Formal Languages week4

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1 Chap 3 (p 98-101): 9, 11, 37, One More

9 Construct a grammar over $\{a, b, c\}$ whose language is $\{a^n b^m c^i | 0 \leq n + m \leq i\}$

$$S \to ASCc|B|\lambda$$
$$A \to AaBCc|a$$
$$B \to Bbc|b$$
$$C \to Cc|c$$

11 Construct a grammar over $\{a, b\}$ whose language is $\{a^m b^i a^n | i = m + n\}$

$$S \to AC$$
$$A \to aAb|ab$$
$$C \to bCa|ba$$

37 Construct unambiguous grammars for the languages $L_1 = \{a^n b^n c^m | n, m > 0\}$ and $L_2 = \{a^n b^m c^m | n, m > 0\}$. Construct a grammar G that generates $L_1 \cup L_2$. Prove that G is ambiguous. This is an example of an inherently ambiguous language. Explain, intuitively, why

every grammar generating $L_1 \cup L_2$ must be ambiguous.

$L_1 : -$

$S \to AC$

$A \to aAb|ab$

$C \to Cc|c$

$L_2 : -$

$S \to AC$

$A \to aA|a$

$C \to bCc|bc$

$L_1 \cup L_2 : -$

$S \to ABC$

$A \to aA|ab$

$B \to bB|b$ $C \to Cc|bc$

That probably isn't right but the idea is that There are enough rules where you can create the same string with different rule paths.

One More) Find a CFG over a,b that generates the language consisting of strings that have twice as many a's as b's and prove your grammar correct.

$S \to ASaab$

$A \to aaAb$