Oppave ①

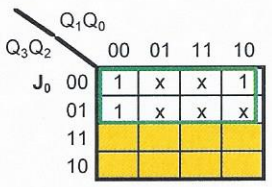
Ontwerp van een synchrone 4-bit teller met JK-flipflops

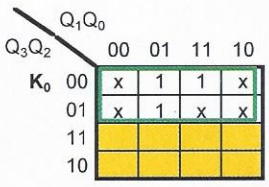
Met deze spreadsheet kan je willekeurige 4-bits synchrone tellers ontwerpen.
Je hoeft enkel de gewenste staten in te vullen in de grijze velden en hij berekent je automatisch de Karnaugh-kaarten.
Blanco velden zijn don't cares.

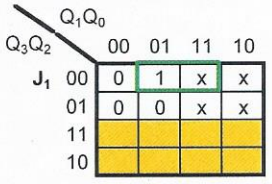
Voorwaartse modulo-6 teller = 6 staten (want ϕ) oplossen met 3 FF's.

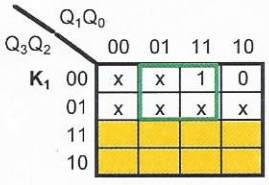
$0 \to 1 \to 2 \to 3 \to 4 \to 5$

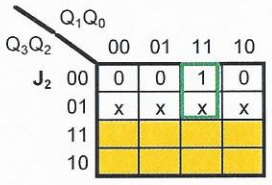
Binair								Decimaal		MSB ←							LSB
huidige staat				volgende staat				oud	nieuw								
Q_3	Q_2	Q_1	Q_0	Q_3	Q_2	Q_1	Q_0	#	#	J_3	K_3	J_2	K_2	J_1	K_1	J_0	K_0
		0	0	0	0	0	1	0	1			0	x	0	x	1	x
		0	1	0	0	1	0	1	2			0	x	1	x	x	1
		1	0	0	0	1	1	2	3			0	x	x	0	1	x
		1	1	0	1	0	0	3	4			1	x	x	1	x	1
		0	0	0	1	0	1	4	5			x	0	0	x	1	x
		0	1	0	0	0	0	5	0			x	1	0	x	x	1
								~~6~~ 7	~~7~~ ✗			x	x	x	x	x	x
								~~7~~ ✗	✗			x	x	x	x	x	x

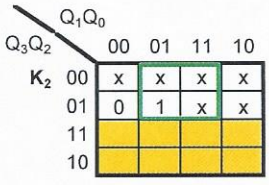


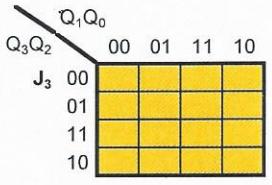


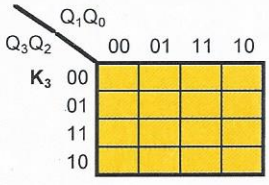


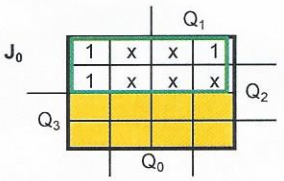


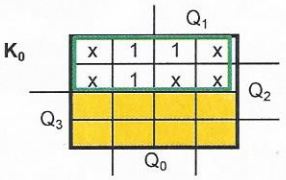


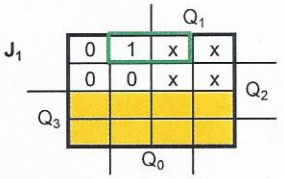


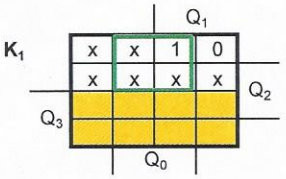


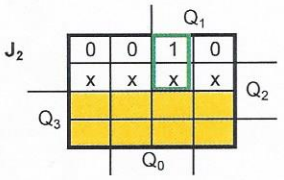


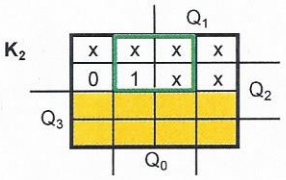


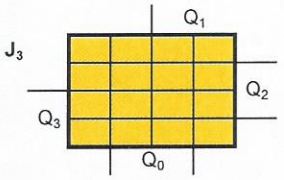


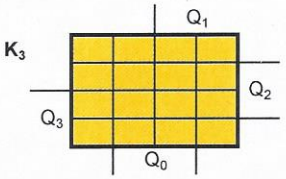












$$J_0 = 1 \qquad K_0 = 1$$
$$J_1 = Q_0 \cdot \bar{Q}_2 \qquad K_1 = Q_0$$
$$J_2 = Q_0 \cdot Q_1 \qquad K_2 = Q_0$$

Modulus 8 afteller

opgave ②: "automatische invulling van Karnaugh" → invullen tabel om automatische nummering bij Karnaugh te gebruiken.

