

Report for the implementation of a 7-segment display

Truth table for the 7-segment display

The following truth table was created using the appendix in the task description. The table consists of the input number and the non-inverted and inverted output as binary and hex representation.

As can be seen in the figure 1, every value in the table 1 is corresponding to the non-inverted and inverted output of the testbench. Therefore, the specification is met.

| bin_i, hex | hex_o, binary (Segments: GFEDCBA) | hex_o, hex | hexn_o, binary (Segments: GFEDCBA) | hexn_o, hex |
|---------------|--------------------------------------|---------------|---------------------------------------|----------------|
| 0 | 0111111 | 3F | 1000000 | 40 |
| 1 | 0000110 | 06 | 1111001 | 79 |
| 2 | 1011011 | 5B | 0100100 | 24 |
| 3 | 1001111 | 4F | 0110000 | 30 |
| 4 | 1100110 | 66 | 0011001 | 19 |
| 5 | 1101101 | 6D | 0010010 | 12 |
| 6 | 1111101 | 7D | 0000010 | 02 |
| 7 | 0000111 | 07 | 1111000 | 78 |
| 8 | 1111111 | 7F | 0000000 | 00 |
| 9 | 1101111 | 6F | 0010000 | 10 |
| A | 1110111 | 77 | 0001000 | 08 |
| B | 1111100 | 7C | 0000011 | 03 |
| C | 0111001 | 39 | 1000110 | 46 |
| D | 1011110 | 5E | 0100001 | 21 |
| E | 1111001 | 79 | 0000110 | 06 |
| F | 1110001 | 71 | 0001110 | 0E |

Table 1: Truth table

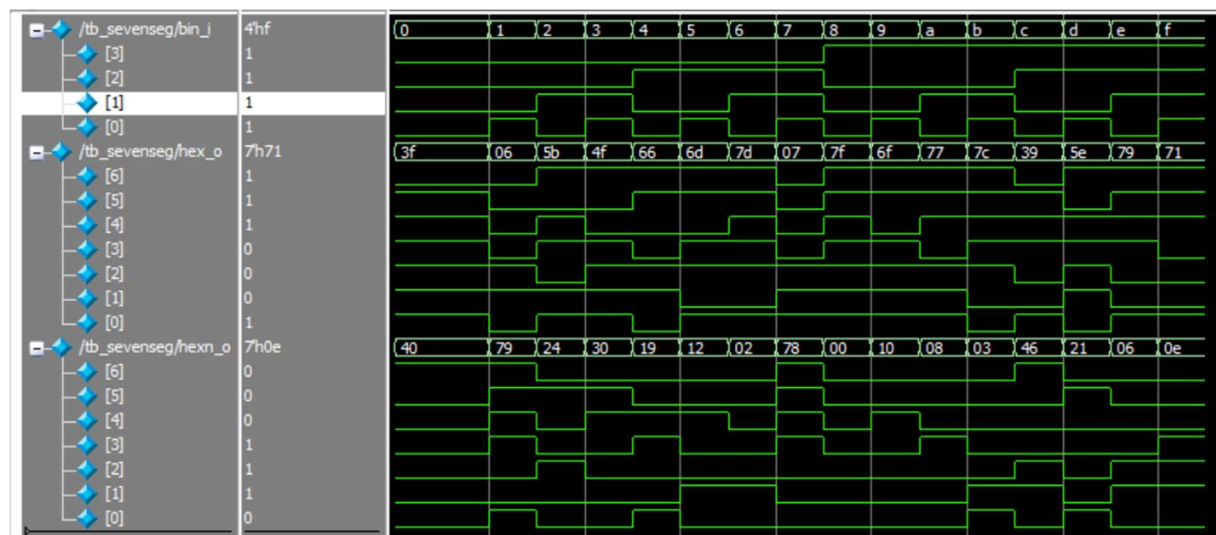


Figure 1: Outputs in respect of the inputs

Debug messages

For debugging purposes, a function was created to display the messages. All relevant data is copied to the function and then displayed. The output for every input is as follows:

Displayed Value: 2

Binary input: 0010

```
# LED Markings:          GFEDCBA
# State Output (non-inverted): 1011011
# State Output (inverted):   0100100
# -----
```

Implementation method

For the implementation a case statement following the truth table was used to control every output. The instruction is easy to read, and every bit represents one LED of the screen. So, every LED can be read without further decoding.

It was considered to make a truth table for every single LED and implement the logic that way. Here is an example for the segments A and B, non-inverted:

Segment A is active except the input has a value of 1, 4, B, D.

Segment B is active except the input has a value of 5, 6, B, C, E, F.

This implementation is not as self-explaining as the chosen implementation. This logic is not easy to read and interpret. Therefore, the chosen implementation method was used.