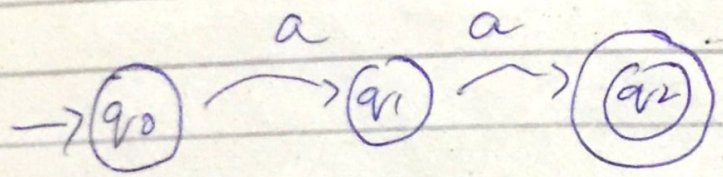
4) ~~Language~~

Finite Automata

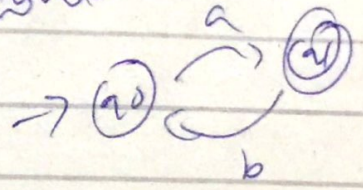
↳ Another method of defining languages.

↳ graphical method

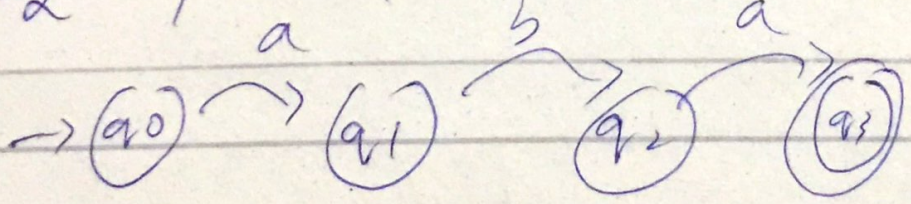
$L = \{aa\}$ → No. of states = Q
Initial state = q_0
Final state = F
letters in alphabet = Σ
transition = δ

