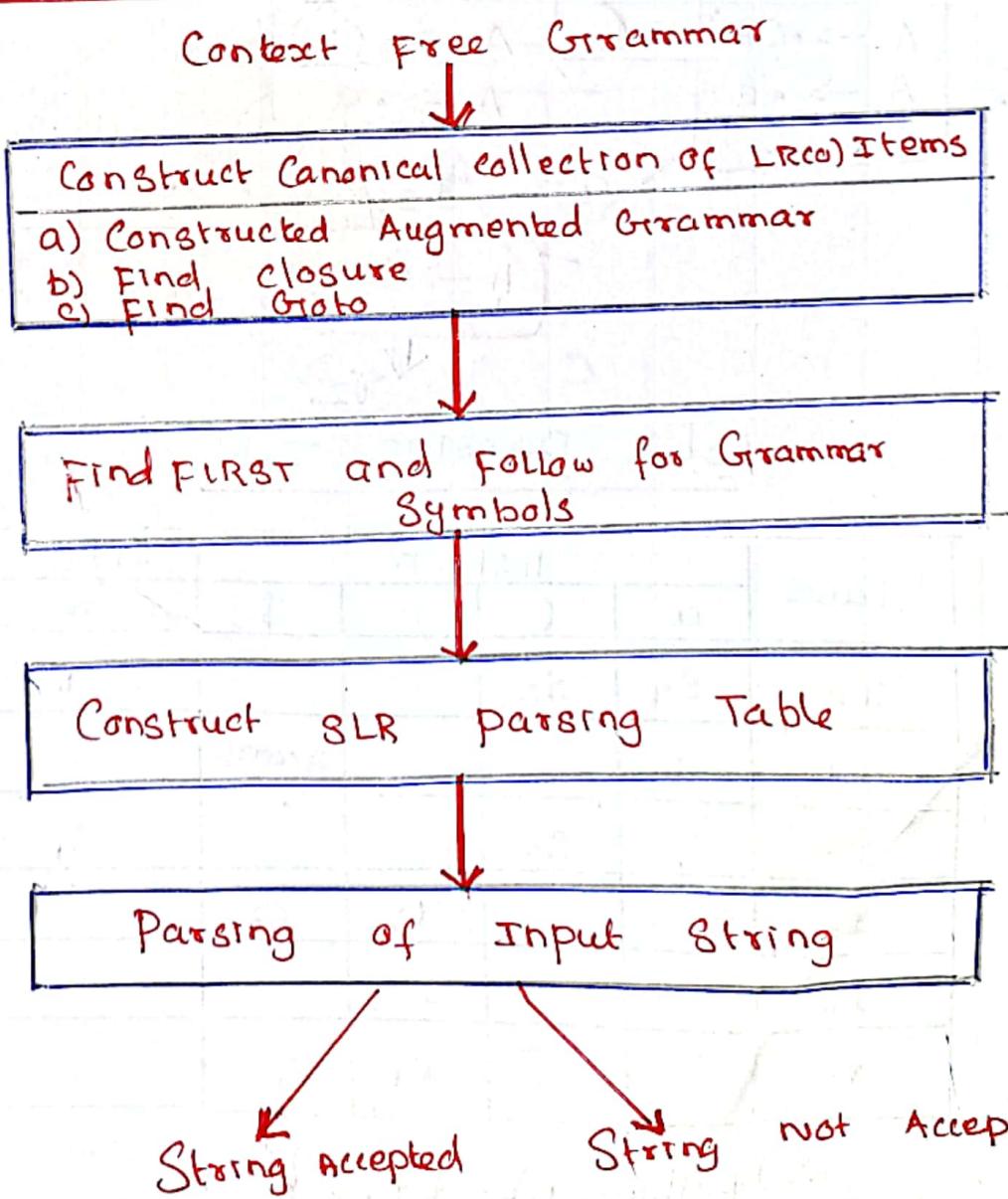


SLR(0) is called as Simple LR

- 1) Smallest class of grammar.
- 2) Few no. of States
3. Simple and fast to reconstruct.

→ In SLR we place the reduce move only in the follow of left hand side not to entire row.

Working of SLR Parsing:

