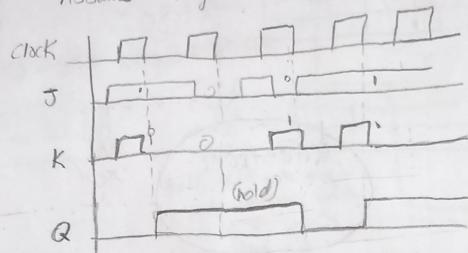


Special Problems (Homework) Alex Sahagun

1) Fill in timing diagram below for a falling-edge triggered JK flip-flop

Assume Q begins at 0.



JK	Q^+
00	Q (hold)
01	0
10	1
11	\bar{Q}

2) Using T-flip flops Design a counter for the following counting seq.

$0 \rightarrow 1 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 7$ 6 states ... so at least 3 T FF

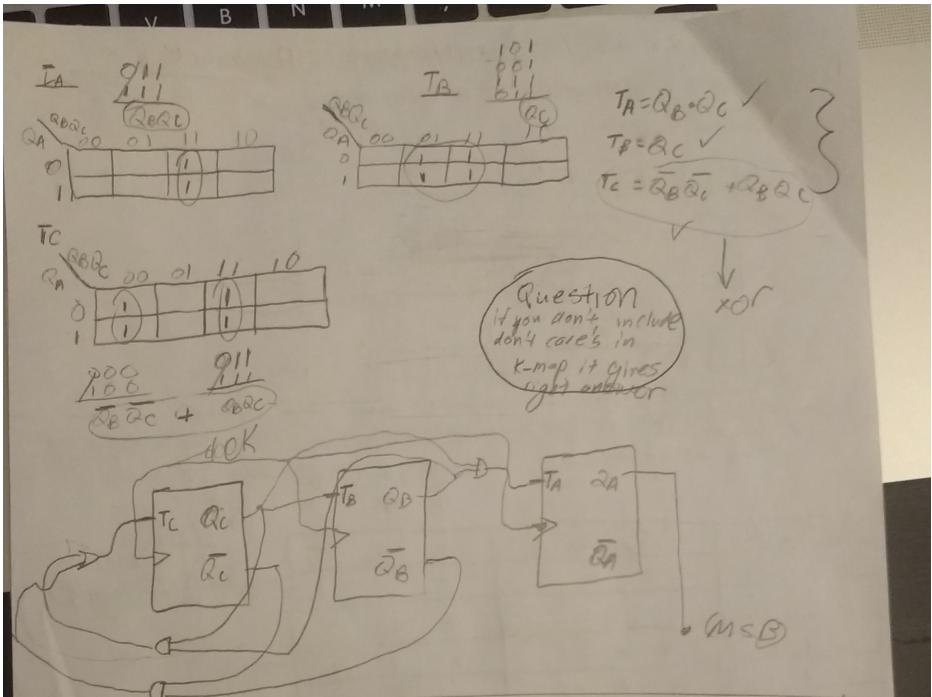
Next St. 4 2 1

Q_A	Q_B	Q_C	Q_A^+	Q_B^+	Q_C^+	T_A	T_B	T_C
0	0	0	0	0	1	0	0	1
0	0	1	0	1	1	0	1	0
0	1	0	X	X	X	X	X	X
0	1	1	1	0	0	1	1	1
1	0	0	1	0	1	0	0	1
1	0	1	1	1	1	0	1	0
1	1	0	X	X	X	X	X	X
1	1	1	0	0	0	1	1	1

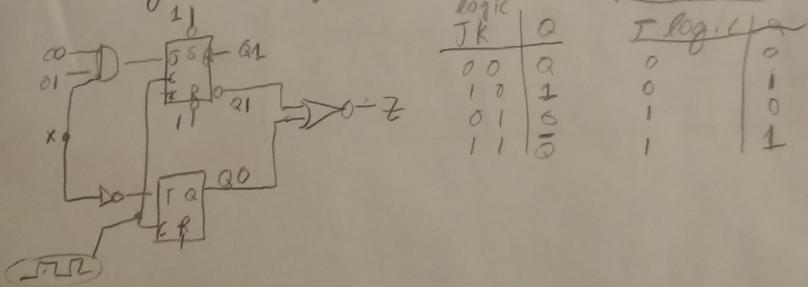
T	Q^+
0	Q (Hold)
1	\bar{Q} (Toggle)

2

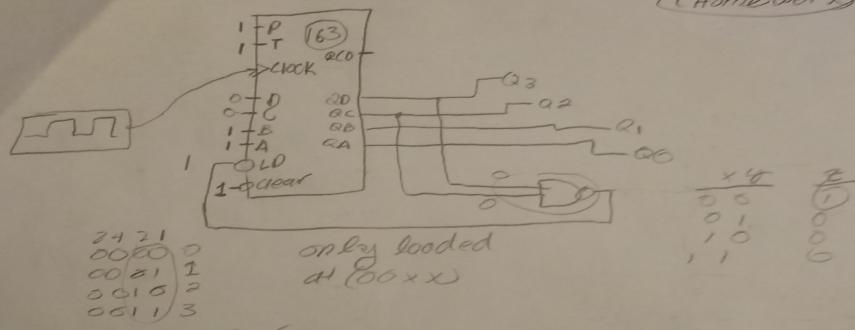
6



#3 Analyze following circuit with one T-flip-flop and one JK flip-flop



④ What is the counting sequence of the circuit shown below?
(Homework)



