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1. $A \to BaC \mid CbB$

$B \to Ac \mid c$

$C \to Bb \mid b$

解 将A产生式代入B产生式，得

$B \to BaCc \mid CbBc \mid c$

可改写成 $B \to CbBcB' \mid cB'$

$B' \to aCcB' \mid \varepsilon$

将B带入C，得

$C \to CbBcB'b \mid cB'b \mid b$

可改成 $C \to cB'bC' \mid bC'$

$C' \to bBcB'bC' \mid \varepsilon$

整理得 $G'(A)$: $A \to BaC \mid CbB$

$B \to CbBcB' \mid cB'$

$B' \to aCcB' \mid \varepsilon$

$C \to CbBcB'b \mid cB'b \mid b$

$C' \to bBcB'bC' \mid \varepsilon$

2. $G(A)$: $A \to BCc \mid eDB$

$B \to \varepsilon \mid bCD$

$C \to DaB \mid ca$

$D \to \varepsilon \mid dD$

解: (1) 对于A:

$FIRST(BCc) = \{a, b, c, d\}$, $FIRST(eDB) = \{e\}$

对于B:

$FIRST(\varepsilon) = \{\varepsilon\}$, $FIRST(bCD) = \{b\}$

$FOLLOW(B) = FOLLOW(A) \cup FIRST(Cc) \cup FOLLOW(C) = \{a, c, d, \#\}$.

对于C：

$FIRST(DaB) = \{a, d\}$. $FIRST(ca) = \{c\}$

对于D：

$FIRST(\varepsilon) = \varepsilon$, $FIRST(dD) = \{d\}$

$FOLLOW(D) = (FIRST(B) - \{\varepsilon\}) \cup FOLLOW(A) \cup FOLLOW(B) \cup FIRST(aB)$

$= \{a, b, c, d, \#\}$.

(2)

	a	b	c	d	e	#
A	$A \to BCc$	$A \to BCc$	$A \to BCc$	$A \to BCc$	$A \to eDB$	
B	$B \to \varepsilon$	$B \to bCD$	$B \to \varepsilon$	$B \to \varepsilon$		$B \to \varepsilon$
C	$C \to DaB$		$C \to ca$	$C \to DaB$		
D	$D \to \varepsilon$	$D \to \varepsilon$	$D \to \varepsilon$	$D \to \varepsilon, D \to dD$		$D \to \varepsilon$

3. G(Program)： <program> → begin <stmt> end

<stmt> → d; <stmt> | s <tail>

<tail> → ε | ;s <tail>

$V_T = \{begin, end, d, ;, s\}$

解：(1) 对于<program>：

FIRST(begin<stmt>end) = {begin}.

对于<stmt>：

FIRST(d; <stmt>) = d, FIRST(s <tail>) = s

对于<tail>：

FIRST(ε) = {ε}, FIRST(;s <tail>) = {;}

FOLLOW(<tail>) = FOLLOW(<stmt>) = FIRST(end) = {end}

∴ 分析表如下：

	begin	end	d	s	;
<program>	<program>→begin<stmt>end				
<stmt>			<stmt>→d;<stmt>	<stmt>→s<tail>	
<tail>		<tail>→ε			<tail>→;s<tail>

(2) 分析过程如下表:

步骤	分析栈	待匹配串	分析动作
1	#<program>	begin d;s end #	<program>→begin<stmt>end
2	# end<stmt>begin	begin d;s end #	pop
3.	# end<stmt>	d;s end #	<stmt>→d;<stmt>
4	# end<stmt>;d	d;s end #	pop
5	# end <stmt>;	;s end #	pop
6	# end <stmt>	s end #	<stmt>→s<tail>
7	#end<tail>s	s end #	pop
8	#end<tail>	end #	<tail>→ε
9	#end	end #	pop
10	#	#	

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解: (1) $A \to baB \mid \varepsilon$

$B \to Abb \mid a$

非左递归文法.

对于A:

$FIRST(baB)=\{b\}$, $FIRST(\varepsilon)=\{\varepsilon\}$

$FOLLOW(A)=FIRST(bb)=\{b\}$.

$FOLLOW(A) \cap FIRST(baB) \neq \phi$

∴ 该文法非LL(1)文法.

将A多生式带入B,得

$A \to baB \mid \varepsilon$

$B \to baBbb \mid bb \mid a$

继续修改，提取公因子b，得

$A \to baB \mid \varepsilon$

$B \to bB' \mid a$

$B' \to aBbb \mid b$

(2) $M \to MaH \mid H$

$H \to b(M) \mid (M) \mid b$

为左递归文法，不是LL(1)文法.

消除左递归和提取公因子，得.

$M \to HM'$

$M' \to aHM' \mid \varepsilon$

$H \to bH' \mid (M)$

$H' \to (M) \mid \varepsilon$

此时为LL(1)文法.

(3) $S \to AB$

$A \to Ba \mid \varepsilon$

$B \to Db \mid D$

$D \to d \mid \varepsilon$

非左递归文法，但有公因子，提出，得

$S \to AB$

$A \to Ba \mid \varepsilon$

$B \to DB'$

$B' \to b \mid \varepsilon$

$D \to d \mid \varepsilon$

此时为LL(1)文法.

(4) $S \to Ab \mid Ba$

$A \to aA \mid a$

$B \to a$

$FIRST(Ab) = \{a\}$, $FIRST(Ba) = \{a\}$

$FIRST(Ab) \cap FIRST(Ba) \neq \emptyset$

非LL(1)文法.

则. A产生式带入S产生式, 得

$S \to aAb \mid ab \mid Ba$.

$A \to aA \mid a$.

$B \to a$.

提取左公因子, 得

$S \to aS' \mid Ba$

$S' \to Ab \mid b$

$A \to aA'$

$A' \to A \mid \varepsilon$

$B \to a$

此时 $FIRST(aS') = \{a\}$, $FIRST(Ba) = \{a\}$, 不符合条件

将B产生式带入S, 提取左公因子,

$S \to aS'$

$S' \to Ab \mid b \mid a$

$A \to aA'$

$A' \to A \mid \varepsilon$

而 $FIRST(Ab) \cap FIRST(a) \neq \emptyset$

将A产生式代入S', 提取左公因子, 得.

$S \to aS'$

$S' \to aS'' \mid b$

$S'' \to A'b \mid \varepsilon$

$A \to aA'$ $A' \to A \mid \varepsilon$ 此时为LL(1)文法