Digital Clock Project

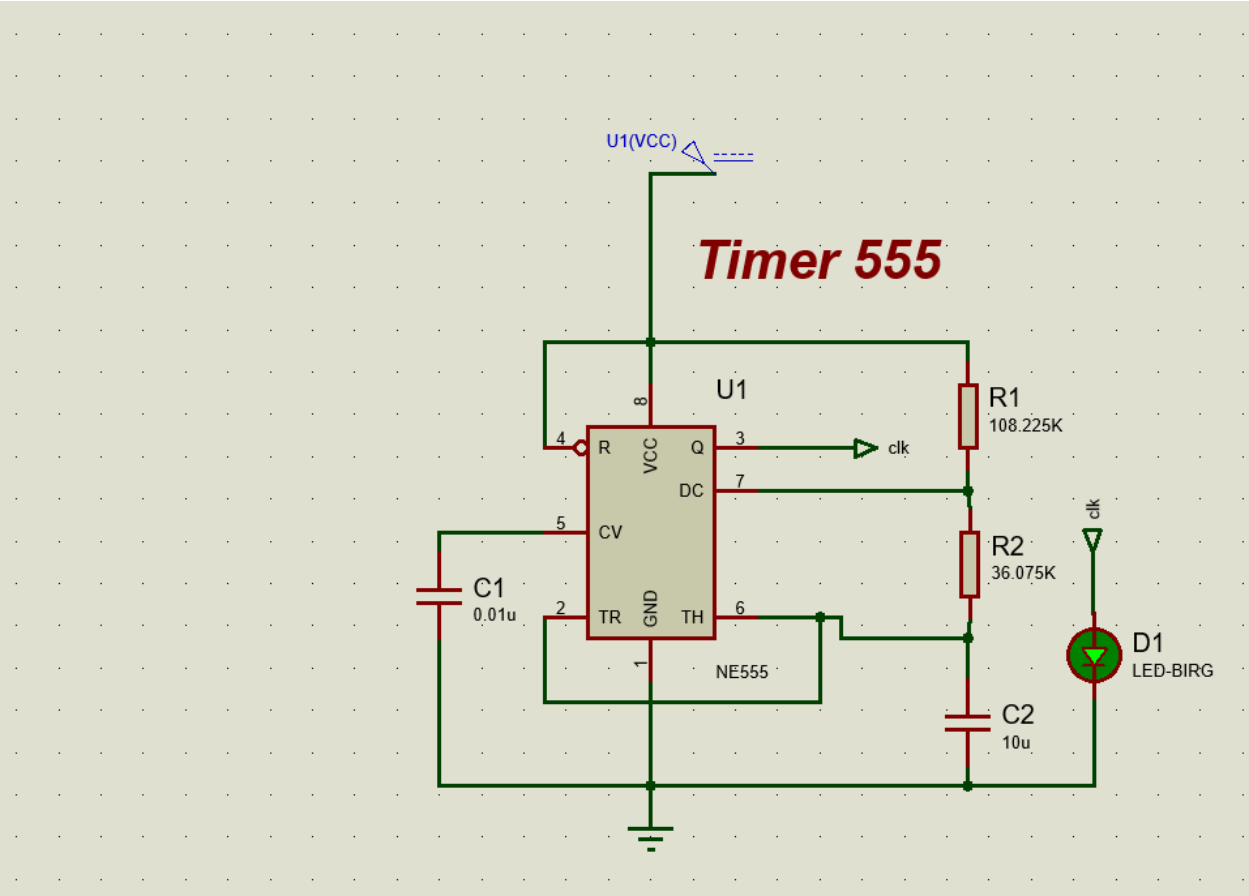
Problem statement: Creating a digital clock with an AM/PM display using logic gates and components involves several essential steps and connections.

