

1.1

$x_1 x_2$	$y_1 y_2$	z
00	--	0
01	00	1
01	1-	0
01	01	0
10	00	1
10	01	1
10	1-	0
11	00	1
11	01	1
11	10	1
11	11	0

$$z = \bar{x}_1 \bar{x}_2 \bar{y}_1 \bar{y}_2 + x_1 \bar{x}_2 \bar{y}_1 \bar{y}_2 + x_1 \bar{x}_2 \bar{y}_1 y_2 + x_1 x_2 \bar{y}_1 \bar{y}_2 + x_1 x_2 \bar{y}_1 y_2 + x_1 x_2 y_1 \bar{y}_2$$

1.2

$x_7 x_6 x_5 x_4 x_3 x_2 x_1 x_0$	z
10000000	1
01000000	1
00100000	1
00010000	1
00001000	1
00000100	1
00000010	1
00000001	1

$$z = x_7 \bar{x}_6 \bar{x}_5 \bar{x}_4 \bar{x}_3 \bar{x}_2 \bar{x}_1 \bar{x}_0 + \bar{x}_7 x_6 \bar{x}_5 \bar{x}_4 \bar{x}_3 \bar{x}_2 \bar{x}_1 \bar{x}_0 + \bar{x}_7 \bar{x}_6 x_5 \bar{x}_4 \bar{x}_3 \bar{x}_2 \bar{x}_1 \bar{x}_0 + \bar{x}_7 \bar{x}_6 \bar{x}_5 x_4 \bar{x}_3 \bar{x}_2 \bar{x}_1 \bar{x}_0 + \bar{x}_7 \bar{x}_6 \bar{x}_5 \bar{x}_4 x_3 \bar{x}_2 \bar{x}_1 \bar{x}_0 + \bar{x}_7 \bar{x}_6 \bar{x}_5 \bar{x}_4 \bar{x}_3 x_2 \bar{x}_1 \bar{x}_0 + \bar{x}_7 \bar{x}_6 \bar{x}_5 \bar{x}_4 \bar{x}_3 \bar{x}_2 x_1 \bar{x}_0 + \bar{x}_7 \bar{x}_6 \bar{x}_5 \bar{x}_4 \bar{x}_3 \bar{x}_2 \bar{x}_1 x_0$$

1.3

$x_1 x_2 x_3 x_4 x_5 x_6 x_7 x_8$	z
00000000	1
00000011	1
00001100	1
00001111	1
00110000	1
00110011	1
00111100	1
00111111	1
11 " " "	1

$$z = \bar{x}_1 \bar{x}_2 \bar{x}_3 \bar{x}_4 \bar{x}_5 \bar{x}_6 \bar{x}_7 \bar{x}_8 + \bar{x}_1 \bar{x}_2 \bar{x}_3 \bar{x}_4 \bar{x}_5 \bar{x}_6 x_7 x_8 + \bar{x}_1 \bar{x}_2 \bar{x}_3 \bar{x}_4 x_5 x_6 \bar{x}_7 \bar{x}_8 + \bar{x}_1 \bar{x}_2 \bar{x}_3 \bar{x}_4 x_5 x_6 x_7 x_8 + \bar{x}_1 \bar{x}_2 x_3 x_4 \bar{x}_5 \bar{x}_6 \bar{x}_7 \bar{x}_8 + \bar{x}_1 \bar{x}_2 x_3 x_4 \bar{x}_5 \bar{x}_6 x_7 x_8 + \bar{x}_1 \bar{x}_2 x_3 x_4 x_5 x_6 \bar{x}_7 \bar{x}_8 + \bar{x}_1 \bar{x}_2 x_3 x_4 x_5 x_6 x_7 x_8 + x_1 x_2 \bar{x}_3 \bar{x}_4 \bar{x}_5 \bar{x}_6 \bar{x}_7 \bar{x}_8$$

also 8 rows on 11 + xxxxxx case sepe

1

$$\begin{aligned}
 2.1 \quad & \bar{x}_1 \bar{x}_2 \bar{x}_3 + x_1 x_2 \bar{x}_3 + x_1 \bar{x}_2 x_3 + \bar{x}_1 x_2 x_3 = \\
 & = (\bar{x}_1 + x_1) x_2 \bar{x}_3 + (x_1 + \bar{x}_1) \bar{x}_2 x_3 = \\
 & = x_2 \bar{x}_3 + \bar{x}_2 x_3
 \end{aligned}$$

