

### 4.3

(a)

$$\begin{array}{ll} S' \rightarrow S & \text{print}(S.num) \\ S \rightarrow (L) & S.num = L.num + 1 \\ S \rightarrow a & S.num = 0 \\ L \rightarrow L_1, S & L.num = L_1.num + S.num \\ L \rightarrow S & L.num = S.num \end{array}$$

(b)

$$\begin{array}{ll} S' \rightarrow S & \text{print}(S.max) \\ S \rightarrow (L) & S.max = L.max + 1 \\ S \rightarrow a & S.max = 0 \\ L \rightarrow L_1, S & L.max = \text{if}(L_1.max > S.max) L_1.max \text{ else } S.max \\ L \rightarrow S & L.max = S.max \end{array}$$

### 4.9b

此时应该将小数部分和整数部分分开处理，此时的文法

$$\begin{array}{l} S \rightarrow L.R|L \\ L \rightarrow BL|B \\ R \rightarrow RB|B \\ B \rightarrow 0|1 \end{array}$$

$i$ 是B的继承属性， $val$ 和 $c$ 是综合属性

$$\begin{array}{ll} S \rightarrow L.R & S.val = L.val + R.val; \\ S \rightarrow L & S.val = L.val; \\ L \rightarrow BL_1 & B.i = L_1.c \times 2; L.c = L_1.c \times 2; L_1.val = L_1.val + B.c; \\ L \rightarrow B & B.i = 1; L.c = 1; L.val = B.c; \\ R \rightarrow R_1B & B.i = R_1.c/2; R.c = R_1.c/2; R_1.val = R_1.val + B.c; \\ R \rightarrow B & B.i = 1/2; R.c = 1/2; R.val = R.c; \\ R \rightarrow 0 & B.c = 0; \\ R \rightarrow 1 & B.c = B.i; \end{array}$$

### 4.12

(a)

继承属性 $depth$ 表示嵌套深度

$$\begin{array}{l} S' \rightarrow \{S.depth = 0;\}S \\ S \rightarrow \{L.depth = S.depth + 1;\}(L) \\ S \rightarrow a\{\text{print}(S.depth);\} \\ L \rightarrow \{L_1.depth = L.depth;\}L_1, \{S.depth = L.depth;\}S \\ L \rightarrow \{S.depth = L.depth;\}S \end{array}$$

(b)

继承属性 $in$ 表示该文法符号推出的字符序列前面的字符个数，综合属性 $out$ 表示该文法推出的字符序列最后一个字符是第多少个字符

$S' \rightarrow \{S.in = 0;\}S$   
 $S \rightarrow \{L.in = S.in + 1;\}(L)\{S.out = L.out + 1;\}$   
 $S \rightarrow a\{S.out = S.in + 1; \textit{print}(S.out);\}$   
 $L \rightarrow \{L_1.in = L.in;\}L_1, \{S.in = L_1.out + 1;\}S\{L.out = S.out;\}$   
 $L \rightarrow \{S.in = L.in;\}S\{L.out = S.out;\}$