

Homework Assignment #5

Reading Assignment:

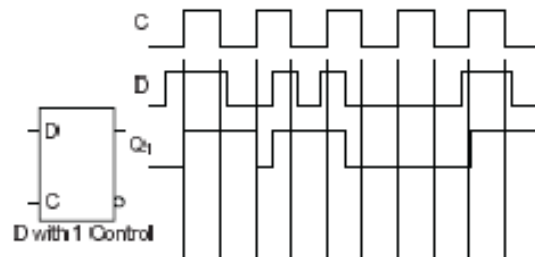
Chapter 5 in the textbook Logic and Computer Design Fundamentals, 4th Edition by Mano
 Online supplement “Design and Analysis using JK and T Flip-Flops” (see www.prenhall.com/mano)

Problem Assignment:

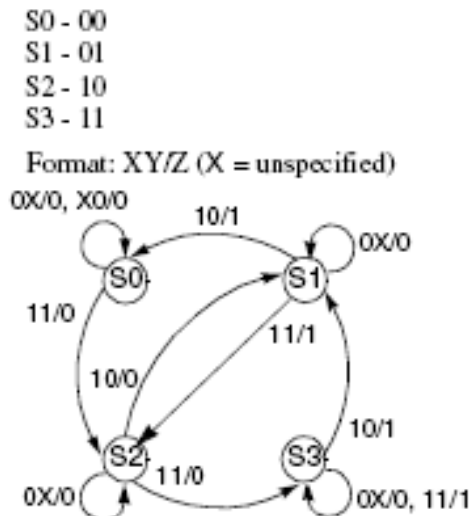
- 1) Chapter 5 problems: 4, 6, 7, 9, 10, 11, 13, 26
- 2) Problems 4, 5, 6 in the online supplement “Design and Analysis using JK and T Flip-Flops.” Note: Problem 4 should refer to Figure 5-44, not Figure 6-40, in the text.
- 3) Design a mod-6 UP/DOWN counter:
 - A) Using JK flip-flops and the *state equation method*. (Show the state diagram, state table, state equations, flip-flop input equations, and the logic diagram.)
 - B) Using D flip-flops and the *state equation method*. (Show the state diagram, state table, state equations, flip-flop input equations, and the logic diagram.)
 - C) Using D flip-flops and the *“one-hot” method*. (Show the state diagram, the ASM chart, and the logic diagram.)
- 4) Draw the state diagram for a sequence that detects the sequence 0101 using a minimal number of states. The detector should also detect overlapping sequences. Design the circuit using D flip-flops. Draw the logic diagram.

Selected Answers:

5-4.



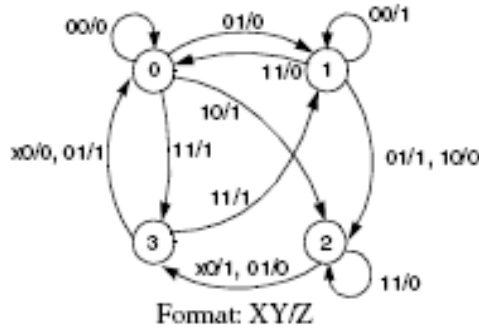
5-6)



5-9.

Present State	00	01	00	00	01	11	00	01	11	10	10
Input	1	0	0	1	1	0	1	1	1	1	0
Output	0	1	0	0	0	1	0	0	0	0	1
Next State	01	00	00	01	11	00	01	11	10	10	00

5-10.



4-supplement) $JA = KA = XB, JB = KB = X'$

5-supplement) $JA = KA = EXB + EX'B', JB = KB = E$

6-supplement) $TA = A'BX' + ABX, TB = B'C + AX + A'BX'$

3A)

$$JA = XBC + X'B'C'$$

$$KA = (X + C)(B' + C')(X' + C)$$

$$JB = X'AC' + XA'C$$

$$KB = (X + C')(A' + C)(X' + C)$$

$$JC = 1, KC = 1$$

3B)

$$DA = A(t+1) = X'AC + XBC + X'A'B'C' + XAC'$$

$$DB = B(t+1) = X'BC + X'AC' + XA'B'C + XBC'$$

$$DC = C(t+1) = C'$$

3C)

$$Q0(t+1) = D0 = XD5 + X'D1$$

$$Q1(t+1) = D1 = XD0 + X'D2$$

...

$$Q5(t+1) = D5 = XD4 + X'D0$$

4) $D1 = XQ0 + X'Q1Q0'$

$$D0 = X'$$

$$Y = XQ1Q0$$