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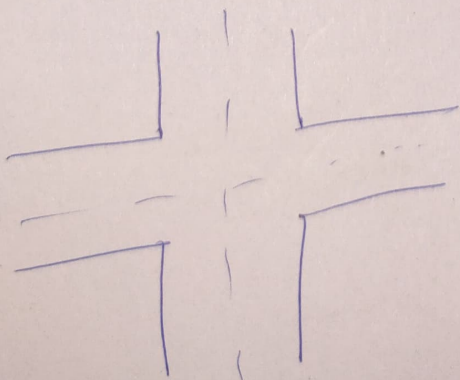
Roll No: 302010501003

Course: BCSE (Lateral)

Group: A1

Q Design a system for a traffic signal at a 4 way crossing.

➤ Traffic signals are used to control flow of vehicles. In the recent years, the need of transportation has ~~for~~ gain immense importance for logistics as well as for common human. Traffic signals provide an easy, cheap, automatic and justified solution to the road points where the vehicles may turn to other direction. The basic idea ~~to~~ behind the design is to avoid the collision of vehicles by providing ~~at~~ appropriate signals to different directions for a limited time slot, after which the next waiting drivers will be given same treatment. In this way a cycle will be established which will control the traffic control signals are 4 lights. 1st one is for left and 2nd one is for right. 3rd one is for straight and 4th one is for stop or wait. By default, the left signal is always remains open for 4 way traffic signals. After every 3 seconds, the signal is alternating. We also ~~include~~ include the busy slot. At timing of morning 5 to 11 and evening 5 to 7. The signal is alternating after every 60 sec. For designing the traffic signal we use decade counter, mod 6 up counter, mod 60 up counter, mod 4, mod 24 up counter, 24 hour clock, mod 30 up counter and Time selector. We also use the parallel loading for input.





# Decade Counter using JK-Flip Flop.

S	Initial state				Final state				Input Given			
	$Q_4$	$Q_3$	$Q_2$	$Q_1$	$\bar{Q}_4$	$\bar{Q}_3$	$\bar{Q}_2$	$\bar{Q}_1$	$q_1$	$q_2$	$q_3$	$q_4$
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	0	1	1	1	0	0	0
0	0	1	0	0	0	1	0	0	1	1	1	0
0	0	1	0	1	0	1	0	1	1	0	0	0
0	0	1	1	0	0	1	1	0	1	1	0	0
0	0	1	1	1	0	1	1	1	1	0	0	0
0	1	0	0	0	1	0	0	0	1	1	1	0
0	1	0	0	1	1	0	0	0	1	0	0	0
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	0	0	0
1	0	0	1	1	0	0	0	1	1	0	0	0
1	0	1	0	0	0	0	1	0	1	1	0	0
1	0	1	0	1	0	0	1	0	1	0	0	0
1	0	1	1	0	0	0	1	1	1	1	0	0
1	0	1	1	1	0	0	1	1	1	0	0	0
1	1	0	0	0	0	1	0	0	1	1	1	0
1	1	0	0	1	0	1	0	0	1	0	0	0
1	1	0	1	0	0	1	1	0	1	1	0	0
1	1	0	1	1	0	1	1	1	1	0	0	0
1	1	1	0	0	0	0	0	0	1	1	1	0
1	1	1	0	1	0	0	0	0	1	0	0	0
1	1	1	1	0	0	0	0	1	1	1	0	0
1	1	1	1	1	0	0	0	1	1	0	0	0

For  $S = 0$ ;

Kmaps

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

JK for  $q_2 = \bar{a}_1 a_2 + \bar{a}_1 \bar{a}_3 + \bar{a}_1 a_4$



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	0
$a_4 a_3$	1	0	d	d
$a_4 \bar{a}_3$	d	d	d	d
$a_4 \bar{a}_3$	1	0	0	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
$a_4 a_3$	0	0	d	d
$a_4 \bar{a}_3$	d	d	d	d
$a_4 \bar{a}_3$	1	0	d	d

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



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~~ <sup>high</sup> counting and at ~~high~~ <sup>low</sup> means 1, it represents ~~low~~ <sup>high</sup> counting. The count is going high from 0 to 99 at high counting and it going to 99 to zero 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~~ 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 JK 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



(Q) Design a counter which counts from 0 to 59 ~~counter~~

→ The job of a counter is to count by advancing the contents of the counter by one count with each clock pulse. Counter which advance their sequence of numbers or states when activated by a clock input are said to operate in a "count up" mode likewise counters which decrease their sequence of numbers or states when activated by a clock input are said to operate in a "count down" mode. Counters can be operated in the both UP and down mode. For mode 60 counter, we design it by using a mode 10 counter that counts 0 to 9 and a mode 6 counter that counts 0 to 5.

In designing of mode 60 counter, at low means 0 it represent low counting and at high means 1, it represent high counting. At high counting, it going 0 to 59 and at low counting, it going from 59 to 0. We design the counter by using JK flip flops. We also use the clock for updown counting of the clock pulse. A clear button is used for reset the counter. To represent the count, we use LED display for counting the pulse.

JK Flip Flop Transition Table

$Q_N$	$Q_{N+1}$	J	K
0	0	0	X
0	1	1	X
1	0	X	0
1	1	X	1



Designing mod 6 updown counter:  $\Rightarrow$

mode	Initial state			Final state		
	$a_2$	$a_1$	$Q_0$	$\bar{a}_2$	$\bar{a}_1$	$\bar{Q}_0$
0	0	0	0	0	0	1
0	0	0	1	0	1	0
0	0	1	0	0	1	1
0	0	1	1	0	0	0
0	1	0	0	1	0	1
0	1	0	1	0	0	0
1	0	0	0	1	0	1
1	0	0	1	0	0	0
1	0	1	0	0	0	1
1	0	1	1	0	1	0
1	1	0	0	0	1	1
1	1	0	1	0	0	0

