Minimization of the Boolean Function

Given the K-map with variables x, y, z:

$x\backslash yz$	00	01	11	10
0	1	1	1	0
1	0	0	1	0

where the entries with 1 correspond to the minterms:

$$m_0, m_1, m_3, m_7$$

—

Step 1: Write the canonical sum of products

$$f = m_0 + m_1 + m_3 + m_7 = x'y'z' + x'y'z + x'yz + xyz$$

—

Step 2: Group terms from the K-map

From the K-map, group the first three 1's in the top row:

$$x'(y'z' + y'z + yz) = x'(y' + yz)$$

Using Boolean algebra, simplify inside the parentheses:

$$y' + yz = y' + z$$

Thus,

$$f = x'(y' + z) + xyz$$

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Step 3: Expand the expression

$$f = x'y' + x'z + xyz$$

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Step 4: Check for further simplification

Using the consensus theorem, the term $x'z$ is redundant because it is the consensus of $x'y'$ and yz. Hence, we can write:

$$f = x'y' + yz$$

—

Final simplified expression:

$$\boxed{f = x'y' + yz}$$

Raspberry Pi Pico GPIO Pin Mapping

Signal	GPIO Pin	Purpose
x	GPIO 14	Input from push button (with pull-down)
y	GPIO 15	Input from push button (with pull-down)
z	GPIO 16	Input from push button (with pull-down)
f	GPIO 17	Output to LED

Note: Connect each push button between 3.3V and its respective GPIO pin. Use internal pull-down resistors. Connect the LED with a current-limiting resistor from GPIO 17 to GND.