

AVR-GCC ASSIGNMENT

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1 Problem

(GATE2019-QP-EE)

Q.35 The output expression for the Karnaugh map shown below is

RS \ PQ				
	00	01	11	10
00	0	1	1	0
01	1	1	1	1
11	1	1	1	1
10	0	0	0	0

(A) $Q\bar{R} + S$

(B) $QR + S$

(C) $Q\bar{R} + \bar{S}$

(D) $QR + \bar{S}$

2 Components

Components	Value	Quantity
Breadboard	-	1
Arduino	uno	1
Jumper wires		4

Table 1: Components

2.1 Arduino

The Arduino Uno has some ground pins, analog input pins A0-A5 and digital pins D0-D13 that can be used for both input as well as output. It also has two power pins that can generate 3.3V and 5V. In the following exercise, we use digital pins, GND and 5V.

3 Implementation

3.1 Truth table

Input A	Input B	Output
0	0	1
0	1	0
1	0	0
1	1	0

Table 2: Truth Table

3.2 Boolean Equation

$$F = \bar{R}\bar{S}\bar{Q}(\bar{Q} + Q) + \bar{R}S\bar{P}(\bar{Q} + Q) + \bar{R}\bar{S}Q(\bar{P} + P) + \bar{R}SQ(\bar{P} + P) + RS\bar{P}(\bar{Q} + Q) + RS\bar{P}(Q + \bar{Q}) \quad (1)$$

$$F = \bar{R}S(\bar{P} + P) + \bar{R}Q(\bar{S} + S) + RS(\bar{P} + P) \quad (2)$$

$$F = S(\bar{R} + R) + \bar{R}Q \quad (3)$$

$$F = S + Q\bar{R} \quad (4)$$

4 Hardware

1. Connect one end of jumper wire to the ground pin on the Arduino and other end to the breadboard's ground rail(-).
2. Connect the one terminal of jumper wire to the input pin (PIN 10) of Arduino and other end to the positive rail(+) on the breadboard.
3. Connect one end of another jumper wire to the input pin (PIN 11) of Arduino and other end to the positive rail(+) on the breadboard.
4. Enable the power supply to breadboard from arduino by connecting one end of jumper wire to the power pin (5V) of arduino and other end to the positive rail (+) on the breadboard.
5. Change the input pin connections on breadboard for different outputs.

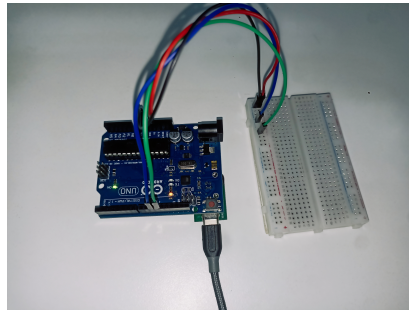


Figure 1: Connections

5 Software

Now execute the code which is available in below path and upload it to the Arduino.

<https://github.com/Pavan2k01/Digital-Design/blob/main/AVR-GCC/main.c>

6 Conclusion

Hence, we have implemented the NOR gate for the given problem in avr-gcc environment with help of Arduino.