

Solution to  
11/28 example State transition table (with assignments) ①

Present state	Next state		Output $\rightarrow \emptyset$
	$x=0$	$x=1$	
$Q_2\ Q_1\ Q_0$	$Q_2^+\ Q_1^+\ Q_0^+$	$Q_2^+\ Q_1^+\ Q_0^+$	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
0	1	0	0
1	0	0	1
1	1	1	1

One way is draw Truth table for each  $J_2 K_2$ ,  $J, K$ , and  $J_0 K_0$

A shortcut is to draw K-maps for  $Q_2^+, Q_1^+, Q_0^+$

and then convert them to  $J_2 K_2$ ,  $J, K$ ,  $J_0 K_0$

~~with faults~~ K-maps

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$Q_2^+$	$Q_2 Q_1$	$Q_0 X$	$Q_2$
0	0	0	12
0	1	0	13 0
0	1	d	15 11
0	0	d	14 10

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

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

$J_2$	$Q_2 Q_1$	$Q_2$
0	0	d d
d	1 d d	d
0	1 d d	d
0	0 d d	d

$$J_2 = Q_1 \cdot X$$

$K_2$	$Q_2 Q_1$	$Q_2$
d	d 1 0	d
d	d 1 1	d
d	d d d	d
d	d d d	d

$$K_2 = X + Q_1$$

$Q_1$	$Q_2 Q_1$	$Q_2$	
$Q_0 X$			
0	1	1	1
0	0	0	0
0	0	d	0
1	1	d	1

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

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

JK excitation			
$Q$	$Q^*$	$J$	$K$
0	0	0	d
0	1	1	d
1	0	d	1
1	1	d	d

$J_1 Q_2 Q_1$	$Q_2$	
$Q_0 X$		
0	d	d
0	d	d
0	d	d
1	d	d

$$J_1 = Q_0 \cdot \bar{X} + Q_1 \cdot \bar{X}$$

$K_1 Q_2 Q_1$	$Q_2$	
$Q_0 X$		
d	0	0
d	1	1
d	1	d
d	0	d

$$K_1 = X$$

(4)

$Q_0$	$Q_2 Q_1$	$\overline{Q_2}$	
$Q_0 X$		1	1
$Q_0$		0	0
		0	0
		0	1
		0	1

] X

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

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

$J_0$	$Q_2 Q_1$	$\overline{Q_2}$	
$Q_0 X$		1	1
$Q_0$		0	0
		0	0
		d	d
		d	d
		d	d

] X

$K_0$	$Q_2 Q_1$	$\overline{Q_2}$	
$Q_0 X$		d	d
$Q_0$		d	d
		1	0
		1	0

] X

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

$$K_0 = \bar{Q}_1$$

$Z$	$Q_2 Q_1$	$\overline{Q_2}$	
$Q_0$		0	1
$Q_0$		0	0
		0	1
		d	1

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

(5)

