Pregunta 1

Sistema combinacional para saber quien gana en cada jugada

Entradas:

jugador A piedra 00
papel 01
Tijera 10

jugador B piedra 00
papel 01
Tijera 10

Salidas:

Jugador A: gana 00
: empate 01
: pierde 10

A_1 A_0	B_1 B_0	S_1 S_0
0 0	0 0	0 1
0 0	0 1	1 0
0 0	1 0	0 0
0 0	1 1	x x
0 1	0 0	0 0
0 1	0 1	0 1
0 1	1 0	1 0
0 1	1 1	x x
1 0	0 0	1 0
1 0	0 1	0 0
1 0	1 0	0 1
1 0	1 1	x x
1 1	0 0	x x
1 1	0 1	x x
1 1	1 0	x x
1 1	1 1	x x

A_1A_0 \ B_1B_0	00	01	11	10
00	0	1	x	0
01	0	0	x	1
11	x	x	x	x
10	1	0	x	0

$$S_1 = A_0 B_1 + A_1 \bar{B}_1 \bar{B}_0 + \bar{A}_1 \bar{A}_0 B_0$$

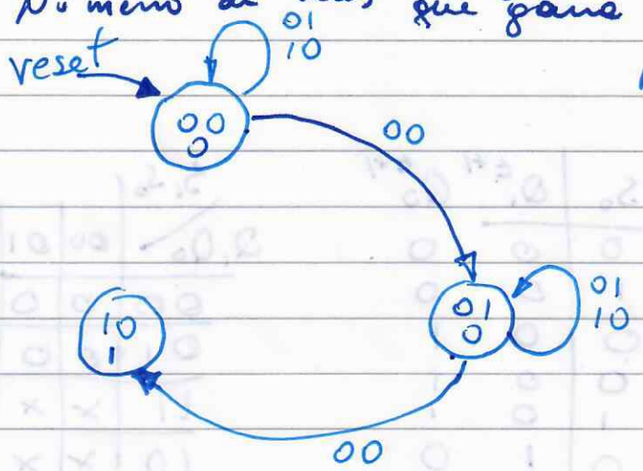
A_1A_0 \ B_1B_0	00	01	11	10
00	1	0	x	0
01	0	1	x	0
11	x	x	x	x
10	0	0	x	1

$$S_0 = A_0 B_0 + A_1 B_1 + \bar{A}_0 \bar{A}_1 \bar{B}_0 \bar{B}_1$$

Máquina Moore

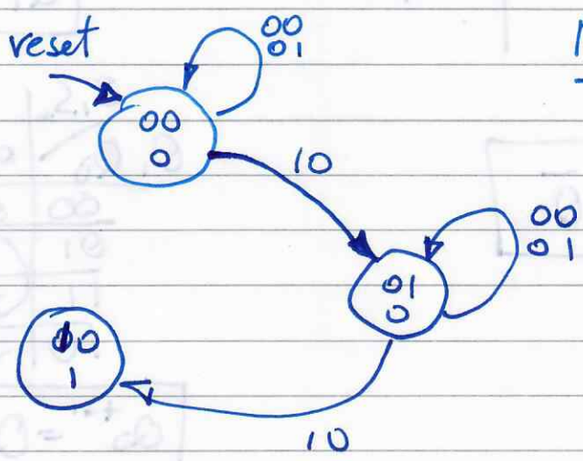
Entradas $S_1 S_0$ (00 gana A, 01 empate, 10 pierde A)

Estados: Número de veces que gana A
Número de veces que gana B



Máquina para A

Salida P (la partida la gana A)



Máquina para B

Salida T (la partida la gana B)

Máquina A

Q_1	Q_0	S_1	S_0	Q_1^{t+1}	Q_0^{t+1}
0	0	0	0	0	1
0	0	0	1	0	0
0	0	1	0	0	0
0	1	0	0	1	0
0	1	0	1	0	1
0	1	1	0	0	1
1	0	0	0	X	
1	0	0	1		
1	0	1	0		
		X		X	

