



CS & IT ENGINEERING



THEORY OF COMPUTATION

Regular Expression



Finite Automata

Lecture No. - 07



By- Venkat sir

Recap of Previous Lecture



Topic

Regular Expression

Topic

Construction of Regular Expression

Topic

DFA States

✓ DFA, ✓ NFA, ✓ E-NFA

Finite Automata



Regular Expression

~~1~~ State elimination

2 Arden's method

3 R_{ij}^k method

(Kleene's method)

Topics to be Covered



Topic

Conversion from ϵ NFA to NFA

Topic

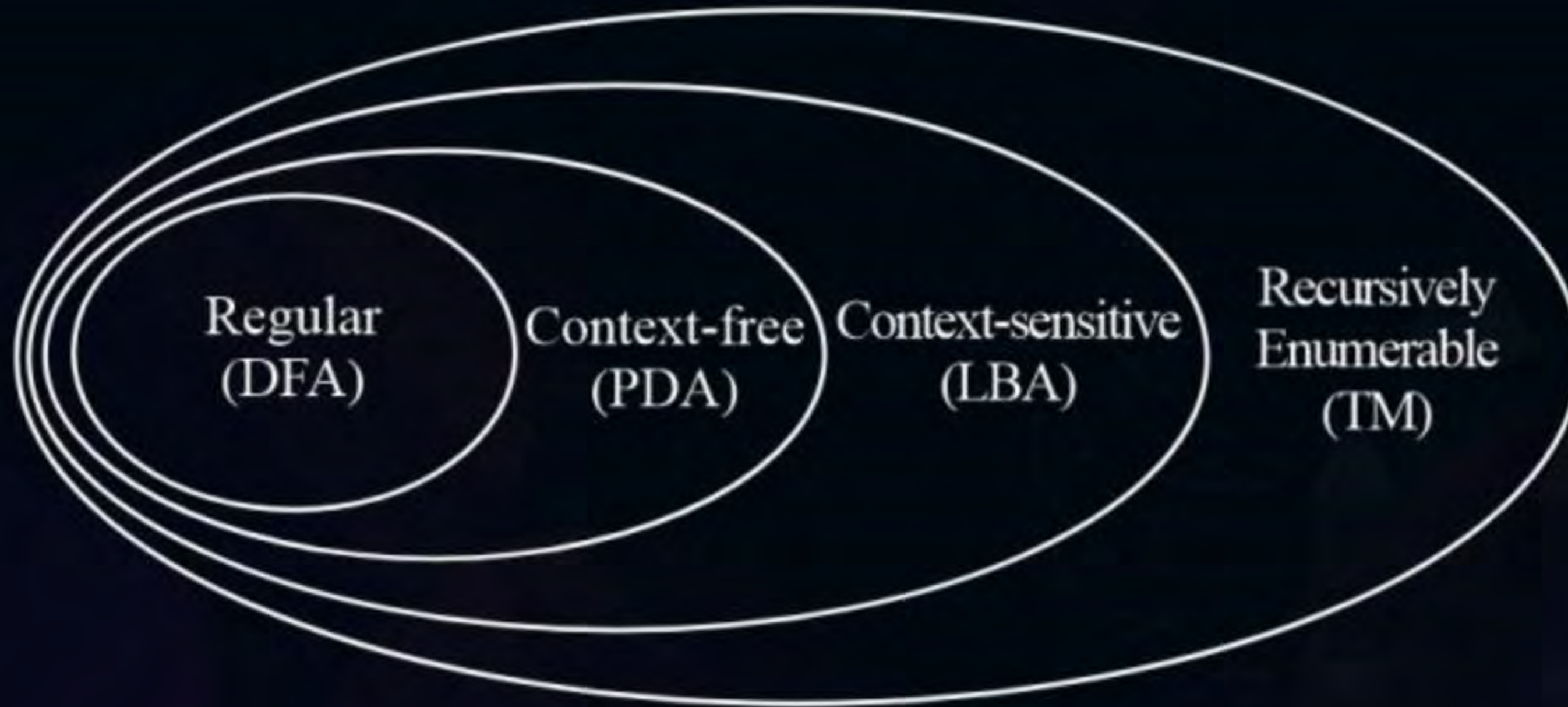
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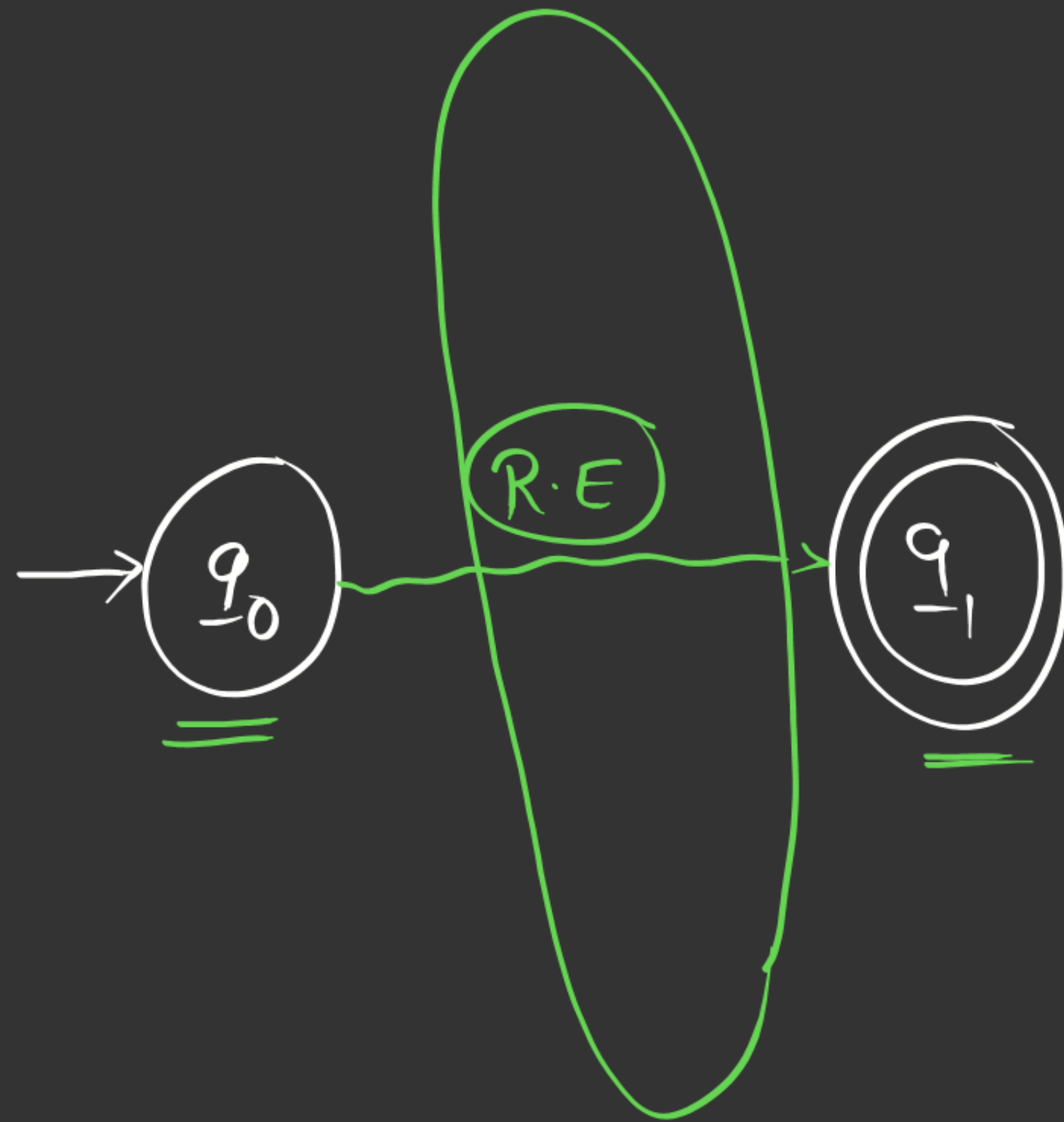
Topic

??



Topic : Theory of Computation





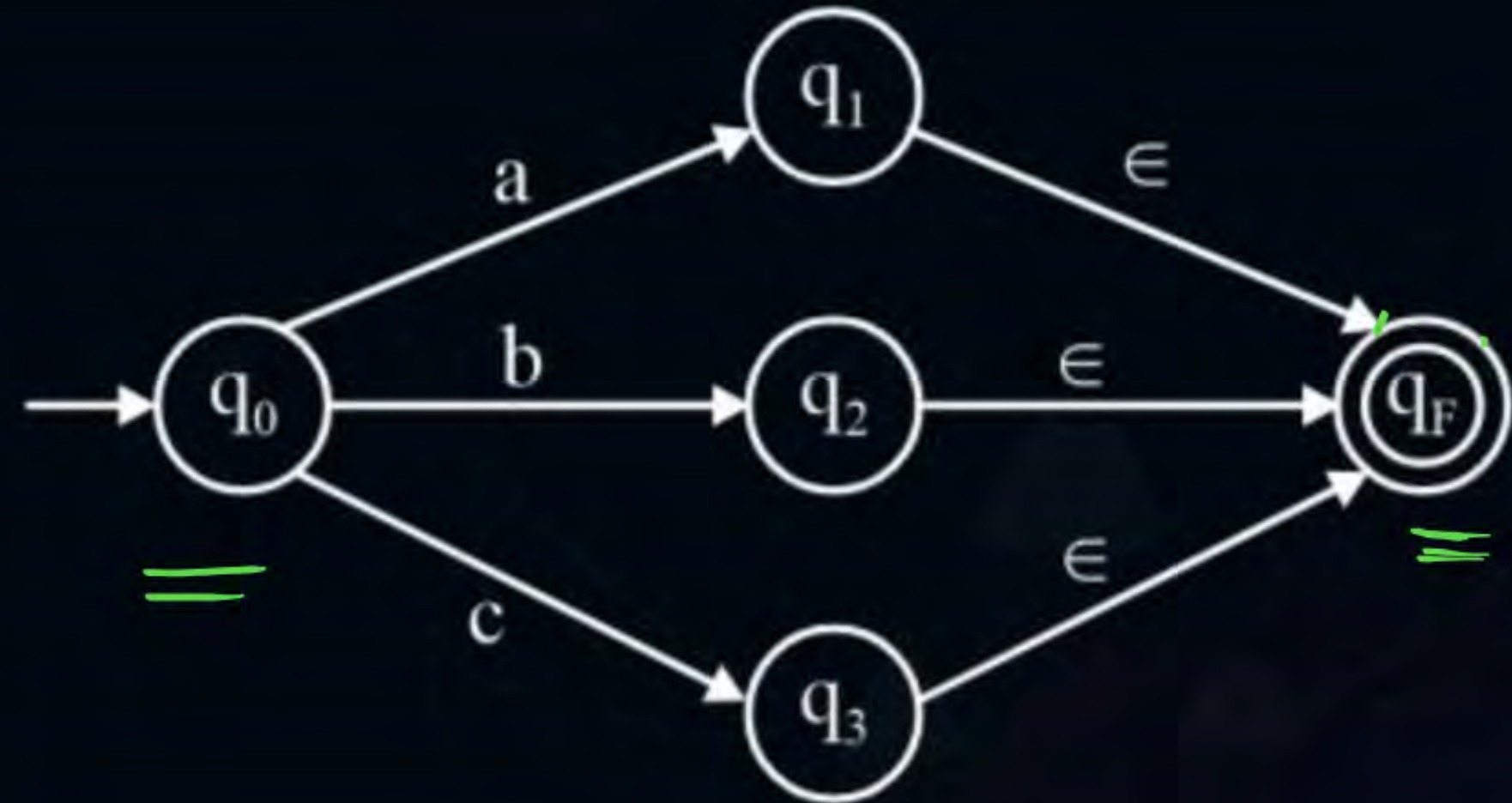
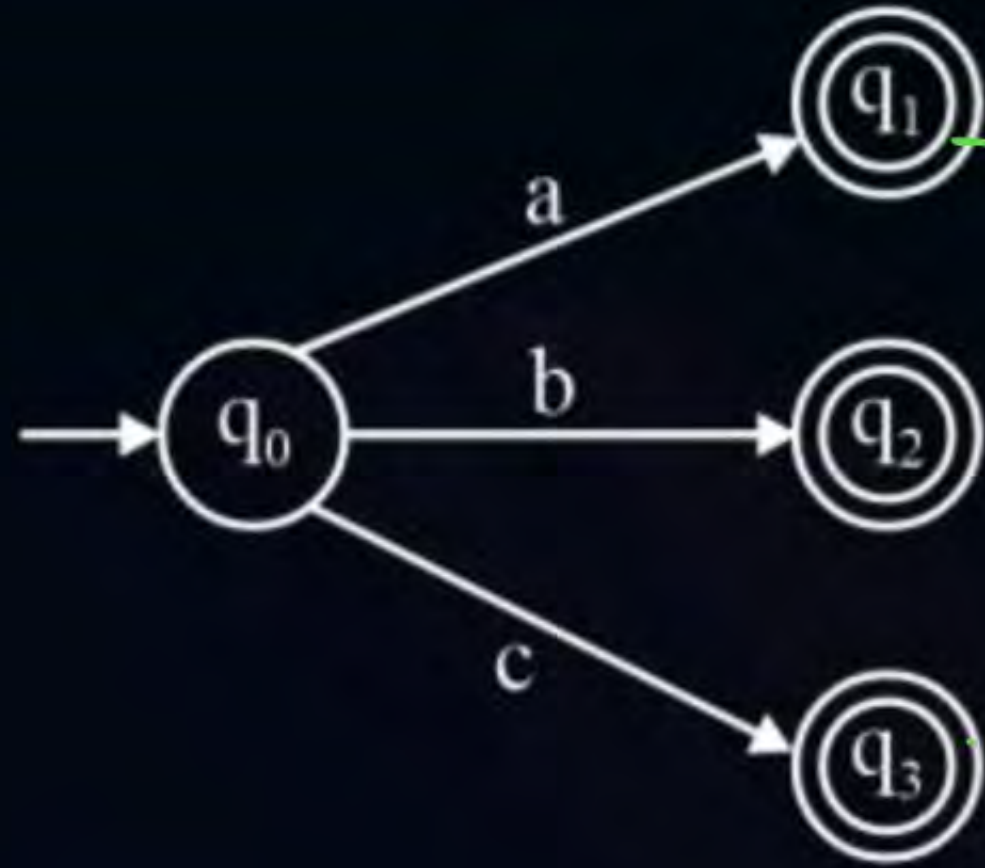