K map  $\rightarrow$

$J_0$	$\bar{a}_2 \bar{a}_1$	$\bar{a}_2 a_1$	$a_2 a_1$	$a_2 \bar{a}_1$
$\bar{Q}_0$	1	1	X	1
$Q_0$	X	X	X	X

$$J_0 = 1$$

$K_0$	$\bar{a}_2 \bar{a}_1$	$\bar{a}_2 a_1$	$a_2 a_1$	$a_2 \bar{a}_1$
$\bar{Q}_0$	X	X	X	X
$Q_0$	1	1	X	1

$$K_0 = 1$$

$J_1$	$\bar{a}_2 \bar{a}_1$	$\bar{a}_2 a_1$	$a_2 a_1$	$a_2 \bar{a}_1$
$\bar{Q}_0$	0	X	X	1
$Q_0$	0	X	X	0

$$J_1 = a_2 \bar{Q}_0$$

$K_1$	$\bar{a}_2 \bar{a}_1$	$\bar{a}_2 a_1$	$a_2 a_1$	$a_2 \bar{a}_1$
$\bar{Q}_0$	X	1	X	X
$Q_0$	X	0	X	X

$$K_1 = \bar{Q}_0$$

$J_2$	$\bar{a}_2 \bar{a}_1$	$\bar{a}_2 a_1$	$a_2 a_1$	$a_2 \bar{a}_1$
$\bar{Q}_0$	1	0	X	X
$Q_0$	0	0	X	X

$$J_2 = \bar{a}_1 \bar{Q}_0$$

$K_2$	$\bar{a}_2 \bar{a}_1$	$\bar{a}_2 a_1$	$a_2 a_1$	$a_2 \bar{a}_1$
$\bar{Q}_0$	X	X	X	1
$Q_0$	X	X	X	0

$$K_2 = \bar{Q}_0$$



\* For counting 24, we can use mod 3 and mod 5

Mod-3

mode	Initial State		Final State		Inputs			
	$Q_1$	$Q_0$	$Q_1^*$	$Q_0^*$	$J_1$	$K_1$	$J_0$	$K_0$
0	0	0	0	1	0	X	1	X
0	0	1	1	0	1	X	X	1
0	1	0	0	0	X	1	0	X

K map.

$J_1$

$Q_1 \backslash Q_0$	$\bar{Q}_0$	$Q_0$
$\bar{Q}_1$	0	1
$Q_1$	X	X

$$J_1 = Q_0$$

$K_1$

$Q_1 \backslash Q_0$	$\bar{Q}_0$	$Q_0$
$\bar{Q}_1$	X	X
$Q_1$	1	X

$$K_1 = 1$$

$J_0$

$Q_1 \backslash Q_0$	$\bar{Q}_0$	$Q_0$
$\bar{Q}_1$	1	X
$Q_1$	0	X

$$J_0 = \bar{Q}_1$$

$K_0$

$Q_1 \backslash Q_0$	$\bar{Q}_0$	$Q_0$
$\bar{Q}_1$	X	1
$Q_1$	X	X

$$K_0 = 1$$

# Mod-5

mode	Initial state			Final state			Inputs					
	$Q_2$	$Q_1$	$Q_0$	$a_2^*$	$a_1^*$	$a_0^*$	$J_2$	$K_2$	$J_1$	$K_1$	$J_0$	$K_0$
0	0	0	0	0	0	1	0	X	0	X	0	X
0	0	0	1	0	1	0	0	X	1	X	X	1
0	0	1	0	0	1	1	0	X	X	0	1	X
0	0	1	1	1	0	0	1	X	X	1	X	1
0	1	0	0	0	0	0	X	1	0	X	0	X

Kmap

$J_2$

$a_2 a_1$	$\bar{a}_2 \bar{a}_1$	$\bar{a}_2 a_1$	$a_2 \bar{a}_1$	$a_2 a_1$
$\bar{a}_0$	0	0	1	0
$a_0$	X	X	X	X

$$J_2 = a_1 a_2$$

$K_2$

$a_2 a_1$	$\bar{a}_2 \bar{a}_1$	$\bar{a}_2 a_1$	$a_2 \bar{a}_1$	$a_2 a_1$
$\bar{a}_0$	X	X	X	X
$a_0$	1	X	X	X

$$K_2 = 1$$

$J_1$

$a_2 a_1$	$\bar{a}_2 \bar{a}_1$	$\bar{a}_2 a_1$	$a_2 \bar{a}_1$	$a_2 a_1$
$\bar{a}_0$	0	1	X	X
$a_0$	0	X	X	X

$$J_1 = a_1$$

$K_1$

$a_2 a_1$	$\bar{a}_2 \bar{a}_1$	$\bar{a}_2 a_1$	$a_2 \bar{a}_1$	$a_2 a_1$
$\bar{a}_0$	X	X	1	0
$a_0$	X	X	X	X

$$K_1 = a_1$$

$J_0$

$a_2 a_1$	$\bar{a}_2 \bar{a}_1$	$\bar{a}_2 a_1$	$a_2 \bar{a}_1$	$a_2 a_1$
$\bar{a}_0$	1	X	X	1
$a_0$	0	X	X	X

