

# HW 02

Elizabeth Hunt

September 20, 2023

## 1 Question One

### 1.1 Partition Refinement

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

$S_1 = \{(q_0, q_1), (q_0, q_3), (q_1, q_3)\}$   $S_2 = \{(q_2, q_4)\}$

$\delta(q_0, 1) = q_3 \in S_1$   $\delta(q_1, 1) = q_4 \in S_2$

$(q_0, q_1)$  need to be split

$\delta(q_0, 0) = q_1 \in S_1$   $\delta(q_3, 0) = q_2 \in S_2$

$(q_1, q_2)$  need to be split

$\forall x \in \Sigma, \delta(q_1, x) = \delta(q_3, x)$  so  $\{q_1, q_3\}$  does not need to be split

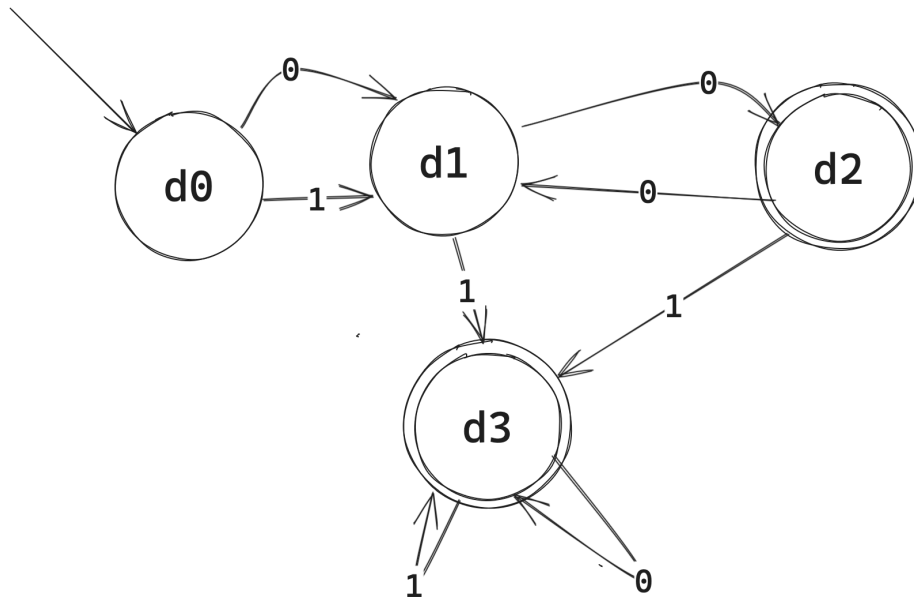
In  $S_2$ ,  $\delta(q_2, 0) \in S_1$  and  $\delta(q_4, 0) \in S_2$ , thus need to be split

Finally, the refined partitions are  $\{\{q_0\}, \{q_1, q_3\}, \{q_2\}, \{q_4\}\}$

### 1.2 Minimization

| $a \in \Sigma$ | $\{q_0\}$      | $\{q_1, q_3\}$ | $\{q_2\}$      | $\{q_4\}$ |
|----------------|----------------|----------------|----------------|-----------|
| 0              | $\{q_1, q_3\}$ | $\{q_2\}$      | $\{q_1, q_3\}$ | $\{q_4\}$ |
| 1              | $\{q_1, q_3\}$ | $\{q_4\}$      | $\{q_4\}$      | $\{q_4\}$ |

with  $d_0 = \{q_0\}$ ,  $d_1 = \{q_1, q_3\}$ ,  $d_2 = \{q_2\}$  and  $d_3 = \{q_4\}$



## 2 Question Two

See attached python