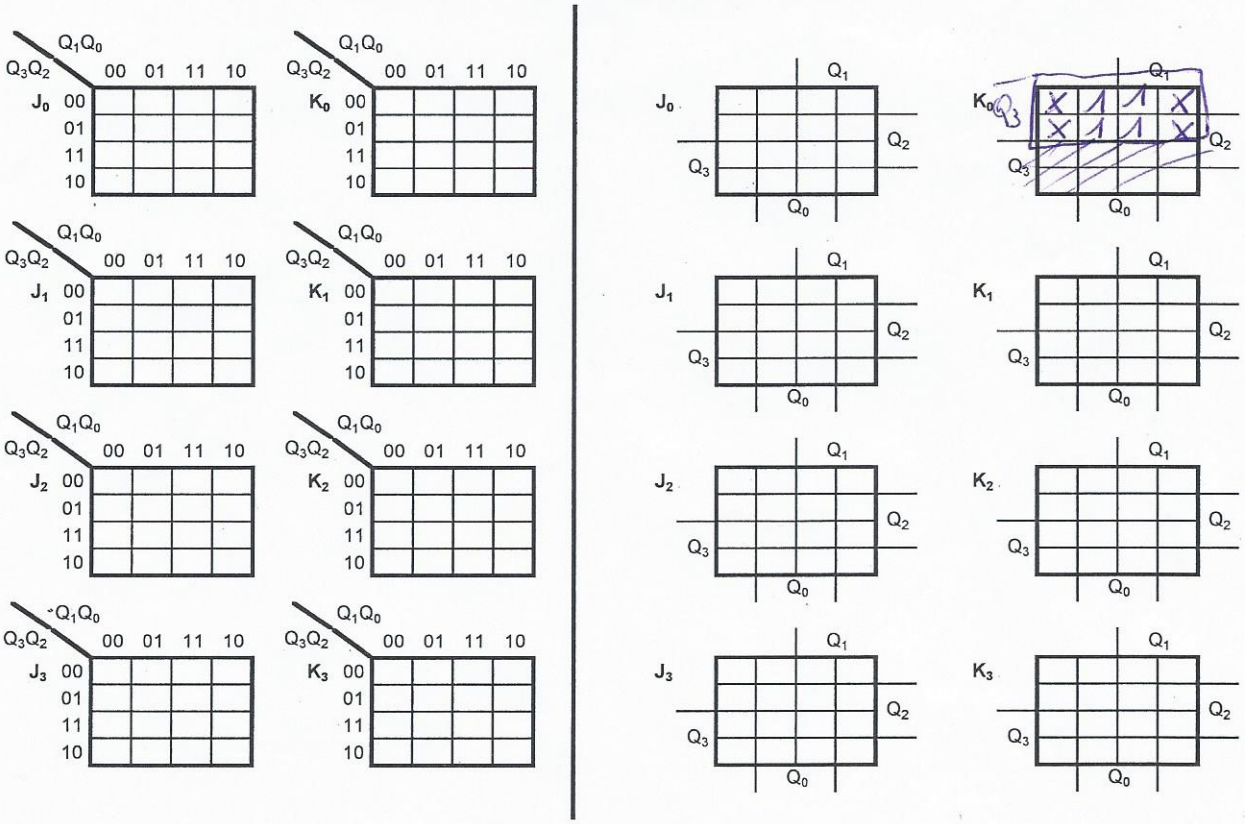
→ 7 → 6 → 5 → 4 → 3 → 2 → 1 → 0 → 7

Ontwerp van een synchrone 4-bit teller met JK-flipflops

Met deze spreadsheet kan je willekeurige 4-bits synchrone tellers ontwerpen.
Je hoeft enkel de gewenste staten in te vullen in de grijze velden en hij berekent je automatisch de Karnaugh-kaarten.
Blanco velden zijn don't cares.

huidige staat = oud = Q
volgende staat = nieuw = Q^+

Binair								Decimaal		MSB ←							LSB
huidige staat				volgende staat				oud	nieuw								
Q_3	Q_2	Q_1	Q_0	Q_3	Q_2	Q_1	Q_0	#	#	J_3	K_3	J_2	K_2	J_1	K_1	J_0	K_0
0	0	0	0	1	1	1	1	0	7			1	X	1	X	1	X
0	0	0	1	0	0	0	0	1	0			0	X	0	X	X	1
0	0	1	0	0	0	0	1	2	1			0	X	X	1	1	X
0	0	1	1	0	0	1	0	3	2			0	X	X	0	X	1
0	1	0	0	0	0	1	1	4	3			X	1	1	X	1	X
0	1	0	1	0	1	0	0	5	4			X	0	0	X	X	1
0	1	1	0	0	1	0	1	6	5			X	0	X	1	1	X
0	1	1	1	0	1	1	0	7	6			X	0	X	0	X	1