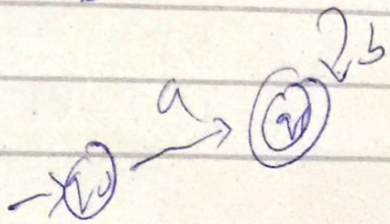


=> contain a + b



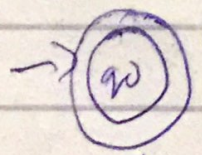
$L_2 = \{aba\}$





for no of a's

=> a^*



ab^*

=> start with a and contain any no. of b

=> any no. of a's and b's

$(a+b)^*$ → (+) a,b

=> starts with a

R.E $a(a+b)^*$

→ (q0) —a→ (q1) a,b

=> start with aa

$R = aa(a+b)^*$

example

$S = \{x, y\}$ starting with prefix

xy

R.E $xy(x+y)^*$

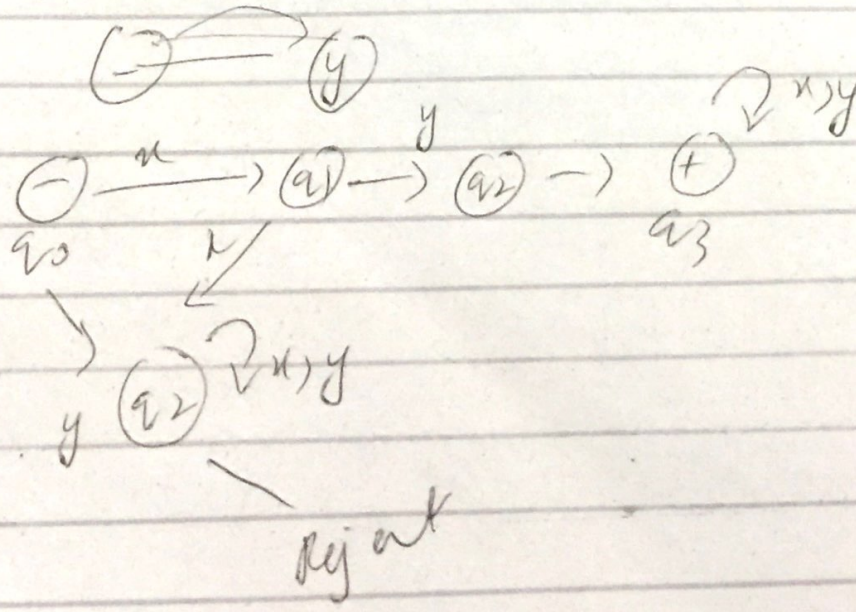
xxyy xx, yy

xyxy,

xy, yyy

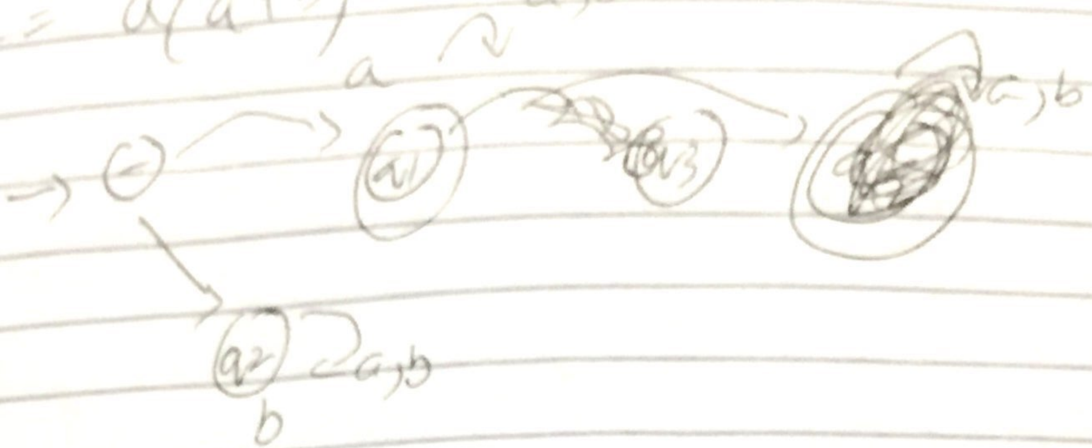
xyxx

DFA



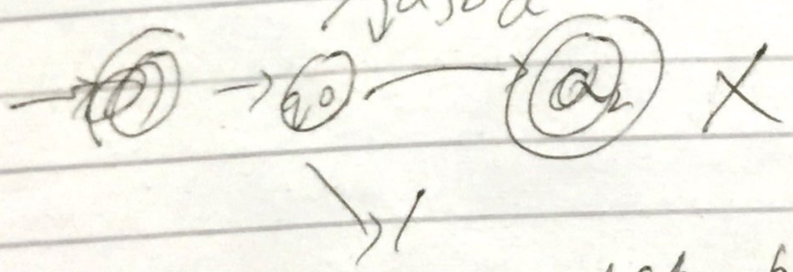
xx aayga

R = a(a+b)*



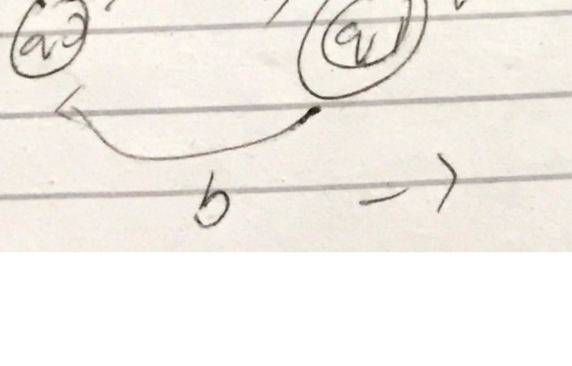
→ ends with a

R = (a+b)* a → This type of problems done by Jump back concept



2(a) a nahy ho tu galat hy!

aba, aa, a, ba, bbba, bbaa



aba ✓ abba ✓

Jumpback concept.