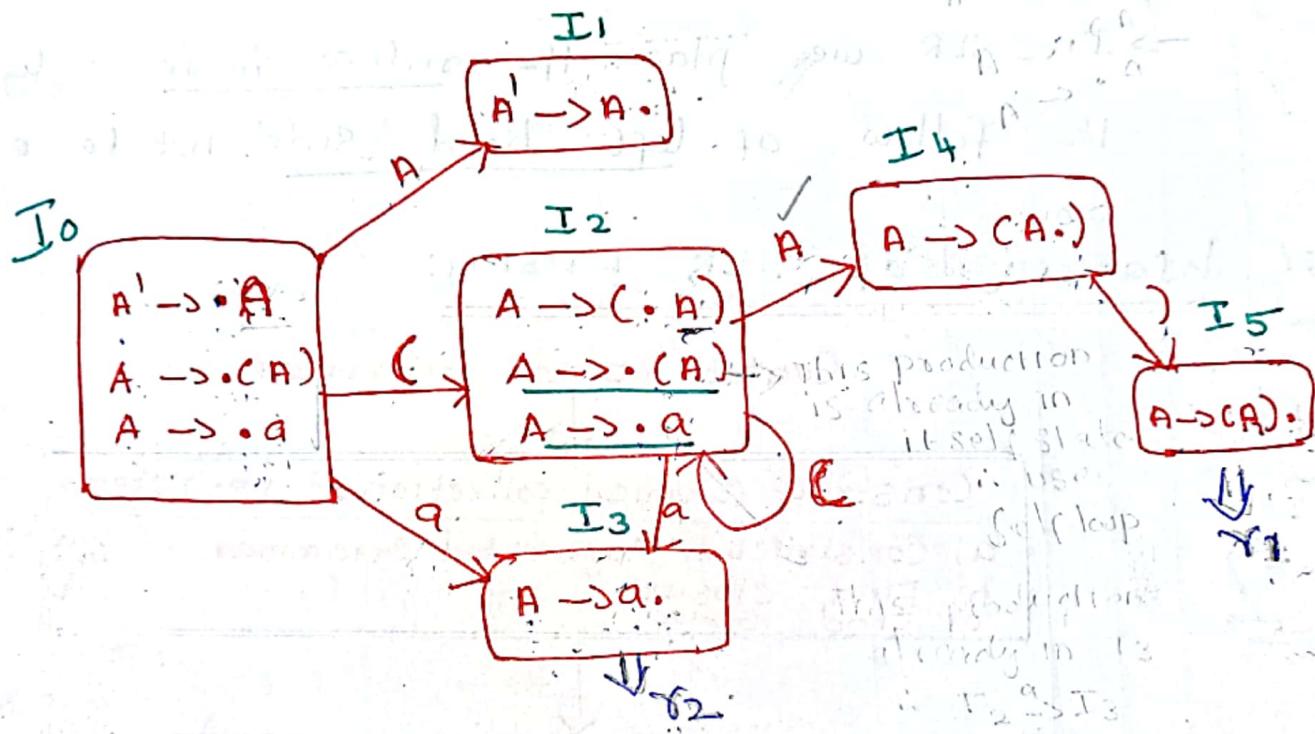


Consider the following grammar:

$$A \rightarrow CA \mid a$$

Construct the SLR parsing table and also parse the input "(a)β".

Solution: Add new production $A' \rightarrow A$



SLR Parsing Table

States	Action					Goto
	a	()	\$	A	
I0	s_3	s_2				I1
I1					Accept	
I2	s_3	s_2				I4
I3				T_2	T_2	
I4				s_5		
I5				T_1	T_1	

$$A \rightarrow CA \rightarrow a$$

X Follow(A) = { \$,) } (1)

- Write the production
- ① $A \rightarrow C(A) \rightarrow T_1$
 - ② $A \rightarrow a \rightarrow T_2$

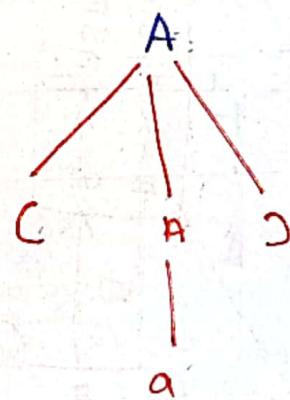
Input String parsing - (a)\$

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Step	Parsing State	Stack	Input	Action
1	\$	\$	<u>(a)</u> \$	Shift 2
2	\$ o	\$ o	<u>a)</u> \$	Shift 3
3	\$ o (2	\$ o (2	<u>a</u> \$	reduce τ_2 $A \rightarrow a$
4	\$ o (2 A	\$ o (2 A	<u>)</u> \$	Shift 5
5	\$ o (2 A) 5	\$ o (2 A) 5	\$	Reduce R ₁ $A \rightarrow C A$
6	\$ o A	\$ o A	\$	Accepted

