Solution to 11/28 example

State transition table (with assignments)

Present State	Next state $x=0$	Next state $x=1$	Output
$Q_2\ Q_1\ Q_0$	$Q_2^+\ Q_1^+\ Q_0^+$	$Q_2^+\ Q_1^+\ Q_0^+$	Z
0 0 0	0 0 1	0 0 0	0
0 0 1	0 1 0	0 0 0	0
0 1 0	0 1 1	1 0 0	0
0 1 1	0 1 1	1 0 1	0
1 0 0	1 1 0	0 0 0	0
1 0 1	1 1 0	0 0 0	1
1 1 0	0 1 0	0 0 0	1
1 1 1	d d d	d d d	d

J-K ff excitation table

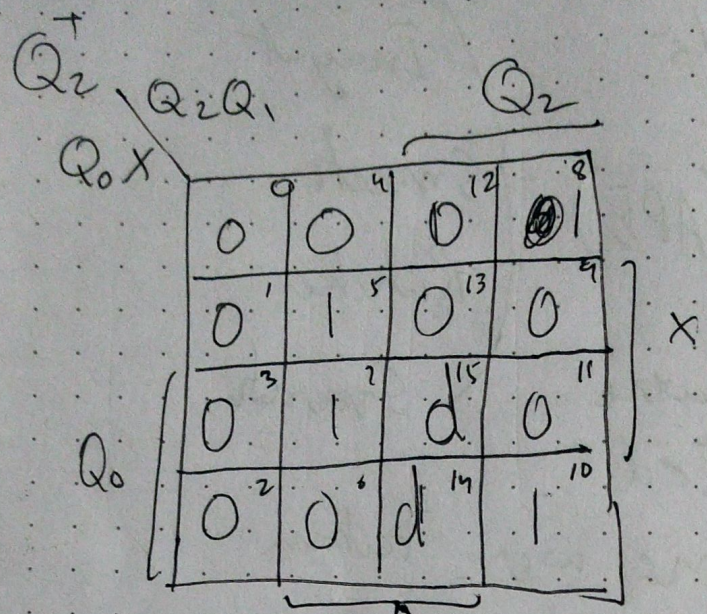
Q	Q^+	J	K
0	0	0	d
0	1	1	d
1	0	d	1
1	1	d	0

JK characteristic table

J	K	Q	Q^+
0	0	0	0
		1	1
0	1	0	0
		1	0
1	0	0	1
		1	1
1	1	0	1
		1	0

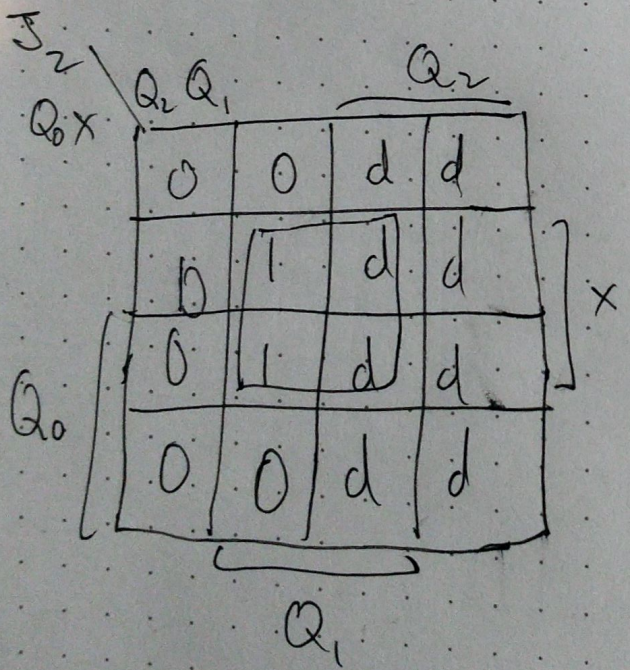
One way is draw Truth table for each J_2K_2, J_1K_1 and J_0K_0

A shortcut is to draw K-map for Q_2^+, Q_1^+, Q_0^+ and the convert them to J_2K_2, J_1K_1, J_0K_0 ~~truth tables~~ K-maps

