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Assignment 5

Q.1. Construct LL Parsing table for the given grammar.

$S \rightarrow iEtS \mid iEtSeS \mid a$
$E \rightarrow b$

After removing the left recursion,

	First	Follow
$S \rightarrow iEtSS' \mid a$	$S \rightarrow \{i, a\}$	$S \rightarrow \{e, \$\}$
$S' \rightarrow eS \mid \epsilon$	$S' \rightarrow \{e, \epsilon\}$	$S' \rightarrow \{e, \$\}$
$E \rightarrow b$	$E \rightarrow \{b\}$	$E \rightarrow \{t\}$

Predictive Parsing table

	i	t	a	e	b	$
S	$S \rightarrow iEtSS'$		$S \rightarrow a$			
S'				$S' \rightarrow eS$		$S' \rightarrow \epsilon$
E					$E \rightarrow b$	

Q.2. Perform shift reduce parsing for the given input string

$S \rightarrow S+S$
$S \rightarrow S*S$
$S \rightarrow id$

input string : id+id+id

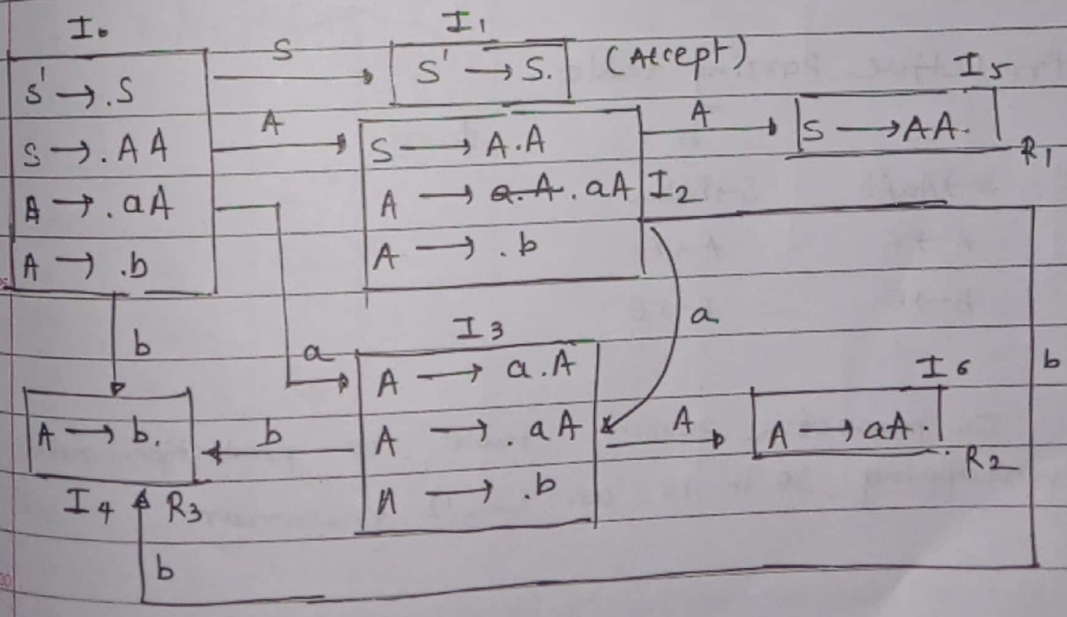
Input:	Action:	Stack:
id + id + id $	shift	$
+ id + id $	Reduce {S → id}	$id
+ id + id $	shift	$S
id + id $	shift	$S+
+ id $	Reduce {S → id}	$S+id
+ id $	shift	$S+S
+ id $	Reduce {S → S+S}	$S
id $	shift	$S+
$	~~Reduce~~ shift	$S+id
$	Reduce {S → id}	$S+S
$	Reduce {S → S+S}	$S
$	Accept	$S

Q.3 Construct LR parsing table for the given grammar.

$S \rightarrow AA$

$A \rightarrow aA \mid b$

1) $S' \rightarrow .S$
2) $S \rightarrow .AA$
3) $A \rightarrow .aA$
4) $A \rightarrow .b$



State	Action			Goto	
	a	b	$	A	S
I_0	S_3	S_4		2	1
I_1			Accept		
I_2	S_3	S_4		5	
I_3	S_3	S_4		6	
I_4	R_4	R_4	R_3		
I_5	R_1	R_1	R_1		
I_6	R_2	R_2	R_2		

Q.4 Show that the following grammar is LL(1) but not SLR(1)

