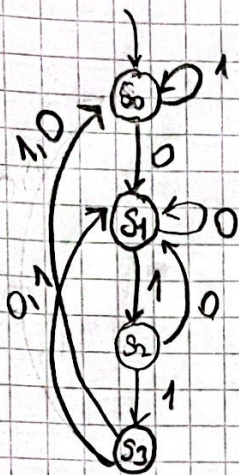


$A=6 \Rightarrow 0110$ $B=3 \Rightarrow 0011$

FSM for A:



| | $x=0$ | $x=1$ | code |
|-------|----------|----------|------|
| S_0 | $S_0, 0$ | $S_0, 0$ | 00 |
| S_1 | $S_1, 0$ | $S_2, 0$ | 01 |
| S_2 | $S_1, 0$ | $S_3, 0$ | 10 |
| S_3 | $S_1, 1$ | $S_0, 0$ | 11 |

Detect A:

| x | q_1 | q_0 | Q_1 | Q_0 | Detected - A |
|---|-------|-------|-------|-------|--------------|
| 0 | 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 | 1 | 0 |
| 0 | 1 | 1 | 0 | 1 | 1 |
| 1 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 | 0 | 0 |
| 1 | 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 1 | 0 | 0 | 0 |

Karnaugh Map for Q_1

Q_1 :

| $x \backslash q_1 q_0$ | 01 | 11 | 10 | 00 |
|------------------------|----|----|----|----|
| 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 | 1 |

$$Q_1 = x \cdot (q_1 \oplus q_0)$$

Q_0 :

| $x \backslash q_1 q_0$ | 01 | 11 | 10 | 00 |
|------------------------|----|----|----|----|
| 0 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 |

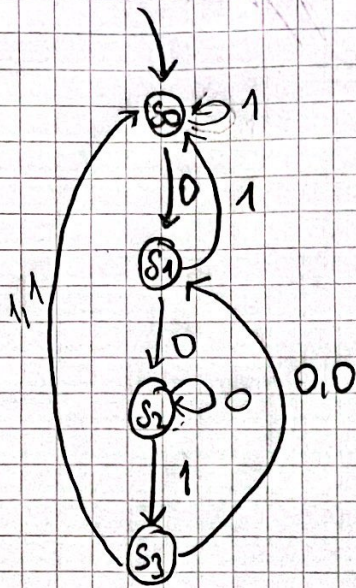
$$Q_0 = q_1 \bar{q}_0 + \bar{x}$$

①

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B = 0011
FSM for B (0011)



| | <u>X=0</u> | <u>X=1</u> | <u>Code</u> |
|----------------|--------------------|--------------------|-------------|
| S ₀ | S ₁ , 0 | S ₀ , 0 | 0 0 |
| S ₁ | S ₂ , 0 | S ₀ , 1 | 0 1 |
| S ₂ | S ₂ , 0 | S ₃ , 1 | 1 0 |
| S ₃ | S ₁ , 0 | S ₀ , 1 | 1 1 |

Detect B

| X | q ₃ | q ₂ | Q ₃ | Q ₂ | <u>Detected B</u> |
|---|----------------|----------------|----------------|----------------|-------------------|
| 0 | 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 1 | 0 | 0 |
| 0 | 1 | 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 0 | 1 | 0 |
| 1 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 1 | 0 | 0 | 1 |

Karnaugh Map

Q₃

| x \ q ₃ q ₂ | 00 | 01 | 11 | 10 |
|-----------------------------------|----|----|----|----|
| 0 | 0 | 1 | 0 | 1 |
| 1 | 0 | 0 | 0 | 0 |

$$Q_3 = \bar{x}\bar{q}_3q_2 + q_3q_2$$

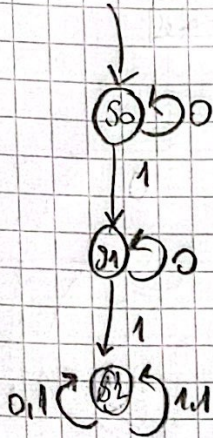
Q₂

| x \ q ₃ q ₂ | 00 | 01 | 11 | 10 |
|-----------------------------------|----|----|----|----|
| 0 | 1 | 0 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 |

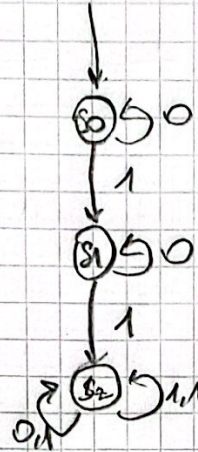
$$Q_2 = \bar{x}\bar{q}_3q_2 + xq_3q_2 + \bar{x}q_3q_2$$

②

Lock state A



Lock state B



For Lock state A :

| | <u>x=0</u> | <u>x=1</u> | <u>Code</u> |
|----------------|--------------------|--------------------|-------------|
| S ₀ | S ₀ , 0 | S ₁ , 0 | 0 0 |
| S ₁ | S ₁ , 0 | S ₂ , 0 | 0 1 |
| S ₂ | S ₂ , 1 | S ₂ , 1 | 1 0 |

For Lock state B :

| | <u>x=0</u> | <u>x=1</u> | <u>Code</u> |
|----------------|--------------------|--------------------|-------------|
| S ₀ | S ₀ , 0 | S ₁ , 0 | 0 0 |
| S ₁ | S ₁ , 0 | S ₂ , 0 | 0 1 |
| S ₂ | S ₂ , 1 | S ₂ , 1 | 1 0 |

| <u>Detected A</u> | q ₅ | q ₄ | Q ₅ | Q ₄ |
|-------------------|----------------|----------------|----------------|----------------|
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | X | X |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | X | X |

Lock state A

0
0
1
X
0
0
1
X

$$Q_5 = \text{Detected A } q_4 + q_5$$

$$Q_4 = \text{Detected A } \overline{q_5} + \text{Detected A } q_4$$

| <u>Detected B</u> | q ₇ | q ₆ | Q ₇ | Q ₆ |
|-------------------|----------------|----------------|----------------|----------------|
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | X | X |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | X | X |

Lock state B

0
0
1
X
0
0
1
X

$$Q_7 = \text{Detected B } q_6 + q_7$$

$$Q_6 = \text{Detected B } \overline{q_7} + \text{Detected B } q_6$$

3