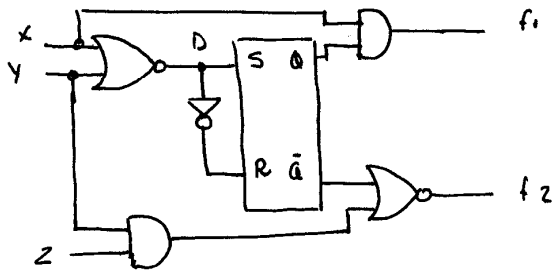
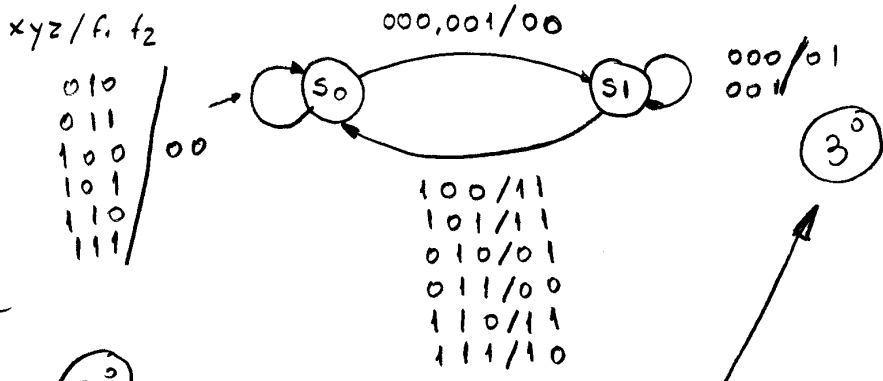


Mayo 94 (2)



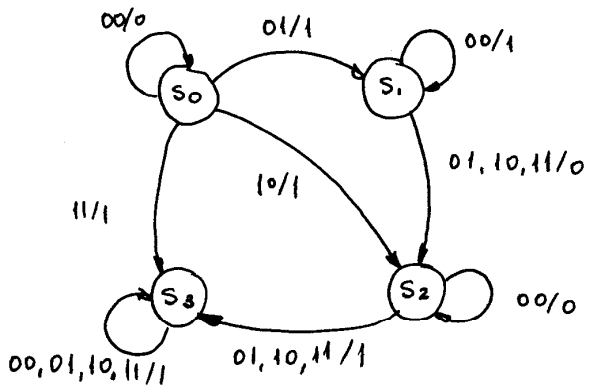
$f_1 = xQ$   
 $f_2 = (y \cdot z) + \bar{Q}$   
 $Q = \overline{x+y}$



2<sup>o</sup>

| Q | x | y | z | Q | f1 | f2 |
|---|---|---|---|---|----|----|
| 0 | 0 | 0 | 0 | ↓ | 0  | 0  |
| 0 | 0 | 0 | 1 | ↓ | 0  | 0  |
| 0 | 0 | 1 | 0 | 0 | 0  | 0  |
| 0 | 0 | 1 | 1 | 0 | 0  | 0  |
| 0 | 1 | 0 | 0 | 0 | 0  | 0  |
| 0 | 1 | 0 | 1 | 0 | 0  | 0  |
| 0 | 1 | 1 | 0 | 0 | 0  | 0  |
| 0 | 1 | 1 | 1 | 0 | 0  | 0  |
| 1 | 0 | 0 | 0 | ↓ | 0  | 1  |
| 1 | 0 | 0 | 1 | ↓ | 0  | 1  |
| 1 | 0 | 1 | 0 | 0 | 0  | 1  |
| 1 | 0 | 1 | 1 | 0 | 0  | 1  |
| 1 | 1 | 0 | 0 | 0 | 1  | 1  |
| 1 | 1 | 0 | 1 | 0 | 1  | 1  |
| 1 | 1 | 1 | 0 | 0 | 1  | 0  |
| 1 | 1 | 1 | 1 | 0 | 1  | 0  |

