

### **Question ONE**

Construct the DFA , parsing stack for input(x,(x)), and Parsing table of LR(0) parser for the following grammar

$$1: S \rightarrow (L)$$

$$2: S \rightarrow x$$

$$3: L \rightarrow S$$

$$4: L \rightarrow L, S$$

Solution

$$0: S' \rightarrow S\$$$

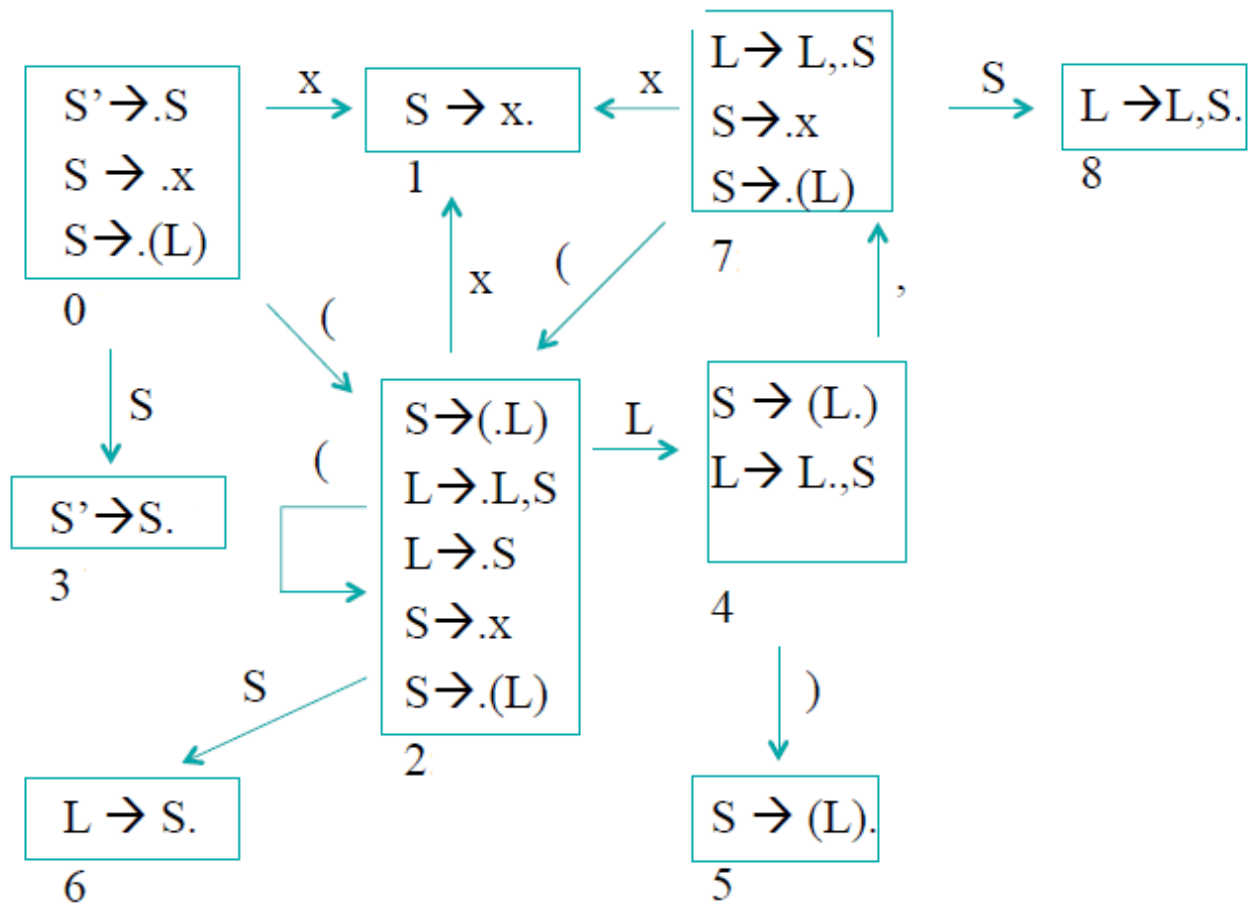
$$1: S \rightarrow (L)$$

$$2: S \rightarrow x$$

$$3: L \rightarrow S$$

$$4: L \rightarrow L, S$$

## DFA



## Parsing Stack

<i>parse</i>	$(x, (x))\$$	
<i>stack</i>	<i>input</i>	<i>action</i>
0	$(x, (x))\$$	$s2$
0(2	$x, (x))\$$	$s1$
0(2x1	$, (x))\$$	$r2: S \rightarrow x$
0(2S6	$, (x))\$$	$r3: L \rightarrow S$
0(2L4	$, (x))\$$	$s7$
0(2L4,7	$(x))\$$	$s2$
0(2L4,7(2	$x))\$$	$s1$
0(2L4,7(2x1	$)\$$	$r2: S \rightarrow x$
