Transformação e minimização

1) Quando dois autômatos são equivalentes?

Se ambos reconhecem a mesma linguagem, ou seja, se a palavra é aceita no AFD, tem que ser aceita no AFND, e vice-versa.

2) Todo autômato finito determinístico (AFD) tem um autômato finito não determinístico (AFND) equivalente? Explique.

Sim. Da mesma forma que conseguimos encontrar um AFD para um AFND por meio de transformação, também podemos encontrar um AFND equivalente a um AFD.

3) Qual o poder computacional de um AFND? É o mesmo poder de um AFD? Explique.

4) AFND: $E=\{S_0, S_1, S_2\}$
$\Sigma=\{0,1\}$
$I=\{S_0\}$
$F=\{S_2\}$

a)

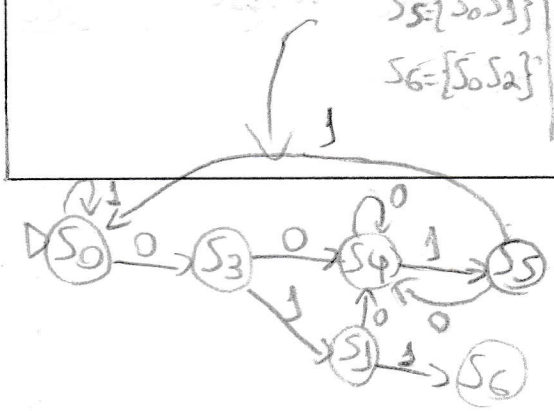
AFND

δ	0	1
S_0	S_1S_2	S_0
S_1	S_0S_1	X
S_2	S_0S_2	S_1

⇒

AFD

δ	0	1
S_0	S_3	S_0
S_1	S_4	X
S_2	S_6	S_1
$S_3=\{S_1S_2\}$	S_4	S_1
$S_4=\{S_0S_1S_2\}$	S_4	S_5
$S_5=\{S_0S_1\}$	S_4	S_0
$S_6=\{S_0S_2\}$	S_4	S_5



b)

S_1						
S_2	⊗	⊗				
S_3	⊗	⊗				
S_4	⊗	⊗				
S_5			⊗	⊗	⊗	
S_6	⊗	⊗				⊗
	S_0	S_1	S_2	S_3	S_4	S_5

5) AFND: a)

$E = \{S_0, S_1, S_2, S_3\}$

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

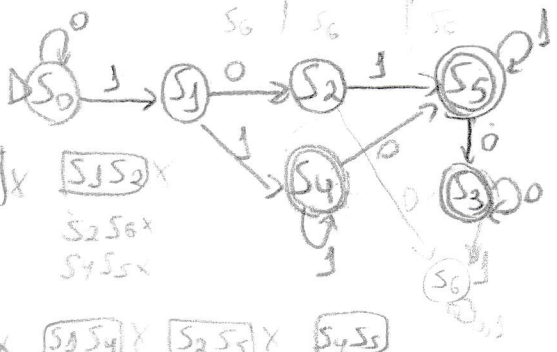
$I = \{S_0\}$

$F = \{S_3\}$

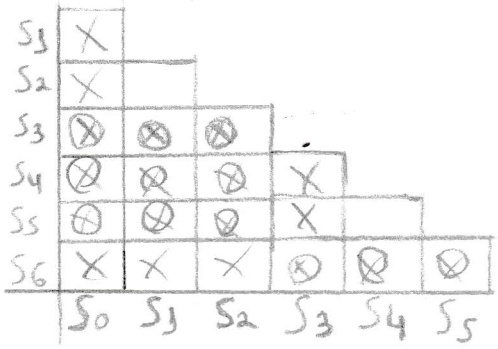
δ	0	1
S_0	S_0	S_1
S_1	S_2	$S_1 S_3$
S_2	X	$S_2 S_3$
S_3	S_3	X

→

δ	0	1
S_0	S_0	S_1
S_1	S_2	S_4
S_2	X (S_6)	S_5
S_3	S_3	X (S_6)
$S_4 = \{S_1 S_3\}$	S_5	S_4
$S_5 = \{S_2 S_3\}$	S_3	S_5
S_6	S_6	S_6



b)



