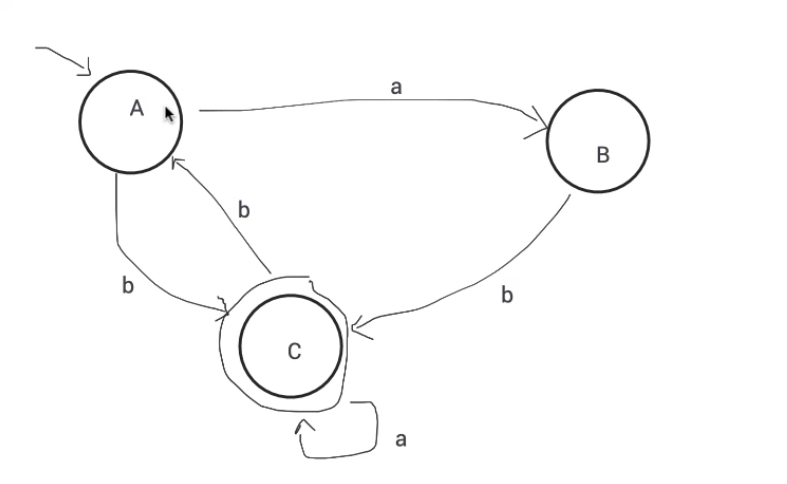
**I. FA => RE**

1. Find the RE for the FA:



We replace (2) in (3): C = Aab + Ab + Ca ⬄C = A(ab + b) + Ca

We replace (1) in (c): C = (

⬄C = ab + b + Cbab + Cbb + Ca

⬄C = C(bab + bb + a) + ab + b**; *X = Xa + b => X = ba\* (NF****)*

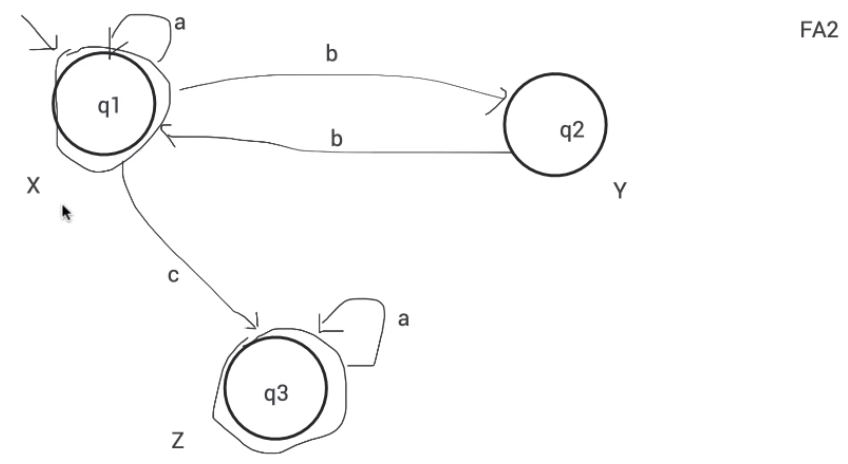
⬄C = (ab + b)(bab + bb + a)\*

2. Find the RE for the FA:

X – regular expression that puts the FA in q1

Y – regular expression that puts the FA in q2

Z – regular expression that puts the FA in q3



We replace (2) in (1): X = + Xbb + Xa ⬄ X = + X(bb + a) => X = (bb + a)\*= (bb + a)\*

We replace X in (3): Z = (bb + a)\*c + Za => Z = (bb + a)\*ca\*

We don’t need cu compute Y, it is not final state (circled)

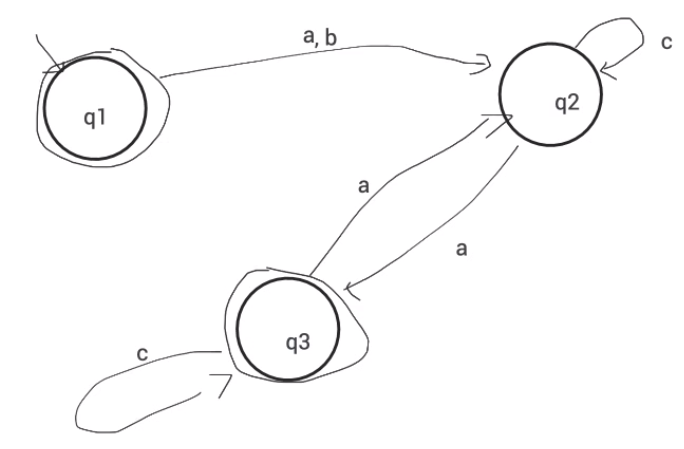
RE = X + Z = (bb + a)\* + (bb + a)\*ca\* = (bb+a)\*(ɛ+ca\*)

3. Individual:

X – regular expression that puts the FA in q1

Y – regular expression that puts the FA in q2

Z – regular expression that puts the FA in q3



(1): X = ɛ

We replace X in (2)

(2): Y = ɛ(a + b) + Za + Yc => Y = Zac\*

⬄Y = Yc + Za + a + b = (a + b + Za)c\*

We replace Y in (3)

(3): Z = (a + b + Za)c\*a + Zc

⬄ Z = ac\*a + bc\*a + Zac\*a + Zc

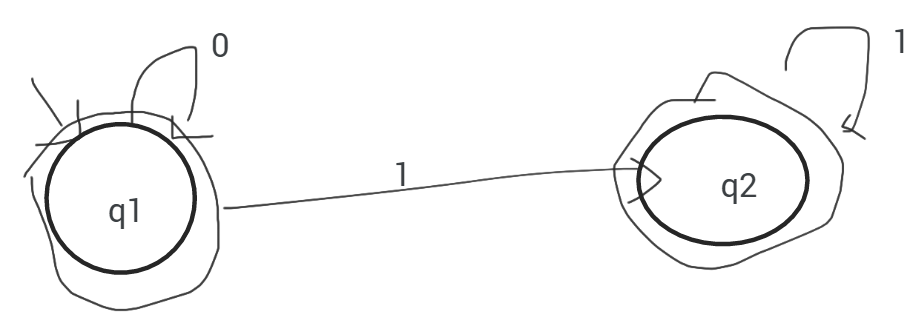
⬄ Z = Z(ac\*a + c) + (a + b) => Z = (a + b)c\*a(ac\*a + c)\*

RE = X + Z = ɛ (a + b)c\*a(ac\*a + c)\*

**II. RE => FA, RE => RG**

|  |  |
| --- | --- |
| RE | RG |
| a | S -> a |
| a + b | S -> a | b |
| ab | S -> aA, A -> b |
| a\* | S -> aS | ɛ |
|  | S -> aS | a |
| (a+b)\* | S -> aS | bS | ɛ |

a) 0\*1\*



G1: 0\*: S1 -> 0S1 | ɛ

G2: 1\*: S2 -> 1S2 | ɛ

(S3 -> S1S2 non terminal => not regular/linear)

G3: S3 -> 0S1 | 1S2 | ɛ

S1 -> 0S1

S2 -> 1S2 | ɛ

b) 0\*(1 (0 + 1))\*

(0+1): S1 -> 0 | 1

(1(0 + 1))\*: S2 -> 1S1 | ɛ

0\*(1 (0 + 1))\*:

S3 -> 0S2 | 0S3 | ɛ

S2 -> 1S1

S1 -> 0 | 1