Sirindhorn International Institute of Technology
Thammasat University at Rangsit
School of Information, Computer and Communication Technology

ECS 371: Problem Set 7 Solution

Semester/Year: **1/2009**
Course Title: Digital Circuits
Instructor: Dr. Prapun Suksompong (prapun@siit.tu.ac.th)
Course Web Site: http://www.siit.tu.ac.th/prapun/ecs371/

Due date: August 26, 2009 (Wednesday)

Instructions

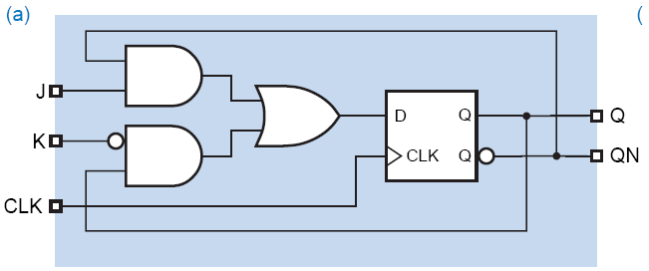
1. The questions in part B are assigned from the following textbook:

   Thomas L. Floyd, *Digital Fundamentals*, 10th Edition, Pearson Education International (2009).

2. Only ONE of the problems will be graded. Of course, you do not know which problems will be selected; so you should work on all of them.
3. Late submission will not be accepted.
4. ***Write down all the steps*** that you have done to obtain your answers. You may not get full credit even when your answer is correct without showing how you get your answer.

Part A

1. Construct a J-K flip-flop from a D flip-flop. You may use additional AND, OR, NOT gates.



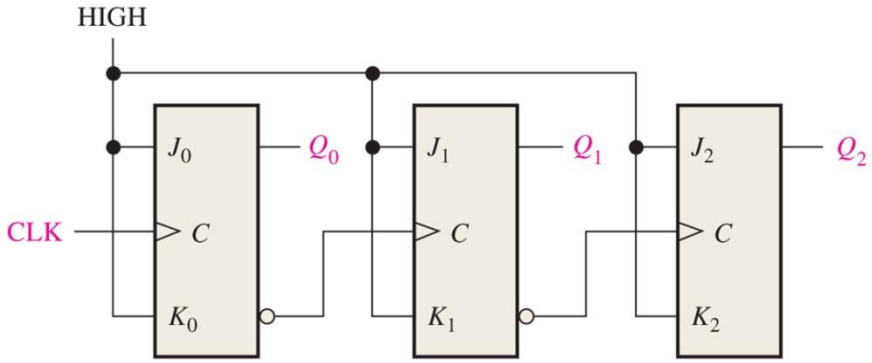
   This problem is discussed in lecture #21.

Part B: Chapter 8

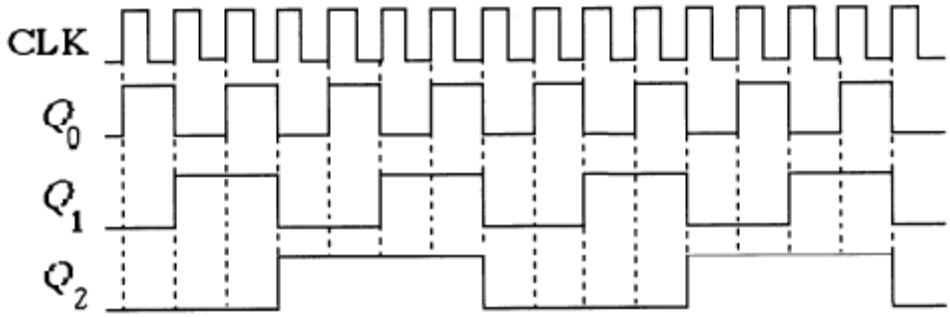
- Please submit your solutions for the following questions: **2, 4(b,d), 8, 10, 16**

2. For the ripple counter in Figure 8–70, show the complete timing diagram for sixteen clock pulses. Show the clock, Q_0, Q_1, and Q_2 waveforms.

