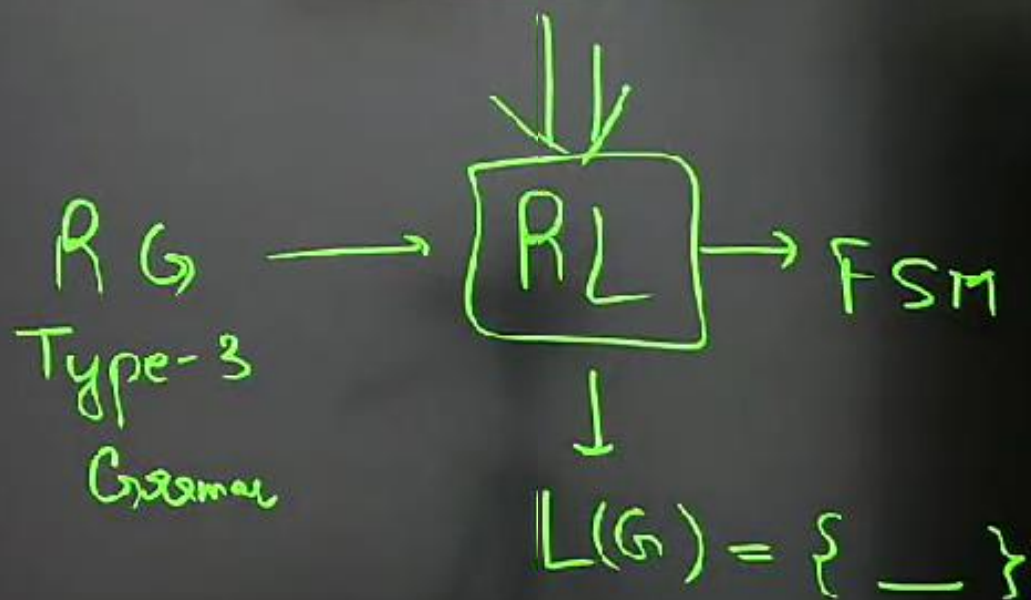


# Regular Exp



$\cup$  - Union

$\cdot$  - Concatenate

$+$

$\epsilon$

$\emptyset$



$a \rightarrow$  Symbol

$a^*$   $\rightarrow$  All possible  
Strings  
with different  
# of  $a$

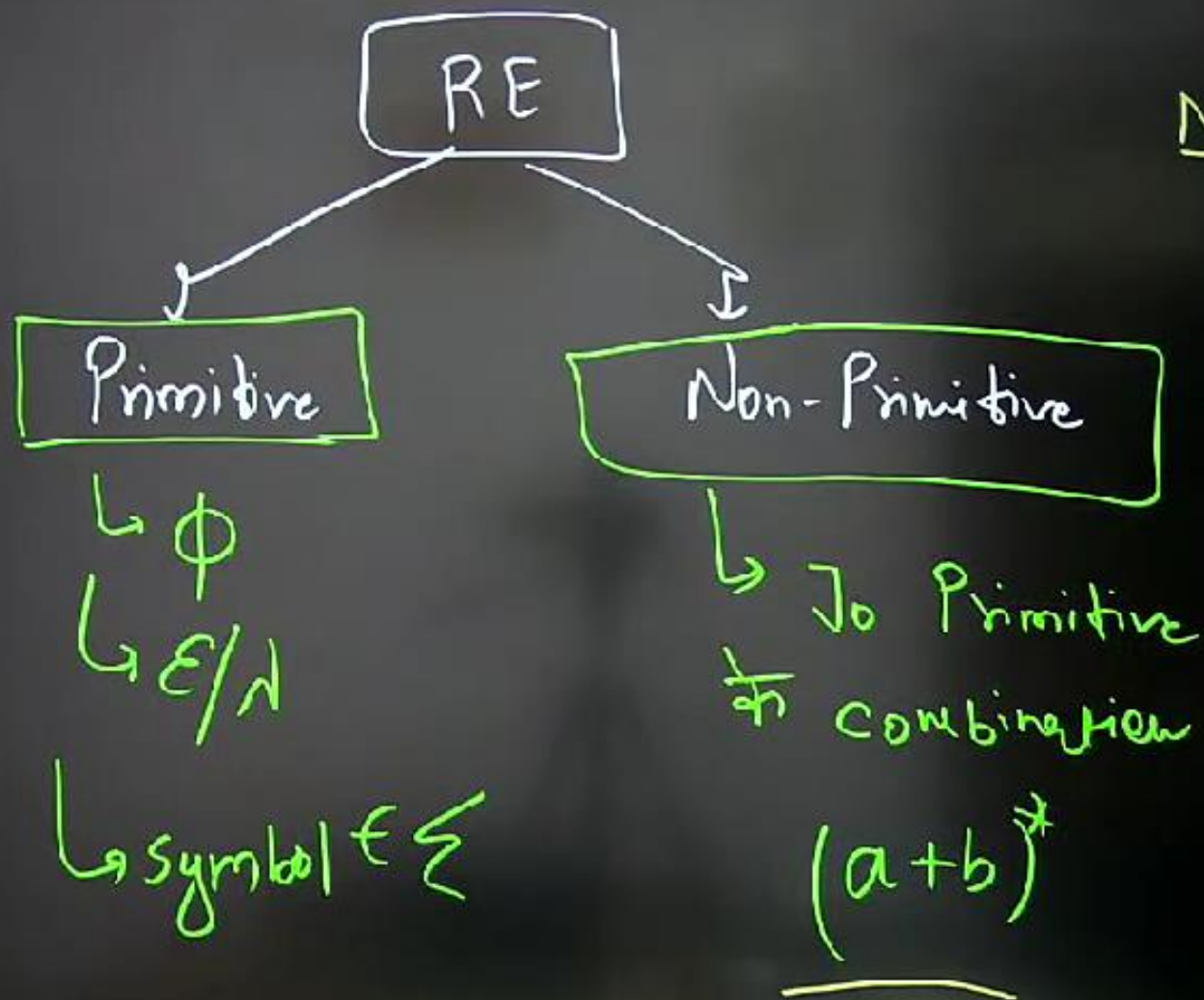
$\epsilon, a, a^2, a^3, a^4, \dots, a^\infty$

