

Lab 5

VHDL Behavioral Design

Objectives

- To get familiar with the Xilinx VHDL Editor Tool.
- To design and implement simple combinational logic circuits using VHDL at the Behavioral level.
- Simulate and test combinational circuits.
- To download your circuit onto the prototype board and test it.

Laboratory Instructions

- Use the Xilinx VHDL editor to create the VHDL source file(s) for your design before coming to the lab.
- Create a directory with your name on drive C of your lab PC. Use this directory to create your project, store your results, bitstreams, etc. during the lab session.
- You can bring a complete project (i.e. *project.pdf* file and *project* directory) 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 create a new project in your directory on the C drive and then copy your VHDL to that new project directory. Remember to *Add* your VHDL file to the project.
- Perform functional simulation of your design and have it checked by your TA.
- If the circuit works as expected, implement it using the prototyping board assigned to you.
- Use keyboard and LEDs available to apply input stimuli and observe the outputs. Disconnect the XSPORT (parallel port) when you apply input stimulus from the workbench.
- Test and demonstrate your circuit to your TA.

Design Problems

Using the Xilinx VHDL Editor, design, test and demonstrate the following circuits. Your circuits should be as small as possible.

1. Design an up/down counter using VHDL at the Behavioral level having the same functionality as the MC14029B IC.
2. Design a 7-segment decoder using VHDL at the Behavioral level that has a 4-bit, hexadecimal input ($I_3I_2I_1I_0$) and seven outputs ($S_0, S_1, S_2, S_3, S_4, S_5, S_6$) one for each segment of display. Your decoder should be designed to use the 7-segment display on your prototype board and should be capable of decoding all hexadecimal inputs.
3. Design a tri-state buffer using VHDL at the Behavioral level.