

Formal Languages Homework 8

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April 9, 2019

1 Problem 7.1.3

Repeat Exercise 7.1.2 for the following grammar:

$$\begin{array}{lcl} S & \rightarrow & 0A0 \mid 1B1 \mid BB \\ A & \rightarrow & C \\ B & \rightarrow & S \mid A \\ C & \rightarrow & S \mid \epsilon \end{array}$$

- 1.1 a). Eliminate ϵ -productions
- 1.2 b). Eliminate any unit productions in the resulting grammar
- 1.3 c). Eliminate any useless symbols in the resulting grammar
- 1.4 d). Put the resulting grammar into Chomsky Normal Form

2 Problem 7.2.1

Use the CFL pumping lemme to show each of these languages not to be *context-free*

- 2.1 a). $\{a^i b^j c^k \mid i < j < k\}$
- 2.2 b). $\{a^n b^n c^i \mid i \leq n\}$

3 Problem 7.3.2

Consider the following two languages:

$$\begin{array}{l} L_1 = \{a^n b^{2n} c^m \mid n, m \geq 0\} \\ L_2 = \{a^n b^m c^{2m} \mid n, m \geq 0\} \end{array}$$

- 3.1 a). Show that each of these languages is context-free by giving grammars for each
- 3.2 b). Is $L_1 \cap L_2$ a CFL? Justify your answer