IMPLEMENTATION OF KMAP BOOLEAN LOGIC WITH ARDUINO

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Abstract

The minimal sum-of-products expression for the logic function f represented by the given Karnaugh map is:

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

Options:

(A) QS + $\overline{P}R\overline{S}$ + PQR + $\overline{P}RS$ + P$\overline{Q}R$

(B) QS + $\overline{P}R\overline{S}$ + PQR + $\overline{P}RS$

(C) $\overline{P}RS$ + PQR + $\overline{P}RS$ + P$\overline{Q}R$

(D) $\overline{P}RS$ + PQR + P$\overline{Q}R$

Kmap

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

Components

Component	**Value**	**Quantity**
Arduino Board	–	1
Jumper Wires	M-F	10
Push Buttons	–	4
Breadboard	–	1
USB Cable	–	1
LED	–	1
Resistors	220 Ω, 10k Ω	5

Setup

1. Connect buttons to pins D2–D5 for inputs P, Q, R, S, each with a 10kΩ pull-down resistor to ground.
2. Connect an LED to pin D13 through a 220 Ω resistor to ground.
3. Write Arduino code to read inputs and compute $f = !P \cdot R \cdot S + P \cdot Q \cdot R + !P \cdot R \cdot !S + !P \cdot Q \cdot R$.
4. Use `digitalWrite(13, f)` to control the LED based on the computed output.
5. Upload the code and test by pressing buttons to check when the LED turns ON for $f = 1$.

Implementation

Connect push buttons to pins D2–D5 for inputs P, Q, R, S with 10kΩ pull-down resistors.

Connect an LED to pin D13 through a 220Ω resistor to ground.

Write Arduino code to read inputs and compute $f = !P{\cdot}R{\cdot}S + P{\cdot}Q{\cdot}R + !P{\cdot}R{\cdot}!S + !P{\cdot}Q{\cdot}R$.

Use `digitalWrite(13, f)` to control the LED based on the computed output.

Upload the code and test by pressing buttons to check when the LED turns ON for $f = 1$.