$Q_1 Q_0$ \ $S_1 S_0$	00	01	11	10
00	0	0	x	0
01	1	0	x	0
11	x	x	x	x
10	x	x	x	x

$$Q_1^{t+1} = Q_0 \overline{S_1}\,\overline{S_0}$$

Q_1Q_0 \ S_1S_0	00	01	11	10
00	1	0	x	0
01	0	1	x	1
11	x	x	x	x
10	x	x	x	x

$$Q_0^{t+1} = Q_0 S_0 + Q_0 S_1 + \bar{Q}_0 S_1 \bar{S}_0$$

Salida $P = Q_1 \bar{Q}_0$

Máquina B

Q_1	Q_0	S_1	S_0	Q_1^{t+1}	Q_0^{t+1}
0	0	0	0	0	0
0	0	0	1	0	0
0	0	1	0	0	1
0	1	0	0	0	1
0	1	0	1	0	1
0	1	1	0	1	0
X				X	

Q_1Q_0 \ S_1S_0	00	01	11	10
00	0	0	x	0
01	0	0	x	1
11	x	x	x	x
10	x	x	x	x

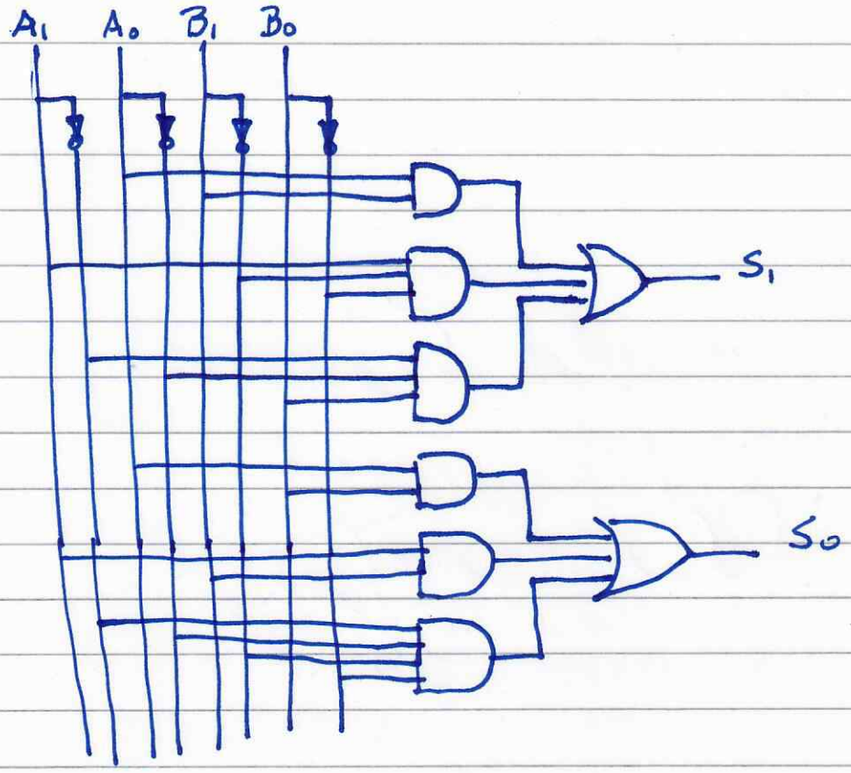
$$Q_1^{t+1} = Q_0 S_1$$

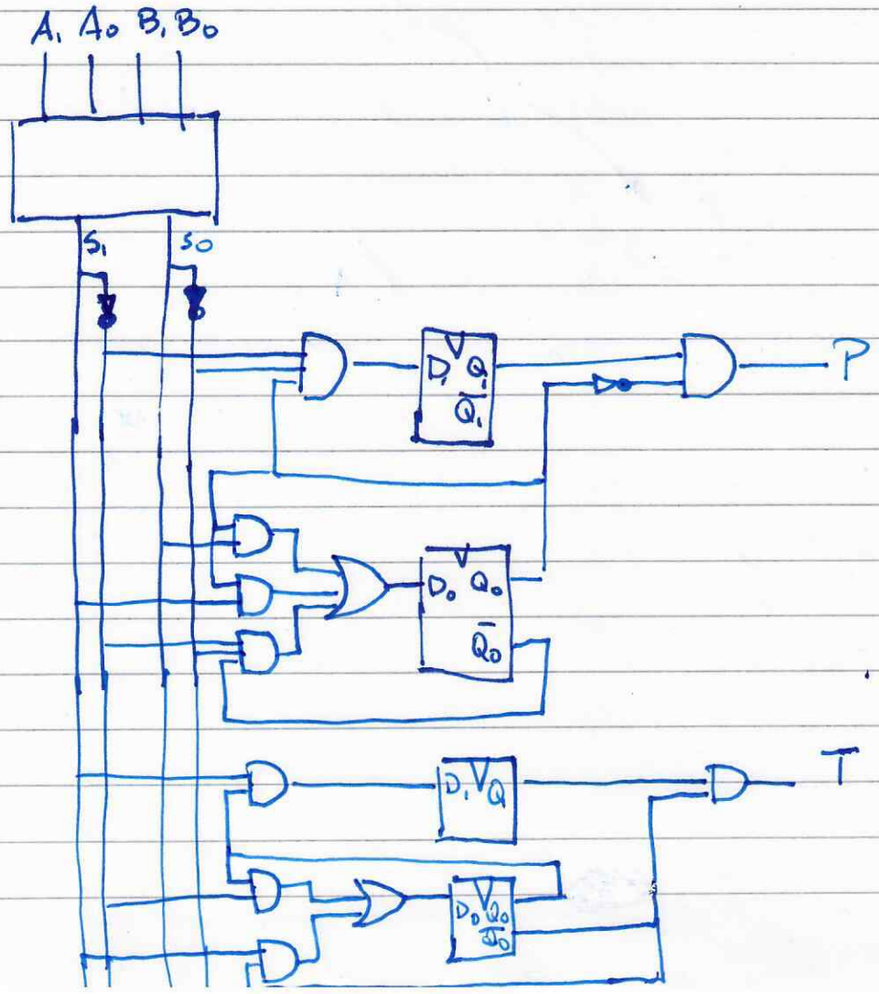
Salida $T = Q_1 \bar{Q}_0$

Q_1Q_0 \ S_1S_0	00	01	11	10
00	0	0	x	1
01	1	1	x	0
11	x	x	x	x
10	x	x	x	x

$$Q_0^{t+1} = Q_0 \bar{S}_1 + \bar{Q}_0 S_1$$

Sistema Combinacional





Pregunta 2

Sistema combinacional

Idéntico sistema combinacional que en la pregunta 1

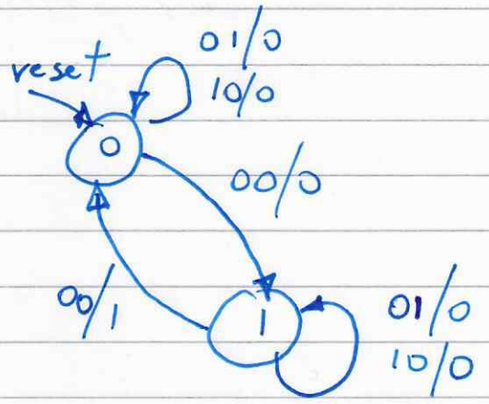
Máquina Moore

Entradas $S_1 S_0$ (00 gana A, 01 empate, 10 gana A)

