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ECE 3140
Testbench Explanations HW4

For the testbench for the hw4p1 entity, I tested all switch outputs and tested pushbutton combinations that produced a unique result. Figure 1 displays the resulting testbench results and the first 300ns of the waveform. In Figure 2, the pushbutton combinations tested were 11, 01, and 10 as each input allowed for a unique output. The combination 00 was tested for one input because the design was made so that Key 0 for blanking the LED would override Key 1 for implementing the complement of the switch input. As outlined in HW4, this design was made from entity hw3p42 so the output for hw4p1 when both pushbuttons were released ("11" as outlined in the DE10-Lite User Manual) reflects the output expected from hw3p42's structural architecture.

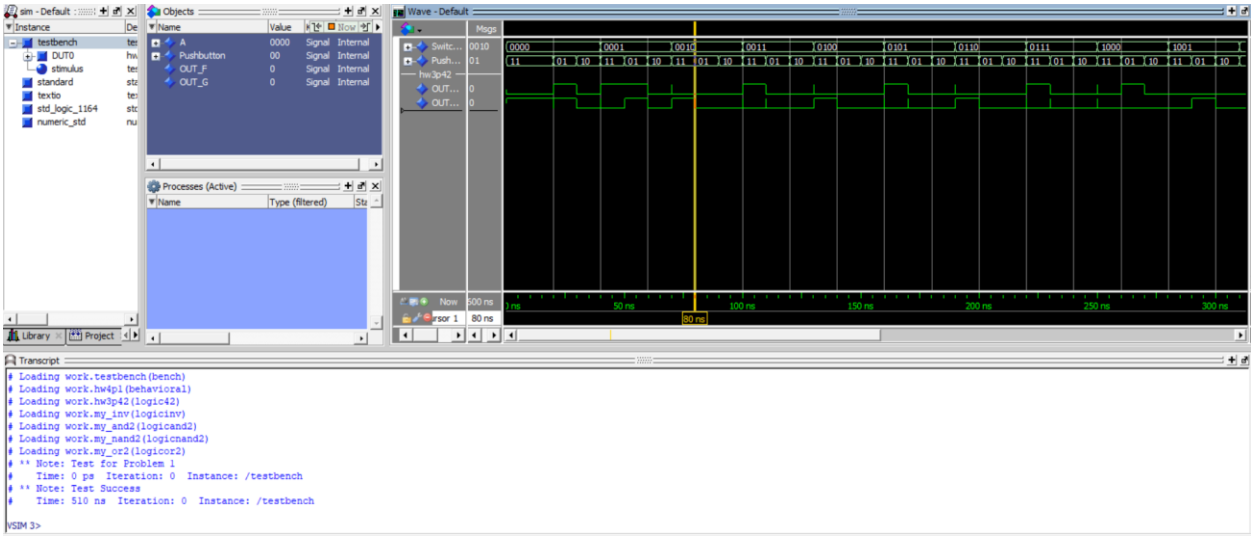

Figure 1: Resulting output waveform for the first 300ns of the testbench. Vector A was renamed to Switch, OUT_F renamed to OUT_F1, and OUT_G renamed to OUT_F2.

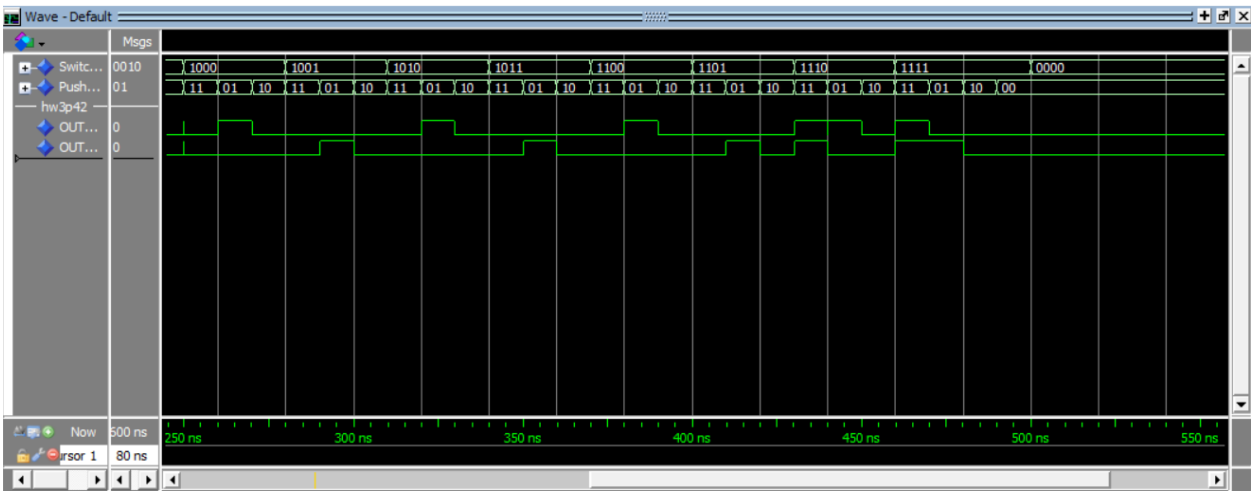

Figure 2: Second half of the testbench waveform for entity hw4p1.

