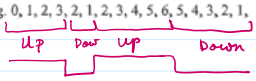
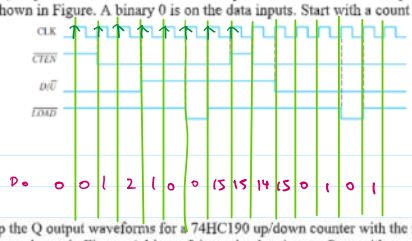
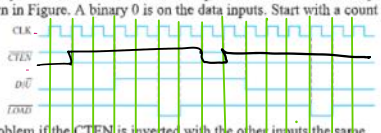
1. Show a complete timing diagram for a 3-bit up/down counter that goes through the following sequence. Indicate when the counter is in the UP mode and when it is in the DOWN mode. Assume positive edge-triggering. 0, 1, 2, 3, 2, 1, 2, 3, 4, 5, 6, 5, 4, 3, 2, 1, 0



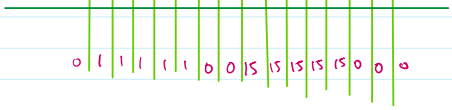
2. Develop the Q output waveforms for a 74HC190 up/down counter with the input waveforms shown in Figure. A binary 0 is on the data inputs. Start with a count of 0000.



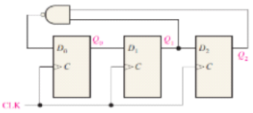
2. Develop the Q output waveforms for a 74HC190 up/down counter with the input waveforms shown in Figure. A binary 0 is on the data inputs. Start with a count of 0000.

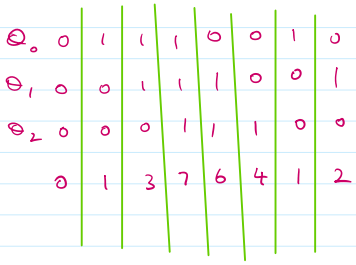


3. Repeat above Problem if the CTEN is inverted with the other inputs the same.

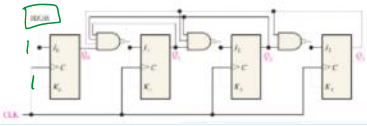


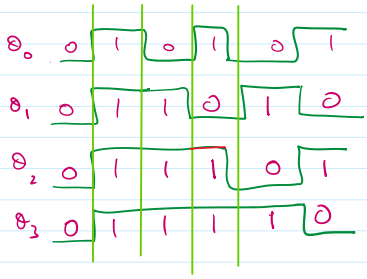
4. Determine the sequence of the counter in Figure.