Solution:

The clock Have Four things to discuss

1-clock,

- **I used Time 555 in a stable mode with the design shown.**
- **I used R1=108.225k and R2=36.075 to ensure that every cycle is 1hz.**



2-circuit for count seconds from 0 to 59

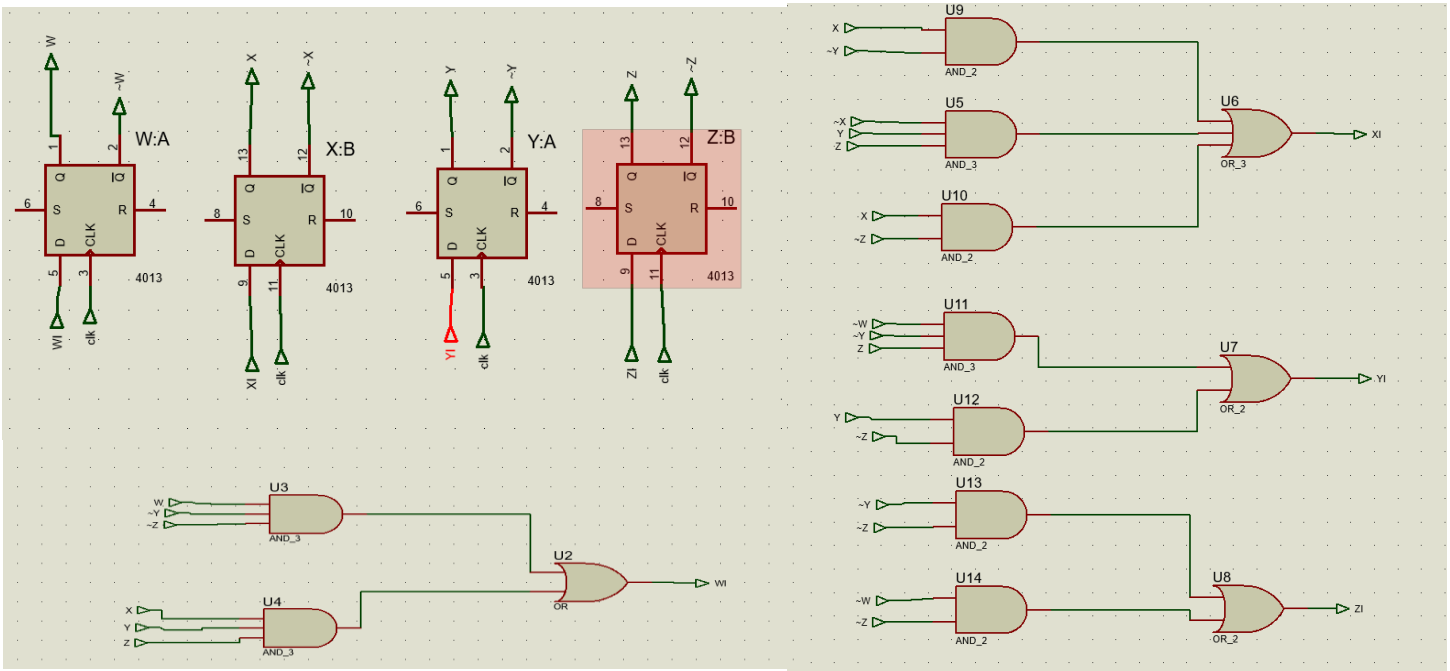
My solution is to make two counters one counting from 0 to 9 and the other count from 0 to 5 with the clock of tens depending on reaching 9 and flipping to zero.

In all counters, I used a D flip-flop

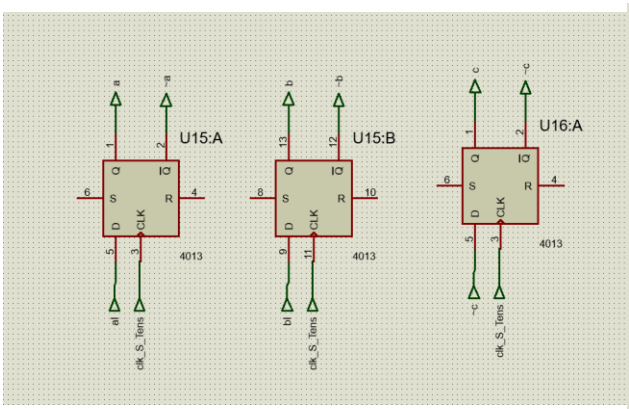
The first one is a counter from 0 to 9 and has the design as shown:

