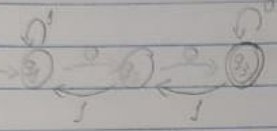
Lista de Exercícios 5

1a) $(a+b+c)^*a(a+b+c)^*b(a+b+c)^* + (a+b+c)^*b(a+b+c)^*a(a+b+c)^*$

b) $(a+1)^*1(a+1)(a+1)(a+1)(a+1)(a+1)(a+1)(a+1)(a+1)(a+1)$

c) $0^*(10)^*(\varepsilon+11)0^*(10)^*$

2a)



$R_{11}^{(0)}$	$\varepsilon+1$
$R_{12}^{(0)}$	0
$R_{13}^{(0)}$	$\emptyset$
$R_{21}^{(0)}$	1
$R_{22}^{(0)}$	ε
$R_{23}^{(0)}$	0
$R_{31}^{(0)}$	$\emptyset$
$R_{32}^{(0)}$	1
$R_{33}^{(0)}$	$\varepsilon+0$

b) $R_{11}^{(1)} = (\varepsilon+1) + (\varepsilon+1)(\varepsilon+1)^*(\varepsilon+1) = 1^*$

$R_{12}^{(1)}$	$0+(\varepsilon+1)(\varepsilon+1)^*0 = 0+1^*0$
$R_{13}^{(1)}$	$\emptyset+(\varepsilon+1)(\varepsilon+1)^*\emptyset = \emptyset$
$R_{21}^{(1)}$	$1+1(\varepsilon+1)^*(\varepsilon+1) = 1+11^* = 11^*$
$R_{22}^{(1)}$	$\varepsilon+1(\varepsilon+1)^*0 = \varepsilon+11^*0$
$R_{23}^{(1)}$	$0+1(\varepsilon+1)^*\emptyset = 0$
$R_{31}^{(1)}$	$\emptyset+0(\varepsilon+1)^*(\varepsilon+1) = \emptyset$
$R_{32}^{(1)}$	$1+\emptyset(\varepsilon+1)^*0 = 1$
$R_{33}^{(1)}$	$(\varepsilon+0)+\emptyset(\varepsilon+1)^*\emptyset = \varepsilon+0$

tilibra

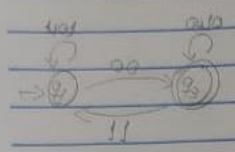
c)

$q_1 \xrightarrow{2a} q_2$: $\emptyset + 0\emptyset^*0 = 00$

$q_2 \xrightarrow{2a} q_2$: $1 + 0\emptyset^*1 = 1 + 01$

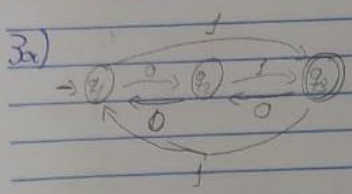
$q_1 \xrightarrow{2a} q_3$: $\emptyset + 10^*1 = 11$

$q_2 \xrightarrow{2a} q_3$: $0 + 10^*0 = 0 + 10$



RE: $((1+01)+00(0+10)^*11)^*00(0+10)^*$

3a)



R_{11}	ε
R_{21}	0
R_{31}	1
R_{12}	1
R_{22}	0
R_{32}	ε
R_{13}	1
R_{23}	1
R_{33}	1
R_{14}	0
R_{24}	ε

b) $R_{11}^{(1)}$ $\varepsilon+\varepsilon\varepsilon^*\varepsilon = \varepsilon$

$R_{12}^{(1)}$ $0+\varepsilon\varepsilon^*0 = 0$

$R_{13}^{(1)}$ $1+\varepsilon\varepsilon^*1 = 1+01$

$R_{21}^{(1)}$ $0+0\varepsilon^*\varepsilon = 0$

$R_{22}^{(1)}$ $\varepsilon+0\varepsilon^*0 = \varepsilon+00$

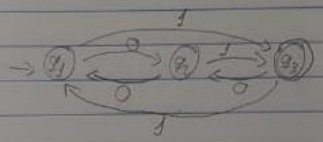
$R_{23}^{(1)}$ $1+0\varepsilon^*1 = 1+01$

$R_{31}^{(1)}$ $1+1\varepsilon^*\varepsilon = 1$

$R_{32}^{(1)}$ $0+1\varepsilon^*0 = 0+10$

$R_{33}^{(1)}$ $\varepsilon+1\varepsilon^*1 = \varepsilon+11$

c)

