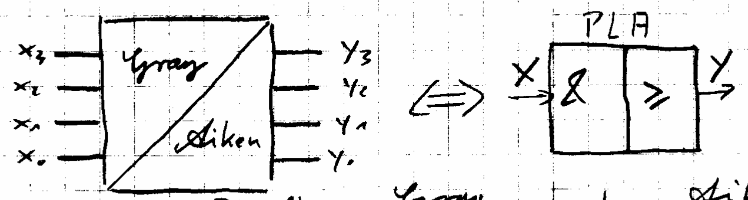
BA Mannheim Digitaltechnik 2 SS 2001
18.06.01

Lösungen

Codewandler X: 4-bit-Gray-Code, Y: 4bit-Aiken-Code

(1)



Codetabelle:

Dezimal i	x_3	x_2	x_1	x_0	y_3	y_2	y_1	y_0
0	0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	0	1
2	0	0	1	1	0	0	1	0
3	0	0	1	0	0	0	1	1
4	0	1	1	0	0	1	0	0
5	0	1	1	1	1	0	1	1
6	0	1	0	1	1	1	0	0
7	0	1	0	0	1	1	0	1
8	1	1	0	0	1	1	1	0
9	1	1	0	1	1	1	1	1
10	1	1	1	1	0	0	0	0
11	1	1	1	0	0			0
12	1	0	1	0	0			0
13	1	0	1	1	0	0		0
14	1	0	0	1	0			0
15	1	0	0	0	0	0	0	0

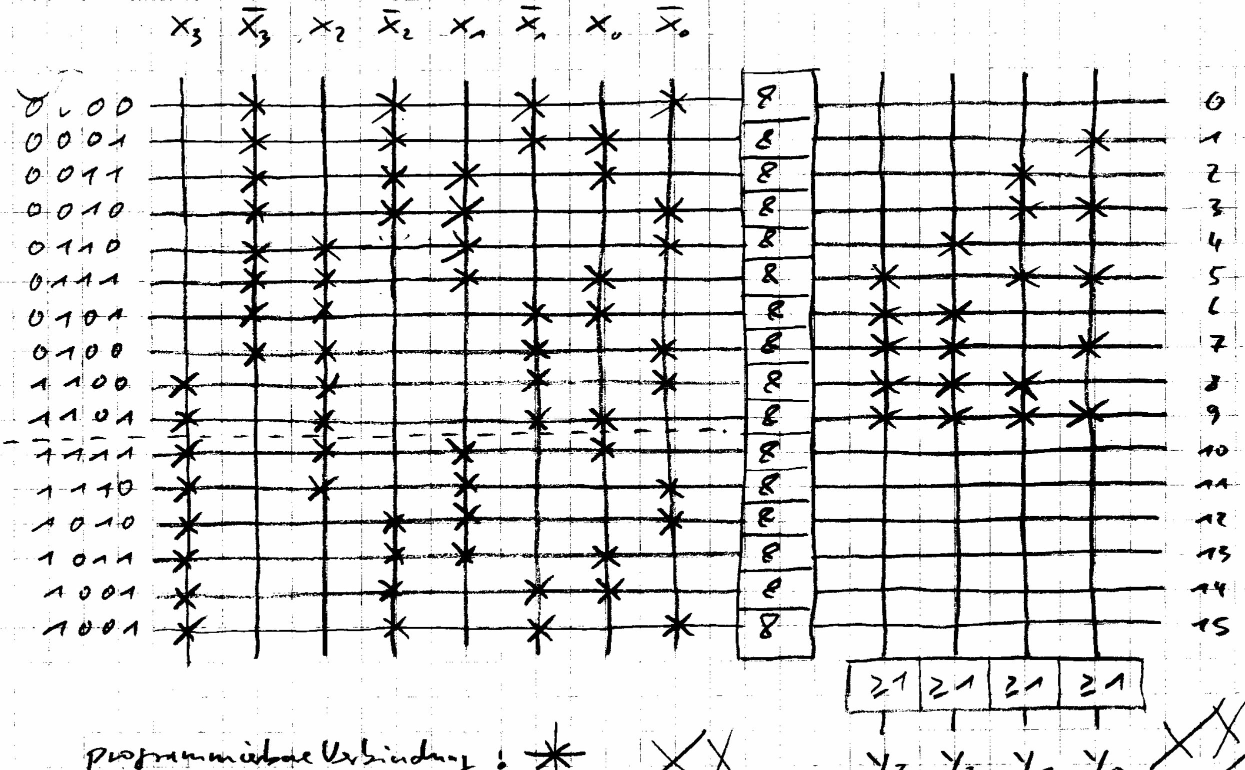
Dezimalwert Gray	Dezimalwert Aiken
0	0
1	1
3	2
2	3
6	4
7	11
5	12
4	13
12	14
13	15
15	0
14	0
10	0
11	0
9	0
8	0