$S \rightarrow AaAb \mid BbBa$

$A \rightarrow \epsilon$

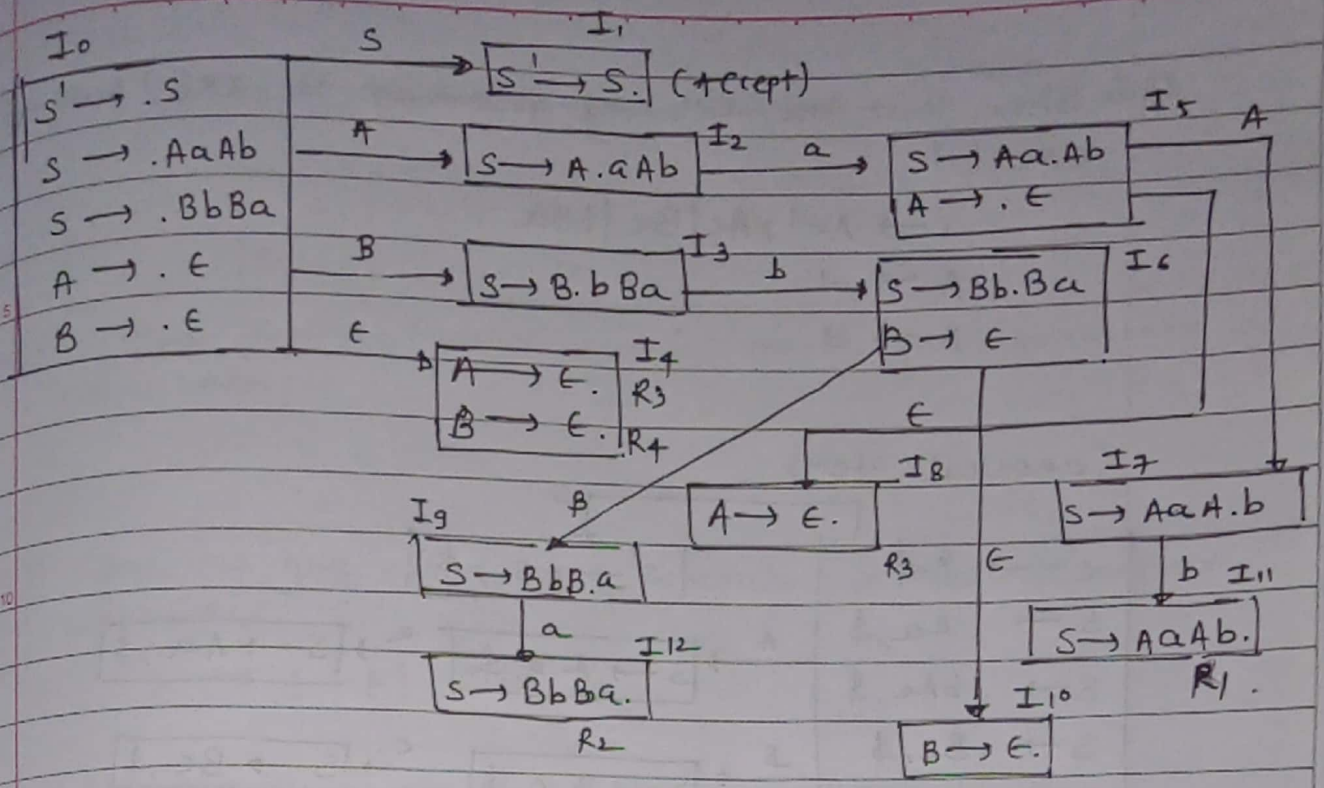
$B \rightarrow \epsilon$

	first	follow
S	{a, b}	{$}
A	{ϵ}	{a, b}
B	{ϵ}	{b, a}

Predictive Parsing table

	a	b	$
S	$S \rightarrow AaAb$	$S \rightarrow BbBa$	
A	$A \rightarrow \epsilon$	$A \rightarrow \epsilon$	
B	$B \rightarrow \epsilon$	$B \rightarrow \epsilon$	

In predictive parsing table, no production rules are overlapping. So it is an LL(1) grammar



States	Actions				Goto		
	a	b	ϵ	$	S	A	B
I_0			S_4		1	2	3
I_1				Accept			
I_2	S_5	~~S_6~~					
I_3		S_6					
I_4	R_3/R_4	R_3/R_4					
I_5			S_8			7	
I_6			S_{10}				9
I_7		S_{11}					
I_8	R_3	R_3					
I_9	S_{12}						
I_{10}	R_4	R_4					
I_{11}				R_1			
I_{12}				R_2			

