

(1)

Econ 202 Assignment 3

Daniel Eisen 300947549

1. sequ: 000, 010, 101, 110, 000

JK_A

00, 0x

01, 1x

10, x1

11, x0

01, x0

J_B

xx

xx

xx

xx

xx

xx

xx

xx

K_C

xx

xx

xx

xx

xx

xx

xx

xx

J_D

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K_E

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J_F

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K_G

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J_H

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K_I

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J_J

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K_K

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J_L

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xx

K_M

xx

xx

xx

xx

xx

xx

xx

xx

Transition:	C	B	A	Next	J _A	K _C	J _B	K _E	J _A
	0	0	0	010	0X	1X	1X	1X	1X
	0	0	1	000	0X	0X	X1	X1	X1
	0	1	0	101	1X	X1	X1	X1	X1
	0	1	1	000	0X	X1	X1	X1	X1
	1	0	0	000	X1	0X	0X	0X	0X
	1	0	1	110	X0	1X	X1	X1	X1
	1	1	0	000	X1	X1	X1	0X	X1
	1	1	1	000	X1	X1	X1	X1	X1

Kmaps... ~~not used~~ for J_C

J _C :	\bar{C}	0	0	0	1
	C	X	X	X	X
	$\bar{B}A$	$\bar{B}A$	BA	BA	$\bar{B}A$

$$J_C = \bar{A}B$$

K _C :	\bar{C}	X	X	X	X
	C	1	0	1	1
	$\bar{B}A$	$\bar{B}A$	BA	BA	$\bar{B}A$

$$K_C = B + \bar{A}$$

J _B :	\bar{C}	1	0	X	X
	C	0	1	X	X
	$\bar{B}A$	$\bar{B}A$	BA	BA	$\bar{B}A$

$$J_B = AC + A\bar{C}$$

R _B :	\bar{C}	X	X	1	1
	C	X	X	1	1
	$\bar{B}A$	$\bar{B}A$	BA	BA	$\bar{B}A$

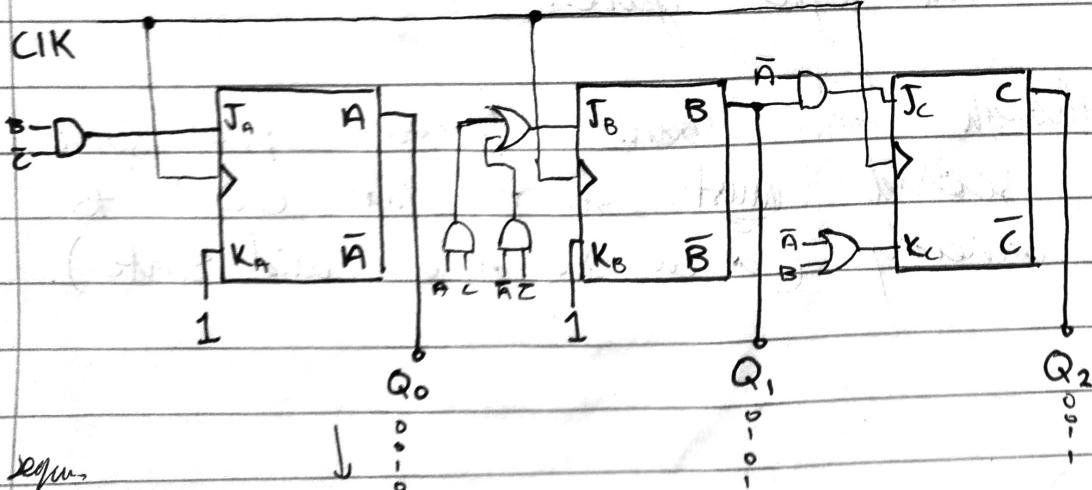
$$R_B = 1$$

J _A :	\bar{C}	0	X	X	1
	C	0	X	X	0
	$\bar{B}A$	$\bar{B}A$	BA	BA	$\bar{B}A$

$$J_A = B\bar{C}$$

K _A :	\bar{C}	X	1	1	X
	C	X	1	1	X
	$\bar{B}A$	$\bar{B}A$	BA	BA	$\bar{B}A$

$$K_A = 1$$



2. Transition:		CBA	next	J _C K _C	J _B K _B	J _A K _A
		0 0 0	0 1 0	0 X	1 X	0 X
		0 0 1	X X Y	X X	X X	X X
		0 1 0	1 0 1	1 X	X 1	1 X
		0 1 1	X X Y	X X	X X	X X
		1 0 0	X X X	X X	X X	X X
		1 0 1	1 1 0	X 0	1 X	X 1
		1 1 0	0 0 0	X 1	X 1	0 X
		1 1 1	X X X	X X	X X	X X

J _C :	C	0	X	1	X	1	1
= B							
		$\bar{B}A$	$\bar{B}A$	$\bar{B}A$	$\bar{B}A$	$\bar{B}A$	