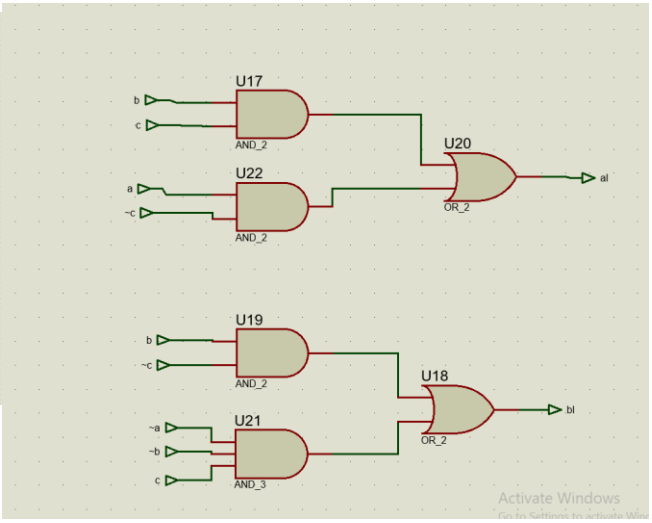
output (WXYZ) W is MSB and Z is LSB

The design is shown in the photo, I concluded the next state equation using the ps-ns table and extracted the equation from the Karno map



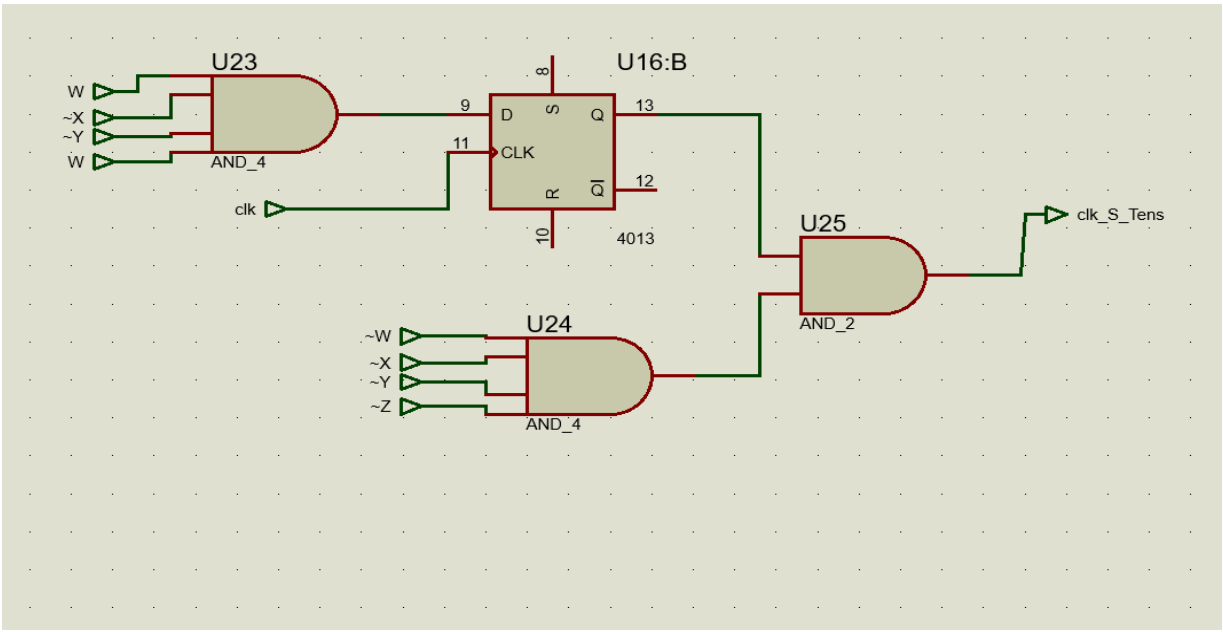
the second counter is from 0 to 5 and the design is shown.