5. Determine the sequence of the counter in Figure 9–74. Begin with the counter cleared.





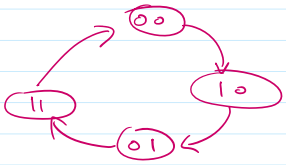
$J_0 = 1$

$J_1 = \overline{Q_0 Q_1 Q_2 Q_3}$

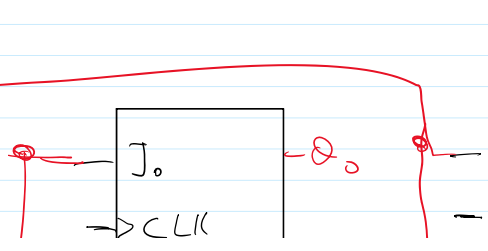
$J_2 = \overline{Q_1 Q_2 Q_3}$

$J_3 = \overline{Q_2 Q_3}$

6. Design a counter to produce the following sequence. Use J-K flip-flops. 00, 10, 01, 11, 00, ...



P state N state



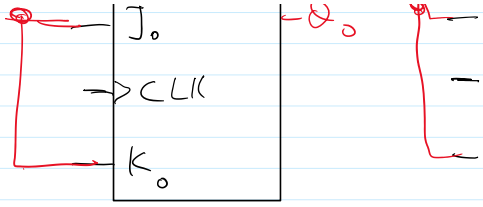
P state

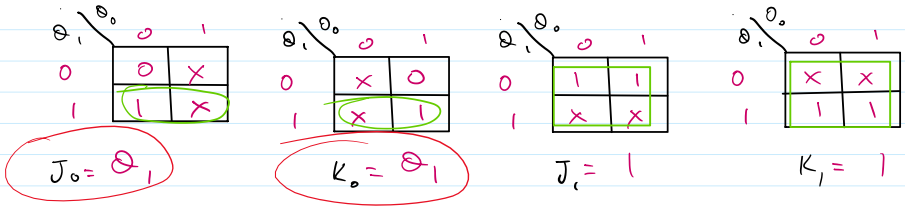
Q_1	Q_0
0	0
1	0
0	1
1	1

N state

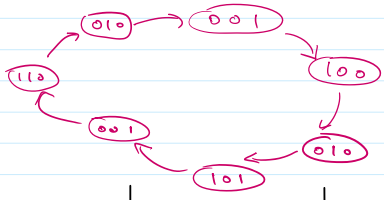
Q_1	Q_0
1	0
0	1
1	1
0	0

Q_n	Q_{n+1}	
0	0	0 x
0	1	1 x
1	0	x 1
1	1	x 0



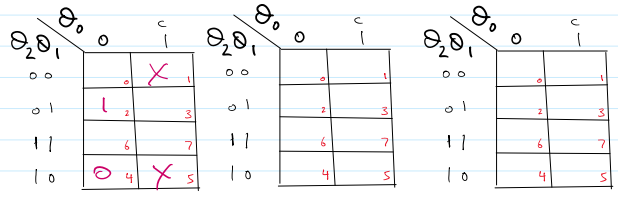


7. Design a counter to produce the following binary sequence. Use J-K flip-flops. 1, 4, 2, 5, 1, 6, 2, 1, ...

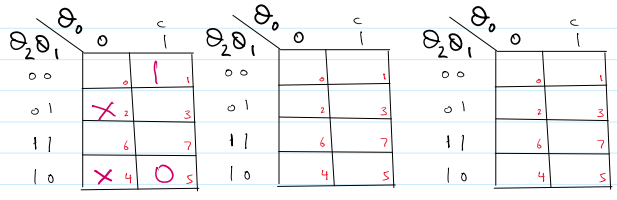


Present			Next state		
Q_2	Q_1	Q_0	Q_2	Q_1	Q_0
0	0	1	1	0	0
1	0	0	0	1	0
0	1	0	1	0	1
1	0	1	0	0	1
0	0	1	1	1	0
1	1	0	0	1	0
0	1	0	0	0	1

Q_n	Q_{n+1}	
0	0	0 x
0	1	1 x
1	0	x 1
1	1	x 0

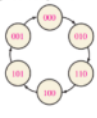


$J_0 =$ $J_1 =$ J_2



$K_0 =$ K_1 $K_2 =$

9. Design a counter by using D -flip flop only with the irregular binary count sequence shown in the state diagram of Fig. Include Next-state table, transition table, Karnaugh maps and final circuit.