Topic : Finite Automata to Regular Expression

(1)

F.A

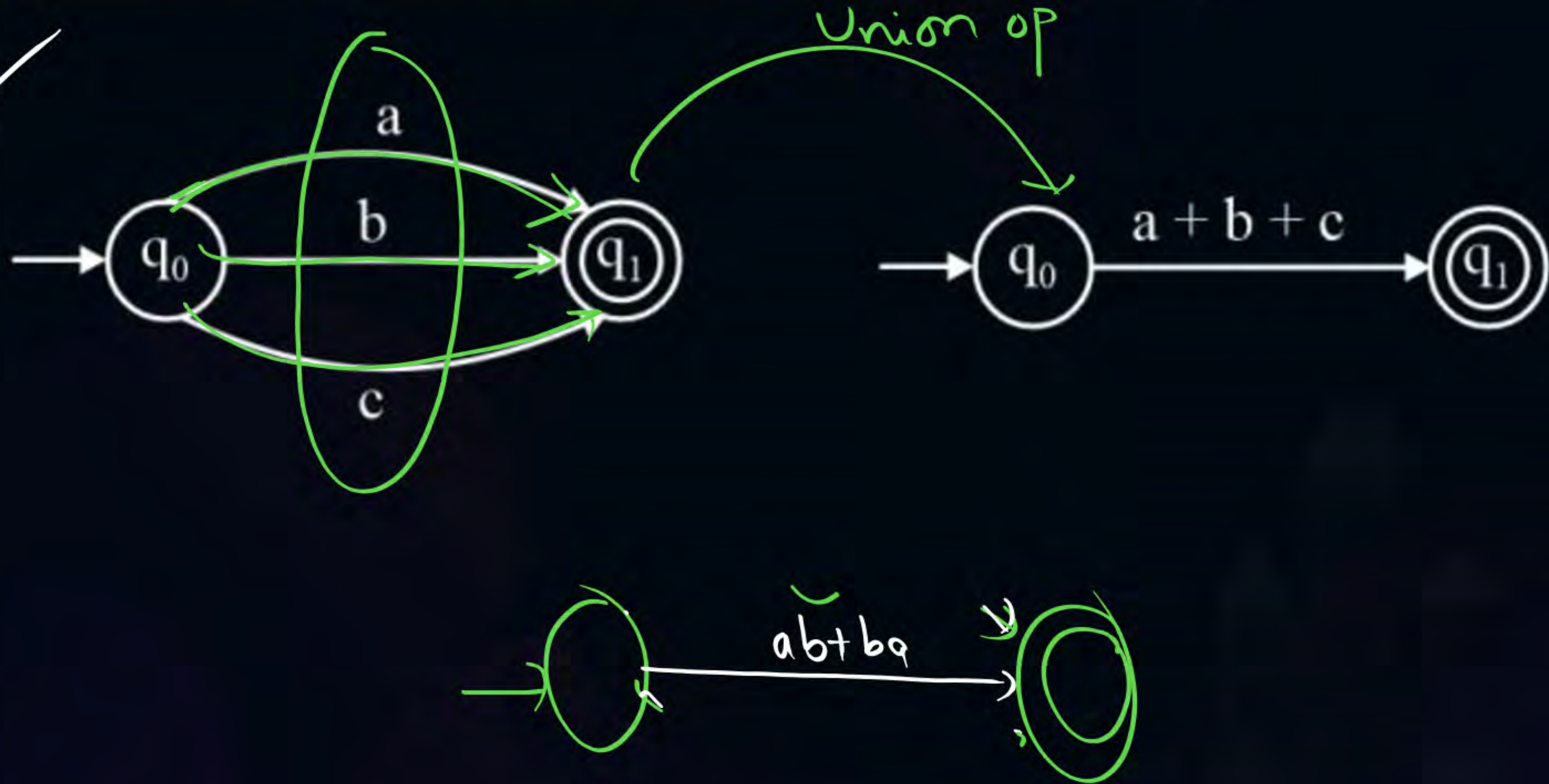
S.E





Topic : Finite Automata to Regular Expression

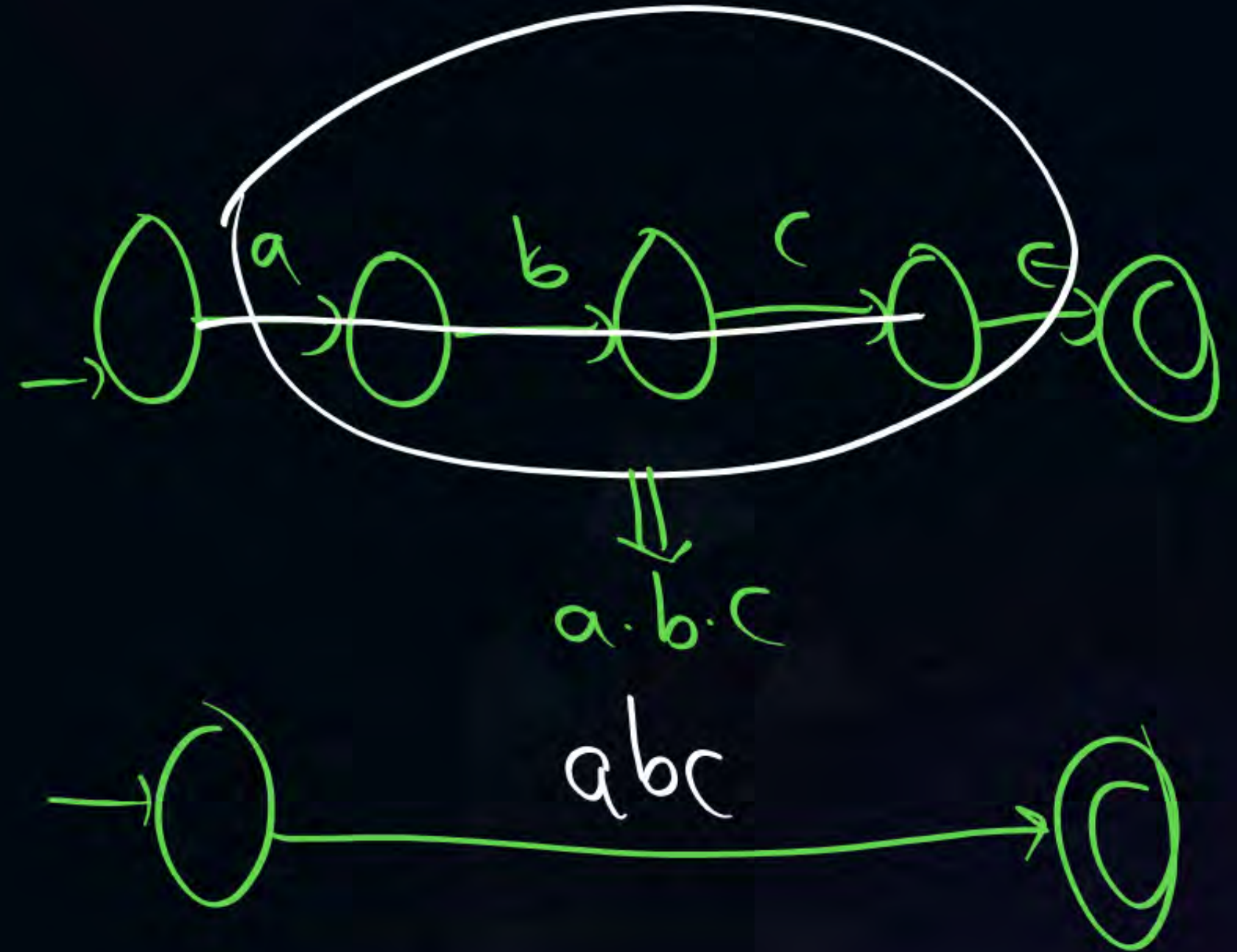
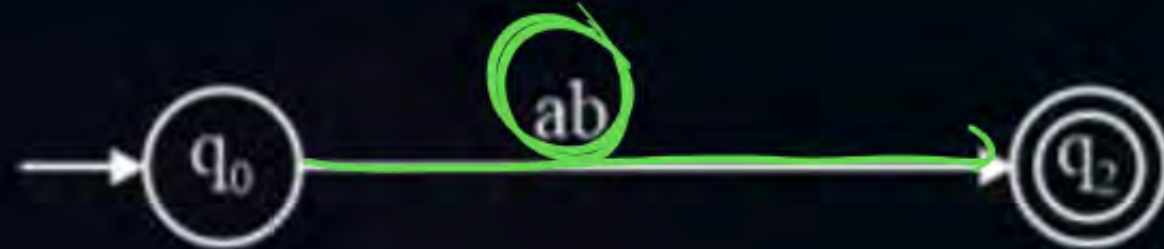
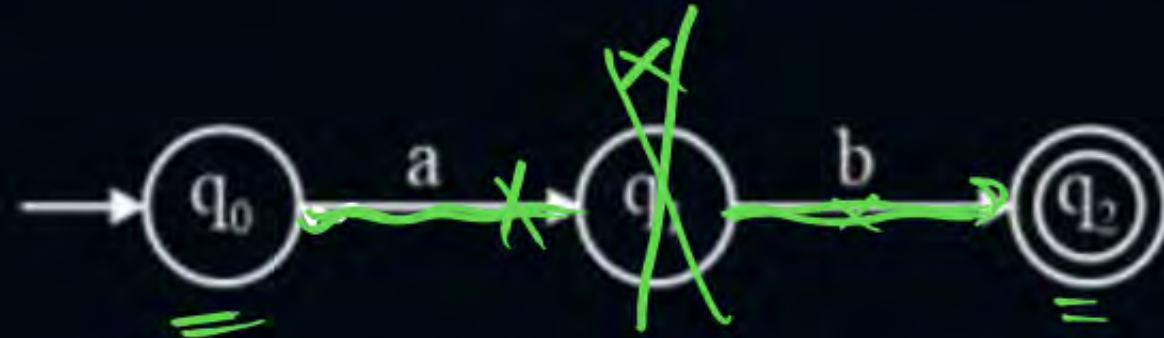
(2)





Topic : Finite Automata to Regular Expression

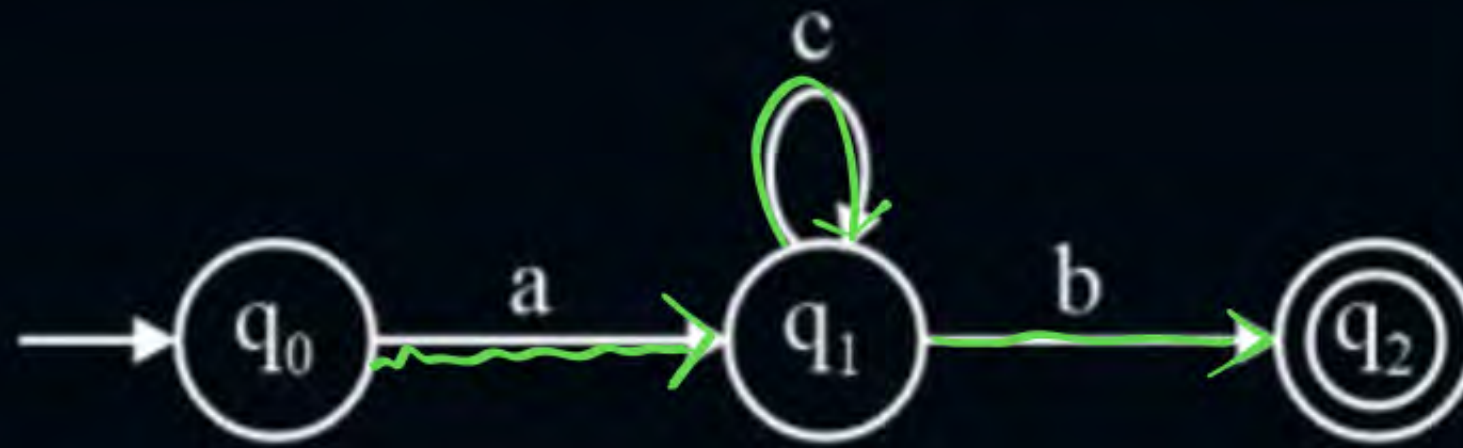
(3)



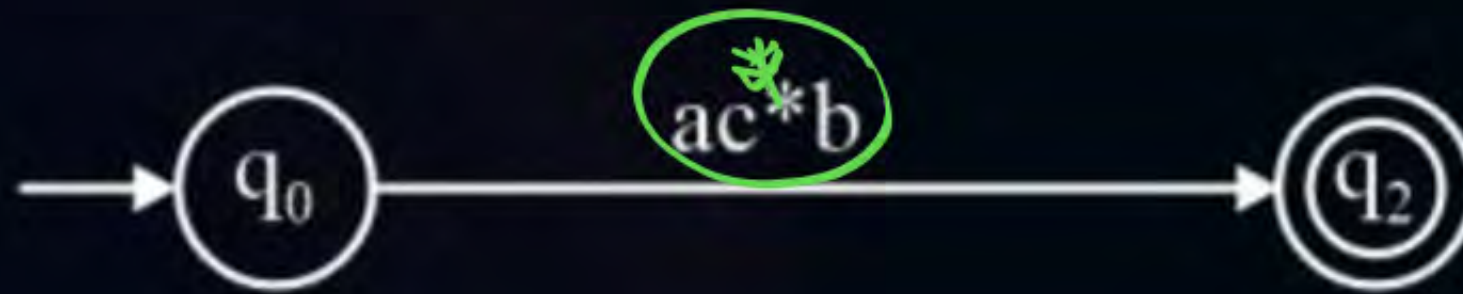


Topic : Finite Automata to Regular Expression

(4)



