

Convert the following finite automata into equivalent regular expressions.

1.  $M=(Q, \Sigma, \delta, q_0, F)$  with

$Q=\{q_0, q_1, q_2, q_3, q_4\}$

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

$F=\{q_4\}$ , and  $\delta$  is defined by

| $\delta$ | 0     | 1     |
|----------|-------|-------|
| $q_0$    | $q_1$ | $q_3$ |
| $q_1$    | $q_1$ | $q_4$ |
| $q_2$    | $q_2$ | $q_1$ |
| $q_3$    | $q_4$ | $q_3$ |
| $q_4$    | $q_2$ | $q_4$ |

2.  $M=(Q, \Sigma, \delta, q_0, F)$  with

$Q=\{q_0, q_1, q_2, q_3\}$

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

$F=\{q_3\}$ , and  $\delta$  is defined by

| $\delta$ | 0     | 1     |
|----------|-------|-------|
| $q_0$    | $q_2$ | $q_1$ |
| $q_1$    | $q_1$ | $q_3$ |
| $q_2$    | $q_2$ | $q_1$ |
| $q_3$    | $q_3$ | $q_3$ |

3.  $M=(Q, \Sigma, \delta, q_0, F)$  with

$Q=\{q_0, q_1, q_2, q_3, q_4, q_5, q_6, q_7\}$

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

$F=\{q_3\}$ , and  $\delta$  is defined by

| $\delta$ | 0     | 1     |
|----------|-------|-------|
| $q_0$    | $q_1$ | $q_0$ |
| $q_1$    | $q_0$ | $q_2$ |
| $q_2$    | $q_3$ | $q_1$ |
| $q_3$    | $q_3$ | $q_0$ |
| $q_4$    | $q_3$ | $q_5$ |
| $q_5$    | $q_6$ | $q_4$ |
| $q_6$    | $q_5$ | $q_6$ |
| $q_7$    | $q_6$ | $q_3$ |