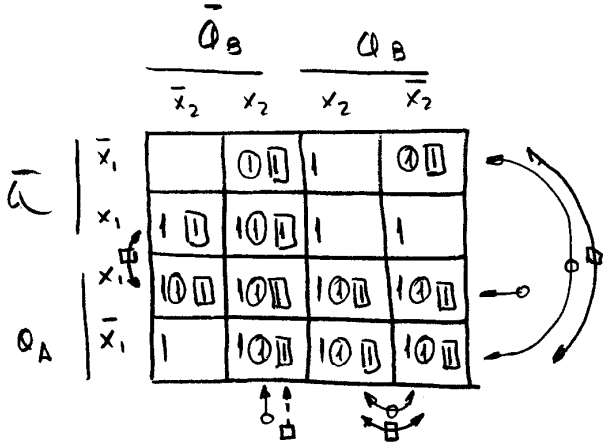
Junio 95 (1)



$S_0 \div S_3 \Rightarrow$  2 básculas

$00/0 \Rightarrow x_1, x_2 / y$

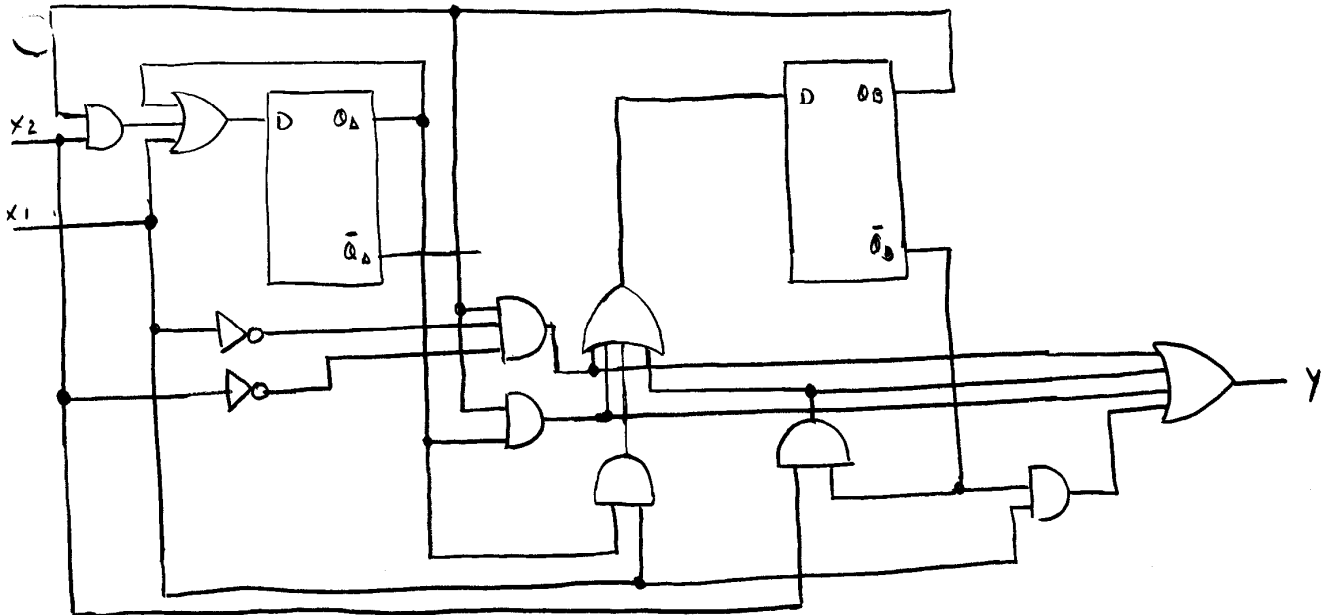
| $x_1$ | $x_2$ | $Q_A$ | $Q_B$ | $Q_{A+1}$ | $Q_{B+1}$ | $Y$ |
|-------|-------|-------|-------|-----------|-----------|-----|
| 0     | 0     | 0     | 0     | 0         | 0         | 0   |
| 0     | 1     | 0     | 0     | 0         | 1         | 1   |
| 1     | 0     | 0     | 0     | 1         | 0         | 1   |
| 1     | 0     | 0     | 1     | 0         | 1         | 1   |
| 0     | 1     | 0     | 1     | 1         | 0         | 0   |
| 1     | 1     | 0     | 1     | 1         | 0         | 0   |
| 0     | 0     | 1     | 0     | 1         | 1         | 0   |
| 0     | 1     | 1     | 0     | 1         | 1         | 0   |
| 1     | 0     | 1     | 0     | 1         | 1         | 0   |
| 1     | 1     | 1     | 0     | 1         | 1         | 0   |