Note: ~~Exklusiv~~-ODER umprogramm. gray-aiken

Note: beliebige Code-Wahl zulassen

XX XX

PLA-Programmierung:



programmierbare Verbindung: ✱
Keine Verbindung: +

XX

XX / 8 Pkt

(2) aus Schaltbild:

$J_2 = Q_1 \cdot Q_0$ X

$K_2 = 1$

$J_1 = \overline{Q_2} \cdot Q_0$ X

$K_1 = Q_2 + Q_0$ X

$J_0 = \overline{Q_2}$ X

$K_0 = 1$

JK-FlipFlop:

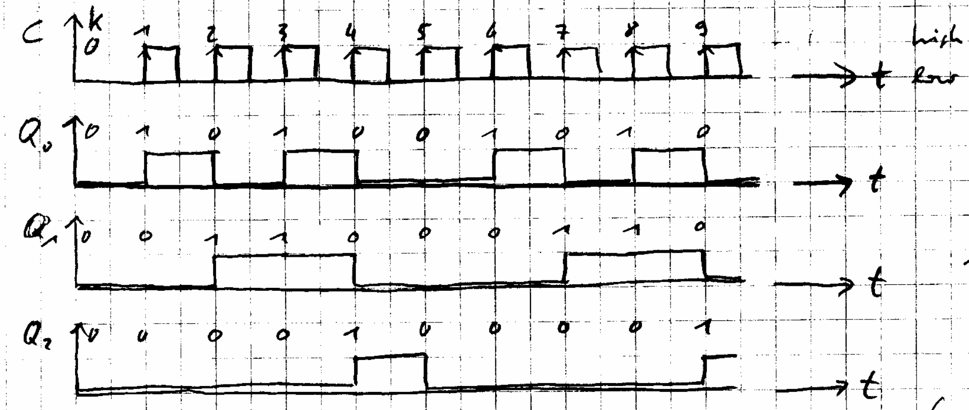
mode	J	K	$Q^{(k+1)}$
hold	0	0	$Q^{(k)}$
reset	0	1	0
set	1	0	1
toggle	1	1	$\overline{Q^{(k)}}$

X

a)

Takt k	Momentanwert $Q_2 . Q_1 . Q_0$	Folgewert $Q_2^{(k+1)} . Q_1^{(k+1)} . Q_0^{(k+1)}$	Erregung $J_2 . K_2 . J_1 . K_1 . J_0 . K_0$	Q-Wort dezimal Z	
0	(Initial) 0 0 0	0 0 1	0·0 = 0 (reset), 1, 1·0 = 0 (hold), 0+0 = 0, $\bar{0}$ = 1 (toggle), 1	0	X
1	0 0 1	0 1 0	0·1 = 0 (reset), 1, 1·1 = 1 (toggle), 0+1 = 1, $\bar{0}$ = 1, 1 (toggle)	1	X
2	0 1 0	0 1 1	1·0 = 0 (reset), 1, 1·0 = 0 (hold), 0+0 = 0, $\bar{0}$ = 1, 1 (toggle)	2	X
3	0 1 1	1 0 0	1·1 = 1 (set), 1, 1·1 = 1 (toggle), 0+1 = 1, $\bar{0}$ = 1, 1 (toggle)	3	X
4	1 0 0	0 0 0	0·0 = 0 (reset), 1, 0·0 = 0 (reset), 1+0 = 1, $\bar{1}$ = 0, 1 (reset)	4	X
5	0 0 0		1 1	0	
6	0 0 1		1 1	1 = $Z^{(6)}$	X
7	0 1 0		1 1	2	
8	0 1 1		1 1	3	
9	1 0 0		1 1	4	

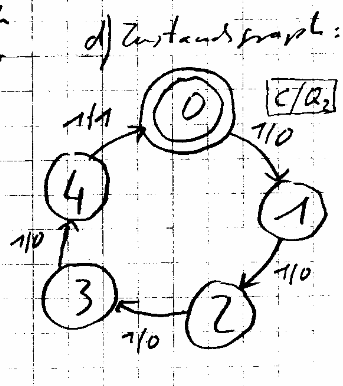
b)



$Z^{(k)}$: 0 1 2 3 4 0 1 2 3 4

Breite 5 Takte

d) Zustandsgraph:



(X X wenn Zusatz bei d)

c) Modulo-5-Zähler bzw. Frequenzteiler $5:1 = f_C : f_{Q_2}$

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