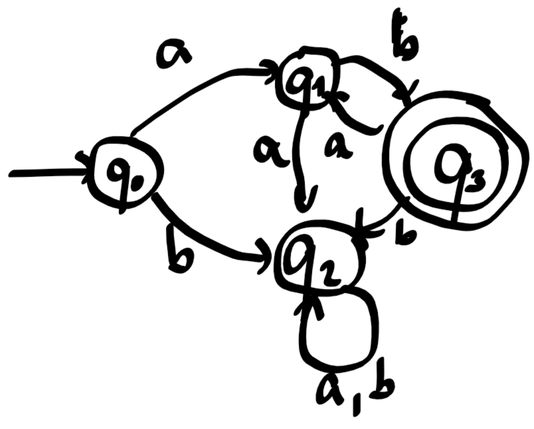
nad Σ - kon. abeceda

Regulárne výrazy $\longleftrightarrow$ Regul. jazyky - podmnožiny Σ^*

Kleenova veta $\longleftrightarrow$ (Kleene) konečné det. autom.

- $\emptyset$ je r.v.
- $\forall a \in \Sigma$ je r.v.
- r, s r.v. $\Rightarrow$ $r \cdot s$ je r.v.
  $r + s$ je r.v.
  r^* je r.v.
- r je r.v. $\rightarrow$ $\overline{r}$ je r.v.

- $\emptyset$ je r.j.
- $\forall a \in \Sigma$ je $\{a\}$ r.j.
- r, s r.j. $\Rightarrow$ $r \cdot s$ r.j.
  $r \cup s$ r.j.
  $\langle r \rangle$ r.j.

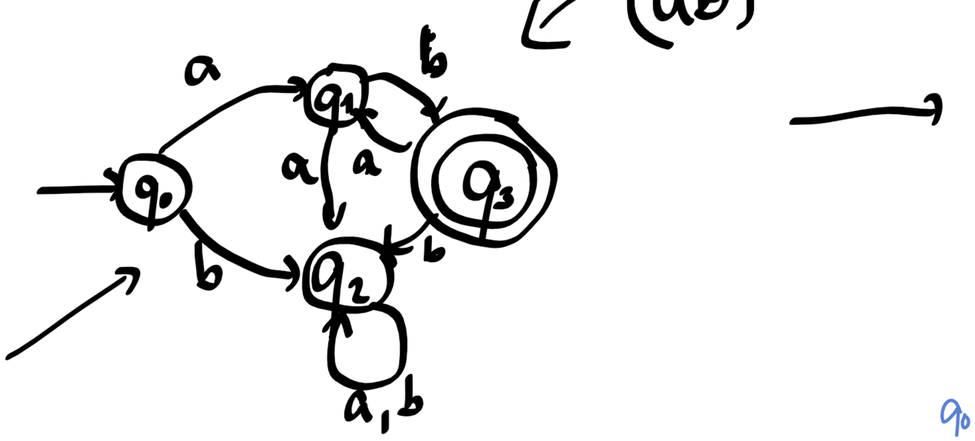


Príklad 1. Nájdite negáciu výrazu $(ab)^+ = (ab)\cdot(ab)^*$ nad $\Sigma = \{a, b\}$

