

Task D5:

Construct CLR(1) and LALR(1) Parsing table and parse the ababc string following CLR(1) and LALR(1) parsing mechanism (if there are conflicts point them out).

$$S \rightarrow \overset{1}{a} \overset{2}{b} \overset{3}{A} \overset{4}{B} C / \overset{5}{D} \overset{6}{E}$$

$$A \rightarrow \overset{7}{a} / \overset{8}{\epsilon}$$

$$B \rightarrow \overset{9}{b} \overset{10}{A} / \overset{11}{\epsilon}$$

$$C \rightarrow \overset{12}{c}$$

$$D \rightarrow \overset{13}{d} / \overset{14}{(E)}$$

$$E \rightarrow \overset{15}{e} / \overset{16}{\epsilon}$$

⇒ Augmented Grammar:

$$S' \rightarrow \cdot S$$

$$S \rightarrow \cdot a b A B C / \cdot D E$$

$$A \rightarrow \cdot a / \cdot \epsilon$$

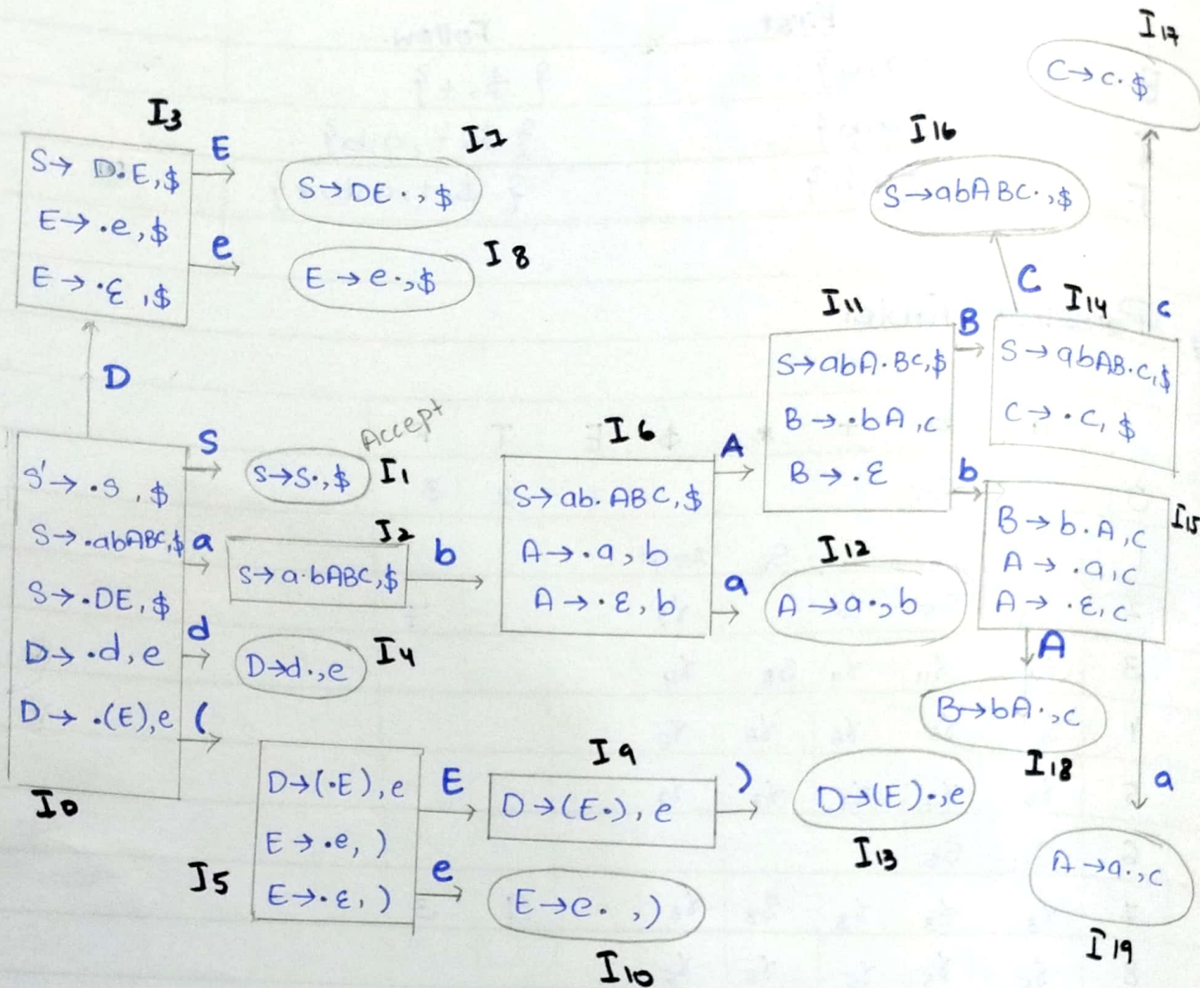
$$B \rightarrow \cdot b A / \cdot \epsilon$$