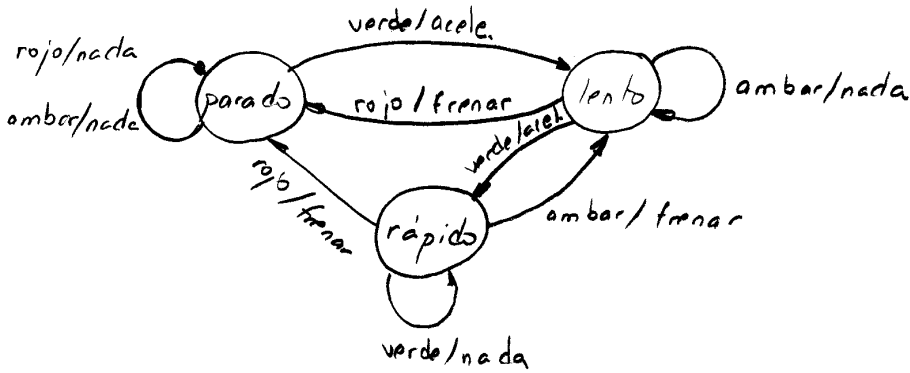
$$Q_{A+1} = Q_A + x_1 + x_2 Q_B$$

$$Q_{B+1} = x_2 \bar{Q}_B + x_1 Q_A + Q_A Q_B + \bar{x}_1 \bar{x}_2 Q_B$$

$$Y = x_2 \bar{Q}_B + x_1 \bar{Q}_B + Q_A Q_B + \bar{x}_1 \bar{x}_2 Q_B$$



Septiembre 93 (1)



Estados  $\left\{ \begin{array}{l} \text{parado (00)} \\ \text{lento (01)} \\ \text{rápido (10)} \end{array} \right.$     entradas  $\left\{ \begin{array}{l} \text{rojo (r)} \\ \text{rojo (a)} \\ \text{verde (v)} \end{array} \right.$     salidas  $\left\{ \begin{array}{l} \text{-nada (A)} \\ \text{-acelerar (A)} \\ \text{-frenar (F)} \end{array} \right.$

↓

$\mathcal{O}_A \quad \mathcal{O}_B$

| r | a | v | $\mathcal{O}_A$ | $\mathcal{O}_B$ | $\mathcal{O}_A$ | $\mathcal{O}_B$ | A | F |
|---|---|---|-----------------|-----------------|-----------------|-----------------|---|---|
| 1 | 0 | 0 | 0               | 0               | 0               | 0               | 0 | 0 |
| 0 | 1 | 0 | 0               | 0               | 0               | 0               | 0 | 0 |
| 0 | 0 | 1 | 0               | 0               | 0               | 1               | 1 | 0 |
| 0 | 0 | 0 | 0               | 0               |                 |                 |   |   |
| 0 | 1 | 0 | 0               | 0               |                 |                 |   |   |
| 0 | 0 | 1 | 0               | 0               |                 |                 |   |   |
| 0 | 1 | 0 | 0               | 1               | 0               | 1               | 0 | 0 |
| 0 | 0 | 0 | 0               | 1               | 0               | 0               | 0 | 1 |
| 0 | 0 | 0 | 0               | 0               |                 |                 |   |   |
| 0 | 0 | 1 | 1               | 0               |                 |                 |   |   |
| 0 | 1 | 0 | 1               | 0               | 1               | 0               | 0 | 1 |
| 1 | 0 | 0 | 1               | 0               | 0               | 0               | 0 | 1 |
|   |   |   | 1               | 0               |                 |                 |   |   |
|   |   |   | 1               | 0               |                 |                 |   |   |
|   |   |   | 1               | 0               |                 |                 |   |   |
| x | x | x | 1               | 1               |                 |                 |   |   |

Los imposibles se pueden tomar como 0 o 1 según interese para conseguir máxima simplificación, pq son entradas que nunca se producen.