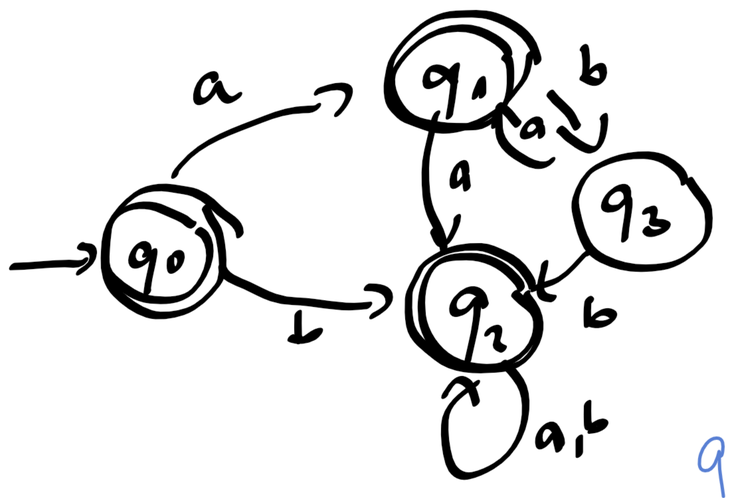
$$\overline{(ab)(ab)^*} = b\,[\,(a+b)^* + (a+b)^*a + (a+b)^*aa(a+b)^* + (a+b)^*bb(a+b)^*]\,\varepsilon$$

začína b; končí a; dve a za sebou; dve b za sebou

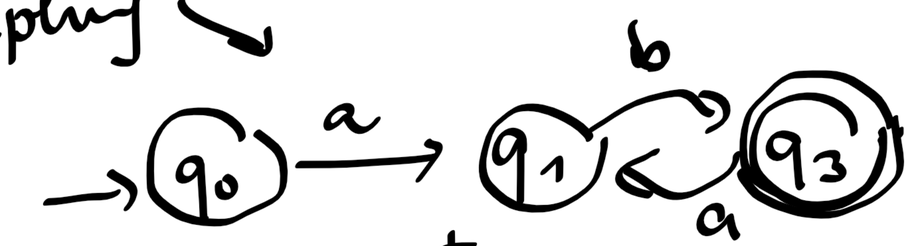
$(ab)^+$



úplný



neúplný

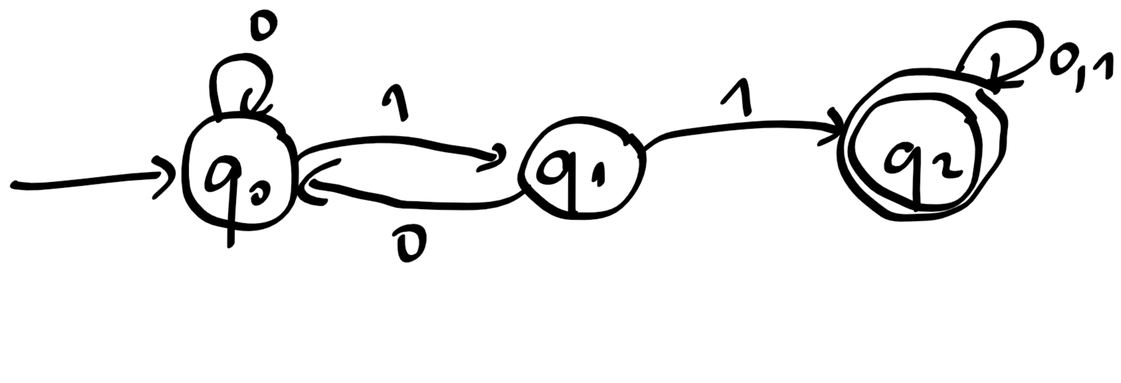


$(ab)^+$

q_0 q_1 q_2

$$\varepsilon + a(ba)^* + [\,b(a+b)^* + a(ba)^*a(a+b)^* + a(ba)^*bb(a+b)^*]$$

Príklad 2 Prevedte DFA na reg. výraz, $\Sigma = \{0, 1\}$



× 101

✓ 1011

→ dve jednotky za sebou obsahuje '11'