Bottom up Approach

Parse Tree. \rightarrow Apply Bottom up Approach

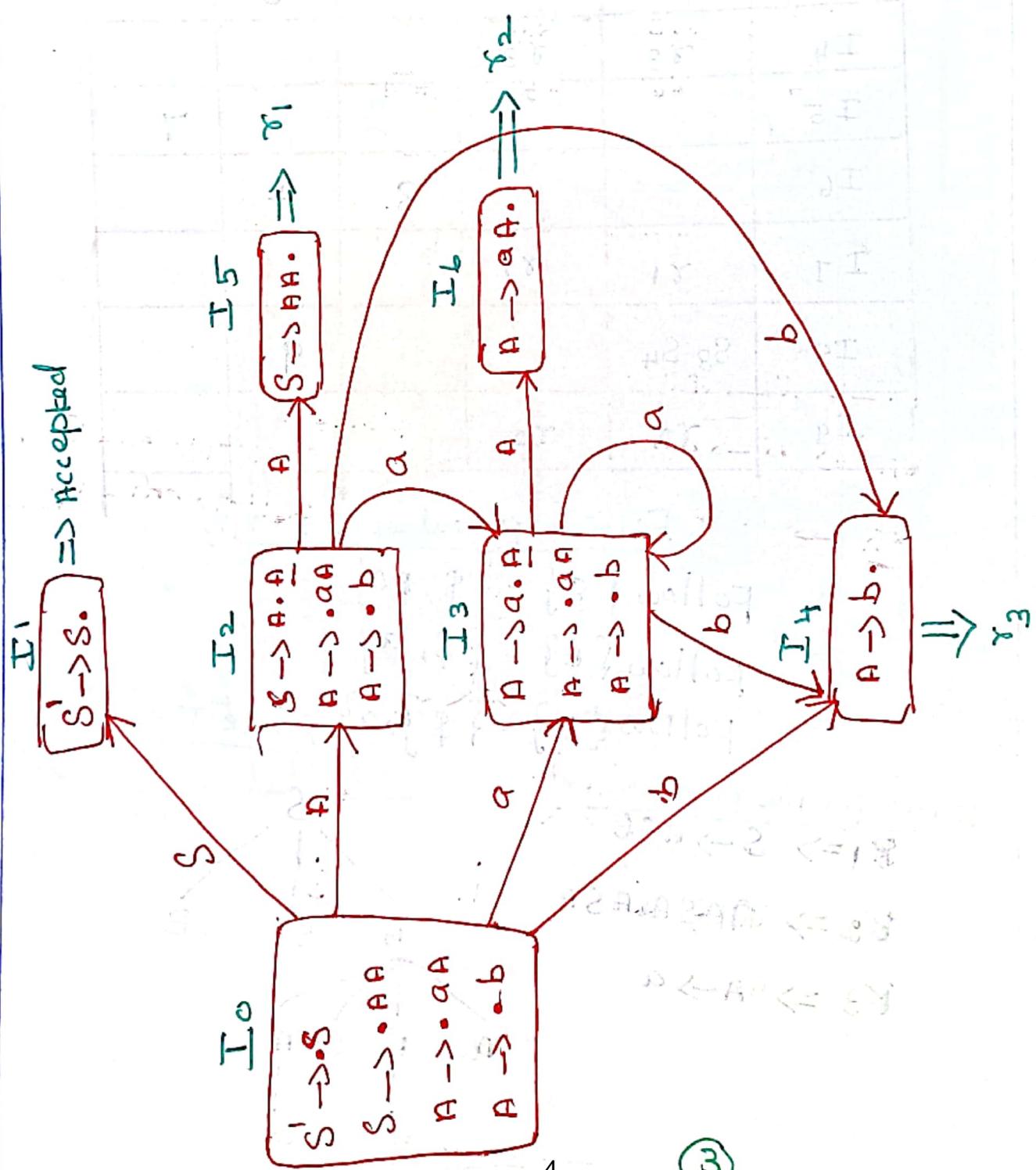


②

2) Construct the SLR 1 parsing table for the given context free Grammar.

$$S \rightarrow AA$$

$$A \rightarrow aA \mid b$$



SLR Parsing Table

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States	ACTION			GOTO	
	a	b	\$	S	A
I ₀	S ₃	S ₄		1	2
I ₁			Accepted		
I ₂	S ₃	S ₄			5
I ₃	S ₃	S ₄			6
I ₄	r ₃	r ₃	r ₃		
I ₅			r ₁		
I ₆	r ₂	r ₂	r ₂		

Rule for Reduce:

$$r_1 \Rightarrow S \rightarrow AA$$

$$r_2 \Rightarrow A \rightarrow aA$$

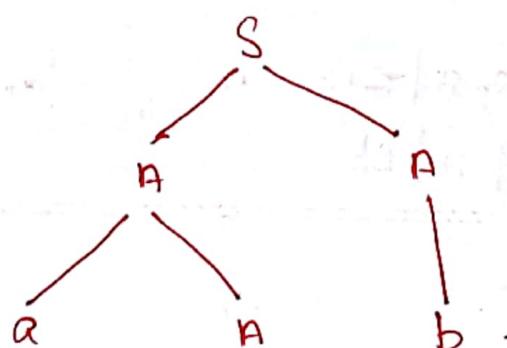
$$r_3 \Rightarrow A \rightarrow b$$

Follow up value of S, A

$$\text{Follow}(S) = \{\$\}$$

$$\text{Follow}(A) = \{\$, a, b\}$$

parse Tree



(4)

Consider the following grammar:

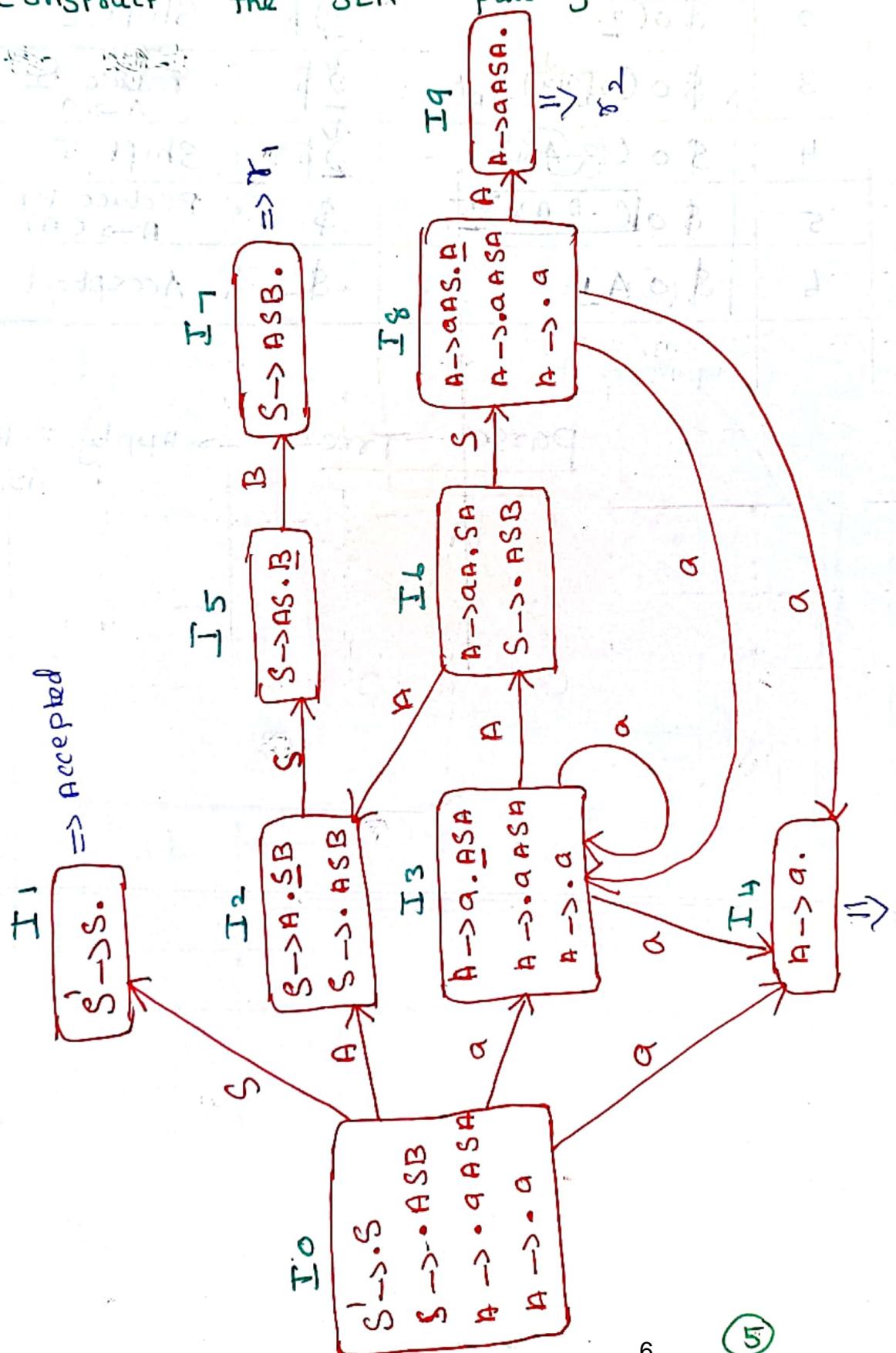
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3)

