



**Mansoura University**  
**Faculty of Computers and Information**  
**Sciences**  
**Department of Computer Science**  
**Second Semester- 2020-2021**



**[CS422P] Compiler Construction**

**Grade : Fourth grade**

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# Syntax Analysis

Bottom UP Parsing



# Bottom Up Parsing

- Bottom Up Shift-Reduce Parsing LR(0) :
  - I. Augment the grammar.
  - II. Draw DFA using LR(0) items.
  - III. Constructing the parse table.
  - IV. Apply LR(0) parsing algorithm to verify some input string.

# LR(0) Parsing – question 1.

- Draw the DFA and ACTION-GOTO table of LR(0) of the following grammar. Then apply the LR(0) algorithm to verify input string **abb**

$S \rightarrow AA$

$A \rightarrow aA \mid b$

## Solution:

Step-1: Augment The Grammar and add LR(0) items:

$S' \rightarrow .S$

1:  $S \rightarrow .AA$

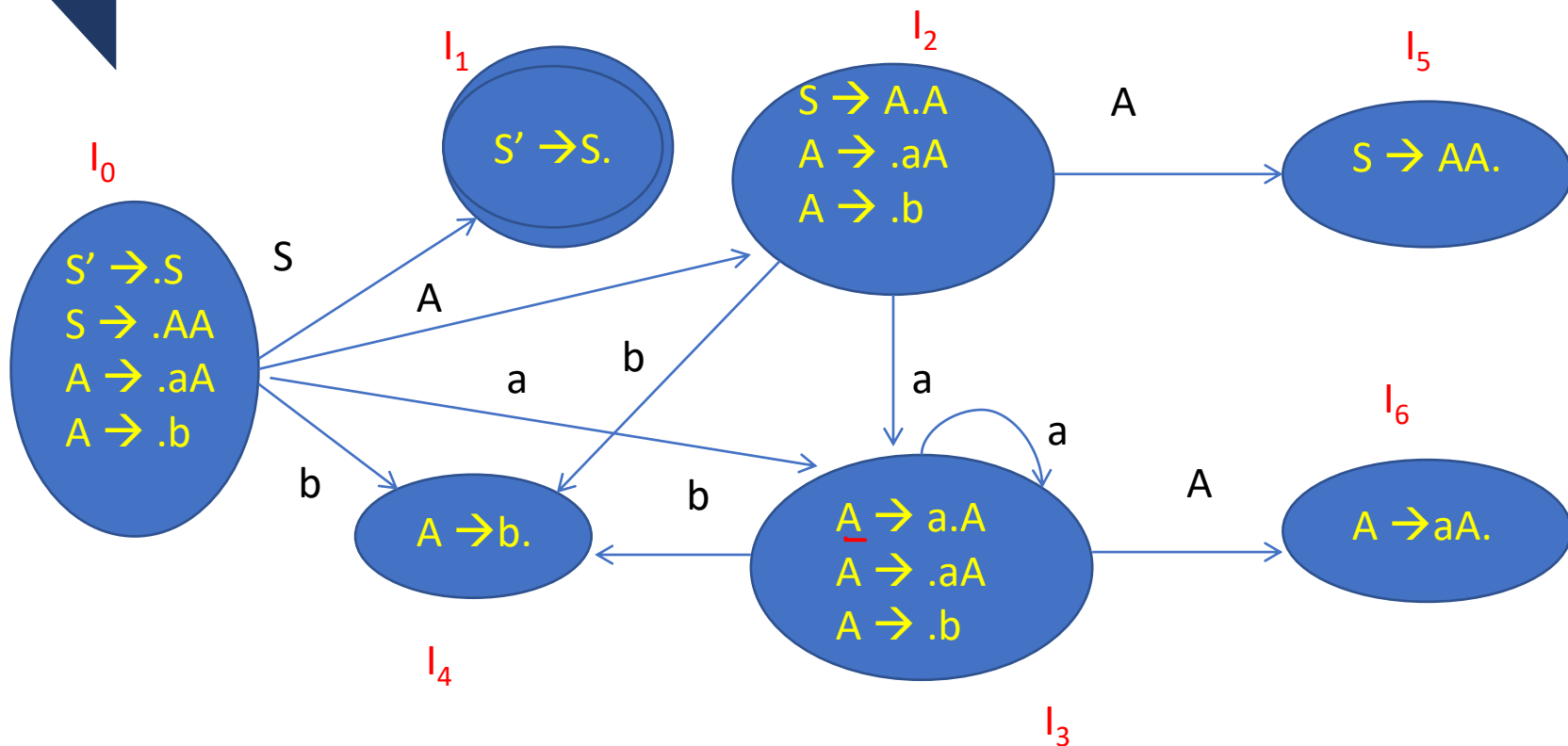
2:  $A \rightarrow .aA$

3:  $A \rightarrow .b$



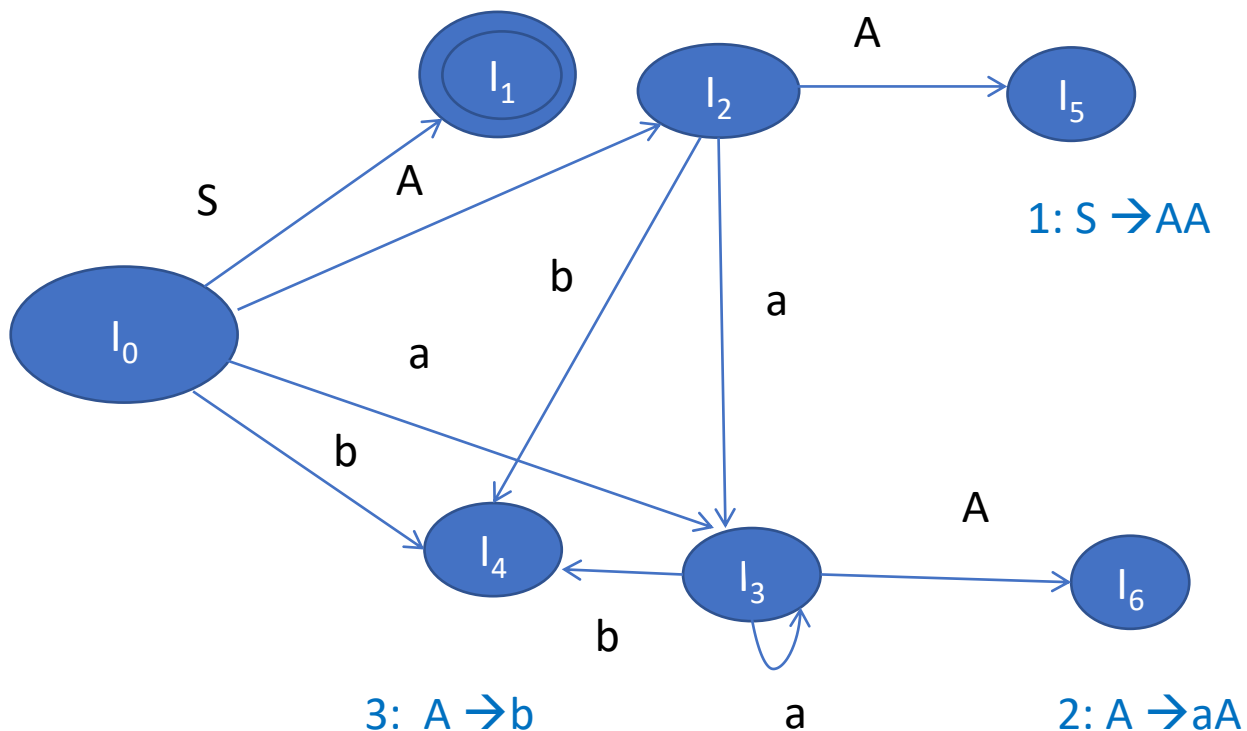
