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GATE 2009, ECE Question Number 59

Abstract

This project uses an Arduino UNO and a 7-segment display to simulate a vending machine logic system from GATE 2009 Question 59. Based on two inputs (P1, P2), prices are displayed: 0, 2, 5, or E.

1. Components

Component	Qty
Arduino UNO	1
Push Buttons (P1, P2)	2
7-Segment Display (Common Cathode)	1
220Ω Resistors	7
Breadboard	1
Jumper Wires	12
Laptop with Arduino IDE	1

Table 1: List of components used

2. Setup and Connections

- Connect push button P1 to D2 and P2 to D3 with pull-down resistors.
- Connect 7-segment display segments:
  - a → D4, b → D5, c → D6, d → D7, e → D8, f → D9, g → D10
- Connect each segment pin through a 220Ω resistor.
- Common cathode pin of display to GND.
- Arduino GND connected to breadboard GND.

3. Logic Summary

- Inputs: P1, P2 (1 = pressed, 0 = not pressed)
- Segment g: $g = P1 + P2$
- Segment e: $e = b + c$
- Segment d: $d = c + e$
- Display outputs: 0, 2, 5, or E depending on input

4. Pin Mapping

- **P1** – D2 (Input)
- **P2** – D3 (Input)
- **7-Segment Display:**
  - a – D4, b – D5, c – D6, d – D7
  - e – D8, f – D9, g – D10

5. Analysis

5.1 Truth Table

P1	P2	Display
0	0	0
1	0	2
0	1	5
1	1	E

5.2 Segment Activation

Digit	a	b	c	d	e	f	g
0	1	1	1	1	1	1	0
2	1	1	0	1	1	0	1
5	1	0	1	1	0	1	1
E	1	0	0	1	1	1	1

5.3 Derivations

- $g = P1 + P2$
- $e = b + c$
- $d = c + e$

6. GitHub Code Link

`https://github.com/amuru052004/Likhitha_fwc/tree/main/Hardware/platformio`

7. Conclusion

This hardware implementation using a 7-segment display successfully models vending machine logic using basic input and output pins of Arduino UNO. The results are validated against GATE 2009 Question 59 output specifications.