

Quiz Buzzer System with Fastest-Finger Lockout and Score Display

A 4-team quiz buzzer console with fastest-finger lockout, team indicator lamps, a configurable answer timer and a host scoreboard — a complete embedded-systems build.

Title

Quiz Buzzer System with Fastest-Finger Lockout and Score Display — a game-show console built on Arduino.

Introduction / Background

Quiz competitions in colleges still run on shouting, raised hands or a single bell, and every close call between two teams ends in an argument about who pressed first. Commercial quiz buzzer sets exist but are expensive black boxes that teach nothing. This project builds the system from scratch as an embedded product: four team stations with big push-buttons, a central controller that arbitrates the fastest press with a hardware-fair lockout, team indicator lamps, a countdown timer for answering, and a scoreboard the host updates from a control panel.

The interesting engineering is all visible — contact debouncing, race-free press arbitration, multiplexed seven-segment driving, and a firmware state machine (idle → buzzed → answering → scored → reset) that the student can explain line by line.

Problem Statement

Fair arbitration of near-simultaneous button presses cannot be done by eye or by naive polling: contact bounce creates phantom presses and slow loops create ties. A credible system needs debounced inputs, a tight arbitration loop with a documented response target, unambiguous winner indication, a host-controlled answer timer and persistent scoring — packaged as one robust console.

Objectives

- Provide four wired team stations with big push-buttons and indicator LEDs.
- Arbitrate the fastest press with lockout in well under 100 ms (design target), ignoring all later presses until reset.
- Debounce every input in firmware so a single press never double-registers.
- Run a host-configurable answer countdown (5–60 s) with audible warning.
- Maintain a per-team scoreboard on the display, updated from the host panel.

Proposed Methodology

The controller samples all four team buttons on a tight poll loop; the first valid (debounced) press wins and a lockout flag freezes all other inputs until the host resets. Debouncing uses a time-windowed state check per input rather than blocking delays, keeping the loop fast. A finite-state machine drives the game flow: idle → buzzed (winner lamp on, timer starts) → answering (countdown on display) → scored (host adds points) → reset. Seven-segment score displays are multiplexed in a timer routine; the host panel (reset, score +/-, timer set) is scanned in

the same loop.

System Architecture / Working

Team stations: push-button + indicator LED each, wired to the console. Console: Arduino, multiplexed seven-segment displays (timer + scores), 16x2 LCD for status, buzzer for timer warnings, host control buttons. Firmware modules: input scan + debounce, arbitration, state machine, display multiplexing, timer engine, score storage (EEPROM).

Hardware / Software Requirements

- Hardware: Arduino Uno/Nano, 4 large push-buttons, 4 indicator LEDs/lamps, multiplexed seven-segment display modules, 16x2 LCD, buzzer, host control buttons, station + console enclosures, multi-core cable.
- Software: Arduino IDE; no external libraries required.

Expected Outcomes

A working 4-team console: fastest-finger lockout at the design-target sub-100 ms arbitration, clean single registration per press, 5–60 s answer timer with end warning, persistent scoreboard, and a host panel covering the full game flow — plus a demo script for viva and events. Timing figures are design targets documented in firmware, verified by the buyer during testing.

Applications

- College and school quiz competitions and tech-fest events.
- Embedded-systems teaching: debouncing, polling, state machines.
- Event-management rental or club asset.
- Viva demonstration of a complete interactive product.

Future Scope

- Wireless team stations over RF modules.
- Projector/audience display output of scores.
- Question-bank integration with automatic scoring.
- Sound effects and per-team buzz tones.