Formal Languages Homework 8

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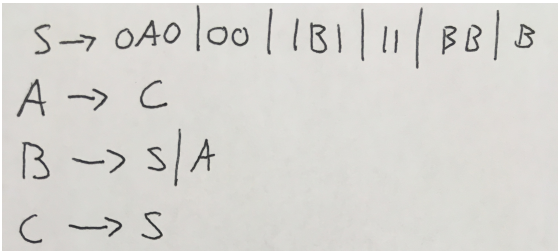
1 Problem 7.1.3

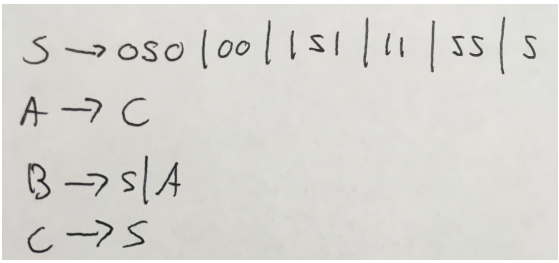
Repeat Exercise 7.1.2 for the following grammar:

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

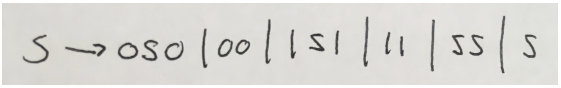
1.1 a). Eliminate ϵ-productions



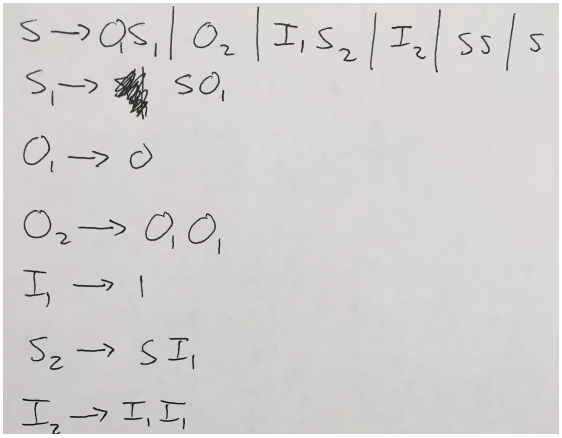
1.2 b). Eliminate any unit productions in the resulting grammar



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). $\{a^i bjck \mid i < j < k\}$

2.2 b). $\{a^n b^n c^i \mid i \leq n\}$

3 Problem 7.3.2

Consider the following two languages:

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

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