

Digital Electronics

**Assignment**

**IE2010**

|  |  |
| --- | --- |
| Title: Design and Implementation of a Multi-stage Amplifier and Filtering circuit | |
| Batch Number: Y2S1  CSNE WD1 | Group Number: (WD 10) |

Declaration:

We hold a copy of this assignment that we can produce if the original is lost or damaged.

We hereby certify that no part of this assignment has been copied from any other group’s work or from any other source. No part of this assignment has been written / produced for our group by another person except where such collaboration has been authorized by the subject lecturer/tutor concerned.

Group Members:

A close up of a signature

Description automatically generated

IT23366336 A.M.N.S.Weerarathne …………………………

signature

A close up of a signature

Description automatically generated

IT23363670 E.D.O.Samarakoon …………………………

signature

**Submitted on: <25/10/20**

**Introduction**

Electronic voting systems are instrumental in the transformation and advancement of electoral processes. This dissertation describes the implementation of a Digital Voting System for purposes of a small election with three contestants. The purpose of the system is to promote Evil politics Free and fast and Reliable voting, overcoming usual limitations when dealing with issues like multiple voting, time constraints and live result candidates updates. Voting Process management has a sequential logic block which controls the time as well as the state transitions while Combinational logic is used in detecting the votes cast and who is the winner. This method particularly reduces the chances of errors or foul play being experienced in the system.

A countdown timer is one of the features of the system which enables voters to vote within 9seconds by pressing the vote button. Voters are also limited to voting for one candidate, after which the system records the vote and updates the tally. To build resilience into the system, a voter will not be able to provide any further input after he or she has cast her vote in the system. There are real time display units that will ensure that the countdown as well as the votes is updated and visible to the voters, boosting their confidence. After the last 5 voting rounds, the board determines the winner of the election and lights up the relevant indicator in the board or handles the ties if necessary.

This project employs ThinkerCAD for practical work concerning the design and simulation of electronic voting machines. The use of components such as the 555 timers, 74193 counter, and 7447 BCD to 7 segment decoder enhances the proposed voting system as well as its feasibility.

**Acknowledgement**

We would like to express our deepest appreciation to the Sri Lanka Institute of Information Technology for providing us with the responsibility to complete this report. In addition, we would like to thank Mr. Dinith Primal, our DE lecturer who played a great role in providing the necessary guidelines to complete this report and all the lab instructors who support us in laboratory practical. We would like to express our thanks to all the people who provided support us in finishing this project.

**Abstract**

This project outlines the design and implementation of a Digital Voting System intended to streamline a small-scale election process featuring three candidates (A, B, and C). The system includes real-time vote tallying, a countdown timer, and winner detection, all aimed at providing an accurate, secure, and efficient voting experience. Voters have 9 seconds to cast their votes; if no input is received, the system automatically proceeds to the next voter. The vote count for each candidate is shown on a 7-segment display, while a mix of sequential and combinational logic ensures smooth transitions between voting rounds. Once all votes are cast, the system determines and displays the winner, considering any potential ties. This system mimics real-world voting applications through digital electronics, offering insights into countdown mechanisms, real-time data management, and automated result processing.

**Table of Contents**

1. **Countdown Timer Subsystem**

The Countdown Timer is designed to provide a 9-second countdown during which voters must cast their votes. If no vote is submitted within this timeframe, the system automatically moves on to the next voter.

Procedure:

* 555 Timer IC:

Utilize a 555 Timer IC to create a 1 Hz clock signal with a 50% duty cycle. This signal acts as the fundamental time unit for the countdown (1 second per tick). Set up the circuit with the necessary resistors and capacitors to achieve the desired frequency (1 Hz).

* 74193 Counter IC:

The 74193 counter IC will operate in down-counting mode, receiving the clock signal from the 555 Timer. At the beginning of the voting round, load the counter with an initial value of 9. With each clock pulse, the counter will decrease by 1.

* BCD to 7-Segment Decoder (7447 IC):

The binary output from the 74193 counter is sent to the 7447 BCD to 7-segment decoder. The 7447 IC translates the binary countdown value into the corresponding digits (0-9), which will be shown on the 7-segment display.

* Display Unit:

The 7-segment display indicates the remaining time for each voter. When the counter hits 0, voting input will be disabled for that voter.

Edge Case: If a voter fails to cast a vote before the countdown expires, the system will skip that voter, lock all inputs, and reset the countdown timer in preparation for the next voter**.**

1. **Vote Casting Subsystem**

This subsystem captures the voter's choice when they press one of the three buttons for candidates A, B, or C.