$$S \rightarrow ASB$$

$$A \rightarrow a ASA | a$$

Construct the SLR parsing table.



SLR Parsing Table

States	ACTION		GOTO		
	a	\$.	S	A	B
I ₀	$S_3 S_4$		1	2	
I ₁		Accept			
I ₂			5		
I ₃	$S_3 S_4$			6	
I ₄	γ_3	γ_3			
I ₅					7
I ₆			8	2	
I ₇	γ_1	γ_1			
I ₈	$S_3 S_4$			9	
I ₉	γ_2	γ_2			

Follow up values of S, A, B

$$\text{Follow } \{S\} = \{\$, \gamma_1\}$$

$$\text{Follow } \{A\} = \{\$, \gamma_2\}$$

$$\text{Follow } \{B\} = \{\$\}, \gamma_3 \quad \text{parse Tree}$$

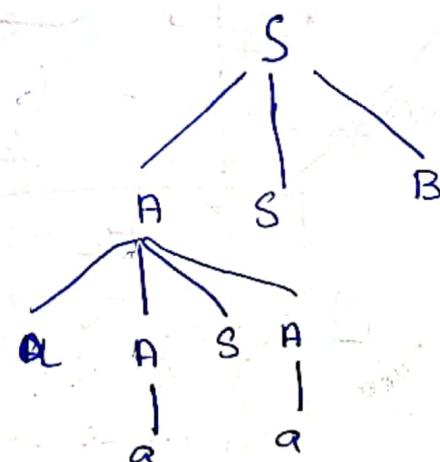
Rules for the production

$$\gamma_1 \Rightarrow S \rightarrow ASB$$

$$\gamma_2 \Rightarrow A \rightarrow aASA$$

$$\gamma_3 \Rightarrow ^a A \rightarrow a$$

(b)



4) Consider the following grammar

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

$$T \rightarrow TF \mid F$$

$$F \rightarrow F * \mid a \mid b$$

Construct the SLR parsing table and also parse the input "a * b + a".

Solution:

