FPGA ASSIGNMENT

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FWC22137 IITH - Future Wireless Communications

Contents

1 Problem

(GATE2021-QP-IN)
Q.31 A Boolean function F of three X, Y and Z is given as $F(X,Y,Z) = (X'+Y+Z)\cdot(X+Y'+Z')\cdot(X'Y+Z')\cdot(X'Y'Z'+X'YZ'+XYZ')$. Which one of the following is true?

(a) $F(X,Y,Z) = (X+Y+Z')\cdot(X'+Y'+Z')$

(b) $F(X,Y,Z) = (X'+Y)\cdot(X+Y'+Z')$

(c) $F(X,Y,Z) = X'Z'+YZ'$

(d) $F(X,Y,Z) = X'Y'Z+XYZ$

2 Components

Components	Value	Quantity
Breadboard		1
Jumper Wires		6
Resistor	1KΩ	1
LED		1
Vaman		1

Table 1: Components

3 Implementation

3.1 Boolean Expression

The above equation can be reduced as :
$\rightarrow (X'+Y+Z)\cdot(X'+Y+Z')\cdot(X+Y'+Z')\cdot(X'Y'Z'+X'YZ'+XYZ')$
$\rightarrow (X'+Y)\cdot(X+Y'+Z')\cdot(X'Z'+XYZ')$

$\rightarrow (X' + Y) \cdot (X + Y' + Z') \cdot (X'Z' + YZ')$
$\rightarrow (X'Y' + X'Z' + YX + YZ') \cdot (X'Z' + YZ')$
$\rightarrow X'Y'Z' + X'Z' + X'YZ' + XYZ' + X'YZ' + YZ'$
$\rightarrow X'Z' + YZ' + YZ'$
$\rightarrow X'Z' + YZ'$
Therefore, the Boolean function $F(X, Y, Z) = (X' + Y) \cdot Z'$

3.2 Truth Table

X	Y	Z	F
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	0

Table 2: Truth Table

4 Hardware

Make the connections between the Breadboard and Vaman borad as follows:

1. Connect the ground pin(GND) of the Vaman board to the Breadboard's ground rail(-).
2. Connect the 5V pin of Vaman board to the beadboard's Positive rail (+).
3. Connect the Output pin (Pin 13) of vaman board to one end of resistor on the breadboard and connect LED to the other end of the resistor.
4. Give the Power supply to the Vaman board.
5. Now Connect the Input pins (Pin 2,3,4) of vaman board to the breadboard's Positive and Negative rails and observe the output.
6. Change the connections according to the truth table for different outputs.

5 Software

Now write the code which is available in the below path and upload it to the Vaman.

https://github.com/pavannagasuryach/cbse-12th-optimization/tree/main/IDE/FPGA

6 Conclusion

Hence, We have executed the above code using Vaman according to the given Problem.