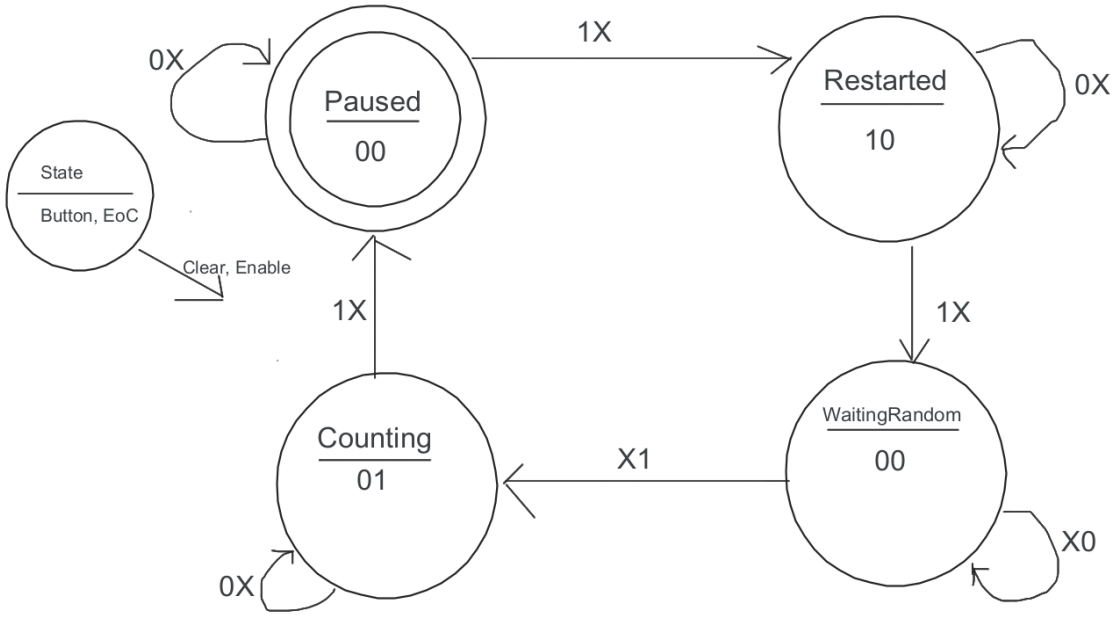
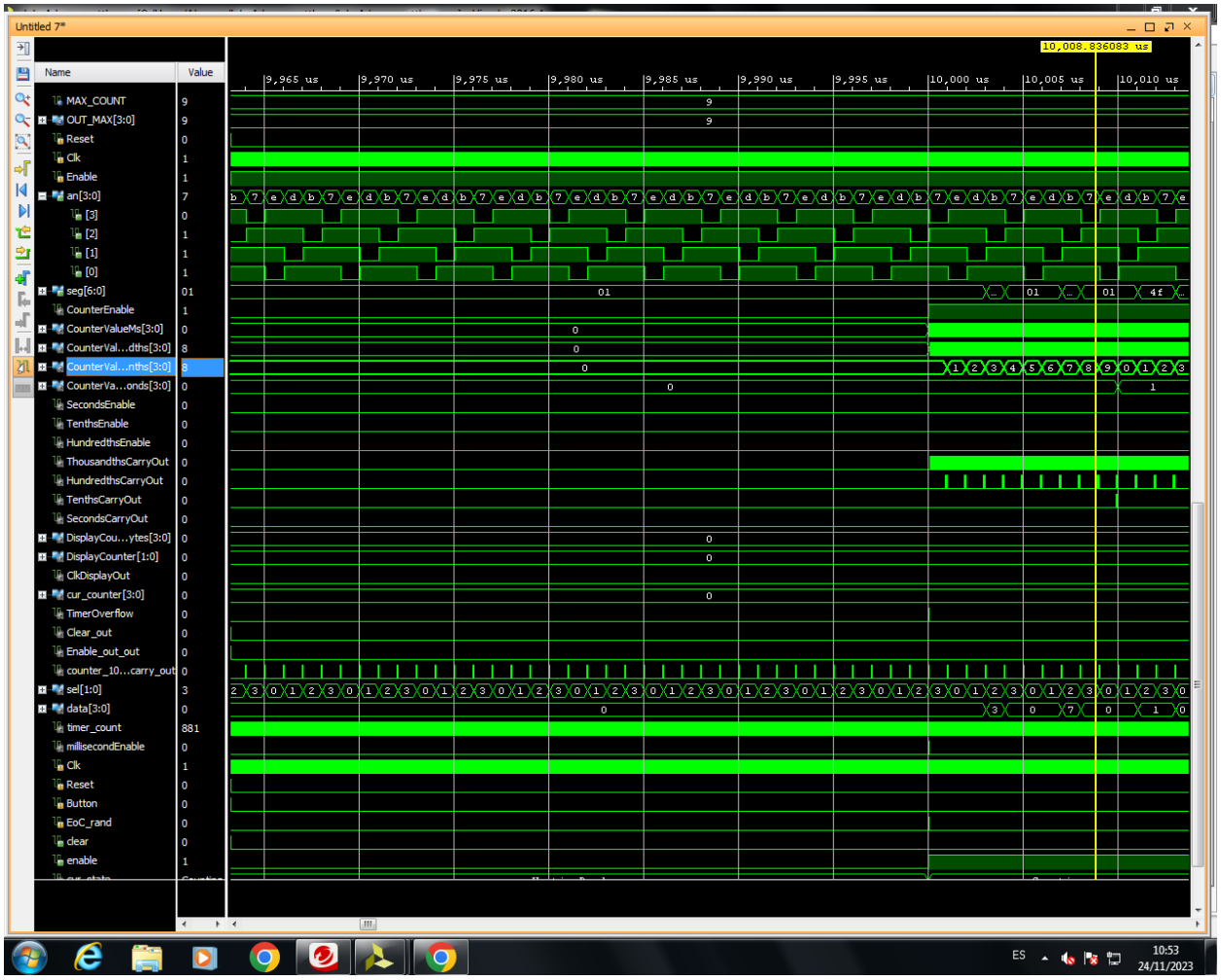
Finite State Machine



A Moore Diagram was used to represent FSM of the reaction timer system. Each state either enables a single input output of the FSM - the Clear or Enable to cause the display to clear or start counting, respectively. The inputs of the FSM are the button which is a direct input to the reaction timer system based on whether the user has pressed the button, and the EoC which is an output of an instance of a random timer to trigger the timer to start counting again.

Vivado Simulation



The above image shows the simulation of the reaction timer system, with the Clk, Reset, and Enable as the inputs of the system, and seg and an as the output. CounterValues show counts representing milliseconds, hundredths, tenths, and whole seconds which are decoded by another section. Sel shows the display that is selected and it changes every 10 ms as you can see in the image above it goes from 0-3 every 10 ms and then restarts. The counter that counts every 10 ms is Counter_10 and the output counter_10…carry_out signals when 10ms have gone. When the button is pressed the counter waits for Eoc_rand to output a 1 signal. The Eoc_rand output has to do with the one second timer that always counts so we can get a random start time. And as seen in the image the counter doesn't count when the button is pressed until the Eoc_rand outputs a 1.

When the random timer reaches its 1 second the counter starts counting and will continue to count until the button is pressed again.