Pregunta 1

R0 ← sr R4 — SHR 0,4

0001101 000 000 100

R2 ← R1 + 4 — ADI 2,1,4

1000010 010 001 100

M[R0] ← R1 — ST 0,1

0100000 000 000 001

R7 ← M[R3] — LD 7,3

0010000 111 011 000

R6 ← R1 — MOVA 6,1

0000000 110 001 000

if R2 < 0
  PC ← PC - 18
else
  PC ← PC + 1

BRN 2,-18

1100001 101 010 110

18 → 010010

-18 → 101110

Pregunta 2

$N = M[21]$

$M_0 = M[17]$

Asumiendo un RESET en la unidad de registros

```
0   LDI   0,7
1   ADI   0,0,3
2   MOVA  6,0      / Sobre 0 + 10 en R6
3   ADI   0,0,6
4   ADI   0,0,1
5   LD    1,0      / M0 en R1
6   ADI   0,0,4
7   LD    2,0      / N en R2
8   DEC   2,2      / N = N-1
9   MOVA  4,1      / Acumulador en R4
10  BRZ   2,5
11  ADI   1,1,2    / M0 = M0 + 2
12  DEC   2,2      / N = N-1
13  ADD   4,4,1    / Acumulador = Acumulador + M0
14  JMP   6
```

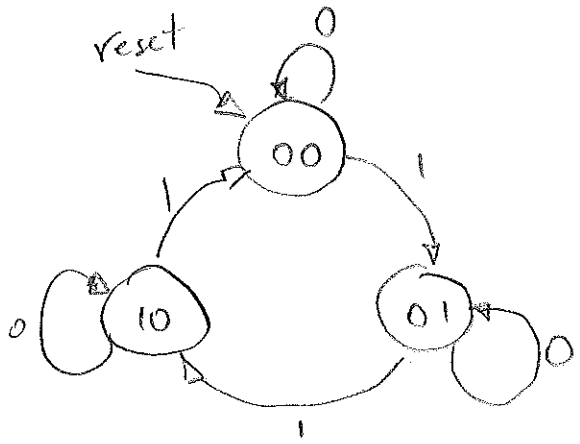
Pregunta 3

Máquina 1 : selector de modo

Entrada: A

Estados: modo de operación ($M_1 M_0$)

Salidas = Estados

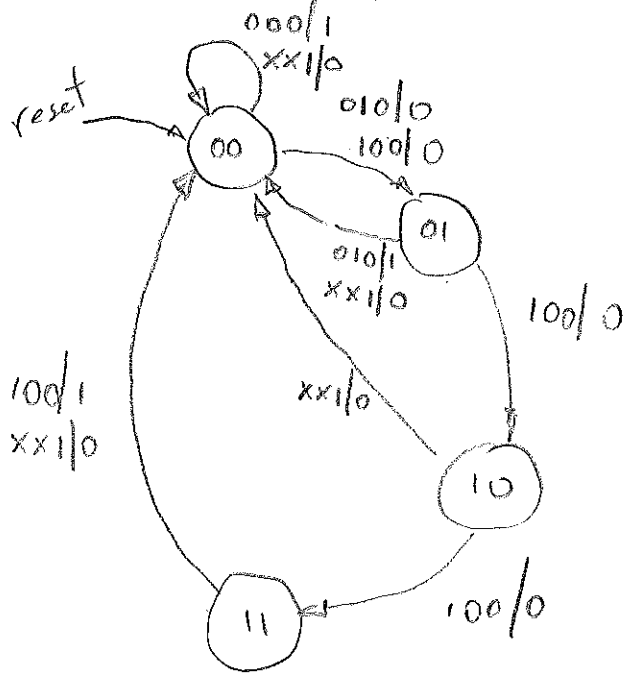


Máquina 2 : divisor de frecuencia de clock

Entradas : $M_1 M_0$ A

Estado : contador 0, 1, 2, 3

Salidas : B (naranja contador general)

