

Homework 7

Computer Architecture

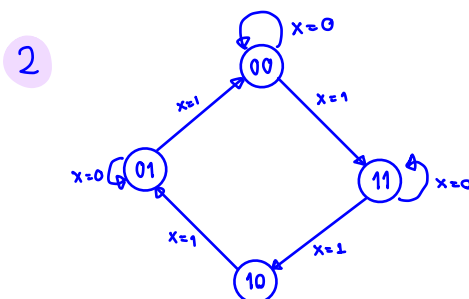
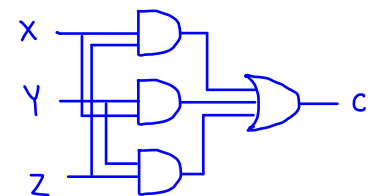
1. A majority function is generated in a combinational circuit when the output is equal to 1 if the input variables have more 1's than 0's. The output is 0 otherwise. Design a three-input majority function.
2. Design a 2-bit count-down counter. This is a sequential circuit with two flip-flops and one input x. When $x = 0$, the state of the flip-flops does not change. When $x = 1$, the state sequence is 11, 10, 01, 00, 11, and repeat.

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input			output	
X	Y	Z	C	S
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

YZ \ X	00	01	11	10
0			1	
1		1	1	1

$C = XZ + XY + YZ$



Present state		input	Next state		flip-flop inputs			
A	B	X	A	B	J_A	K_A	J_B	K_B
0	0	0	0	0	0	X	0	X
0	0	1	1	1	1	X	1	X
0	1	0	0	1	0	X	X	0
0	1	1	0	0	0	X	X	1
1	0	0	1	0	X	0	0	X
1	0	1	0	1	X	1	1	X
1	1	0	1	1	X	0	X	0
1	1	1	1	0	X	0	X	1

		B	
A		0	1
0	X	1	X
1	X	X	X

$J_A = B'X$

		B	
A		0	1
0	X	1	X
1	X	X	X

$K_A = B'X$

		B	
A		0	1
0	1	X	X
1	1	X	X

$J_B = X$

		B	
A		0	1
0	X	X	1
1	X	X	1

$K_B = X$