

CS & IT ENGINEERING

Compiler Design

Lexical Analysis & Syntax Analysis

Lecture No. **8**



By- DEVA Sir



01

LR(0) DFA

02

LR(0) CFG?

03

SLR(1) CFG?

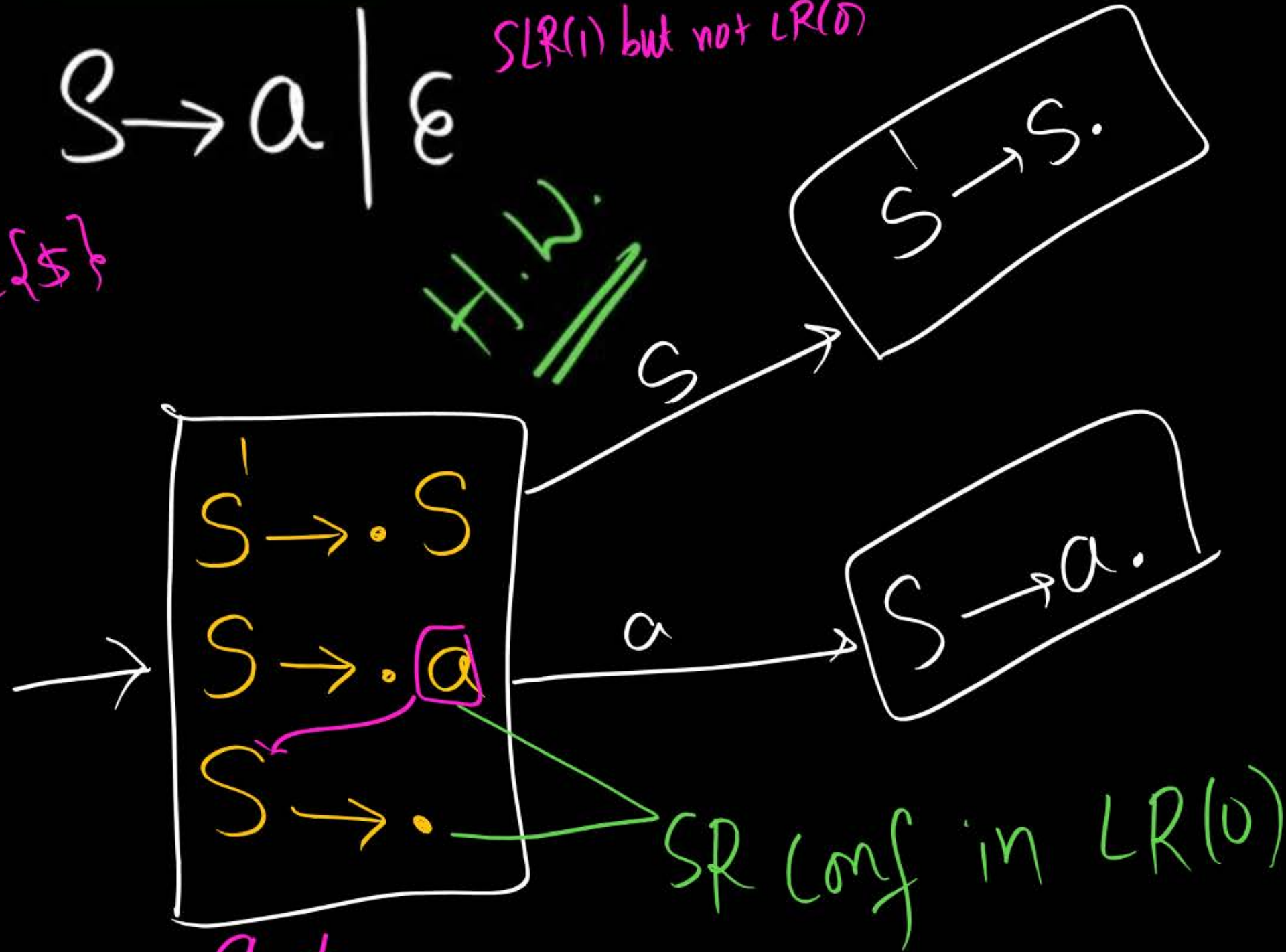
04

05



④ $S \rightarrow a \mid \epsilon$ SLR(1) but not LR(0)

