VERIFICATION OF BOOLEAN IDENTITIES

MADHU LATHA ADDANKI(FWC22129)

2 June 2023

Contents

1 PROBLEM

(GATE CS-2018) Q.4 Let $\oplus$ and $\odot$ denote the Exclusive OR and Exclusive NOR operations,respectively. Which one of the following is NOT CORRECT?

(A) $(P \oplus Q)' = (P \odot Q)$

(B) $(P' \oplus Q) = (P \odot Q)$

(C) $(P' \oplus Q') = (P \oplus Q)$

(D) $(P \oplus P') \oplus Q = (P \odot P') \odot Q'$

2 COMPONENTS

Component	Value	Quantity
Arduino	UNO	1
Bread board	-	1
Jumper wires	M-M	8
LED	-	2
Resistor	150ohms	2

3 INTRODUCTION

An "identity" is merely a relationship that is always true, regardless of the values that any variables involved might take on; similar to laws or properties. Many of these can be analogous to normal multiplication and addition, particularly when the symbols 0,1 are used for FALSE, TRUE.

4 TRUTH TABLE

The Truth Table for the above identities is as follows:

(A) $(P \oplus Q)' = (P \odot Q)$
where $Y1 = (P \oplus Q)', Y2 = (P \odot Q)$

P	Q	Y1	Y2
0	0	1	1
0	1	0	0
1	0	0	0
1	1	1	1

Table 1

(B) $(P' \oplus Q) = (P \odot Q)$
where $Y1 = (P' \oplus Q), Y2 = (P \odot Q)$

P	Q	Y1	Y2
0	0	1	1
0	1	0	0
1	0	0	0
1	1	1	1

Table 2

(C) $(P' \oplus Q') = (P \oplus Q)$
where $Y1 = (P' \oplus Q'), Y2 = (P \oplus Q)$

P	Q	Y1	Y2
0	0	0	0
0	1	1	1
1	0	1	1
1	1	0	0

Table 3

(D) $(P \oplus P') \oplus Q = (P \odot P') \odot Q'$
where $Y1 = (P \oplus P') \oplus Q, Y2 = (P \odot P') \odot Q'$

P	Q	Y1	Y2
0	0	1	0
0	1	0	1
1	0	1	0
1	1	0	1

Table 4

Here, Except **(D)** identity all other identies are valid according to the mentioned truth tables.

5 Implementation

Table 5: connections

Arduino pin	INPUT	OUTPUT
5	P	
6	Q	
2		C
3		R

6 Procedure

1. Connect the circuit as per the above table.
2. Connect the Output pins C and R to the LED's.
3. Connect the other end of the LED's to the Ground terminal.
4. Connect inputs to Vcc for logic 1,ground for logic 0.
5. Execute the circuits using the below code.
6. Change the values of P,Q in the code and verify the Truth tables respectively.

7 CODE

The arduino code can be downloaded from the below link.

https://github.com/madhu-addanki/FWC/tree/main/vaman/iot/code