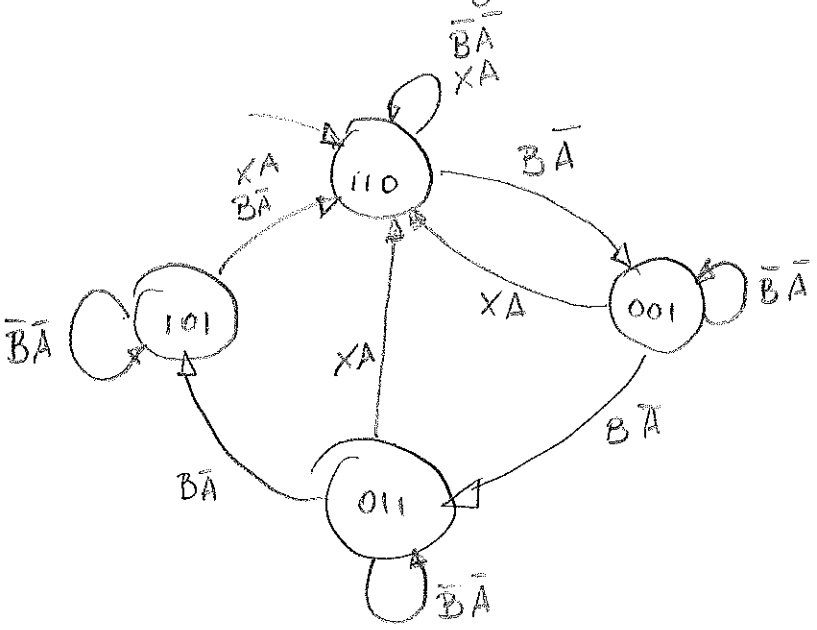


Máquina 3 Contador general

Entrada: B A

Estados: números 6, 1, 3, 5

Salidas: no hay



J K	Q^{t+1}
0 0	Q^t
0 1	0
1 0	1
1 1	$\overline{Q^t}$

Máquina 1

A	M_1	M_0	M_1^{t+1}	M_0^{t+1}	J_1	K_1	J_0	K_0
0	0	0	0	0	0	X	0	X
0	0	1	0	1	0	X	X	0
0	1	0	1	0	X	0	0	X
0	1	1						
1	0	0	0	1	0	X	1	X
1	0	1	1	0	1	X	X	1
1	1	0	0	0	X	1	0	X
1	1	1						

A \ M_1M_0	00	01	11	10
0	0	0	X	X
1	0	1	X	X

$J_1 = A M_0$

A \ M_1M_0	00	01	11	10
0	X	X	X	0
1	X	X	X	1

$K_1 = A$

A \ M_1M_0	00	01	11	10
0	0	X	X	0
1	1	X	X	0

$J_0 = A \bar{M}_1$

A \ M_1M_0	00	01	11	10
0	X	0	X	X
1	X	X	X	X

$K_0 = A$

Máquina 2

M_1	M_0	A	Q_1	Q_0	Q_1^+	Q_0^+	B	J_1	K_1	J_0	K_0
0	0	0	0	0	0	0	1	0	X	0	X
0	0	0	0	1	X	X	X	X	X	X	X
0	0	0	1	0	X	X	X	X	X	X	X
0	0	0	1	1	X	X	X	X	X	X	X
X	X	1	0	0	0	0	0	0	X	0	X
X	X	1	0	1	0	0	0	0	X	X	1
X	X	1	1	0	0	0	0	X	1	0	X
X	X	1	1	1	0	0	0	X	1	X	1
0	1	0	0	0	0	1	0	0	X	1	X
0	1	0	0	1	0	0	1	0	X	X	1
0	1	0	1	0	X	X	X	X	X	X	X
0	1	0	1	1	X	X	X	X	X	X	X
1	0	0	0	0	0	1	0	0	X	1	X
1	0	0	0	1	1	0	0	1	X	X	1
1	0	0	1	0	1	1	0	X	0	1	X
1	0	0	1	1	0	0	1	X	1	X	1

