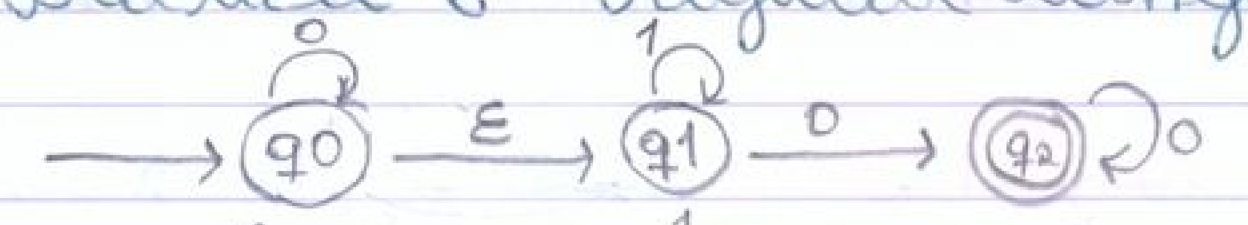
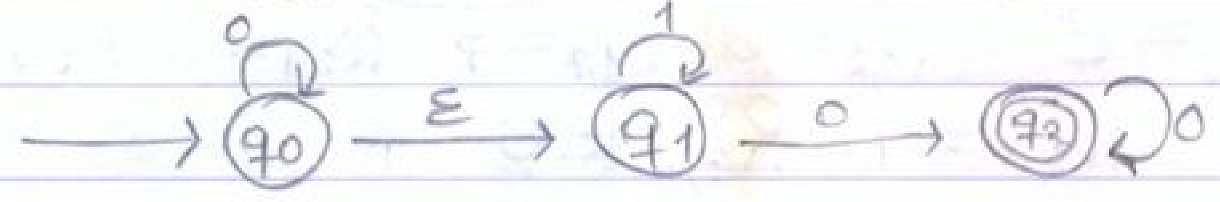
Prática 6 - Regular Languages (RLs)

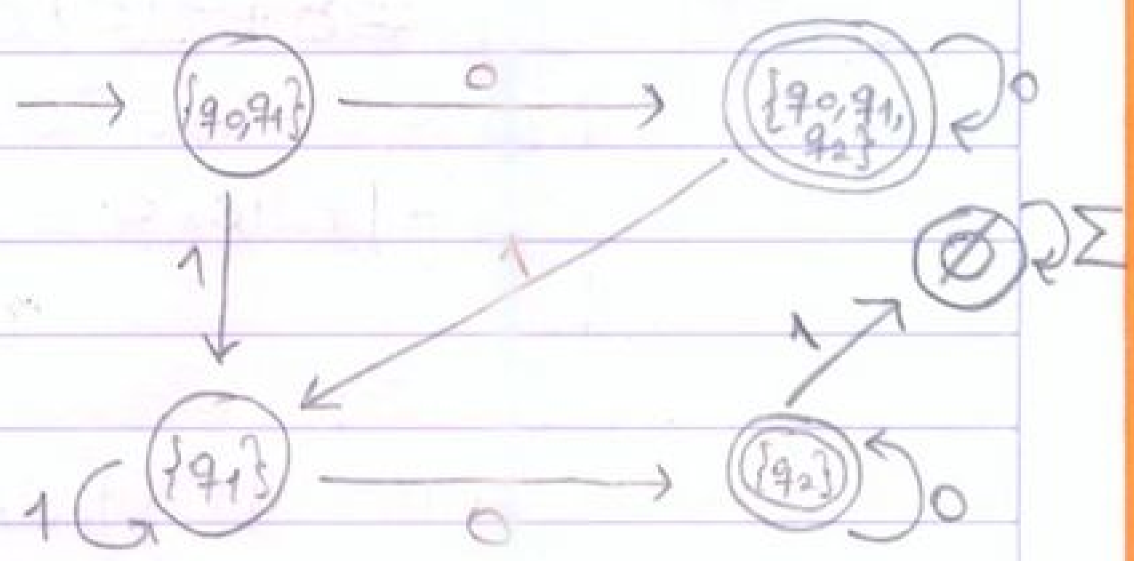
① a) 