$( )^*$   $\rightarrow$  Kleen's Closure  
 $( )^+$   $\rightarrow$  Kleen's Positive Closure

$\rightarrow$   $(RE)$   $\cup$   $A \rightarrow$  Union  
 $\cdot \rightarrow$  Concatenation

$\phi \rightarrow$  Null / phi  
 $\epsilon / \lambda \rightarrow$  Epsilon





Note:

All RE are said to be valid iff it has been derived from primitive Exp, & contains basic ops like

- ↳ Union
- ↳ Cont
- ↳ \*
- ↳ +





$$\textcircled{1} \Sigma = \{a, b\}^*$$

✓ या

-  $a \rightarrow$  kitni baar  
-  $b \rightarrow$  similarly

- dono ke combinations

-  $\epsilon / \phi / \lambda$

$$\Sigma^* \rightarrow \Sigma^+ + \Sigma^0$$

$$\Sigma^0 + \Sigma^1 + \Sigma^2 + \Sigma^3 + \dots + \Sigma^\infty$$

$\textcircled{2}$

$$(a+b)^* \cdot (a+b)$$

$\phi^x$   
 $\epsilon^x$

$\left. \begin{array}{l} \rightarrow a \\ \rightarrow b \\ \rightarrow ab \end{array} \right\}$



~~Feb~~ 2023

$$a/\epsilon \leftarrow a + \epsilon = a/\epsilon$$

$$a / \underbrace{(\phi)}_{\substack{\downarrow \\ \times}} \leftarrow a + \underbrace{\phi}_{\{ \}} = a$$

$$L = a$$

$$L(\Sigma) = \{ a \mid a \in \Sigma \}$$

$$L = \epsilon \rightarrow L(\Sigma) = \{ \epsilon \}$$

$$L = \phi \rightarrow L(\Sigma) = \{ \} / \phi$$



$\xrightarrow{*} \cdot b$   
 $(a+b)^* \cdot b$   
 $r \Rightarrow (ab+a)^* \cdot b$   
 $L(r) \Rightarrow \varepsilon, ab, abbb$   
 $b, abab, ababb$   
 $abbb$

