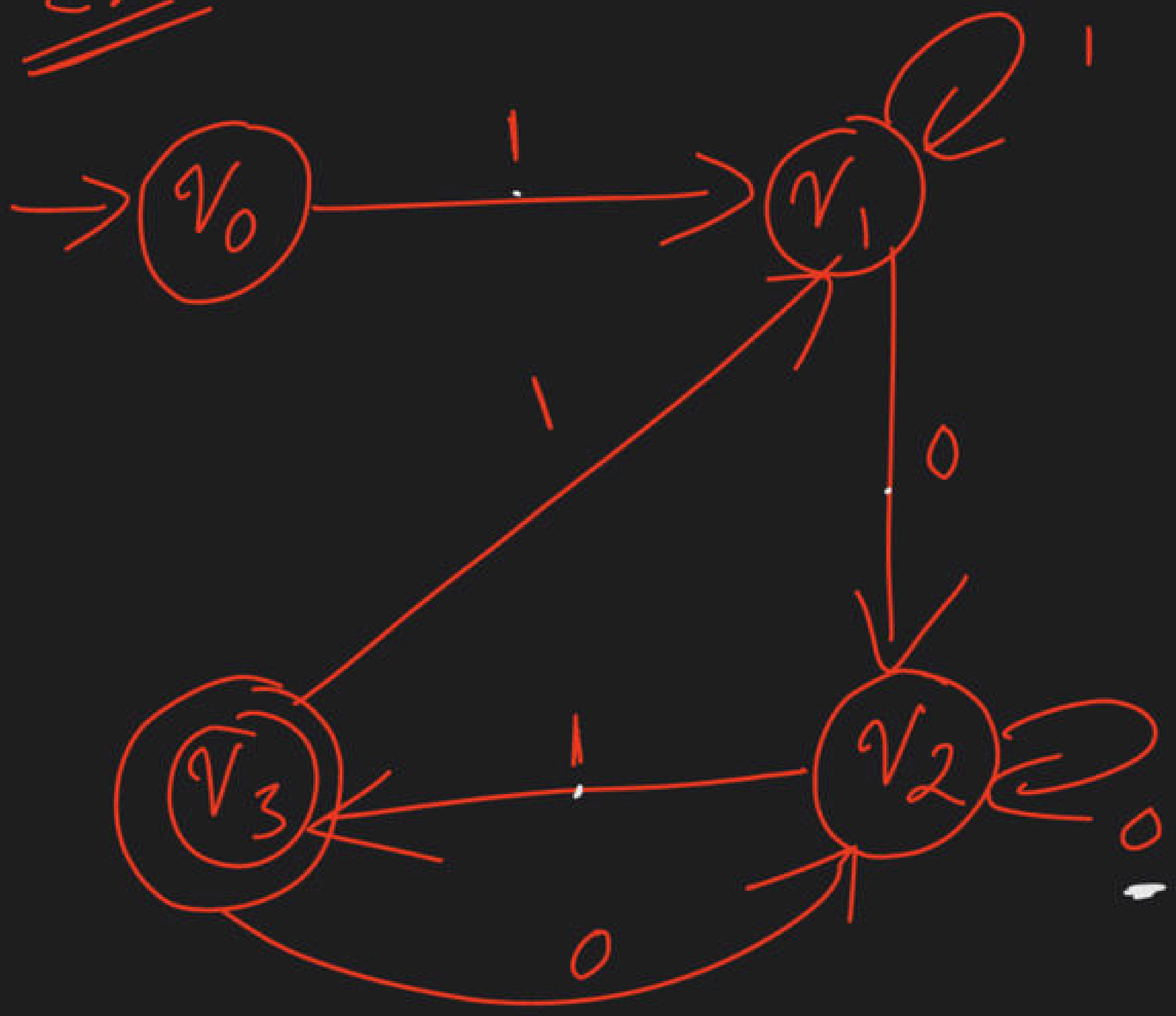
Closure Properties - I

Complete Course on Theory of Computation

Subbarao Lingamgunta • Lesson 21 • Mar 2, 2022

ex



R.E = ?

$\Longrightarrow$ 101, 1111101, 1000001

10 10101010 00000 1

$v_0 = \epsilon \qquad v_1 = v_0 \cdot 1 + v_3 \cdot 1 + v_1 \cdot 1$

$v_2 = v_2 \cdot 0 + v_1 \cdot 0 + v_3 \cdot 0$

$v_3 = v_2 \cdot 1$

$v_2 = v_2 \cdot 0 + v_1 \cdot 0 + v_2 \cdot 10$

$\underset{R}{v_2} = \underset{Q}{v_1 \cdot 0} + \underset{R}{v_2}\underset{P}{(0+10)}$

$= \underset{Q}{v_1 \cdot 0}\underset{P^*}{(0+10)^*} \Longrightarrow v_3 \cdot 1 \qquad \Longrightarrow v_2 11$