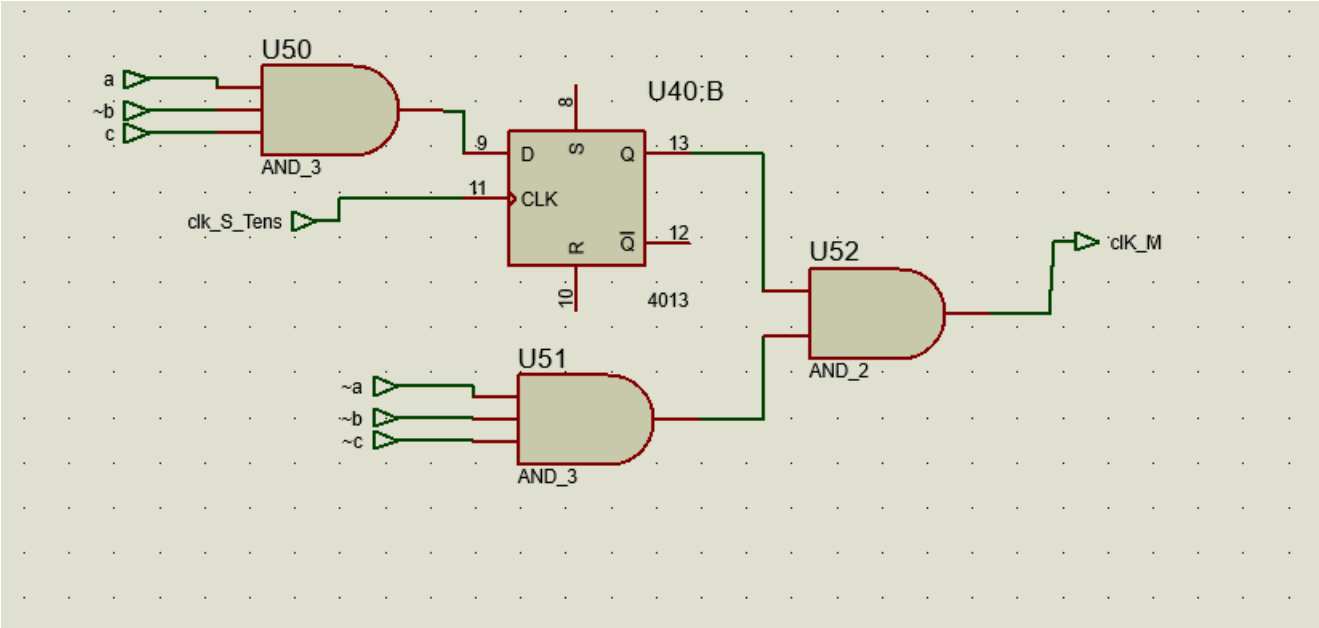


output (ABC) a is MSB and c lsb

I make the relation between the tens and one through this design that ensures that the one reaches 9 and flips to 0 to send the clock to seconds tens to increase by one



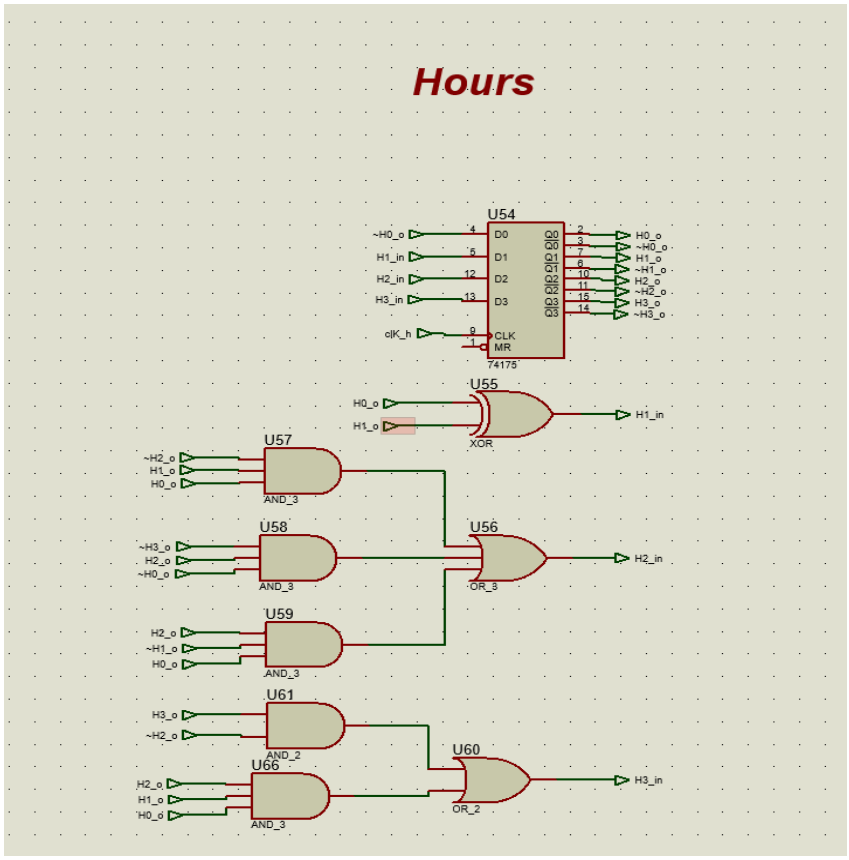
3- minutes: the circuit of minutes is the same as seconds one except the clock enters the minutes it depends on that seconds reach 59 and flip to zero to increase minutes by one as the shown design and tens of minutes clock like seconds but depend on minutes clock not seconds clock.



