

$$1. (1) (\{S, A\}, \{0, 1\}, \{S \rightarrow 00A, A \rightarrow 0A \mid 1A \mid 0 \mid 1\epsilon\}, S)$$

$$(2) (\{S, A\}, \{0, 1\}, \{S \rightarrow 11A \mid A11, A \rightarrow 0A \mid 1A \mid 0 \mid 1\epsilon\}, S)$$

$$(3) (\{S, A, B\}, \{0, 1\}, \{S \rightarrow A \mid B, A \rightarrow 01A \mid A10 \mid 101A \mid A101 \mid 00, \\ B \rightarrow 10B \mid B01 \mid 010B \mid B010 \mid 11\}, S)$$

$$(4) (\{S, A\}, \{0, 1\}, \{S \rightarrow A, A \rightarrow 01A \mid 10A \mid \epsilon\}, S)$$

$$(5) (\{S, A\}, \{0, 1\}, \{S \rightarrow A, A \rightarrow 0A \mid 1A \mid 1011\}, S)$$

$$2. (1) (\{S\}, \{a\}, \{S \rightarrow aS \mid a\}, S)$$

$$(2) (\{S, A\}, \{a\}, \{S \rightarrow A, A \rightarrow aA \mid a\}, S)$$

$$(3) (\{S, A\}, \{a\}, \{S \rightarrow A, A \rightarrow aA \mid a, aA \rightarrow aa\}, S)$$

$$(4) (\{S, A\}, \{a\}, \{S \rightarrow A, A \rightarrow aA \mid a, aA \rightarrow a\}, S)$$

3. 推导1:

$$\begin{aligned} S &\Rightarrow ABC \\ &\Rightarrow aABC \\ &\Rightarrow aaBC \\ &\Rightarrow aabBC \\ &\Rightarrow aabbBC \\ &\Rightarrow aabbbC \\ &\Rightarrow aabbbC \\ &\Rightarrow aabbbCC \end{aligned}$$

推导2:

$$\begin{aligned} S &\Rightarrow aSBC \\ &\Rightarrow aABCBC \\ &\Rightarrow aaBCBC \\ &\Rightarrow aaBBCC \\ &\Rightarrow aabBBCC \\ &\dots \\ &\Rightarrow aabbbCC \end{aligned}$$

归纳1:

aabbbcc
 \Rightarrow aAbbbcc
 \Rightarrow Abbbcc
 \Rightarrow AbbbBcc
 \Rightarrow AbBcc
 \Rightarrow ABcc
 \Rightarrow ABcC
 \Rightarrow ABC
 \Rightarrow S

归纳2:

aabbbcc
 \Rightarrow aabbbccC
...
 \Rightarrow aabBBCC
 \Rightarrow aabBCBC
 \Rightarrow aaBCBC
 \Rightarrow aABCBC
 \Rightarrow aSBC
 \Rightarrow S

4. (1)

$(\{S, A, B, T\}, \{0, 1\}, \{S \rightarrow ABT, A \rightarrow 000, T \rightarrow 111, B \rightarrow 0B \mid 1B \mid \varepsilon\}, S)$

(2)

$S \Rightarrow ABT$
 $\Rightarrow 000BT$
 $\Rightarrow 000B111$
 $\Rightarrow 000111$