

- a.  $S \rightarrow aS \mid bS \mid \Lambda$   
 b.  $S \rightarrow SS \mid bS \mid a$   
 c.  $S \rightarrow SaS \mid b$   
 d.  $S \rightarrow SaS \mid b \mid \Lambda$   
 e.  $S \rightarrow TT \quad T \rightarrow aT \mid Ta \mid b$   
 f.  $S \rightarrow aSa \mid bSb \mid aAb \mid bAa \quad A \rightarrow aAa \mid bAb \mid a \mid b \mid \Lambda$   
 g.  $S \rightarrow aT \mid bT \mid \Lambda \quad T \rightarrow aS \mid bS$   
 h.  $S \rightarrow aT \mid bT \quad T \rightarrow aS \mid bS \mid \Lambda$

- 4.2. Find a context-free grammar corresponding to the “syntax diagram” in Figure 4.32.
- 4.3. In each case below, find a CFG generating the given language.
- The set of odd-length strings in  $\{a, b\}^*$  with middle symbol  $a$ .
  - The set of even-length strings in  $\{a, b\}^*$  with the two middle symbols equal.
  - The set of odd-length strings in  $\{a, b\}^*$  whose first, middle, and last symbols are all the same.
- 4.4. In both parts below, the productions in a CFG  $G$  are given. In each part, show first that for every string  $x \in L(G)$ ,  $n_a(x) = n_b(x)$ ; then find a string  $x \in \{a, b\}^*$  with  $n_a(x) = n_b(x)$  that is not in  $L(G)$ .
- $S \rightarrow SabS \mid SbaS \mid \Lambda$
  - $S \rightarrow aSb \mid bSa \mid abS \mid baS \mid Sab \mid Sba \mid \Lambda$

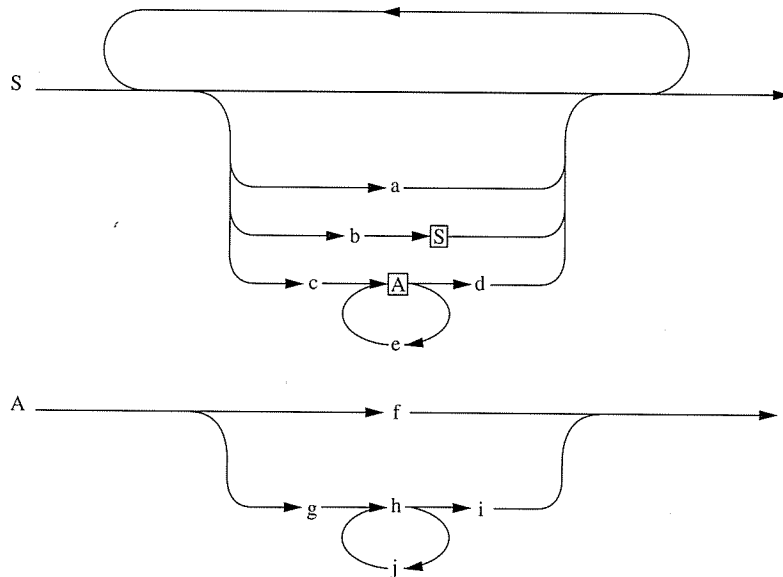


Figure 4.32 |