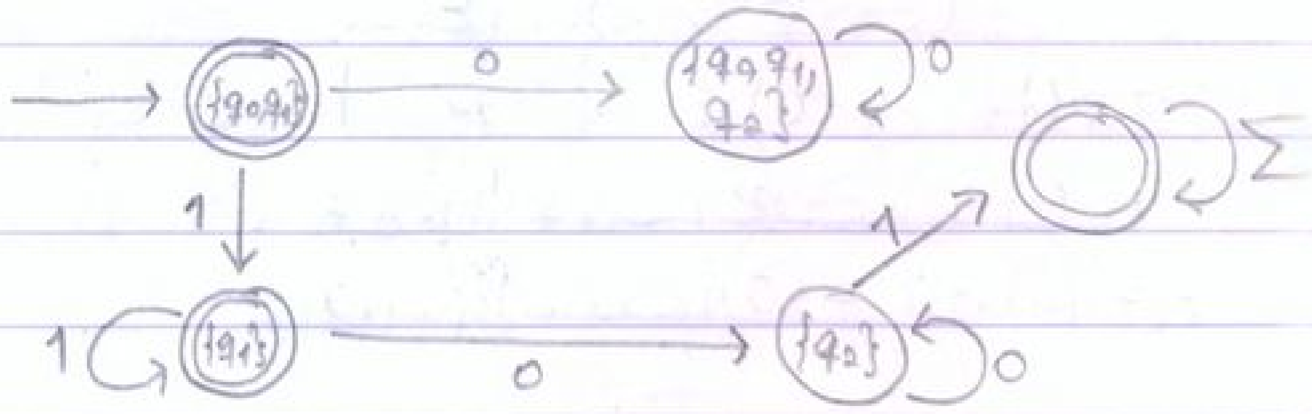
b) 

Estado	Fecho-ε
q_0	$\{q_0, q_1\}$
q_1	$\{q_1\}$
q_2	$\{q_2\}$

c)

	0	1
$\rightarrow\{q_0,q_1\}$	$\{q_0,q_1,q_2\}$	$\{q_1\}$
$*\{q_0,q_1,q_2\}$	$\{q_0,q_1,q_2\}$	$\{q_1\}$
$\{q_1\}$	$\{q_2\}$	$\{q_1\}$
$*\{q_2\}$	$\{q_2\}$	$\emptyset$
$\emptyset$	$\emptyset$	$\emptyset$



d) 

e) $1^*(\varepsilon+0^+1(0+1)^*)$

② a) $NFA = (\{1,2,3,4\}, \{a,b\}, \delta, 1, \{2\})$, onde δ é:

$\delta(1,a)=\{1,2\}$; $\delta(1,b)=\{3\}$; $\delta(2,a)=\emptyset$; $\delta(2,b)=\{1\}$
$\delta(3,a)=\{4\}$; $\delta(3,b)=\{2\}$; $\delta(4,a)=\{2,3\}$; $\delta(4,b)=\{4\}$

b)

δ	a	b
$\rightarrow 1$	$\{1,2\}$	$\{3\}$
$*2$	$\emptyset$	$\{1\}$
3	$\{4\}$	$\{2\}$
4	$\{2,3\}$	$\{4\}$

(não vale a pena desenhar)

tabela do DFA ⟶

c)

