

A3

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| 1. | x | y | z | a | b | c |
|----|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 1 |
| | 0 | 0 | 1 | 0 | 1 | 0 |
| | 0 | 1 | 0 | 0 | 1 | 1 |
| | 0 | 1 | 1 | 1 | 0 | 0 |
| | 1 | 0 | 0 | 0 | 1 | 1 |
| | 1 | 0 | 1 | 1 | 0 | 0 |
| | 1 | 1 | 0 | 1 | 0 | 1 |
| | 1 | 1 | 1 | 1 | 1 | 0 |

$$a = xz + yz + xy = yz + x(z+y)$$

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

$$b = (x \oplus y \oplus z)'$$

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

$$c = z'$$

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

| 2. | w | x | y | z | a | b | c | d |
|----|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 |
| | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 |
| | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 |
| | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |
| 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 |
| 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 |

$$a = xw'y'z' + x'wy' + x'z + x'y$$

$$b = wy'z' + w'z + w'y$$

| xw \ yz | 00 | 01 | 11 | 10 |
|---------|----|----|----|----|
| 00 | | 1 | 1 | 1 |
| 01 | 1 | 1 | 1 | 1 |
| 11 | | | | |
| 10 | 1 | | | |

| xw \ yz | 00 | 01 | 11 | 10 |
|---------|----|----|----|----|
| 00 | | 1 | 1 | 1 |
| 01 | 1 | | | |
| 11 | 1 | | | |
| 10 | | 1 | 1 | 1 |

$$c = y'z + yz' = y \oplus z$$

$$d = z$$

| xw \ yz | 00 | 01 | 11 | 10 |
|---------|----|----|----|----|
| 00 | | 1 | | 1 |
| 01 | | 1 | | 1 |
| 11 | | 1 | | 1 |
| 10 | | 1 | | 1 |

| xw \ yz | 00 | 01 | 11 | 10 |
|---------|----|----|----|----|
| 00 | | 1 | 1 | |
| 01 | | 1 | 1 | |
| 11 | | 1 | 1 | |
| 10 | | 1 | 1 | |

$$3. Q'(t+1) = J'Q' + KQ$$

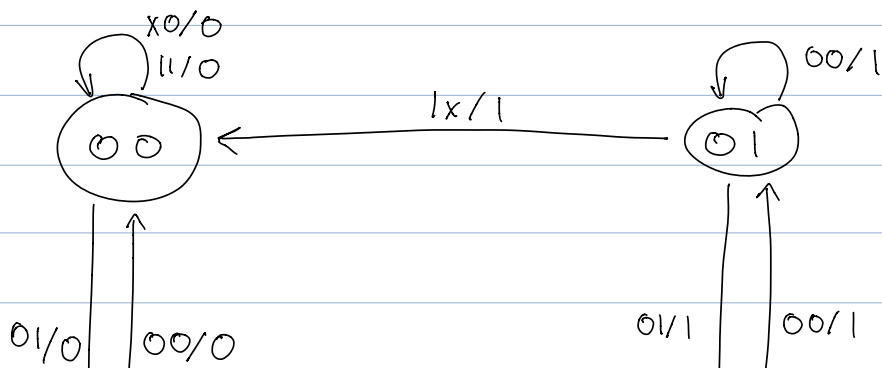
| J | K | Q^{+} |
|---|---|------------------------------|
| 0 | 0 | Q' (Refresh) |
| 0 | 1 | $Q' + Q = 1$ (set) |
| 1 | 0 | $0 + 0 = 0$ (Reset or clear) |

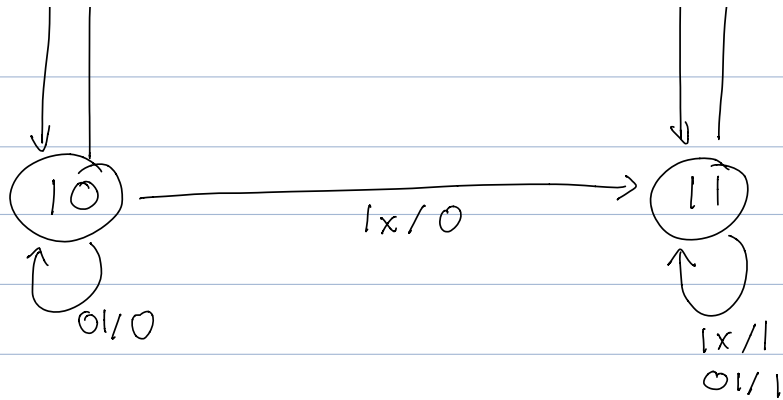
1 1 1 1 Q (complement)

4.

| x | y | D_A | D_B | $D_A(t+1)$ | $D_B(t+1)$ | z |
|------|---|-------|-------|------------|------------|---|
| b) 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 | 1 | 1 | 0 |
| 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 |

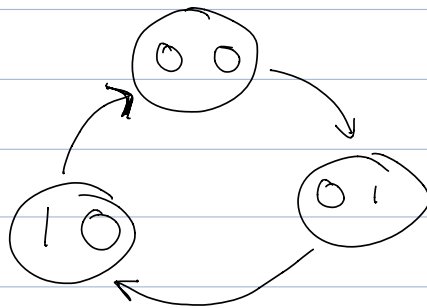
c)





5.

| A | B | $A(t+1)$ | $B(t+1)$ | T_A | T_B |
|---|---|----------|----------|-------|-------|
| 0 | 0 | 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 | 0 |
| 1 | 1 | 0 | 0 | 1 | 1 |



6.

| X | A | B | $A(t+1)$ | $B(t+1)$ | J_A | K_A | J_B | K_B |
|---|---|---|----------|----------|-------|-------|-------|-------|
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 |

a) $A(t+1) = XA' + AB$

| X \ AB | 00 | 01 | 11 | 10 |
|--------|----|----|----|----|
| 0 | | 1 | 1 | |
| 1 | 1 | 1 | 1 | |

$B(t+1) = XB' + A'B$

| X \ AB | 00 | 01 | 11 | 10 |
|--------|----|----|----|----|
| 0 | | 1 | | |
| 1 | 1 | 1 | | 1 |

b)