$v_1 = 1 + v_1 \cdot 0 (0+10)^* 11 + v_1 \cdot 1$

$v_1 = 1 + v_1 (0 (0+10)^* 11 + 1)$

$\Longrightarrow 1 (0 (0+10)^* 11 + 1)^*$

$$r_3 = r_2 \cdot 1$$

$$\Downarrow$$

$$r_1\, 0\,(0+10)^* \cdot 1$$

$$\Downarrow$$

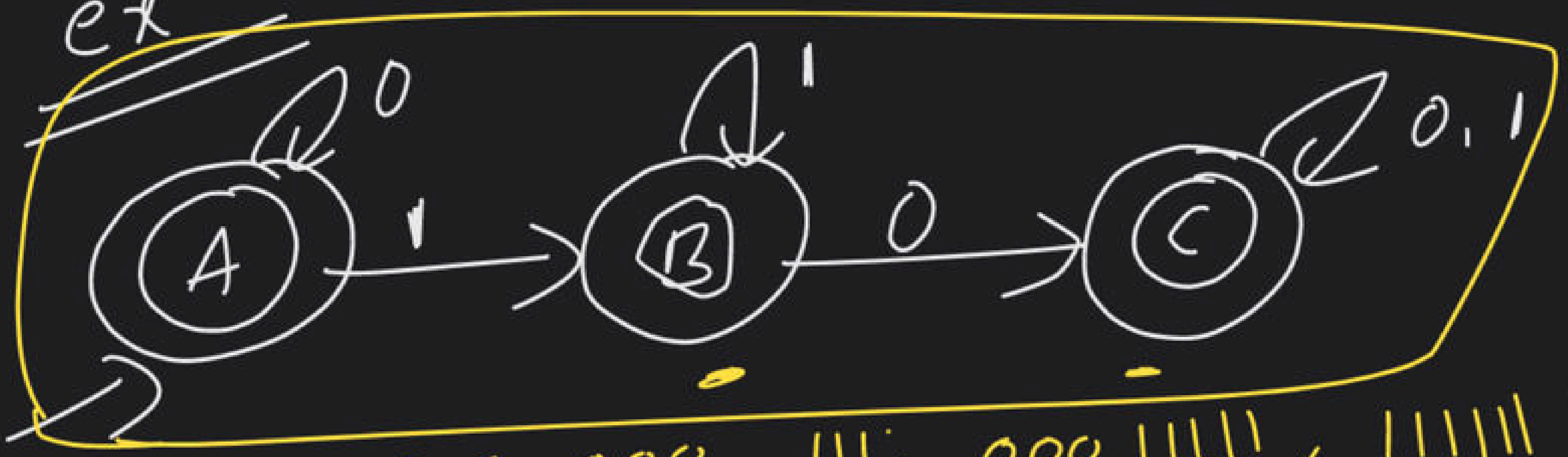
$$1\,\big(0\,(0+10)^*\,1 + 1\big)^*\, 0\,(0+10)^*\,1 \Rightarrow 101,\ 100000001$$

1010101010000001

111111101, 101101

1011011011 01

ex



$\Rightarrow \epsilon, 000, 111, 000\,11111, 111111\,0000$

DFA

$\Downarrow$

All Fin

$\Downarrow$

Σ^*

$1^* = \{\epsilon, 1, 11, 111, \dots\}$

$1\cdot 1^* = 1, 11, 111, 1111 \dots$

$\Rightarrow 1^+$

$A = \epsilon + A\cdot 0$, $B = A\cdot 1 + B\cdot 1$, $C = B\cdot 0 + C\cdot 0 + C\cdot 1$