Step 1: Construct the augmented Grammar

$$E' \rightarrow E$$

$$E \rightarrow E + T$$

$$E \rightarrow T$$

$$T \rightarrow TF$$

$$T \rightarrow F$$

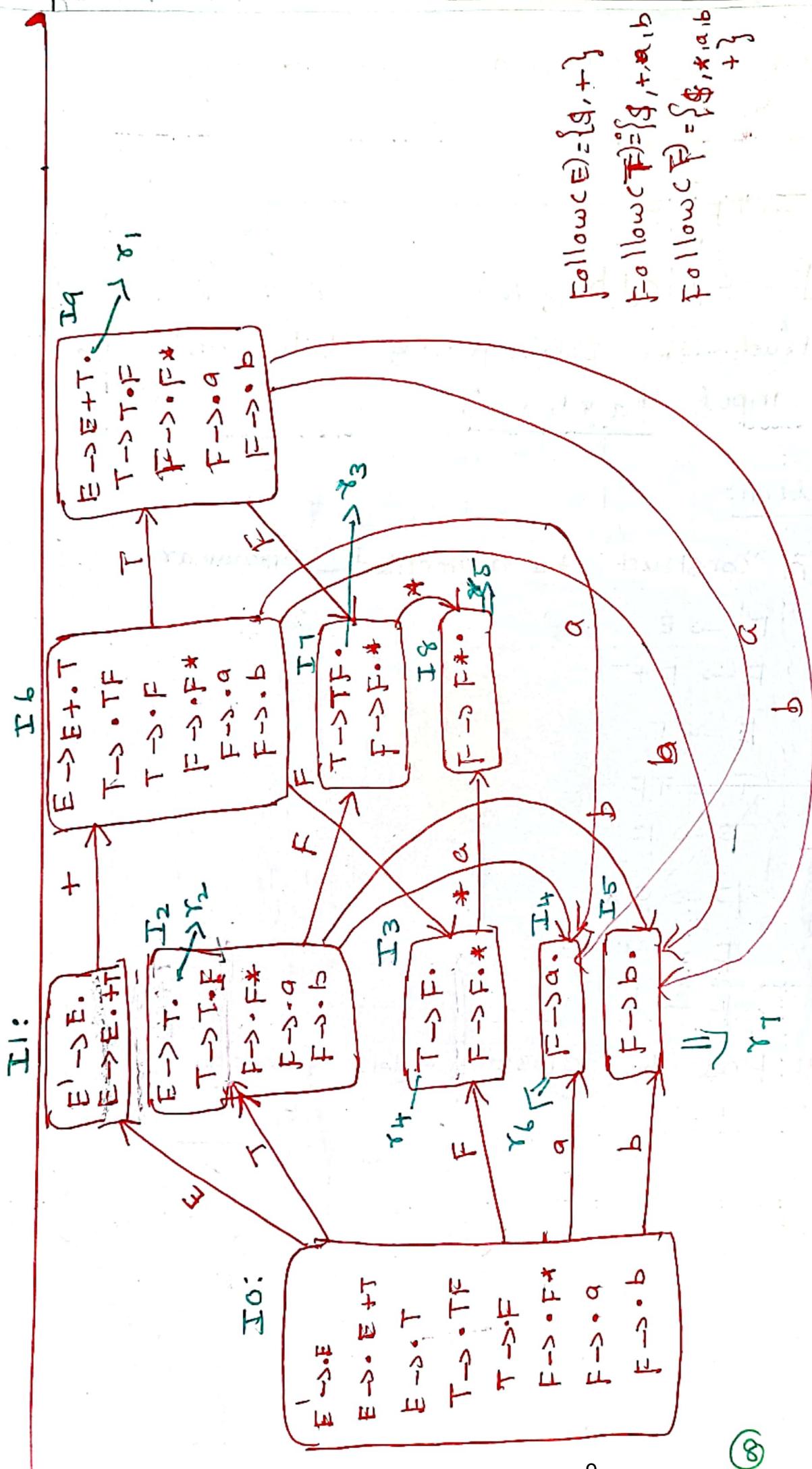
$$F \rightarrow F *$$

$$F \rightarrow a$$

$$F \rightarrow b$$

Step 2: Find the closure & goto functions

⑦



Consider the following grammar

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

$$T \rightarrow TF \mid F$$

$$F \rightarrow F^* \mid a \mid b$$

Construct the SLR parsing table and also parse the input "a * b + a".

$$1) E \rightarrow E + T$$

$$2) E \rightarrow T$$

$$3) T \rightarrow TF$$

$$4) T \rightarrow F$$

$$5) F \rightarrow F^*$$

$$6) F \rightarrow a$$

$$7) F \rightarrow b$$

ACTION		GOTO									
		E	F	a	b	*	\$	T	E	F	T
Shrinks	+:										
	*										
	TO										
	TI										
	TI1										
	TI2										
	TI3										
	TI4										
	TI5										
	TI6										
Accept											
		S4	S5	S4	S5	S4	S5	S4	S5	S4	S5

