Assignment 1

AVVARU BHARAT

Download all latex-tikz codes from

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

1 Problem

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

2 Algorithm

1. Obtain K-Map for given truth table.
2. From K-Map obtain NAND Logic instead of SOP form.

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

Now the K-Map for given truth table 1 is as below.

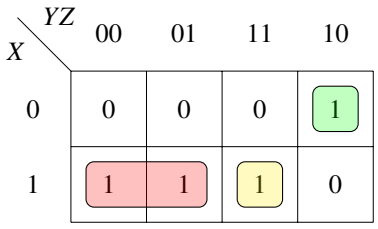

Figure 1: K-Map for given truth table

Now the NAND logic from K-Map in figure 1 is as follows.

$$G = \overline{\left(\overline{X.\overline{Y}}\right).\left(\overline{X.Y.Z}\right).\left(\overline{\overline{X}.Y.\overline{Z}}\right)} \tag{3.0.1}$$

Now we will draw logic circuit according to the above expression.

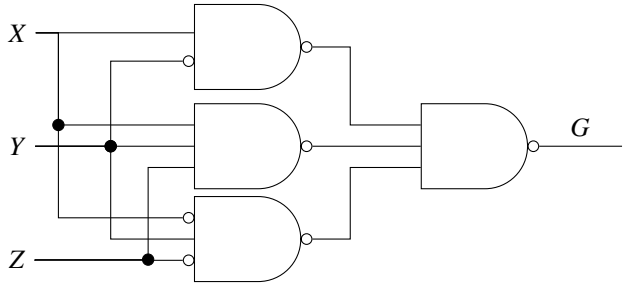

Figure 2: Logic circuit using NAND gate for given truth table

Whereas SOP form from K-Map in figure 1 is given as below.

$$G = X.\overline{Y} + X.Y.Z + \overline{X}.Y.\overline{Z} \tag{3.0.2}$$

Now the logic circuit for above SOP form expression is as given below.

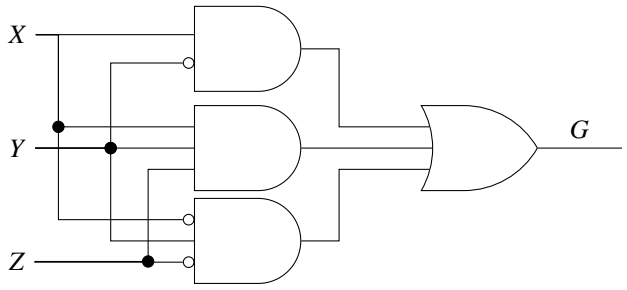

Figure 3: Logic circuit from SOP form

4 Conclusion

From the above circuit figures 2 and 3, 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.