Tutorial - 3

Sudakshina Dutta

IIT Goa

4^{th} March, 2022

We can say that a grammar is not LL(1) or not SLR(1) if their respective tables have 2 entries at any cell.

Question - 1(a)

The grammar is $S \rightarrow 0S1|01$ and the input string is 000111

- $S \rightarrow 0S1 \rightarrow 00S11 \rightarrow 000111$

What are the handles here ?

Question - 2

- Consider the following grammar

$$S \rightarrow A|a$$
$$A \rightarrow a$$

- $FIRST(S) = ?$, $FIRST(A) = ?$, $FOLLOW(S) = ?$, $FOLLOW(A) = ?$

Question - 2

- Consider the following grammar

$$S \rightarrow A|a$$
$$A \rightarrow a$$

- $FIRST(S) = \{a\}$, $FIRST(A) = \{a\}$, $FOLLOW(S) = FOLLOW(A) = \{\$\}$

Question - 2

- The predictive parsing table is given below.

	a	\$
S	$S \rightarrow A$ $S \rightarrow a$	
A	$A \rightarrow a$	

The grammar is not $LL(1)$

Question - 2

- The canonical collection of $LR(0)$ is given below.

$I_0 : S' \to .S$
$S \to .A|.a$
$A \to .a$

$I_1 : S' \to S.$

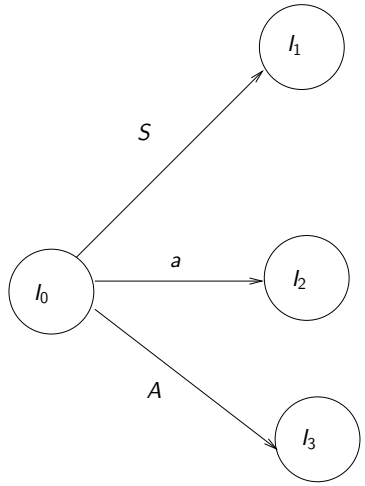
$I_2 : S \to a.$
$A \to a.$

2 reduce actions possible.

$I_3 : S \to A.$

The grammar is not $SLR(1)$

Question - 2



	action		goto	
	a	\$	S	A
0	s_2		1	3
1		Accept		
2		r_2/r_3		
3		r_1		

Question - 5

- Consider the following grammar

$$E \rightarrow E + E | E * E | id$$

Question - 5

- Consider the following grammar

$$E \rightarrow E + E | E * E | id$$

After left recursion elimination, the grammar is the following

- $E \rightarrow idX$
- $X \rightarrow +EX | \epsilon$
- $E \rightarrow idY$
- $Y \rightarrow *EY | \epsilon$
- $E \rightarrow id$

E -> E + E | id :: A -> A @ | B

E -> E * E | id :: A -> A @ | B

$FIRST(E) =?$, $FIRST(X) =?$, $FIRST(Y) =?$
$FOLLOW(E) =?$, $FOLLOW(X) =?$, $FOLLOW(Y) =?$

Question - 5

- Consider the following grammar

$$E \rightarrow E + E | E * E | id$$

After left recursion elimination, the grammar is the following

- $E \rightarrow idX$
- $X \rightarrow +EX | \epsilon$
- $E \rightarrow idY$
- $Y \rightarrow *EY | \epsilon$
- $E \rightarrow id$

$FIRST(E) = \{id\}$, $FIRST(X) = \{+, \epsilon\}$, $FIRST(Y) = \{*, \epsilon\}$
$FOLLOW(E) = \{+, *, \$\}$, $FOLLOW(X) = \{+, *, \$\}$,
$FOLLOW(Y) = \{+, *, \$\}$

Question - 5

	$+$	$*$	id	\$
E			$E \to idX$ $E \to idY$ $E \to id$	
X	$X \to +EX$ $X \to \epsilon$	$X \to \epsilon$		$X \to \epsilon$
Y	$Y \to \epsilon$	$Y \to *EY$ $Y \to \epsilon$		$Y \to \epsilon$

The grammar is not $LL(1)$

Question - 5

Note that for the same G, to check for SLR Parsing, We need not use the G after Left recursion elimination & Left factoring.. We can use G directly.