Estados: Número de veces que gana A
Número de veces que gana B

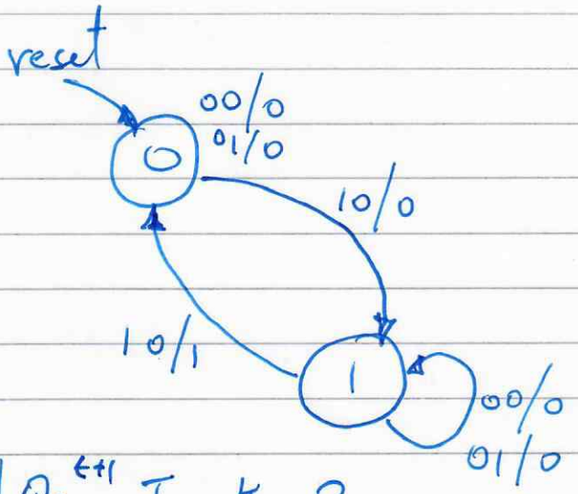
Máquina A

Salida P
(la partida la gana A)



Máquina B

Salida T
(la partida la gana B)



Máquina A

J K	Q^{t+1}
00	Q^t
01	0
10	1
11	$\overline{Q^t}$

Q_0	S_1	S_0	Q_0^{t+1}	J_0	K_0	?
0	0	0	1	1	X	0
0	0	1	0	0	X	0
0	1	0	0	0	X	0
1	0	0	0	X	1	1
1	0	1	1	X	0	0
1	1	0	1	X	0	0
	X		X			

$J_0 = \bar{S}_1 \bar{S}_0$

Q_0 \ S_1S_0	00	01	11	10
0	1	0	X	0
1	X	X	X	X

$K_0 = \bar{S}_1 \bar{S}_0$

Q_0 \ S_1S_0	00	01	11	10
0	X	X	X	X
1	1	0	X	0

$P = Q_0 \bar{S}_1 \bar{S}_0$

Q_0 \ S_1S_0	00	01	11	10
0	0	0	X	0
1	1	0	X	0

Máquina B

Q_0	S_1	S_0	Q_0^{t+1}	J_0	K_0	T
0	0	0	0	0	x	0
0	0	1	0	0	x	0
0	1	0	1	1	x	0
1	0	0	1	x	0	0
1	0	1	1	x	0	0
1	1	0	0	x	1	1
	x		x			

$J_0 = S_1$

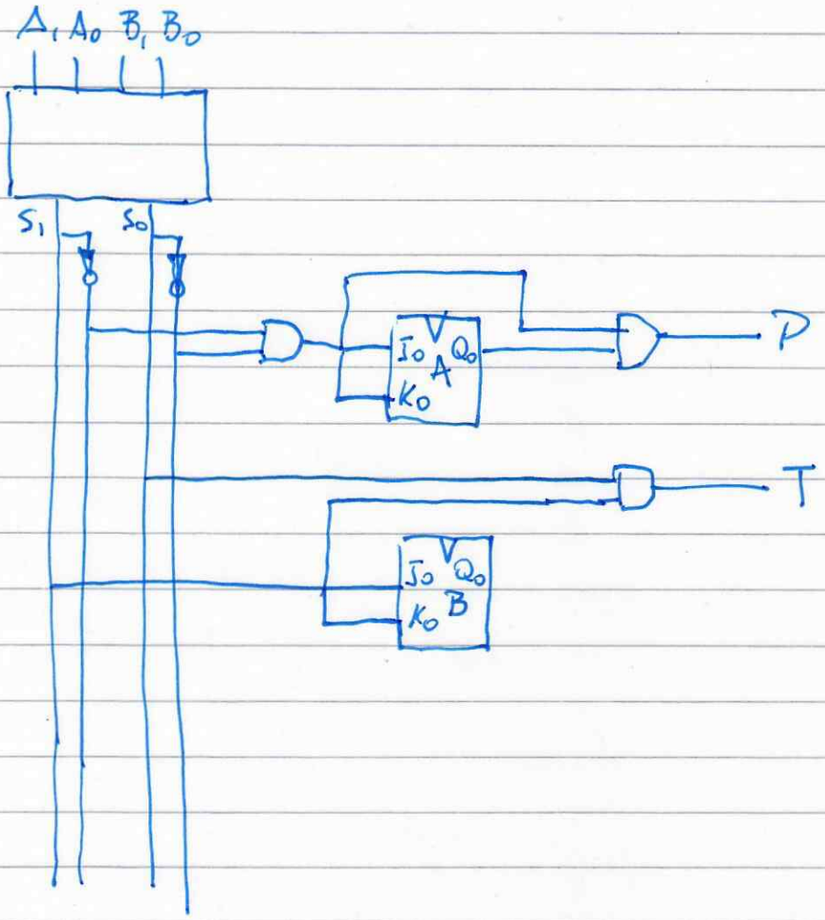
Q_0 \ S_1S_0	00	01	11	10
0	0	0	x	1
1	x	x	x	x