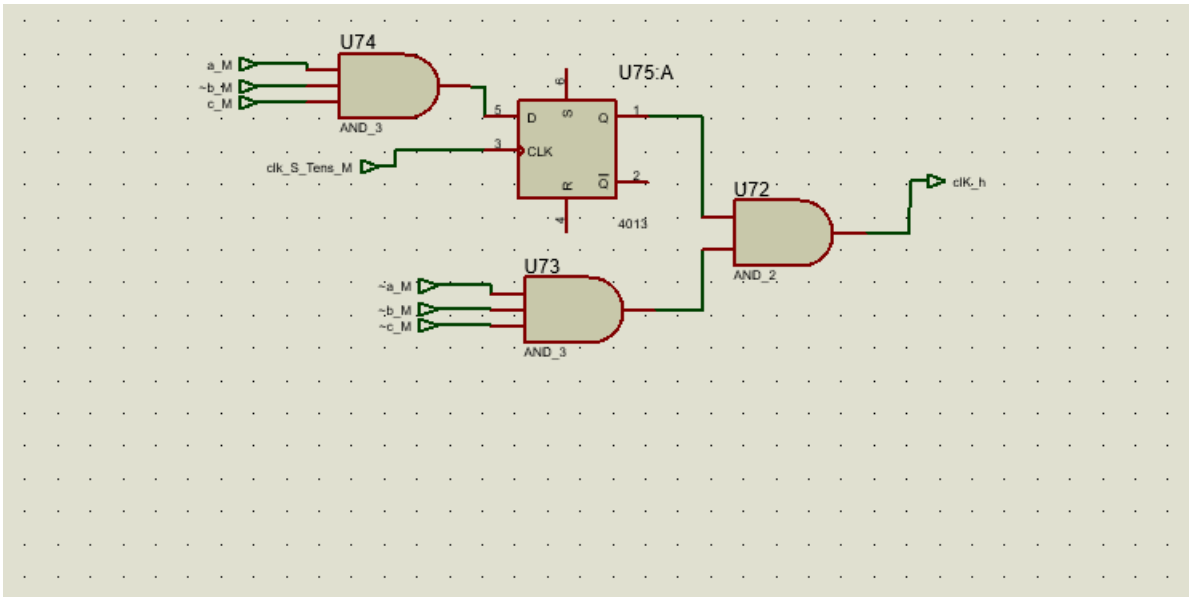
4- hours counter

The design of the hour counter depends on the counter count from 1 to 12 and the 4-bit output goes to the correction circuit to make one the four-bit and tens in one bit to make it easy to show it on two 7segmentst Also there is a circuit to check to flip from AM to PM and vice versa the final output of the circuit is (f5f4f3f2f1f0)

Design of hours counter :