$F_0(S) = \{\$ \}$



$a \notin F_0(S) \Rightarrow$ No SR conf in SLR(1)

3 states in LR(0)

Given CFG
is not LR(0)
but it is SLR(1)

Note : I) $S' \rightarrow S$. never participates in conflict



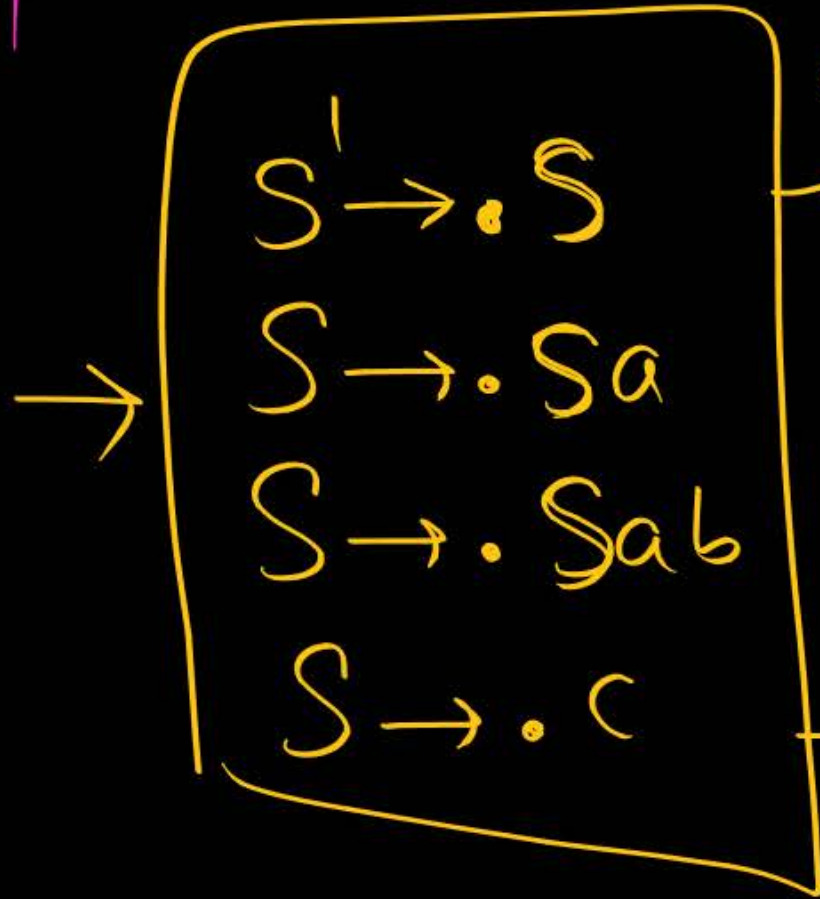
Acceptance Item