Estado	a	b
$\rightarrow\{1\}$	$\{1,2\}$	$\{3\}$
$*\{1,2\}$	$\{1,2\}$	$\{1,3\}$
$\{3\}$	$\{4\}$	$\{2\}$
$\{1,3\}$	$\{1,2,4\}$	$\{2,3\}$
$\{4\}$	$\{2,3\}$	$\{4\}$
$*\{2\}$	$\emptyset$	$\{1\}$
$*\{1,2,4\}$	$\{1,2,3\}$	$\{1,3,4\}$
$*\{2,3\}$	$\{4\}$	$\{1,2\}$
$*\{1,2,3\}$	$\{1,2,4\}$	$\{1,2,3\}$
$\{1,3,4\}$	$\{1,2,3,4\}$	$\{2,3,4\}$
$*\{1,2,3,4\}$	$\{1,2,3,4\}$	$\{1,2,3,4\}$
$*\{2,3,4\}$	$\{2,3,4\}$	$\{1,2,4\}$
$\emptyset$	$\emptyset$	$\emptyset$

3) $b^*ab^*ab^*a(a+b)^*$

4) Verdadeira.

5) $R^0_{1,1}=\varepsilon \quad R^0_{1,2}=0 \quad R^0_{1,3}=1 \quad R^0_{2,1}=0 \quad R^0_{2,2}=\varepsilon \quad R^0_{2,3}=1$
$R^0_{3,1}=1 \quad R^0_{3,2}=0 \quad R^0_{3,3}=\varepsilon$

$R^1_{1,1}=\varepsilon+\varepsilon(\varepsilon)^*\varepsilon=\varepsilon \quad R^1_{1,2}=0+\varepsilon(\varepsilon)^*0=0 \quad R^1_{1,3}=1+\varepsilon(\varepsilon)^*1=1$
$R^1_{2,1}=0+0(\varepsilon)^*\varepsilon=0 \quad R^1_{2,2}=\varepsilon+0(\varepsilon)^*0=\varepsilon+00 \quad R^1_{2,3}=1+0(\varepsilon)^*1=1+01$
$R^1_{3,1}=1+1(\varepsilon)^*\varepsilon=1 \quad R^1_{3,2}=0+1(\varepsilon)^*0=0+10 \quad R^1_{3,3}=\varepsilon+1(\varepsilon)^*1=\varepsilon+11$

$R^2_{1,1}=\varepsilon+0(\varepsilon+00)^*0=(00)^+ \quad R^2_{1,2}=0+0(\varepsilon+00)^*(\varepsilon+00)=0(\varepsilon+00)^+$
$R^2_{1,3}=1+0(\varepsilon+00)^*(1+01) \quad R^2_{2,1}=0+(\varepsilon+00)^+0=0(\varepsilon+00)^*$
$R^2_{2,2}=(\varepsilon+00)+(\varepsilon+00)(\varepsilon+00)^*(\varepsilon+00)=(\varepsilon+00)^*$
$R^2_{2,3}=(1+01)+(\varepsilon+00)(\varepsilon+00)^*(1+01)=(\varepsilon+00)^*(1+01)$
$R^2_{3,1}=1+(0+10)(\varepsilon+00)^*0 \quad R^2_{3,2}=(0+10)+(0+10)(\varepsilon+00)^*(\varepsilon+00)=(0+10)(\varepsilon+00)^*$
$R^2_{3,3}=(\varepsilon+11)+(0+10)(\varepsilon+00)^*(1+01)$

A expressão regular é dada por $R^3_{1,3}$, e:

$$R^3_{1,3}=\left(1+0(\varepsilon+00)^*(1+01)\right)+\left(1+0(\varepsilon+00)^*(1+01)\right)\left((\varepsilon+11)+(0+10)(\varepsilon+00)^*(1+01)\right)^*\left((\varepsilon+11)+(0+10)(\varepsilon+00)^*(1+01)\right)=\left(1+0(\varepsilon+00)^*(1+01)\right)\left((\varepsilon+11)+(0+10)(\varepsilon+00)^*(1+01)\right)^*$$

6) a) Falso. O limite são 2^k estados que correspondem aos subconjuntos possíveis de formar a partir dos estados do NFA mais o estado morto.

b) Verdadeiro. A linguagem obtida de L^* inclui sempre ε (a cadeia vazia) pois $L^0=\{\varepsilon\}$.