$A = \epsilon\cdot 0^*$

$= 0^*$

$B = 0^*\cdot 1 + B\cdot 1$

$= 0^* 1 1^*$

$= 0^* 1^+$

$C = 0^* 1^+ 0 + C(0+1)$

$= 0^* 1^+ 0 (0+1)^*$

$(0+1)^*$

$\Uparrow$

Σ^*

$\Uparrow$

$\Rightarrow A + B + C \Rightarrow \boxed{0^* + 0^* 1^+ + 0^* 1^+ 0 (0+1)^*}$

$1\cdot 0 = 0\cdot 1$

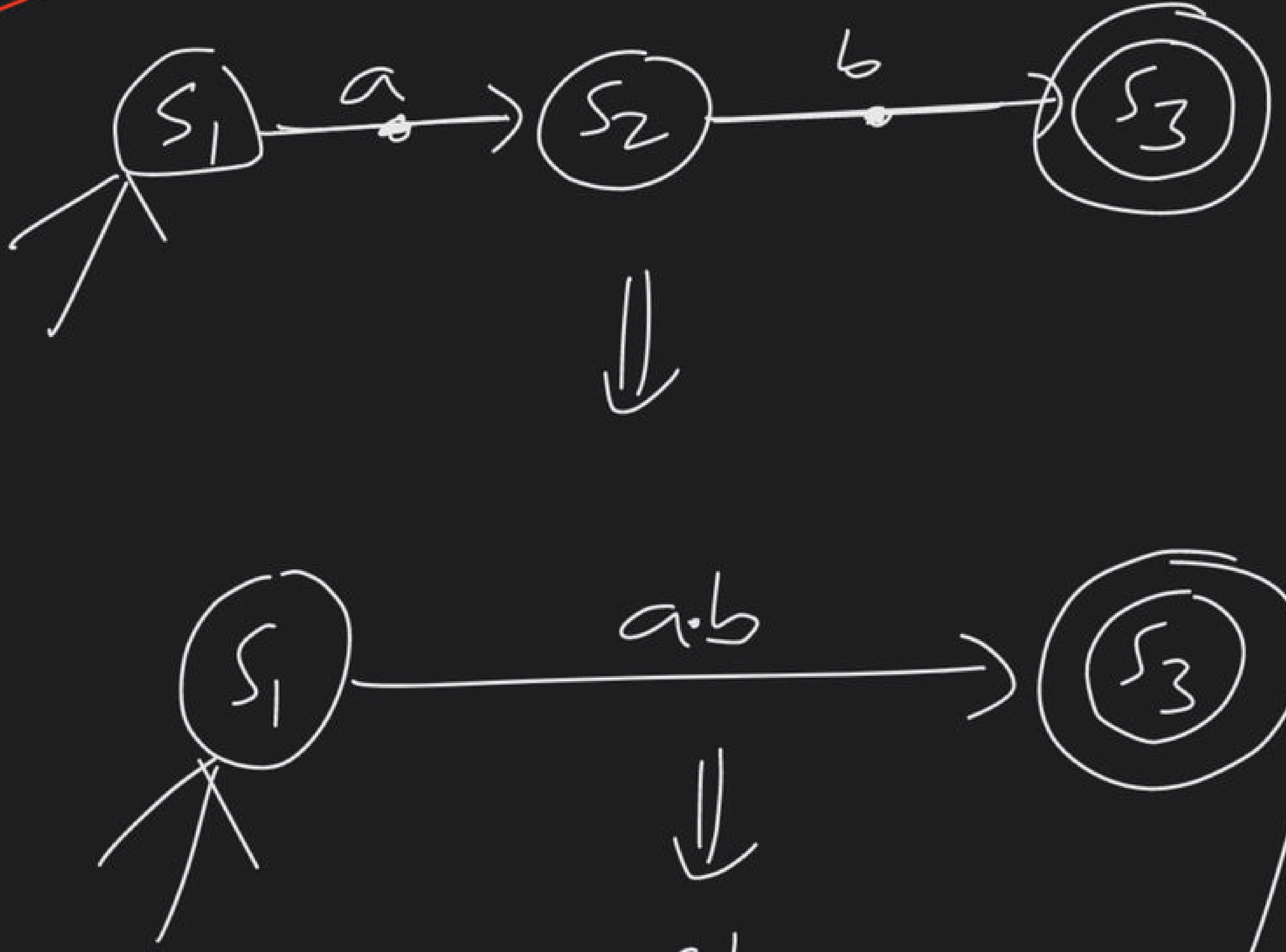
$\Rightarrow 0^*[\epsilon + 1^+ + 1^+ 0 (0+1)^*] \Rightarrow 0^*[1^* + 1^+ 0 (0+1)^*]$

$$1 \cdot 0 = 0 \cdot 1$$

$$1 + 0 = 0 + 1$$

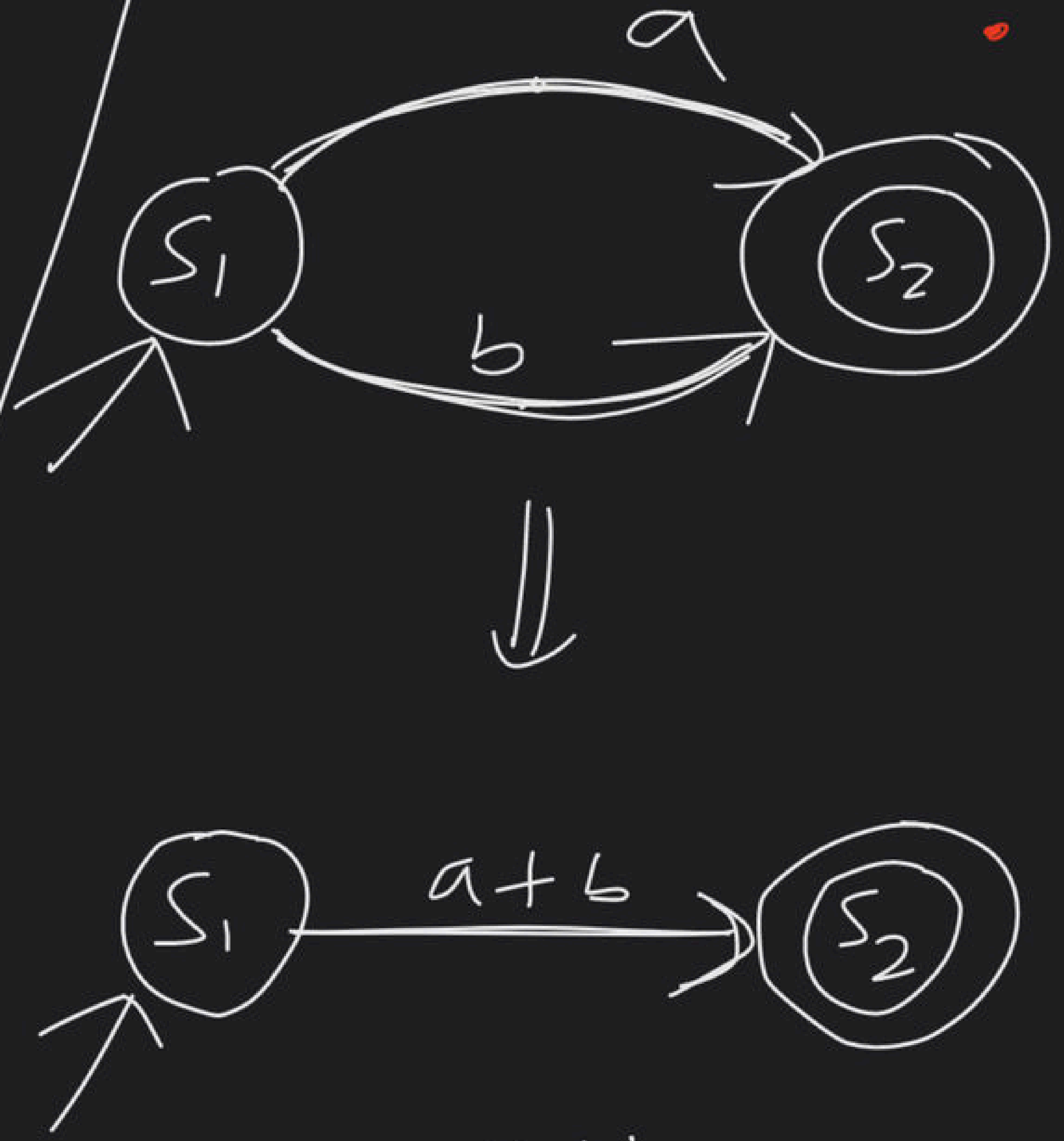
State Elimination method (NFA, ε-NFA, DFA)