$$\begin{aligned}
 2.2 \quad & \bar{x}_1 \bar{x}_2 \bar{x}_3 \bar{x}_4 + \bar{x}_1 x_2 \bar{x}_3 \bar{x}_4 + \bar{x}_1 \bar{x}_2 x_3 \bar{x}_4 + \bar{x}_1 x_2 x_3 \bar{x}_4 + \\
 & \quad \bar{x}_1 \bar{x}_3 \bar{x}_4 (\bar{x}_2 + x_2) \quad \bar{x}_1 \bar{x}_3 \bar{x}_4 (\bar{x}_2 + x_2) \\
 & x_1 x_2 \bar{x}_3 \bar{x}_4 + x_1 x_2 x_3 \bar{x}_4 + \bar{x}_1 x_2 x_3 \bar{x}_4 + x_1 x_2 x_3 \bar{x}_4 + \\
 & \quad x_1 x_2 \bar{x}_4 (\bar{x}_3 + x_3) \quad x_1 x_3 \bar{x}_4 (x_2 + \bar{x}_2) \\
 & x_1 \bar{x}_2 x_3 \bar{x}_4 + x_1 \bar{x}_2 x_3 \bar{x}_4 =
 \end{aligned}$$

$$\begin{aligned}
 & \bar{x}_1 \bar{x}_3 \bar{x}_4 + \bar{x}_1 \bar{x}_3 \bar{x}_4 + x_1 x_2 \bar{x}_4 + x_1 x_3 \bar{x}_4 + \bar{x}_1 x_2 x_3 \bar{x}_4 + x_1 \bar{x}_2 x_3 \bar{x}_4 = \\
 & \quad \bar{x}_1 \bar{x}_3 (\bar{x}_4 + \bar{x}_4) \quad x_1 x_2 (\bar{x}_4 + \bar{x}_4)
 \end{aligned}$$

$$= \bar{x}_1 \bar{x}_3 + x_1 x_2 + x_3 \bar{x}_4 (\bar{x}_1 \bar{x}_2 + x_1 x_2)$$

2.3

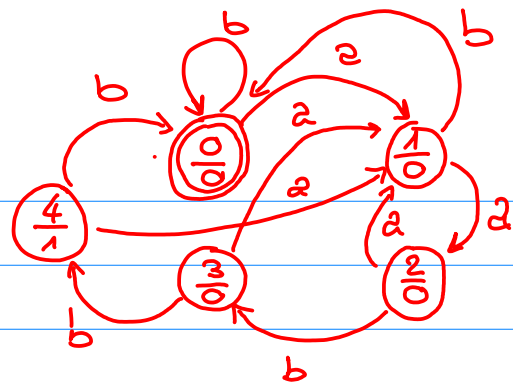
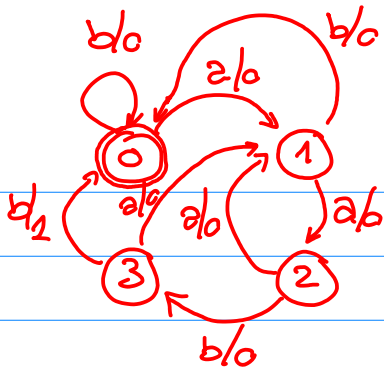
$$\overline{x_1} x_2 \overline{x_3} + \overline{x_1} \overline{x_2} \overline{x_3} = \overline{x_1} \overline{x_3} (x_2 + \overline{x_2}) = \overline{x_1} \overline{x_3}$$