0(2L4,7(2S6	$)\$$	$r3: L \rightarrow S$
0(2L4,7(2L4	$)\$$	$s5$
0(2L4,7(2L4)5	$)\$$	$r1: S \rightarrow (L)$
0(2L4,7S8	$)\$$	$r4: L \rightarrow L, S$
0(2L4	$)\$$	$s5$
0(2L4)5	$\$$	$r1: S \rightarrow (L)$
03S	$\$$	$a$

## Parsing TABLE

	(	)	x	,	\$	S	L
0	s2		s1			g3	
1	r2	r2	r2	r2	r2		
2	s2		s1			g6	g4
3					a		
4		s5		s7			
5	r1	r1	r1	r1	r1		
6	r3	r3	r3	r3	r3		
7	s2		s1			g8	
8	r4	r4	r4	r4	r4		

## Question Two

Construct the DFA ,Parsing table of LR(0) parser for the following grammar

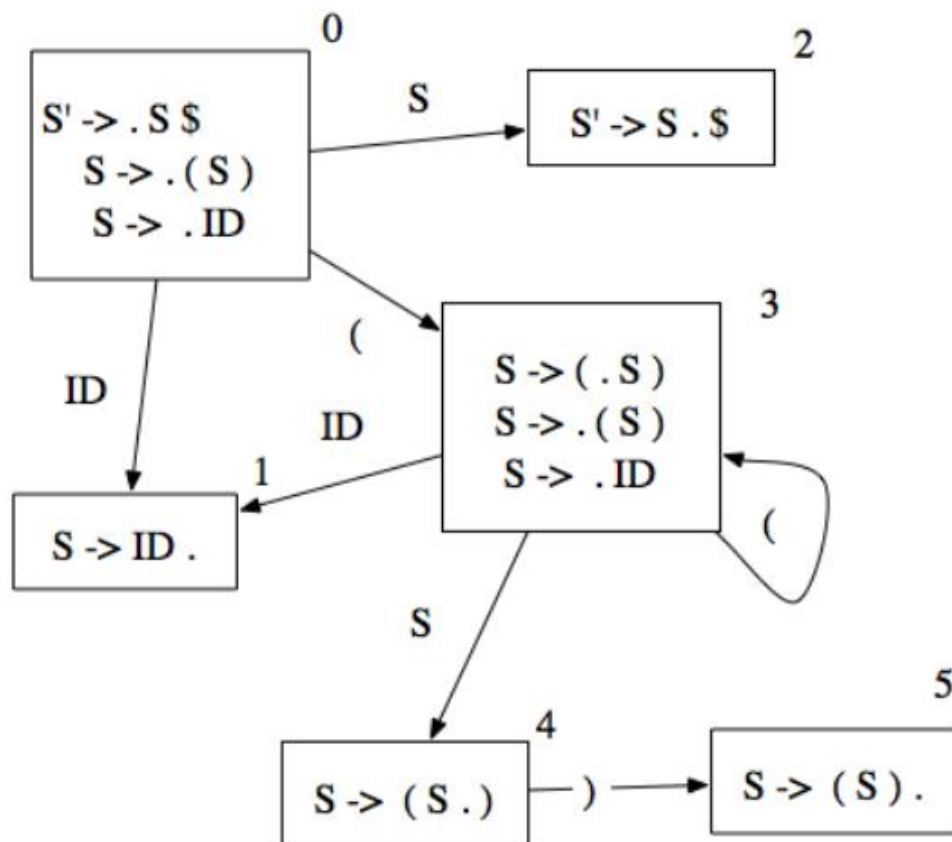
$S \rightarrow (S) | ID$

Solution

$S' \rightarrow s\$$

$S \rightarrow (S) | ID$

DFA



Parsing table

	Action				Goto
State	(	)	\$	ID	S
0	s3			s1	2
1	r2	r2	r2	r2	
2			accept		
3	s3			s1	4
4		s5			
5	r0	r0	r0	r0	

