

# Assignment 4 | FPGA Lab

Deeshant Sharma [ EE21MTECH14002 ]

April 2022

## 1 Question

We have to perform the problem presented in Assignment-1 on arduino and verify the output using C language. **Also, Draw the truth table for the inputs and outputs for the given expression**

$$(A.B)' + (A' \Rightarrow B)$$

## 2 Operators Description

### 2.1 Binary Operator: AND

The AND operator (symbolically: ".") also known as logical conjunction requires both A and B to be True(1) for the result to be True(1). All other cases result in False(0).

### 2.2 Binary Operator: OR

The OR operator (symbolically: "+") requires only one premise to be True(1) for the result to be True(1)

### 2.3 Binary Operator: NOT

The NOT operator is commonly represented by a '['. It negates, or switches truth value.

### 2.4 Conditional Operator: if-then

Logical implication (symbolically:  $\mathbf{A} \rightarrow \mathbf{B}$  or " $\Rightarrow$ "), also known as "if-then", results True(1) in all cases except the case  $\mathbf{T} \rightarrow \mathbf{F}$ . This is logically equivalent to  $\mathbf{A}' + \mathbf{B}$

## 3 Solution

### 3.1 Tautology

Truth Values are True(1) for any combination of truth value of variables.

### 3.2 Contradiction

Truth Values are False(0) for any combination of truth value of variables.

### 3.3 Contingency

Some Truth Values are True(1) for some combination of truth value of variables and some truth value are False(0) for truth value combination of other variables.

### 3.4 Truth Table

A	B	A.B	(A.B)'	A'	(A'=>B)	(A.B)' + (A'=>B)
1	1	1	0	0	1	1
1	0	0	1	0	1	1
0	1	0	1	1	1	1
0	0	0	1	1	0	1

## 4 C Code

```
#include <avr/io.h>
#include <util/delay.h>

int main (void)
{
    DDRD    |= 0b00000000;
    DDRB    |= ((1 << DDB5));
    int i,p,q,r,w,a,b,output;
    while (1) {

        i = PIND;

        r= i & 0b00000100;
        q= i & 0b00001000;
        p= i & 0b00010000;

        output=(a||b)||(!(a&&b));

        if(output==1)
            PORTB = ((1 << PB5));
```

```

else
PORTB = ((0 << PB5));

    }
    return 0;
}

```

## 5 Result

Since for all combination of A and B given proposition gives output as **True(1)** hence, given proposition is a **Tautology**.

The assignment has been completed and truth table isverified.

Implemented the above truth table in Arduino. Output for different input combinations of A,B are displayed with Arduino builtin LED.