II) State item also not participated in conflict-1

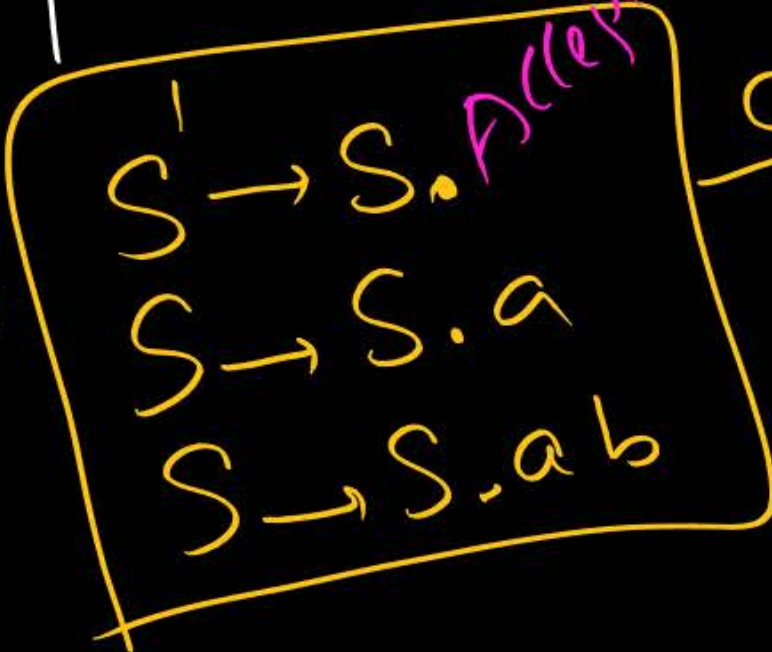
⑤

$S \rightarrow Sa \mid Sab \mid c$

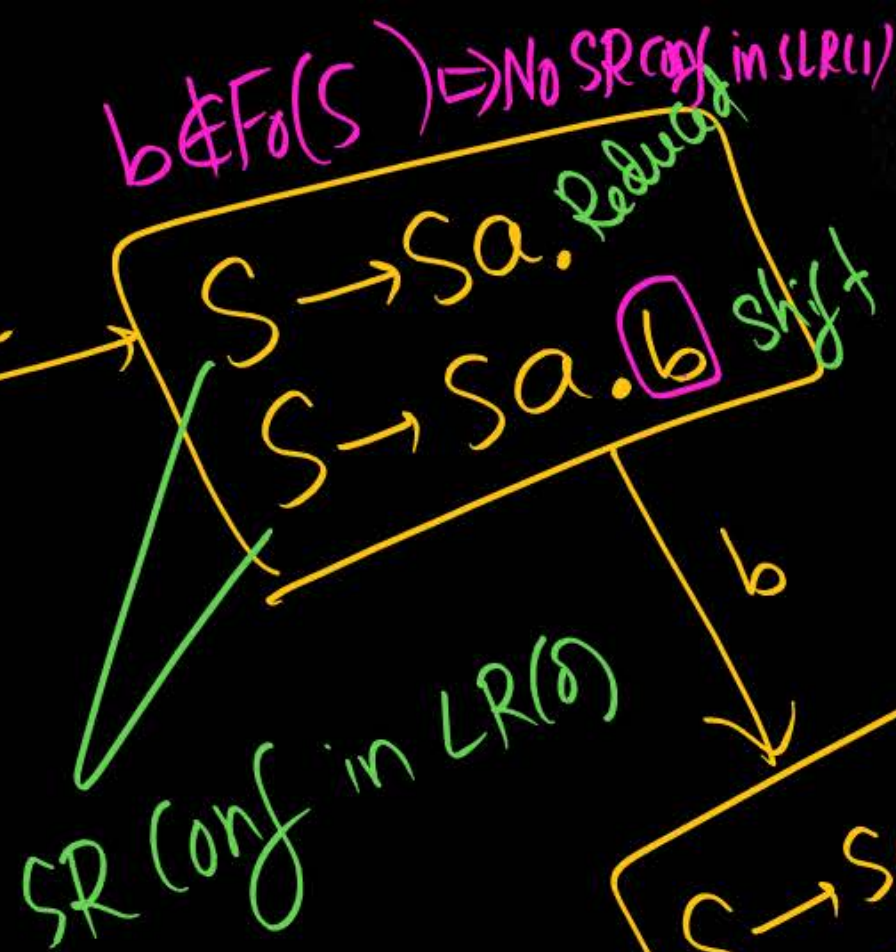
$F_0(S) = \{a, b\}$



\xrightarrow{S}



\xrightarrow{a}



\xrightarrow{c}



It is SLR(1) but not LR(0)

Given CFG is not LR(0)