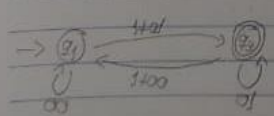


$q_1 \xrightarrow{q_1} q_3 : 1+0\emptyset^*1 = 1+01$

$q_1 \xrightarrow{q_1} q_1 : \emptyset+0\emptyset^*0 = 00$

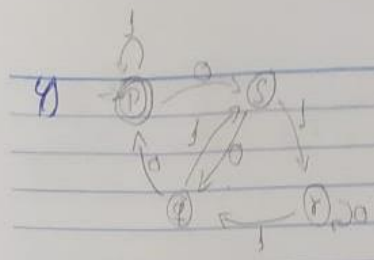
$q_3 \xrightarrow{q_3} q_1 : 1+0\emptyset^*0 = 1+00$

$q_3 \xrightarrow{q_3} q_3 : \emptyset+0\emptyset^*1 = 01$

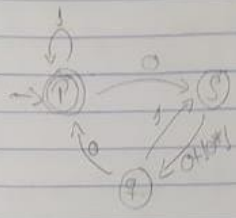


$RE = (00+(1+01)(01)^*(1+00))^*(1+01)(01)^*$

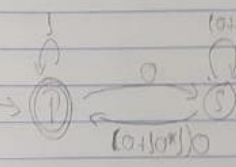
4)



Eliminando R:
$S \xrightarrow{} Q : 0 + 10^*1$

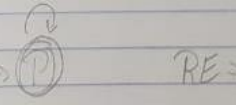


Eliminando Q:
$S \xrightarrow{} S : \emptyset + (0+10^*1)\emptyset^*1 = (0+10^*1)1$
$S \xrightarrow{} P : \emptyset + (0+10^*1)\emptyset^*0 = (0+10^*1)0$



Eliminando S:
$P \xrightarrow{} P : 1 + 0(0+10^*1)1)^*(0+10^*1)0$

$1 + 0((0+10^*1)1)^*(0+10^*1)0$



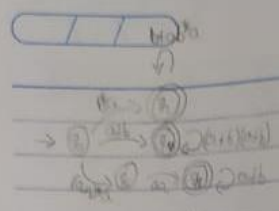
$RE = (1+0((0+10^*1)1)^*(0+10^*1)0)^*$

5) Eliminando q_1:
$q_0 \xrightarrow{} q_2 : \phi + \varepsilon b^*a = b^*a$
$q_1 \xrightarrow{} q_2 : b + ab^*a = b + ab^*a$

Eliminando q_3:
$q_0 \xrightarrow{} q_2 : \phi + \varepsilon(a+b)^*a = (a+b)^*a$

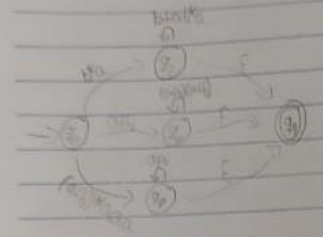
Eliminando q_3:
$q_0 \xrightarrow{} q_4 : \phi + \varepsilon\phi^*(a+b) = a+b$
$q_4 \xrightarrow{} q_4 : \phi + (a+b)\phi^*(a+b) = (a+b)(a+b)$

Eliminando q_2:
$q_0 \xrightarrow{} q_e : \phi + a\phi^*a = aa$



Eliminando q_5

$q_0 \xrightarrow{q_5} q_8 : \emptyset + ((a+b)^*a)\emptyset^*(aa) = (a+b)^*aaa$



Eliminando q_2

$q_0 \xrightarrow{q_2} q_9 : (b^*a)(b+ab^*a)^*$

Eliminando q_4

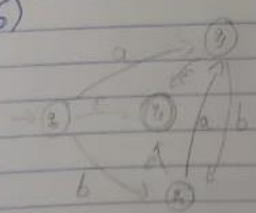
$q_0 \xrightarrow{q_4} q_9 : (a+b)((a+b)(a+b))^*$

Eliminando q_8

$q_0 \xrightarrow{q_8} q_9 : (a+b)^*aaa(a+b)^*$

RE: $(b^*a)(b+ab^*a)^* + (a+b)((a+b)(a+b))^* + (a+b)^*aaa(a+b)^*$

6)



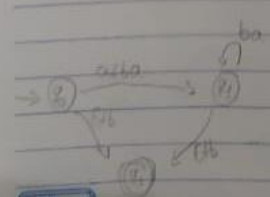
Eliminando q_2

$q_0 \xrightarrow{q_2} q_3 : \varepsilon + b\emptyset^*\varepsilon = \varepsilon + b$

