VERIFICATION OF BOOLEAN IDENTITIES

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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 to Display.
3. Connect inputs to Vcc for logic 1,ground to logic 0.
4. Execute the circuit using below code.
5. And verify the truth table.

7 Code

The vaman code can be downloaded from the below link.

https://github.com/BharathMorri/CS42018/blob/main/arm/code/src/main.c