# LR(0) Parsing – question 1.

**Step -2** : Draw DFA using LR(0) items .



# LR(0) Parsing – question 1.

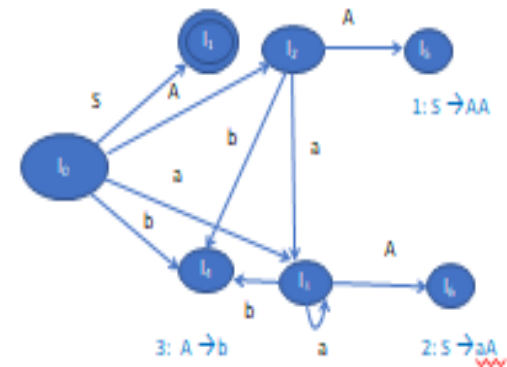
The DFA:



# LR(0) Parsing – question 1.

**Step -3** : Construct the LR(0) parsing table .

state s	ACTIONS			GO TO	
	a	b	\$	A	S
$I_0$	S3	S4		2	1
$I_1$			ACCEPT		
$I_2$	S3	S4		5	
$I_3$	S3	S4		6	
$I_4$	r3	r3	r3		
$I_5$	r1	r1	r1		
$I_6$	r2	r2	r2		



# LR(0) Parsing – question 1.

CONTD...

State	ACTIONS			GO TO	
	a	b	\$	A	S
$I_0$	S3	S4		2	1
$I_1$			ACCEPT		
$I_2$	S3	S4		5	
$I_3$	S3	S4		6	
$I_4$	r3	r3	r3		
$I_5$	r1	r1	r1		
$I_6$	r2	r2	r2		

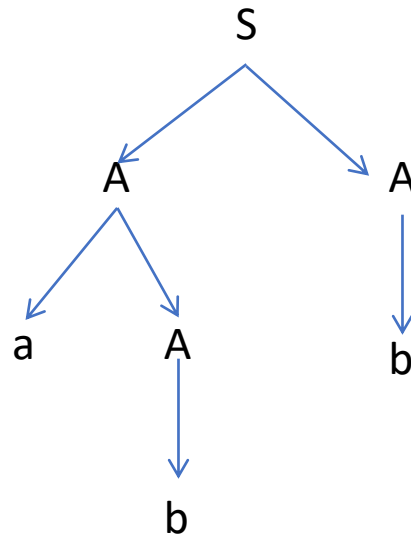
**Step -4** : Parse the input string abb .

STEP #	PARSING STACK	INPUT STRING	ACTION
1	\$0	abb\$	Shift a3
2	\$0a3	bb\$	Shift b4
3	\$0a3b4	b\$	Reduce r3 ( $A \rightarrow b$ )
4	\$0a3A <sup>6</sup>	b\$	Reduce r2 ( $A \rightarrow aA$ )
5	\$0A <sup>2</sup>	b\$	Shift b4
6	\$0A2b4	\$	Reduce r3 ( $A \rightarrow b$ )
7	\$0A2A <sup>5</sup>	\$	Reduce r1 ( $S \rightarrow AA$ )
8	\$0S <sup>1</sup>	\$	Accept



# LR (0)Parsing – question 1.

## The Parsing Tree:



# Bottom UP Parsing – LR(0)

**THANK YOU**