$$J_0 = \bar{a}_0$$

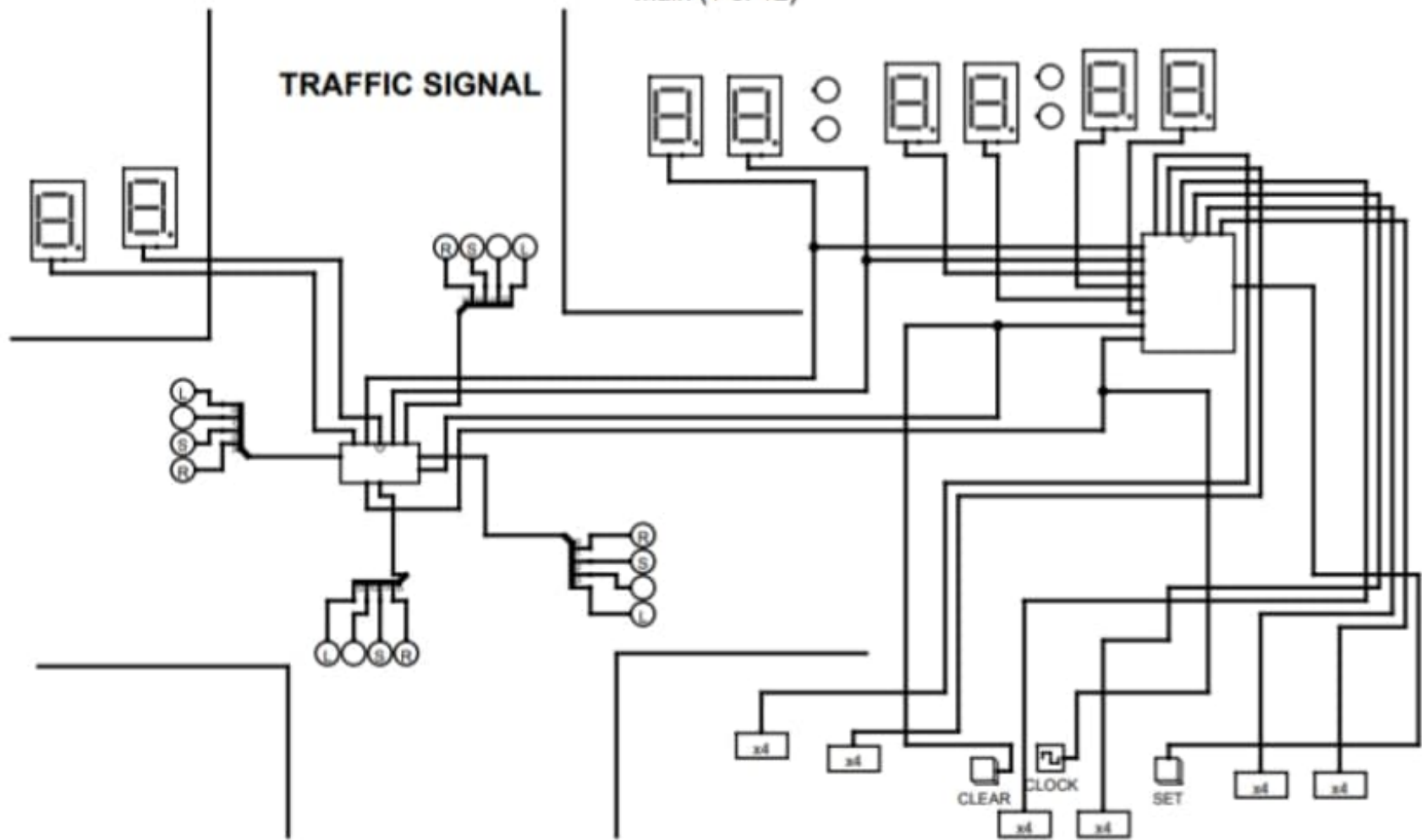
$K_0$

$a_2 a_1$	$\bar{a}_2 \bar{a}_1$	$\bar{a}_2 a_1$	$a_2 \bar{a}_1$	$a_2 a_1$
$\bar{a}_0$	X	1	1	X
$a_0$	X	X	X	X

$$K_0 = 1$$

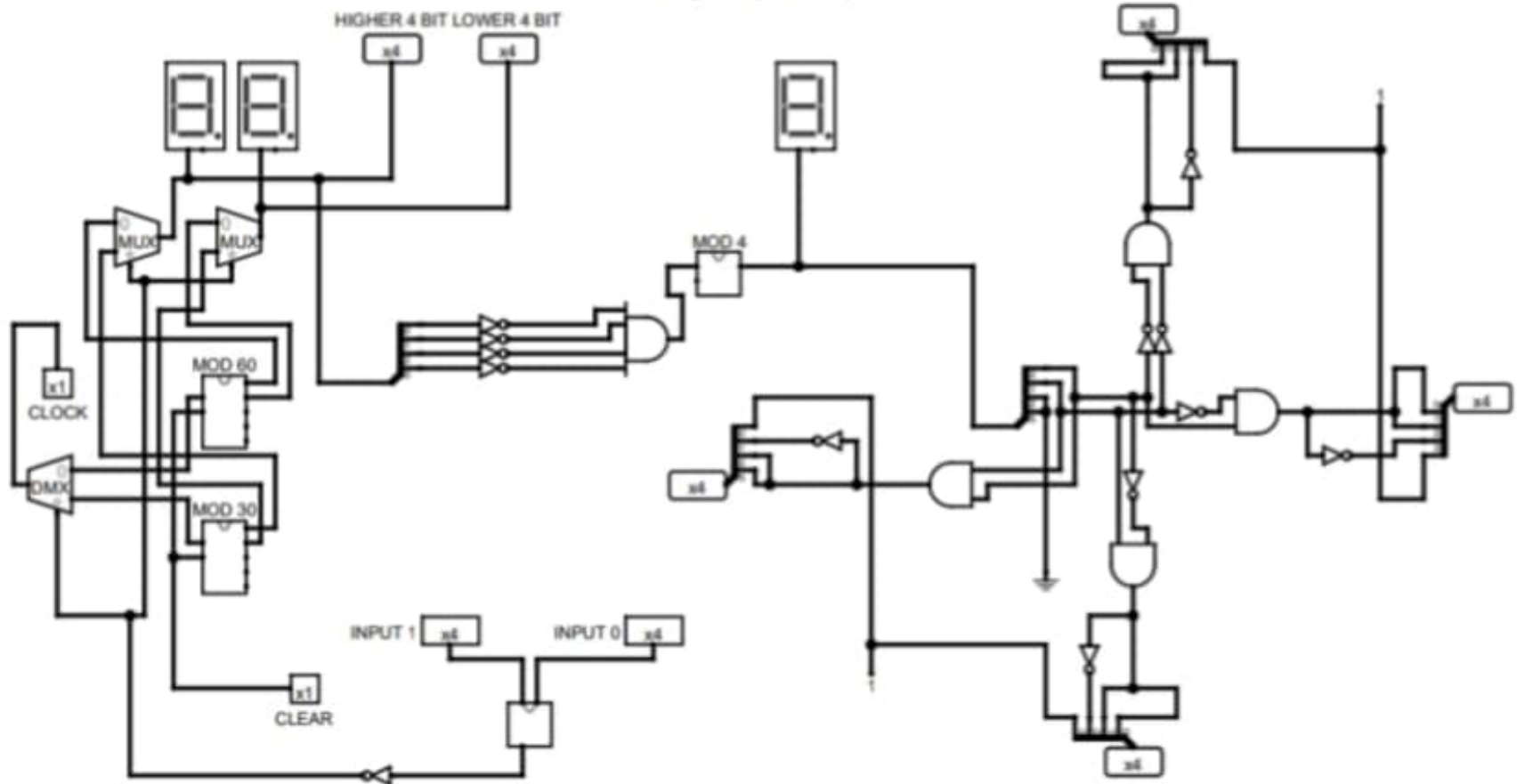


main (1 of 12)



