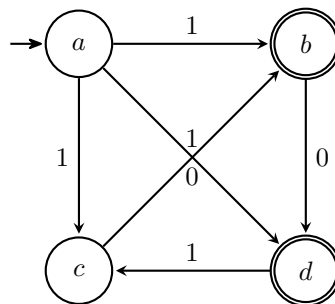


# Aufgabe 1

NFA  $M = (\{0, 1\}, \{a, b, c, d\}, \delta, \{a, d\}, \{b, d\})$   $\delta$ :



Zustand	0	1
$\emptyset$	$\emptyset$	$\emptyset$
a	$\emptyset$	$\{b, c, d\}$
b	$\{d\}$	$\emptyset$
c	$\{b\}$	$\emptyset$
d	$\emptyset$	$\{c\}$

(a)

$$\begin{aligned}
 \delta^*(\{a\}, 1001) &= \bigcup_{z \in \{a\}} \delta^*(\delta(\{a\}, 1), 001) \\
 &= \delta^*(\{b, c, d\}, 001) \\
 &= \bigcup_{z \in \{b, c, d\}} \delta^*(\delta(\{b, c, d\}, 0), 01) \\
 &= \delta^*(\{d\}, 01) \cup \delta^*(\{b\}, 01) \cup \delta^*(\emptyset, 01) \\
 &= \delta^*(\delta(\{d\}, 0), 1) \cup \delta^*(\delta(\{b\}, 0), 1) \\
 &= \emptyset \cup \delta^*(\{d\}, 1) \\
 &= \delta^*(\delta(\{d\}, 1), \lambda) \\
 &= \delta^*(\{c\}, \lambda) \\
 &= \{c\}
 \end{aligned}$$

$$\begin{aligned}
 \delta^*(\{d\}, 1000) &= \delta^*(\delta(\{d\}, 1), 000) \\
 &= \delta^*(\{c\}, 000) \\
 &= \delta^*(\delta(\{c\}, 0), 00) \\
 &= \delta^*(\{b\}, 00) \\
 &= \delta^*(\delta(\{b\}, 0), 0) \\
 &= \delta^*(\{d\}, 0) \\
 &= \delta^*(\delta(\{d\}, 0), \lambda) \\
 &= \delta^*(\emptyset, \lambda) = \emptyset
 \end{aligned}$$

(b)

Bestimmen Sie  $\{w \in \{0, 1\}^* \mid \delta^*(\{a\}, w) \cap \{d\} \neq \emptyset\}$ !

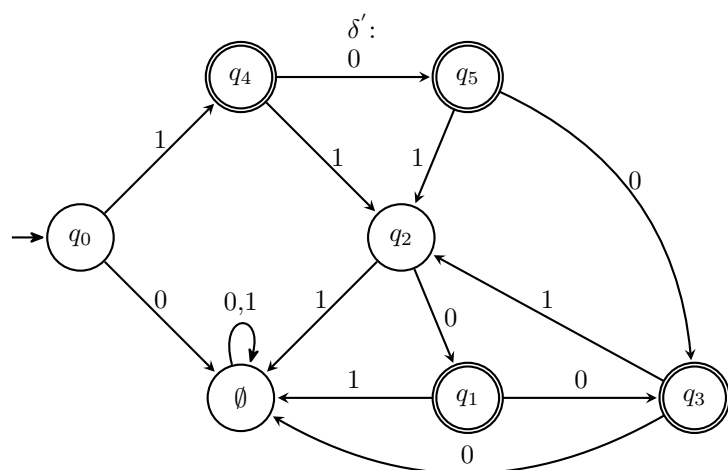
$\delta^*(\{a\}, w)$ ... Menge der

Zustand	0	1
$\emptyset$	$\emptyset$	$\emptyset$
a	$\emptyset$	$\{b, c, d\}$
b	$\{d\}$	$\emptyset$
c	$\{b\}$	$\emptyset$
d	$\emptyset$	$\{c\}$
$\{b, c, d\}$	$\{d, b\}$	$\{c\}$
$\{d, b\}$	$\{d\}$	$\{c\}$

Bzw.