④ ① → ② → ③

BOOK 7th EDITION / Chapter 12

20) Using a 3 bit counter use following flip-flops that count sequence
 $\{001, 100, 101, 111, 110, 010, 011, 001\}$
 $\{1, 4, 5, 7, 6, 2, 3, 1\}$
 $\rightarrow 1 \rightarrow 4 \rightarrow 5 \rightarrow 7 \rightarrow 6 \rightarrow 2 \rightarrow 3 \rightarrow 1$

$$\begin{array}{|c|c|} \hline D & Q^+ \\ \hline 0 & 0 \\ 1 & 1 \\ \hline \end{array}$$

a) Using DFF

$$\begin{array}{|c|c|c|c|} \hline A & B & C & Q \\ \hline 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ \hline \end{array} \quad \begin{array}{c} 1 \\ 0 \\ 1 \\ 1 \\ \hline 101 \end{array}$$

Present State			Next State			Flip Flop		
QA	QB	QC	QA ⁺	QB ⁺	QC ⁺	(DA)	(PB)	(DC)
0	0	0	X	X	X	Y	X	X
1	0	0	1	0	0	1	0	0
2	0	1	0	0	1	0	1	1
3	0	1	1	0	0	1	0	1
4	1	0	0	1	0	1	1	0
5	1	0	1	1	1	1	1	1
6	1	1	0	0	1	0	0	1
7	1	1	1	1	1	0	1	0

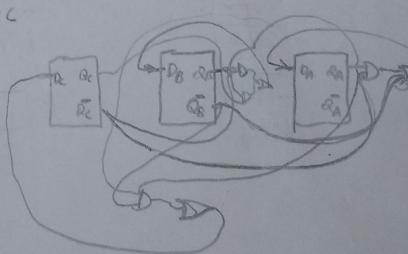
Low
put to not get confused
use K-map

QA	QB	QC	D _B
0	0	0	X
0	0	1	0
0	1	0	1
1	0	1	0
1	1	0	0

A	B	C	D _C
0	0	1	X
0	1	0	1
0	1	1	0
1	1	0	0
1	0	0	1

$$D_C = Q_A Q_B' + Q_A' Q_B$$

$$\begin{array}{c} Q_1 \\ Q_2 \\ Q_3 \\ \hline 1 \\ 0 \\ 1 \\ 1 \\ \hline 101 \end{array} \quad \begin{array}{c} Q_1 \\ Q_2 \\ Q_3 \\ \hline 1 \\ 1 \\ 0 \\ 1 \\ \hline 101 \end{array} \quad \begin{array}{c} Q_1 \\ Q_2 \\ Q_3 \\ \hline 0 \\ 1 \\ 1 \\ 0 \\ \hline 101 \end{array}$$



$$Q_B Q_C + Q_A Q_C$$

Q) Homework

	A	B	C
0	0	0	0
1	0	0	1
2	0	1	0
3	0	1	1
4	1	0	0
5	1	0	1
6	1	1	0
7	1	1	1

	A^+	B^+	C^+
0	X	X	X
1	0	0	0
2	0	1	1
3	0	0	1
4	1	0	1
5	1	1	1
6	0	1	0
7	1	1	0

S _A	S _B	R _B	S _c	R _c
XX	YY	XX		
10	0X	01		
0X	X0	10		
X0	0X	10		
X0	1X	X0		
X1	X0	0X		
X0	X0	01		

$$S_A = \bar{B}$$

$$R_A = B\bar{C}$$

$$S_B = AC$$

$$R_B = A'C$$

$$S_c = AB' + A'B$$

$$R_c = A'B' + AB$$

Q) Homework

	A	B	C
0	0	0	0
1	0	0	1
2	0	1	0
3	0	1	1
4	1	0	0
5	1	0	1
6	1	1	0
7	1	1	1

	A^+	B^+	C^+
0	X	X	X
1	0	0	0
2	0	1	1
3	0	0	1
4	1	0	1
5	1	1	1
6	0	1	0
7	1	1	0

S _A	S _B	R _B	S _c	R _c
XX	YY	XX		
10	0X	01		
0X	X0	10		
X0	0X	10		
X0	1X	X0		
X1	X0	0X		
X0	X0	01		

$$S_A = \bar{B}$$

$$R_A = B\bar{C}$$

$$S_B = AC$$

$$R_B = A'C$$

$$S_c = AB' + A'B$$

$$R_c = A'B' + AB$$