DFA for even numbers

even no of a's and b's

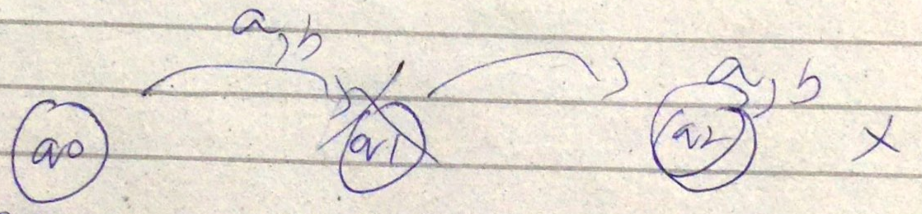
aa, bb, aabb, baba, abab,
aabb, abbabb

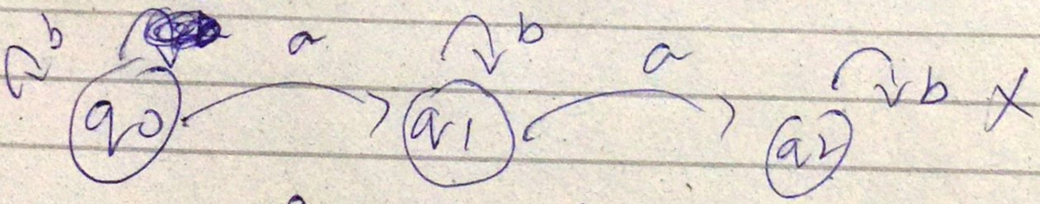
$[aa + bb + (ab + ba)(aa+bb)^* (ab + ba)]^*$

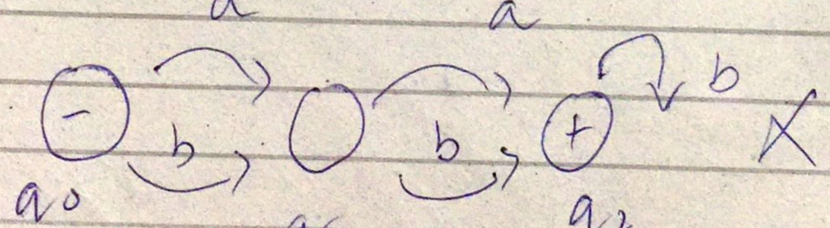
$(ab+ba)(ab+ba) = \left(\begin{array}{l} abab + baba \\ abba + baba \end{array}\right)$ ✓