$q_0 \xrightarrow{q_2} q_1 : a + b\emptyset^*a = a + ba$

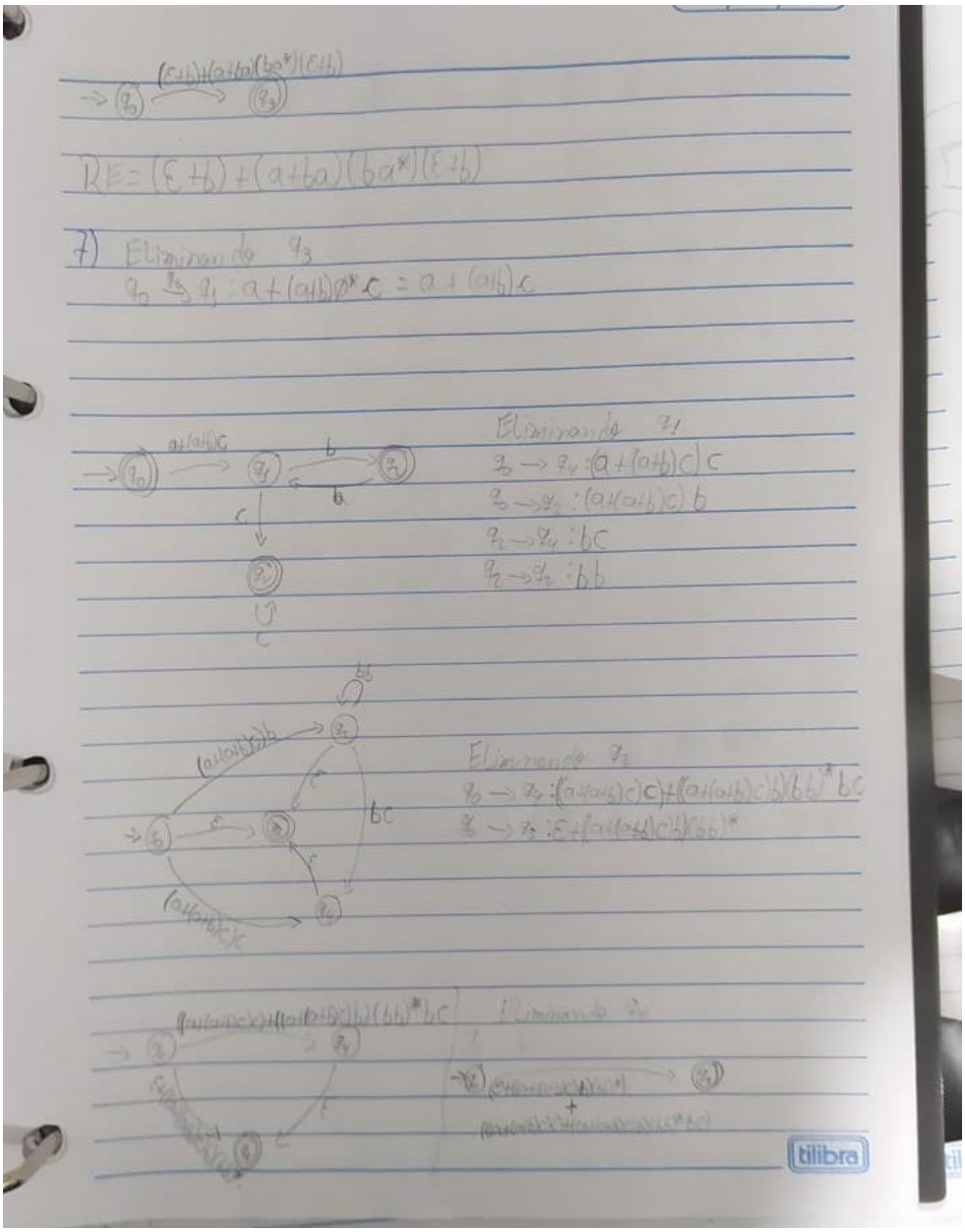
$q_1 \xrightarrow{q_2} q_3 : \varepsilon + b$

$q_1 \xrightarrow{q_2} q_1 : ba$



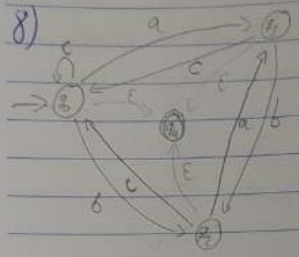
Eliminando q_1:

$q_0 \xrightarrow{q_1} q_3 : (\varepsilon+b) + (a+ba)(ba)^*(\varepsilon+b)$


RE = (ε+b)+(a+ba)(ba*)(ε+b)
7) Eliminando q3
q0 → q1 : a+(a+b)b*c = a+(a+b)c
Eliminando q1
q0 → q4 : (a+(a+b)c)c
q0 → q2 : (a+(a+b)c)b
q2 → q4 : bc
q2 → q2 : bb
Eliminando q2
Eliminando q4

RE = (ε + ((a + (a+b)c)b)(bb)*) + (((a+(a+b)c)c) + ((a+(a+b)c)b)(bb)*bc)