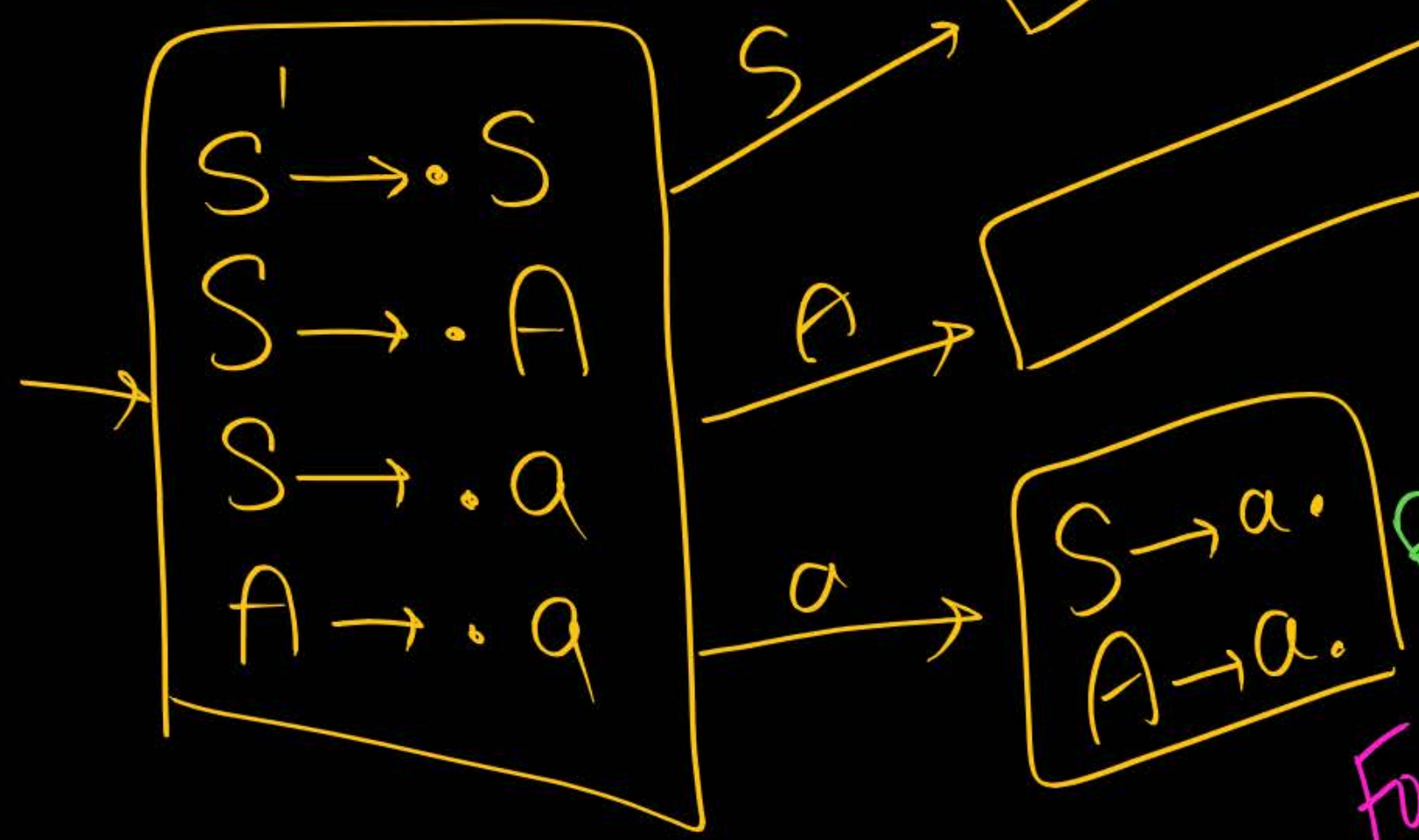
= 5 states

= 1 conflict state



6) $S \rightarrow A|a$
 $A \rightarrow a$

\Rightarrow Not LR(0) CFG
 \Rightarrow Not SLR(1) CFG



RR conf in LR(0)

$F_0(S) \cap F_0(A) \neq \emptyset$
 \Downarrow
 RR conf in SLR(1)

$F_0(S) = \{ \$ \}$
 $F_0(A) = \{ \$ \}$

$$R_1 = \begin{matrix} & \cdot & \varepsilon \end{matrix}$$

$$R_2 = \begin{matrix} \varepsilon & \cdot \end{matrix}$$

$$R_3 = \begin{matrix} & & \cdot \end{matrix}$$

$$\left. \begin{matrix} R_1 = \begin{matrix} & \cdot & \varepsilon \end{matrix} \\ R_2 = \begin{matrix} \varepsilon & \cdot \end{matrix} \\ R_3 = \begin{matrix} & & \cdot \end{matrix} \end{matrix} \right\} = \begin{matrix} & & \cdot \end{matrix}$$



How to check given CFG is LR(0) ?



Step 1: Construct ^{LR(0)} DFA

Step 2: check SR & RR conflicts in LR(0).

If any conflict present in any state,
then given CFG is not LR(0).

How to check given CFG is SLR(1) ?



Step 1: Construct $LR(0)$ DFA

Step 2: check SR & RR conflicts in SLR(1)

If any conflict present in any state,
then given CFG is not LR(0).

