6(a) LALR Parser

G: S → Aa
S → bAc
S → Bc
S → bBa
A →d
B → a

Computation of LR(1) Items Set for G

(1) Augmented Grammar

G': S' → S
S → Aa (R_1)
S → bAc (R_2)
S → Bc (R_3)
S → bBa (R_4)
A →d (R_5)
B → a (R_6)

(2) CLOSURE (S' →S)

S' →.S, $
S → .Aa, $
S → .bAc , $
S → .Bc, $
S → .bBa, $
A → .d, a | $
B → .a, c | $.....($I_0$)

(3) GOTO( )

GOTO (I_0, S): S' → S., $ ……(I_1)

GOTO (I_0, A): S → A.a, $ …… (I_2)

GOTO (I_0, B): S → B.c, $ ……(I_3)

GOTO (I_0, a): B → a., c |$ …(I_4)

GOTO (I_0, b): S → b.Ac, $
S →b.Ba, $
A → .d, c |$
B →.a, a | $ ……(I_5)

GOTO (I_0, d): A →d., a | $.....($I_6$)

GOTO (I_2, a): S → Aa., $ …… (I_7)

GOTO (I_3, c): S → Bc., $ ……(I_8)

GOTO (I_5, A): S → bA.c, $ ……(I_9)
GOTO (I_5, B): S → bB.a, $ ……(I_{10})
GOTO (I_5, a): B → a., a |$ ……(I_{11})
GOTO (I_5, d): A → d., c|$ ……(I_{12})

GOTO (I_9, c): S → bAc., $ ……(I_{13})

GOTO (I_{10}, a): S → bBa., $ ……(I_{14})

(4) LR(1) Items set Grouping

By Merging I_4 and I_{11} : B → a., a|c|$ ……(I_{411})
By Merging I_6 and I_{12} : A → d., a|c|$ ……(I_{612})

(5) LALR Parsing Table

State	ACTION					GOTO		
	a	**b**	**c**	**d**	**$**	**S**	**A**	**B**
0	S_{411}	S_5		S_{612}		1	2	3
1					ACC			
2	S_7							
3			S_8					
411	R_5		R_5		R_5			
5	S_{411}			S_{612}		9	10	
612	R_6		R_6		R_6			
7					R_1			
8					R_3			
9			S_{13}					
10	S_{14}							
13					R_2			
14					R_4			

6(b) CLR Parser

6(a) LALR Parser

G: S → (L)
S → id
L → L * S
L→ S

Computation of LR(1) Items Set for G

(1) Augmented Grammar

G': S' → S
S → (L) (R_1)
S → id (R_2)
L → L * S (R_3)
L→ S (R_4)

(2) CLOSURE (S' →S)

S' →.S, $
S → .(L), $
S → .id, $.....($I_0$)

(3) GOTO( )

GOTO (I_0, S): S' → S., $ ……(I_1)

GOTO (I_0, (): S → (.L), $
L → .L * S, * |) |$
L → .S, * |) |$
S → .(L), * |) |$
S → .id, * |) |$ …… (I_2)

GOTO (I_0, id): S → id., $ ……(I_3)

GOTO (I_2, S): L → S., * |) |$…($I_4$)

GOTO (I_2, L): S → (L.), $
L → L.*S, * |) |$……($I_5$)

GOTO (I_2, (): S → (.L), * |) |$
L → .L * S, * |) |$
L → .S, * |) |$
S → .(L), * |) |$
S → .id, * |) |$ …… (I_6)

GOTO (I_2, id): S → id., * |) |$ …… (I_7)

GOTO (I_5,)): S → (L)., $……($I_8$)

GOTO (I_5, *): L → L*.S, * |) |$
S → .(L), * |) |$
S → .id, * |) |$ …… (I_9)

GOTO (I_6, S): L → S., * |) |$…($I_4$)

GOTO (I_6, L): S → (L.), *|)|$
L → L.*S, *|)|$……($I_{10}$)

GOTO (I_6, (): S → (.L), * |) |$
L → .L * S, * |) |$
L → .S, * |) |$
S → .(L), * |) |$
S → .id, * |) |$ …… (I_6)

GOTO (I_6, id): S → id., * |) |$ …… (I_7)

GOTO (I_9, S): L → L*S., * |) |$ ……(I_{11})

GOTO (I_9, (): S → (.L), * |) |$
L → .L * S, * |) |$
L → .S, * |) |$
S → .(L), * |) |$
S → .id, * |) |$ …… (I_6)

GOTO (I_9, id): S → id., * |) |$ …… (I_7)

GOTO (I_{10},)): S → (L)., * |) |$ ……(I_{12})

GOTO (I_{10}, *): L → L*.S, * |) |$
S → .(L), * |) |$
S → .id, * |) |$ …… (I_9)

(4) LALR Parsing Table

State	ACTION					GOTO	
	id	(	)	*	$	S	L
0	S_3	S_2				1	
1					ACC		
2	S_7	S_6				4	5
3					R_2		
4			R_4	R_4	R_4		
5			S_8	S_9			
6	S_7	S_6				4	10
7			R_2	R_2	R_2		
8					R_1		
9	S_7	S_6				11	
10			S_{12}	S_9			
11			R_3	R_3	R_3		
12			R_1	R_1	R_1		

(5). LALR Parsing: Input string (id*id*id) Highlighted contents on Stack - Handle

Stack	Input buffer	Action Taken
0	(id*id*id)$	ACTION [0,(] = S2 – Shift
0(2	id*id*id)$	ACTION [2, id] = S7 – Shift
0(2id 7	*id*id)$	ACTION [7, *] = R2 & GOTO(2, S) = 4
0(2S4	*id*id)$	ACTION [4, *] = R4 & GOTO(2, L) = 5
0(2L5	*id*id)$	ACTION [5, *] = S9 – Shift
0(2L5*9	id*id)$	ACTION [9, id] = S7 – Shift
0(2L5*9id7	*id)$	ACTION [7, *] = R2 & GOTO(9, S) = 11
0(2L5*9S11	*id)$	ACTION [11, *] = R3 & GOTO(2, L) = 5
0(2L5	*id)$	ACTION [5, *] = S9 – Shift
0(2L5*9	id)$	ACTION [9, id] = S7 – Shift
0(2L5*9id7	)$	ACTION [7,)] = R2 & GOTO(9, S) = 11
0(2L5*9S11	)$	ACTION [11,)] = R3 & GOTO(2, L) = 5
0(2L5	)$	ACTION [5,)] = S8 Shift
0(2L5)8	$	ACTION [8, $] = R1 & GOTO(0,S) = 1
0S1	$	ACTION [1, $] = Accept.