

Lab Report: Arduino Uno-Based Clock, Stopwatch, and Timer System

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1 Aim

To design and implement a multifunctional display system using Arduino Uno that integrates:

- Digital clock (with date/day display)
- Stopwatch (single-button control)
- Countdown timer (single-button control)

using 7-segment displays, LCD, and only 3 control buttons.

2 Materials Required

2.1 Hardware Components

- Arduino Uno
- Six common cathode 7-segment displays
- 7447 BCD to 7-segment decoder IC
- 16×2 LCD
- Three push buttons
- 220 ohm resistors (for current limiting)
- 10k ohm resistors (for pull-up)
- Breadboard and jumper wires
- Potentiometer (for LCD contrast adjustment)

2.2 Software

- Arduino IDE (for C++ code)
- AVR GCC (for C code)

3 Circuit Connections

3.1 Seven-Segment Displays with 7447 IC

- **7447 IC Connections:**

- Pins A, B, C, D (BCD inputs) to Arduino Pins D2, D3, D4, D5
- Outputs (a, b, c, d, e, f, g) to All seven-segment displays (parallel connection)

- **Common Cathode Control:**

- Each display's common cathode to Arduino Pins D6-D11 (via 220 ohm resistors)

3.2 16×2 LCD Connections

- **Control Pins:**

- RS → D12
- E → D13
- RW → GND

- **Data Pins:**

- D4 → A0
- D5 → A1
- D6 → A2
- D7 → A3

- **Contrast Adjustment:**

- V0 → Potentiometer middle pin

3.3 Button Connections (3-Button System)

- **Button 1 (Clock Mode)** to A4 (PC4)
- **Button 2 (Stopwatch)** to A5 (PC5)
 - Single press: Resets and starts stopwatch
- **Button 3 (Timer)** to D1 (PD1)
 - Single press: Resets to preset value and starts countdown
- All buttons use internal pull-up resistors

3.4 Power Supply

- Arduino 5V to Power rail
- Arduino GND to Ground rail

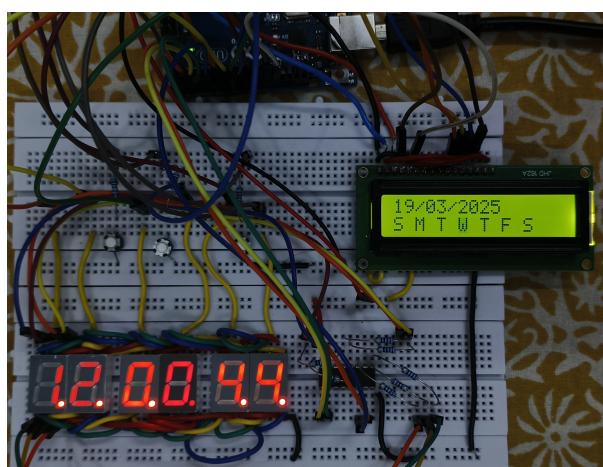
4 Observations

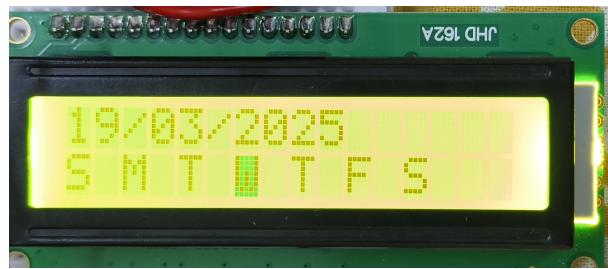
4.1 Clock Mode

- **Functionality:**

- 7-segment displays show time in HH:MM:SS format
- LCD shows date (DD/MM/YYYY) and blinking day indicator

- **Image:**



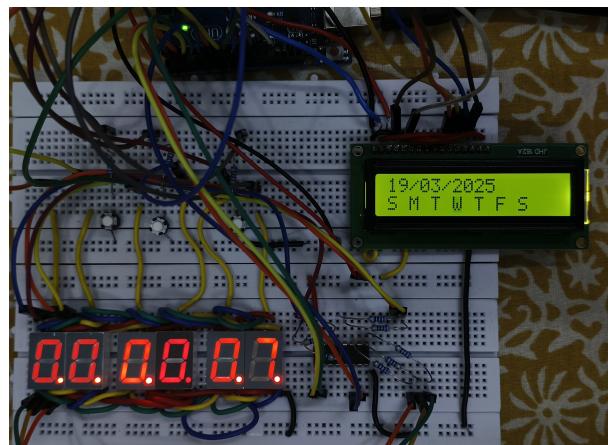


4.2 Stopwatch Mode

- **Functionality:**

- Starts immediately when Button 2 is pressed
- Displays elapsed time in HH:MM:SS
- No pause function (requires reset to restart)

- **Image:**

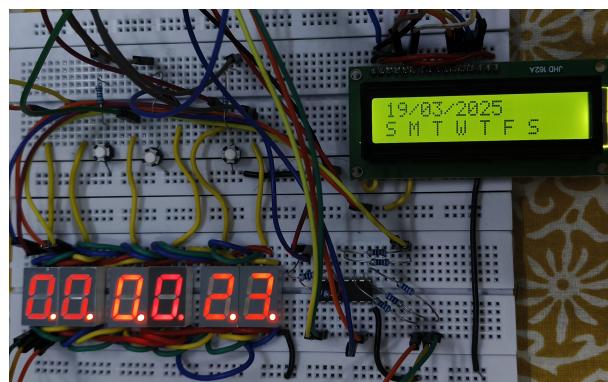


4.3 Timer Mode

- **Functionality:**

- Starts countdown from preset value (5:00) when Button 3 is pressed
- Automatically returns to clock mode at 00:00

- **Image:**



5 Conclusion

The system successfully implements all required functionalities using only three buttons:

- Simplified control scheme (no separate start/stop buttons)
- Accurate timekeeping with 1-second resolution
- Clear visual feedback through 7-segment displays and LCD