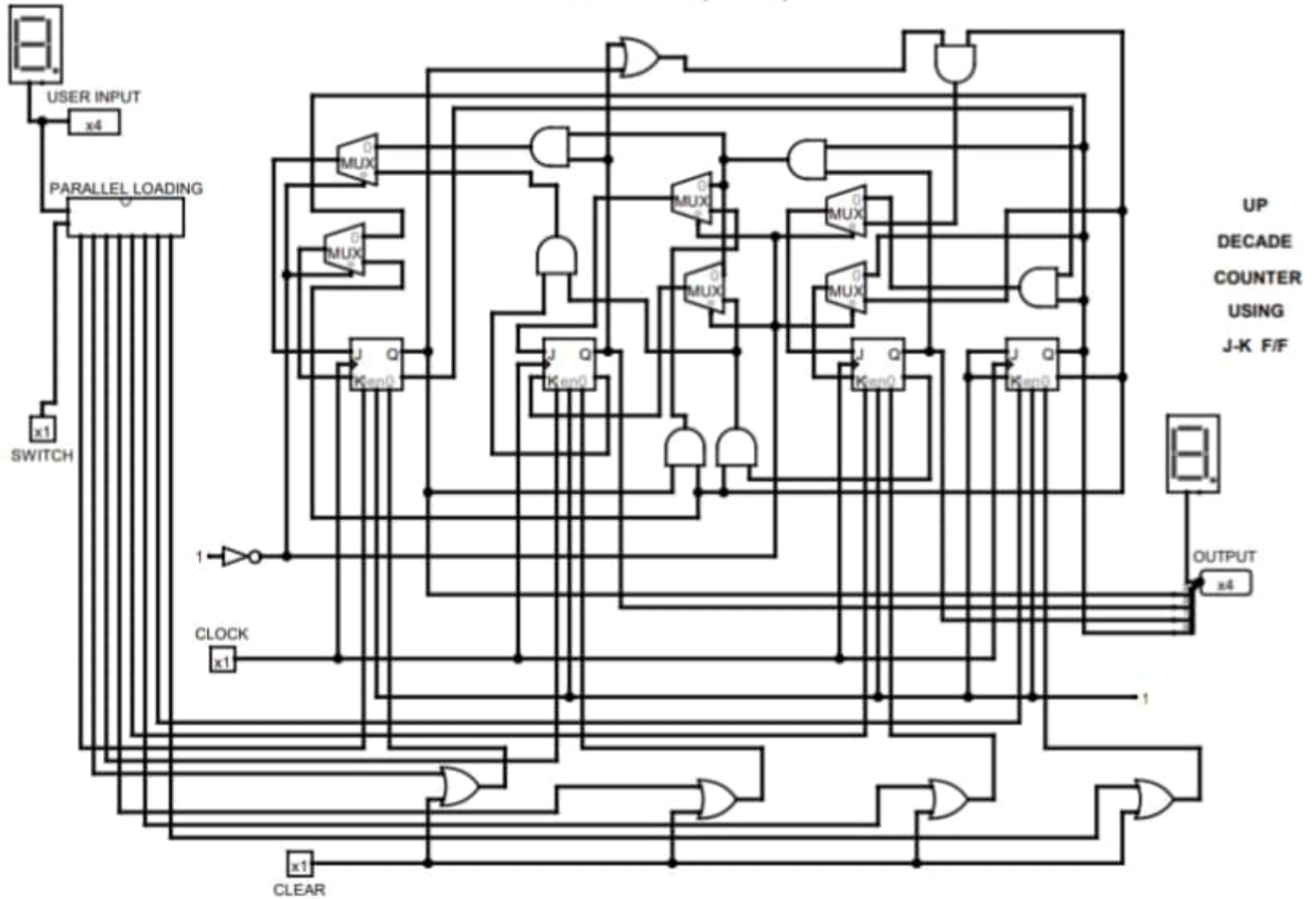


signal (2 of 12)





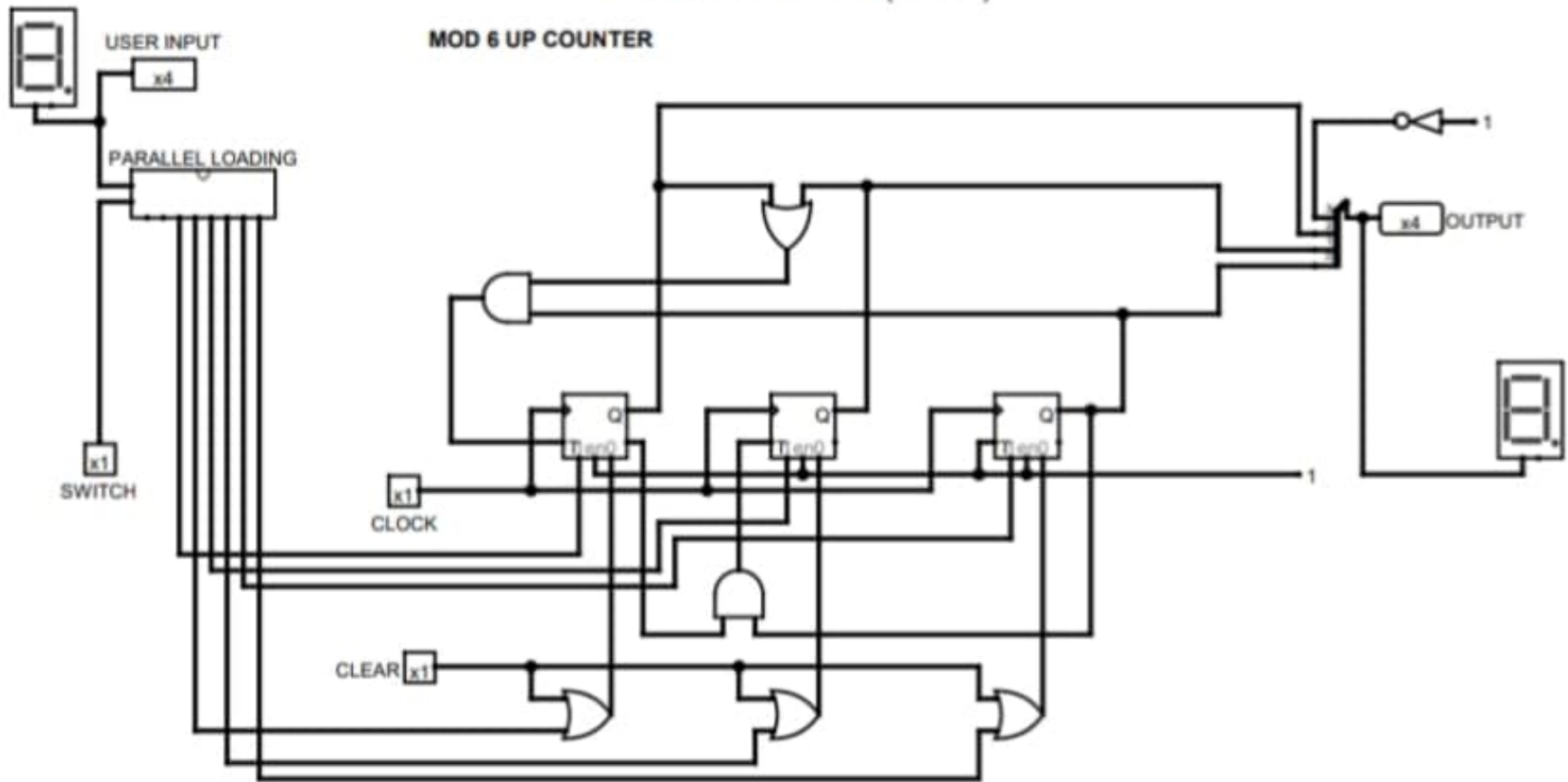
decade counter (3 of 12)