J_0

J_1

J_2

J_3

K_0 1 (of $\overline{Q_3}$)

K_1

K_2

K_3

opgave ② "manuele invulling van Karnaugh

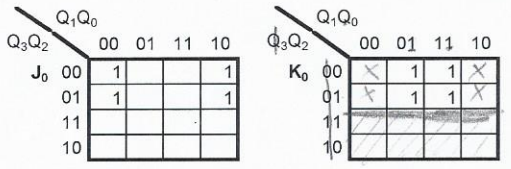
Ontwerp van een synchrone 4-bit teller met JK-flipflops

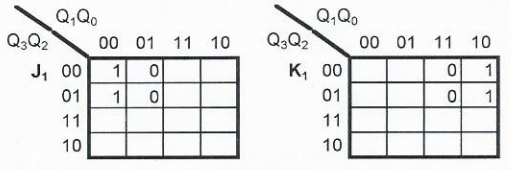
Met deze spreadsheet kan je willekeurige 4-bits synchrone tellers ontwerpen.
Je hoeft enkel de gewenste staten in te vullen in de grijze velden en hij berekent je automatisch de Karnaugh-kaarten.
Blanco velden zijn don't cares. **Modulus 8 afteller**

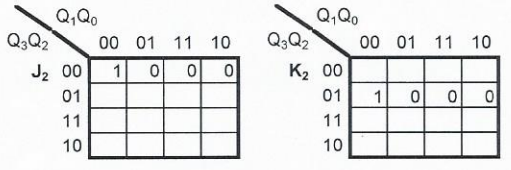
Opgelet: op deze manier ingevuld kan de student de 'automatische nummering' niet toepassen!

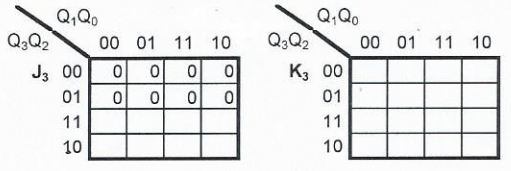
3 FF's voldoende ⇒ Q_3 schrappen

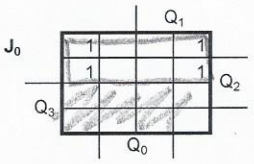
Binair								Decimaal								
huidige staat				volgende staat				oud	nieuw	MSB ←						LSB
Q_3	Q_2	Q_1	Q_0	Q_3	Q_2	Q_1	Q_0	#	#	J_3	K_3	J_2	K_2	J_1	K_1	J_0	K_0
		0111				0110		7	6	0			0		0		1
		0110				0101		6	5	0			0		1	1	
		0101				0100		5	4	0			0	0			1
		0100				0011		4	3	0			1	1		1	
		0011				0010		3	2	0		0			0		1
		0010				0001		2	1	0		0			1	1	
		0001				0000		1	0	0		0		0			1
		0000				0111		0	7	0		1		1		1	

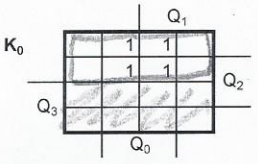


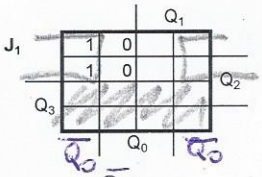


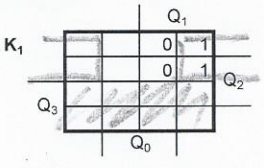


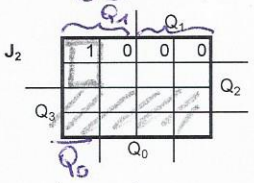


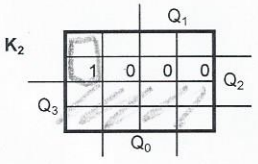


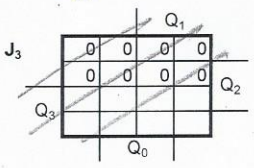


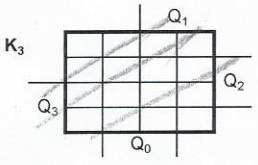












$$J_0 = 1 \quad = \quad K_0 = 1$$
$$J_1 = \bar{Q}_0 \quad = \quad K_1 = \bar{Q}_0$$
$$J_2 = \bar{Q}_0 \cdot \bar{Q}_1 \quad = \quad K_2 = \bar{Q}_0 \cdot \bar{Q}_1$$

Je hebt dus 3 FF's en 1 AND poort nodig om deze teller te maken.