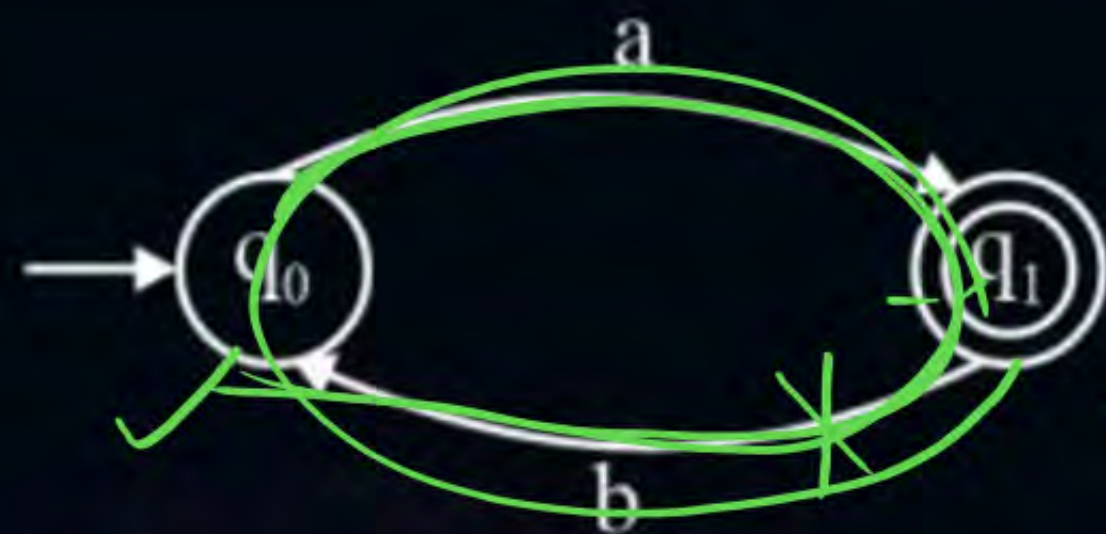
Self Loop \Rightarrow Kleene closure op



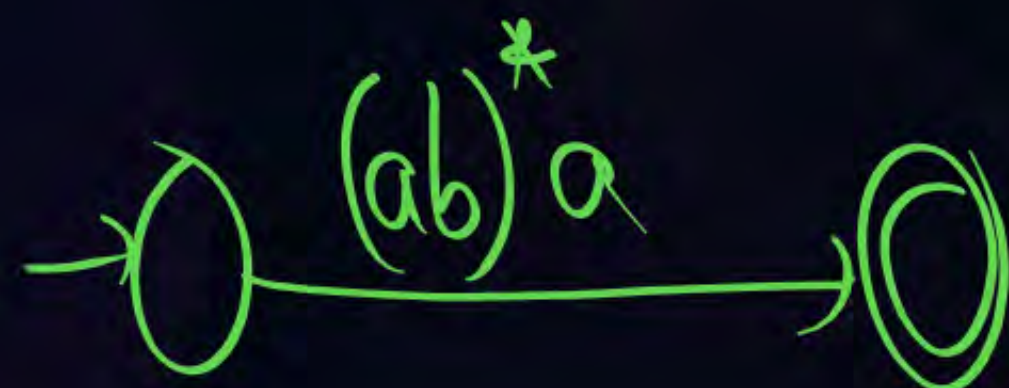
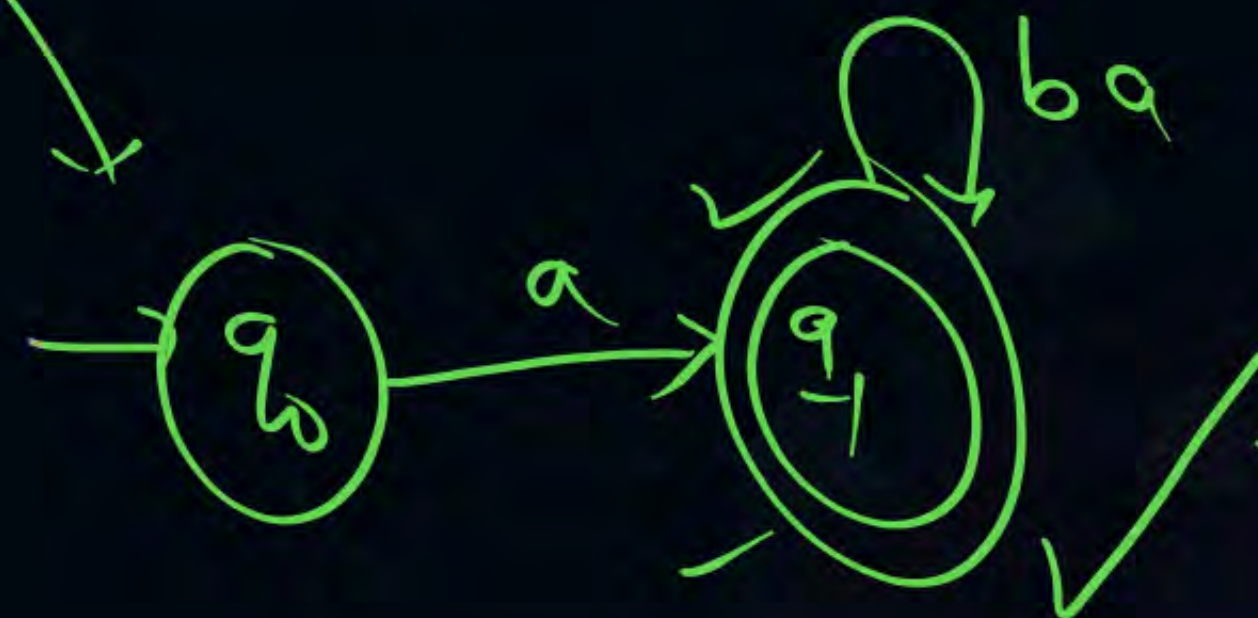
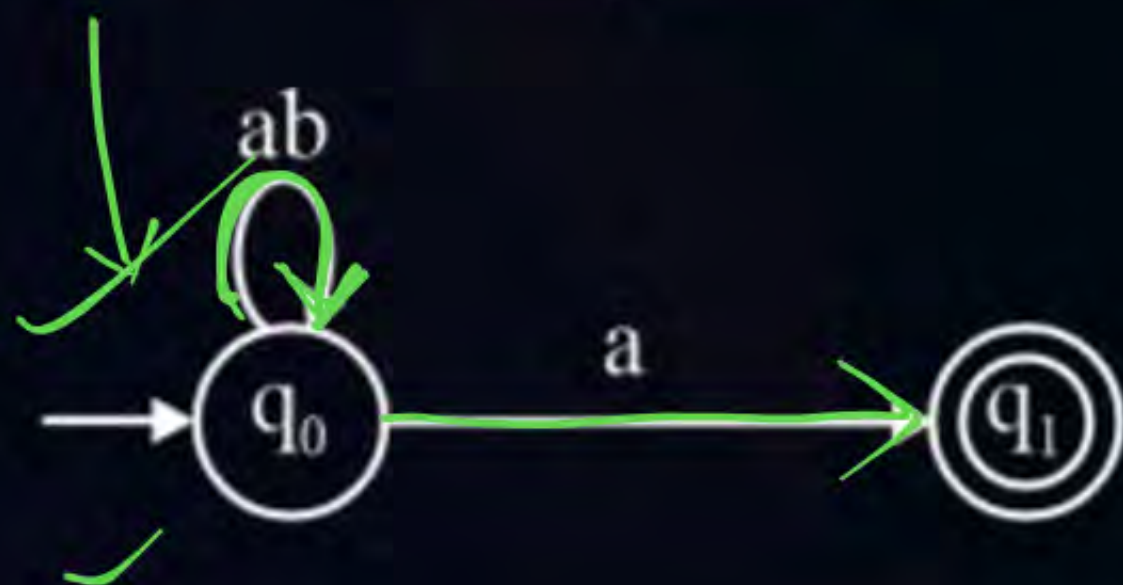


Topic : Finite Automata to Regular Expression

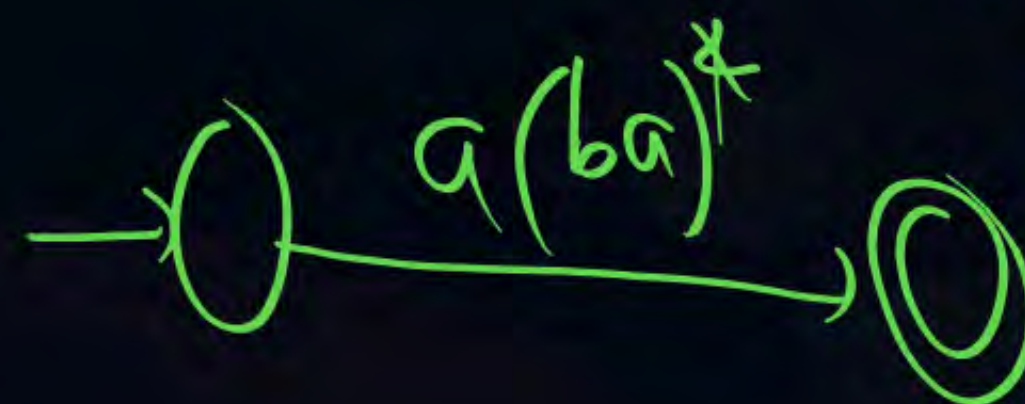
(5)



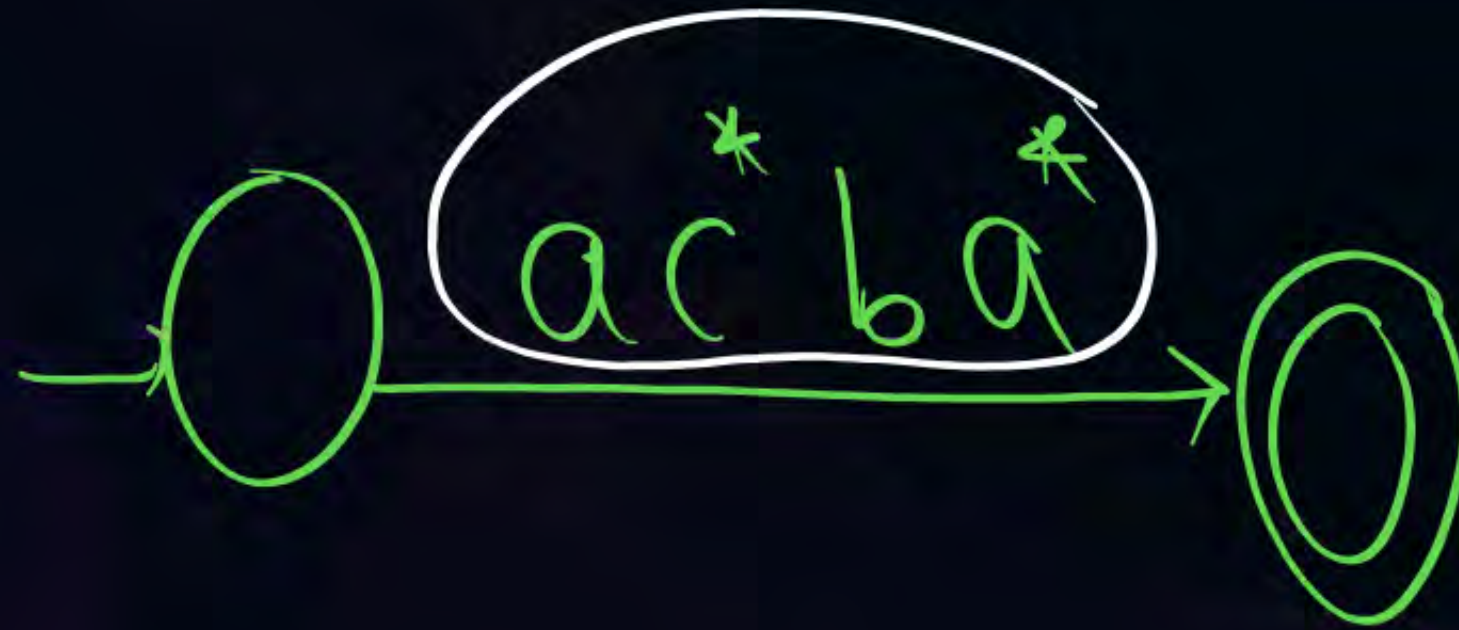
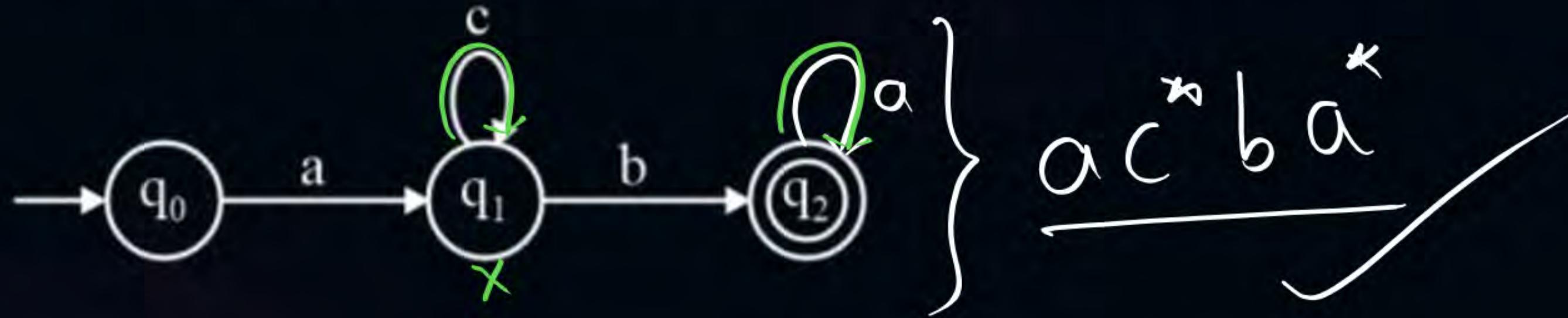
Cycles:
Reverse Edge