due livelli di logica
2tp

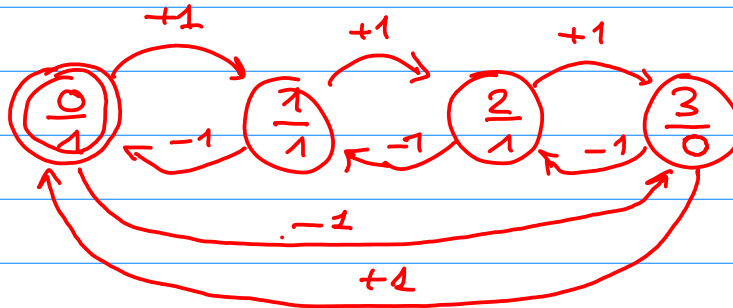
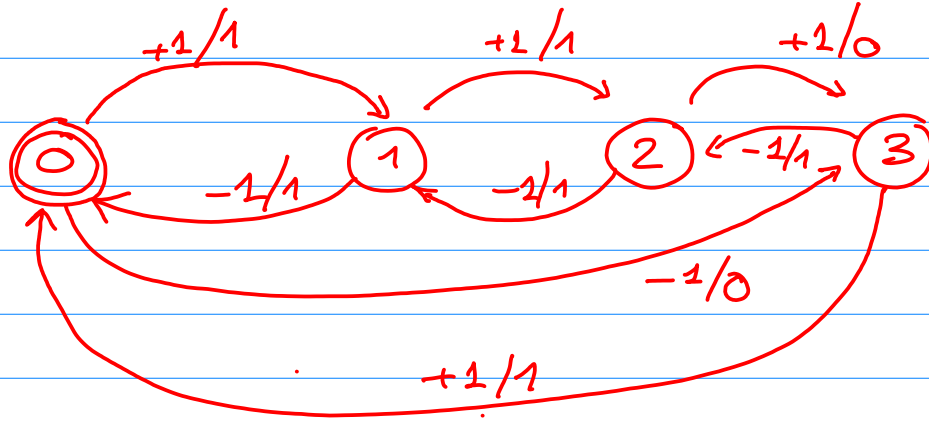
1 livello di
logica
1tp

$$\begin{aligned} \overline{x_2} + \overline{x_3} \overline{x_4} + \overline{x_3} x_4 &= \overline{x_2} + \overline{\overline{x_3} \overline{x_4}} \cdot \overline{\overline{x_3} x_4} = \\ &= \overline{x_2} + (\overline{\overline{x_3}} + \overline{\overline{x_4}}) \cdot (\overline{\overline{x_3}} + \overline{\overline{x_4}}) = \\ &= \overline{x_2} + (x_3 + x_4)(x_3 + \overline{x_4}) = \\ &= \overline{x_2} + x_3 x_3 + x_3 \overline{x_4} + x_4 x_3 + x_4 \overline{x_4} = \\ &\quad \quad \quad \underbrace{x_3}_{x_3} \quad \underbrace{x_3(\overline{x_4} + x_4)}_0 \quad \quad \quad 0 \\ &= \overline{x_2} + \underbrace{x_3 + x_3}_{x_3} = \overline{x_2} + x_3 \end{aligned}$$

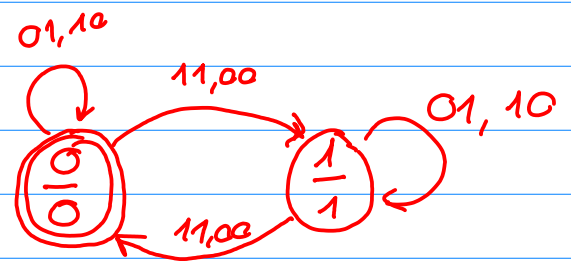
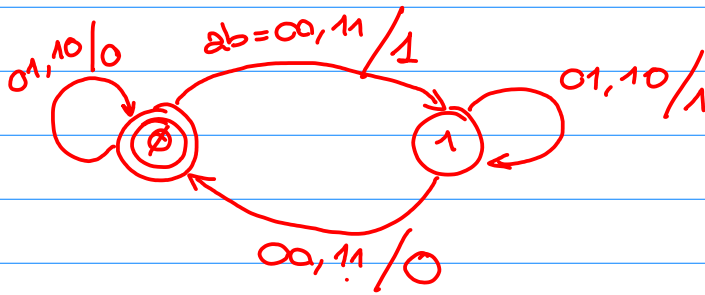
3.1



