

IMPLEMENTATION OF BOOLEAN LOGIC USING ARDUINO

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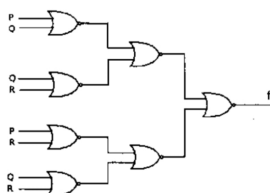
COMET.FWC026

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Abstract

Q.31 What is the boolean expression for the output f of the combinational logic circuit of NOR gates given below?



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

(GATE 2010 CS , Question No. 31 – Implementing a Boolean logic function)

1. Components

Component	Qty
Arduino UNO Board	1
USB Cable (Type B)	1
Push Buttons	3
LEDs	1
220 Ω 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 220 Ω 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	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

5. Boolean Expression Simplification

$$\begin{aligned}f &= (P + Q)' \cdot (Q + R)' \cdot (P + R)' \cdot (Q + R)' \\&= [(P + Q) + (Q + R)]' + [(P + R) + (Q + R)]' \\&= [(P + Q)' + (Q + R)']' + [(P + R)' + (Q + R)']' \\&= [((P + Q)' + (Q + R)')' + ((P + R)' + (Q + R)')']' \\&= \overline{P + Q + R}\end{aligned}$$

6. Input and Output Pins

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