ex ①



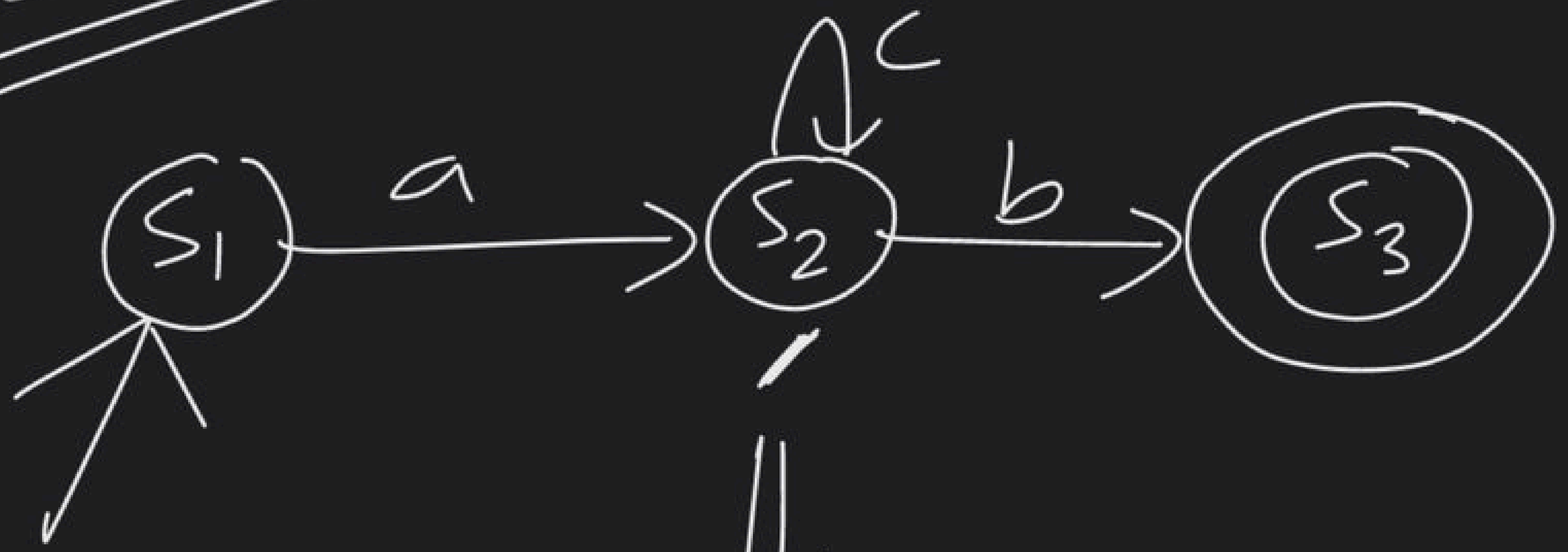
ab

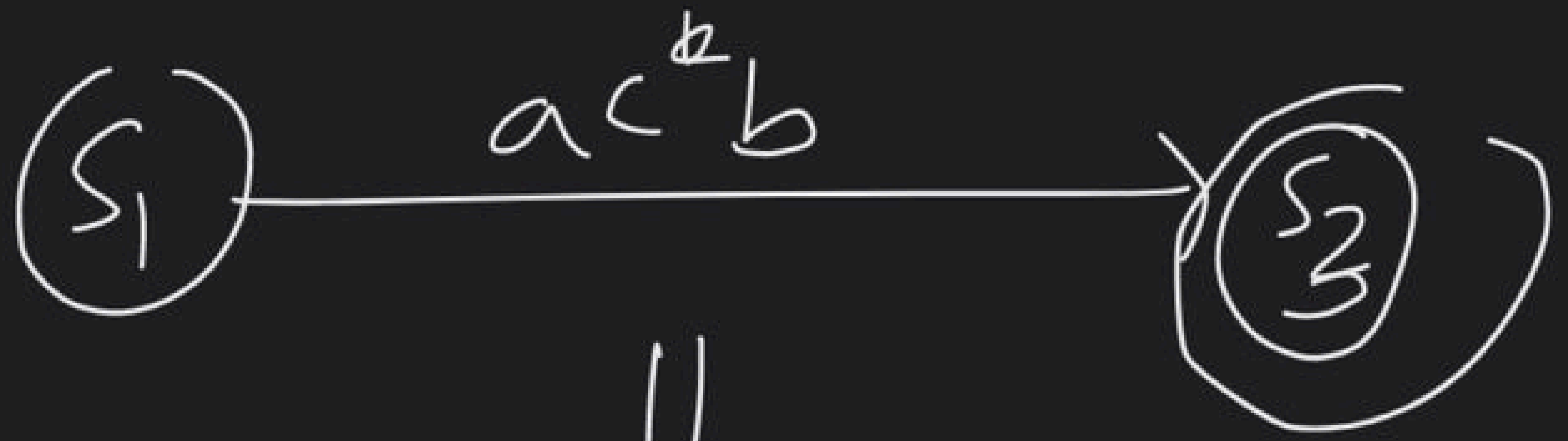
ex ②



$a+b$

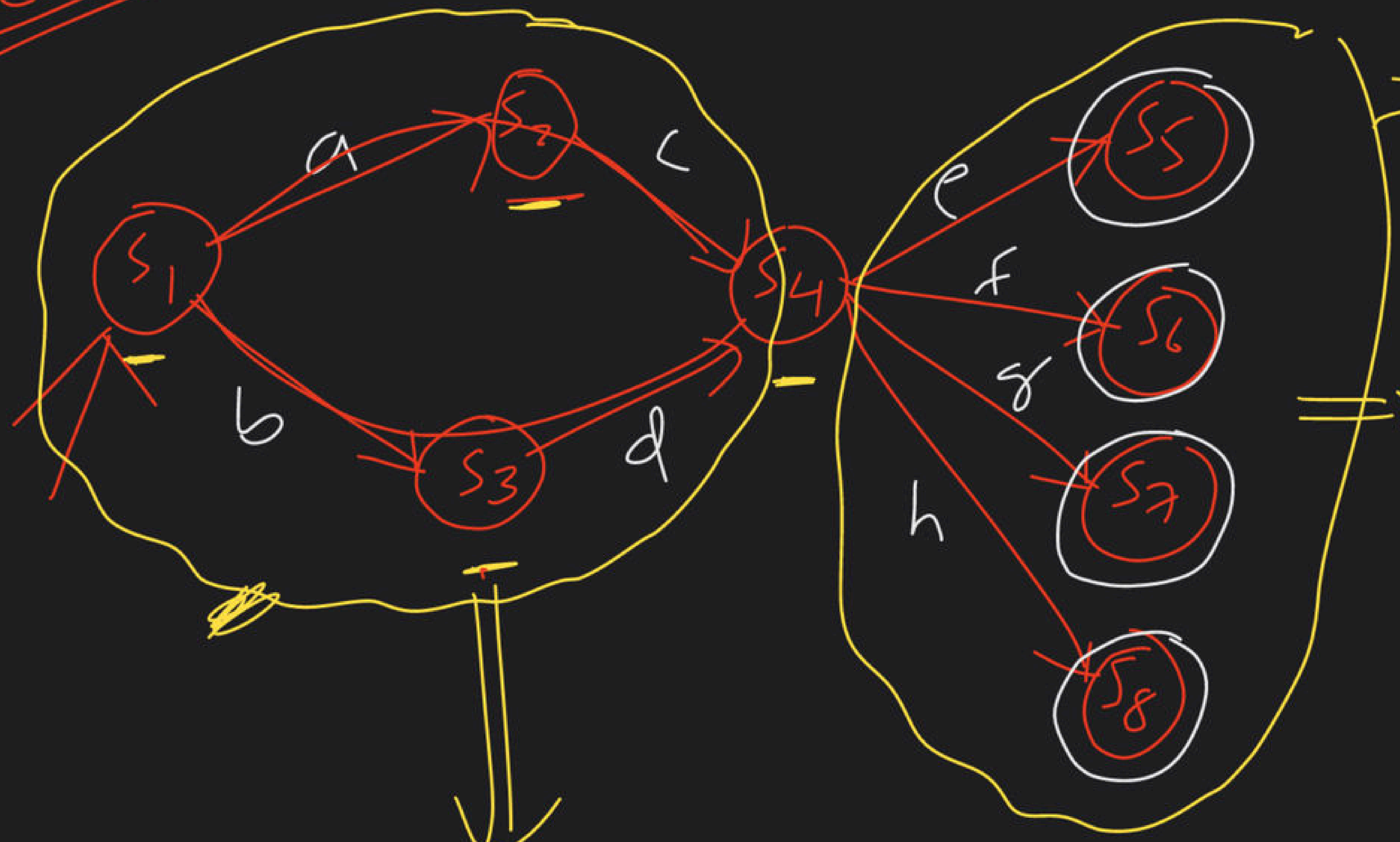
ex 3

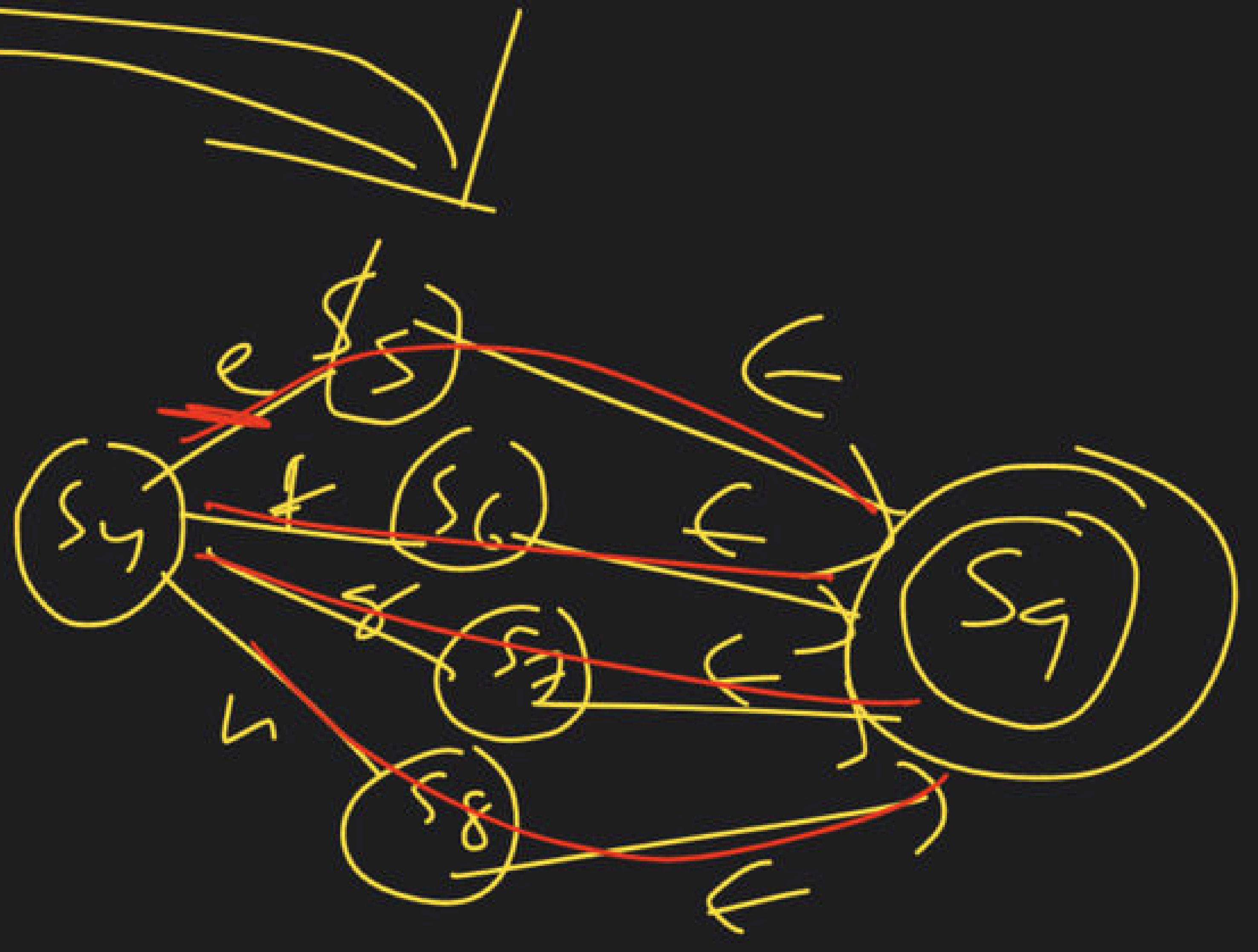


