**E-1005 Digital Logic Design**

**“4 Bit Combinational Lock System”**

A picture containing text, gear, metalware

Description automatically generated

### Course Name: Digital Logic Design Lab

### Instructor: Muhammad Nadeem Ghori

**Members:**

Muhammad Tahir(21k-4503)

Department of Computer Science

National University of Computer and Emerging Sciences-FAST

Karachi Campus

**Project Description:**

# The combination lock system is implemented using the XOR gates and the universal NOR gate. The XOR gates are used as comparators to compare the input and the lock key, if the entered key is correct a green led is turned on, otherwise the alarm system is activated. This project covers the basics of digital logic, logic gates, implementation of combinational circuits and comparators.

**Components Used:**

* XOR GATES
* NOR GATES
* LEDs
* RESISTORS
* DIP SWITCHES
* DIODES
* JUMPER WIRES
* PUSH SWITCH
* BATTERIES

**Procedure:**

1. Set the power supply to 9 volts, and place voltage and ground to the breadboard.
2. Connect voltage to each “key code” switch and each “data entry switch.”
3. Connect a “key code” switch to pins 1, 4, 10, and 13 of the XOR gate, as well as connect a “data entry switch” to pins 2, 5, 9, and 12 of the XOR gate.
4. Connect a 10kΩ resistors to each “key code” switch, as well as, to each “data entry” switch.
5. Place a wire from each resistor to ground.
6. Allow a wire to come from pin 3, pin 6, pin 8, and pin 11 the XOR gate to pins 1, 3, 5, and 9 of the 1N914 “switching” diode.
7. Place a wire from pins 2, 4, 6, and 8 of the 1N914 “switching” diode to a 10kΩ resistor.
8. Place a wire from the 10kΩ resistors to ground.
9. Connect the pin 2 of the 1N914 “switching” diode to pin 1 of the NOR gate, as well as a 10kΩ resistors connected to pin 2 of the 4001 quads.
10. Place a wire from pin 3 of the 4001 quads to pin 4 of the 4001 quad and place a wire from pin 5 to the pushbutton switch.
11. Connect the pushbutton switch to ground.
12. Place a wire from pin 6 to a light-emitting diode.
13. Place a wire from pin 3 of the 1N914 “switching” diode to pin 10 of the 4001 quads, as well as, a wire from pin 9 of the 4001 quad to a 10kΩ resistor.
14. Connect the 10kΩ resistor to voltage. o. Place a wire from pin 8 of the 4001 quads to a light-emitting diode.
15. Place a 470Ω resistor to each light-emitting diode.
16. Connect each 470Ω resistor to ground.

**Applications:**

***Related to Industry*** The use of logic gates is critical to industries worldwide. In today’s world, copious individuals’ input password into his/her security system to secure or to unsecure his/her home and/or business. A company like Ring provides a great number of homes with security systems so that individuals can protect his/her property. For example, individuals can receive alerts and video footage when someone is new his/her home. Individuals can also always check the Ring app to make sure there is not anything going on in or outside of his/her property. Above it all, a company like Ring is great with providing security systems to people’s homes thanks to the use of logic gates within each security system.

**Circuit Diagram:**

Diagram, schematic

Description automatically generated

**Implementation on Proteus 8 Pro:**

A picture containing text, cage

Description automatically generated