

5.12 For the following state table

Present State	Next State		Output	
	$x = 0$	$x = 1$	$x = 0$	$x = 1$
<i>a</i>	<i>f</i>	<i>b</i>	0	0
<i>b</i>	<i>d</i>	<i>c</i>	0	0
<i>c</i>	<i>f</i>	<i>e</i>	0	0
<i>d</i>	<i>g</i>	<i>a</i>	1	0
<i>e</i>	<i>d</i>	<i>c</i>	0	0
<i>f</i>	<i>f</i>	<i>b</i>	1	1
<i>g</i>	<i>g</i>	<i>h</i>	0	1
<i>h</i>	<i>g</i>	<i>a</i>	1	0

- Draw the corresponding state diagram.
- * Tabulate the reduced state table.
- Draw the state diagram corresponding to the reduced state table.

- 5.13** Starting from state a , and the input sequence 01110010011, determine the output sequence for
- (a) The state table of the previous problem.
 - (b) The reduced state table from the previous problem. Show that the same output sequence is obtained for both.

- 5.14** Substitute the one-hot assignment 2 from Table 5.9 to the states in Table 5.8 and obtain the binary state table.

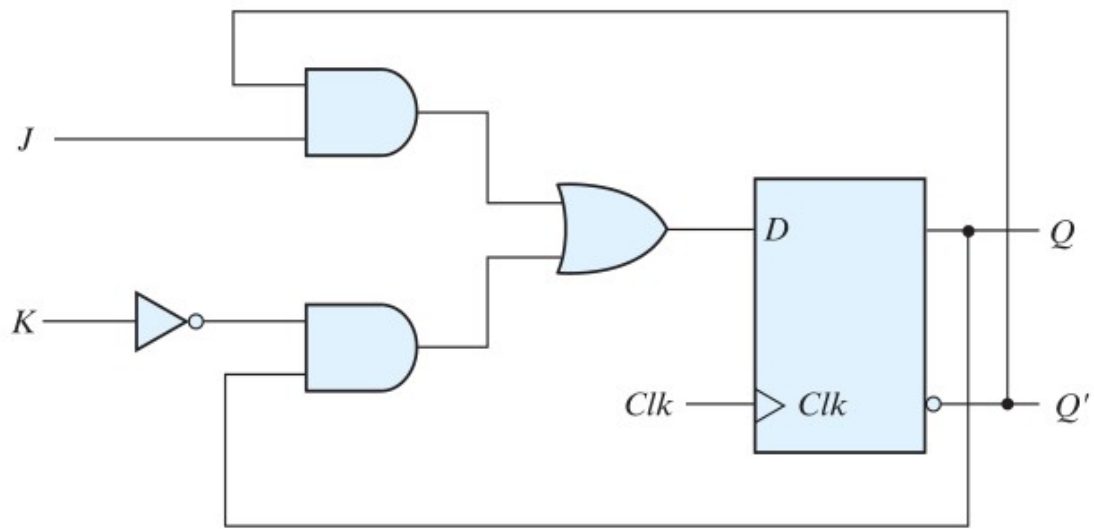
Table 5.9
Three Possible Binary State Assignments

State	Assignment 1, Binary	Assignment 2, Gray Code	Assignment 3, One-Hot
<i>a</i>	000	000	00001
<i>b</i>	001	001	00010
<i>c</i>	010	011	00100
<i>d</i>	011	010	01000
<i>e</i>	100	110	10000

Table 5.8
Reduced State Table

Present State	Next State		Output	
	<i>x</i> = 0	<i>x</i> = 1	<i>x</i> = 0	<i>x</i> = 1
<i>a</i>	<i>a</i>	<i>b</i>	0	0
<i>b</i>	<i>c</i>	<i>d</i>	0	0
<i>c</i>	<i>a</i>	<i>d</i>	0	0
<i>d</i>	<i>e</i>	<i>d</i>	0	1
<i>e</i>	<i>a</i>	<i>d</i>	0	1

- 5.15** List a state table for the JK flip-flop using Q as the present and next state and J and K as inputs. Design the sequential circuit specified by the state table and show that it is equivalent to Fig. 5.12(a).



(a) Circuit diagram

FIGURE 5.12
 JK flip-flop

5.16 Design a sequential circuit with two D flip-flops A and B , and one input x_{in} .

- (a)* When $x_{in} = 0$, the state of the circuit remains the same. When $x_{in} = 1$, the circuit goes through the state transitions from 00 to 01, to 11, to 10, back to 00, and repeats.
- (b) When $x_{in} = 0$, the state of the circuit remains the same. When $x_{in} = 1$, the circuit goes through the state transitions from 00 to 11, to 01, to 10, back to 00, and repeats. (HDL—see Problem 5.38.)

- 5.18*** Design a sequential circuit with two JK flip-flops A and B and two inputs E and F . If $E = 0$, the circuit remains in the same state regardless of the value of F . When $E = 1$ and $F = 1$, the circuit goes through the state transitions from 00 to 01, to 10, to 11, back to 00, and repeats. When $E = 1$ and $F = 0$, the circuit goes through the state transitions from 00 to 11, to 10, to 01, back to 00, and repeats. (HDL—see Problem 5.40.)

5.19 A sequential circuit has three flip-flops A, B, C ; one input x_{in} ; and one output y_{out} . The state diagram is shown in Fig. P5.19. The circuit is to be designed by treating the unused states as don't-care conditions. Analyze the circuit obtained from the design to determine the effect of the unused states. (HDL—see Problem 5.41.)

- (a)* Use D flip-flops in the design.
- (b) Use JK flip-flops in the design.

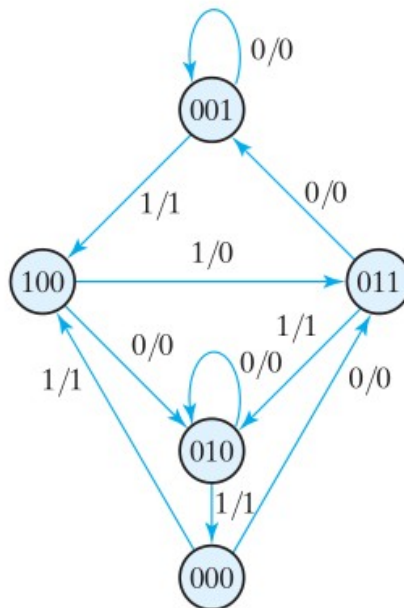


FIGURE P5.19

5.20 Design the sequential circuit specified by the state diagram of Fig. 5.19, using T flip-flops.
(Same Figure as last question)

