ETH zürich
Departement Informatik

Theoretische Informatik

Prof. Dr. Juraj Hromkovič
Dr. Hans-Joachim Böckenhauer
https://courses.ite.inf.ethz.ch/theoInf20

Exercises – Sheet 12

Zürich, December 4, 2020

Exercise 32

(a) Design a regular grammar for the language

$$L_1 = \{w1x1y1z \in \{0,1\}^* \mid |x| = |y| = 2\}$$

and provide a short informal justification of your design.

(b) Design a regular grammar for the language

$$L_2 = \{x \in \{a,b\}^* \mid (|x|_a + 2|x|_b) \bmod 3 = 2 \text{ or } x \text{ starts and ends by } bb\}$$

and provide a short informal justification of your design.

10 points

Exercise 33

Let L be a regular language and let $G = (\Sigma_N, \Sigma_T, P, S)$ be a normalized regular grammar for L. Transform G into a context-free grammar G' for the language

$$L' = \{vwv^{\mathsf{R}} \mid v, w \in L\}$$

and provide an informal justification of your construction. **10 points**

Exercise 34

Design an unrestricted (also called type-0) grammar for the language

$$L = \{0^n 1^n 2^n \mid n \in \mathbb{N}\},$$

provide a short justification of your design, and give a derivation of the word 000111222 in your grammar. **10 points**

Submission: Friday, December 11, by 11:15 at the latest, as a clearly legible PDF via e-mail directly to the respective teaching assistant.