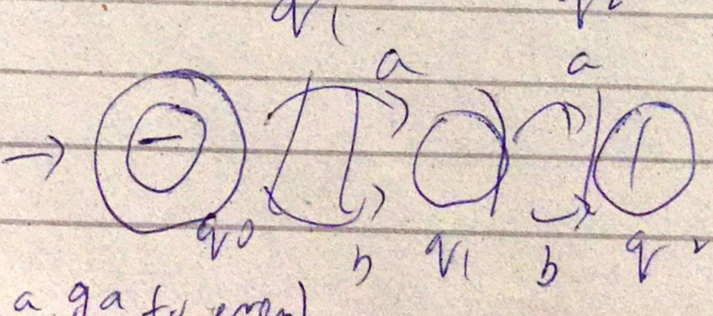
their product always be even

abaaab

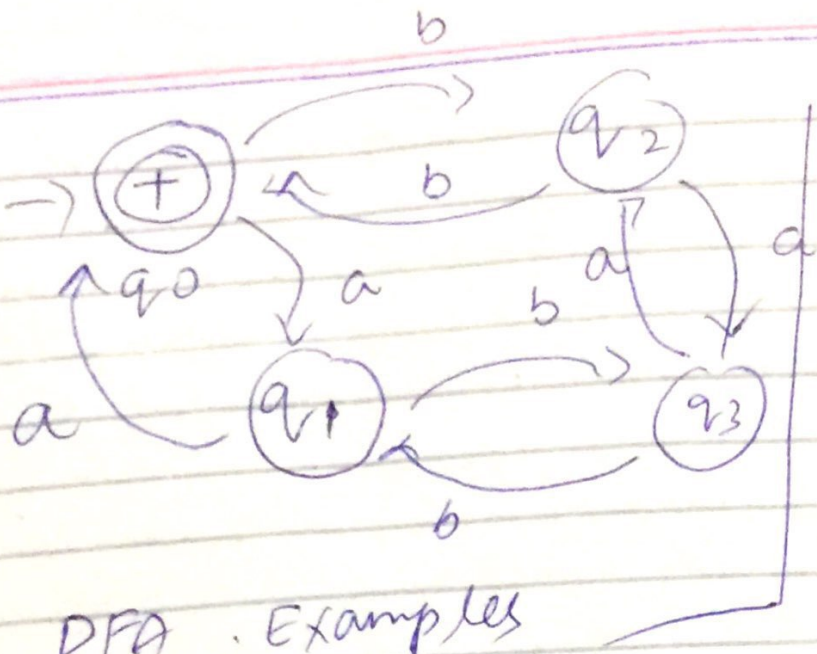




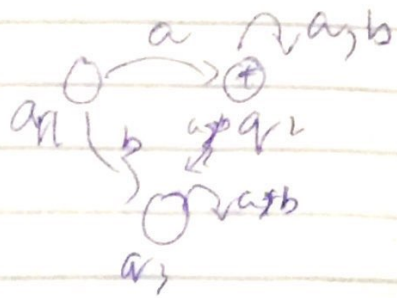




(0 ho a ga to even)



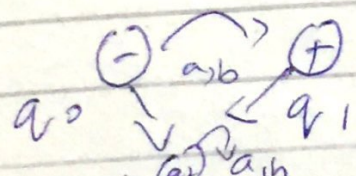
ab aa ab



DFA : Examples

* Draw DFA that accepts exactly a.

$R = a$

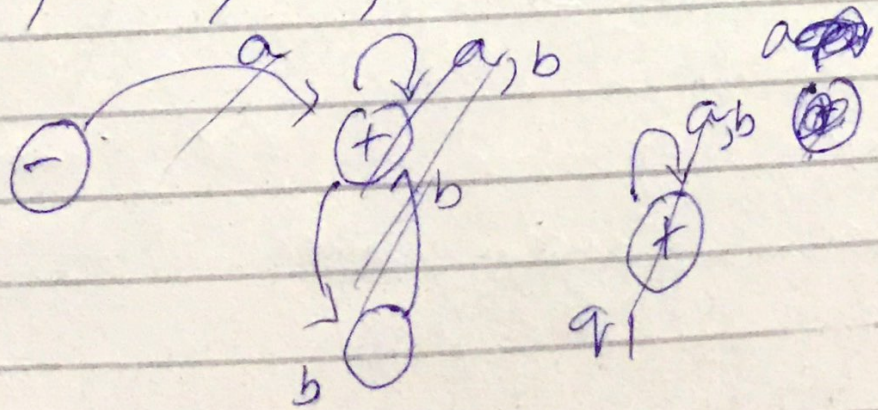


→ To reject karayga.

* Draw DFA that accept all words starting with a.