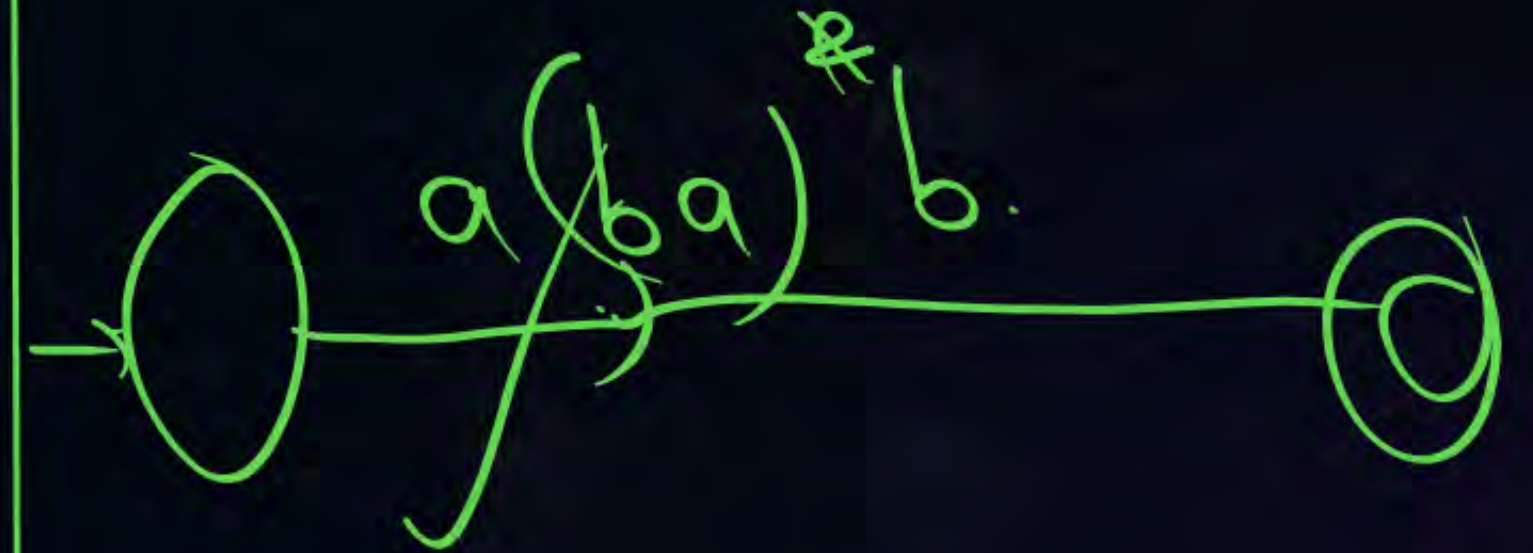
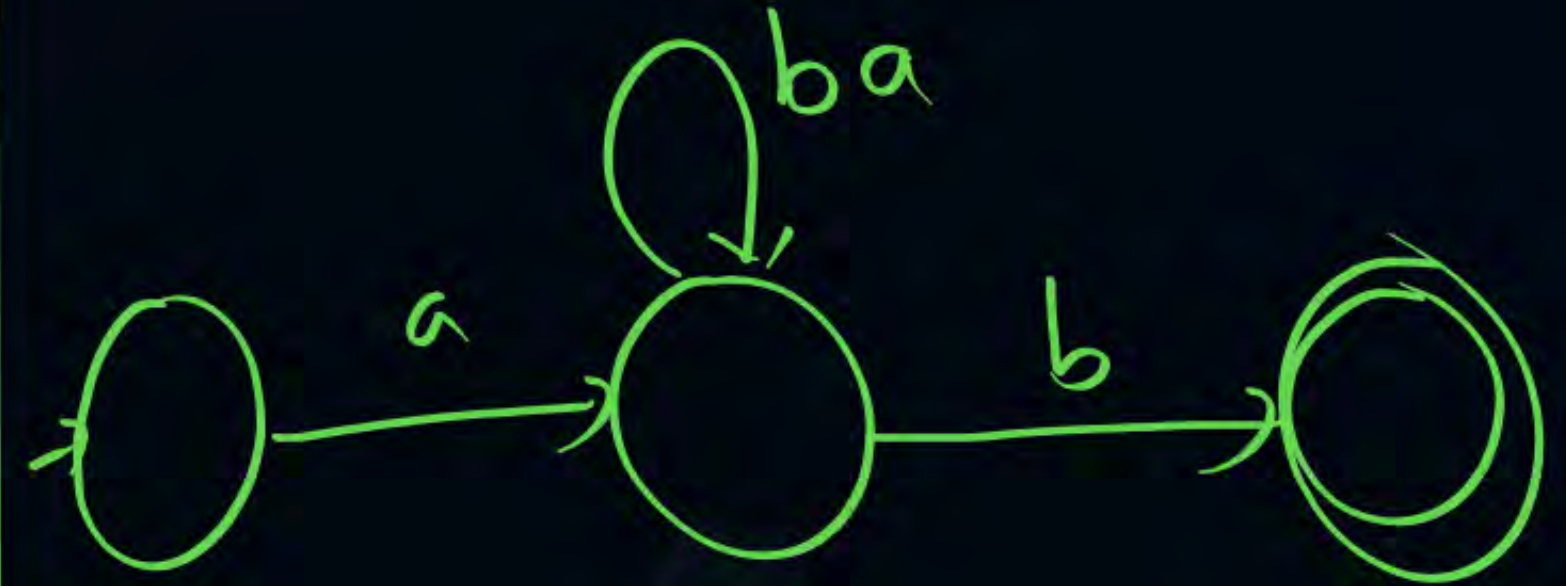
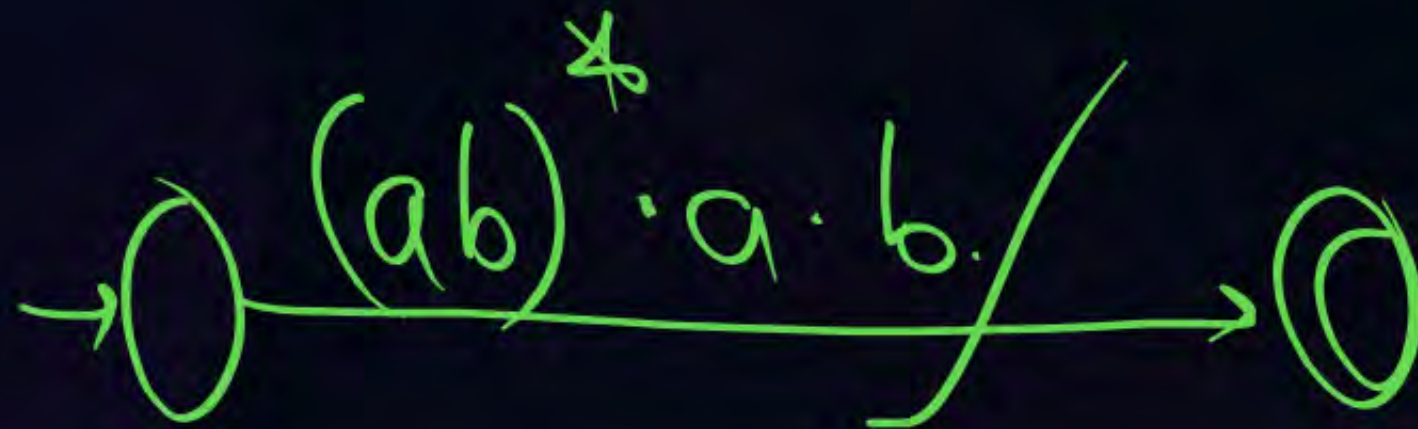
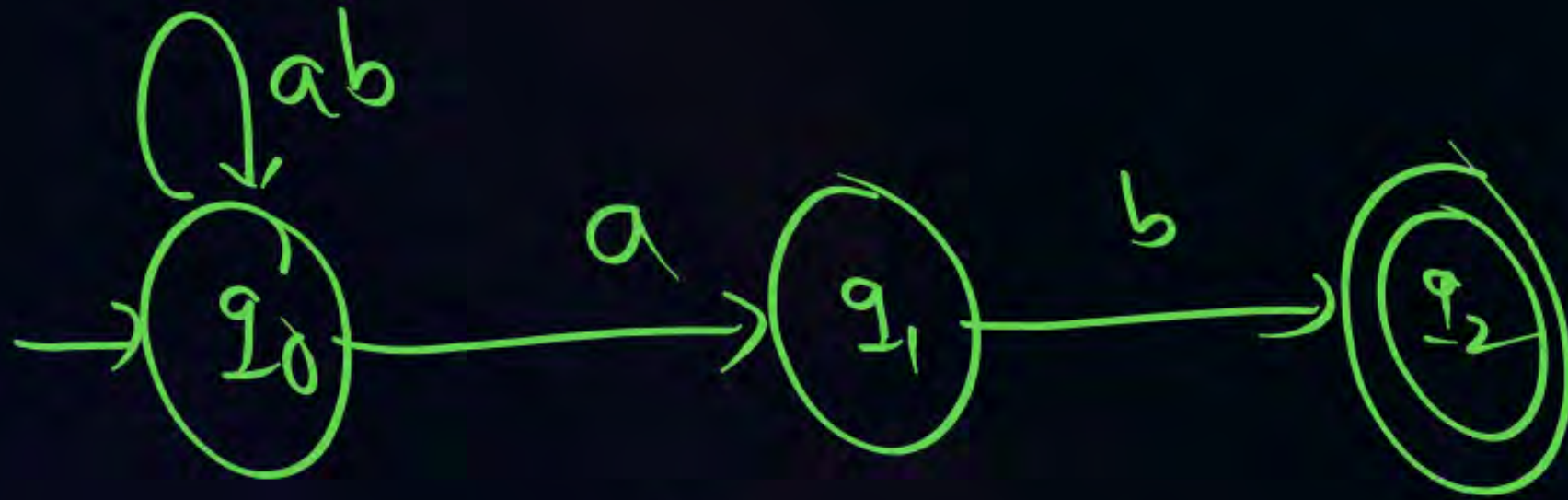
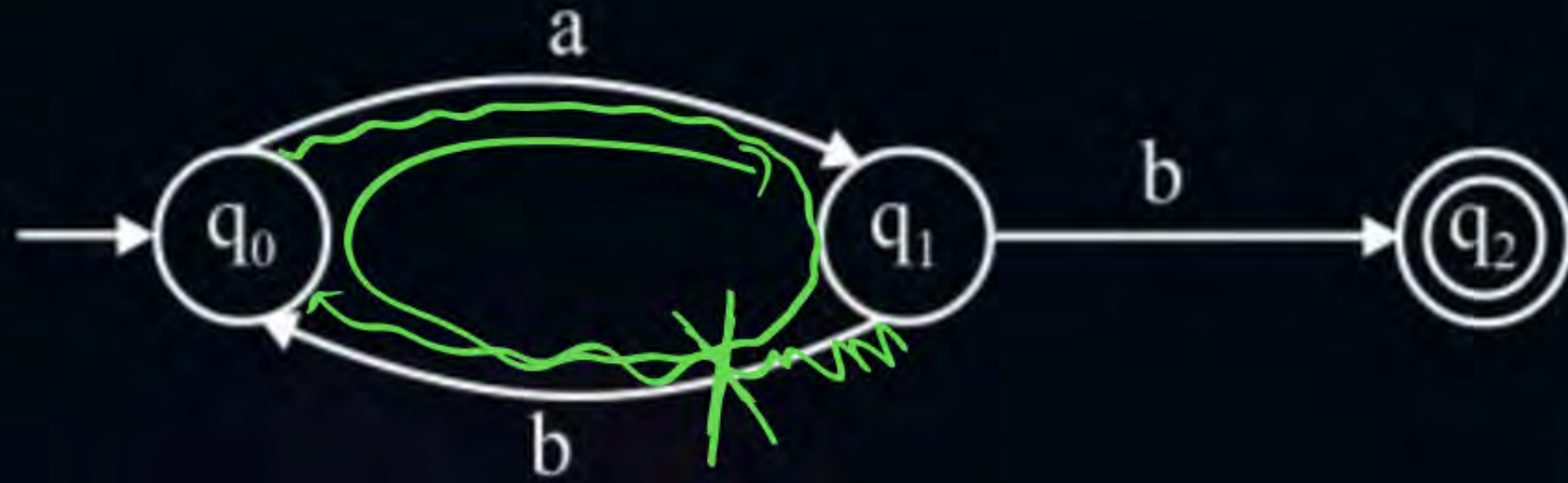
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#Q. Construct Regular Expression for the following Finite Automata.

