United International University
QUEST FOR EXCELLENCE

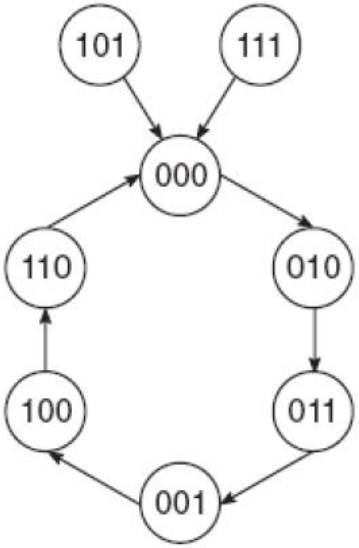
CSE 1326: Digital Logic Design Lab
Counters with Arbitrary Sequences

United International University

What to do

- Implement an arbitrary sequence Counter using
  - (1) D flip-flop – trainer board and
  - (2) J-K flip-flop - logisim

- That counts the following sequence repeatedly
  - 2->3->1->4->6->0->2->so on,
- If accidentally the counter starts with ‘5’ or ‘7’, it should move to ‘0’ in the next step



State Diagram

Flip-flop input table: using J-K

Q(t)	Q(t+1)	J	K
0	0	0	x
0	1	1	x
1	0	x	1
1	1	x	0

J-K Excitation Table

2->3->1->4->6->0->2->so on

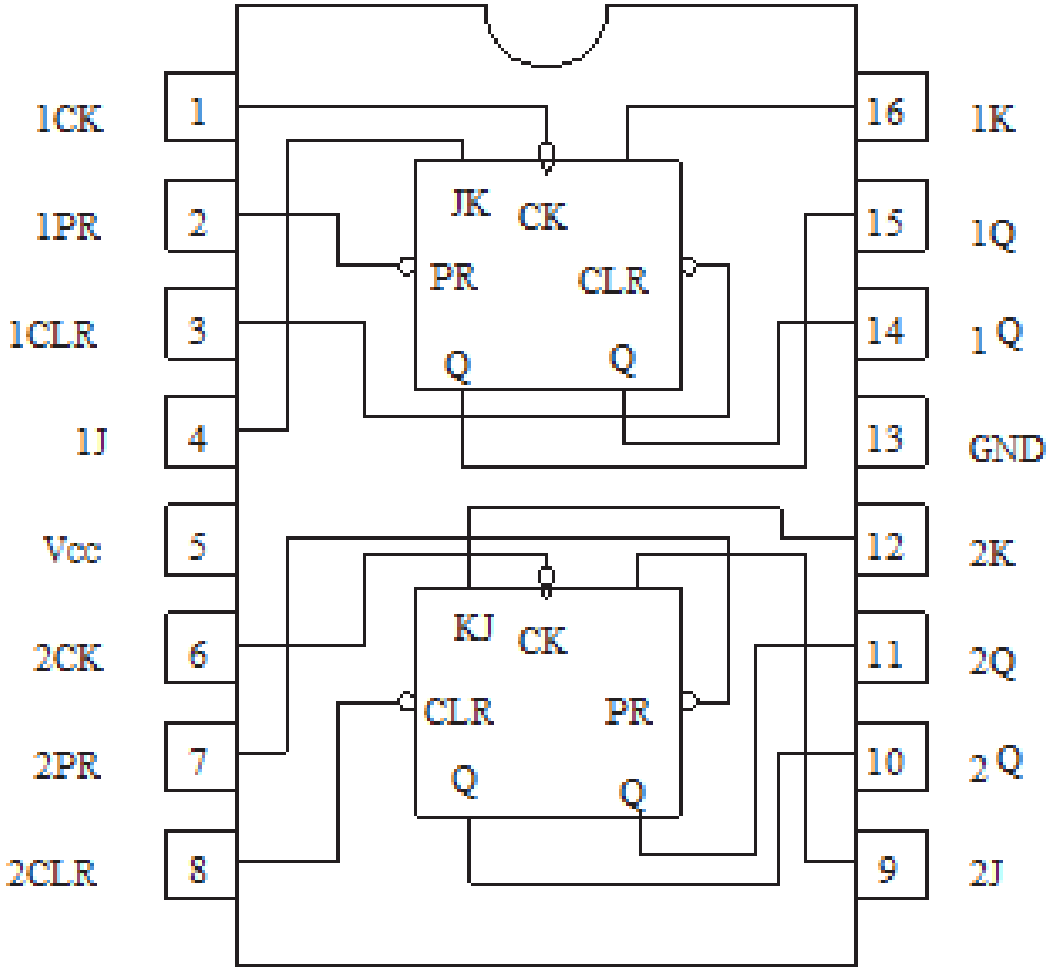
Present state			Next state			Inputs					
			D_2	D_1	D_0						
Q_2	Q_1	Q_0	Q_2	Q_1	Q_0	J_2	K_2	J_1	K_1	J_0	K_0
0	0	0	0	1	0	0	X	1	X	0	X
0	0	1	1	0	0	1	X	0	X	X	1
0	1	0	0	1	1	0	X	X	0	1	X
0	1	1	0	0	1	0	X	X	1	X	0
1	0	0	1	1	0	X	0	1	X	0	X
1	0	1	0	0	0	X	1	0	X	X	1
1	1	0	0	0	0	X	1	X	1	0	X
1	1	1	0	0	0	X	1	X	1	X	1

Input Equations

$$J_2 = Q_0 \cdot \overline{Q}_1$$
$$K_2 = \overline{Q}_1 + Q_0$$
$$J_1 = \overline{Q}_0$$
$$K_1 = Q_2 + Q_0$$
$$J_0 = Q_1 \cdot \overline{Q}_2$$
$$K_0 = \overline{Q}_1 + Q_2$$

Verify that you also have the same equations.

74LS76AP: Dual J-K Flip-Flops (with Preset and Clear)



Writing Report

- ICs being used
- For the arbitrary sequence counter, provide for both J-K and D flip-flop
  - Flip-flop Input/Output (state) tables
  - K-maps
  - Equations
  - Circuit diagrams