E.B.3

|             |           | $\bar{Q}_B$ |     |     |           | $Q_B$     |     |           |           |
|-------------|-----------|-------------|-----|-----|-----------|-----------|-----|-----------|-----------|
|             |           | $\bar{v}$   |     | $v$ |           | $v$       |     | $\bar{v}$ |           |
|             |           | $\bar{r}$   | $r$ | $r$ | $\bar{r}$ | $\bar{r}$ | $r$ | $r$       | $\bar{r}$ |
| $\bar{Q}_A$ | $\bar{a}$ | x           | 0   | x   | 1 1       | 1 1       | x   | 1         | x         |
|             | $a$       | 0           | x   | x   | x         | x         | x   | x         | 1         |
| $Q_A$       | $a$       | 1           | x   | x   | x         | x         | x   | x         | x         |
|             | $\bar{a}$ | x           | 1   | x   | 1         | x         | x   | x         | x         |

$$Q_A = v Q_B + v Q_A = v (Q_B + Q_A)$$

$$Q_B = a Q_B + a Q_A + v \bar{Q}_A \bar{Q}_B$$

$$A = v \bar{Q}_A$$

$$F = r Q_B + \bar{v} Q_A$$

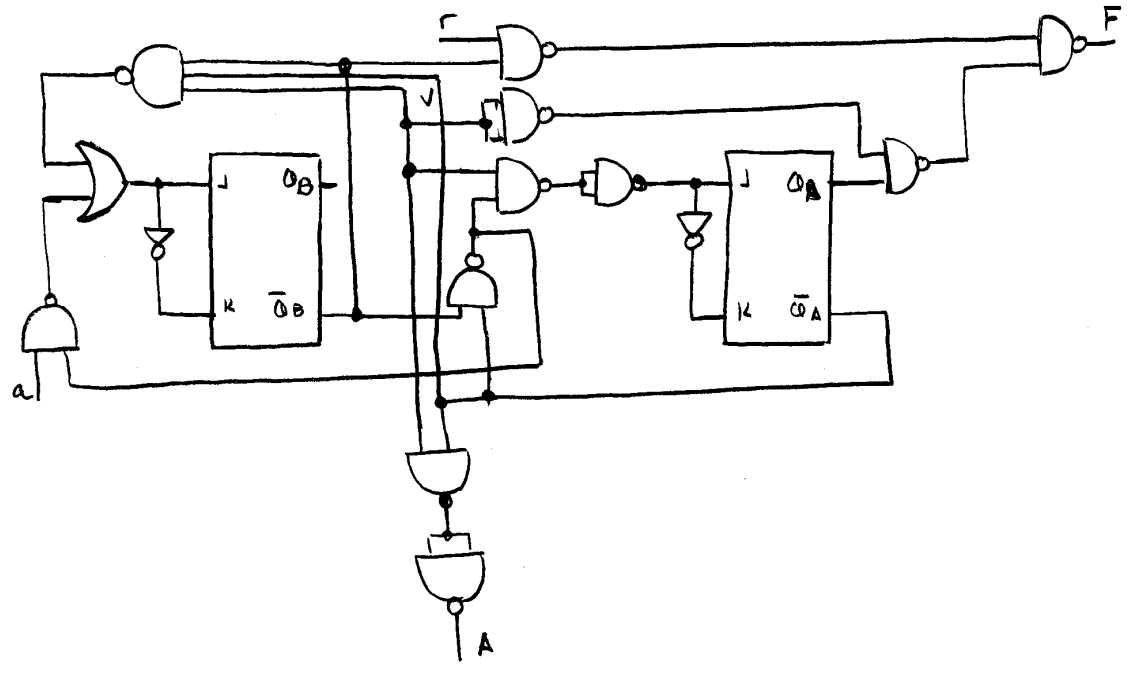
$$Q_A = v (Q_B + Q_A) = v (\overline{Q_B + Q_A}) = v \overline{Q_B} \cdot \overline{Q_A}$$