Parsing String $a * b + a$

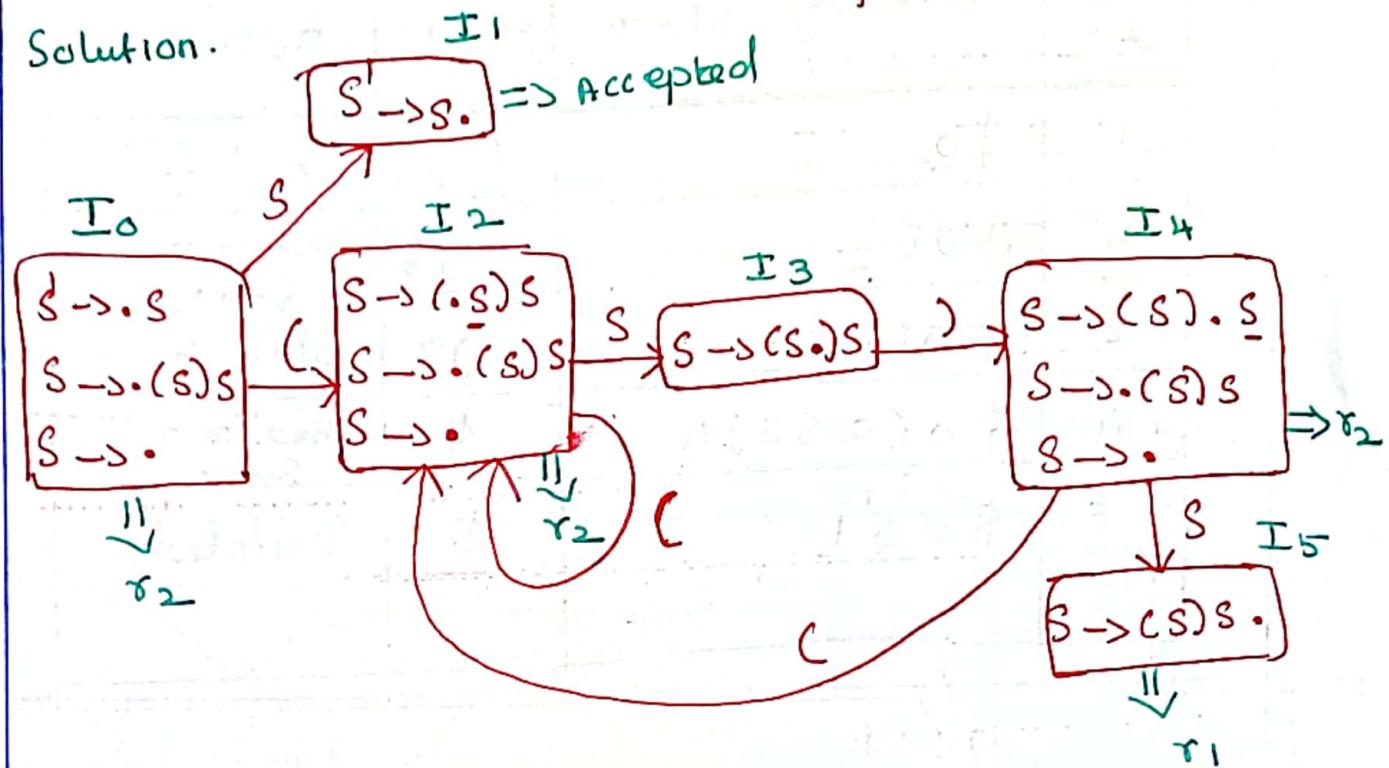
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Step	Stack	Input String	Action
1	<u>\$</u>	<u>a</u> * b + a \$	Shift 4
2	<u>\$ 0</u> <u>A</u> <u>4</u>	<u>*</u> b + a \$	Reduced by b $F \rightarrow a$
3	<u>\$ 0 F</u> <u>3</u>	* b + a \$	Shift 8
4	<u>\$ 0 E</u> <u>3</u> * <u>8</u>	b + a \$	reduce 5 $F \rightarrow F*$
5	<u>\$ 0 F</u> <u>8</u>	b + a \$	reduce 4 $T \rightarrow F$
6	<u>\$ 0 T</u> <u>2</u>	b + a \$	Shift 5
7	<u>\$ 0 T</u> <u>2</u> b <u>5</u>	+ a \$	SR reduce 7 $E \rightarrow F \rightarrow b$
8	<u>\$ 0 T</u> <u>2</u> F <u>7</u>	+ a \$	Reduce 3 $T \rightarrow STF$
9	<u>\$ 0 T</u> <u>2</u>	+ a \$	Reduce 2 $E \rightarrow T$
10	<u>\$ 0 E</u> <u>1</u>	+ a \$	Shift 6
11	<u>\$ 0 E</u> <u>1</u> + <u>b</u>	a \$	Shift 4
12	<u>\$ 0 E</u> <u>1</u> + <u>b</u> <u>a</u> <u>4</u>	\$	Reduce 6 $F \rightarrow a$
13	<u>\$ 0 E</u> <u>1</u> + <u>b</u> F <u>3</u>	\$	Reduce 4 $T \rightarrow F$
14	<u>\$ 0 E</u> <u>1</u> + <u>b</u> <u>T</u> <u>9</u>	\$	Reduce 1 $E \rightarrow E + T$
15	<u>\$ 0 E</u> <u>1</u>	\$	Accepted

5)

Construct the SLR parsing Table for the given Grammar and also parse the input string C)\$.
 $S \rightarrow (S)S \mid \epsilon$

Solution.

SLR Parsing Table.

States	ACTION			GOTO
ϵ	()	\$	S
I_0	s_2	r_2	r_2	1
I_1			Accepted	
I_2	s_2	r_2	r_2	3
I_3		s_4		
I_4	s_2	r_2	r_2	5
I_5		r_1	r_1	

Rules
 $S \rightarrow (S)S \Rightarrow r_1$

$S \rightarrow \bullet \Rightarrow r_2$

Follow of S

$\text{Follow}(S) = \{\$,)\}$

The Given Input ()\$

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Steps	Parsing Stack	Inputs	Action
1	\$ 0	() \$	Shift 2
2	\$ 0 (2) \$	Reduce 2 $S \rightarrow \cdot$
3	\$ 0 (2 S 3) \$	Shift 4
4	\$ 0 (2 S 3) 4	\$	Reduce 2 $S \rightarrow \cdot$
5	\$ 0 S 1	\$	Accepted