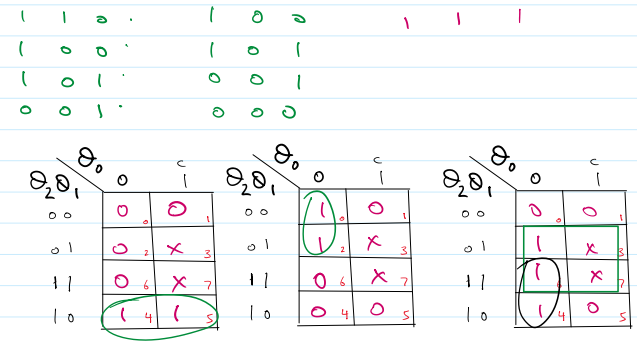
P

Q_2	Q_1	Q_0
0	0	0
0	1	0

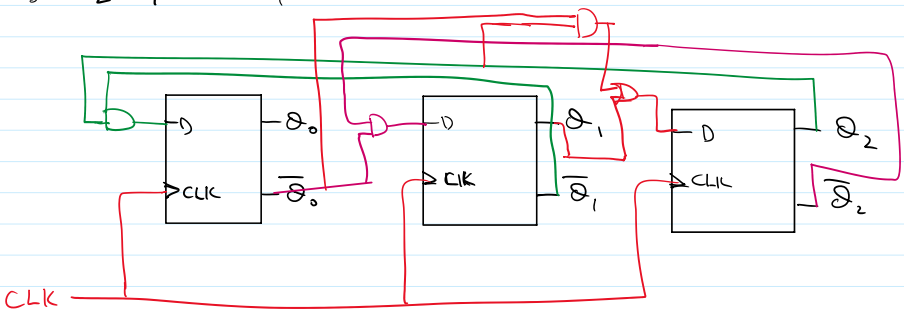
N

Q_2	Q_1	Q_0
0	1	0
1	1	0

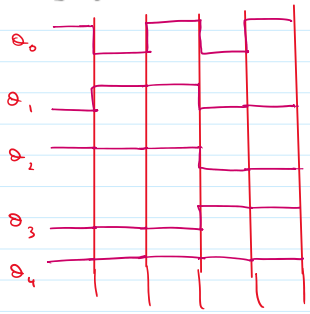
Q_n	Q_{n+1}	
0	0	0
0	1	1
1	0	0



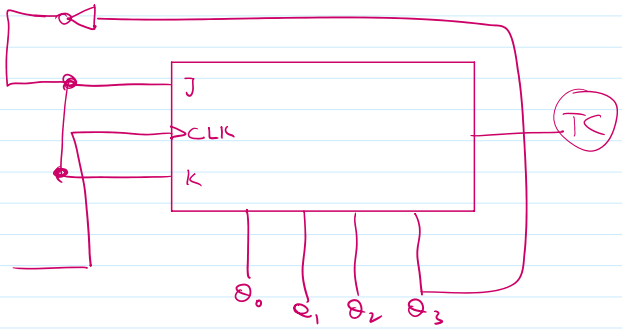
$D_0 = Q_2\overline{Q}_1$ $D_1 = \overline{Q}_2\overline{Q}_0$ $D_2 = Q_1 + Q_2\overline{Q}_0$



10. If a 5-bit ring counter has an initial state 10101, determine the waveform for each Q output



11. Design a modulus-10 Johnson counter using J K flip flop. Write the sequence in tabular form.



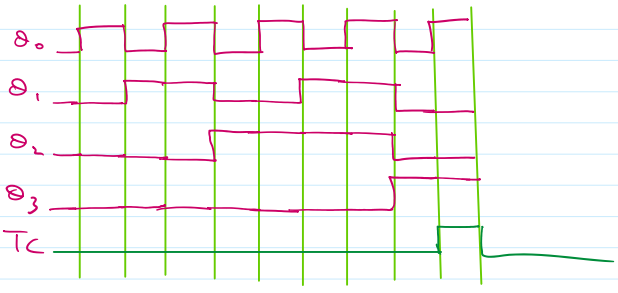
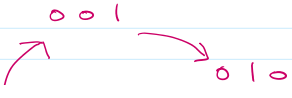
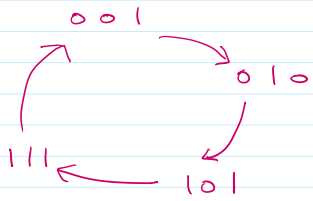


Fig-5

(d) Design an up /down counter with the binary count sequence: 001 → 010 → 101 → 111 → 001. You may use any type of flip-flop. [10]