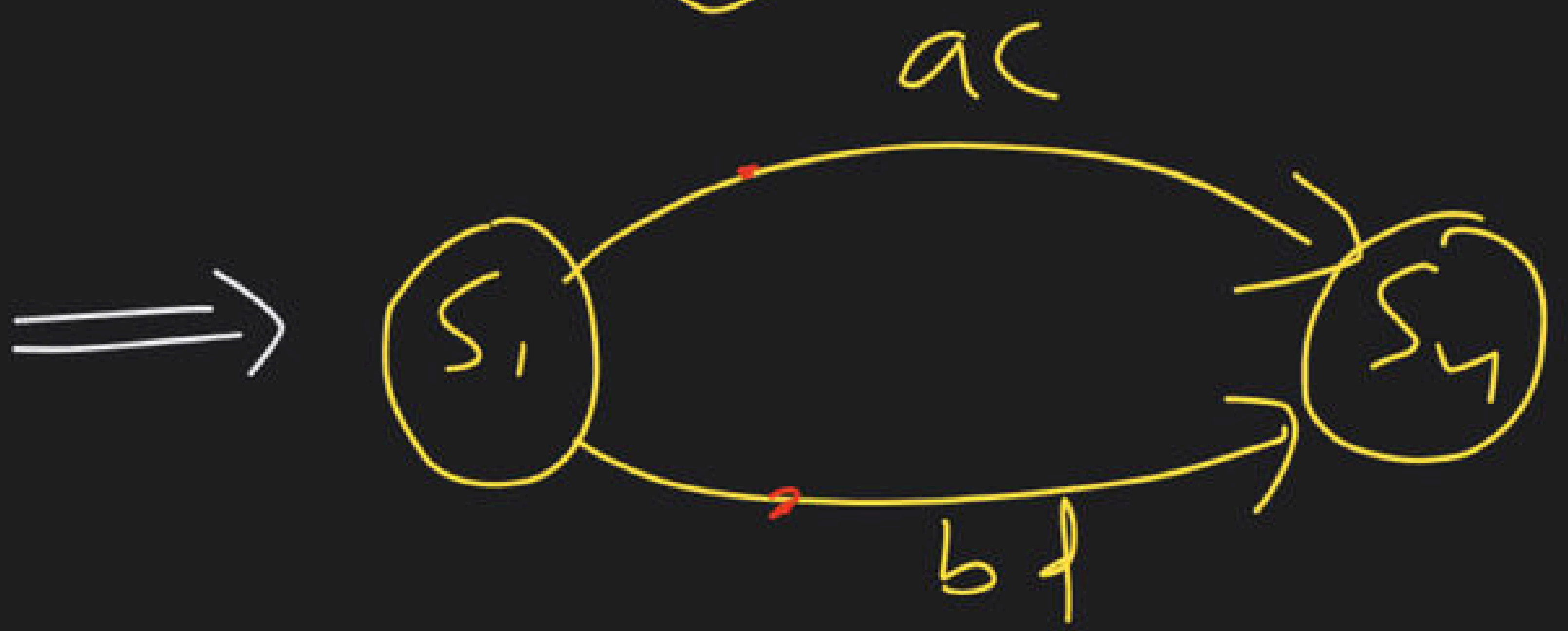


$$ac^*b$$

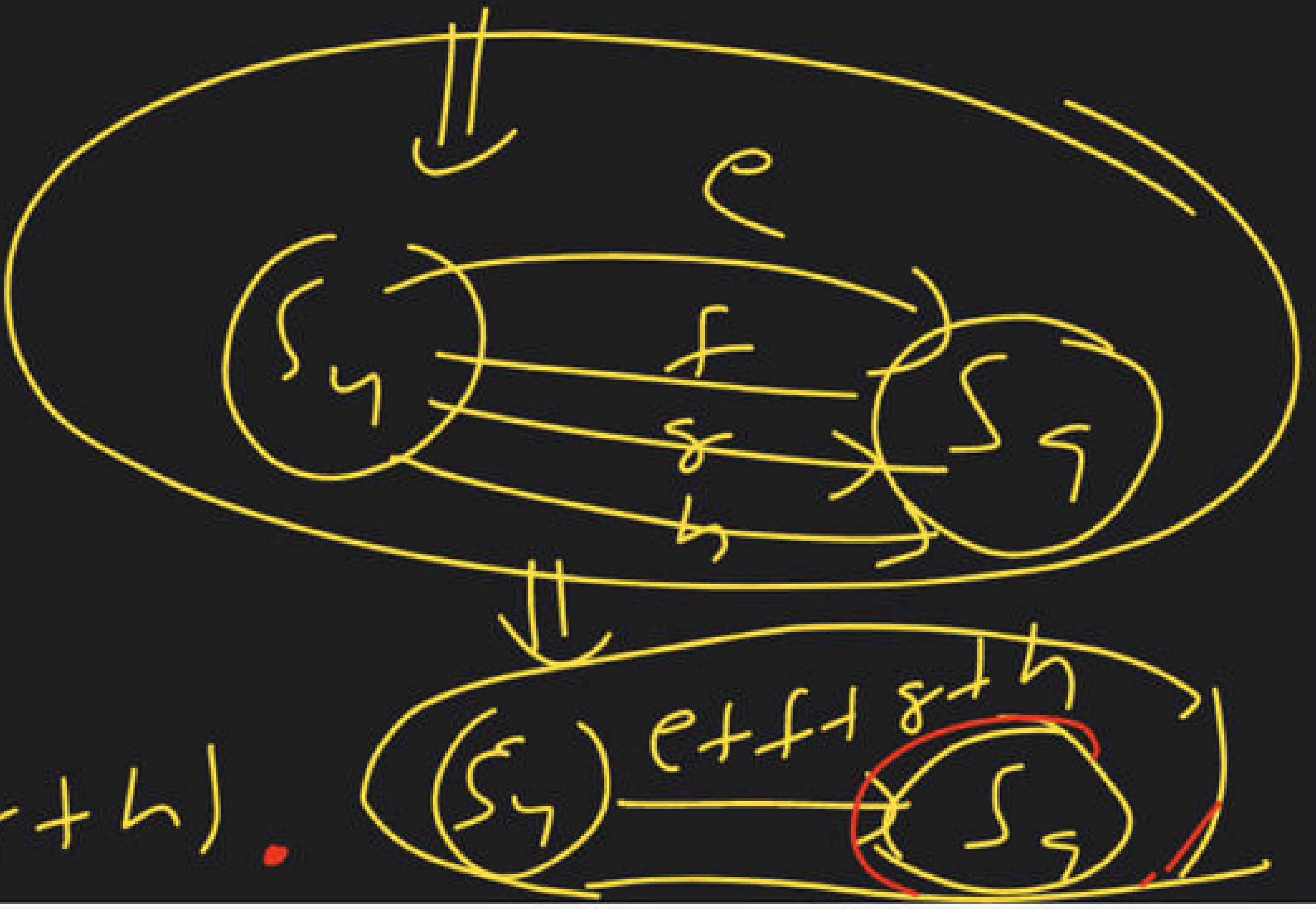
ex







$\Longrightarrow$ ac+bd



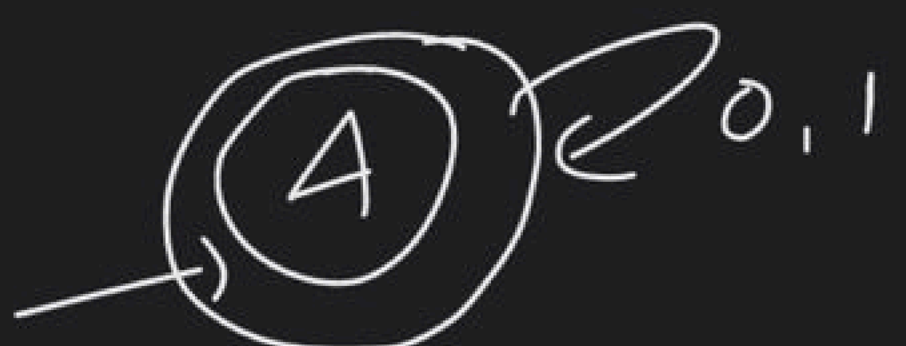
(ac+bd)(e+f+g+h).