Zustand	0	1
$\emptyset$	$\emptyset$	$\emptyset$
$q_0$	$\emptyset$	$\{q_4\}$
$q_1$	$\{q_3\}$	$\emptyset$
$q_2$	$\{q_1\}$	$\emptyset$
$q_3$	$\emptyset$	$\{q_2\}$
$q_4$	$\{q_5\}$	$\{q_2\}$
$q_5$	$\{q_3\}$	$\{q_2\}$

(c)



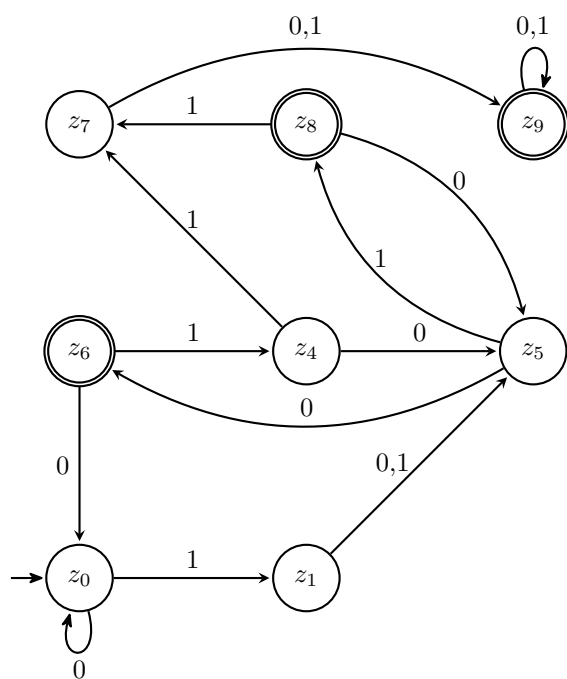
$$M' = (\{0, 1\}, Z', \delta', S', Z'_E)$$

## Aufgabe 2

(a)

$$M' = (\{0, 1\}, Z', \delta', S', Z'_E)$$

$\delta$ :



Zustand	0	1
$z_0$	$\{z_0\}$	$\{z_1\}$
$z_1$	$\{z_0, z_2\}$	$\{z_0, z_2\}$
$z_2$	$\{z_0, z_3\}$	$\{z_0, z_3\}$
$z_3$	$\{z_0\}$	$\{z_0\}$
$\{z_0, z_1\}$	$\{z_0, z_2\}$	$\{z_0, z_1, z_2\}$
$\{z_0, z_2\}$	$\{z_0, z_3\}$	$\{z_0, z_1, z_3\}$
$\{z_0, z_3\}$	$\{z_0\}$	$\{z_0, z_1\}$
$\{z_0, z_1, z_2\}$	$\{z_0, z_1, z_2, z_3\}$	$\{z_0, z_1, z_2, z_3\}$
$\{z_0, z_1, z_3\}$	$\{z_0, z_2\}$	$\{z_0, z_1, z_2\}$
$\{z_0, z_1, z_2, z_3\}$	$\{z_0, z_1, z_2, z_3\}$	$\{z_0, z_1, z_2, z_3\}$

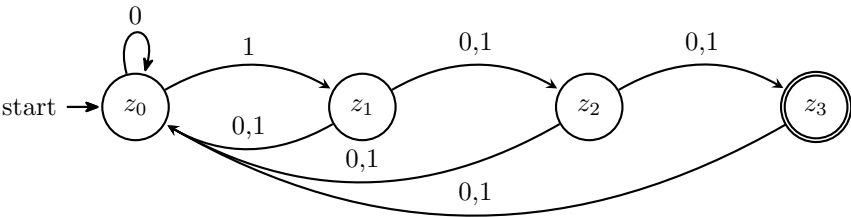
Bzw.

Zustand	0	1
$z_0$	$\{z_0\}$	$\{z_1\}$
$z_1$	$\{z_5\}$	$\{z_5\}$
$z_2$	$\{z_6\}$	$\{z_6\}$
$z_3$	$\{z_0\}$	$\{z_0\}$
$z_4$	$\{z_5\}$	$\{z_7\}$
$z_5$	$\{z_6\}$	$\{z_8\}$
$z_6$	$\{z_0\}$	$\{z_4\}$
$z_7$	$\{z_9\}$	$\{z_9\}$
$z_8$	$\{z_5\}$	$\{z_7\}$
$z_9$	$\{z_9\}$	$\{z_9\}$

(b)

$M = (\{0, 1\}, Z, \delta, S, Z_E)$

$\delta$ :



Zustand	0	1
$z_0$	$\{z_0\}$	$\{z_1\}$
$z_1$	$\{z_0, z_2\}$	$\{z_0, z_2\}$
$z_2$	$\{z_0, z_3\}$	$\{z_0, z_3\}$
$z_3$	$\{z_0\}$	$\{z_0\}$

**Aufgabe 3**

**Aufgabe 4**