$$(0+1)^*11(0+1)^*$$

q_0: $(0 + (10))^*$

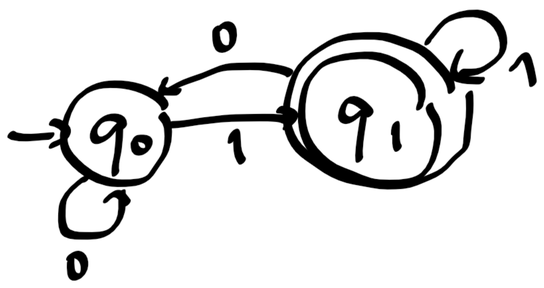
q_1: $(0 + (10))^*1$

q_2: $(0 + (10))^*11(0+1)^*$

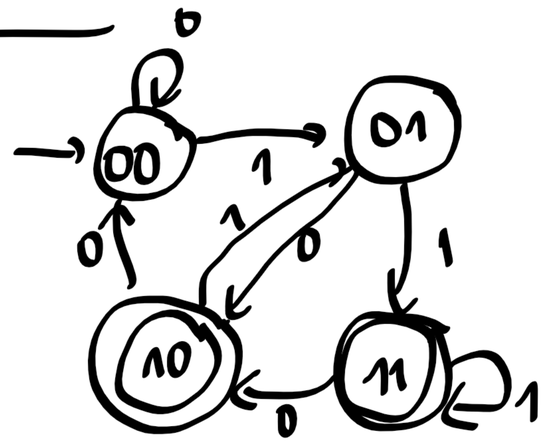
Príklad 3. Nájdite najmenší automat, ktorý prijíma L