Down 0

Present state

Q_2	Q_1	Q_0
0	0	1
0	1	0
1	0	1
1	1	1

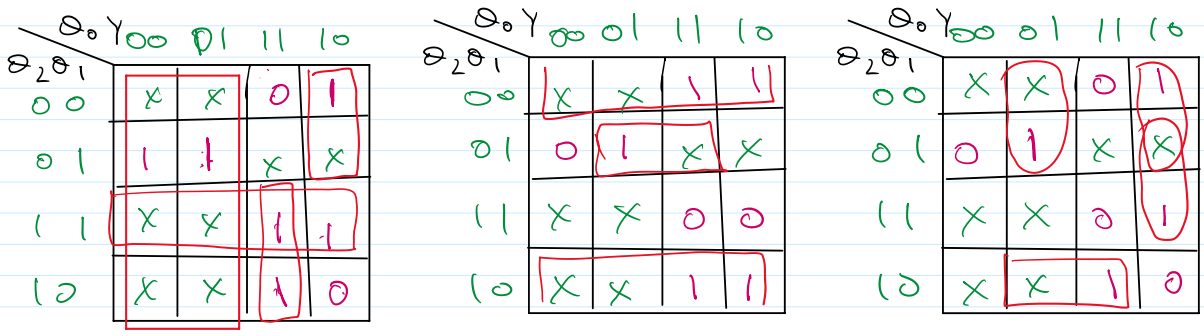
Next state

Q_2	Q_1	Q_0
1	1	1
0	0	1
0	1	0
1	0	1

Up 1

Next state

Q_2	Q_1	Q_0
0	1	0
1	0	1
1	1	1
0	0	1



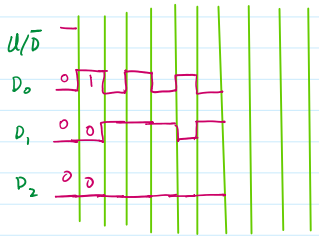
$$D_0 = \overline{Q_0} + Q_2Q_1 + Q_2Q_0Y + \overline{Q_2}Q_0\overline{Y}$$

$$D_1 = \overline{Q_1} + Q_2Q_1Y$$

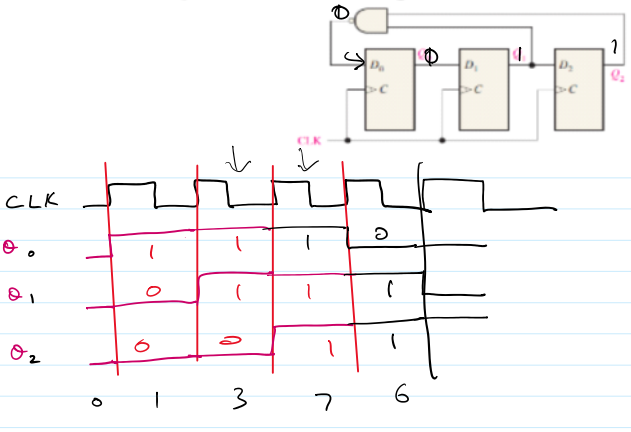
$$D_2 = \overline{Q_2}\,\overline{Q_0}Y + \overline{Q_2}Q_0\overline{Y} + Q_1Q_0\overline{Y} + Q_2\overline{Q_1}$$

1. Show a complete timing diagram for a 3-bit up/down counter that goes through the following sequence. Indicate when the counter is in the UP mode and when it is in the DOWN mode. Assume positive edge-triggering. 0, 1, 2, 3, 2, 1, 2, 3, 4, 5, 6, 5, 4, 3, 2, 1, 0

Up Down Up Down



4. Determine the sequence of the counter in Figure.



23. Design a binary counter with the sequence shown in the state diagram of Figure 9–75.

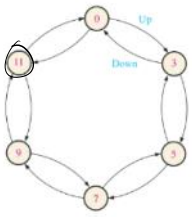
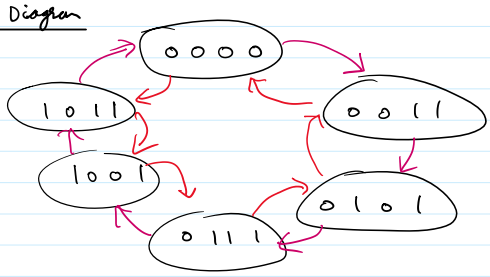


FIGURE 9–75

State Diagram



PRESENT STATE			NEXT STATE Y = 0 (DOWN)			Y
Q_2	Q_1	Q_0	Q_2	Q_1	Q_0	Q_2
0	0	0	1	0	0	0
0	0	1	0	0	0	0
0	1	1	0	0	1	0
0	1	0	0	1	1	1
1	1	0	0	1	0	1
1	1	1	1	1	0	1
1	0	1	1	1	1	1
1	0	0	1	0	1	0

Y = UP/DOWN control input.