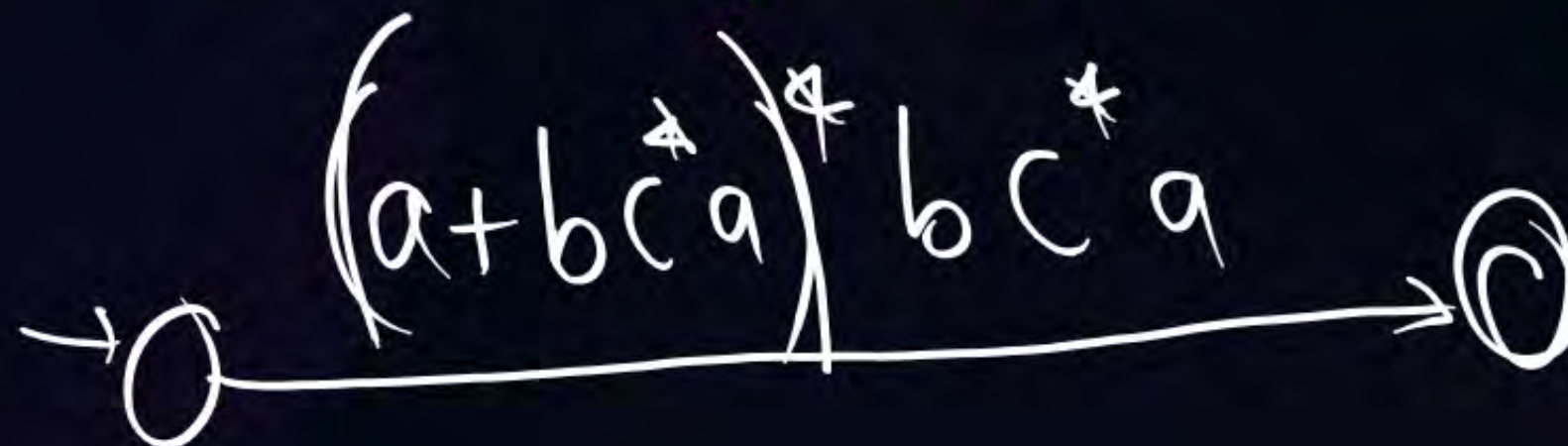
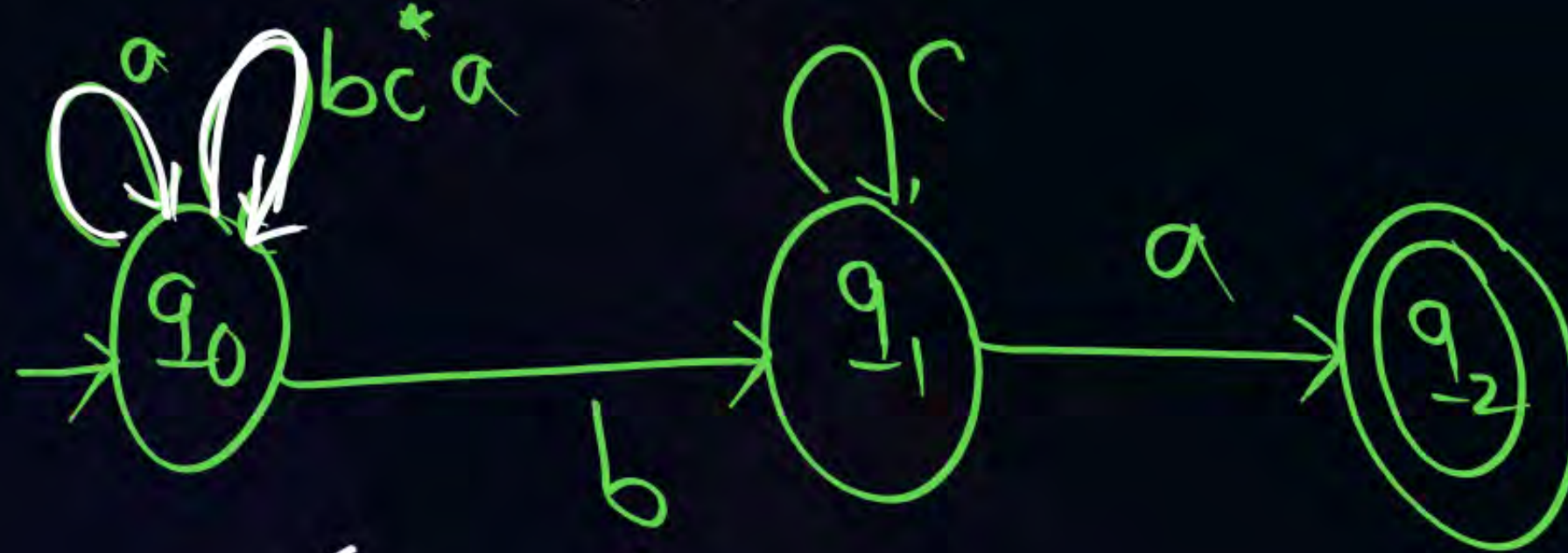
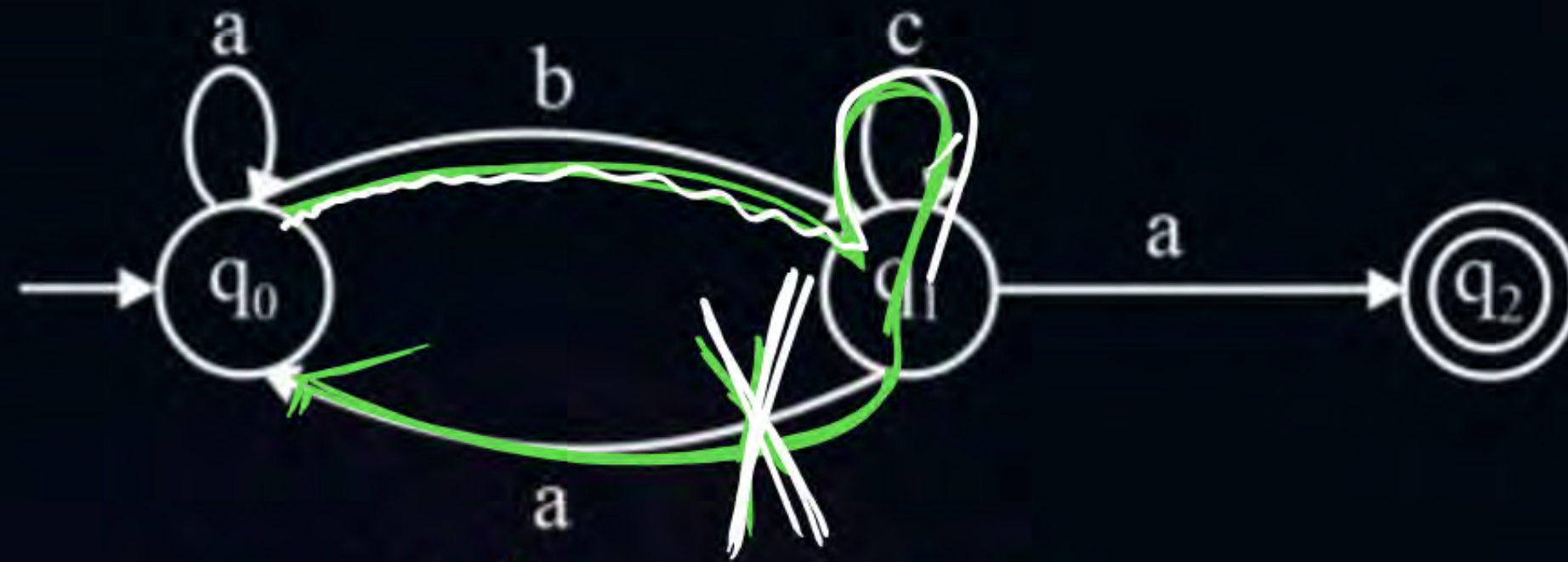


#Q. Construct Regular Expression for the following Finite Automata



#Q. Construct Regular Expression for the following Finite Automata

~~a.b*~~



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

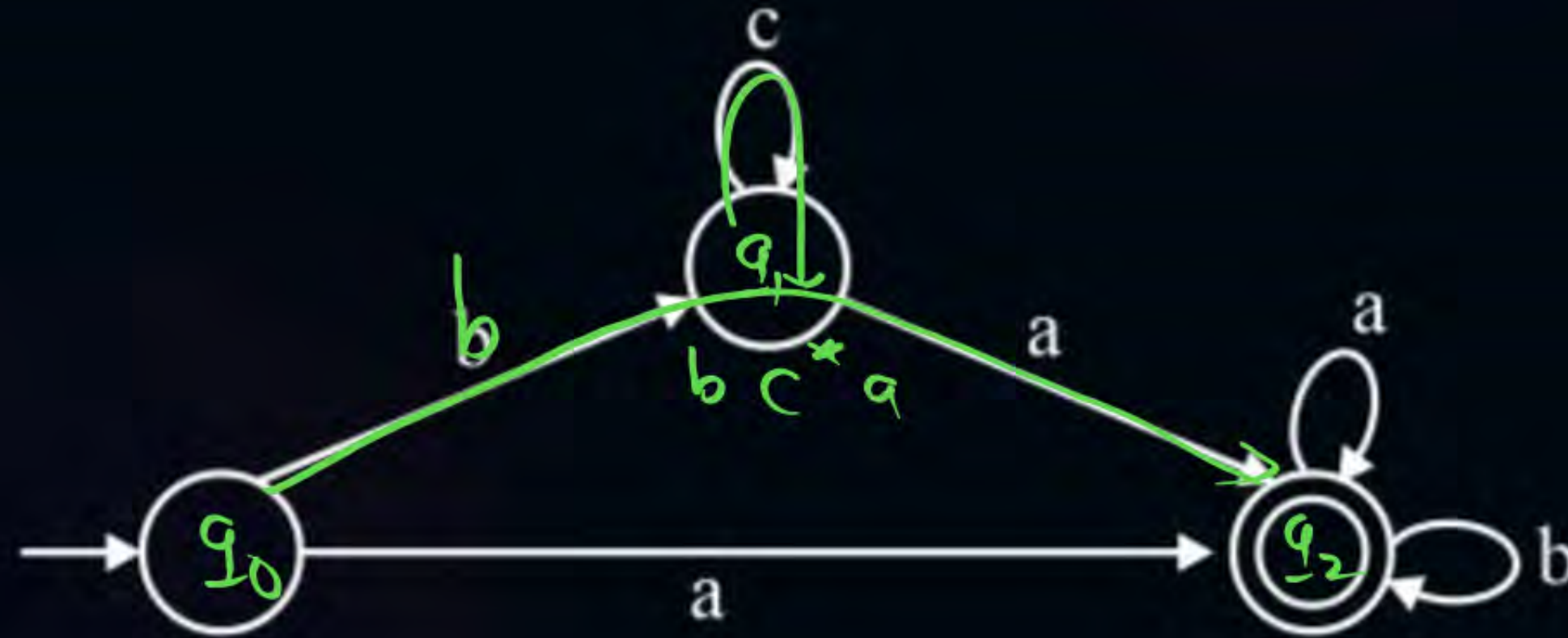


$$= \Sigma^*$$

Complete language

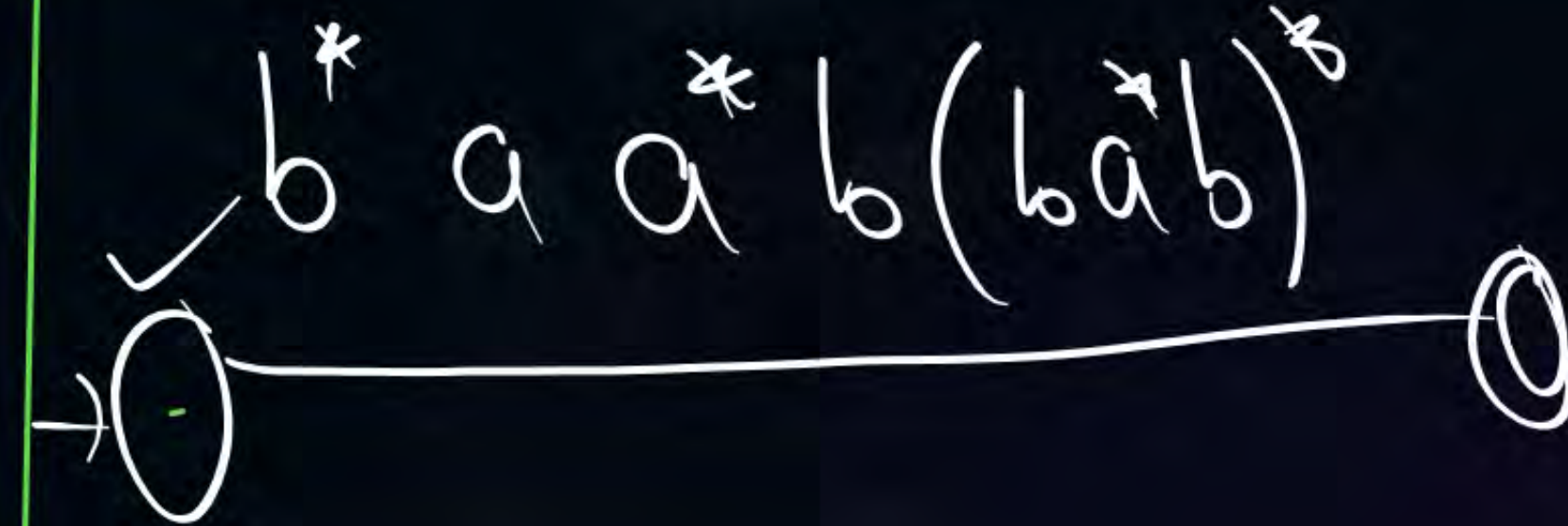
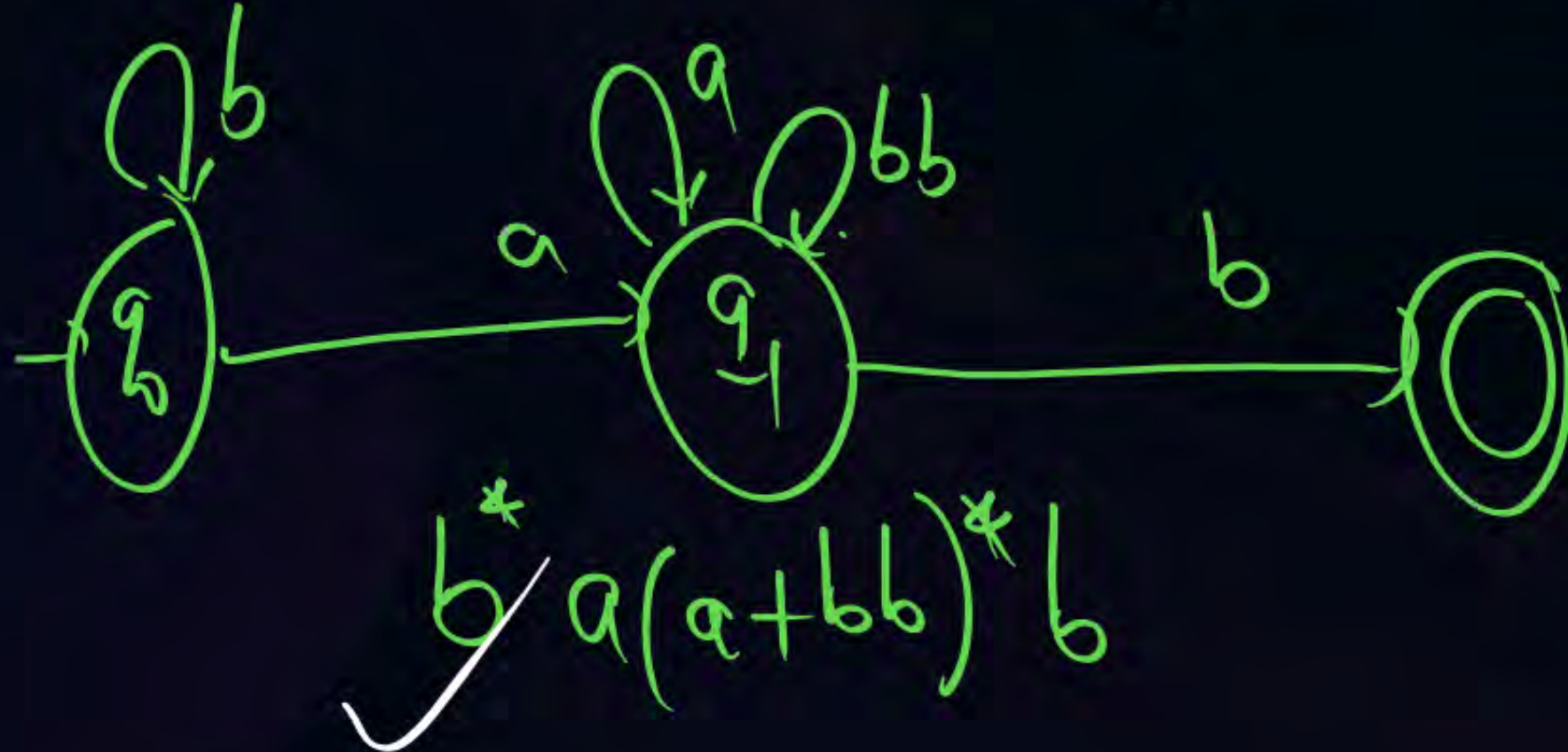
$$(a+b)^*$$