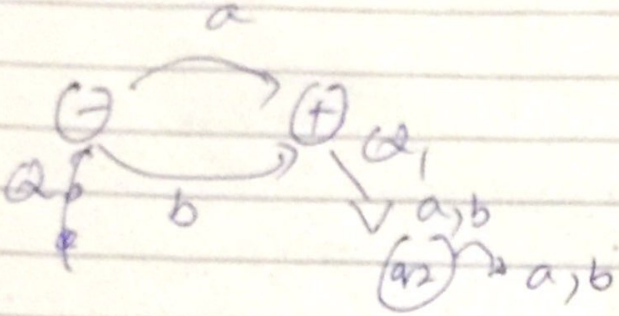
$a(a+b)^*$

a, ab, aa, aabb, abab, abbb, abba



③ FA that exaept exactly a or b

RE = a+b

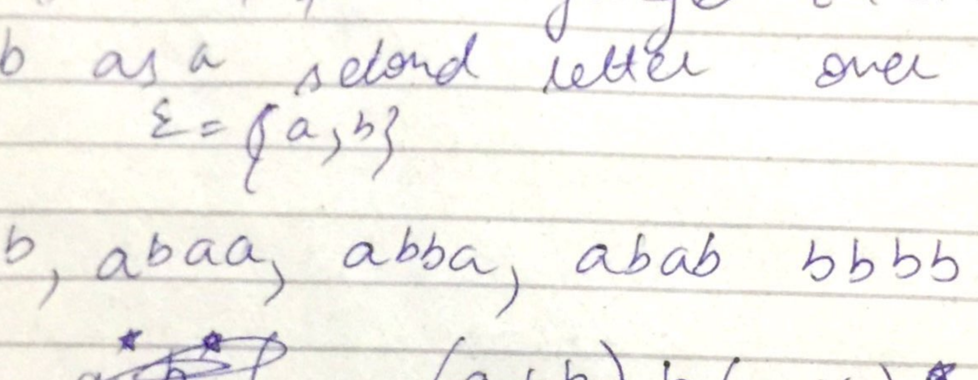


④ Draw FA for language that have b as a second letter over
$\Sigma = \{a, b\}$

ab, abaa, abba, abab bbbb

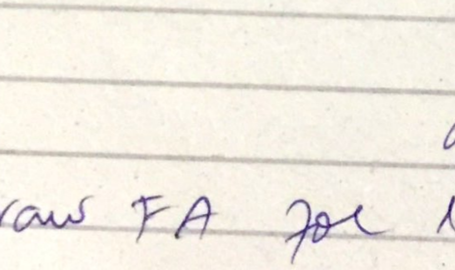
~~ab~~

(a+b) b (a+b)*



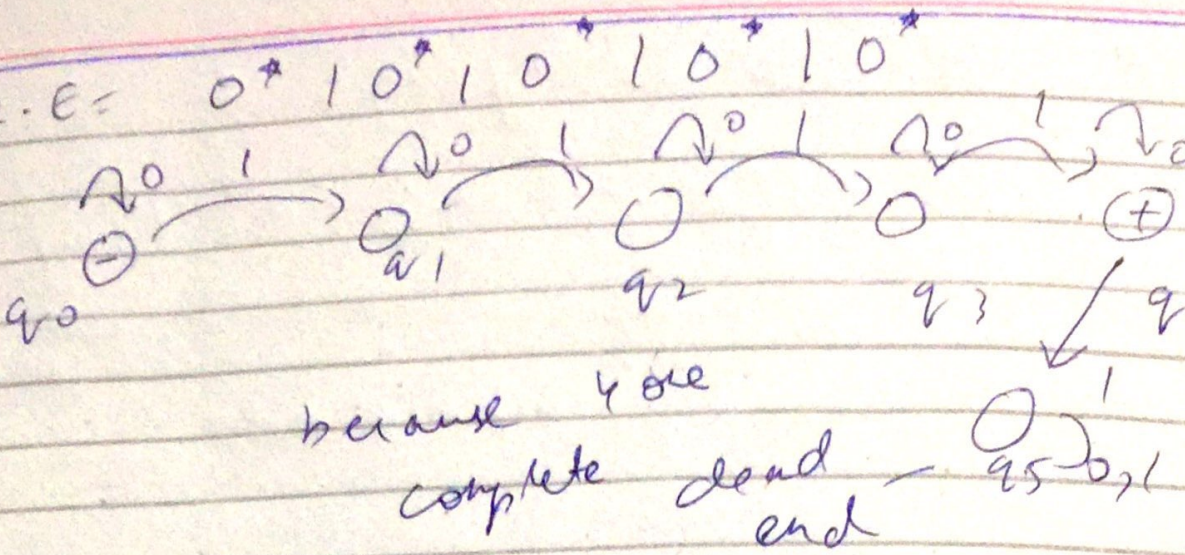
⑤ Draw FA for language that have exactly 4 one in every over {0,1}