$$A = v \bar{Q}_A$$

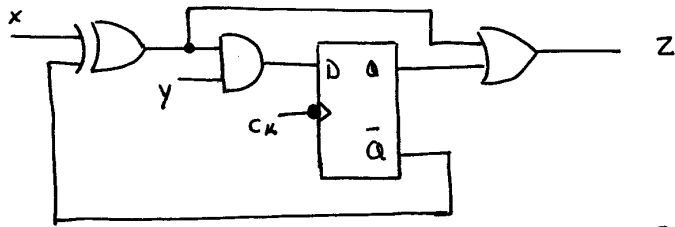
$$F = r Q_B + \bar{v} Q_A = r Q_B + \bar{v} \bar{Q}_A$$

$$Q_B = a (Q_A + Q_B) + v \bar{Q}_A \bar{Q}_B$$

$$Q_B = a (\bar{Q}_B \bar{Q}_A) + v \bar{Q}_A \bar{Q}_B$$



Septiembre 96

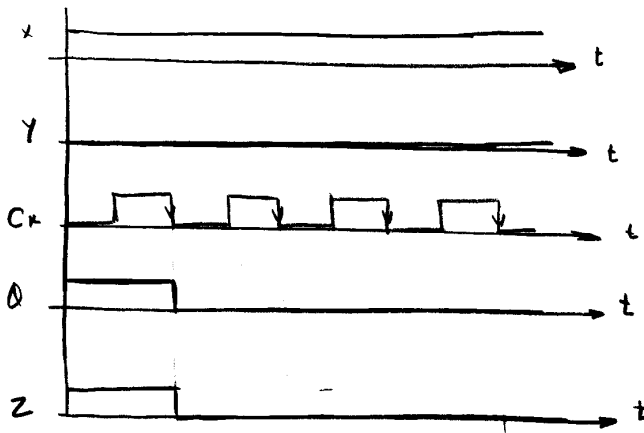
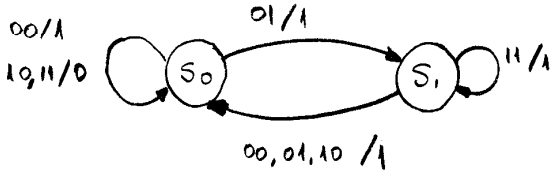


x/y/z

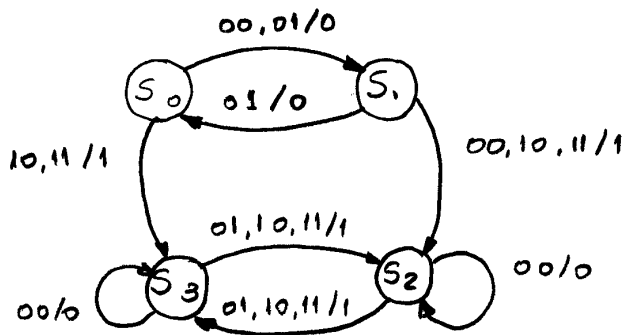
$$D = (x \oplus \bar{Q}) y$$

$$z = (x \oplus \bar{Q}) + Q =$$

$$z = xQ + \bar{x}\bar{Q} + Q = Q + \bar{x}$$



Septiembre 98



Estados = 4  $\Rightarrow$  2 básculas

Entrada =  $x_1, x_2$

Salidas =  $y$

2°

|             | $\bar{Q}_1$ |            | $Q_1$       |            |            |
|-------------|-------------|------------|-------------|------------|------------|
|             | $\bar{Q}_0$ | $Q_0$      | $\bar{Q}_0$ | $Q_0$      |            |
| $\bar{x}_1$ | $\bar{x}_2$ | 0          | 1 $\Delta$  | 1 $\Delta$ | 1          |
|             | $x_2$       | 0          |             | 1 $\Delta$ | 1 $\Delta$ |
| $x_1$       | $x_2$       | 1 $\Delta$ | 1 $\Delta$  | 1 $\Delta$ | 1 $\Delta$ |
|             | $\bar{x}_2$ | 1 $\Delta$ | 1 $\Delta$  | 1 $\Delta$ | 1 $\Delta$ |