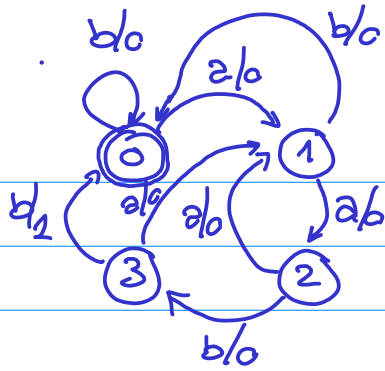
3.2



3.3



4.1



$S_0 = 00$ $d = 0$
 $S_1 = 01$ $b = 1$
 $S_2 = 10$
 $S_3 = 11$

$s_1 s_2 x$	z	$s'_1 s'_2$
00 0	0	01
00 1	0	00
01 0	0	10
01 1	0	00
10 0	0	01
10 1	0	11
11 0	0	01
11 1	1	00

ω

$z = s_1 s_2 x$

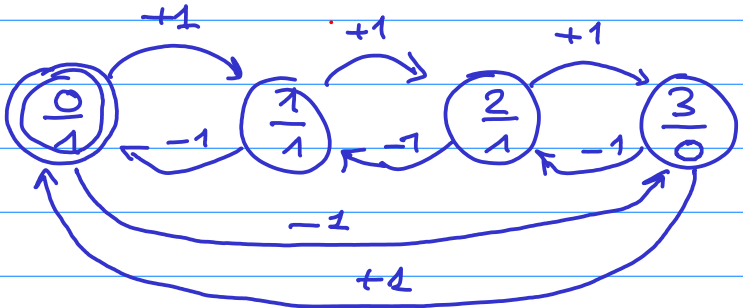
σ

$s'_1 = \bar{s}_1 s_2 \bar{x} + s_1 \bar{s}_2 x$

$s'_2 = \bar{s}_1 \bar{s}_2 \bar{x} + s_1 \bar{s}_2 \bar{x} + s_1 \bar{s}_2 x + s_1 s_2 \bar{x}$

$z = \max \{T_{a1}, T_{01}\} + \delta = 2dp + dp = 3dp$

4.2



$+1 \rightarrow 1$
 $-1 \rightarrow \emptyset$

σ

$s_1 s_2 x$	$s'_1 s'_2$	ω	$s_1 s_2$	z
00 0	11		00	1
00 1	01		00	1
01 0	10		01	1
01 1	00		10	1
10 0	11		11	0
10 1	01			
11 0	00			
11 1	10			

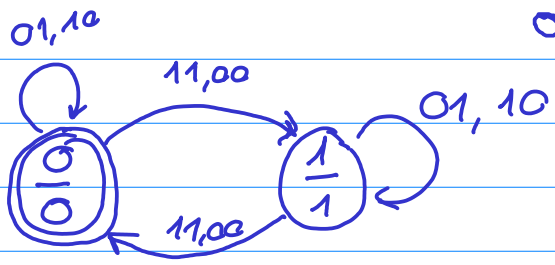
$z = \bar{s}_1 \bar{s}_2 + \bar{s}_1 s_2 + s_1 \bar{s}_2$

$s'_1 = \bar{s}_1 \bar{s}_2 \bar{x} + \bar{s}_1 s_2 \bar{x} + s_1 \bar{s}_2 \bar{x} + s_1 s_2 x$

$s'_2 = \bar{s}_1 \bar{s}_2 \bar{x} + \bar{s}_1 \bar{s}_2 x + s_1 \bar{s}_2 \bar{x} + s_1 \bar{s}_2 x$