$L = \{ w \mid k\text{-ty znak od konca je } 1 \}$; $\Sigma = \{0,1\}$

$k = 1$



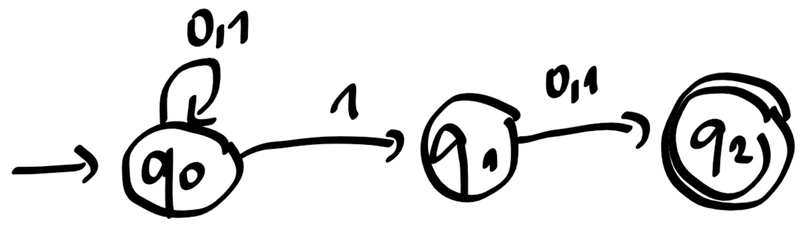
$k = 2$



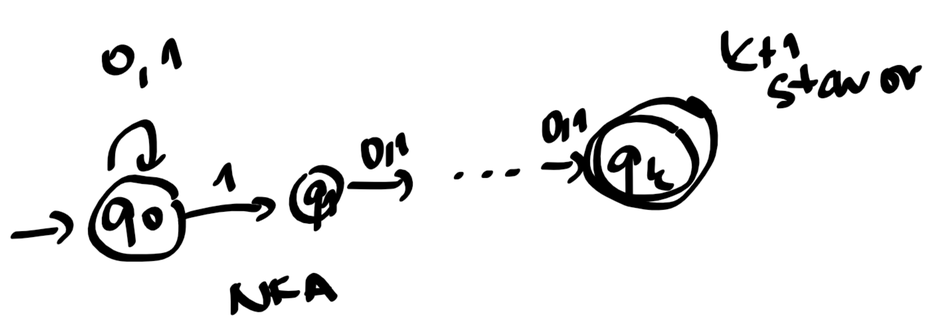
DFA

$\cong$

NFA - nedeterministický konečný automat

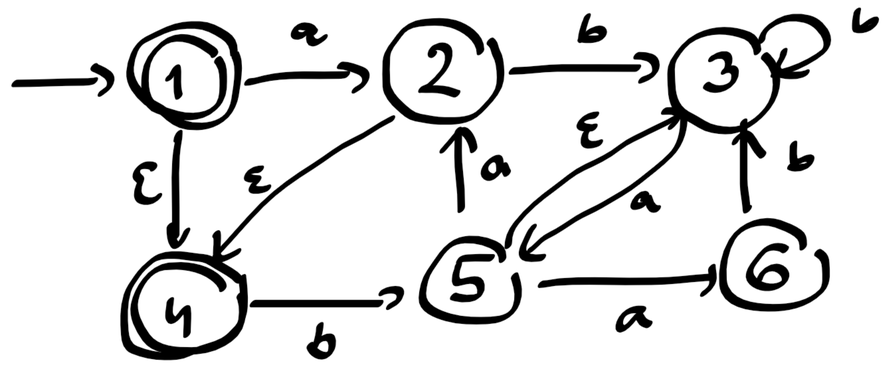


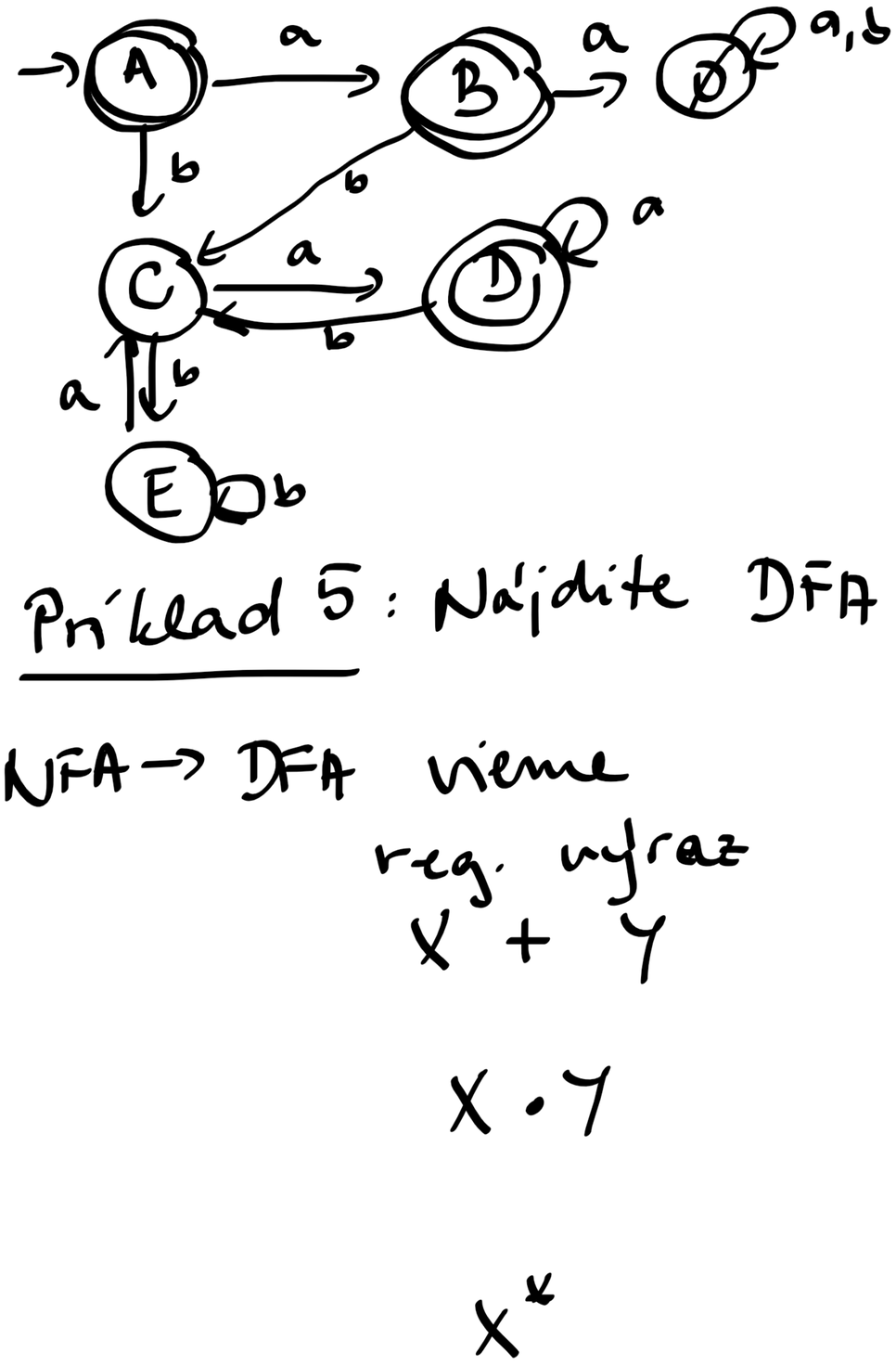
k obecne:



DFA: 2^k stavov
→ odpovedajú slovám dĺžky k
→ žiaden menší neexistuje

Príklad 4. Prevedte NFA na DFA, $\Sigma = [a,b]$





Podmn. stavov		a	b
→ 1,4	A	2,4	5,3
2,4	B	∅	3,5
3,5	C	5,3,2,4,6	3
2,3,4,5,6	D	2,3,4,5,6	3,5
3	E	3,5	3
∅	#∅	∅	∅

Príklad 5: Nájdite DFA k reg. výrazu $a \cdot (bc + d)^* + c$

NFA → DFA vieme

reg. výraz

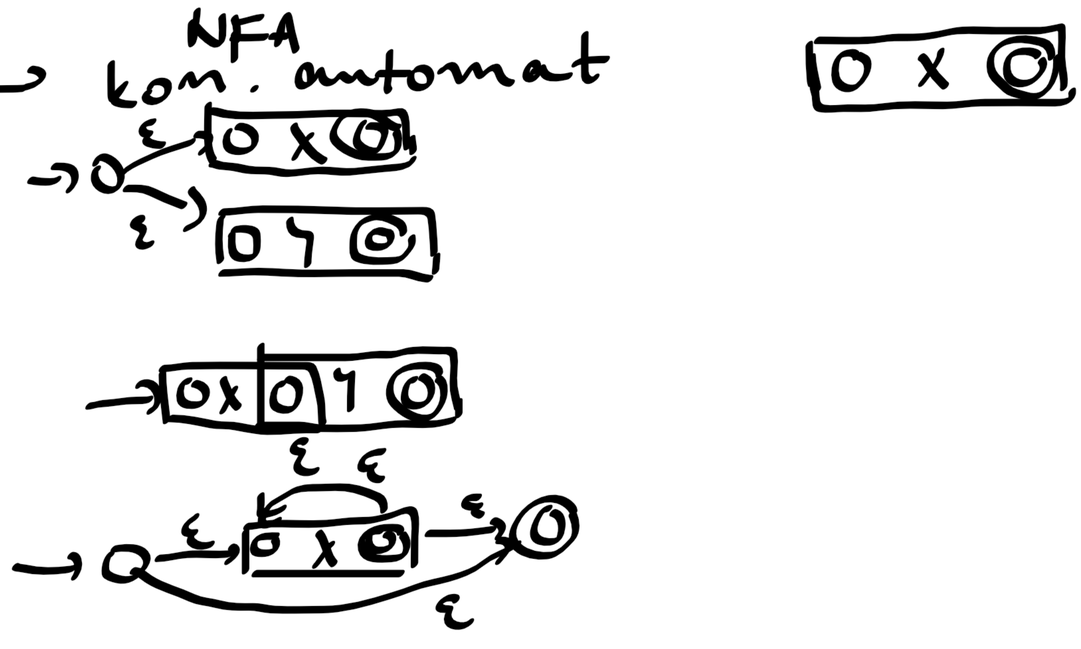
$X + Y$

$X \cdot Y$

X^*

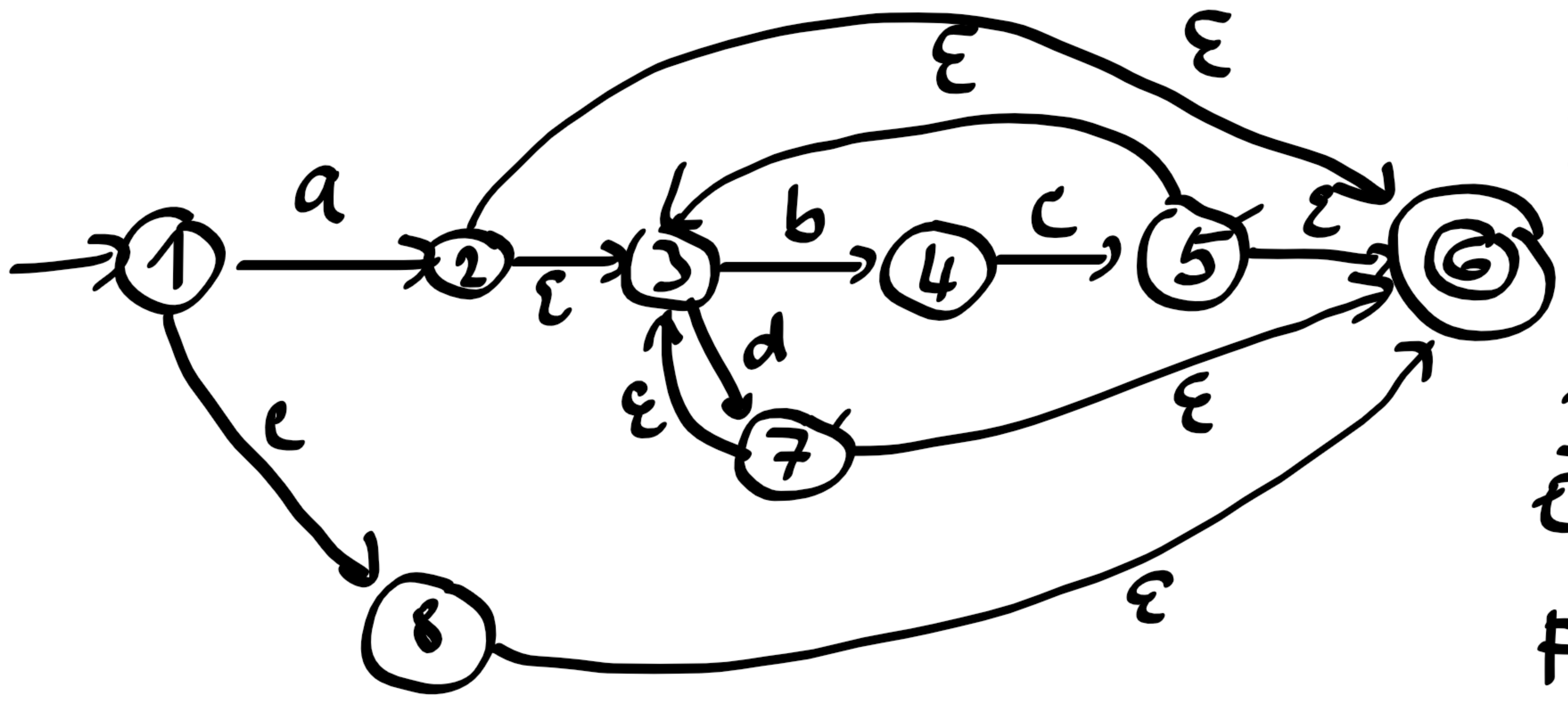
$\Sigma = \{a,b,c,d\}$

$\longleftrightarrow$ NFA kon. automat

