

Experiment 4

Consider again the combinational system (LED Driver) and the seven segment display (LED Display) from Experiment 3. The LED Driver takes as input, a four bit binary number (w, x, y, z with z the LSB) and produces active high output to drive the LED Display. For this experiment, if the input is between 0000 and 1001 inclusive then the LED Display's segments a through g are illuminated so as to display the decimal character that represents the input.² The LED Display's decimal point dp is NOT illuminated. See the testbench to determine the exact segment pattern for each decimal digit.

Task (T1): Perform problem analysis.

Deliverable (D1): Truth table for the LED Driver with one output column for each of a , b , c , d , e , f , g and dp .

Task (T2): Design a ROM to implement the LED Driver. Use a decoder and glue logic to implement the ROM. The glue logic must be composed of either **and** gates, **or** gates, **nand** gates or **nor** gates.

Deliverable (D2): A logic schematic of your solution.

Task (T3): Develop a structural Verilog model of the LED Driver. You are required to use the Verilog model for the TTL IC SN74154.

Deliverable (D3): Electronic submission of source code (**make submit**).

Task (T4): Map your Verilog model to an IC-based physical design using TTL components.

Deliverable (D4): IC logic schematic.

Task (T5): Specify IC interconnections.

²illuminated means the associated input signal is asserted (active high)

Deliverable (D5): One completed pin-out sheet (at least) for each IC employed in your physical design.

Task (T6): In the laboratory, wire-up your physical design, verify its behaviour and sign-off on the design/implementation.

Deliverable (D6): A physical realization of the combinational system that behaves to specification. Details of the circuit-verification process. Student signature indicating that the circuit behaves as specified.

Task (T7): Document any relevant results, explanations or comments.

Deliverable (D7): A section in your report entitled Results/Explanations/Comments in which you have detailed any relevant results, explanations or comments.

NOTES