- The canonical collection of $LR(0)$ is given below.

$I_0 : E' \to .E$
$\quad E \to .E + E$
$\quad E \to .E * E$
$\quad E \to .id$

$I_0 : E' \to E.$
$\quad E \to E. + E$
$\quad E \to E. * E$

$I_2 : E \to .id$

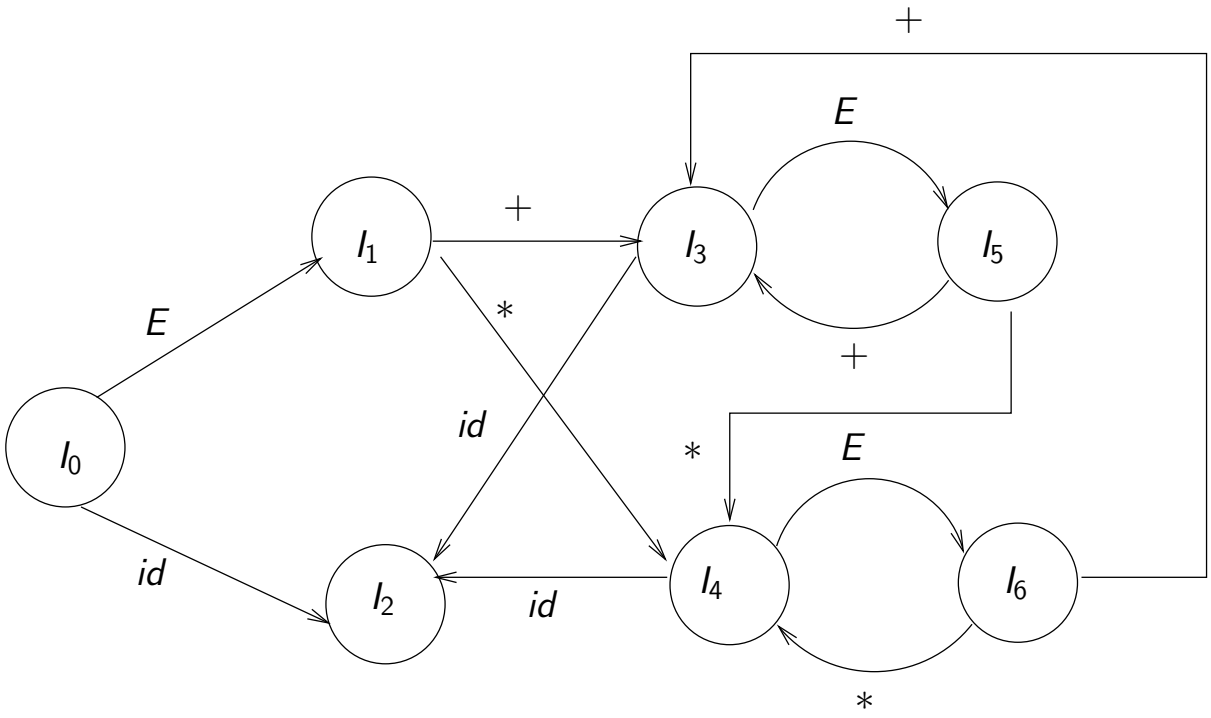
$I_3 : E \to E + .E$
$\quad E \to .E + E$
$\quad E \to .E * E$
$\quad E \to .id$

$I_4 : E \to E * .E$
$\quad E \to .E + E$
$\quad E \to .E * E$
$\quad E \to .id$

$I_5 : E \to E + E.$
$\quad E \to E. + E$
$\quad E \to E. * E$

$I_6 : E \to E * E.$
$\quad E \to E. + E$
$\quad E \to E. * E$

Question - 5



Question - 5

state	action				goto
	$+$	$*$	id	\$	E
0			s_2		1
1	s_3	s_4		Accept	
2	r_4	r_4		r_4	
3			s_2		5
4			s_2		6
5	s_3/r_1	s_4/r_1		r_1	
6	s_3/r_2	s_4/r_2		r_2	