$K_0 = S_1$

Q_0 \ S_1S_0	00	01	11	10
0	x	x	x	x
1	0	0	x	1

$T = S_1 S_0$

Q_0 \ S_1S_0	00	01	11	10
0	0	0	x	0
1	0	0	1	0


A1 A0 B1 B0
S1
S0
J0
Q0
A
K0
P
T
J0
Q0
B
K0

Pergunta 3

A → 1, 2, 3, 4, 5, 6
B → 1, 2, 3, 4, 5, 6
} entradas

L = 00 números não válidos
L = 01 ganha B
L = 10 ganha A
L = 11 empate
} Saídas

A_2	A_1	A_0	B_2	B_1	B_0	L_1	L_0
0	0	0	x	x	x	0	0
x	x	x	0	0	0	0	0
1	1	1	x	x	x	0	0
x	x	x	1	1	1	0	0
0	0	1	0	0	1	1	1
0	0	1	0	1	0	0	1
⋮							
0	0	1	1	1	0	0	1
0	1	0	0	0	1	1	0
0	1	0	0	1	0	1	1
0	1	0	0	1	1	0	1
⋮							
0	1	0	1	1	0	0	1
0	1	1	0	0	1	1	0
0	1	1	0	1	0	1	0
0	1	1	0	1	1	1	1
0	1	1	1	0	0	0	1
⋮							
0	1	1	1	1	0	0	1
1	0	0	0	0	1	1	0
⋮							
1	0	0	0	1	1	1	0
1	0	0	1	0	0	1	1
1	0	0	1	0	1	0	1
1	0	0	1	1	0	0	1
1	0	1	0	0	1	1	0
⋮							
1	0	1	1	0	0	1	0
1	0	1	1	0	1	1	1
1	0	1	1	1	0	0	1
1	1	0	0	0	1	1	0
⋮							
1	1	0	1	0	1	1	0
1	1	0	1	1	0	1	1

$$L_1 = \bar{A}_1 A_0 \bar{B}_2 \bar{B}_1 B_0 + A_2 \bar{A}_0 \bar{B}_2 B_0 + A_2 \bar{A}_0 \bar{B}_2 B_1 + \bar{A}_2 A_1 \bar{B}_2 \bar{A}_2 A_1$$
$$+ A_2 \bar{A}_1 \bar{B}_2 B_1 + A_2 \bar{A}_1 B_2 \bar{B}_1 \bar{B}_0 + A_2 \bar{A}_1 A_0 B_2 \bar{B}_1 + \bar{A}_2 A_1 A_0 \bar{B}_2 B_1 +$$
$$\bar{A}_2 A_1 \bar{B}_2 B_1 \bar{B}_0 + A_2 A_1 \bar{A}_0 B_2 \bar{B}_0 + A_2 A_1 \bar{A}_0 B_2 \bar{B}_1$$