FIGURE 8–70



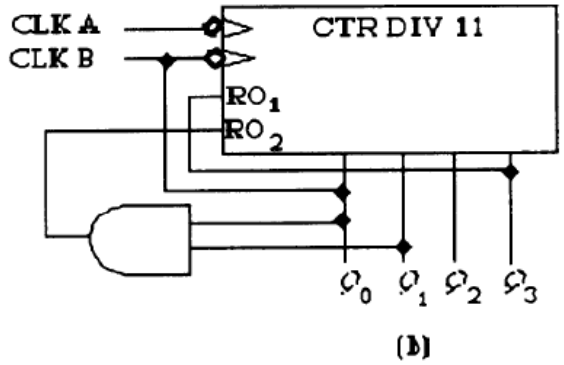
Solution



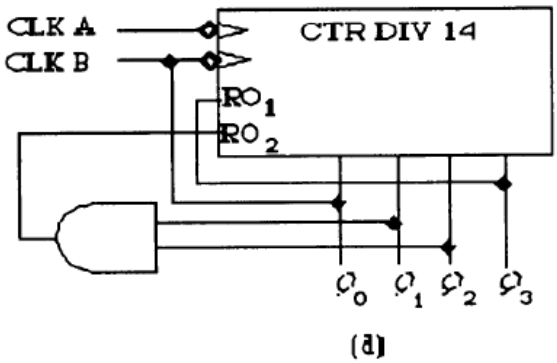
4. Show how to connect a 74LS93 4-bit asynchronous counter for each of the following moduli:

(a) 9 **(b)** 11 **(c)** 13 **(d)** 14 **(e)** 15

Solution



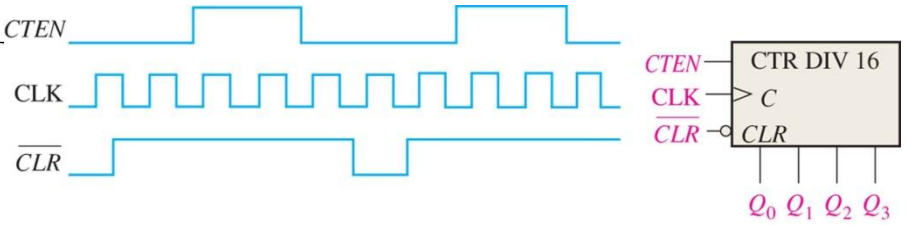
(b)



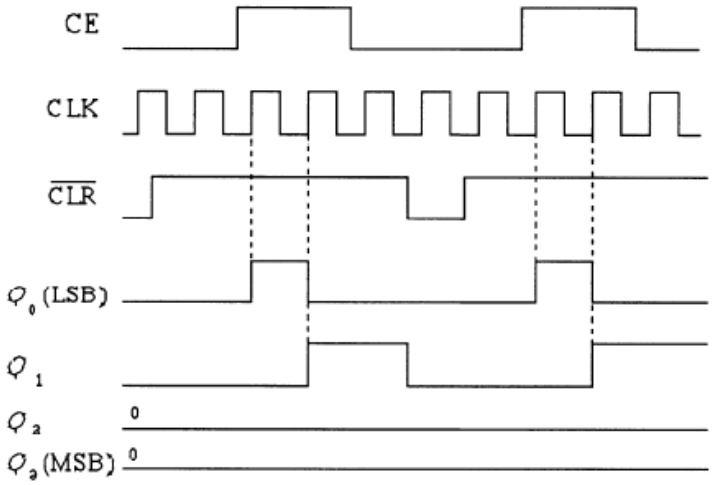
(d)

8. The waveforms in Figure 8–73 are applied to the count enable, clear, and clock inputs as indicated. Show the counter output waveforms in proper relation to these inputs. The clear input is asynchronous.