$z = 3dp$

4.3



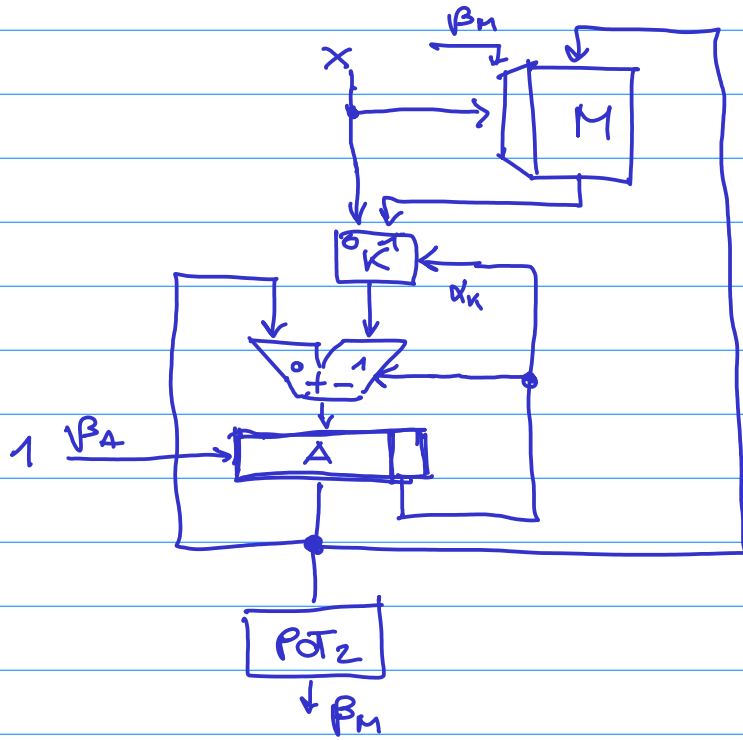
$s a b$	s'	s	z
0 0 1	0	0	0
0 1 0	1	0	0
0 1 1	1	1	1
0 0 0	1	1	1
1 0 1	1	1	0
1 1 0	1	1	0
1 1 1	0	1	0
1 0 0	0	1	0

$z = s$

$s' = \bar{s} e b + \bar{s} a \bar{b} + s \bar{a} b + s e \bar{b}$

$z = 3dp$

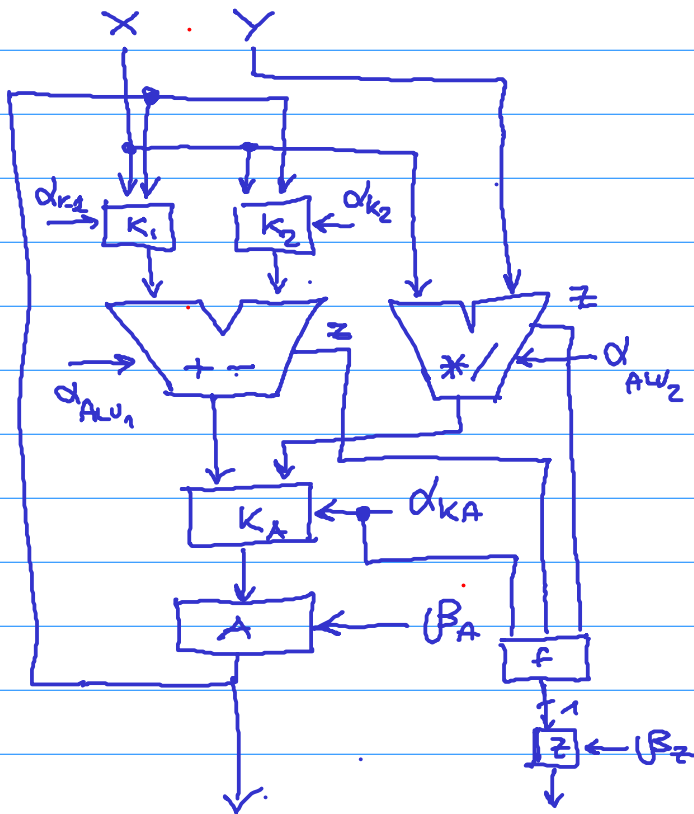
5.1



POTZ

$a_0 a_1 \dots a_{n-1}$	a_n	
1 0	0	1
0 1	0	1
		⋮
0 0	0 1	1

5.2



Ingressi

$\{x, y, \alpha_{k1}, \alpha_{k2}, \alpha_{ALU1}, \alpha_{ALU2}, \alpha_{KA}, \beta_A\}$

Uscite

$\{A\}$

Stato interno

$\{A\}$

F :

α_{z_1, z_2}		
0	1	-
1	-	1

$$A - X \rightarrow A : \alpha_{k1} = 1 \quad \alpha_{k2} = 0 \quad \alpha_{ALU2} = 1$$

$$\alpha_{KA} = 0 \quad \beta_A = 1 \quad \beta_Z = 1$$

$$X * Y \rightarrow A : \alpha_{KA} = 1 \quad \alpha_{ALU2} = 0$$

$$\beta_A = \beta_Z = 1$$