Logical Expression through assembly

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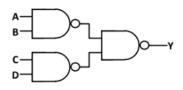
1 PROBLEM STATEMENT

Question-14 : In the logic circuit shown in the figure, Y is given by

(a) Y = ABCD
(b) Y = (A + B) (C + D)
(c) Y = A + B + C + D
(d) Y = AB + CD

2 COMPONENTS

Component	Value	Quantity
Resistor	220 Ohm	1
Arduino	UNO	1
Seven Segment Display		1
Decoder	7447	1
Jumper Wires	M-M	20
Breadboard		1

TABLE I

3 SOLUTION :

3.1 Theoretical Solution

Based on Demorgans Law

$$\overline{AB} = \overline{A} + \overline{B} \tag{1}$$

$$\overline{\overline{A}} = A \tag{2}$$

As per the boolean circuit A,B,C and D are inputs and Y is the output. The equivalent expression of the boolean logic is

$$Y = \overline{\overline{AB}.\overline{CD}}$$

By using equation(1) then the output Y is

$$Y = \overline{\overline{AB}} + \overline{\overline{CD}}$$

Again by using equation(2) then the output Y is

$$Y = AB + CD$$

3.2 Truth table for Boolean Logic

A	B	C	D	Y
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

TABLE II

4 CONNECTIONS

Input	A	B	C	D	
Output					Y
Arduino	2	3	4	5	8

TABLE III

5 PROCEDURE

5.1 LED Blinking

1) Make connections as per TABLE-III
2) Connect Arduino ground to the led - resistor end
3) Connect Arduino 13 pin to the LED Positive
4) In arduino we are having pins A,B,C,D.here we are using port B pin 13 is taken as output pin.
5) port D pins 2,3,4,5 pins are taken as a inputs. portD pins 2,3,4,5 pins are connected vcc or gnd in breadboard as per truth table
6) Execute the following code
7) Observe the results as per below TABLE II by changing input values

Observe the circuit and verify the program by executing the link provided below.

https://github.com/naveed790/FWC/