How to check conflicts in SLR(1)?



I) SR conflict

Shift Item $X \rightarrow \alpha \cdot t \beta$
Reduced Item $Y \rightarrow \alpha \cdot$
⋮

If $t \in \text{Follow}(Y)$
then SR conflict in SLR(1)

II) RR conflict

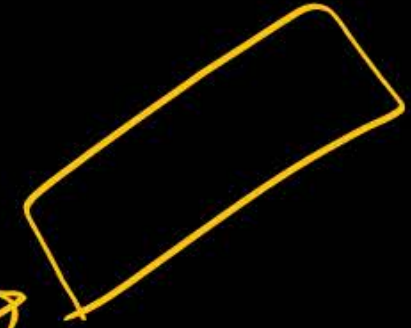
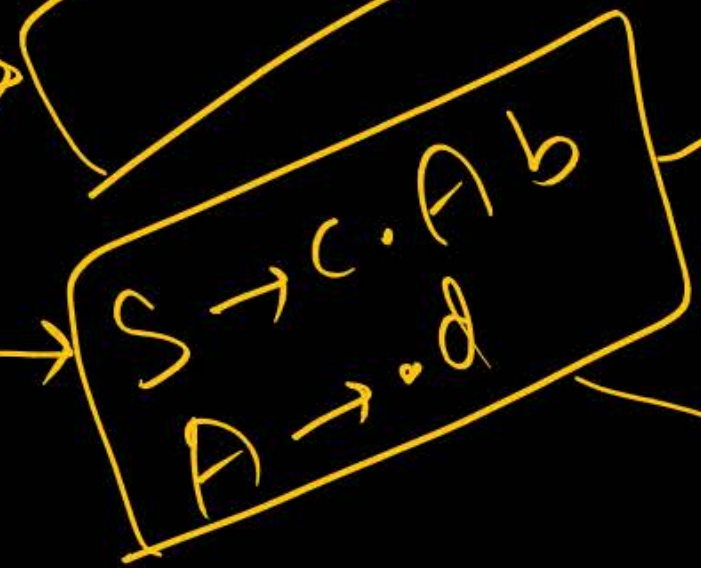
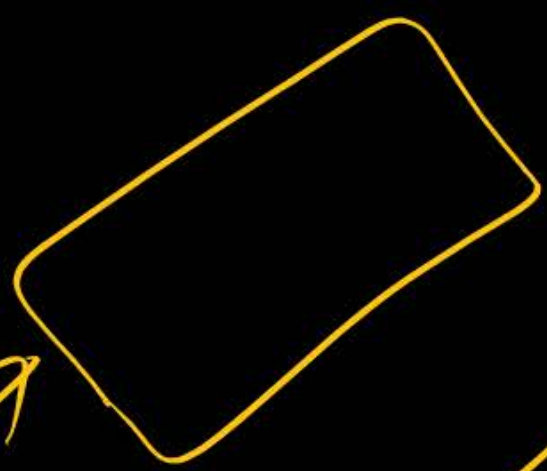
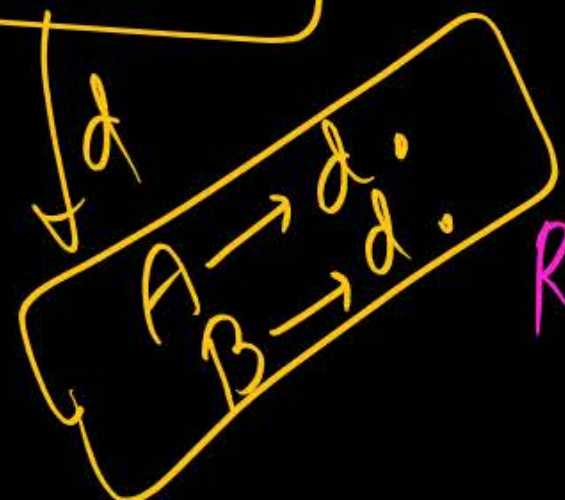
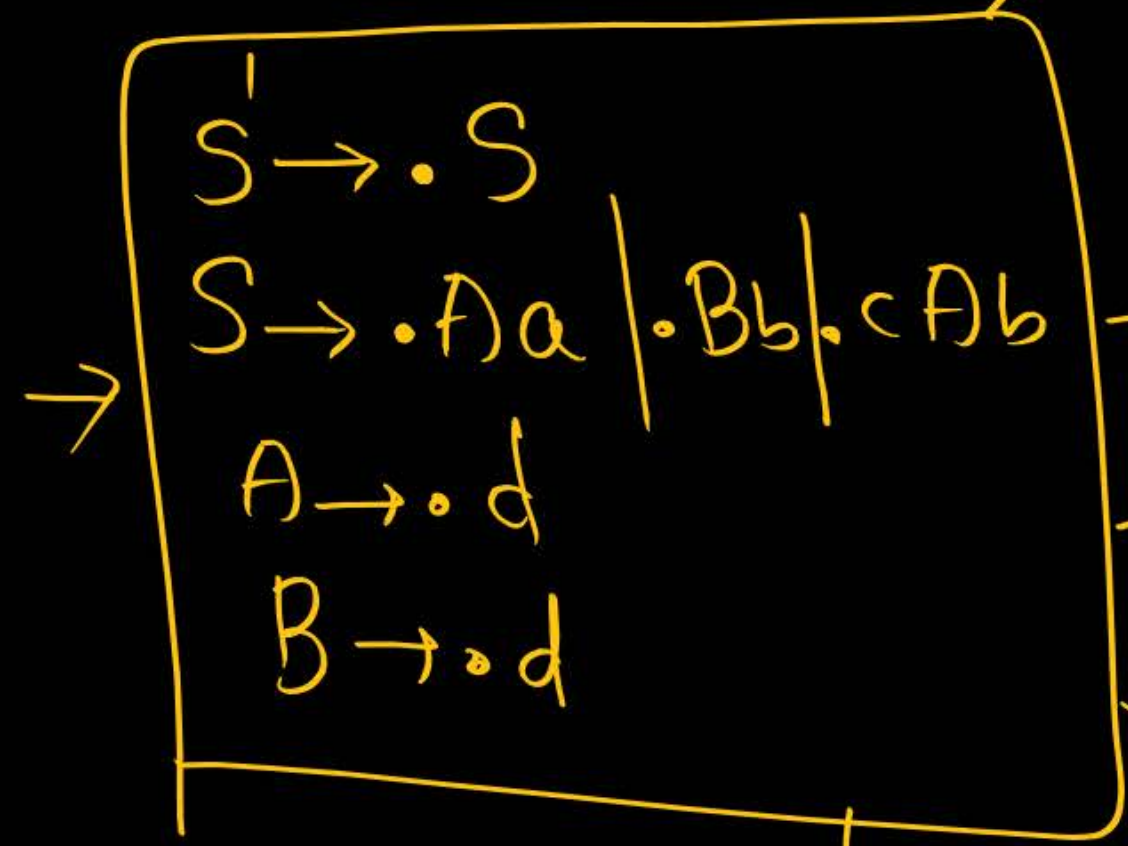
Reduced Item, $X \rightarrow \alpha \cdot$
Reduced Item, $Y \rightarrow \alpha \cdot$
⋮

If $\text{Follow}(X) \cap \text{Follow}(Y) \neq \emptyset$
then RR conflict in SLR(1)

⑦ $S \rightarrow Aa | Bb | cAb$

$F_0(A) = \{a, b\}$ $A \rightarrow d$
 $F_0(B) = \{d, b\}$ $B \rightarrow d$

not SLR(1)
not LR(0)



RR conflict in SLR(1)



Note :

I) If state has only one item, conflict never produces

II) If state has no reduced items, conflict never produces in that state.

SLR(1) CFGs

LR(0) CFGs

$\bullet G_1$

$\bullet G_2$

$\bullet G_3$

Not
SLR(1)
CFGs



I) Every $LR(0)$ CFG is $SLR(1)$.

II) Every not $SLR(1)$ CFG is "not $LR(0)$ "

H.W. ⑧ $S \rightarrow SS | a$

⑨ $S \rightarrow SaS | b$

⑩ $S \rightarrow AB | ab$
 $A \rightarrow Aa | a$
 $B \rightarrow Bb | b$

Ambiguous

A) only LR(0)

B) only SLR(1)

C) Both LR(0) & SLR(1)

~~D) None~~

→ LR(0) CFG ? ✓

SLR(1) CFG ? ✓

Next: LALR & CLR

