练习4.5.2：

文法：$S \to SS+ \mid SS* \mid a$

(1) $SSS+a*+$　　最右句型的句柄是 SS

(2) $SS+a*a+$　　最右句型的句柄是 SS

(3) $aaa+a++$　　没有最右句型的句柄

步骤	栈	输入
0	$	++a*aaa$
1	$+	+a*aaa$
2	$++	a*aaa$
3	$++a	*aaa$
4	$++S	*aaa$
5	$++S*	aaa$
6.	$++S*a	aa$
7.	$++S*S	aa$
8.	$++S*Sa	a$
9	$++S*SS	a$
10	$++SS	a$
11.	$+S	a$
12.	$+Sa	$
13	$+SS	$
14.	$S	$

4.6.2

文法: $S' \to S$　　$S \Rightarrow SS+ \mid SS* \mid a$

$Follow(S) = \{\$, +, *, a\}$

$I_0 = \{S' \to \cdot S,\ S \Rightarrow \cdot SS+,\ S \to \cdot SS*,\ S \to \cdot a\}$

$GOTO(I_0, S) = \{S' \to S \cdot,\ S \to S \cdot S+,\ S \to S \cdot S*,\ S \Rightarrow \cdot SS+,\ S \to \cdot SS*,\ S \to \cdot a\}\ I_1$

$GOTO(I_0, a) = \{S \to a \cdot\}\ I_2$

$GOTO(I_1, S) = \{S \Rightarrow SS \cdot +,\ S \to SS \cdot *,\ S \to S \cdot S+,\ S \to S \cdot S*,\ S \Rightarrow \cdot SS+,\ S \to \cdot SS*,$
$S \to \cdot a\}\ I_3$

$GOTO(I_1, a) = I_2$

$GOTO(I_3, +) = \{S \Rightarrow SS+ \cdot\}\ I_4$

$GOTO(I_3, *) = \{S \Rightarrow SS* \cdot\}\ I_5$

$GOTO(I_3, a) = I_2$

$GOTO(I_3, S) = I_3$

	ACTION				GO TO
	+	*	a	$	S
0			S_2		1
1			S_2	acc	3
2	r_3	r_3	r_3	r_3	
3	S_4	S_5	S_2		3
4	r_1	r_1	r_1	r_1	
5	r_2	r_2	r_2	r_2	

没有移进-归约冲突，~~[illegible]~~ 得SLR法

4.6.5

文法：$S' \to S \quad S \to AaAb \mid BbBa$

$A \to \varepsilon \quad B \to \varepsilon$

$First(S) = \{\varepsilon\}$ $\quad$ $Follow(S) = \{\$\}$

$First(A) = \{\varepsilon\}$ $\quad$ $Follow(A) = \{a, b\}$

$First(B) = \{\varepsilon\}$ $\quad$ $Follow(B) = \{a, b\}$

该文法是LL(1)文法

$I_0 = \{S' \to \cdot S,\ S \to \cdot AaAb,\ S \to \cdot BbBa,\ A \to \cdot\varepsilon,\ B \to \cdot\varepsilon\}$

$GOTO(I_0, S) = \{S' \to S\cdot,\ S \to A\cdot aAb,\ S \to B\cdot bBa\}$ I_1

$GOTO(I_0, \varepsilon) = \{A \to \varepsilon\cdot,\ B \to \varepsilon\cdot\}$ I_2

$GOTO(I_1, a) = \{S \to Aa\cdot Ab,\ A \to \cdot\varepsilon\}$ I_3

$GOTO(I_1, b) = \{S \to Bb\cdot Ba,\ B \to \cdot\varepsilon\}$ I_4

$GOTO(I_3, A) = \{S \to AaA\cdot b\}$ I_5 $\quad$ $GOTO(I_3, \varepsilon) = I_2$

$GOTO(I_4, B) = \{S \to BbB\cdot a\}$ I_6 $\quad$ $GOTO(I_4, \varepsilon) = I_2$

$GOTO(I_5, b) = \{S \to AaAb\cdot\}$ I_7 $\quad$ $GOTO(I_6, a) = \{S \to BbBa\cdot\}$ I_8

	ACTION				GOTO		
	a	b	ε	$	S	A	B
0			s2		1		
1	s3	s4					
2							
3			s2			5	
4			s2				6
5		s7					
6	s8						
7			r1				
8			r2				

在I_2中

$Follow(A) \cap Follow(B) = \{a, b\}$

→ 由此，归约-归约冲突且不可解决，不是SLR文法

4.6.6 文法: $S' \to S$ $S \to SA \mid A$ $A \to a$

Follow(S) = {$, a} Follow(A) = {$, a}

$I_0 = \{S' \to \cdot S,\ S \to \cdot SA,\ S \to \cdot A,\ A \to \cdot a\}$

GOTO(I_0, S) = $\{S' \to S \cdot,\ S \to S \cdot A,\ A \to \cdot a\}$ I_1

GOTO(I_0, A) = $\{S \to A \cdot\}$ I_2

GOTO(I_0, a) = $\{A \to a \cdot\}$ I_3

GOTO(I_1, A) = $\{S \to SA \cdot\}$ I_4 GOTO(I_1, a) = I_3

	a	$	S	A
0	S_3		1	2
1	S_3	acc		4
2	r_2			
3	r_3	r_3		
4	r_1	r_1		

该文法是SLR文法

消除左递归，提公因式

4.7.1 文法： $S' \to S$　$S \to SS+ \mid SS* \mid a$　First(S)={a}

$I_0 = \{[S' \to \cdot S, \$], [S \to \cdot SS+, \$/a], [S \to \cdot SS*, \$/a], [S \to \cdot a, \$/a]\}$