8)

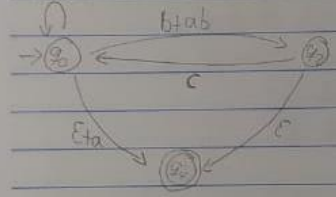


Eliminando q_1

$q_0 \xrightarrow{1} q_4 : \varepsilon + a$

$q_0 \xrightarrow{1} q_2 : b + ab$

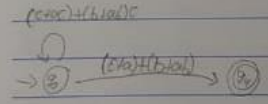
$q_2 \xrightarrow{1} q_0 : c + ac$



Eliminando q_2

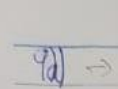
$q_0 \xrightarrow{q_2} q_4 : (\varepsilon + a) + (b + ab)$

$q_0 \xrightarrow{q_2} q_0 : (c + ac) + (b + ab)c$

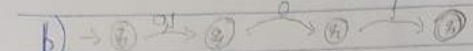


RE = ((c + ac) + (b + ab)c)* ((ε + a) + (b + ab))

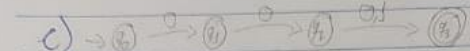
a)



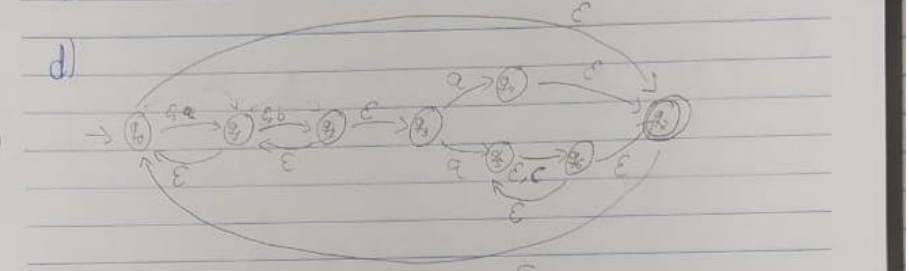
b)



c)



d)



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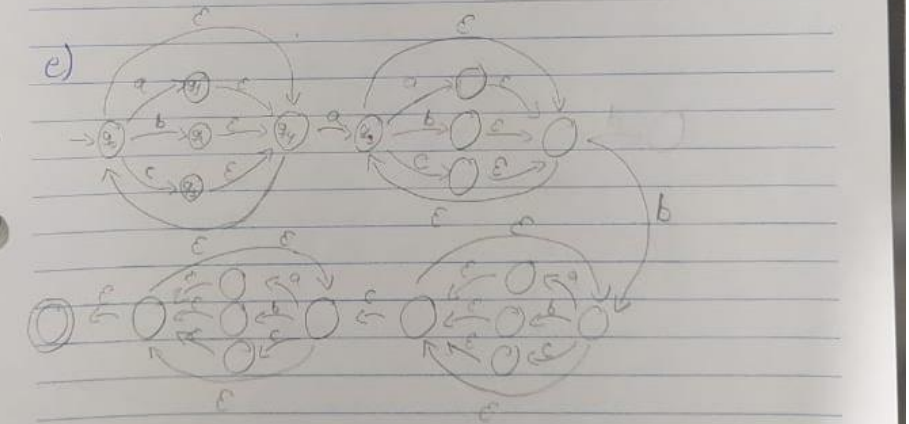

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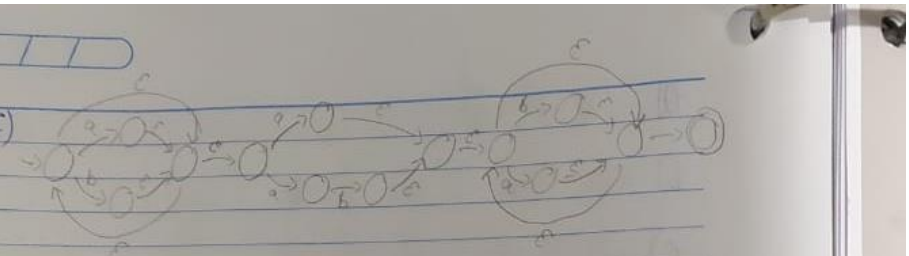
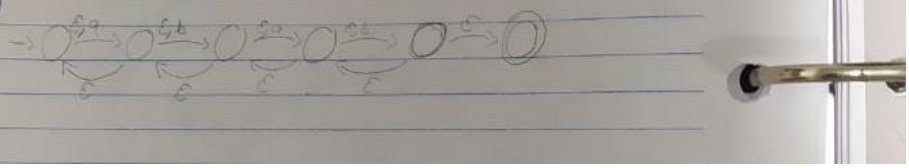
g)