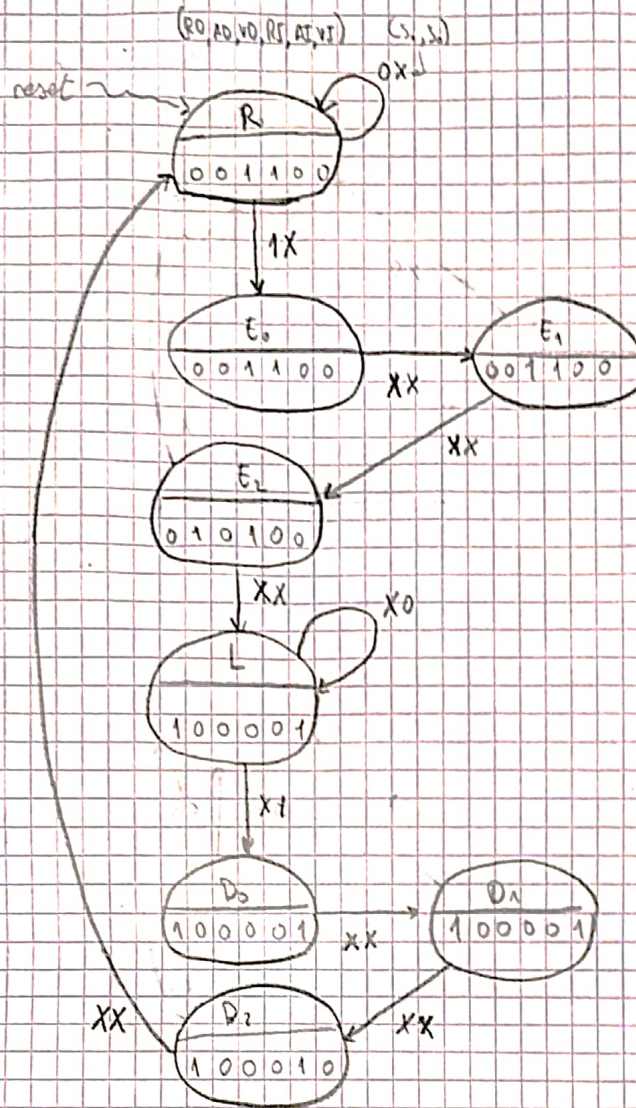


# Task 4 - Exercise 1

Inputs:  $S_0, S_1$  (CLR, CLK), Outputs:  $R_0, A_0, V_0, R_1, A_1, V_1$ .



R = traffic flows from right to left.

$E_0, E_1, E_2$  = transition states from R to L.

L = traffic flows from left to right.

$D_0, D_1, D_2$  = transition states from L to R.

States designation:

$Q_2, Q_1, Q_0$

	$Q_2$	$Q_1$	$Q_0$
R	0	0	0
$E_0$	0	0	1
$E_1$	0	1	0
$E_2$	0	1	1
L	1	0	0
$D_0$	1	0	1
$D_1$	1	1	0
$D_2$	1	1	1

$Q_2, Q_1, Q_0$	$S_1, S_0$	$Q_2, Q_1, Q_0$
000	0X	000
000	1X	001
001	XX	010
010	XX	011
011	XX	100
100	X0	100
100	X1	101
101	XX	110
110	XX	111
111	XX	000



Truth table:

Outputs depend only on the state

	$Q_2^n, Q_1^n, Q_0^n$	$S_1, S_0$	$Q_2^{n+1}, Q_1^{n+1}, Q_0^{n+1}$	$RD, AD, VD, RI, AI, VI$
$R$	0 0 0	0 0	0 0 0	0 0 1 1 0 0
	0 0 0	0 1	0 0 0	0 0 1 1 0 0
	0 0 0	1 0	0 0 1	0 0 1 1 0 0
	0 0 0	1 1	0 0 1	0 0 1 1 0 0
$T_0$	0 0 1	0 0	0 1 0	0 0 1 1 0 0
	0 0 1	0 1	0 1 0	0 0 1 1 0 0
	0 0 1	1 0	0 1 0	0 0 1 1 0 0
	0 0 1	1 1	0 1 0	0 0 1 1 0 0
$T_1$	0 1 0	0 0	0 1 1	0 0 1 1 0 0
	0 1 0	0 1	0 1 1	0 0 1 1 0 0
	0 1 0	1 0	0 1 1	0 0 1 1 0 0
	0 1 0	1 1	0 1 1	0 0 1 1 0 0
$T_2$	0 1 1	0 0	1 0 0	0 1 0 1 0 0
	0 1 1	0 1	1 0 0	0 1 0 1 0 0
	0 1 1	1 0	1 0 0	0 1 0 1 0 0
	0 1 1	1 1	1 0 0	0 1 0 1 0 0
$I$	1 0 0	0 0	1 0 0	1 0 0 0 0 1
	1 0 0	0 1	1 0 1	1 0 0 0 0 1
	1 0 0	1 0	1 0 0	1 0 0 0 0 1
	1 0 0	1 1	1 0 1	1 0 0 0 0 1
$D_0$	1 0 1	0 0	1 1 0	1 0 0 0 0 1
	1 0 1	0 1	1 1 0	1 0 0 0 0 1
	1 0 1	1 0	1 1 0	1 0 0 0 0 1
	1 0 1	1 1	1 1 0	1 0 0 0 0 1
$D_1$	1 1 0	0 0	1 1 1	1 0 0 0 0 1
	1 1 0	0 1	1 1 1	1 0 0 0 0 1
	1 1 0	1 0	1 1 1	1 0 0 0 0 1
	1 1 0	1 1	1 1 1	1 0 0 0 0 1
$D_2$	1 1 1	0 0	0 0 0	1 0 0 0 1 0
	1 1 1	0 1	0 0 0	1 0 0 0 1 0
	1 1 1	1 0	0 0 0	1 0 0 0 1 0
	1 1 1	1 1	0 0 0	1 0 0 0 1 0

$$RD = Q_2^n$$

$$AD = Q_2^n + Q_1^n + Q_0^n$$

$$VD = Q_2^n \cdot (Q_1^n + Q_0^n)$$

$$RI = Q_2^n$$

$$AI = Q_2^n \cdot Q_1^n \cdot Q_0^n$$

$$VI = Q_2^n \cdot (Q_1^n + Q_0^n)$$

$Q_2^{n+1}$ :

$Q_1^n, S_0$	$Q_2^n$	0 0	0 1	1 1	1 0	0 0	0 1	1 1	1 0
0 0	0	0	0	0	0	1	1	1	1
0 1	0	0	0	0	0	1	1	1	1
1 1	1	1	1	1	1	0	0	0	0
1 0	0	0	0	0	0	1	1	1	1

$$Q_2^{n+1} = \overline{Q_1^n} \cdot \overline{Q_0^n} + Q_1^n \cdot Q_0^n + Q_2^n \cdot (\overline{Q_1^n} + \overline{Q_0^n})$$

$Q_1^{n+1}$ :

$Q_2^n, S_0$	$Q_1^n$	0 0	0 1	1 1	1 0	0 0	0 1	1 1	1 0
0 0	0	0	0	0	0	0	0	0	0
0 1	0	0	0	0	0	1	1	1	1
1 1	0	0	0	0	0	0	0	0	0
1 0	0	0	0	0	0	1	1	1	1

$$Q_1^{n+1} = \overline{Q_2^n} \cdot \overline{Q_0^n} + Q_2^n \cdot \overline{Q_0^n}$$

$$Q_1^{n+1} = Q_2^n \oplus Q_0^n$$

$Q_0^{n+1}$ :

$Q_2^n, S_1$	$Q_0^n$	0 0	0 1	1 1	1 0	0 0	0 1	1 1	1 0
0 0	0	0	0	0	0	1	1	1	1
0 1	0	0	0	0	0	0	0	0	0
1 1	0	0	0	0	0	0	0	0	0
1 0	0	0	0	0	0	1	1	1	1

$$Q_0^{n+1} = \overline{Q_2^n} \cdot \overline{Q_1^n} \cdot S_1 + Q_2^n \cdot \overline{Q_1^n} \cdot S_0 + Q_1^n \cdot \overline{Q_0^n}$$

$$Q_0^{n+1} = \overline{Q_2^n} \cdot (\overline{Q_1^n} \cdot S_1 + Q_1^n \cdot S_0) + Q_1^n \cdot \overline{Q_0^n}$$

$$Q_0^{n+1} = \overline{Q_2^n} \cdot (\overline{Q_1^n} \cdot S_1 + Q_1^n \cdot S_0) + Q_1^n \cdot \overline{Q_0^n}$$