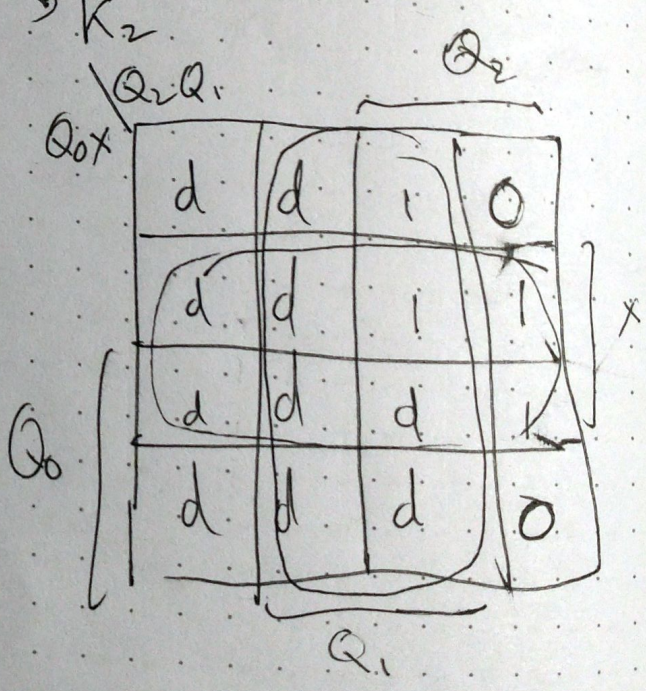


replace $Q_2=1$ with $J_2=d$

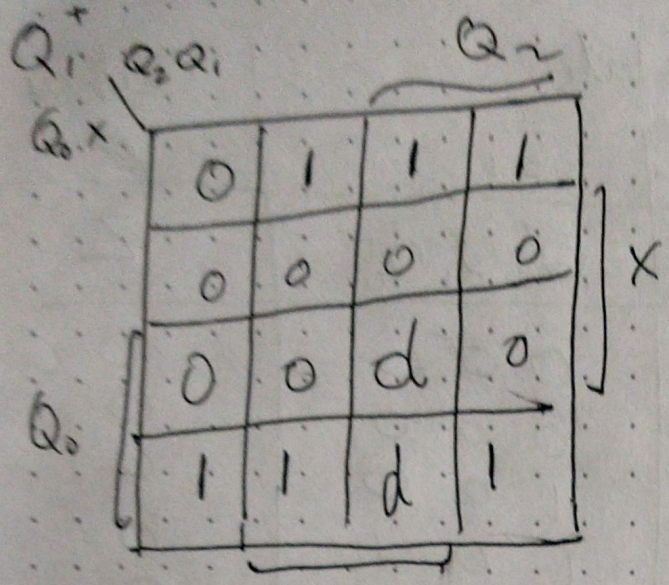
replace $Q_2=0$ with $K_2=d$ and flip Q_2^+



$J_2 = Q_1 \cdot X$



$K_2 = X + Q_1$

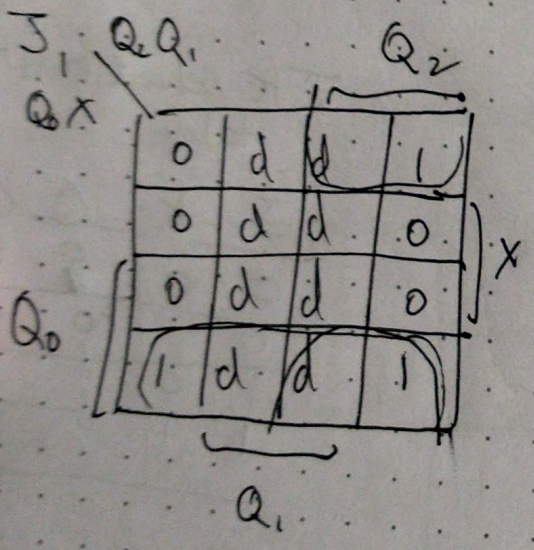


replace $Q_1=1$ with $J_1=d$

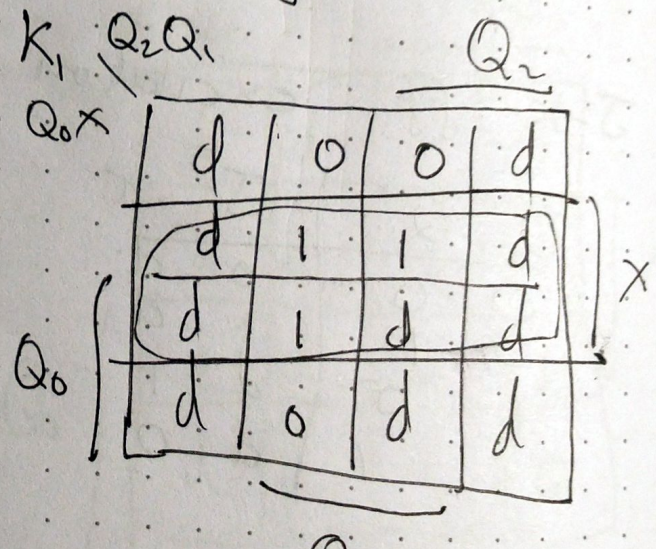
replace $Q_1=0$ with $K_1=d$ and flip rest