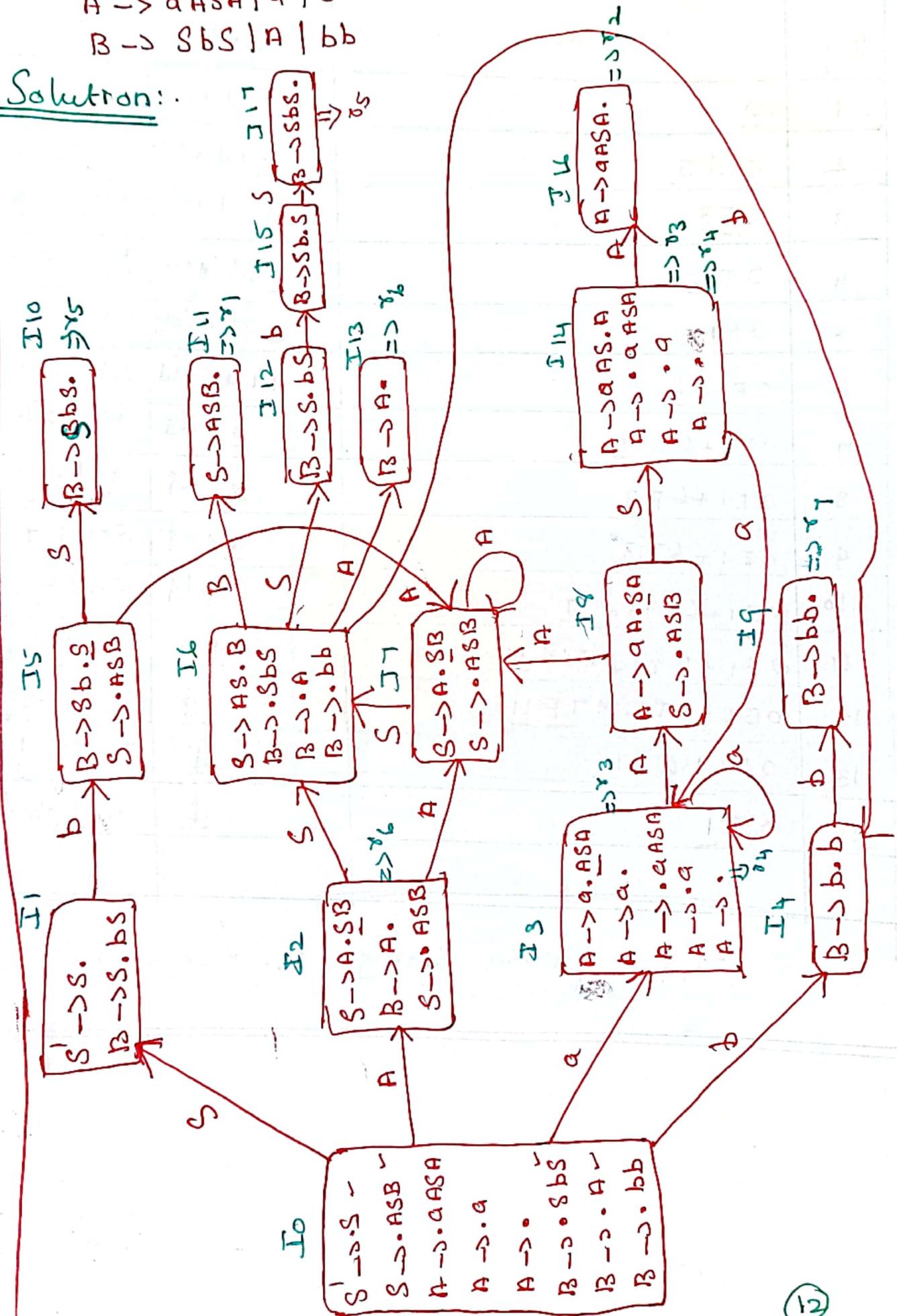
Construct the SLR Parsing Table for the given Grammar.

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b)

$$\begin{aligned} S &\rightarrow ASB \\ A &\rightarrow a \text{ ASA} | a | \epsilon \\ B &\rightarrow SBS | A | bb \end{aligned}$$

Solution:



SLR Parsing Table

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Status	ACTION			GOTO		
	a	b	\$	S	A	B
I ₀	S ₃	S ₄		1	2	
I ₁		S ₅	Accepted			
I ₂	r ₆	r ₆	r ₆	b	7	
I ₃	S ₃	r ₃	r ₃		8	
I ₄		S ₉				
I ₅				10	7	
I ₆		S ₄		12	13	11
I ₇				6	7	
I ₈				14	7	
I ₉	r ₇	r ₇	r ₇			
I ₁₀	r ₅	r ₅	r ₅			
I ₁₁	r ₁	r ₁	r ₁			
I ₁₂		S ₁₅				
I ₁₃	r ₆	r ₆	r ₆			
I ₁₄	S ₃	r ₃	r ₃		16	
I ₁₅				17		
I ₁₆	r ₂	r ₂	r ₂			
I ₁₇	r ₅	r ₅	r ₅			

Rules:

- (1) S → ASB
- (2) A → aASA
- (3) A → a
- (4) A → *

- (5) B → SBS
- (6) B → A
- (7) B → bb

(13)

