

## **The National Institute of Engineering**

(An Autonomous Institution under Visvesvaraya Technological University,  
Belagavi)

**Mysuru-570008**



MAJOR PROJECT REPORT ON

### **“ADVANCED BANK LOCKER SYSTEM USING RFID AND GSM TECHNOLOGY”**

Submitted in partial fulfilment for the award of

BACHELOR OF ENGINEERING IN

### **“ELECTRONICS AND COMMUNICATION”**

For the academic year 2021-2022

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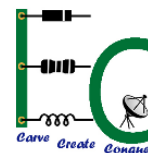
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### CERTIFICATE

Certified that the project work entitled “**ADVANCED BANK LOCKER SYSTEM USING RFID AND GSM TECHNOLOGY**” carried out by Mr. **MANOJ N G, SOHAIL MAIDARGI, VEDARAJ V SHETTI, VEERENDRA S MARADUR** with USN **4NI18EC039, 4NI18EC88, 4NI18EC104, 4NI18EC105** respectively who are Bonafide student of **THE NATIONAL INSTITUTE OF ENGINEERING** is submitted in partial fulfillment for the award of Bachelor of Engineering in **ELECTRONICS AND COMMUNICATION** of **The National Institute of Engineering, Mysuru**, an autonomous institute under Visvesvaraya Technological University, Belagavi during the year **2021-2022**. It is certified that all suggestions/ corrections suggested during Internal Assessment have been incorporated in the Report deposited in the departmental library.

The project report/dissertation has been approved as it satisfies the academic requirements in respect of Project work prescribed for the award of the said Degree.

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Signature with date

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## DECLARATION

We **MANOJ N G, SOHAIL MAIDARGI, VEDARAJ V SHETTI, VEERENDRA S MARADUR** bearing USN: **4NI18EC039, 4NI18EC88, 4NI18EC104, 4NI18EC105** respectively student of **8<sup>th</sup>** semester of UG programme, **BACHELOR OF ENGINEERING** in Department of **ELECTRONICS AND COMMUNICATION**, The National Institute of Engineering, Mysuru, Karnataka hereby declare that the project work entitled “**ADVANCED BANK LOCKER SYSTEM USING RFID AND GSM TECHNOLOGY**” has been carried out by me under the guidance of **KAVITHA S S, ASSISTANT PROFESSOR, ECE DEPT.** (Name, Designation and Department of the supervisor). This project work is submitted to **The National Institute of Engineering, Mysuru, (An Autonomous institute under VTU, Belagavi)** in partial fulfillment of the course requirements for the award of degree in **BACHELOR OF ENGINEERING** during the academic year **2021-2022**. This written submission represents a record of original work and we have adequately cited and referenced the original sources.

Further the matter embodied in this thesis has not been submitted to any other University or Institution for the award of any degree.

Place: Mysuru

Date:

(Signature of the students)

## **DEDICATION**

we dedicate our project work to our families, guide and to our friends.

A special feeling of gratitude to our loving parents, whose words of encouragement and push for making this project a success. The another most important person for making this project is our guide, we sincerely thank and dedicate this to our guide, Kavitha s s for being with us and guiding throughout the project.

We also dedicate this work to our friends, and many others who have supported us throughout the process. We will always appreciate everything they have done, especially for making the project and documentation part easy to complete.

## THE NATIONAL INSTITUTE OF ENGINEERING

(Department of Electronics and Communication)

### ACKNOWLEDGEMENT

We would take this opportunity to express our sincere gratitude and respect to lot of eminent personalities. Without whose constant encouragement and gratitude, the project of ours would not become reality.

Firstly, we would like to sincerely thank our beloved principal, **Dr. Rohini nagapadma** for giving us opportunity and making us to get all the resources we need for the successful completion of this project.

We are grateful for the cooperation and constant encouragement from our honorable Head of the Department **Dr. Roopa K** for her support and encouragement.

We sincerely extend our thanks to our guide **Ms. Kavitha S S**, Assistant Professor, Department of Electronics and Communication Engineering, NIE Mysuru for her valuable guidance, constant assistance, and support for the betterment of this project.

