

# Compiler Construction 2018/19

## — Exercise Sheet 7 —

Hand in until December 3rd before the exercise class.

### Exercise 1

(3 Points)

Let  $L$  be a regular language.

Prove the following claim:

$L$  can be generated by an  $LR(0)$  grammar  $\iff L$  is prefix free

### Exercise 2

(9 Points)

Consider the family of context-free grammars  $G_n = (N_n, \Sigma_n, P_n, S')$  (for  $n \in \mathbb{N} \setminus \{0, 1\}$ ) that is given by:

- $N_n := \{S', S, A_1, \dots, A_n\}$
- $\Sigma_n := \{a_1, \dots, a_n, b_1, \dots, b_n\}$
- $P_n :$

$$\begin{array}{ll}
 S' \rightarrow S & \\
 S \rightarrow A_i b_i & \text{for } 1 \leq i \leq n \\
 A_i \rightarrow a_j A_i \mid a_j & \text{for } 1 \leq i, j \leq n \text{ and } i \neq j
 \end{array}$$

- (a) Prove or disprove:  $G_2$  is an  $LR(0)$  grammar.
- (b) Prove or disprove:  $G_2$  is an  $SLR(1)$  grammar.
- (c) Show that the number of  $LR(0)$  sets in  $G_n$  is at least  $2^n + n^2 + n$ , i.e.,  $|LR(0)(G_n)| \geq 2^n + n^2 + n$ .