$$C \rightarrow \cdot c$$

$$D \rightarrow \cdot d / \cdot (E)$$

$$E \rightarrow \cdot e / \cdot \epsilon$$

Canonical collection of CLR(1):



⇒ CLR(1) Parsing Table:

	a	b	c	d	e	()	\$	S	A	B	C	D	E
0	S ₂			S ₄		S ₅			1				3	
1								Accept						
2		S ₆												
3					S ₈			γ ₁₁						7
4					γ ₈									
5					S ₁₀		γ ₁₁							9
6	S ₁₂	γ ₄								11				
7								γ ₂						
8								γ ₁₀						
9							S ₁₃							
10							γ ₁₀							
11		S ₁₅	γ ₆								14			
12		γ ₃												
13					γ ₉									
14			S ₁₇								16			
15	S ₁₉		γ ₄							18				
16							γ ₁							
17							γ ₇							
18			γ ₅											
19			γ ₃											

⇒ Parssing String 'ababc':

Stack	Input	Action
\$0	ababc \$	Shift a
\$0a2	babc \$	Shift b
\$0a2b6	abc \$	Shift a
\$0a2b6a12	bc \$	Reduce γ_3
\$0a2b6A11	bc \$	Shift b
\$0a2b6A11b15E	c \$	Reduce γ_3
\$0a2b6A11b15A18	c \$	Reduce γ_5
\$0a2b6A11B14	c \$	Shift c
\$0a2b6A11B14C17	\$	Reduce $\leftarrow \delta$
\$0a2b6A11B14C16	\$	Reduce $\leftarrow \epsilon$
\$0S1		Accept

⇒ LALR(1) Parsing Table:

	a	b	c	d	e	()	\$	S	A	B	C	D	E
0	S ₂			S ₄	S ₅				1				3	
1								Accept						7
2		S ₆												7
3					S ₈			⋈ ₁₁						
4					⋈ ₈									9
5					S ₁₀		⋈ ₁₁							
6	S ₁₂	⋈ ₄								11				
7								⋈ ₂						
8 ₁₀							⋈ ₁₀	⋈ ₁₀						
9							S ₁₃							
<u>8₁₀</u>							⋈ ₁₀	⋈ ₁₀						
11		S ₁₅	⋈ ₆								14			
12 ₁₉		⋈ ₃	⋈ ₃											
13					⋈ ₉									
14			S ₁₇									16		
15	S ₁₉		⋈ ₄							18				
16								⋈ ₁						
17								⋈ ₇						
18			⋈ ₅											
<u>12₁₉</u>		⋈ ₃	⋈ ₃											

⇒ As we can see that the state 8,10 and 12,19 have same productions with different lookaheads, so we combined them up for LALR(1).

⇒ LALR(1) Parsing string 'ababc':

Stack	Input	Action.
\$0	ababc\$	Shift a
\$0a2	babc\$	Shift b
\$0a2b6	abc\$	Shift a
\$0a2b6a12	bc\$	Reduce γ_3
\$0a2b6A11	bc\$	Shift b
\$0a2b6A11b15E	c\$	Reduce
\$0a2b6A11b15A18	c\$	Reduce
\$0a2b6A11B14	c\$	Shift c
\$0a2b6A11B14C17	\$	Reduce
\$0a2b6A11B14C16	\$	Reduce
\$0S1		Accept.