JK excitation table

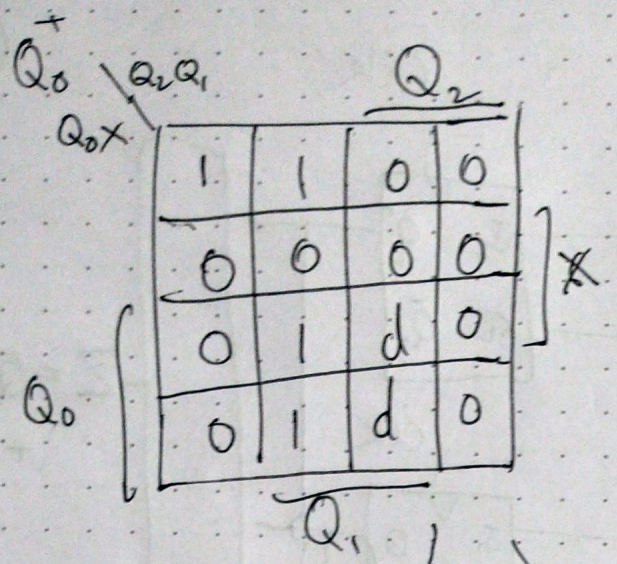
Q	Q^+	J	K
0	0	0	d
0	1	1	d
1	0	d	1
1	1	d	0



$$J_1 = Q_0 \cdot \bar{X} + Q_2 \cdot \bar{X}$$

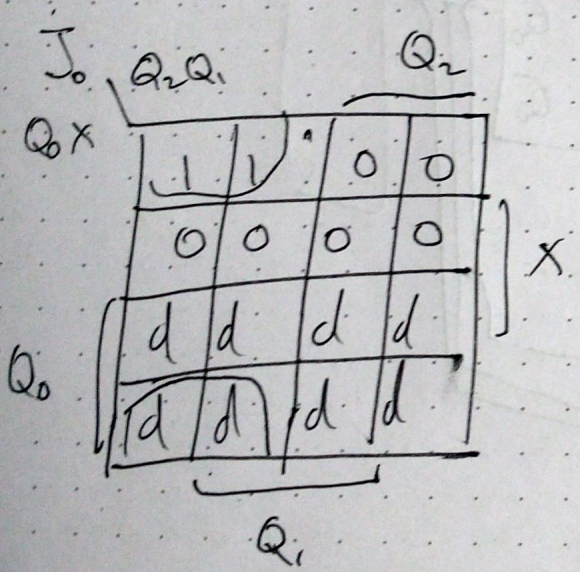


$$K_1 = X$$

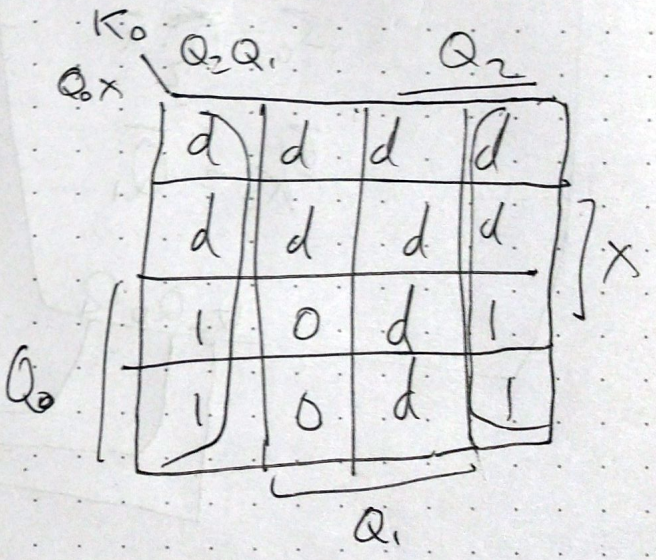


replace $Q_0 = 1$ with $J_0 = d$

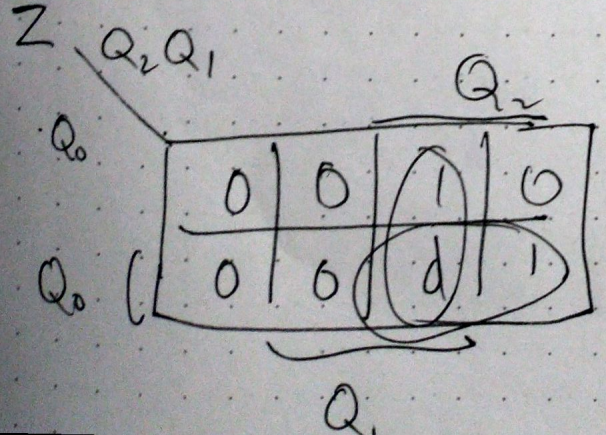
replace $Q_0 = 0$ with $K_0 = d$ and flip rest