Procedure:

* Button Input:

There are three buttons, each linked to a candidate (A, B, or C). When a button is pressed, the input signal is sent to the logic system to record the vote.

* Debouncing Circuit:

Mechanical buttons can bounce, so a debouncing circuit is implemented to ensure that only one signal is registered for each press. This can be done using a debouncing IC or a software-based approach.

* Vote Recording:

After a button is pressed, the system acknowledges the vote by stopping the countdown and illuminating the Green Indicator Light next to the chosen candidate. The vote count for the selected candidate increases by 1. Lock Input: Once a vote is cast, the system locks out further input from that voter, preventing multiple votes from being recorded. The countdown is then reset to 9 for the next voter.

1. **Real-Time Vote Tally Display Subsystem**

This subsystem continuously updates and shows the vote count for each candidate in real time.

Procedure:

* Vote Counting:

For each candidate, keep a counter to track the number of votes. When a vote is cast, the counter for the relevant candidate is increased.

* Display Unit:

The current vote tally for each candidate is shown on a 7-segment display. The counters are linked to 7447 BCD to 7-segment decoders, which convert the vote count (in binary) into digits for display. Each candidate (A, B, C) has a dedicated 7-segment display to show their current vote count.

* Real-Time Update:

As soon as a vote is cast, the system updates the corresponding counter and immediately shows the new vote count on the display.

1. **Multiple Voting Rounds Subsystem**

This subsystem oversees the transitions between voters, ensuring that each voter can cast their vote, while accommodating up to five voters.

Procedure:

* State Machine: Establish a state machine with distinct states for each phase of the voting process.

1. Waiting for Voter: The system is prepared to receive input from the next voter.
2. Counting Down: The countdown timer is active, awaiting a vote.
3. Vote Cast: A vote has been recorded, and the system locks further inputs.
4. Voting Complete: After 5 voters have participated, the system transitions to the final display state.

* Counter:

Utilize a counter to monitor how many voters have cast their votes (with a maximum of 5 voters).

* Reset Countdown:

After each voter casts a vote (or opts to skip), reset the countdown timer to 9 for the next voter.

* Lock System:

Once all 5 voting rounds are finished, the system locks all inputs and shows a "-" on the main 7-segment display, indicating that voting has concluded.

**5. Winner Display Subsystem**

After all votes are cast, this subsystem determines the winner and highlights the corresponding candidate with a Green Indicator Light.

Procedure:

* Comparator Circuit:

Set up a comparator circuit that evaluates the vote counts of all three candidates (A, B, and C).

* Winner Detection:

If one candidate receives the highest vote count, the Green Indicator Light next to their name illuminates. In the event of a tie between candidates, the Green Indicator Lights next to the tied candidates will light up.

* Final Vote Count Display:

The final vote count for each candidate will remain visible on the 7-segment displays.

**6. System Reset Subsystem**

The reset button is designed to clear the system and get it ready for a new voting round.

Procedure:

* Reset Button:

Pressing the reset button clears all vote counts and returns the system to its original state.

* Countdown Reset:

The countdown timer is set back to 9, and the vote tallies for each candidate (A, B, and C) are reset to zero.

* System Ready for New Voting Session: Once the reset is complete, the system is prepared to start a new voting session with a new group of voters.

**Reasons to choose the relevant electronic components**

Each equipment in the ‘Digital Voting System’ is chosen based on specific criteria that align with the system's goals and needs. Here’s a breakdown of the reasons for selecting each component.

1. 555 Timer IC

The 555 Timer is a versatile and commonly used IC that can be easily set up to generate a precise clock signal. In this system, it produces a 1Hz clock signal (1-second interval), which drives the countdown timer. The 555 Timer is perfect for this application because it offers a stable and reliable time base for the countdown.

Advantages :

- Cost-effective and readily available.

- High precision in generating timing pulses.

- Flexible configuration for different time periods by adjusting resistor and capacitor values.

- Delivers a consistent 50% duty cycle output, ideal for driving the counter.

2. 74193 Counter IC (Up/Down Binary Counter)

The 74193 counter is chosen for its ability to operate in both up-counting and down-counting modes, which is crucial for the countdown timer. It counts down directly from 9 to 0, and its outputs are in binary form, easily convertible to decimal for display.

Advantages:

- Supports flexible up/down counting.

- Synchronous design ensures dependable performance.

