PASSWORD LOCK USING LOGIC GATES

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INTRODUCTION

This project presents the design and implementation of a 4-bit digital password lock based entirely on fundamental logic gates, serving as a powerful and practical illustration of combinational logic theory.

The goal of this system is to create a basic access control mechanism that validates a specific set of simultaneous inputs— the 'password'— to switch the device from an "unlocked" to a "locked" state.

The circuit utilizes common integrated circuits (ICs), including the AND gates (74LS08) and NOT gates (74LS04), to perform a critical logical comparison.

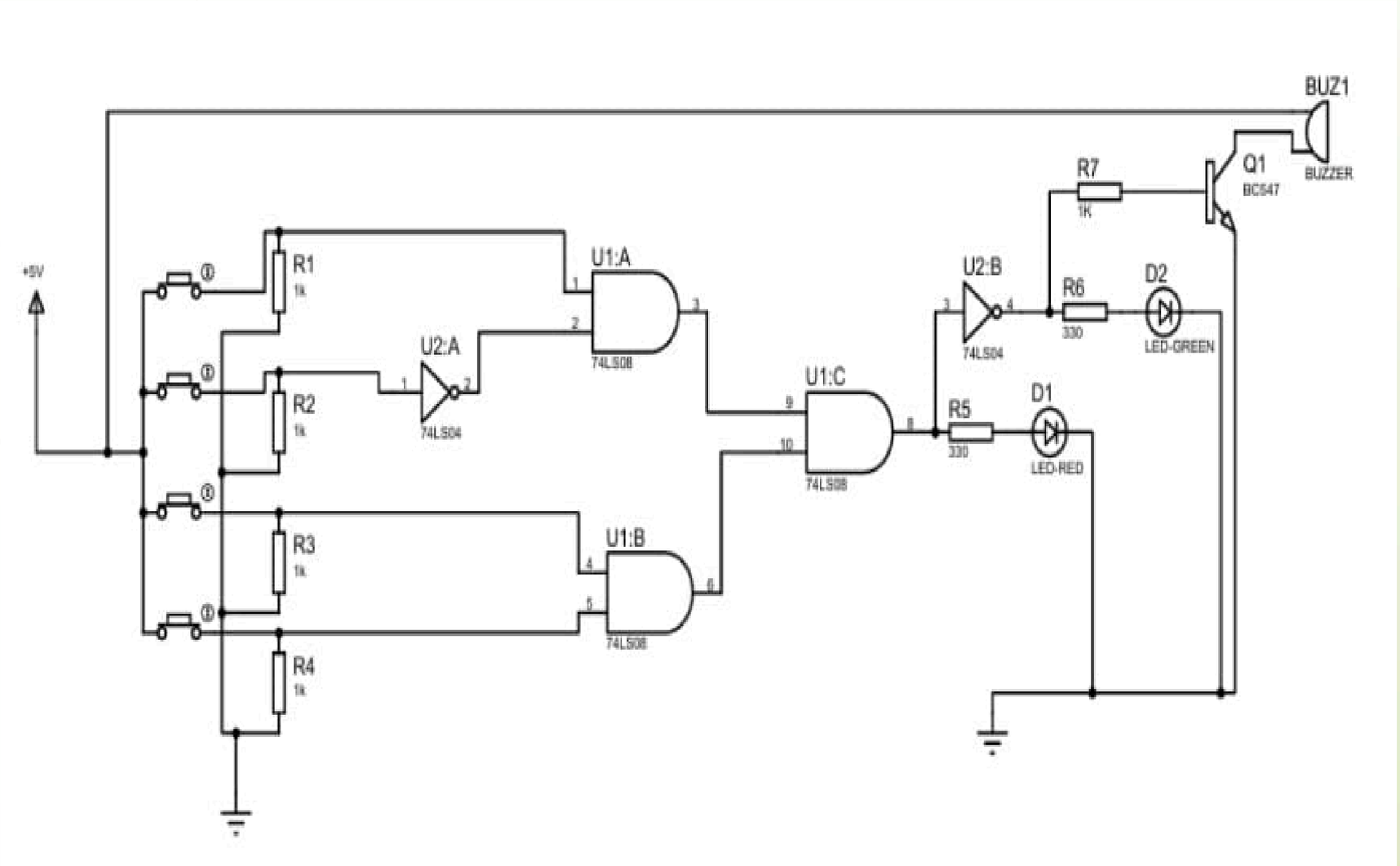
Specifically, it tests the current state of four push-button inputs against a fixed, pre-set 4-bit combination.

The circuit's output is governed solely by the current state of these inputs, making it an excellent example of a combinational circuit, where memory elements are not required to determine the output.

COMPONENTS REQUIRED

Component	Designator	Specification/Value	Function in Circuit
Integrated Circuit (Quad 2-Input AND)	U1	74LS08 (TTL)	Password logic calculation.
Integrated Circuit (Hex NOT Gate)	U2	74LS04 (TTL)	Inverts S2 input and inverts the final logic output.
Push Button Switch	S1, S2, S3, S4	Momentary Contact	User input for the 4-bit password.
Pull-Down Resistors	R1, R2, R3, R4	1 k ohm	Hold inputs LOW when switches are open.
Current Limiting Resistor	R5, R6	330 ohm	Limit current to the LEDs (D1 and D2).
Current Limiting Resistor	R7	1 k	Limit base current for the transistor Q1.
Transistor (NPN)	Q1	BC547 or similar NPN	Driver for the Buzzer (BUZ1).
Red LED	D1	LED-RED	Indicates **Secure State** ($L=1$).
Green LED	D2	LED-GREEN	Indicates **Monitoring State** ($L=0$).
Buzzer	BUZ1	5 v DC Buzzer	Auditory feedback for the **Monitoring State**.
Power Supply		5 v DC	Required voltage for TTL ICs.

CIRCUIT DIAGRAM



CONCLUSION

The project successfully demonstrated the design, construction, and testing of a 4-bit combinational password lock based on the $\mathbf{1011}$ logic.

By correctly applying Boolean algebra and employing standard 74LS-series logic gates, a robust digital decision-making circuit was implemented.

The system operates reliably, providing clear, mutually exclusive output feedback (Red LED ON for correct entry, Green LED/Buzzer ON for incorrect entry).

This project has served as an invaluable exercise in foundational digital logic design, circuit debugging, and the practical application of fundamental gates.

REFERENCE

https://da-iitb.vlabs.ac.in/exp/electronic-lock/theory.html

https://github.com/ShiveshDeogharia/password-security-system

Source: LearnElectronics India https://share.google/UzdNrgrynhI7JHOTY