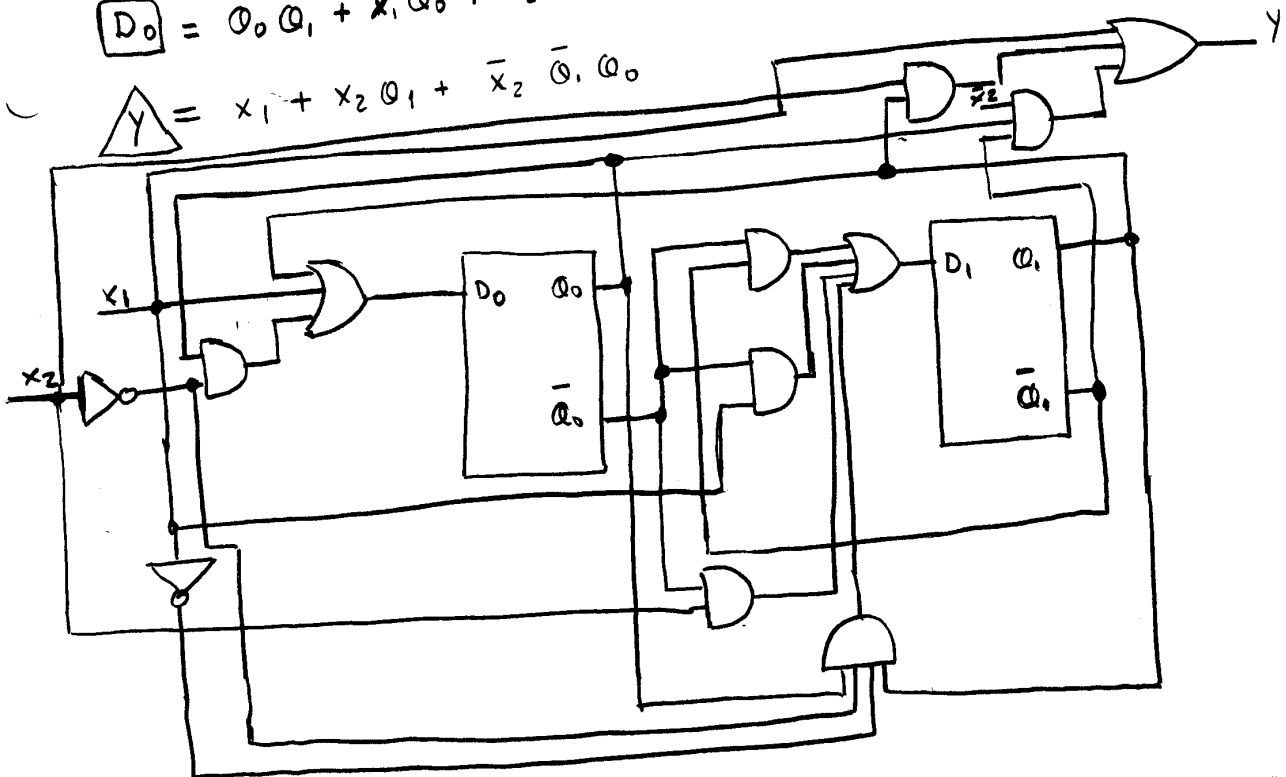
1°

| $Q_1$ | $Q_0$ | $x_1$ | $x_2$ | $D_1$ | $D_0$ | $Y$ |
|-------|-------|-------|-------|-------|-------|-----|
| 0     | 0     | 0     | 0     | 0     | 1     | 0   |
| 0     | 0     | 0     | 1     | 0     | 1     | 0   |
| 0     | 0     | 1     | 0     | 1     | 1     | 1   |
| 0     | 0     | 1     | 1     | 1     | 1     | 1   |
| 0     | 1     | 0     | 0     | 0     | 0     | 0   |
| 0     | 1     | 0     | 1     | 0     | 0     | 0   |
| 0     | 1     | 1     | 0     | 0     | 0     | 0   |
| 0     | 1     | 1     | 1     | 0     | 0     | 0   |
| 1     | 0     | 0     | 0     | 0     | 0     | 0   |
| 1     | 0     | 0     | 1     | 0     | 0     | 0   |
| 1     | 0     | 1     | 0     | 0     | 0     | 0   |
| 1     | 0     | 1     | 1     | 0     | 0     | 0   |
| 1     | 1     | 0     | 0     | 0     | 0     | 0   |
| 1     | 1     | 0     | 1     | 0     | 0     | 0   |
| 1     | 1     | 1     | 0     | 0     | 0     | 0   |
| 1     | 1     | 1     | 1     | 0     | 0     | 0   |