- Easily interfaces with digital circuits, making it a suitable choice for the countdown timer in this system.

- Can be reset, allowing the countdown to restart after each voter.

3. 7447 BCD to 7-Segment Display Decoder

The 7447 IC serves as a Binary Coded Decimal (BCD) to 7-segment decoder, converting binary inputs into the signals needed to operate a 7-segment display. This IC is an excellent fit for the system as it seamlessly translates the binary output from the 74193 counters into the decimal format required for both the countdown and vote tally displays.

Advantages:

-Simplifies the connection between binary counters and 7-segment displays.

- Reduces circuit complexity by managing the conversion from binary to segment control signals.

- Capable of driving multiple 7-segment displays, which is essential for both the countdown and vote count displays.

4. 7-Segment Display

The 7-segment display is perfect for presenting numeric data, such as the countdown timer and real-time vote tally. It offers a clear display of numbers in a compact format.

Advantages:

- Simple, cost-effective, and easy to connect with decoders like the 7447 IC.

- Ensures a clear and legible display of digits, which is vital for both the countdown and vote tally displays.

- Readily available and commonly utilized in digital electronics projects.

5. Vote Casting - Button Inputs A, B, and C

Justification:

In the system, buttons are a simple input form by which the vote will be cast. Each button will relate to one candidate, and upon pressing a button, the vote will fall into the lot of that candidate. They would be a simple user interface to the voter.

Positive Attributes:

They are comparatively simple and reliable systems where there is only one input such as selecting a vote.

It is easy to implement in the system for sensing an input for various button presses.

It is low-cost and requires minimum wiring.

Can be debounced using either hardware or software to prevent multiple triggers from a single press.

6. Debouncing Circuit

Rationale:

Most of the buttons used in mechanical form introduce noise either when pressed or released. Such noise results in unintended multiple signals being received. This is why the debouncing circuitry ensures that only one signal is registered per press of the button for increasing the reliability of the vote-casting system.

Advantages:

Removes unwanted multiple triggers due to switch bouncing.

Prevents system from registering invalid button presses to prevent errors in vote casting. It can be implemented either with basic components like capacitors and resistors, or in software; thus, it's flexible.

7. Green Indicator LEDs

Reason for Choice:

Green LEDs give feedback to both casting of a vote and determination of a winner. The low-current, low-power LED-like indicators acknowledge both the voter and the system operator that there is a recorded vote.

Advantages:

Low power consumption

The addition of immediate visual feedback by the user

Easy interface to logical circuits and microcontrollers.

Can be utilized for real-time status indication, for example-to indicate which candidate leads at the end with a maximum number of votes.

8. Comparator Circuit

Justification:

The comparator circuit is necessary to identify the candidate with the most votes at the end of the voting process. This comparator circuit compares the votes for each of the three candidates and switches on the Green Indicator beside the candidate with the majority. The end

Compares several binary values efficiently to obtain the maximum.

Can comfortably handle situations where there are multiple candidates and a tie might occur.

Gives a simple basis to drive the indicator lights based on the results of voting.

9. State Machine (Logic System)

Reason for Choice:

The voting system works in different stages: countdown, casting a vote, tallying the votes, and display. A state machine ensures that all these transitions will be effectively managed. Sequential logic ensures the system goes through these stages in a controlled and predictable manner.

Advantages:

Clearly defines system behavior at each stage of the voting process.

Ensures proper transitions between states, such as locking after a vote is cast out or resetting for the next voter.

Allows for easy expansion to add more features or modification in the system.

10. Reset Button

Justification for Selection:

The reset button is an essential constituent in any form of voting system that cannot be dispensed with while one needs to restart a new round of voting. This resets all the counters and prepares the system for fresh input once one round of voting is completed.

Advantages:

Gives an easy way of resetting the system such that all votes are cleared.

A simple and effective system to offer new voting rounds.

This eschews the necessity of manual intervention to reset the state of the system.

**Conclusion**

This Digital Voting System effectively illustrates the application of digital electronics in managing elections, providing a timely, tamper-proof, and real-time solution. By utilizing both sequential and combinational logic, the system guarantees smooth functioning during multiple voting rounds, real-time vote counting, and precise winner identification. Its modular design, which includes a countdown timer, voting panel, and display units, highlights the essential coordination needed in digital election systems. This project serves as a practical example of advanced digital concepts like state machines, counters, and BCD-to-7-segment conversions. In the end, the system acts as a prototype for secure, efficient, and error-free voting processes.