x|}$ steps (of computation). For examplefor the word foo it executes $2^{|foo|}$, i.e. 8 steps.

Exercise 2. Design TM generating all well parenthesised expressions over the alphabet $\{(,)\}$, every one exactly once. On the tape there will be writen expressions with one, two, three, ... pairs of partentheses. I.e. the word on the output tape will begin for example as follows:

$$()\$()()\$(())\$()()()\$()(())\$(())()\$(()())\$((()))\$\ldots$$

Remark 1: We suggest to programm this task in your favorit programming language first. Hint for checking: There are $\frac{1}{(n+1)}\binom{2n}{n}$. different well formed expressions with n pairs of parentehseses.

Exercise 3. Design TM which for the input word $w \in \{0,1\}^*$ computes the word w^R.