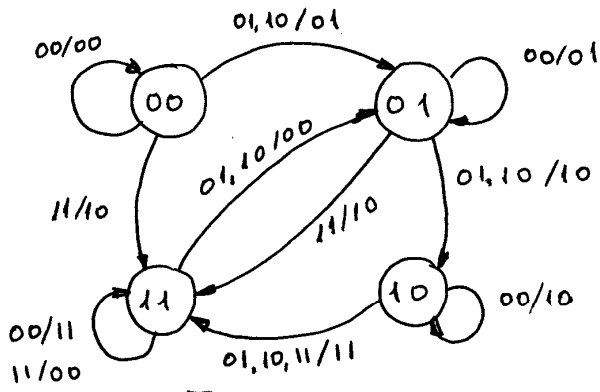
$$D_1 = x_1 + Q_1 + \bar{x}_2 Q_0$$

$$D_0 = \bar{Q}_0 \bar{Q}_1 + x_1 \bar{Q}_0 + x_2 \bar{Q}_0 + Q_1 Q_0 \bar{x}_1 \bar{x}_2$$

$$Y = x_1 + x_2 Q_1 + \bar{x}_2 \bar{Q}_1 Q_0$$



E.B.7



$$\begin{array}{c} \bar{Q}_0 \\ \hline \bar{x}_2 \quad x_2 \\ \hline \end{array} \quad \begin{array}{c} Q_0 \\ \hline x_2 \quad \bar{x}_2 \\ \hline \end{array}$$

|             |             |                     |                     |              |
|-------------|-------------|---------------------|---------------------|--------------|
| $\bar{Q}_1$ | $\bar{x}_1$ | $Q_1 \Delta$        | $1 \square$         | $Q_1 \Delta$ |
| $Q_1$       | $x_1$       | $1 \square \Delta$  | $1 \square \square$ | $1 \square$  |
| $\bar{Q}_1$ | $\bar{x}_1$ | $1 \square \square$ | $1 \square \square$ | $1 \square$  |
| $Q_1$       | $x_1$       | $1 \square \Delta$  | $1 \square \Delta$  | $1 \square$  |