6)- E = {a, b, c, d}
Σ = {0, 1}
I = {a}
F = {a}

AFND:

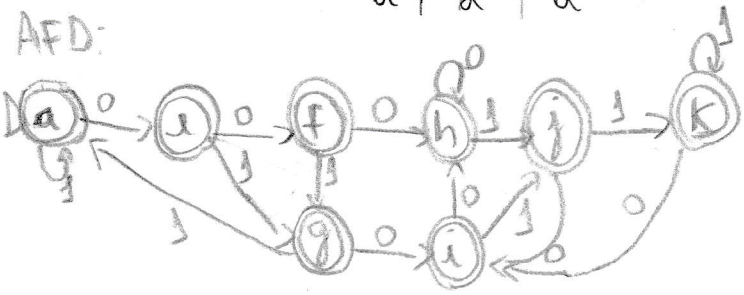
	0	1
a	ab	a
b	c	c
c	d	x
d	d	d

→

AFD:

δ	0	1
a	l	a
l = {ab}	f	g
f = {abc}	h	g
g = {ac}	i	a
h = {abcd}	h	j
i = {abd}	h	j
j = {acd}	i	k
k = {ad}	i	k

AFD:



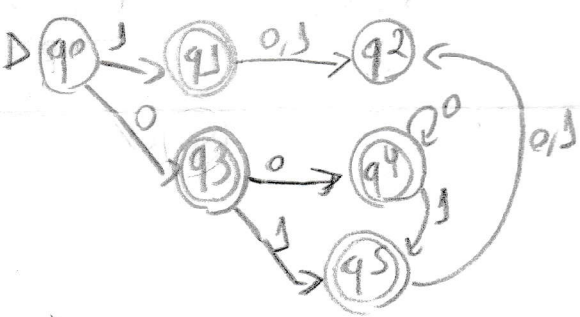
7)- E = {q0, q1, q2}
Σ = {0, 1}
I = {q0}
F = {q1}

AFND:

	0	1
q0	q0q1	q1
q1	q2	q2
q2	X	q2

AFD:

	0	1
q0	q3	q1
q1	q2	q2
q2	X	q2
q3 = {q0q1}	q4	q5
q4 = {q0q1q2}	q4	q5
q5 = {q1q2}	q2	q2



8)- E = {S0, S1, S2}
Σ = {0, 1}
I = {S0}
F = {S1}

AFND:

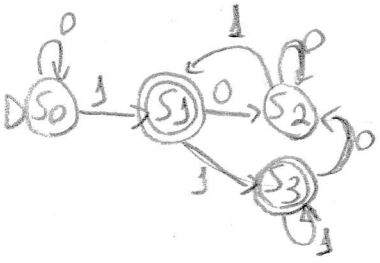
	0	1
S0	S0	S1
S1	S2	S1S2
S2	S2	S1

→

AFD:

	0	1
S0	S0	S1
S1	S2	S3
S2	S2	S1
S3 = {S1, S2}	S2	S3

⇒



9)- E = {S0, S1, S2, SF}
Σ = {a, b}
I = {S0}
F = {SF}

AFND:

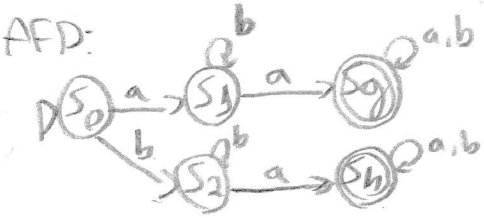
	a	b
S0	S1	S2
S1	S1SF	S1
S2	S2SF	S2
SF	SF	SF

→

AFD:

	a	b
S0	S1	S2
S1	Sg	S1
S2	Sh	S2
SF	SF	SF
Sg = {S1SF}	Sg	Sg
Sh = {S2SF}	Sh	Sh

AFD:



14) - $E=\{S_0, S_1, S_2, S_f\}$

$\Sigma = \{a, b\}$

$I = \{S_0\}$

$F = \{S_f\}$

AFND:

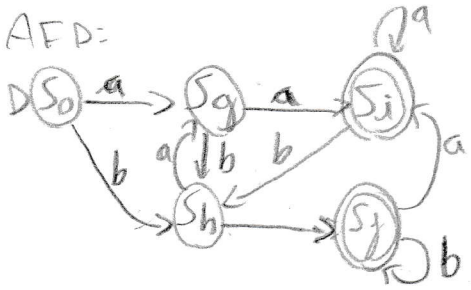
	a	b
S_0	S_0S_1	S_0S_2
S_1	S_f	X
S_2	X	S_f
S_f	S_f	X

→

AFD:

	a	b
S_0	S_g	S_h
$S_g = \{S_0S_1\}$	S_i	S_h
$S_h = \{S_0S_2\}$	S_g	S_j
$S_i = \{S_0S_1S_f\}$	S_j	S_h
$S_j = \{S_0S_2S_f\}$	S_i	S_j

AFD:



15) Converter o AFD:

$E=\{S_0, S_1, S_2, S_3, S_4, S_5\}$

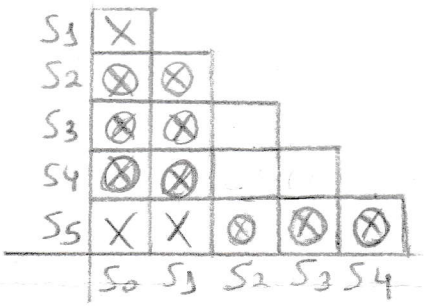
$\Sigma = \{a, b\}$

$I = S_0$

$F = \{S_2, S_3, S_4\}$

δ	a	b
S_0	S_1	S_2
S_1	S_0	S_3
S_2	S_4	S_5
S_3	S_4	S_5
S_4	S_4	S_5
S_5	S_5	S_5

a) AFD mín:



S_0S_1 — S_1S_0 X, S_2S_3 ✓

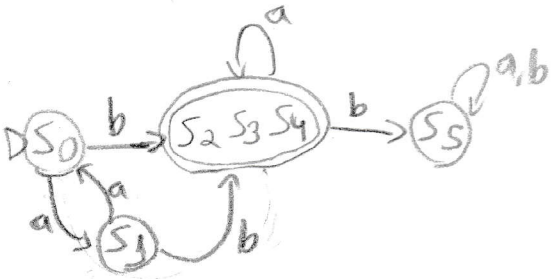
S_2S_3 EQ — S_4S_4 ✓, S_5S_5 ✓

S_0S_5 NEQ — S_1S_4 X, S_2S_5 X

S_1S_5 — S_0S_5 X, S_3S_5 X

S_2S_4 EQ — S_4S_4 ✓, S_5S_5 ✓

S_3S_4 EQ — S_4S_4 ✓, S_5S_5 ✓



16) - AFD:

$E=\{S_0, S_1, S_2, S_3, S_4, S_5\}$

$\Sigma = \{a, b, c\}$

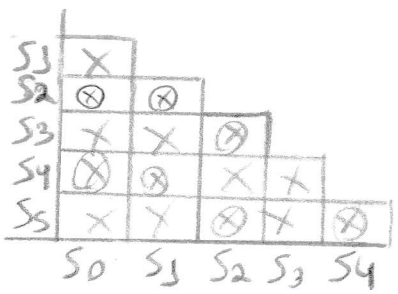
$I = S_0$

$F = \{S_2, S_4\}$

δ	a	b	c
S_0	S_0	S_1	S_3
S_1	S_5	S_1	S_2
S_2	S_5	S_3	S_2
S_3	S_4	S_5	S_3
S_4	S_4	S_1	S_5
S_5	S_5	S_5	S_5

Não há como minimizar

a) AFD mín:



S_0S_1 — S_0S_5 X, S_1S_1 ✓, S_3S_2 X

S_0S_3 — S_0S_4 X, S_1S_5 X, S_3S_3 ✓

S_1S_5 — S_5S_5 ✓, S_1S_5 X, S_2S_5 X

S_0S_5 — S_0S_5 X, S_1S_5 X, S_3S_5 X

S_3S_5 — S_4S_5 X, S_5S_5 X, S_3S_5 X

S_3S_4 — S_4S_4 ✓, S_5S_1 X, S_3S_5 X

S_1S_3 — S_5S_4 X, S_1S_5 X, S_2S_3 X

S_2S_4 — S_5S_4 X, S_3S_1 X, S_2S_5 X