

Group 45

Lab Final - FlipFlops, Displays, and Math!

In this lab, you combine everything you've learned over this semester into one functional design.

Rubric

Item	Description	Value
Summary Answers	Your writings about what you learned in this lab.	25%
Question 1	Your answers to the question	25%
Question 2	Your answers to the question	25%
Question 3	Your answers to the question	25%

Semester Summary

Over the course of this semester, we learned how to design, simulate, and implement digital circuits using Verilog. The labs helped us understand how to break down complex systems into smaller modules and then integrate them into working top-level design. We worked with different types of flip flops, counters, and finite state machines, and developed deepening knowledge and understanding of synchronous logic. Using the Basys 3 board and Vivado software, I gained practical experience in testing and debugging hardware designs, particularly in real-time display systems like 7-segment displays.

Lab Questions

1 - Which state machine design did you use for the scanner, and why?

We used a Moore state machine for the scanner design. This was chosen because the output in a Moore machine depends only on the current state, not on the input. This simplifies the timing and control of the 7-segment display scanning since each state corresponds to a fixed output.

that selects a specific digit. It made the logic cleaner and more predictable, especially for cycling through each display segment.

2 - What function is the selection logic in the decoder representing? Think of functional blocks.

The selected logic in the decoder represents a multiplexer function. It selects one of the four inputs, corresponding to each digit, based on the current state of the scanner and routes it to the 7-segment display. This allows the system to control which digit is shown at any given moment during the scanning cycle.

3 - What would happen if we did not divide down the clock feeding into the scanner?

If we did not divide down the clock feeding into the scanner, the display would scan through the digits far too quickly for the human eye to follow. This would result in flickering or invisible digits, making the output very unpredictable. Dividing the clock slows down the scanning to a human-precision refresh rate, which creates the illusion that all digits are lit simultaneously.

Code Submission

Upload a .zip of all your code or a public repository on GitHub.