# 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

Ein Bild, das Screenshot, Text, Multimedia-Software, Grafiksoftware enthält.

Automatisch generierte Beschreibung

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 simultaneously. The instruction is easy to read, and every bit represents one LED on the screen. So, every LED can be basically read without further decoding.

For exercising purposes, a second way for the implementation was also tested. In this second program, every line assigns the state to one LED segment, not the whole output. Here is an example for this method:

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.

The negated logic was used because there are more zeroes than ones in every row of the truth table. This second implementation is not as self-explaining as the chosen implementation. This logic is not as easy to read and interpret. Therefore, the chosen implementation method was kept.