Truth Table

Present state

Q_3	Q_2	Q_1	Q_0
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
0	0	0	0

Up = 0

Next state

Q_3	Q_2	Q_1	Q_0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
0	0	0	0

Down = 1

Next state

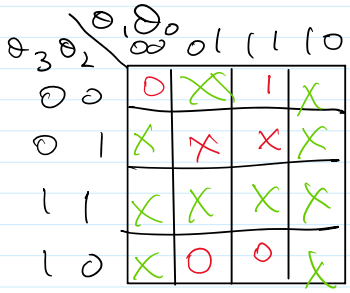
Q_3	Q_2	Q_1	Q_0
1	0	1	1
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1

Transition Table

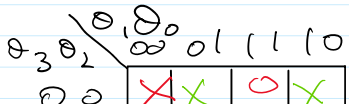
Q_n	Q_{n+1}	J	K
0	0	0	X
0	1	1	X
1	0	X	1
1	1	X	0

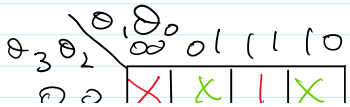
J_0

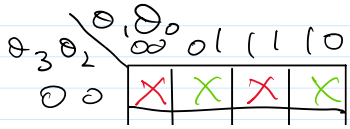
J_1



J_2

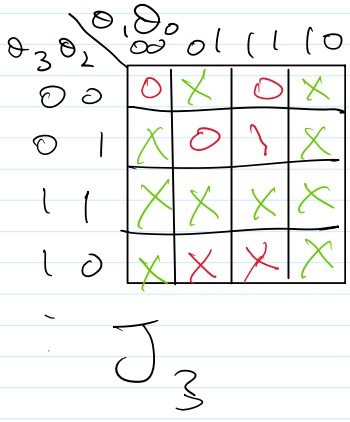


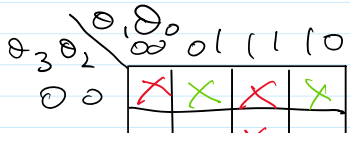


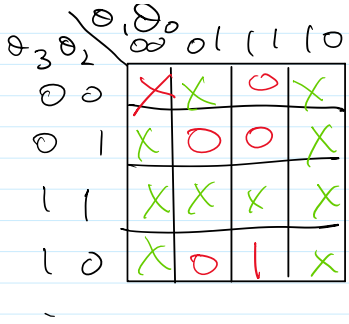


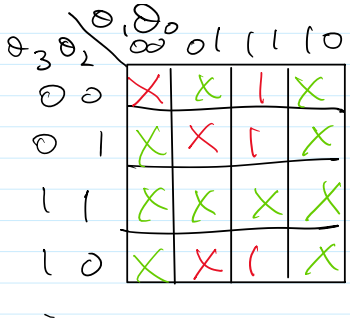
= 1 (UP)

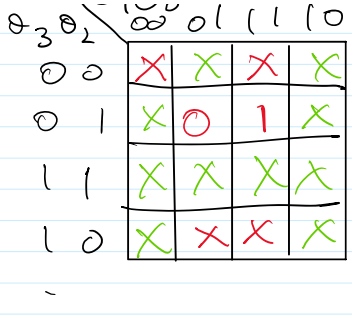
Q_1	Q_0
0	1
1	1
1	0
1	0
1	1
0	1
0	0
0	0

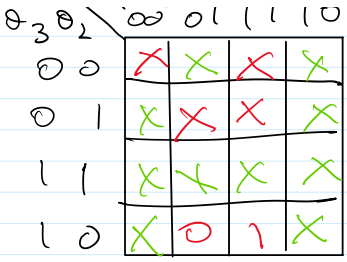











$\theta_3\theta_2$
00 01 11 10
00
01
11
10