

Lab 7

Designing Sequential Circuits

Objectives

- To get familiar with the Xilinx Schematic Editor Tool.
- To get familiar with the Xilinx Simulation Tool.
- To design and implement simple sequential logic circuits using the Schematic Editor and Simulator.
- To download your circuits onto the prototyping board and test it.

Laboratory Instructions

- Create a directory with your name on the C drive of your lab PC. Use this directory to create your project, store your results, bitstreams, etc. during the lab session.
- You can bring complete project files on a floppy disk and then use the **Copy Project** command from the Project Manager menu to copy it into the directory you created above.
- Alternatively, you can create a new project in your directory on the C drive and then copy your files to that new project directory. Remember to **Add** your .SCH file to the project.
- Perform functional simulation of your design and have it checked by your TA.
- Refer to [appendix A](#) for instructions on performing functional simulation.
- Refer to [appendix B](#) for instructions on how to download the circuit to the prototyping board.
- Test and demonstrate your circuit to your TA.
- Before you leave the lab please **remove** the files and directories that you created on your lab PC and leave our workplace clean and tidy.

Design Problems

Using the Xilinx Schematic Editor and Simulation Tools, design, simulate, and demonstrate on the prototyping board the following circuits:

1. A 4-bit register with parallel load.
2. A 10-bit binary up-counter that repeatedly counts the sequence 0000000000 to 1111111111. There should also be an overflow signal that is asserted for one clock cycle when the count reaches 1111111111. Output the count as binary numbers on ten LEDs. This counter circuit will be used in Lab 8.
3. A FSM sequential circuit that repeatedly counts the sequence 5, 2, 9, 1, 8. Output the count as binary numbers on four LEDs.
4. Connect the output of the sequential circuit from question 3 to a BCD to 7-segment decoder and a 7-segment LED. Output the count on the 7-segment LED.