#Q. Construct Regular Expression for the following Finite Automata



MSQ

#Q. Construct Regular Expression for the following Finite Automata

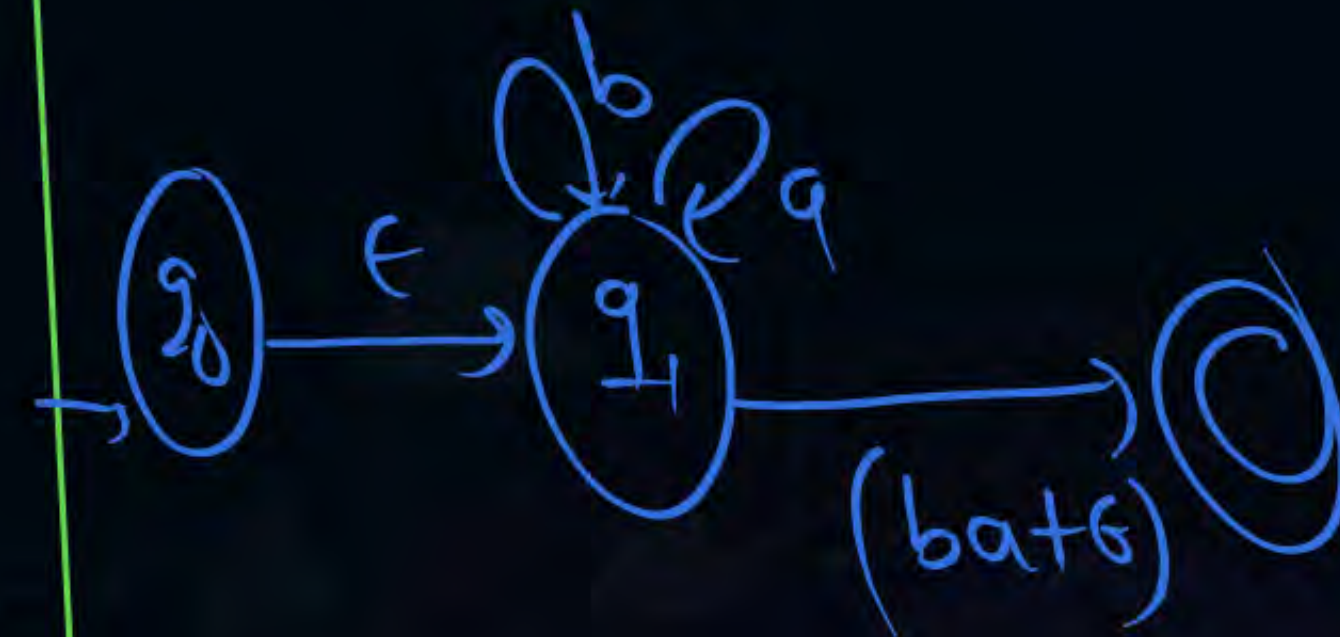
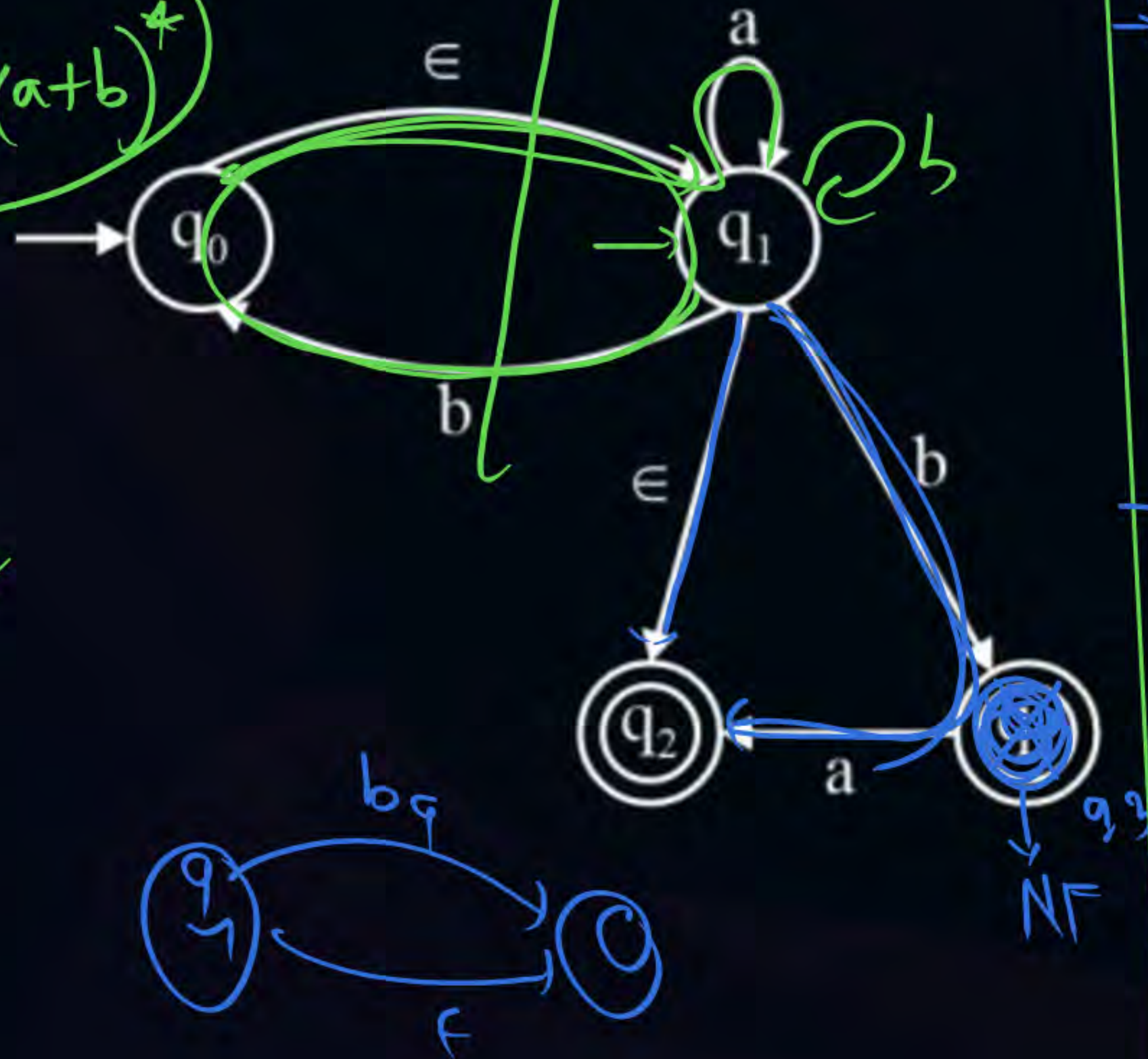


$$(a+b)^* (ba+\epsilon)$$

Construct Regular Expression for the following Finite Automata

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

$$(a+b)^*$$

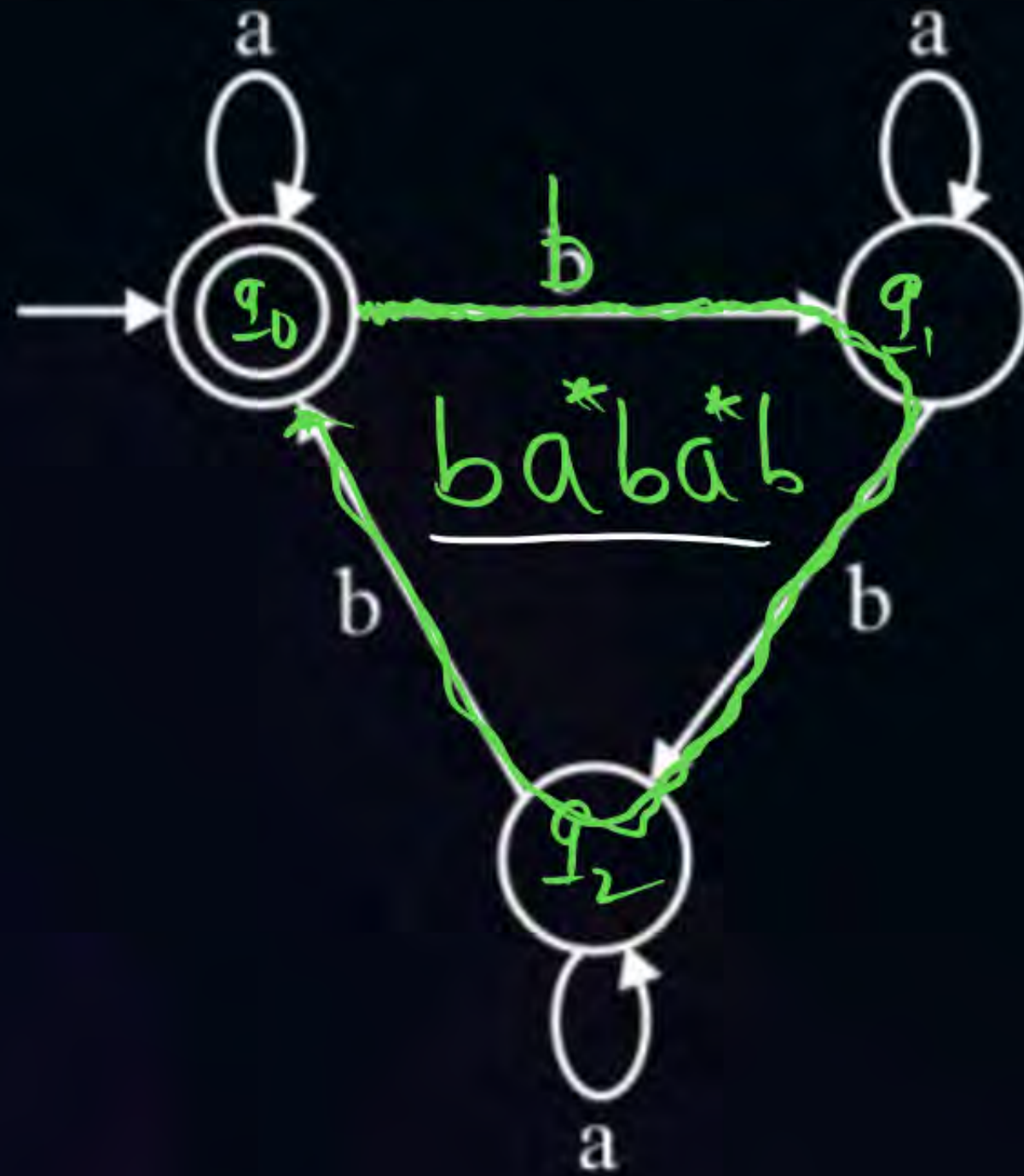


$$(a+b)^* (ba+\epsilon) = (a+b)^*$$

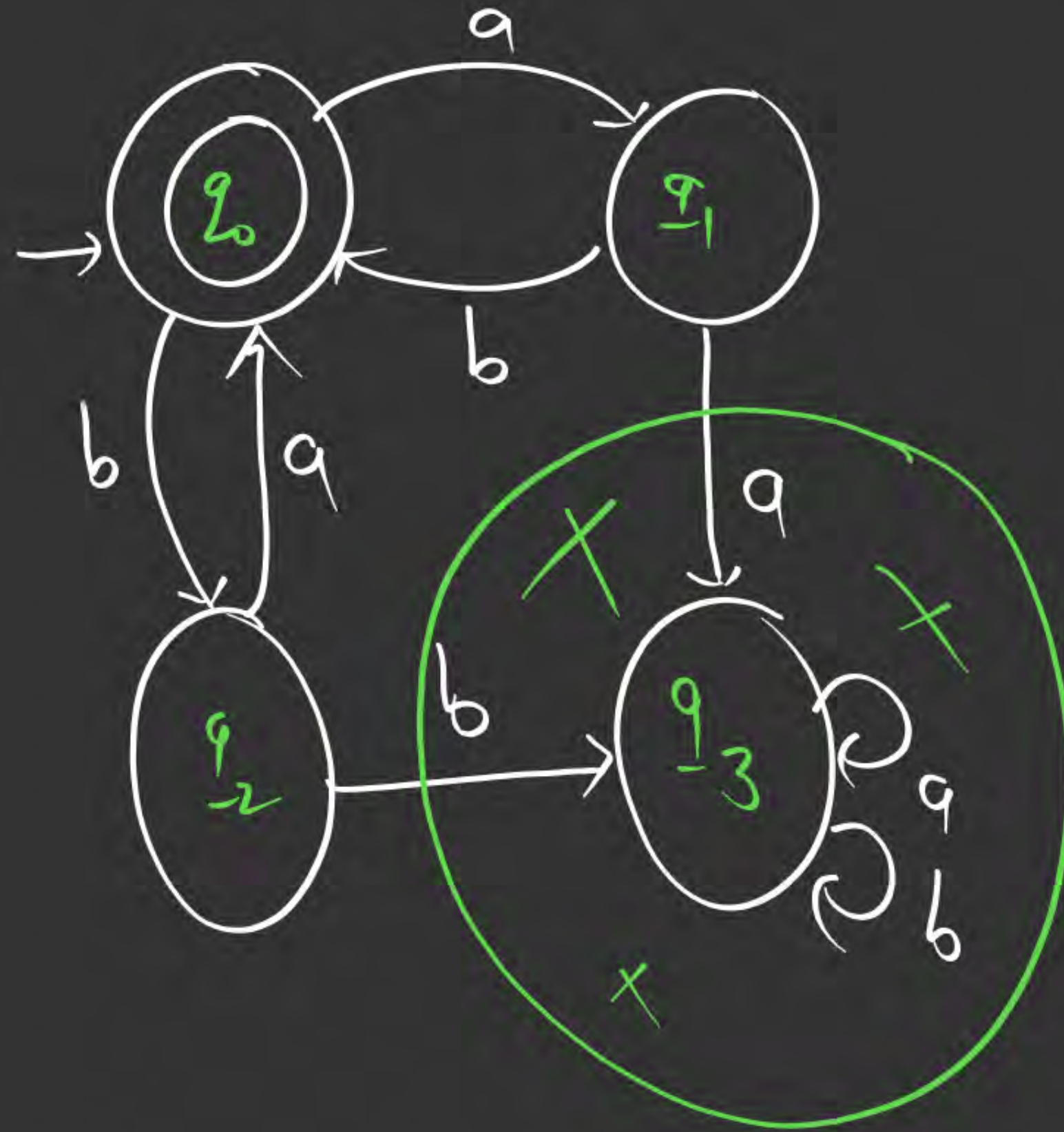
$$\underbrace{(a+b)^*}_{\text{Super}} + \underbrace{a^*}_{\text{Sub}} = \underline{\underline{(a+b)^*}}$$

