IMPLEMENTATION OF BOOLEAN LOGIC BY USING ARDUINO WITH ASSEMBLY

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Contents

1 Problem

(GATE EC-2020)
Q.No 10 The figure(Fig.1) below shows a multiplexer where S_1 and S_0 are select lines, I_0 to I_3 are the input data lines, EN is the enable line, and $F(P, Q, R)$ is the output, F is
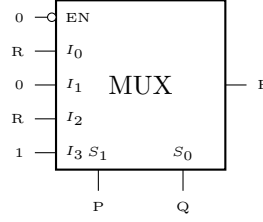

Figure 1: Circuit

1. $PQ + Q'R$

2. $P + QR'$

3. $PQ'R + P'Q$

4. $Q' + PR$

2 Introduction

A 4×1 multiplexer has four data inputs I_3, I_2, I_1 and I_0, two selection lines S_1 and S_0 and one output Y.One of these 4 inputs will be connected to the output based on the combination of inputs present at these two selection lines.

3 Components

Components	Value	Quantity
Resistor	220 Ohm	1
Arduino	UNO	1
Bread Board		1
Jumper Wires	M-M	10
LED		1

Table 1: Components

4 Implementation

We know that the output of a multiplexer is given as:
$F = S_1'S_0'I_0 + S_1'S_0I_1 + S_1S_0'I_2 + S_1S_0I_3$
$F = P'Q'R + P'Q(0) + PQ'R + PQ(1)$
$F = P'Q'R + PQ'R + PQ$
$F = Q'R(P' + R) + PQ$
$F = Q'R + PQ :(P' + R = 1)$

4.1 Truth Table

P	Q	R	F
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

Table 2: Truth Table

4.2 K-map

K-map follows as:

Figure 2: K-map

3

4.3 Boolean Expression

By Solving the above K-map, we get a boolean equation as: $F = PQ + Q'R$

5 IMPLEMENTATION

Arduino PIN	INPUT	OUTPUT
2	P	
3	Q	
4	R	
5		F

Table 3: Connections

5.1 Procedure

1. Connect the circuit as per the above table.

2. Connnect the one end of the resistor to anode of LED and cathode of LED to ground.

3. Connect the output pin to another end of resisor.

4. Connect inputs to Vcc for logic 1, ground for logic 0.

5. Execute the circuit using the below code.

6 Software

Now execute the following code and upload in arduino to see the results

https://github.com/SivaLakkireddy/FWC/blob/main/Assembly/code/assembly.asm