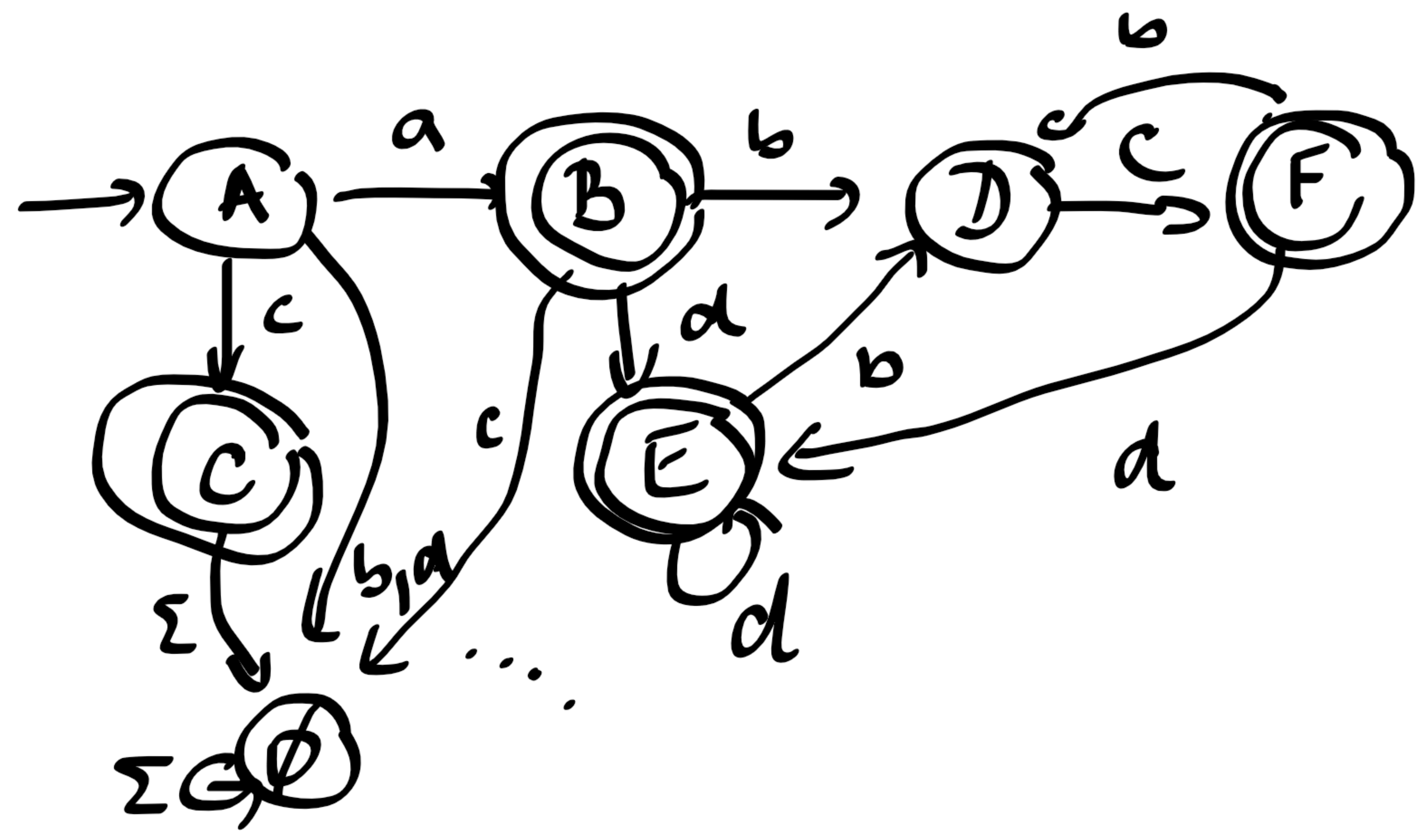


Príklad 5 pokr.

$a \cdot (bc+d)^* + c$



	Stavy	a	b	c	d
A	1	2,3,6	∅	8,6	∅
B	2,3,6	∅	4	∅	6,7,3
C	6,8	∅	∅	∅	∅
D	4	∅	∅	3,5,6	∅
E	3,6,7	∅	4	∅	3,6,7
F	3,5,6	∅	4	∅	3,6,7



DFA
(neúplný)