

Name: Sujan Biswas

Roll No: 302010501003

Course: BCSE Lateral

Q Cascade 2 decade counters (designed from your previous problem) so that it can count through 0-99.

This design offers a practical approach to cascading two decade counters, so that it can count through 0-99. The counters outputs are normally low and high only at their respective decoded time slot at ~~low~~ high means 0, it represents ~~low~~ ^{high} counting and at ~~high~~ ^{low} means 1, it represents ~~high~~ ^{low} counting. The count is going high from 0 to 99 at high counting and it going to 0 at low counting. For the configuration of cascade two decade counters i.e. from 0-99 every 10 counts, on the first IC counter one count on the second IC counter. In this we use clock for up-down counting of pulse of clock. We also use the clear button for reset of the decade counter. After pressing clear button the decade counter is reset to 00. For represent the count, we use LED display for counting the pulse. The design is designed by using 3K flipflops.

This table for 3K flip flop is $S \Rightarrow$
 $A_n \Rightarrow$ present state $A_{n+1} \Rightarrow$ next state

A_n	A_{n+1}	J	K
0	0	0	X
0	1	1	X
1	0	X	1
1	1	X	0

S	Initial state				Final state				Input Given			
	Q_4	Q_3	Q_2	Q_1	Q_4	Q_3	Q_2	Q_1	q_1	q_2	q_3	q_4
0	0	0	0	0	0	0	0	1	1	0	0	0
0	0	0	0	1	0	0	1	0	1	1	0	0
0	0	0	1	0	0	0	1	1	1	0	0	0
0	0	0	1	1	0	1	0	1	1	1	1	0
0	0	1	0	0	0	1	0	1	1	0	0	0
0	0	1	0	1	0	1	1	0	1	1	0	0
0	0	1	1	0	0	1	1	1	1	0	0	0
0	0	1	1	1	1	0	0	0	1	1	1	1
0	1	0	0	0	1	0	0	0	1	0	0	0
0	1	0	0	1	0	0	0	0	1	0	0	1
1	0	0	0	0	1	0	0	1	1	0	0	1
1	0	0	0	1	0	0	0	0	1	0	0	0
1	0	0	1	0	0	0	0	1	1	1	0	0
1	0	0	1	1	0	0	1	0	1	1	0	0
1	0	1	0	0	0	0	1	1	1	0	0	0
1	0	1	0	1	0	0	1	1	1	0	0	0
1	0	1	1	0	0	1	0	0	1	1	0	0
1	0	1	1	1	0	1	0	0	1	1	0	0
1	1	0	0	0	1	1	0	0	1	0	0	0
1	1	0	0	1	1	1	0	0	1	0	0	0
1	1	0	1	0	1	1	1	0	1	0	0	0
1	1	0	1	1	1	1	1	0	1	0	0	0
1	1	1	0	0	1	0	0	1	1	1	0	0
1	1	1	0	1	1	0	0	1	1	1	0	0
1	1	1	1	0	1	0	1	0	1	1	1	0
1	1	1	1	1	1	0	1	0	1	1	1	0

For $S=0$;

Kmap S

q_2	$\bar{a}_2 \bar{a}_1$	$\bar{a}_2 a_1$	$a_2 a_1$	$a_2 \bar{a}_1$
$\bar{a}_4 \bar{a}_3$	0	1	1	0
$\bar{a}_4 a_3$	0	1	1	0
$a_4 \bar{a}_3$	d	d	d	d
$a_4 a_3$	0	0	d	d

JK for $q_2 = a_1 \bar{a}_4$

For $S=1$,

q_2	$\bar{a}_2 \bar{a}_1$	$\bar{a}_2 a_1$	$a_2 a_1$	$a_2 \bar{a}_1$
$\bar{a}_4 \bar{a}_3$	0	0	0	1
$\bar{a}_4 a_3$	1	0	0	1
$a_4 \bar{a}_3$	d	d	d	d
$a_4 a_3$	1	0	d	d

JK for $q_2 = \bar{a}_1 a_2 + \bar{a}_1 a_3 + \bar{a}_1 a_4$

For $S=0$

q_3	$\bar{a}_2 \bar{a}_1$	$\bar{a}_2 a_1$	$a_2 a_1$	$a_2 \bar{a}_1$
$\bar{a}_4 \bar{a}_3$	0	0	1	
$\bar{a}_4 a_3$	0	0	1	0
$a_4 a_3$	d	d	d	d
$a_4 \bar{a}_3$	0	0	d	d

JK for $q_3 = a_1 a_2$

q_4	$\bar{a}_2 \bar{a}_1$	$\bar{a}_2 a_1$	$a_2 a_1$	$a_2 \bar{a}_1$
$\bar{a}_4 \bar{a}_3$	0	0	0	0
$\bar{a}_4 a_3$	0	0	1	0
$a_4 a_3$	d	d	d	d
$a_4 \bar{a}_3$	0	1	d	d

JK for $q_4 = a_1 a_2 a_3 + a_1 a_4$

For $S=1$

q_3	$\bar{a}_2 \bar{a}_1$	$\bar{a}_2 a_1$	$a_2 a_1$	$a_2 \bar{a}_1$
$\bar{a}_4 \bar{a}_3$	0	0	0	0
$\bar{a}_4 a_3$		0	0	0
$a_4 a_3$	1		d	d
$a_4 \bar{a}_3$	1	0	d	d

JK for $q_3 = \bar{a}_1 \bar{a}_2 a_3 + \bar{a}_1 \bar{a}_2 a_4$

q_4	$\bar{a}_2 \bar{a}_1$	$\bar{a}_2 a_1$	$a_2 a_1$	$a_2 \bar{a}_1$
$\bar{a}_4 \bar{a}_3$	1	0	0	0
$\bar{a}_4 a_3$	0	0	0	0
$a_4 a_3$	d	d	d	d
$a_4 \bar{a}_3$	1	0	d	d

JK for $q_4 = \bar{a}_1 \bar{a}_2 \bar{a}_3$

