

Homework 5

Due: Thursday February 26

Problem 1. Give context-free grammars for the following languages:

- (i) L_1 is the set of odd length strings over $\{a, b\}$ whose first middle and last symbols are all the same.
- (ii) $L_2 = \{a^n b^m c^k : n = 3 * (m + k), n, m, k \geq 0\}$
- (iii) $L_3 = \{a^n b^m c^k : n \neq m + k, n, m, k \geq 0\}$

Problem 2. Consider the following grammar:

$$\begin{aligned} S &\rightarrow ABAC \\ A &\rightarrow \lambda \mid aA \\ B &\rightarrow bB \mid \lambda \\ C &\rightarrow c \mid Cc \end{aligned}$$

- (i) Show that the above grammar is ambiguous.
- (ii) Give an equivalent grammar which is not ambiguous.

Problem 3. Convert the following grammar to a grammar in Chomsky normal form.

$$\begin{aligned} S &\rightarrow S * F \mid F \\ F &\rightarrow (S) \mid a \end{aligned}$$