Challenge Problem 1

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Download all latex-tikz codes from

https://github.com/Bharat437/EE5803−FPGA−LAB/tree/main/Challenge−1

1 Problem

Obtain and implement an algorithm to convert any truth table to NAND logic.

2 Algorithm

1. Take the min terms for which the output in truth table will be 1.
2. According to those min terms give inputs to the first level of NAND gates.
3. All the outputs of first level of NAND gates are passed through another NAND gate and obtain required output.

3 Explanation

For example the given truth table is as below

X	Y	Z	G(X,Y,Z)
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	1

Table 1: Given Truth table

From truth table, the min terms for which $G = 1$ are 2,4,5,7.
Now we can draw the logic circuit using NAND gates as below.

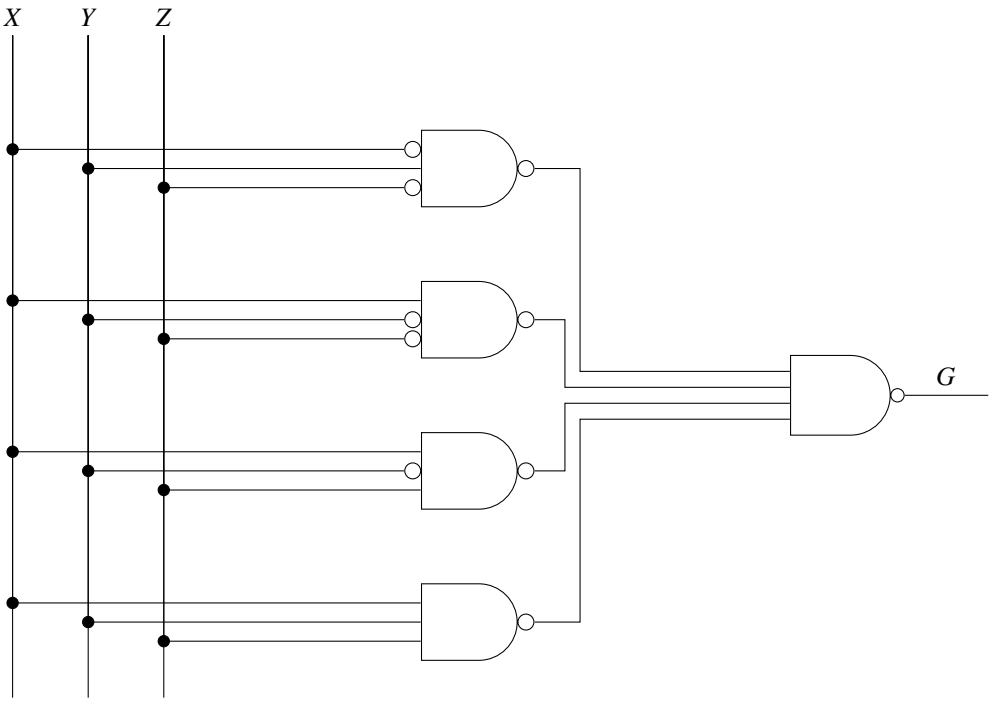

Figure 1: Logic Circuit using NAND gates

The same using AND-OR logic i.e. SOP form is drawn as shown below.

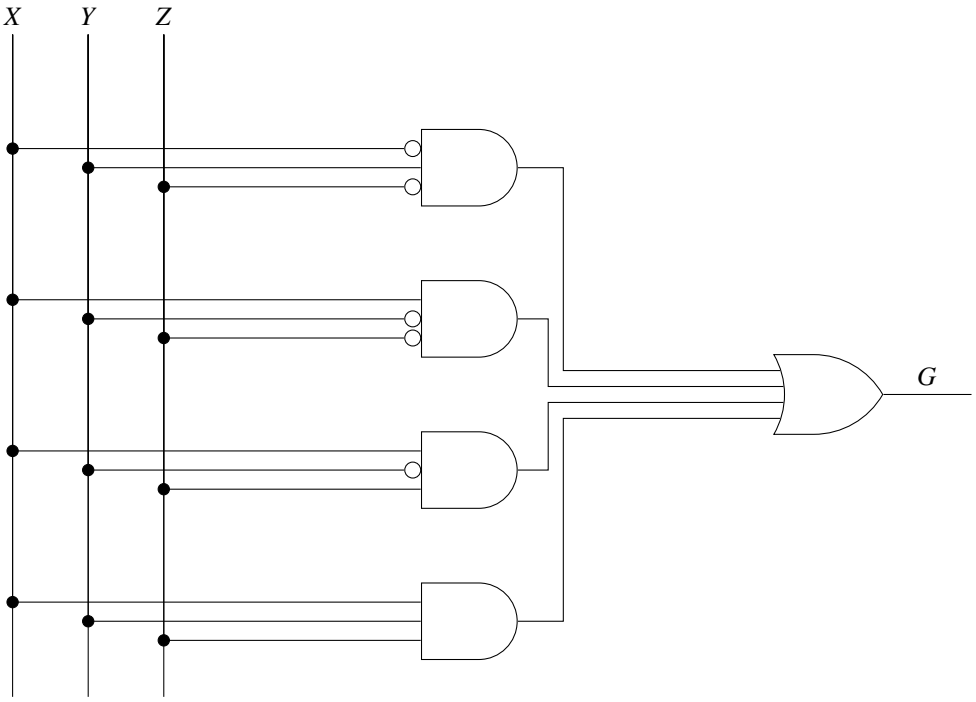

Figure 2: Logic Circuit in SOP form

4 Conclusion

From the above circuit figures 1 and 2, we can say that SOP form i.e. AND-OR logic is equivalent to NAND-NAND logic. The Verification is also done using a c code.