GOTO$(I_0, S) = \{[S' \to S \cdot, \$], [S \to S \cdot S+, \$/a], [S \to S \cdot S*, \$/a], [S \to \cdot SS+, +/*/a], [S \to \cdot SS*, +/*/a], [S \to \cdot a, +/*/a]\} I_1$

GOTO$(I_0, a) = \{[S \to a \cdot, \$/a]\} I_2$

GOTO$(I_1, S) = \{[S \to SS \cdot +, \$/a], [S \to SS \cdot *, \$/a], [S \to S \cdot S+, +/*/a], [S \to S \cdot S*, +/*/a],$
$[S \to \cdot SS+, +/*/a], [S \to \cdot SS*, +/*/a], [S \to \cdot a, +/*/a]\} I_3$

GOTO$(I_1, a) = \{[S \to a \cdot, +/*/a]\} I_4$

GOTO$(I_3, +) = \{[S \to SS+ \cdot, \$/a]\} I_5$　GOTO$(I_3, *) = \{[S \to SS* \cdot, \$/a]\} I_6$

GOTO$(I_3, a) = I_4$

GOTO$(I_3, S) = \{[S \to SS \cdot +, +/*/a], [S \to SS \cdot *, +/*/a], [S \to S \cdot S+, +/*/a], [S \to S \cdot S*, +/*/a],$
$[S \to \cdot SS+, +/*/a], [S \to \cdot SS*, +/*/a], [S \to \cdot a, +/*/a]\} I_7$

GOTO$(I_7, a) = I_4$

GOTO$(I_7, +) = \{[S \to SS+ \cdot, +/*/a]\} I_8$　GOTO$(I_7, *) = \{[S \to SS* \cdot, +/*/a]\} I_9$

GOTO$(I_7, S) = I_7$

LR(1) =

	ACTION				GOTO
	+	*	a	$	S
0			S_2		1
1			S_4	acc	3
2			r_3	r_3	
3	S_5	S_6	S_4		7
4	r_3	r_3	r_3		
5			r_1	r_1	
6			r_2	r_2	
7	S_8	S_9	S_4		7
8	r_1	r_1	r_1		
9	r_2	r_2	r_2		

LALR:

	ACTION				GOTO
	+	*	a	$	S
0			S_{24}		1
1			S_{24}	acc	37
24	r_3	r_3	r_3	r_3	
37	S_{58}	S_{69}	S_{24}		37
58	r_1	r_1	r_1	r_1	
69	r_2	r_2	r_2	r_2	

4.7.5 $S' \to S$

$S \to Aa \mid bAc \mid Bc \mid bBa$

$A \to d \qquad B \to d$

First(S) = {b, d}

First(A) = {d}

First(B) = {d}

$I_0 = \{[S' \to \cdot S, \$], [S \to \cdot Aa, \$], [S \to \cdot bAc, \$], [S \to \cdot Bc, \$], [S \to \cdot bBa, \$], [A \to \cdot d, a], [B \to \cdot d, c]\}$

GOTO(I_0, S) = $\{[S' \to S \cdot, \$]\} I_1$

GOTO(I_0, d) = $\{[A \to d \cdot, a], [B \to d \cdot, c]\} I_2$

GOTO(I_0, A) = $\{[S \to A \cdot a, \$]\} I_3$

GOTO(I_0, B) = $\{[S \to B \cdot c, \$]\} I_4$

GOTO(I_0, b) = $\{[S \to b \cdot Ac, \$], [S \to b \cdot Ba, \$], [A \to \cdot d, c], [B \to \cdot d, a]\} I_5$

GOTO(I_3, a) = $\{[S \to Aa \cdot, \$]\} I_6$

GOTO(I_4, c) = $\{[S \to Bc \cdot, \$]\} I_7$

GOTO(I_5, d) = $\{[A \to d \cdot, c], [B \to d \cdot, a]\} I_8$

GOTO(I_5, A) = $\{[S \to bA \cdot c, \$]\} I_9$

GOTO(I_5, B) = $\{[S \to bB \cdot a, \$]\} I_{10}$

GOTO(I_9, c) = $\{[S \to bAc \cdot, \$]\} I_{11}$

GOTO(I_{10}, a) = $\{[S \to bBa \cdot, \$]\} I_{12}$

	a	b	c	d	$	S	A	B
0		S_5		S_2		1	3	4
1					acc			
2	r_5		r_6					
3	S_6							
4			S_7					
5				S_8			9	10
6					r_1			
7					r_3			
8	r_6		r_5					
9			S_{11}					
10	S_{12}							
11					r_2			
12					r_4			

能得LALR

项集2和8合并不可解,无法合并,所以该文法不是LALR

2和8合并后为{[A→d·, a/c], [B→d·, a/c]}

有归约-归约冲突