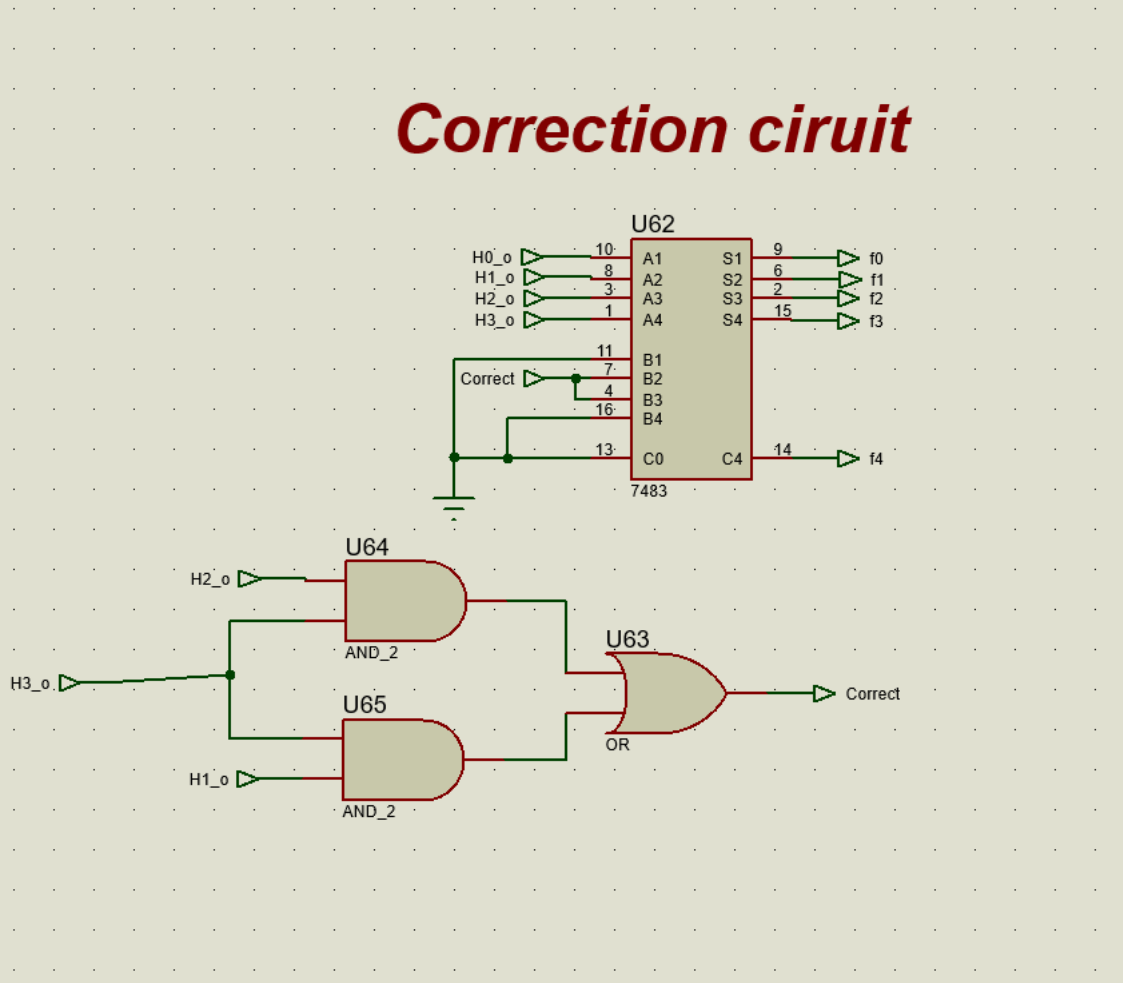


The design of the hours clock depends on the minutes clock :



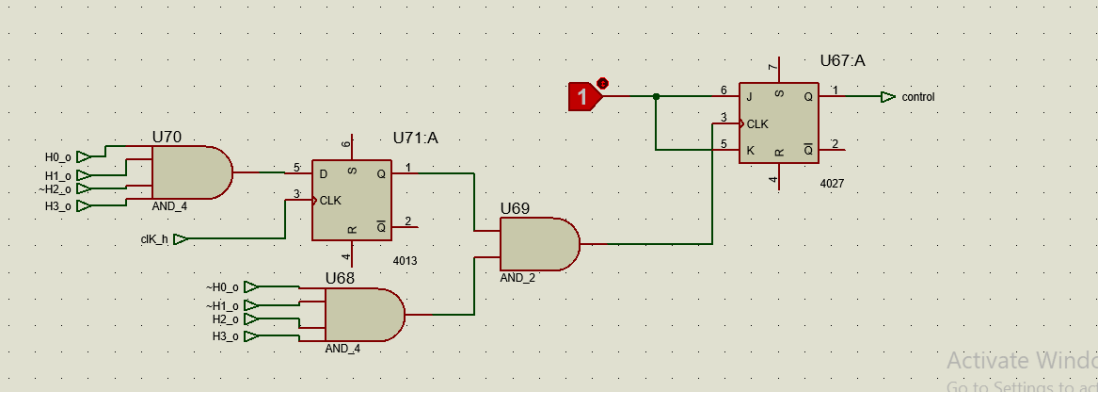
Design of correction circuit:

It depends that check if the number is greater than 9 to add 6 to the original 4-bit and put one in a separate 4 bit and tens in one bit



The final circuit is the circuit used to flip between Am and pm :

The circuit use JKflip flip in toggle situation and make toggle pulse when it comes to it a clock that ensure that hours reach 11:59 and flip to 12 to change between AM and PM



All of the outputs are put to 7-segment display :