### Question Three

Construct the DFA parser for the following grammar

**$E \rightarrow E+T$**

**$E \rightarrow T$**

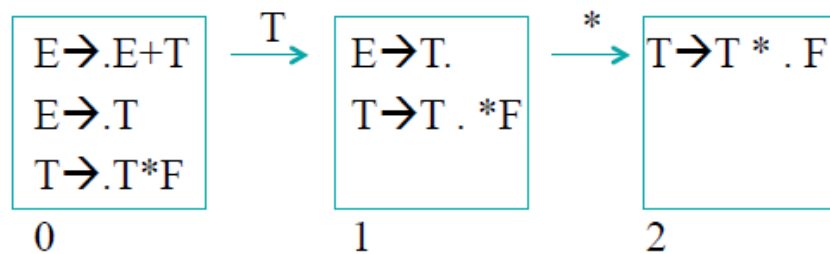
**$T \rightarrow T * F$**

Solution

**$E \rightarrow E+T$**

**$E \rightarrow T$**

**$T \rightarrow T * F$**



**In state 1:**

**we reduce ( $E \rightarrow T.$ ) AND we shift ( $T \rightarrow T . * F$ )**

**shift reduce conflict**

### **Question Four**

Construct the DFA , parsing stack for input  $i+i$  , and Parsing table for LR(0) parser for the following grammar

