

Chapter 1 Homework

1. Find grammars for $\Sigma = \{a, b\}$ that generate the sets of

(a) all strings with at least three a's.

(b) all strings with an even number of b's.

(c) all strings in $\{a^{3n}b^{2n} : n \geq 2\}$

2. Give a simple description of the language generated by the grammar with productions

$S \rightarrow aaA$

$A \rightarrow bS$

$S \rightarrow \lambda$

1. Find grammars for $\Sigma = \{a, b\}$ that generate the sets of

(a) all strings with at least three a's

$\square a \square a \square a \square$

$S \rightarrow AaAaAaA$

$A \rightarrow aA \mid bA \mid \lambda$

(b) all strings with an even number of b's

$a(bb)^*a$

\downarrow

$\begin{cases} S = aS \mid bA \mid \lambda \\ A = aA \mid bS \end{cases}$

(c) all strings in $\{a^{3n}b^{2n} : n \geq 2\}$

$\begin{cases} S = aaaaaaA bbbb \\ A = aaaaA bbb \mid \lambda \end{cases}$

2. Give a simple description of the language generated by the grammar with production

$S \rightarrow aaA$

$A \rightarrow bS$

$S \rightarrow \lambda$

$S \rightarrow aabS \mid \lambda$

$L = \{ (aab)^n : n \geq 0 \}$

\downarrow

$\lambda, aab, aabaab, \dots$

3. Find a grammar that generates the language $L = \{ww^R : w \in \{a, b\}^+\}$

4. Suppose that in some programming language, numbers are restricted as follows:

(a) a number may be signed (with + or - symbol) or unsigned.

(b) the value field consists of two nonempty parts, separated by a decimal point.

(c) there is an optional exponent field. If present, this field must contain the letter e, followed by a signed two-digit integer.

For example, +12.25, -20.45e+10, 35.1e-02. Design a grammar set of such numbers.

3. Find a grammar that generates the languages

$$L = \{ww^R : w \in \{a, b\}^+\}$$

$$w = ab$$

$$w^R = ba$$

沒有 λ

aa

aaaa

abba

bb

baab

babbab

$$\Rightarrow \begin{cases} S \rightarrow aAa \mid bAb \\ A \rightarrow aAa \mid bAb \mid \lambda \end{cases}$$

$$A \rightarrow aAa \mid bAb \mid \lambda$$

4. Suppose that in some programming language, numbers are restricted as follows

(a) a number must be signed (with + or - symbol) or unsigned

(b) the value field consists of two nonempty parts, separated by a decimal point

(c) there is an optional exponent field. If present, this field must contain the letter e, followed by a signed two-digit integer

Design +12.25, -20.45e+10, 35.1e-02, a grammar sets of such numbers.

$$\left\{ \begin{array}{l} \boxed{} \frac{20.45}{\text{Signed <value>}} e \boxed{} \frac{10}{\text{Signed <value>}} \\ \boxed{} \frac{12.45}{\text{Signed <value>}} \end{array} \right\}$$

$$\Rightarrow \begin{cases} L \rightarrow SV.VE \\ E \rightarrow eBV \mid \lambda \\ S \rightarrow + \mid - \mid \lambda \rightarrow \text{前缀} + - \\ B \rightarrow + \mid - \rightarrow \text{科学} + - \\ V \rightarrow DV \mid D \rightarrow (\text{value}) + (\text{digit}) < \text{value} > (\text{digit}) \\ D \rightarrow 0 \mid 1 \mid 2 \mid \dots \mid 9 \end{cases}$$