$bba b \rightarrow X$

$(ab)^{0/1/2/3}$

$$r = a + b$$

$$L(r) = \{a, b\}$$

$$r = \underline{a} \cdot b$$

$$L(r) = \{ab\}$$

$$r = (ab+a) \cdot b$$

$$L(r)$$

$$\downarrow \begin{matrix} ab \cdot b \\ a \cdot b \end{matrix}$$

all string ending  
 with 'b'



$$L = a^*$$

$$\{a^0, a^1, a^2, a^3, \dots\}$$

$$L = a^+$$

$$\{a^1, a^2, a^3, \dots\}$$

$$L = (a + b)^*$$

$$\Sigma^* \rightarrow \begin{matrix} ab \checkmark \\ ba \checkmark \\ \epsilon \checkmark \end{matrix}$$

$$\{\epsilon, a^*, b^*\}$$

$$L = (a.b)^*$$

Sequence follows  $\epsilon^+ \mid \mid \mid$

Ans  $\rightarrow$  Order

$\epsilon$   
 $ab, abab, ababab$   
 $1 \quad 2 \quad 3$   
 $aX \quad bX \quad baX$

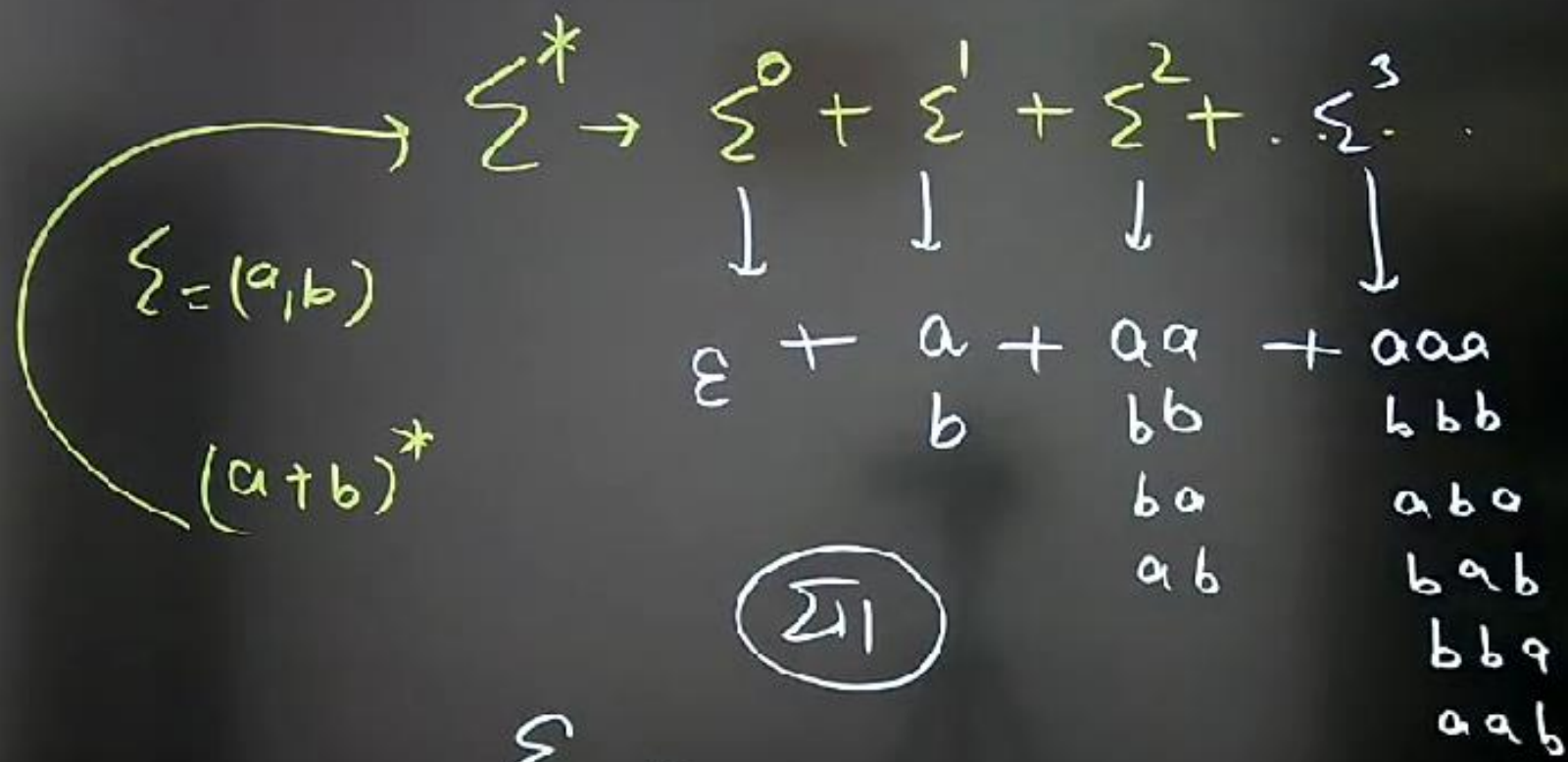
$$(a+b)^+$$

$$a \quad b$$

$$aX$$

$$(ab)$$

$$(1)$$



$\Sigma = (a, b)$   
 $(a+b)^*$

$\Sigma^1$

$\epsilon, a, b, ab, aba, bab, \dots$



$$(ab)^* \neq (a+b)^*$$

$$\varepsilon \text{ --- } (ab)^+ \neq (ab)^+ \text{ --- } x$$

$$\varepsilon \text{ --- } (ab)^* \neq (a+b)^+ \text{ --- } x$$

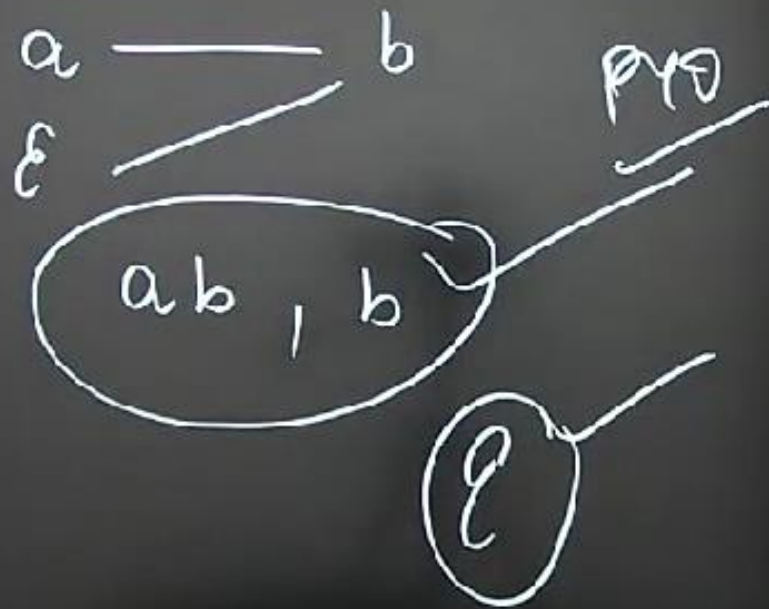