$M_1 = 0$

M_0A \ Q_1Q_0	00	01	11	10
00	1	X	X	X
01	0	0	0	0
11	0	0	0	0
10	0	1	X	X

$M_1 = 1$

M_0A \ Q_1Q_0	00	01	11	10
00	0	0	1	0
01	0	0	0	0
11	0	0	0	0
10	X	X	X	X

$$B = \overline{M_1}\,M_0\bar{A} + M_0\bar{A}Q_0 + \bar{A}Q_1Q_0$$

$M_1 = 0$

M_0A \ Q_1Q_0	00	01	11	10
00	0	X	X	X
01	0	0	X	X
11	0	0	X	X
10	0	0	X	X

$M_1 = 1$

M_0A \ Q_1Q_0	00	01	11	10
00	0	1	X	X
01	0	0	X	X
11	0	0	X	X
10	X	X	X	X

$$J_1 = M_1\bar{A}Q_0$$

$M_1 = 0$

M_0A \ Q_1Q_0	00	01	11	10
00	X	X	X	X
01	X	X	1	1
11	X	X	1	1
10	X	X	X	X

$M_1 = 1$

M_0A \ Q_1Q_0	00	01	11	10
00	X	X	1	0
01	X	X	1	1
11	X	X	1	1
10	X	X	X	X

$$K_1 = Q_0 + A$$

$M_1 = 0$

M_0A \ Q_1Q_0	00	01	11	10
00	0	X	X	X
01	0	X	X	0
11	0	X	X	0
10	1	X	X	X

$M_1 = 1$

M_0A \ Q_1Q_0	00	01	11	10
00	1	X	X	1
01	0	X	X	0
11	0	X	X	0
10	X	X	X	X

$$J_0 = M_0\bar{A} + M_1\bar{A}$$

$M_1 = 0$

M_0A \ Q_1Q_0	00	01	11	10
00	X	X	X	X
01	X	1	1	X
11	X	1	1	X
10	X	1	X	X

$M_1 = 1$

M_0A \ Q_1Q_0	00	01	11	10
00	X	1	1	X
01	X	1	1	X
11	X	1	1	X
10	X	X	X	X

$$K_0 = 1$$

Maquina 3

B A Q_2 Q_1 Q_0	Q_2^{t+1}	Q_1^{t+1}	Q_0^{t+1}	J_2	K_2	J_1	K_1	J_0	K_0
0 0 0 0 1	0	0	1	0	x	0	x	x	0
0 1 0 0 1	1	0	0	1	x	0	x	x	1
1 0 0 0 1	0	0	1	0	x	0	x	x	0
1 1 0 0 1	1	0	0	1	x	0	x	x	1
0 0 0 1 1	0	1	1	0	x	x	0	x	0
0 1 0 1 1	1	1	0	1	x	x	0	x	1
1 0 0 1 1	1	0	1	1	x	x	1	x	0
1 1 0 1 1	1	1	0	1	x	x	0	x	1
0 0 1 0 1	1	0	1	x	0	0	x	x	0
0 1 1 0 1	1	1	0	x	0	1	x	x	1
1 0 1 0 1	1	1	0	x	0	1	x	x	1
1 1 1 0 1	1	1	0	x	0	1	x	x	1
0 0 1 1 0	1	1	0	x	0	x	0	0	x
0 1 1 1 0	1	1	0	x	0	x	0	0	x
1 0 1 1 0	0	0	1	x	1	x	1	1	x
1 1 1 1 0	1	1	0	x	0	x	0	0	x

B=0

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

B=1

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

$$J_2 = A + B Q_1$$

B=0

A \ Q_1Q_0	00	01	11	10
00	x	x	x	x
01	x	0	x	0
11	x	0	x	0
10	x	x	x	x

B=1

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

$$K_2 = B \bar{A} Q_1$$