

Formal Languages and Automata Theory, SS 2020. Homework 9 (due Week 11)

1. Write context-free grammars for the following languages:

- (a) $L = \{w \mid w \text{ is a binary palindrome}\}$
- (b) $L = \{ \text{the language of balanced paranthesis} \}$
Examples: $()((((()))((())), (((()))((());$ *Counterexamples:* $((((()))((()), (((()))((())$
- (c) $L = \{0^m 1^n \mid m \geq n\}$
- (d) $L = \{0^n 1^n \mid n \geq 1\}$ *Examples:* 01, 00001111
- (e) $L = \{0^n 1^n \mid n \geq 0\}$ *Examples:* λ , 01, 00001111
- (f) $L = \{ \text{The set of all strings with an equal number of a's and b's} \}$
Examples: λ , aabb, bbaa, abbababa, bbababaa.
- (g) $L = \{ \text{Binary words with even length} \}$
- (h) $L = \{0^i 1^j 2^k \mid i = j \text{ or } j = k, \text{ where } i, j, k \geq 0\}$
- (i) $L = \{a^i b^j c^k \mid i + j = k, i, j, k \geq 0\}$.
- (j) $L = \{a^i b^j c^k \mid \neg(i = j) \text{ or } \neg(j = k)\}$
- (k) The language of all binary strings that are not of the form ww , that is, not equal to any repeated string.
- (l) The language of all strings with twice as many 0's as 1's.