IMPLEMENTATION OF BOOLEAN LOGIC USING ARDUINO

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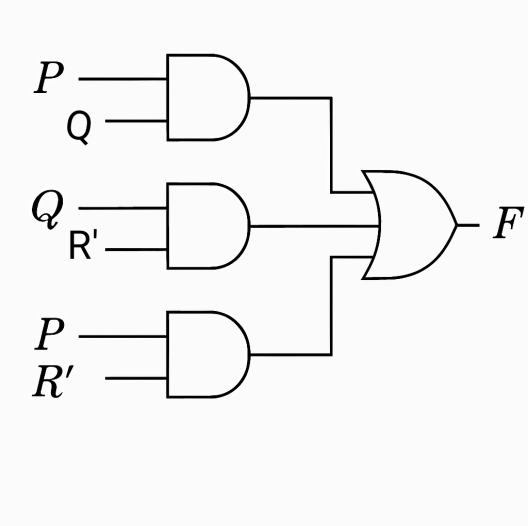
Abstract



(GATE 2010, Question No. 53 – Implementing a Boolean logic function using Arduino)

1. Components

Component	Qty
Arduino UNO Board	1
USB Cable (Type B)	1
Push Buttons	3
LEDs	1
220Ω Resistors	3
Jumper Wires (M-M)	10
Breadboard	1
Android Mobile with Arduinodroid App	1

Table 1: List of components used

2. Setup and Connections

1. Connect push buttons to D2, D3, D4 for P, Q, R.
2. Add pull-down resistors to each input.
3. Connect an LED to pin D13 via a 220Ω resistor.
4. Common ground for buttons and LED.
5. Power Arduino via USB and Arduinodroid app.

3. Steps for Implementation

1. Complete the circuit connections.
2. Connect Arduino to mobile via USB.
3. Open Arduinodroid, select board and port.
4. Open, save, compile and upload code.

4. Truth Table

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

5. Boolean Expression Simplification

F = PQ$\overline{R}$ + P$\overline{Q}$R + P$\overline{QR}$ + $\overline{P}$Q$\overline{R}$
= P Q (R + $\overline{R}$) + P$\overline{Q}$(R + $\overline{R}$) + $\overline{P}$Q$\overline{R}$
= P Q + P $\overline{Q}$ + $\overline{P}$Q$\overline{R}$
= P(Q + $\overline{Q}$) + $\overline{P}$Q$\overline{R}$
= P + $\overline{P}$Q$\overline{R}$
= P (Q + R') + Q R'
= PQ + PR' + Q R'

6. Input and Output Pins

- **P (Input)** – D2
- **Q (Input)** – D3
- **R (Input)** – D4
- **F (Output LED)** – D13

7. Arduino Code Link

`https://github.com/varalakshmi298/ide/gate/gate_q1.ino`