

Implementation of Boolean Logic Using Arduino

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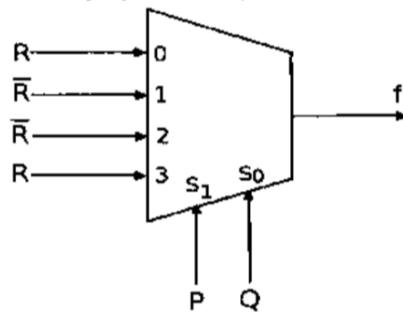
COMET.FWC17

Future Wireless Communication (FWC)

Assignment
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Abstract

Q.9 The Boolean expression for the output f of the multiplexer shown below is



- (A) $\overline{P \oplus Q \oplus R}$ (B) $P \oplus Q \oplus R$ (C) $P + Q + R$ (D) $\overline{P + Q + R}$

(GATE 2010 CS, Question No.9 – Implementing an answer of the above question 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

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	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

5 Implementation

$$\begin{aligned}f &= P\bar{Q}R + PQ\bar{R} + \bar{P}QR + \bar{P}\bar{Q}\bar{R} \\&= P(QR + \bar{Q}R) + \bar{P}(Q\bar{R} + \bar{Q}R) \\&= P(Q \oplus R) + \bar{P}(Q \oplus R)' \\&= P \oplus (Q \oplus R) \\&= f = P \oplus Q \oplus R\end{aligned}$$

6 Input and Output Pins

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