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

#Q. Construct Regular Expression for the following Finite Automata



$$\underline{[a+ba^*ba^*b]^*}$$



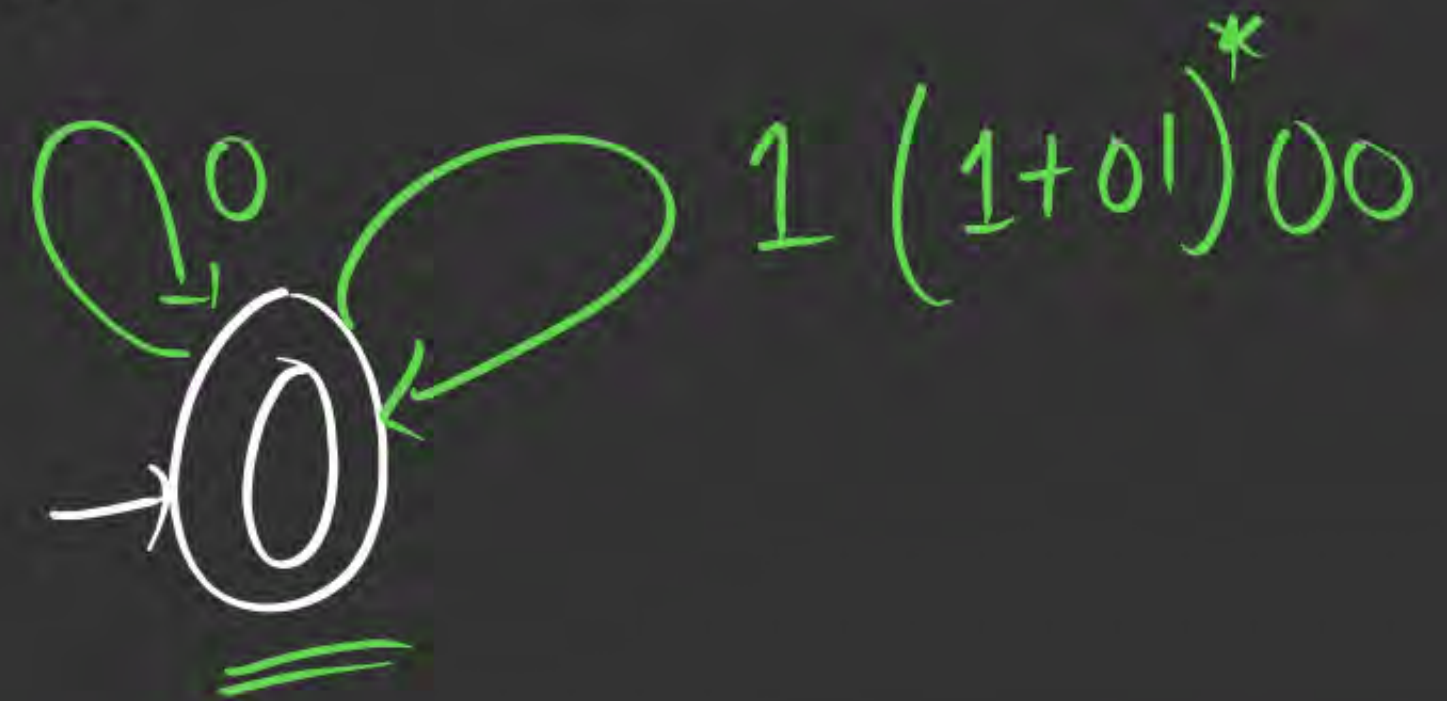
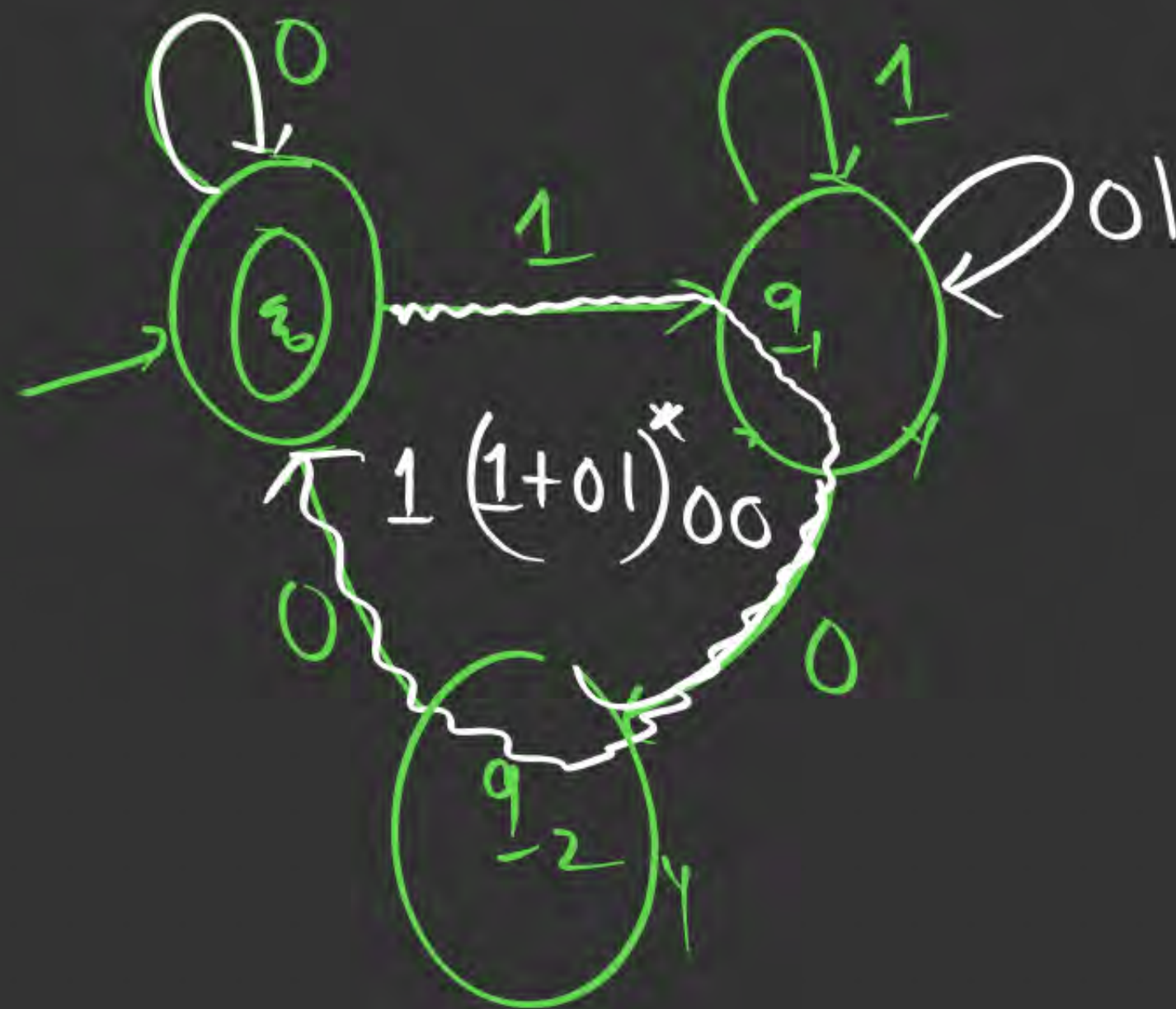
Remove
(Dead State)

q_3 is Dead state

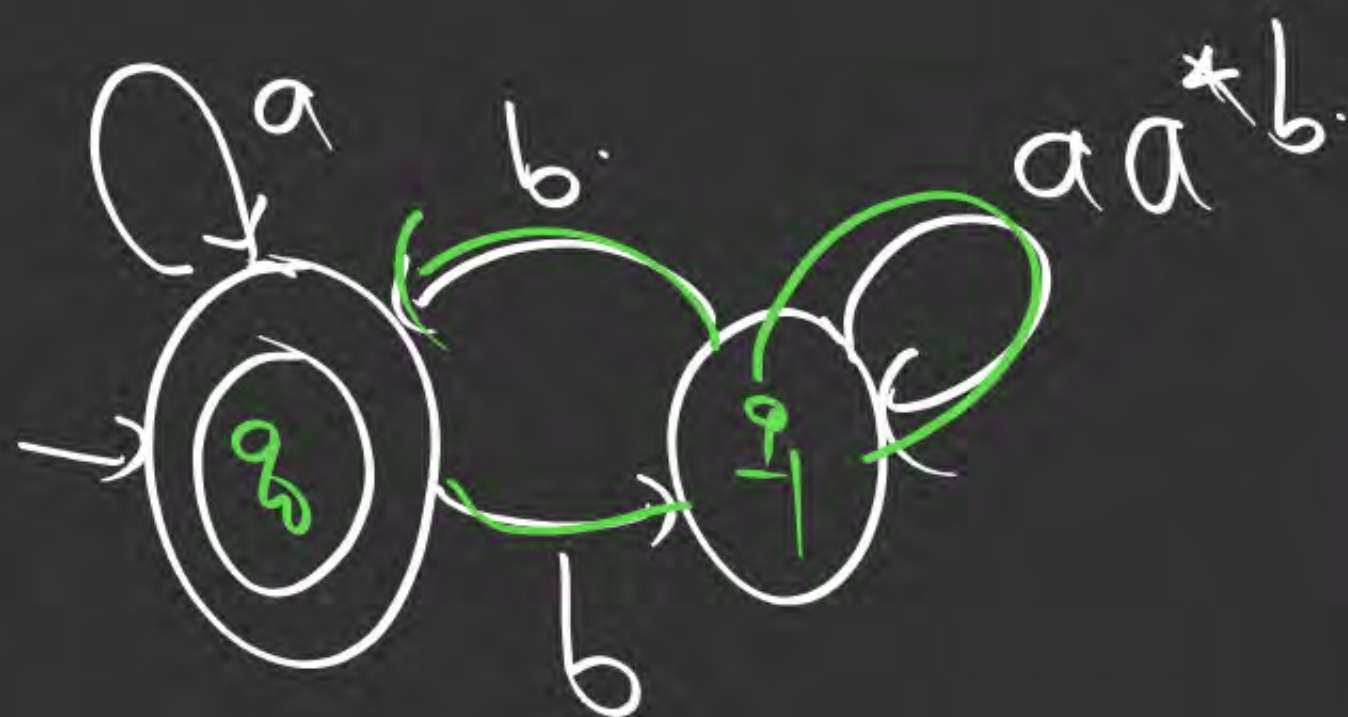
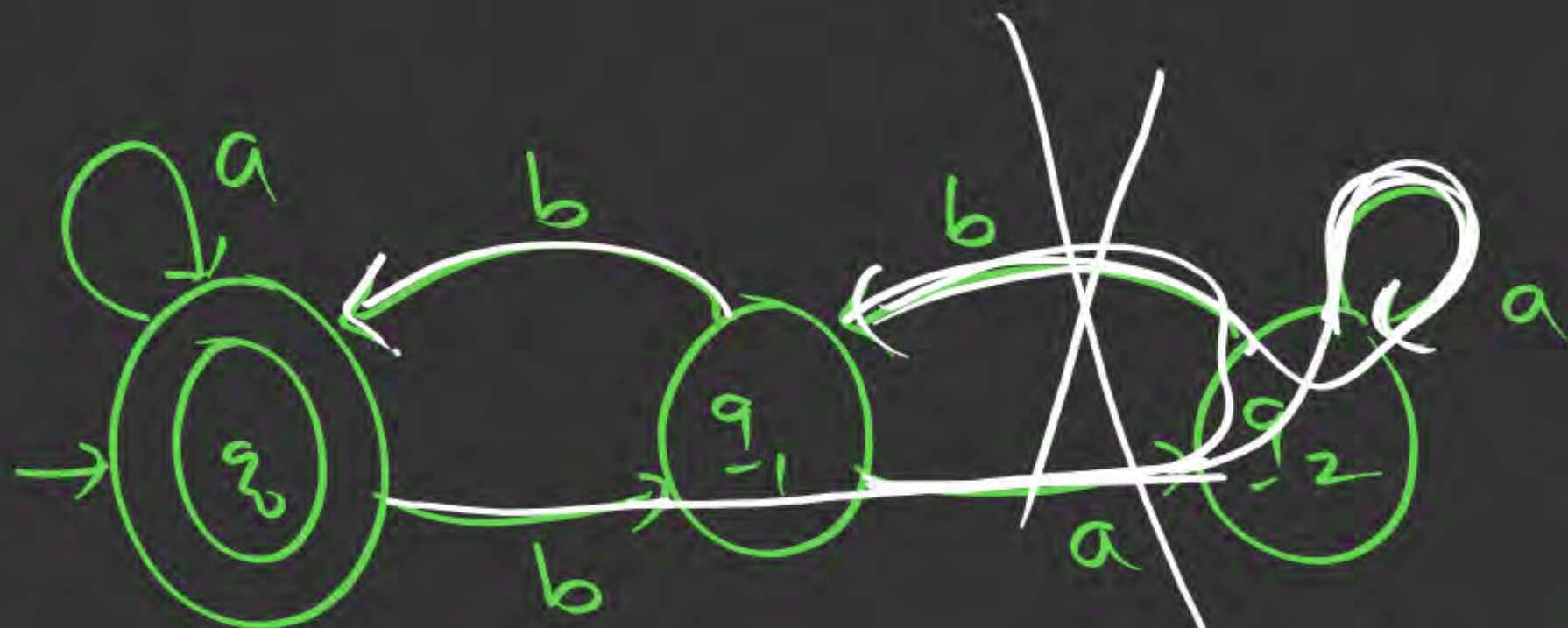