There is Reduce-Reduce conflict, so this is not SLR(1) grammar

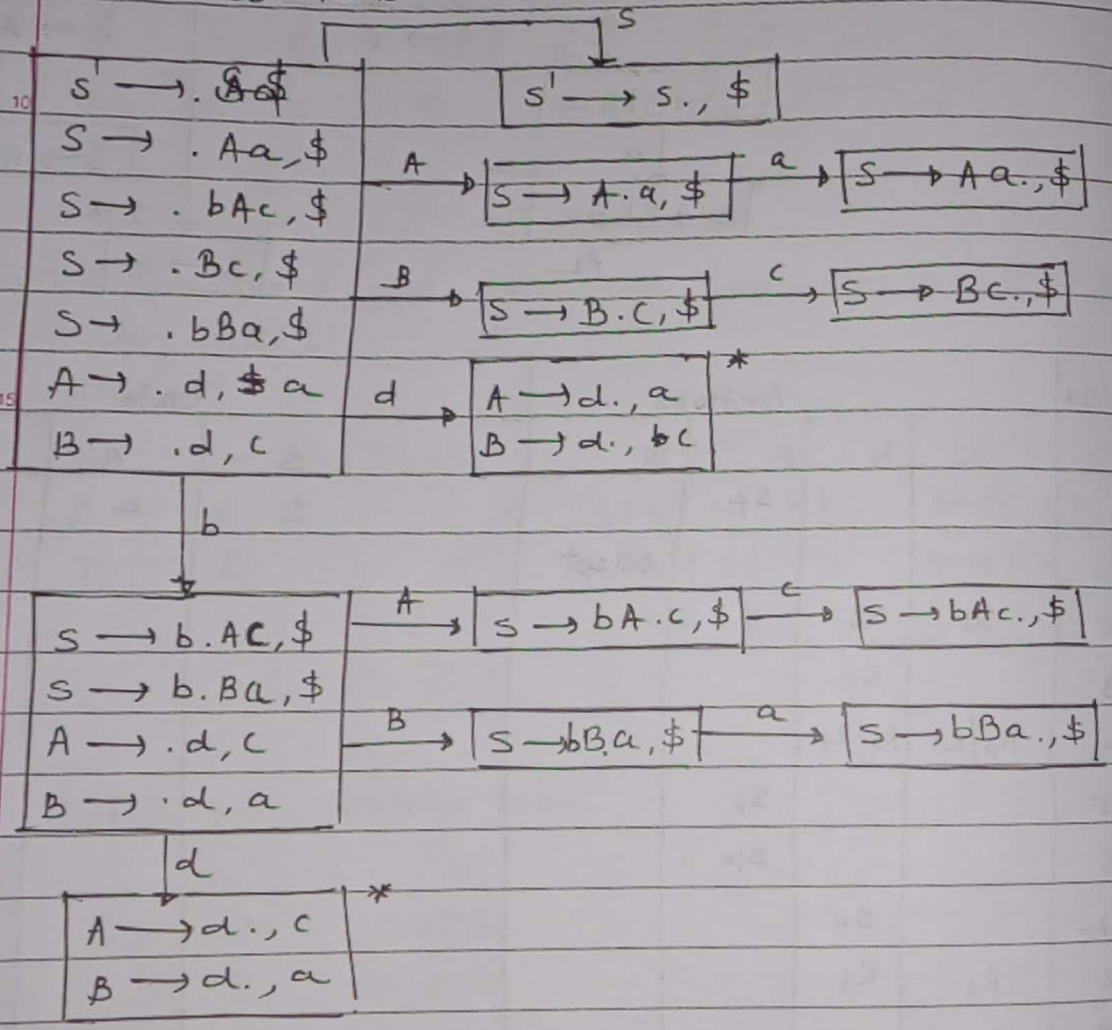
Q.5 Show that the following grammar is LR(1) but not LALR(1)

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

$A \rightarrow d$

$B \rightarrow d$

Canonical items



for LR(1)	a	b	c	d	$
I_2	R5		R5		
I_3	R6		R6		

Here, there is no RR conflict, hence given grammar is LR(1)

for LALR(1), combining state 2 & state 3

state	a	b	c	d	$
2,3	R5/R6		R5/R6		

Here Reduce - Reduce occurs, hence given grammar is not LALR(1)

Q.6 Parse the give string using operator precedence parser
id+id*id

$E \rightarrow E+E \mid E*E \mid id$

Operator Precedence Table

	id	+	*	$
id		>	>	>
+	<	>	<	>
*	<	>	>	>
$	<	<	<	Accept

Input: id+id*id$	Action: shift	stack: $
+id*id$	Reduce {E→id}	$id
+id*id$	shift	$E
id*id$	shift	$E+
*id$	shift	$E+id
*id$	Reduce {E→id}	$E+E
id$	shift	$E+E*
$	shift	$E+E*id
$	Reduce {E→id}	$E+E*E
$	Reduce {E→E*E}	$E+E
$	Reduce {E→E+E}	$E
$	Accept	$E