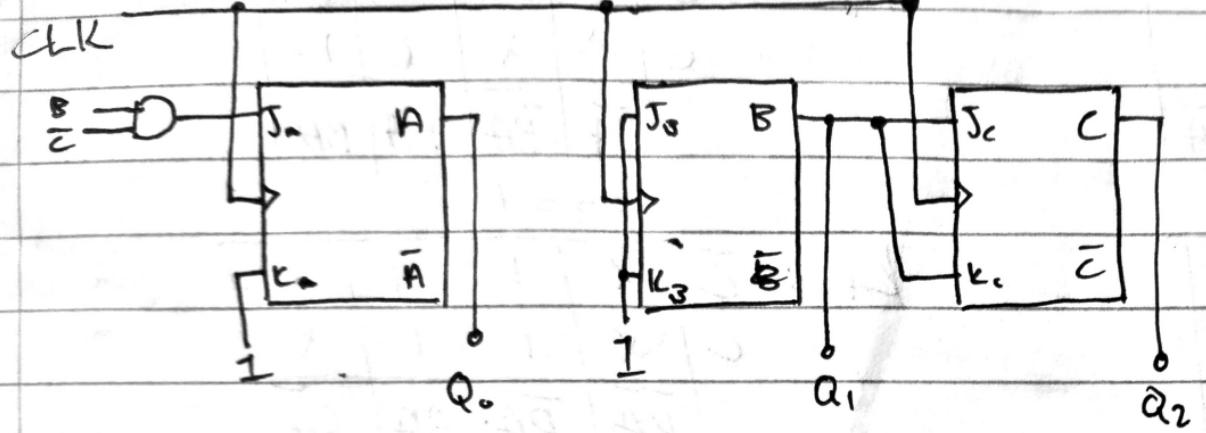
K _C :	C	X	X	X	X	1	1
= B							
		$\bar{B}A$	$\bar{B}A$	$\bar{B}A$	$\bar{B}A$	$\bar{B}A$	

J _B :	C	X	X	X	1	1
= 1						
		$\bar{B}A$	$\bar{B}A$	BA	BA	$\bar{B}A$

K _B :	C	X	X	X	1	1
= 1						
		$\bar{B}A$	$\bar{B}A$	BA	BA	$\bar{B}A$

J _A :	C	0	X	X	1	1
= BC						
		$\bar{B}A$	$\bar{B}A$	BA	BA	$\bar{B}A$

K _A :	C	X	X	X	1	1
= 1						
		$\bar{B}A$	$\bar{B}A$	BA	BA	$\bar{B}A$



In comparison to the Q_1 design this is far, far simpler having only 1 external logic gate.

And however, although both counter through the same sequence, the second must start at 000 to count through correctly (or on any other valid state).

4. Truth table:

D C B A

0 0 0 0

0 0 0 1

0 0 1 0

0 0 1 1

0 1 0 0

0 1 0 1

0 1 1 0

0 1 1 1

1 0 0 0

1 0 0 1

1 0 1 0

1 0 1 1

1 1 0 0

1 1 0 1

1 1 1 0

1 1 1 1

Z

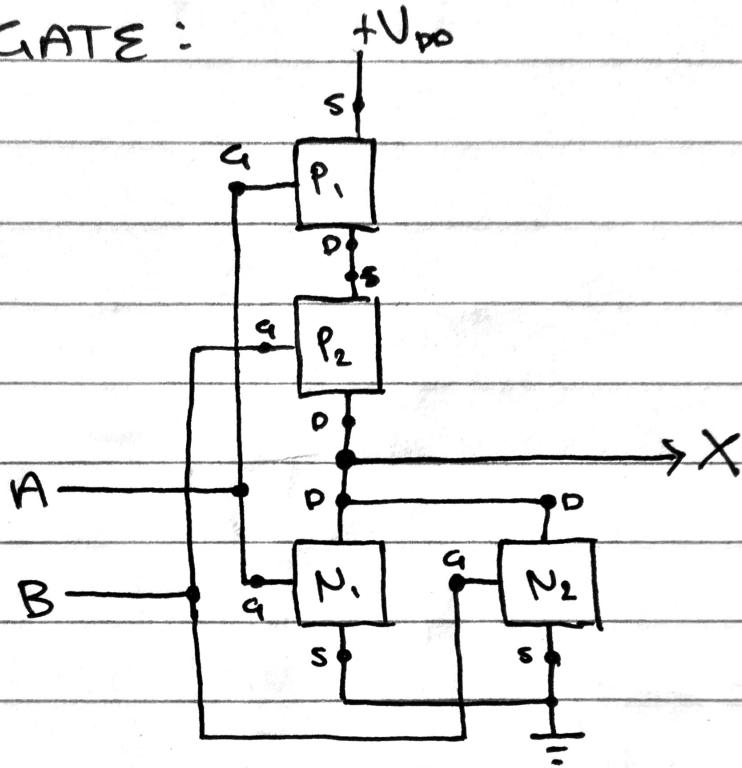
$\bar{A}\bar{B}$ $\bar{A}B$ AB $A\bar{B}$

$\bar{D}\bar{C}$	0	1	0	0
$\bar{D}C$	1	0	0	0
$D\bar{C}$	0	0	0	0
$D\bar{C}$	0	1	0	1

$$Z = \bar{D}\bar{C}\bar{B}\bar{A} + \bar{D}C\bar{B}\bar{A} + D\bar{C}\bar{B}A + D\bar{C}B\bar{A}$$

From K map: $\bar{C}\bar{B}\bar{A} + \bar{D}C\bar{B}\bar{A} + D\bar{C}\bar{B}C$

5. CMOS NOR GATE:



A	B	P ₁	P ₂	N ₁	N ₂	X
LO	LO	on	on	off	off	HI
LO	HI	on	off	off	on	LO
HI	LO	off	on	on	off	LO
HI	HI	off	off	on	on	LO

$$X = \overline{A+B}$$