$$(a+ba)^+ \cdot (b+a)^+$$



$ab, aa, bab, baa$



$$(a + \varepsilon) \cdot (b + \phi)$$



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Peekerserer 😊



Same

$$\left\{ \begin{array}{l} r_1 = \varepsilon^* \rightarrow (\varepsilon) \\ r_2 = \varepsilon^+ \rightarrow (\varepsilon) \\ r_3 = \phi^* \rightarrow \{\varepsilon\} \end{array} \right.$$

diff

$$\left\{ r_4 = \phi^+ = \{ \quad \} \right.$$

$$1) \quad r_1^+ \cup r_2^* \downarrow r^*$$

$$2) \quad r^* \cap r^+ \downarrow r^+$$





$$\lambda^* \cdot \lambda^+ \Rightarrow \lambda^+$$

$$(\varepsilon + \lambda^+) \cdot \lambda^+$$

$$(\lambda^*)^* \rightarrow \lambda^*$$

$$(\lambda^+)^* \rightarrow \lambda^+$$

$$\left( \left( \left( \lambda^+ \right)^* \right)^+ \right)^* \cdot \lambda^+$$

$$\left( \lambda^* \right) \cdot \lambda^+$$


---


$$\lambda^+$$



$$(a+b)^* = \underline{\Sigma^*}$$

↓

$$(a^* + b)^*$$

$$(a + b^*)^*$$

$$(a^* + b^*)^*$$

$$(a+b)^* \neq (ab)^*$$

$$(a+b)^* \neq (a^* \cdot b)^* \neq (a \cdot b^*)^*$$

$$(a+b)^* = (a^* \cdot b^*)^*$$

✓ Imp

h.p