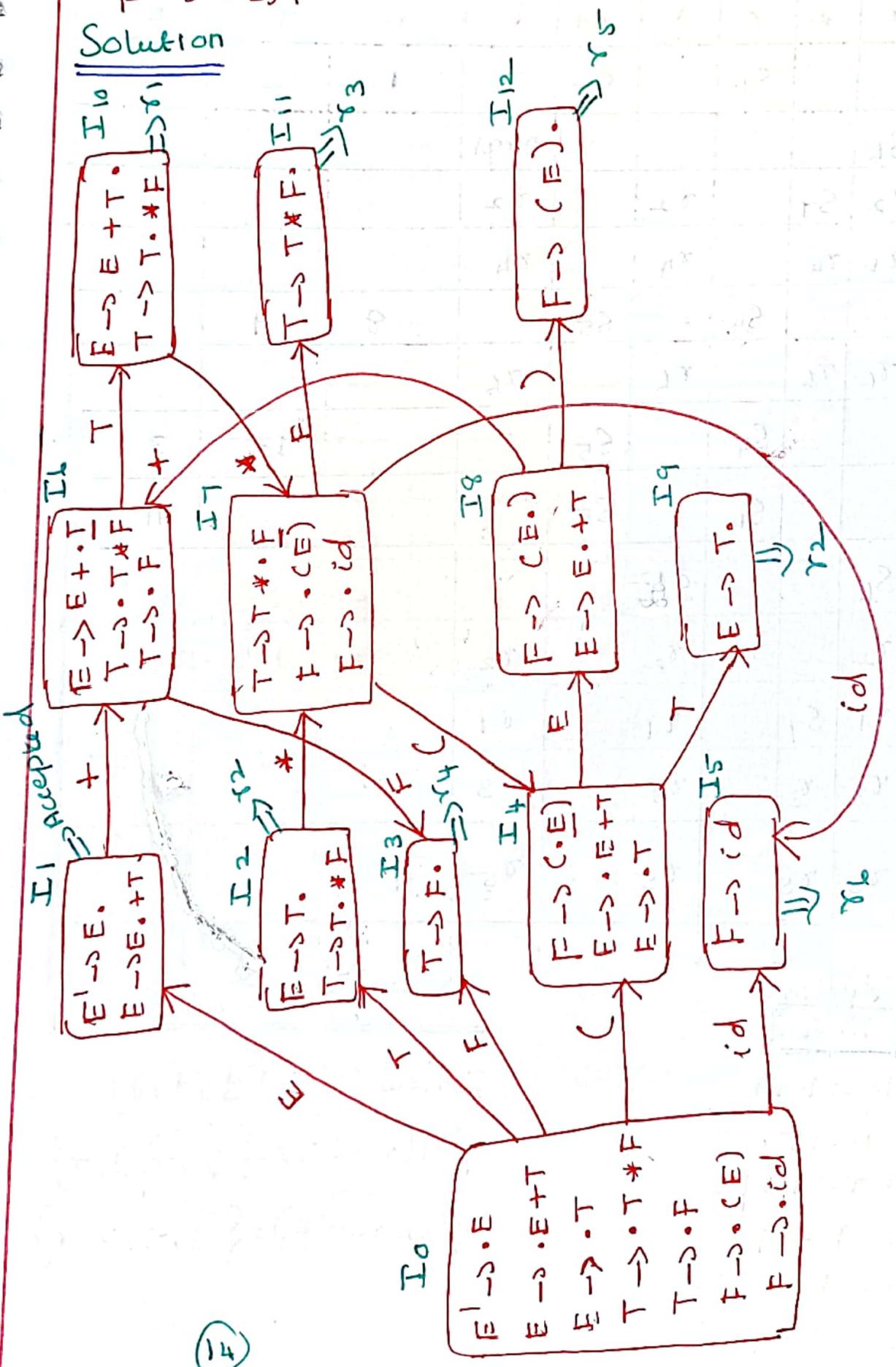
$$\begin{aligned}
 \text{Follow}(S) &= \{\$, b, a\} \\
 \text{Follow}(A) &= \{\$, b, a\} \\
 \text{Follow}(B) &= \{\$, b, a\}
 \end{aligned}$$

15

Construct the SLR parsing Table for the given Grammar
 $E \rightarrow E + T \mid T$ and parse the input string $id * id + id$

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Solution



SLR parsing Table

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States	ACTION						GOTO		
	+	*	()	id	\$	E	T	F
I ₀			S ₄		S ₅		1	2	3
I ₁	S ₆					Accept			
I ₂	r ₂	S ₇		r ₂		r ₂			
I ₃	r ₄	r ₄		r ₄		r ₄			
I ₄			S ₄		S ₅		8	9	
I ₅	r ₆	r ₆		r ₆		r ₆			
I ₆			S ₄		S ₅			10	3
I ₇			S ₄		S ₅				11
I ₈	S ₆			S ₁₂					
I ₉	r ₂			r ₂		r ₂			
I ₁₀	r ₁	S ₇		r ₁		r ₁			
I ₁₁	r ₃	r ₃		r ₃		r ₃			
I ₁₂	r ₅	r ₅		r ₅		r ₅			

Production Rule.

- r₁ → E → E + T
- r₂ → E → T
- r₃ → T → T * F
- r₄ → T → F
- r₅ → F → (E)
- r₆ → F → id

Follow of E, T, F

$$\text{Follow}(E) = \{ \$, +,) \}$$

$$\text{Follow}(T) = \{ \$, +,), * \}$$

$$\text{Follow}(F) = \{ \$, +,), * \}$$

(15)

SLR Input String cd+id * id

Step	Parsing Stack	Input	ACTION
1	<u>O</u>	<u>cd+id * id\$</u>	Shift 5
2	O id <u>5</u>	<u>+ id * id\$</u>	reduce 6 F → id
3	O F <u>3</u>	<u>+ id * id\$</u>	reduce 4 T → F
4	O T <u>2</u>	<u>+ id * id\$</u>	Reduce 2 E → T
5	O E <u>1</u>	<u>+ id * id\$</u>	Shift 6
6	O E 1 + <u>b</u>	<u>id * id\$</u>	Shift 5
7	O E 1 + b id <u>5</u>	<u>* id\$</u>	reduce 6 F → id
8	O E 1 + b F <u>3</u>	<u>* id\$</u>	reduce 4 T → F
9	O E 1 + b T <u>10</u>	<u>* id\$</u>	Shift 7
10	O E 1 + b T 10 * <u>I</u>	<u>id\$</u>	Shift 5
11	O E 1 + b T 10 * id <u>5</u>	\$	reduce 6 F → id
12	O E 1 + b T 10 * T F <u>11</u>	\$	reduce 3 T → T * E
13	O E 1 + b T <u>10</u>	\$	reduce 1 E → E + T
14	O E <u>1</u>	\$	Accepted.

∴ The Given String is accepted.

Construct the SLR parsing Table for the given context free grammar

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

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

$$F \rightarrow id$$

Construct the SLR parsing Table for the given context free Grammar. Also Parsing the input string $id * id + id$ using the SLR parser table for the grammar.

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

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

$$F \rightarrow (E) \mid id$$

Construct SLR Parsing Table for the grammar

$$S \rightarrow CC$$

$$C \rightarrow Cc \mid d$$

Construct SLR parsing Table for the grammar

$$S \rightarrow ASB$$

$$A \rightarrow a A S A \mid a \epsilon$$

$$B \rightarrow S b S \mid A \mid bb$$