UF Herbert Wertheim College of Engineering
Department of Electrical & Computer Engineering
UNIVERSITY of FLORIDA

Dr. Christophe Bobda
Lucas Perez
EEL3701C - Fall 2025

HW4: Solutions

1. Draw the NSTT for a J-K Flip Flop, Toggle Flip Flop, D Flip Flop and S-R Latch

Q	J	K	Q+
0	0	X	0
0	1	X	1
1	X	0	1
1	X	1	0

Q	D	Q+
0	0	0
0	1	1
1	0	0
1	1	1

Q	T	Q+
0	0	0
0	1	1
1	0	1
1	1	0

UF Herbert Wertheim College of Engineering
Department of Electrical & Computer Engineering
UNIVERSITY of FLORIDA

Dr. Christophe Bobda
Lucas Perez
EEL3701C - Fall 2025

2. Design a counter with the sequence 3, 7, 0, 1. Use a D Flip Flop for the 0th bit, and J-K Flip Flop for the 1st bit. Use variables Y3, Y2, Y1, and Y0 to represent the value sent to the seven segment decoder.

Q1	**Q0**	**Q1+**	**Q0+**	**J1**	**K1**	**D0**	**Y3**	**Y2**	**Y1**	**Y0**
0	0	0	1	0	X	1	0	0	1	1
0	1	1	0	1	X	0	0	1	1	1
1	0	1	1	X	0	1	0	0	0	0
1	1	0	0	X	1	0	0	0	0	1

00 -> 3
01 -> 7
10 -> 0
11 -> 1

Create K-maps for: Inputs Q1Q0, outputs J1K1D0
And
Inputs Q1Q0, outputs Y3Y2Y1Y0

UF Herbert Wertheim College of Engineering
Department of Electrical & Computer Engineering
UNIVERSITY of FLORIDA

Dr. Christophe Bobda
Lucas Perez
EEL3701C - Fall 2025

3. Design a counter that is controlled by a singular asynchronous input X. Use J-K Flip flops for all Q bits
   X = 0 -> Sequence is .. 01, 10, 11, 00
   X = 1 -> Sequence is .. 00, 11, 10, 01

X	Q1	Q0	Q1+	Q0+	J1	K1	J0	K0
0	0	0	0	1	0	X	1	X
0	0	1	1	0	1	X	X	1
0	1	0	1	1	X	0	1	X
0	1	1	0	0	X	1	X	1
1	0	0	1	1	1	X	1	X
1	0	1	0	0	0	X	X	1
1	1	0	0	1	X	0	1	X
1	1	1	1	0	X	0	X	1

J1 = X * /Q0 + /X * Q0
K1 = /X * Q0
J0 = 1 or VCC
K0 = 1 or VCC

UF Herbert Wertheim College of Engineering
Department of Electrical & Computer Engineering
UNIVERSITY of FLORIDA

Dr. Christophe Bobda
Lucas Perez
EEL3701C - Fall 2025

4. Design a counter that is controlled by TWO asynchronous inputs X1, and X0. Use T Flip flops for all Q bits
   X1 = 0, X0 = 0 -> Sequence is .. 00, 01, 11, 10
   X1 = 0, X0 = 1 -> Sequence is .. 10, 11, 01, 00
   X1 = 1, X0 = 0 -> Sequence is .. 11, 10, 00, 01
   X1 = 1, X0 = 1 -> Sequence is .. 01, 00, 10, 11

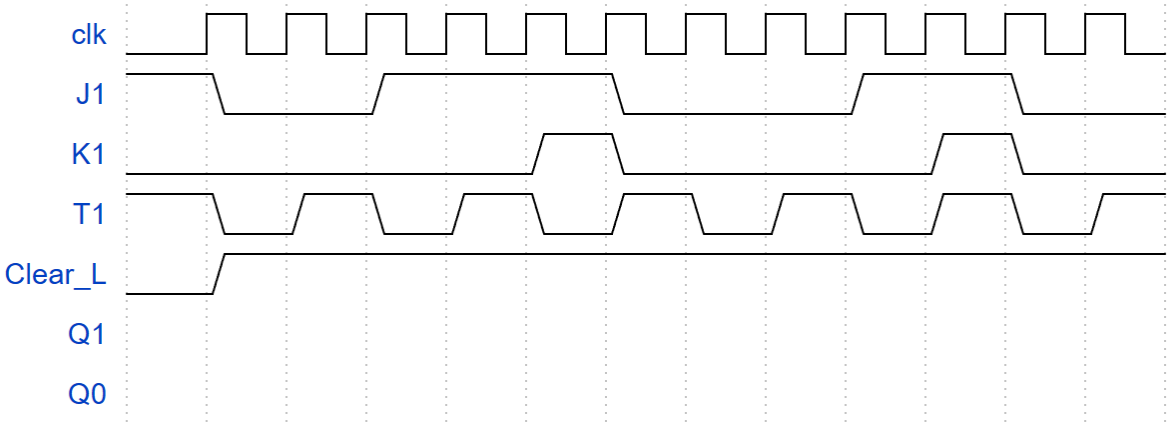
X1	X0	Q1	Q0	Q1+	Q0+	T1	T0
0	0	0	0	0	1	0	1
0	0	0	1	1	1	1	0
0	0	1	0	0	0	1	0
0	0	1	1	1	0	0	1
0	1	0	0	1	0	1	0
0	1	0	1	0	0	0	1
0	1	1	0	1	1	0	1
0	1	1	1	0	1	1	0

1	0	0	0	0	1	0	1
1	0	0	1	1	1	1	0
1	0	1	0	0	0	1	0
1	0	1	1	1	0	0	1
1	1	0	0	1	0	1	0
1	1	0	1	0	0	0	1
1	1	1	0	1	1	0	1
1	1	1	1	0	1	1	0

T1 = /X0*Q0 + X0 * /Q0
T0 = (/X0 * /Q1 * /Q0) + (X0 * /Q1 * Q0) + (/X0 * Q1 * Q0) + (X0 * Q1 * /Q0)

5. Complete the Timing Diagram for the Q_1 and Q_0 where a J-K Flip Flop is used for Q_1 and a T Flip Flop is used for Q_0

Question



Solution

Herbert Wertheim
College of Engineering
Department of Electrical & Computer Engineering
UNIVERSITY *of* FLORIDA

Dr. Christophe Bobda
Lucas Perez
EEL3701C - Fall 2025