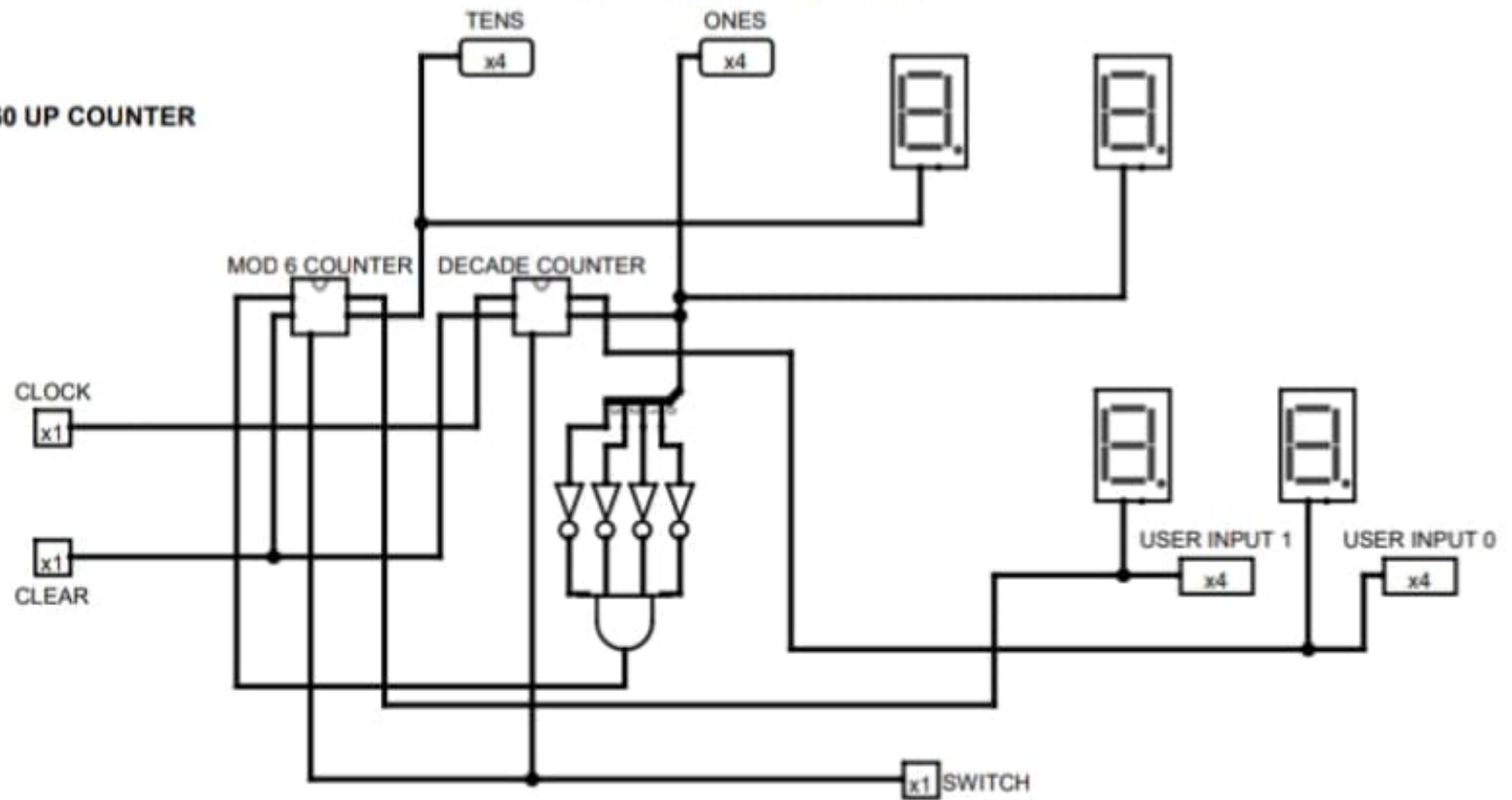
# MOD 6 UP COUNTER (4 of 12)