$A_2 A_1 = 00$

$A_0 B_2$ \ $B_1 B_0$	00	01	11	10
00	0	0	0	0
01	0	0	0	0
11	0	0	0	0
10	0	1	0	0

$A_2 A_1 = 01$

$A_0 B_2$ \ $B_1 B_0$	00	01	11	10
00	0	1	0	1
01	0	0	0	0
11	0	0	0	0
10	0	1	1	1

$A_2 A_1 = 10$

$A_0 B_2$ \ $B_1 B_0$	00	01	11	10
00	0	1	1	1
01	1	0	0	0
11	1	1	0	0
10	0	1	1	1

$A_2 A_1 = 11$

$A_0 B_2$ \ $B_1 B_0$	00	01	11	10
00	0	1	1	1
01	1	1	0	1
11	0	0	0	0
10	0	0	0	0

$$L_0 = \bar{A}_2 A_1 B_2 \bar{B}_1 + \bar{A}_2 A_1 B_2 \bar{B}_0 + A_1 \bar{A}_0 B_2 \bar{B}_1 \bar{B}_0 + A_2 \bar{A}_1 \bar{A}_0 \bar{B}_2 B_1 + \bar{A}_1 A_0 B_2 A_2 \bar{A}_1 + \bar{A}_2 A_1 \bar{B}_2 B_1 B_0 + \bar{A}_2 A_1 \bar{A}_0 B_2 \bar{B}_0 + A_2 \bar{A}_1 B_2 \bar{B}_1 B_0 + \bar{A}_2 A_0 B_2 \bar{B}_1 + \bar{A}_2 \bar{A}_1 A_0 \bar{B}_2 B_0 + \bar{A}_2 \bar{A}_1 A_0 \bar{B}_2 B_1$$

$A_2 A_1 = 00$

$A_0 B_2$ \ $B_1 B_0$	00	01	11	10
00	0	0	0	0
01	0	0	0	0
11	1	1	0	1
10	0	1	1	1

$A_2 A_1 = 01$

$A_0 B_2$ \ $B_1 B_0$	00	01	11	10
00	0	0	1	1
01	1	1	0	1
11	1	1	0	1
10	0	0	1	0

$A_2 A_1 = 10$

$A_0 B_2$ \ $B_1 B_0$	00	01	11	10
00	0	0	0	0
01	1	1	0	1
11	0	1	0	1
10	0	0	0	0

$A_2 A_1 = 11$

$A_0 B_2$ \ $B_1 B_0$	00	01	11	10
00	0	0	0	0
01	0	0	0	1
11	0	0	0	0
10	0	0	0	0

```
module dados (input [2:0] A, B,
              output [1:0] L );

assign L[1] = ~A[1]&A[0]&~B[2]&~B[1]&B[0] |
              A[2]&~A[0]&~B[2]&B[0] |
              A[2]&~A[0]&~B[2]&B[1] |
              ~A[2]&A[1]&~B[2]&~A[2]&A[1] |
              A[2]&~A[1]&~B[2]&B[1] |
              A[2]&~A[1]&B[2]&~B[1]&~B[0] |
              A[2]&~A[1]&A[0]&B[2]&~B[1] |
              ~A[2]&A[1]&A[0]&~B[2]&B[1] |
              ~A[2]&A[1]&~B[2]&B[1]&~B[0] |
              A[2]&A[1]&~A[0]&B[2]&~B[0] |
              A[2]&A[1]&~A[0]&B[2]&~B[1];

assign L[0] = ~A[2]&A[1]&B[2]&~B[1] |
              ~A[2]&A[1]&B[2]&~B[0] |
              A[1]&~A[0]&B[2]&B[1]&~B[0] |
              A[2]&~A[1]&~A[0]&~B[2]&B[1] |
              ~A[1]&A[0]&B[2]&A[2]&~A[1] |
              ~A[2]&A[1]&~B[2]&B[1]&B[0] |
              ~A[2]&A[1]&~A[0]&B[2]&~B[0] |
              A[2]&~A[1]&B[2]&~B[1]&B[0] |
              ~A[2]&A[0]&B[2]&~B[1] |
              ~A[2]&~A[1]&A[0]&~B[2]&B[0] |
              ~A[2]&~A[1]&A[0]&~B[2]&B[1];

endmodule
```