$Q_1 \quad Q_0 \quad x_1 \quad x_2 \quad y_1 \quad y_2$

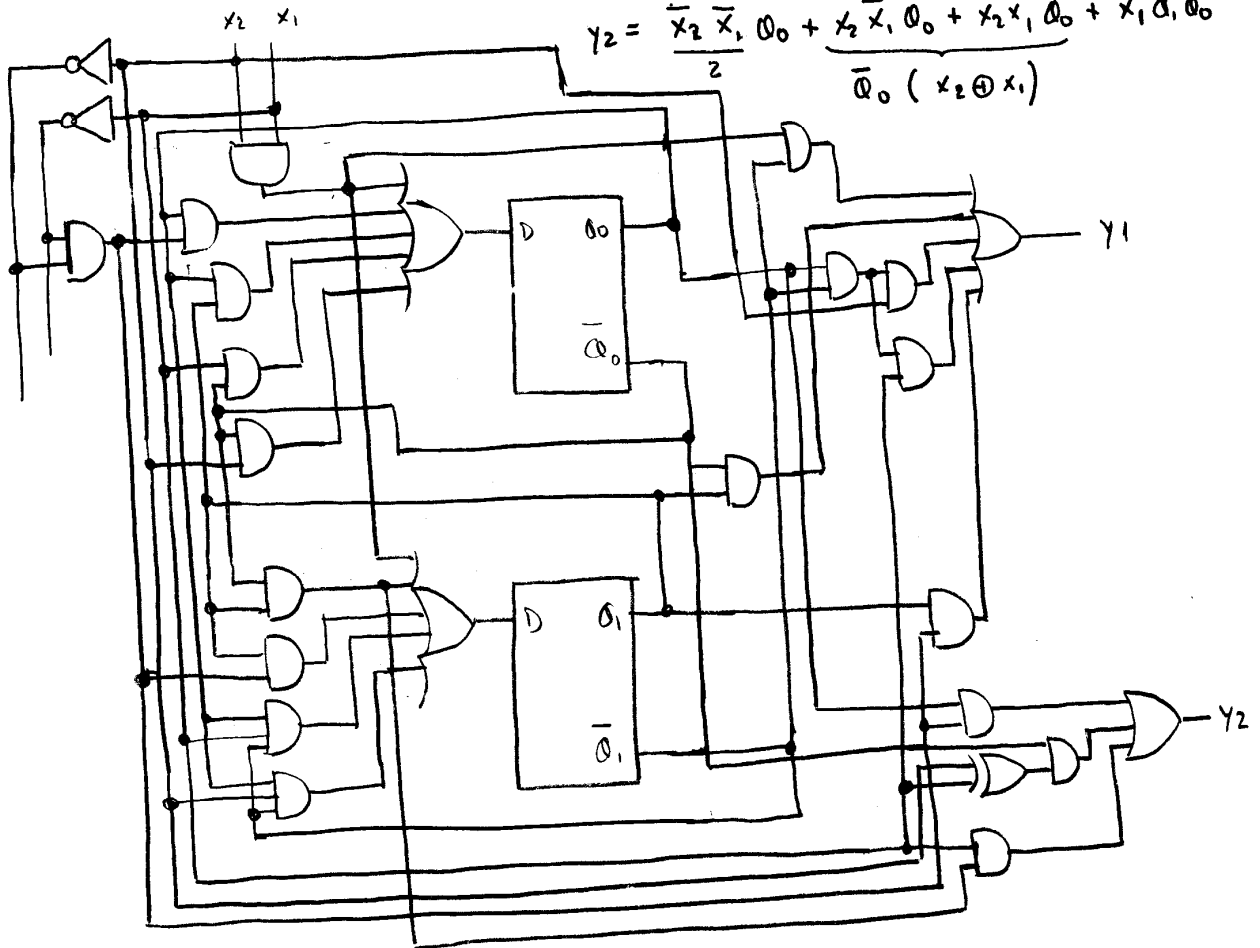
| $x_1$ | $x_2$ | $Q_1$ | $Q_0$ | $y_1$ | $y_2$ |
|-------|-------|-------|-------|-------|-------|
| 0     | 0     | 0     | 0     | 0     | 0     |
| 0     | 1     | 0     | 0     | 0     | 1     |
| 1     | 0     | 0     | 0     | 0     | 0     |
| 1     | 1     | 0     | 0     | 0     | 0     |
| 0     | 0     | 1     | 0     | 0     | 0     |
| 0     | 1     | 1     | 0     | 0     | 1     |
| 1     | 0     | 1     | 0     | 0     | 0     |
| 1     | 1     | 1     | 0     | 0     | 0     |
| 0     | 0     | 0     | 1     | 0     | 0     |
| 0     | 1     | 0     | 1     | 0     | 1     |
| 1     | 0     | 0     | 1     | 0     | 0     |
| 1     | 1     | 0     | 1     | 0     | 0     |

$$Q_1 = \frac{x_2 x_1}{2} + Q_1 \bar{Q}_0 + \frac{\bar{x}_2 \bar{x}_1}{2} Q_1 + x_1 \bar{Q}_1 Q_0 + x_2 \bar{Q}_1 Q_0$$

$$Q_0 = x_2 Q_0 + x_1 \bar{Q}_0 + \frac{x_2 x_1}{2} Q_0 + \bar{Q}_0 Q_1 + \frac{\bar{x}_2 \bar{x}_1}{2} Q_0$$

$$y_1 = Q_1 \bar{Q}_0 + \frac{x_2 x_1}{2} \bar{Q}_1 + x_2 \bar{Q}_1 Q_0 + x_1 \bar{Q}_1 Q_0 + \frac{\bar{x}_2 \bar{x}_1}{2} Q_1$$

$$y_2 = \frac{\bar{x}_2 \bar{x}_1}{2} Q_0 + \frac{x_2 \bar{x}_1}{2} \bar{Q}_0 + \bar{x}_2 x_1 \bar{Q}_0 + x_1 Q_1 \bar{Q}_0$$



Mayo 2001

Biestables RS

Septiembre 2001

Biestables JK

Septiembre 2002 - Septiembre 2003

Biestables T y D

Junio 2003

Biestables R-S