## MOD 6 UP COUNTER

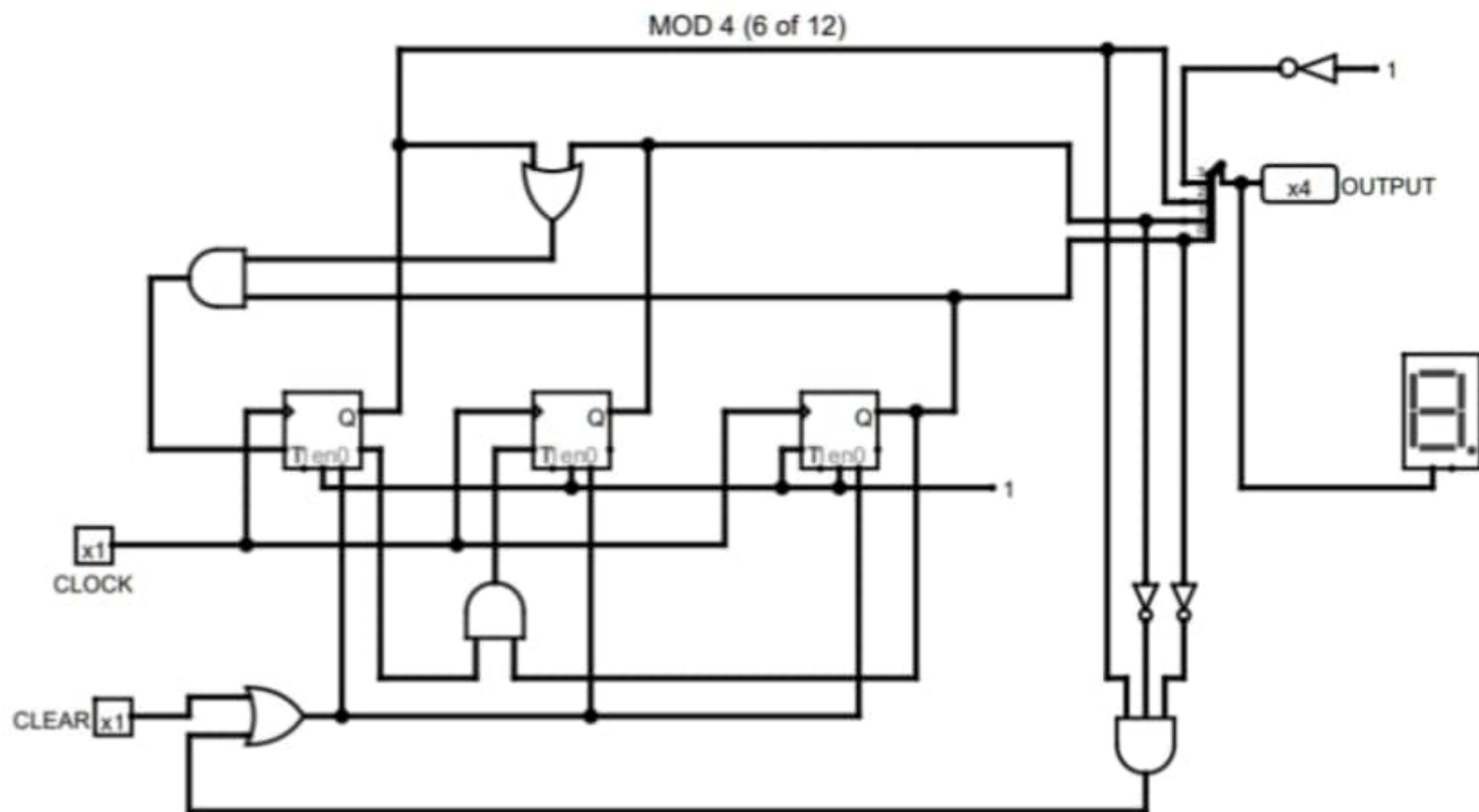


# MOD 60 UP COUNTER (5 of 12)

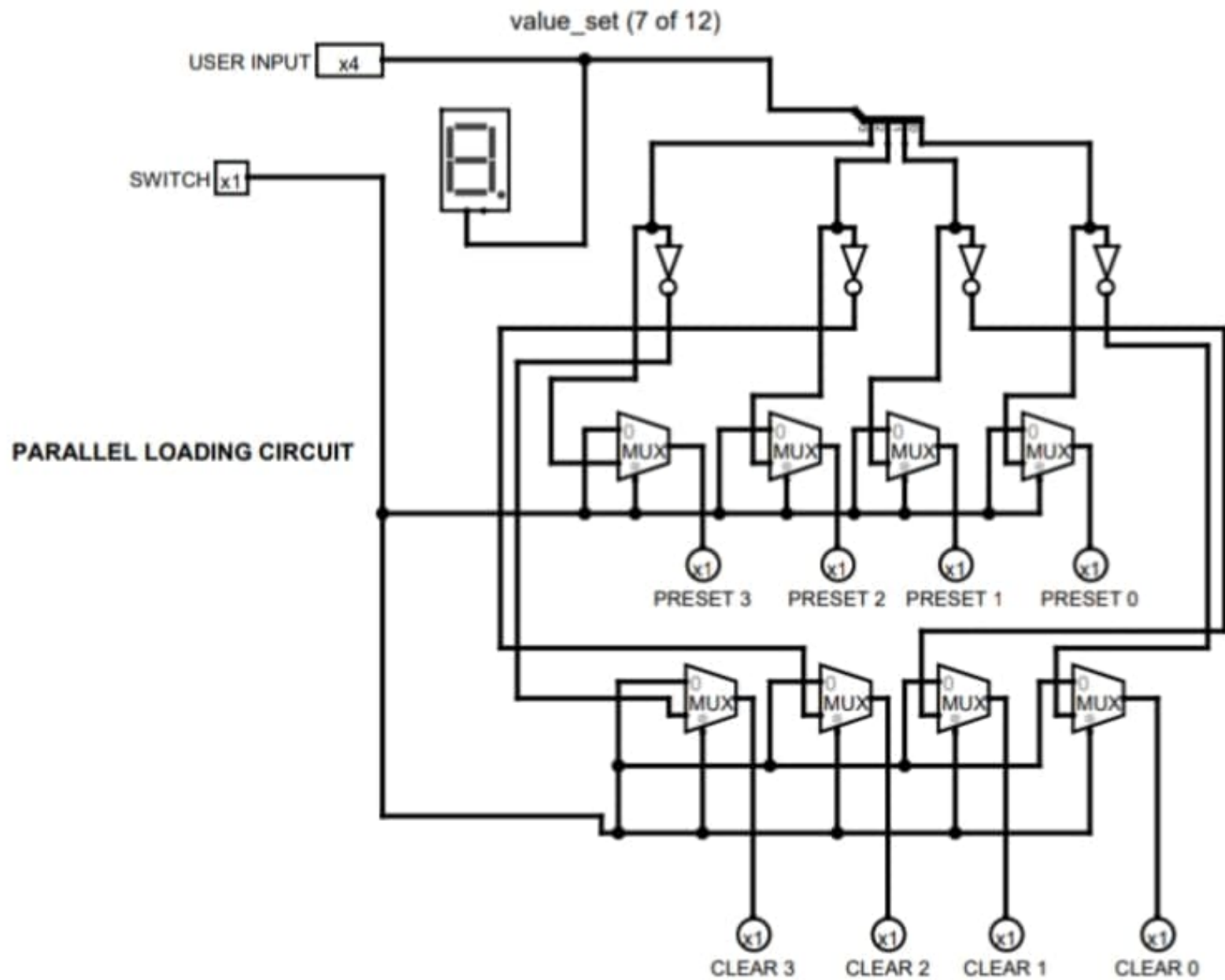
## MOD 60 UP COUNTER