$$E \rightarrow T$$

$$E \rightarrow E + T$$

$$T \rightarrow i$$

$$T \rightarrow ( E )$$

Solution

*Grammar G:*

$$Z \rightarrow E\$$$

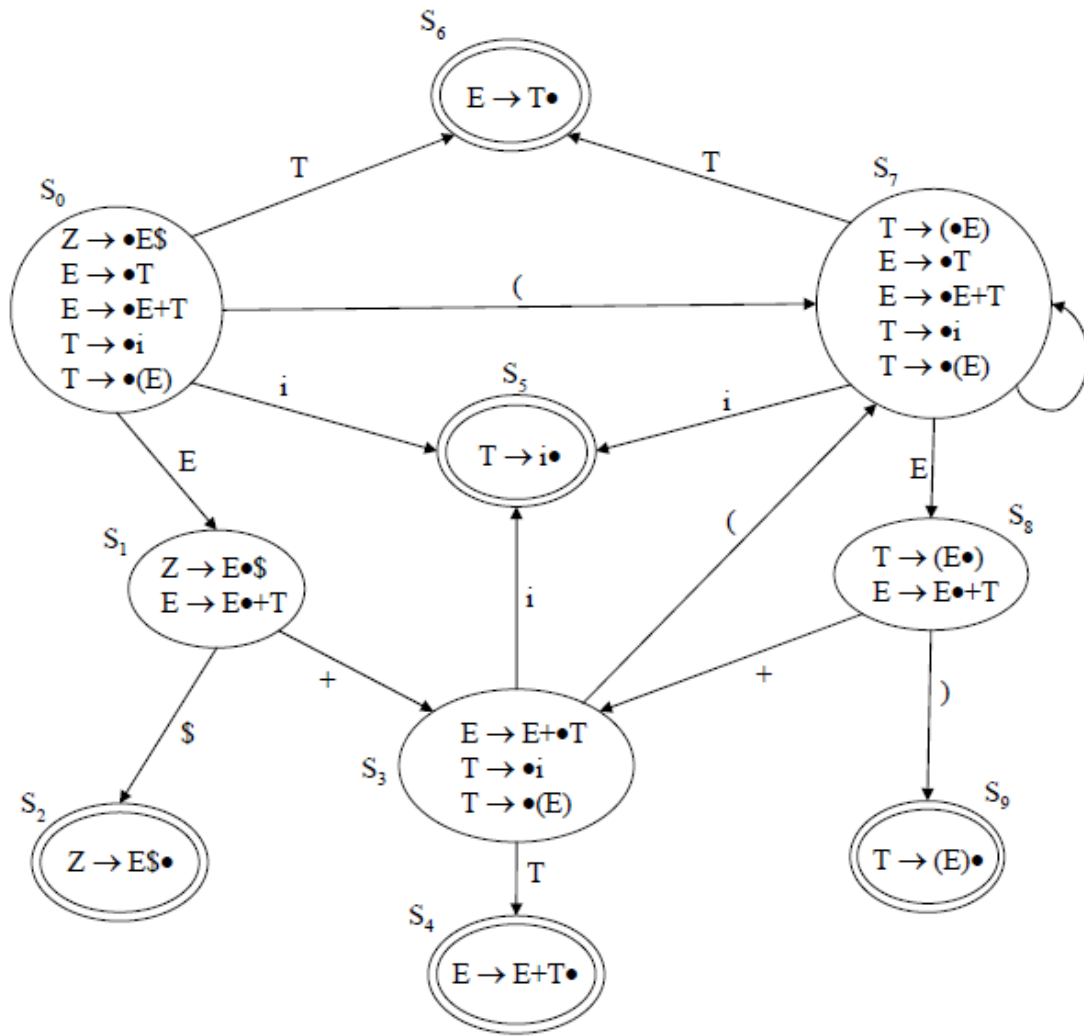
$$E \rightarrow T$$

$$E \rightarrow E + T$$

$$T \rightarrow i$$

$$T \rightarrow ( E )$$





state	i	+	(	)	\$	E	T	
0	5		7			1	6	shift
1		3			2			shift
2								$Z \rightarrow E\$$
3	5		7				4	shift
4								$E \rightarrow E+T$
5								$T \rightarrow I$
6								$E \rightarrow T$
7	5		7			8	6	shift
8		3		9				shift
9								$T \rightarrow (E)$

Stack	Input	Action
$S_0$	$i + i \$$	shift
$S_0 i S_5$	$+ i \$$	reduce by $T \rightarrow i$
$S_0 T S_6$	$+ i \$$	reduce by $E \rightarrow T$
$S_0 E S_1$	$+ i \$$	shift
$S_0 E S_1 + S$	$i \$$	shift
$S_0 E S_1 + S_3 i S_5$	$\$$	reduce by $T \rightarrow i$
$S_0 E S_1 + S_3 T S_4$	$\$$	reduce by $E \rightarrow E + T$
$S_0 E S_1$	$\$$	shift
$S_0 E S_1 \$ S_2$		reduce by $Z \rightarrow E \$$
$S_0 Z$		stop

### Question Five

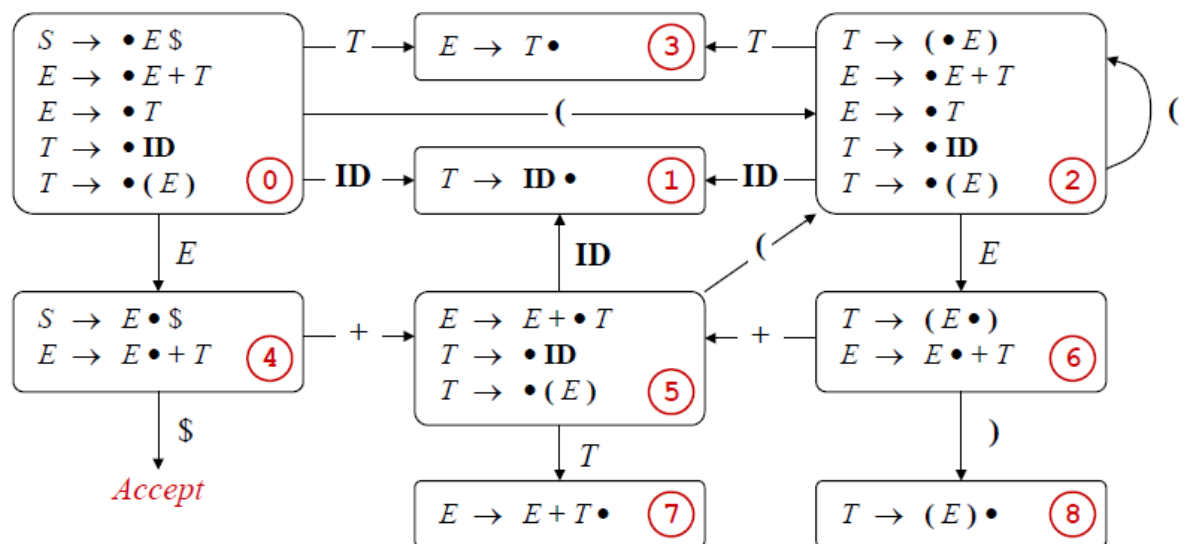
Construct the DFA , and Parsing table of LR(0) parser for the following grammar

$$E \rightarrow E + T \mid T$$

$$T \rightarrow ID \mid (E)$$

Solution

DFA



## Parsing Table

State	Action					Goto	
	+	ID	(	)	\$	<i>E</i>	<i>T</i>
0		S1	S2			G4	G3
1	R3	R3	R3	R3	R3		
2		S1	S2			G6	G3
3	R2	R2	R2	R2	R2		
4	S5				A		
5		S1	S2				G7
6	S5			S8			
7	R1	R1	R1	R1	R1		
8	R4	R4	R4	R4	R4		

## References

<http://www.cse.aucegypt.edu/~rafea/CSCE447/>

<https://www.cs.bgu.ac.il/~romanm/wcc06/LR%20Parsing.pdf>

<https://www.cs.colostate.edu/~cs453/yr2014/Slides/12-LR0-SLR.ppt.pdf>