FIGURE 8–73

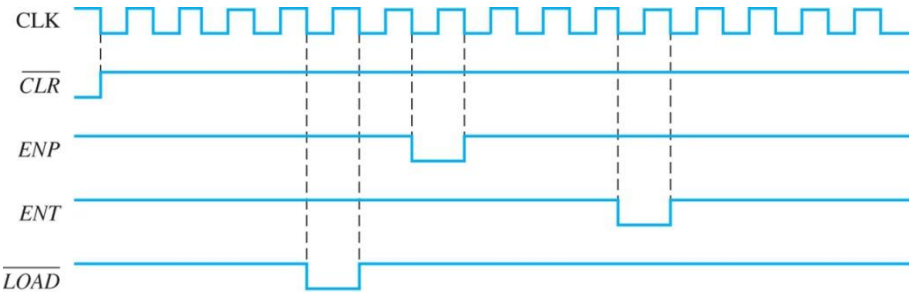


Solution

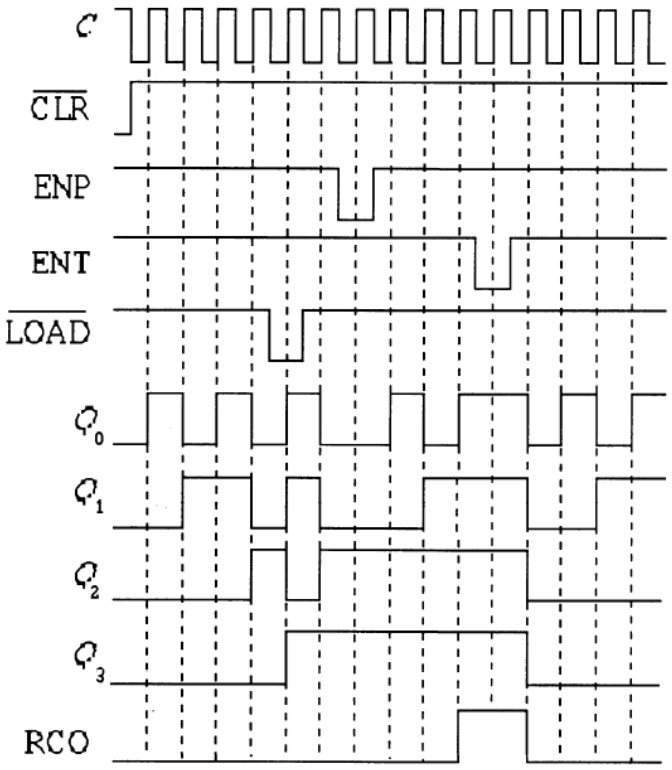


10. The waveforms in Figure 8–75 are applied to a 74HC163 binary counter. Determine the *Q* outputs and the *RCO*. The inputs are $D_0 = 1$, $D_1 = 1$, $D_2 = 0$, and $D_3 = 1$.

FIGURE 8–75

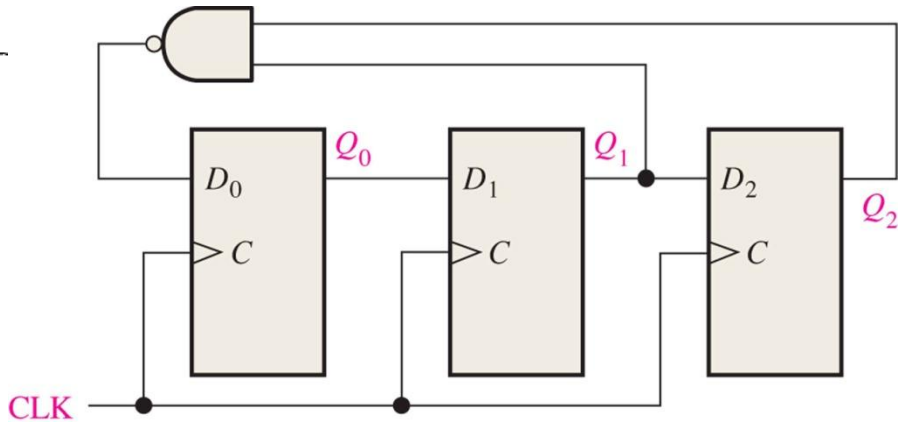


Solution



16. Determine the sequence of the counter in Figure 8–77.

FIGURE 8–77



Solution

	Q_2	Q_1	Q_0	D_2	D_1	D_0
Initially	0	0	0	0	0	1
At CLK 1	0	0	1	0	1	1
At CLK 2	0	1	1	1	1	1
At CLK 3	1	1	1	1	1	0
At CLK 4	1	1	0	1	0	0
At CLK 5	1	0	0	0	0	1
At CLK 6	0	0	1	0	1	1

The sequence is 000 to 001 to 011 to 111 to 110 to 100 and back to 001, etc.

This problem is discussed in lecture #21.