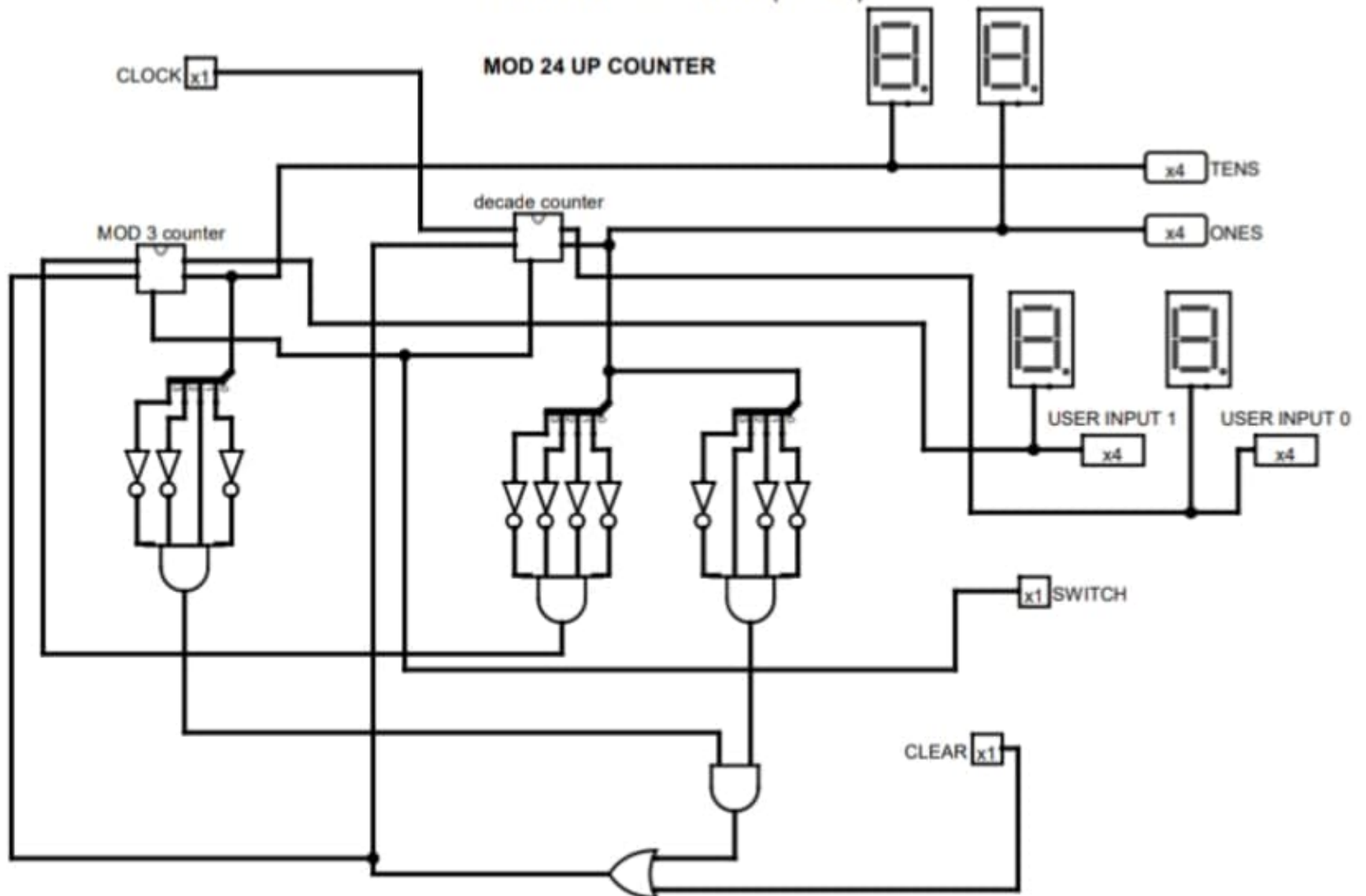


MOD 4 UP COUNTER

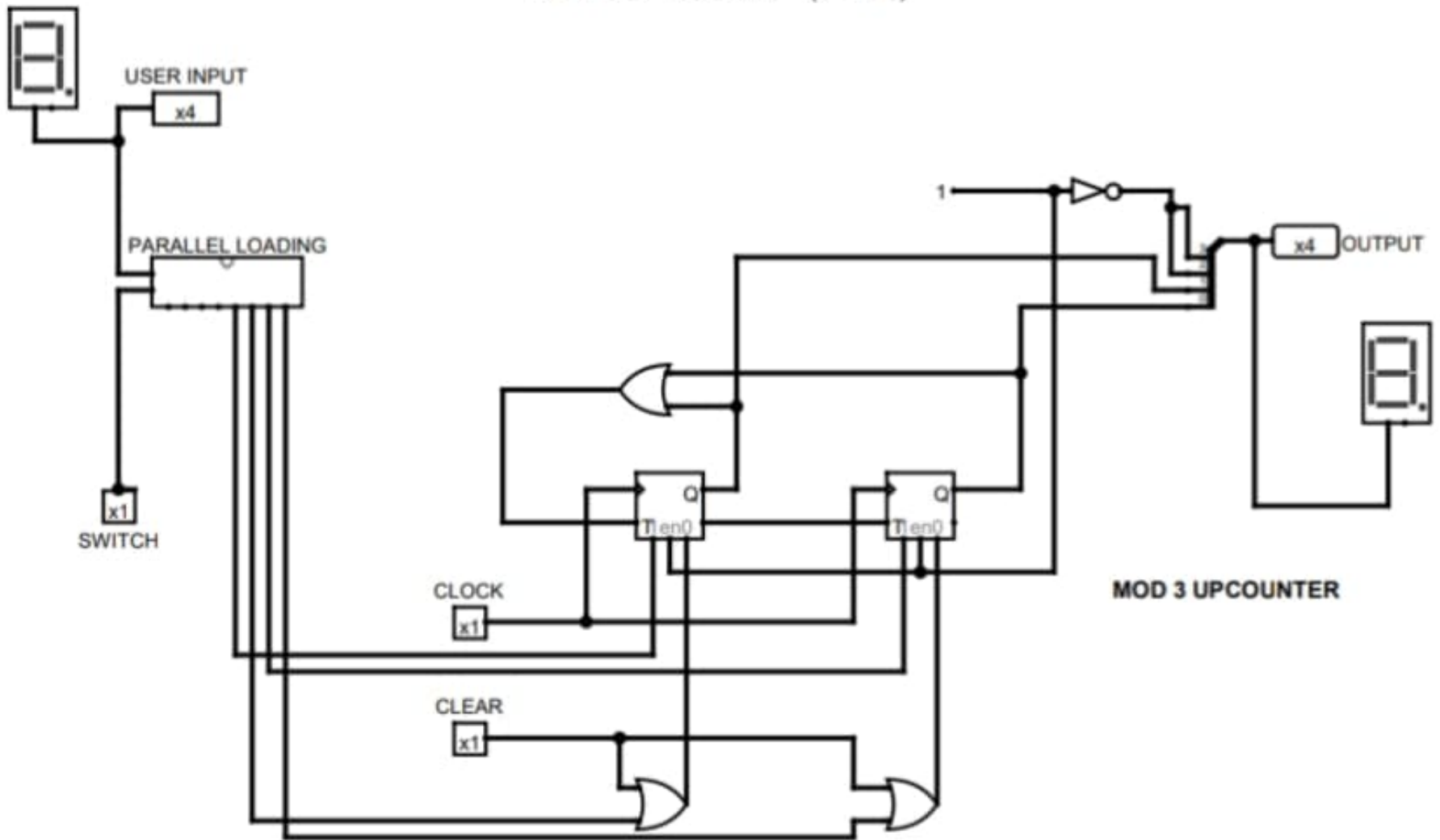




# MOD 24 UP COUNTER (8 of 12)



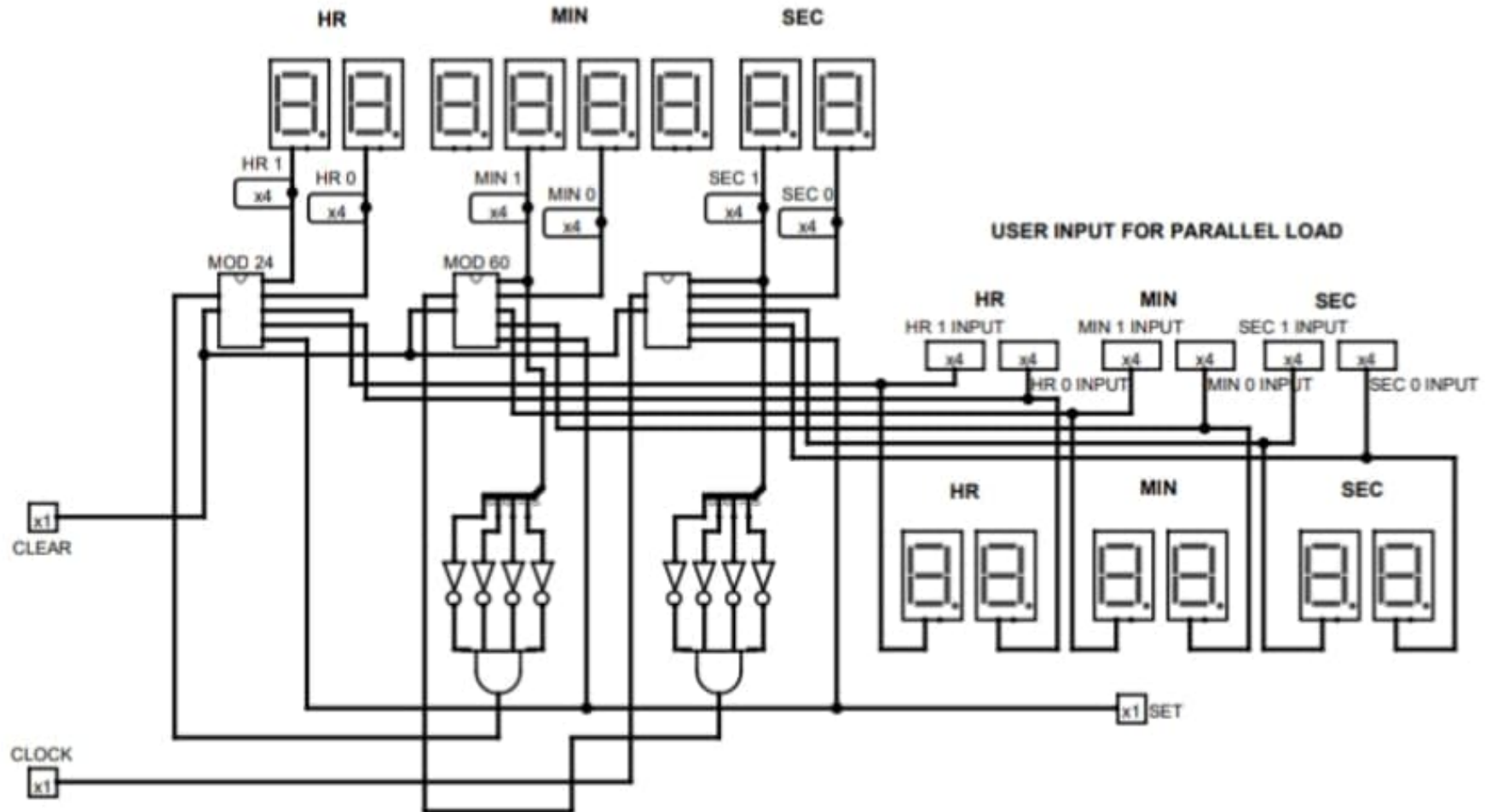