$\Sigma = \{0, 1\}$



1111, 01111, 010101 0
001111,

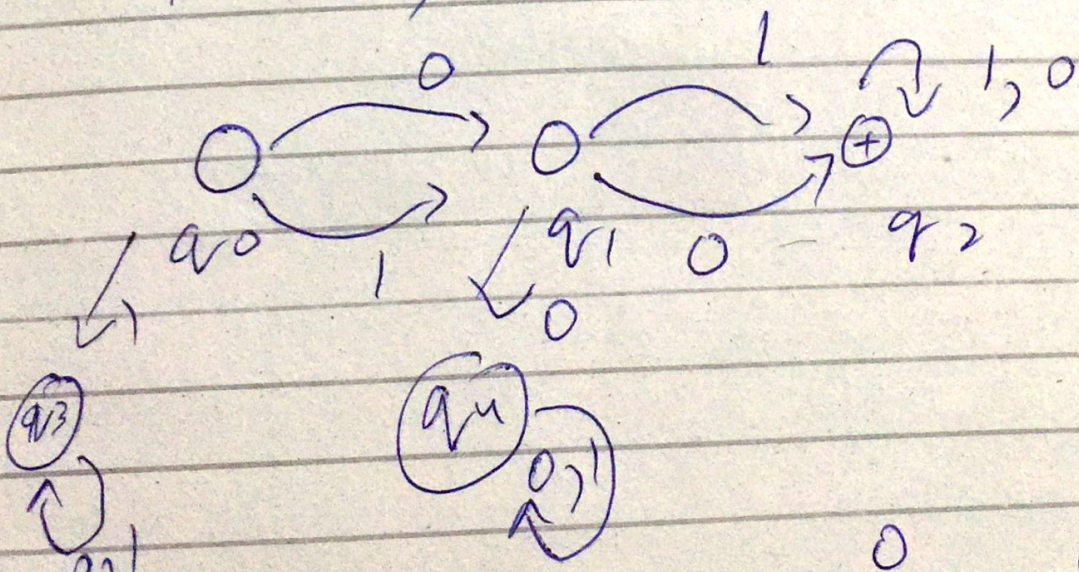
R.E = $0^* 1 0^* 1 0^* 1 0^* 1 0^*$

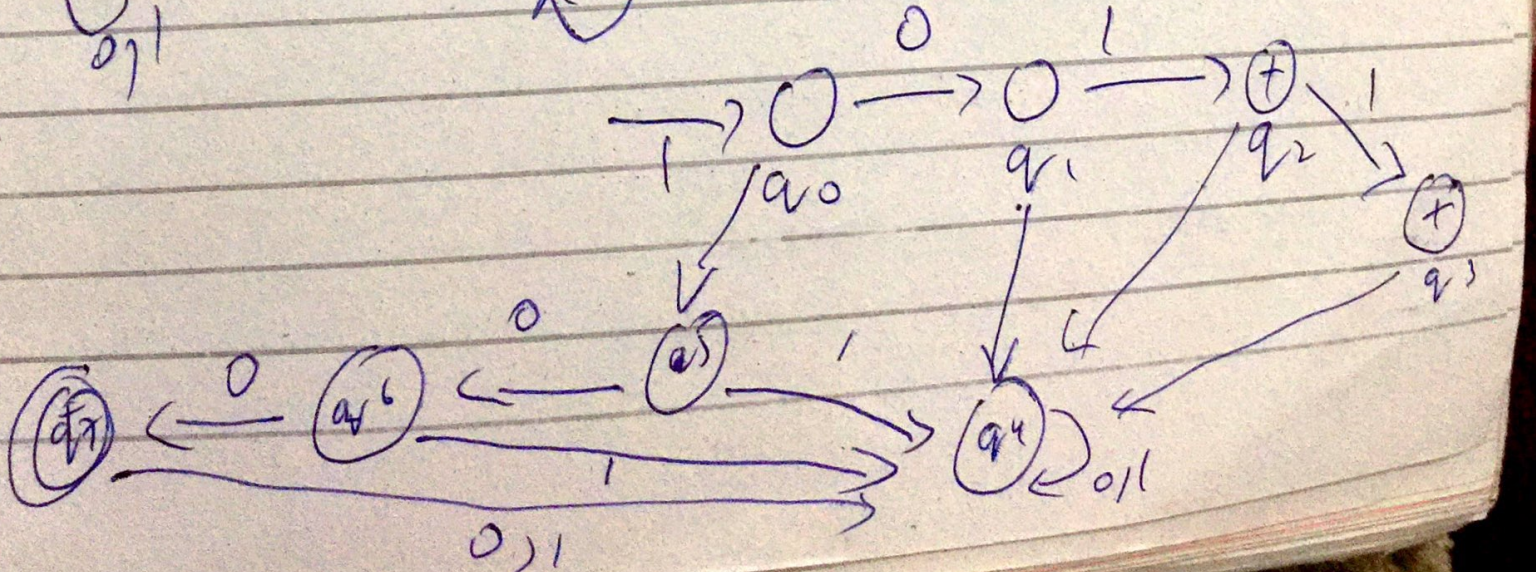


because 4 are complete dead end

Q Draw FA for language that accepts $L = \{01, 011, 100\}$ over $\Sigma = \{0, 1\}$

$R = 01 + 011 + 100$