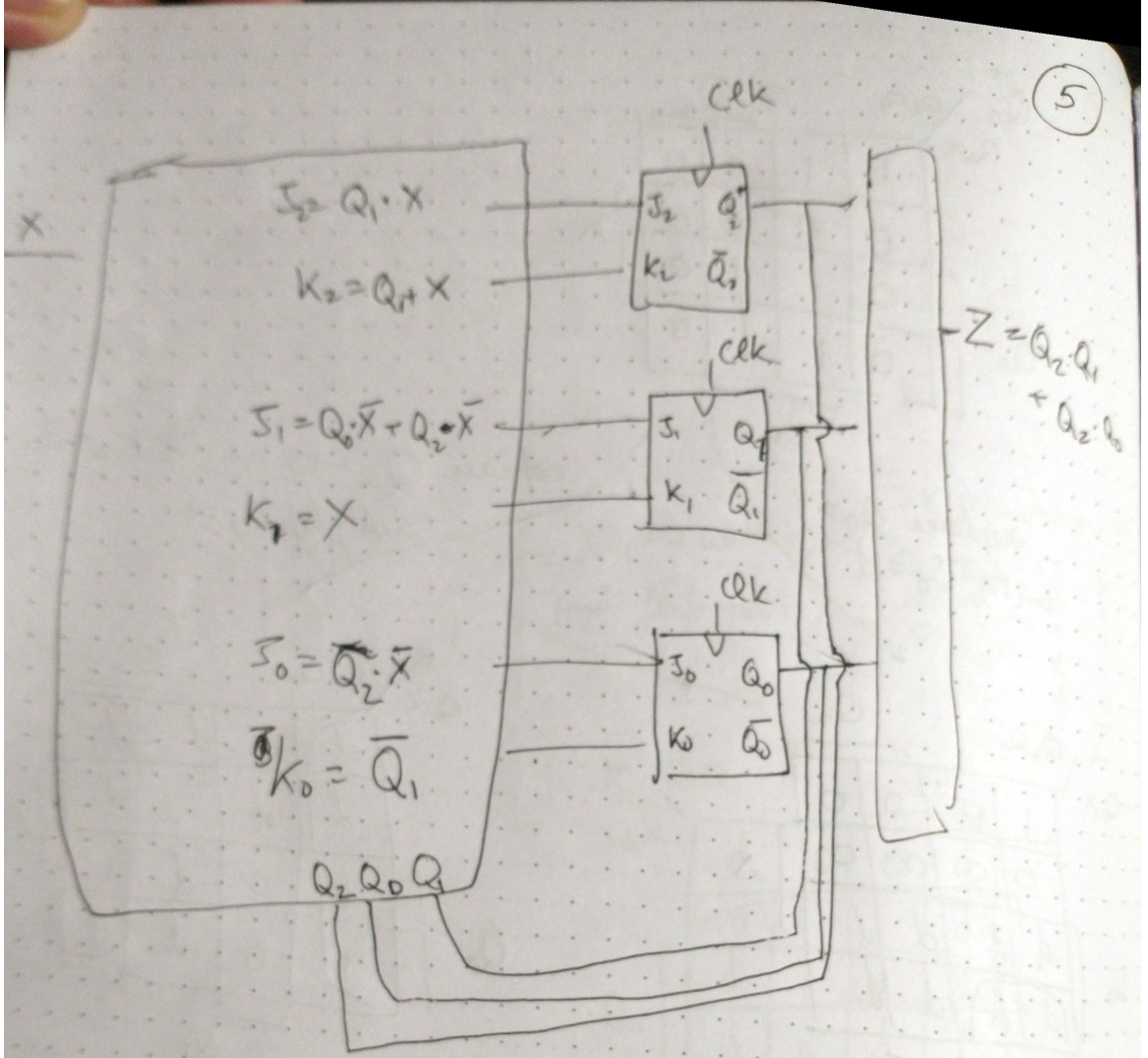
$J_0 = \bar{Q}_2 \cdot \bar{x}$



$K_0 = \bar{Q}_1$



$Z = Q_2 \cdot Q_1 + Q_2 \cdot Q_0$


clk
clk
clk
$J_2 = Q_1 \cdot X$
$K_2 = Q_1 + X$
$J_1 = Q_0 \cdot \bar{X} + Q_2 \cdot \bar{X}$
$K_1 = X$
$J_0 = \overline{Q_2} \cdot \bar{X}$
$K_0 = \overline{Q_1}$
$Z = Q_2 \cdot Q_1 + Q_2 \cdot Q_0$
$Q_2\ Q_0\ Q_1$