# MOD 3 UP COUNTER (9 of 12)





# 24 HR CLOCK (10 of 12)

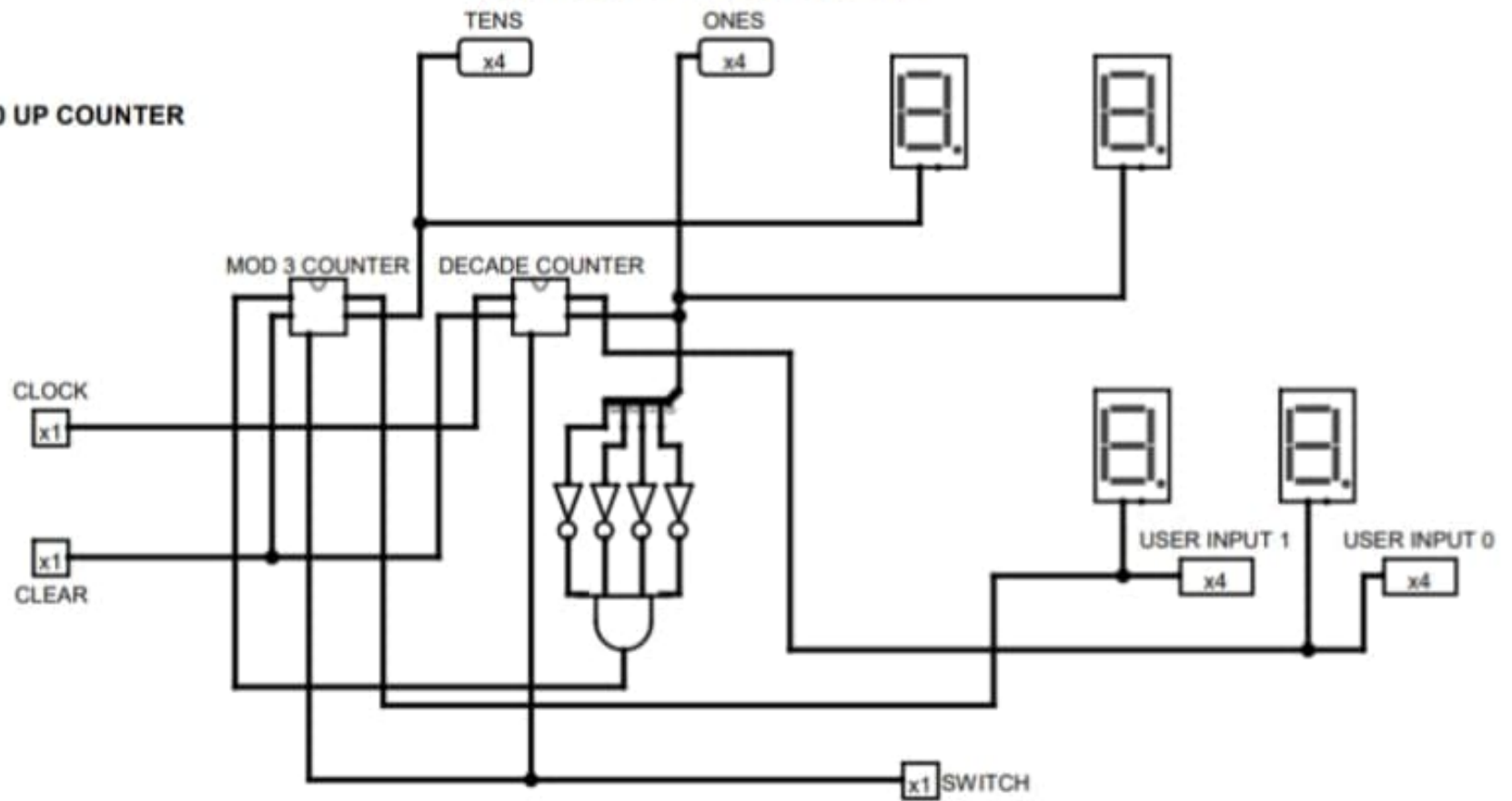
## 24 HR CLOCK



ONES

x4

4





TIME SELECTOR (12 of 12)