$(ab+ba)^*$

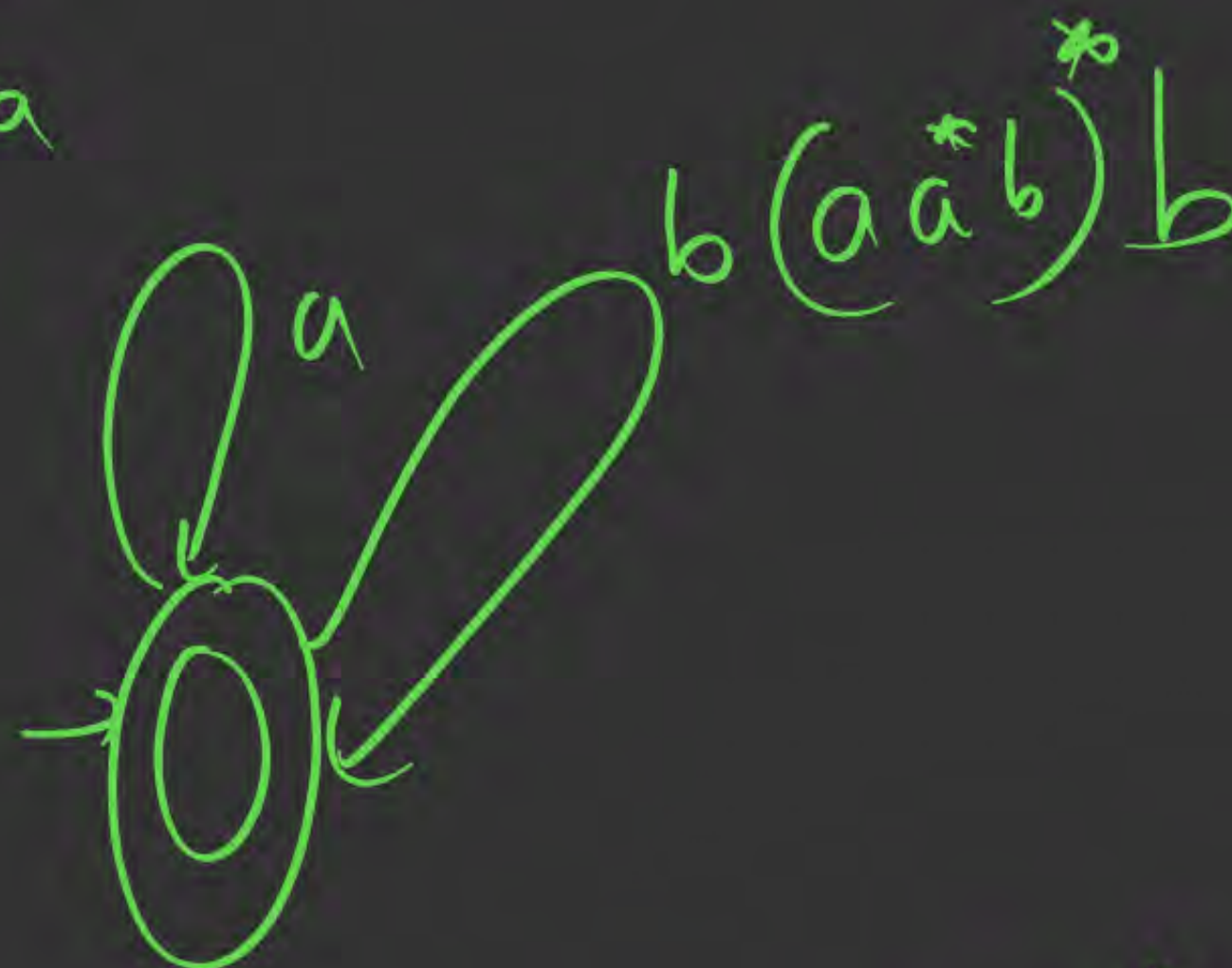
Regular Expression?



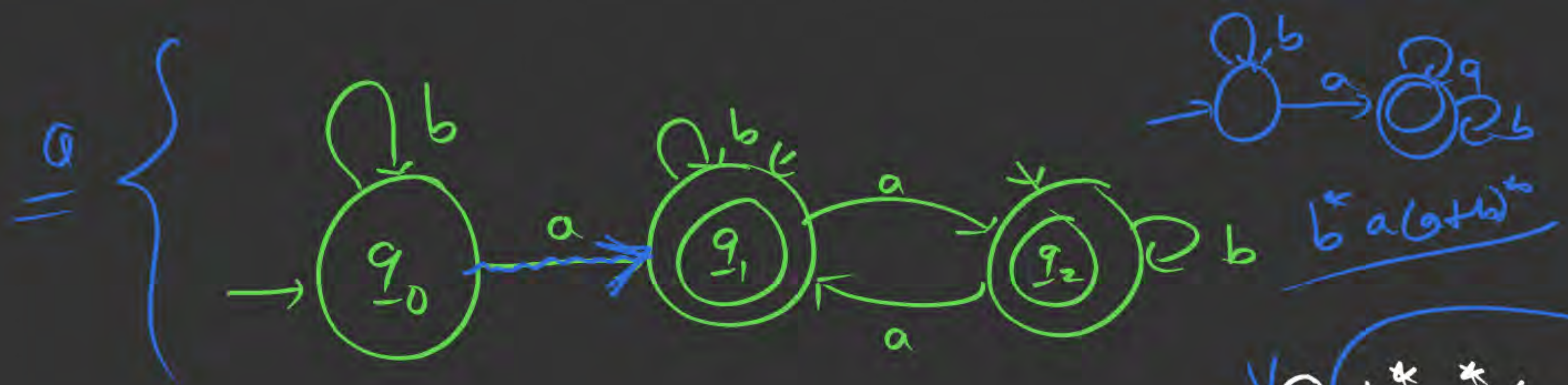
$$\left[0 + 1(1+01)^* 00 \right]^*$$



$$\underline{a \cdot a^* = a^+}$$



$$\frac{\left[a + \underset{a^+}{\underbrace{b(aa^*b)^*b}} \right]^*}{\cancel{\left[a + b(a^+b)^*b \right]^*}}$$



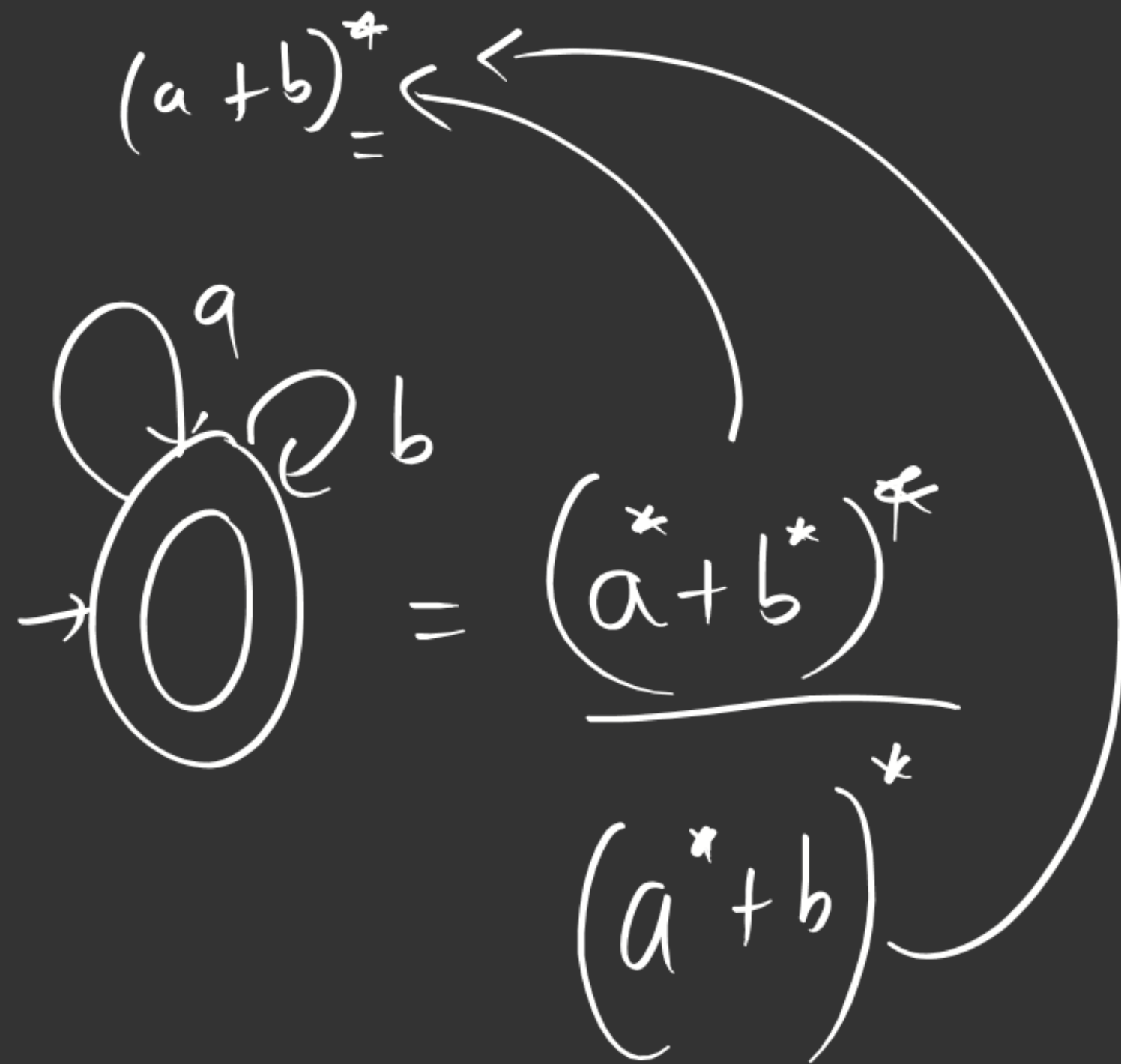
Which of the following
Regular Expression is
accepted by given DFA?

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

~~(b) $b^* \overline{a(a+b)}$~~

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

ab ~~(d) $(ba)^* \underline{a} (ab)^* \underline{b}$~~



[MCQ]



#Q. Which one of the following regular expressions is equivalent to the language accepted by the DFA given below? [GATE-CS-shift-II-24; 1M]

- A $0^*1(0+10^*1)^*$
- B $0^*(10^*11)^*0^* \in X$
- C $0(1+0^*10^*1)^*0^* \in X$
- D $0^*1(010^*1)^*0^* \in X$
 $0^*1111111111$



[MCQ]



#Q. Let M be the 5-state NFA with ϵ - transitions shown in the diagram below. Which one of the following regular expressions represents the language accepted by M? [GATE-CS-shift-II-24: 2M]

$$\epsilon \cdot 0 \cdot \epsilon = 0$$

A $0^* + (1 + 0(00)^*)(11)^*$

B $(00)^* + 1(11)^*$ X

C $(00)^* + (1 + (00)^*)(11)^*$ X

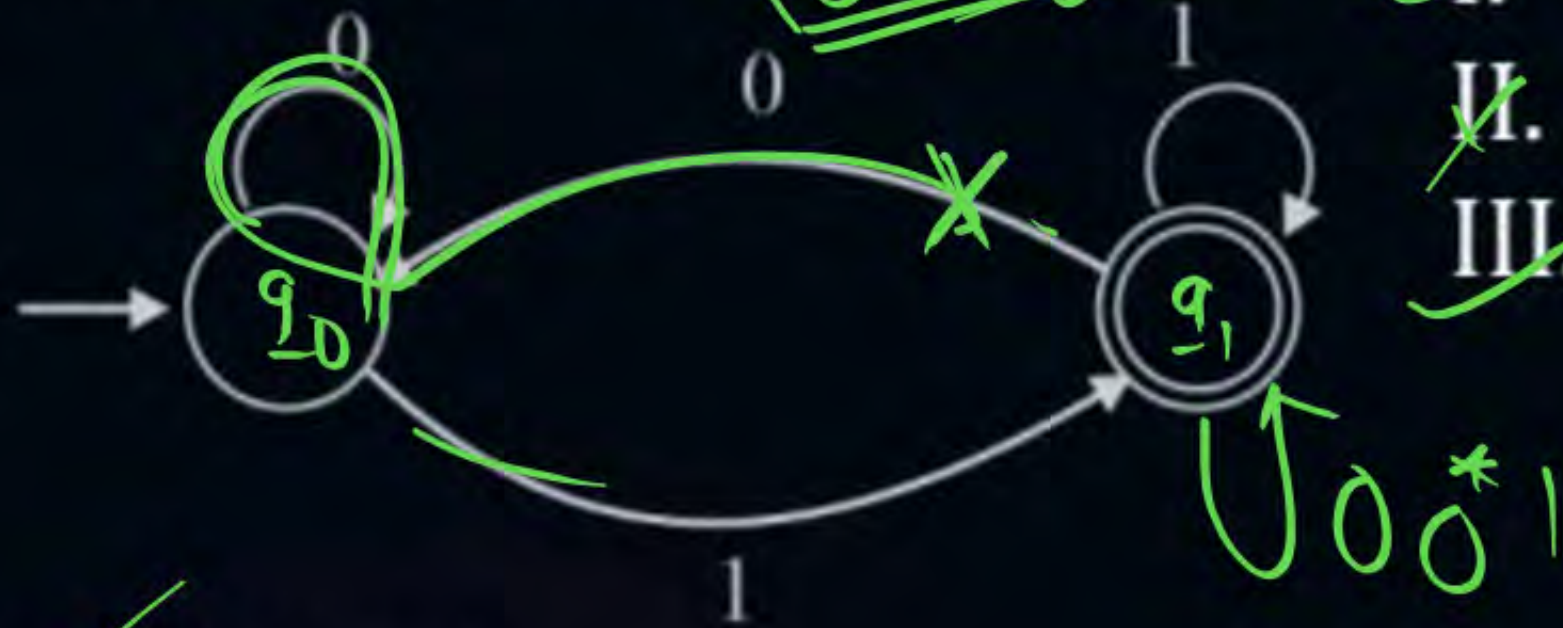
D $0^+ + 1(11)^* + 0(11)^*$ X



Q



Which of the regular expressions given below represent the following DFA?



I.

$$0^*1(1 + 00^*1)^*$$

II.

$$0^*1^*1 + 11^*0^*1^*$$

III.

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

[2014-Set1: 2 Mark]

$$\text{II) } 0^*1^+ + 1^+0^*1^*$$

0101



$$0^*1(1+00^*1)^*$$

A

I and II only

B

I and III only

C

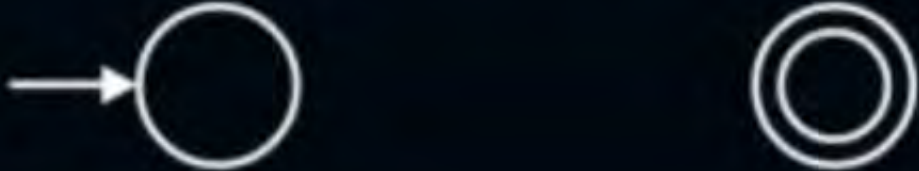

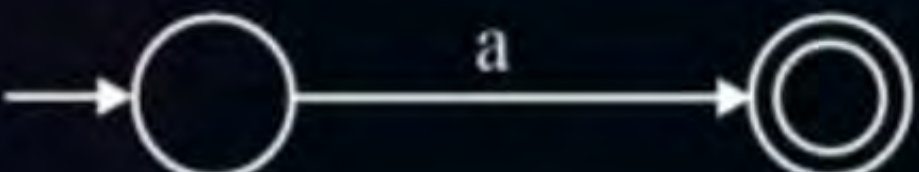

II and III only

D

I, II, and III



Topic : Regular Expression to Finite Automata Construction

Regular expression	ϵ -NFA
1. ϕ	
2. ϵ	
3. a	
4. $r_1 + r_2$	

THANK - YOU