* FA for language L

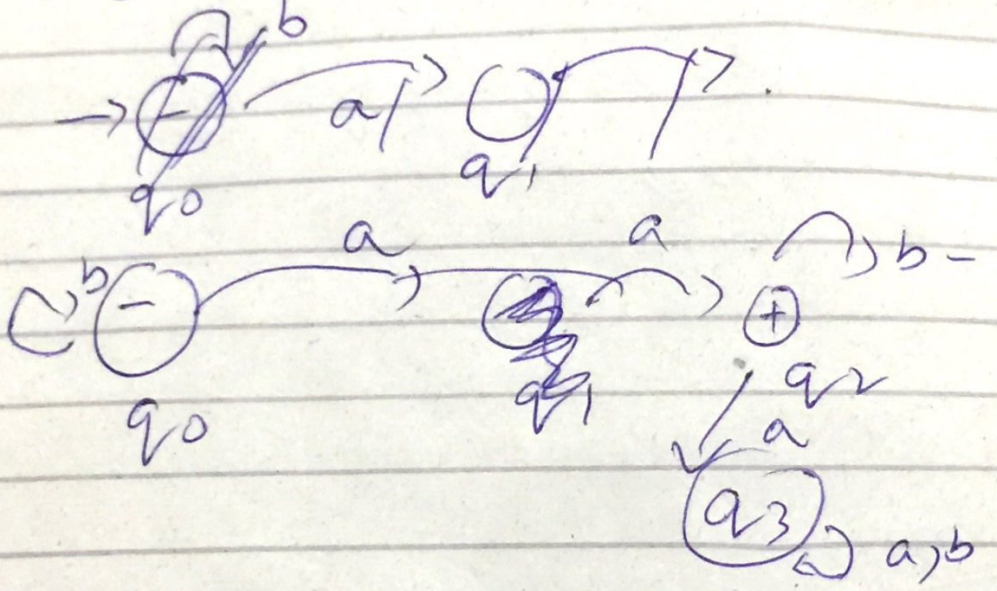
$\{ w \cdot n_a = 1 \mid w \in (a,b)^* \}$

no of a

→ a one time

a, ab, ba, bbb a bbb

$R = b^* a b^*$



* $L = \{ w \in \{0,1\}^* \mid w$ contain 00 as a substring $\}$

00
100
101 001
01 0001
111 00 111

$R.E = (0+1)^* 00 (0+1)^*$