For the implementation of the bin2seg7 entity all possible combinations of the inData vector were tested. All combinations between the dispHex, blanking, and dispPoint bits were tested inpendently for all outputs. The blanking bit was tested first and involved the use of flipping the

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dispPoint bits so that the blanking bit could override the dispPoint bit. The next bit to be tested within the process of testing all possible input vectors of inData was the dispPoint bit in order to show that flipping the bit when blanking is high displays the decimal point on the seven segment. Finally around test vectors of “1001” and “1010” were tested using the dispHex bit since the output could be different (at “1010”) or not (at “1001”) depending on the input vectors of inData. Blanking bit and dispPoint were also used in this process showing how these two bits can affect the output by flipping the dispHex bit. Figure 3 shows the resulting testbench. The entire design was made in reference to the DE10-Lite User Manual and derived from Figure 4 also posted on the homework assignment.

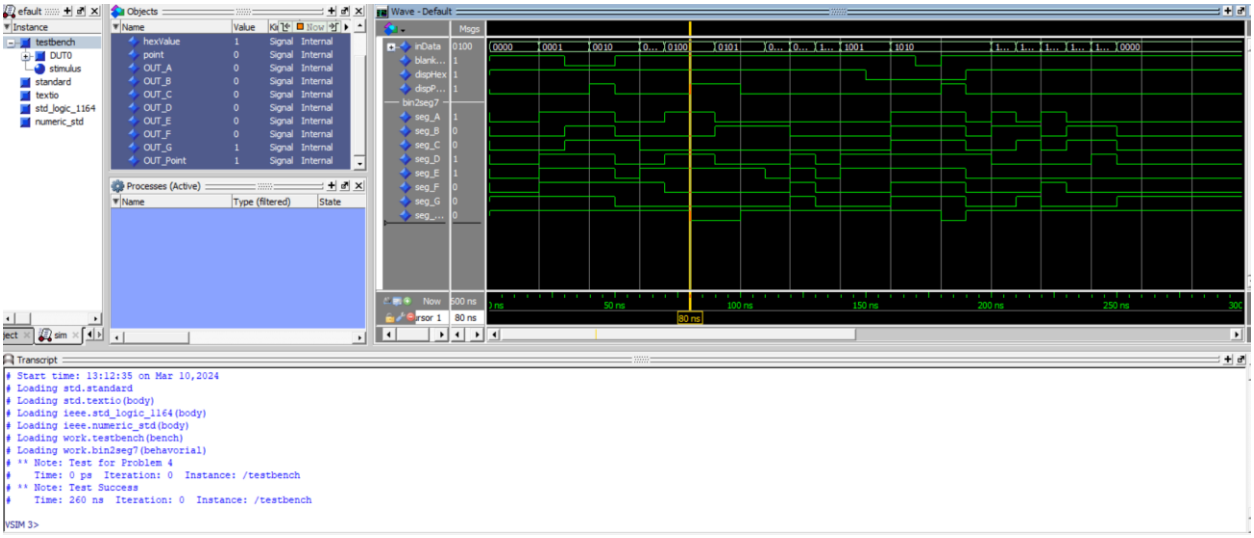

Figure 3: Resulting waveform and testbench for entity bin2seg7.

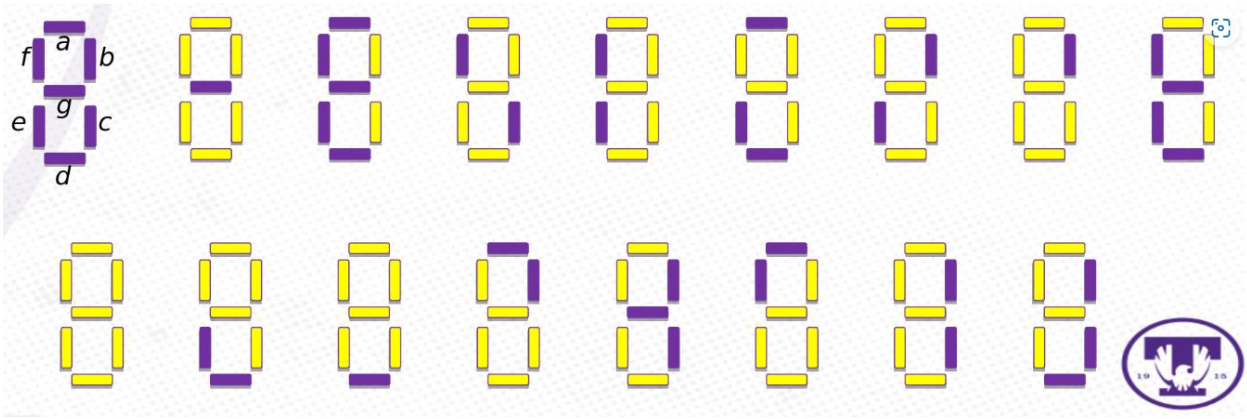

Figure 4: Seven Segment output reference. From Manual, logic 0 indicates high.