Thanks

Dedicate Hate

$\Pi_0 = (ABC)$

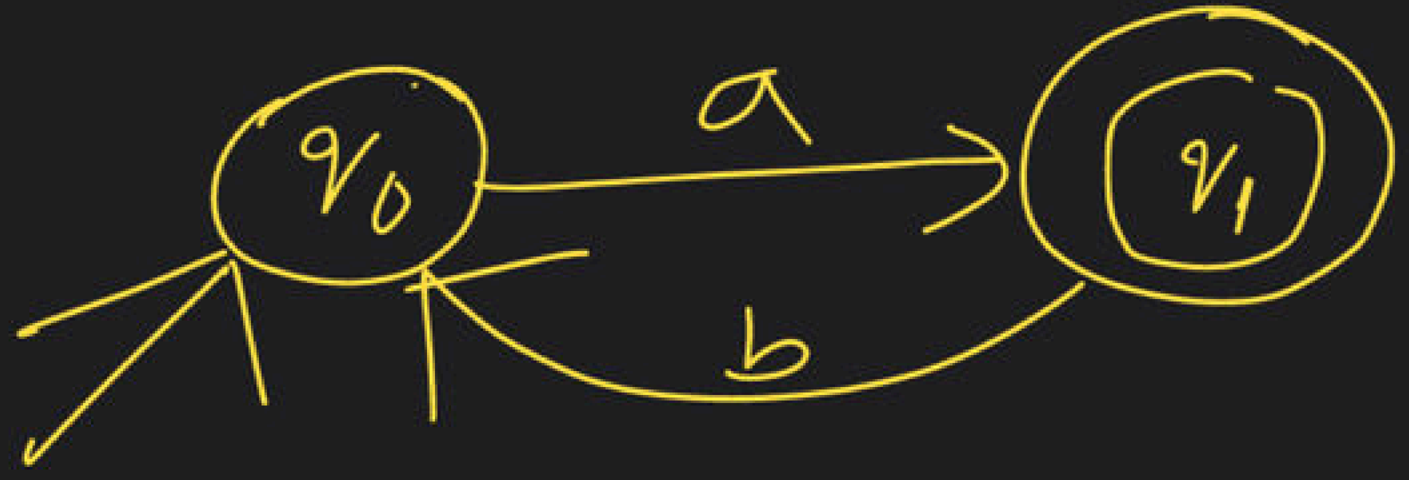
$\Pi_1 = (ABC)$ Stop $\Longrightarrow$



$q_0 = \varepsilon + q_0 ab$
$= (ab)^*$

$\boxed{q_1 = (ab)^* a}$

ex



$(ab)^* a \;/\; a(ba)^*$

Note

$(ar)^* a = a(ra)^*$

$q_0 = \epsilon + q_1 \cdot b \qquad q_1 = q_0 \cdot a$

$= (\epsilon + q_1 \cdot b)a$

$a(ba)^* \Longleftarrow q_1 = a + q_1 ba$