## ABSTRACT

The main objective of this paper is to design and implement a secure advanced bank locker system based on RFID and GSM technology which can be organized in banks, offices or even in homes. In this designed project the authenticated person can only recover the thing present inside the locker. The traditional locker systems using mechanical and key mechanism are replaced by new advanced techniques of locking system. These techniques are an integration of mechanical and electronic devices and are highly intelligent, simple and high efficiency. Here, we have implemented bank security system consisting of door lock system based on RFID and GSM which can activate, authenticate, and validate the user and give the access for the door in real time. This system consists of a microcontroller, RFID and its reader, LCD display, keyboard, GSM module and a relay. The main advantage of using passive RFID and GSM is for two step authentication and to make system more secure than the others. On the other hand it also has advantage of generating real time password. In this system, the RFID reader reads the ID number from passive tag and later it will be checked by the microcontroller, if ID number matches it sends a message to the registered phone number to generate a password in the real time. Then it will provide you an option to enter the generated password on the keyboard present at the locker. If both password matches the door will get unlocked otherwise it denies the access and the user cannot make further use of locker.

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## **LIST OF NOTATIONS/ABBREVIATIONS**

- RFID ..... Radio frequency identifier
- GSM ..... Global System for Mobile communication
- GPRS ..... General packet radio service
- Hz ..... Hertz
- B ..... Bytes
- IC ..... Integrated circuit
- PC ..... Personal computer
- DC ..... Direct current
- RPM ..... Rotation per minute
- A ..... Ampere
- Tx ..... Transmission
- Rx ..... Receiver
- Fig. .... Figure



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# CHAPTER 1

## INTRODUCTION

### 1.1 Problem statement

Humans have invented locks since ancient times, to use them to protect their privacy and personal belongings. they are constantly evolving over the ages for better protection. But the problem is that locking the door these days is not safe and can be easily bypassed. Our doors can be forgotten, and this is a common occurrence for most people. Locks are trying these days to depends on technology by using a code or phone or by card to make our things safer. But there are limits, which are the lack of features to be combined in one place. also, the lack of high-security features. To solve this problem, we need to combine all the modern security features into one lock as well as monitoring features. Thus, we have high security, comfortable opening, and closing systems, and features that help us easier and faster, all requirements do not conflict and help to make our homes safer than before.

### 1.2 Motivation and theoretical overview

In this present age, safety has become an essential issue for most of the people especially in the rural and urban areas. Some people will try to cheat or steal the property which may endanger the safety of money in the bank, house, and office. To overcome the security threat, a most of people will install bunch of locks or alarm system. There are many types of alarm systems available in the market which utilizes different types of sensors. The sensor can detect different types of changes occur in the surrounding and the changes will be processed to be given out an alert according to the pre-set value. By the same time this system may not be good for all the time. In this work we have implemented safety of the money in the bank locker, house, and office (treasury) by using RFID and GSM technology which will be more secure than other

systems. Radio-frequency identification (RFID)based access-control system allows only authorized persons to open the bank locker with GSM technology. Basically, an RFID system consists of an antenna or coil, a transceiver (with decoder) and a transponder (RF tag) electronically programmed with unique information. There are many different types of RFID systems in the market. These are categorized on the basis of their frequency ranges. Some of the most commonly used RFID kits are low-frequency (30- 500 kHz), mid-frequency (900 kHz-1500MHz) and high frequency (2.4-2.5GHz). The passive tags are lighter and less expensive than the active tags. Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. GSM is a common European mobile telephone standard for a mobile cellular radio system operating at 900 MHz in the current work, SIM800A GSM module is used. The SIM800A module is a Triband GSM/GPRS solution in a compact plug-in module featuring an industry-standard interface. It delivers voice, data and fax in a small form factor with low power consumption. In this project work we have designed and implemented a bank locker security system based on RFID and GSM technology. In this system only authentic person can be recovered money from bank locker with two password protection method.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Literature review:

Authors	Title	Summary
Ms.Kausalya, Dr.T.Menaka Devi,Kaviya Manoranjitha, Monisha	Arduino Based Bank Locker Security System	It tells about the design and implementation of secured locker system based on RFID reader, GSM modem, Arduino AT mega2560 board which can be used in bank, secured offices and homes.
R Ramani Selvaraju, Niranjan Valarmathy	Bank security system using RFID and GSM	It provides a picture about the working of AT89C51 Microcontroller and its interface with other components.
Zhaoxia Wang, Hanshi Wang, Lizhen Liu	Community alarm design based on MCU and GSM	It is aimed to strengthen the LSB technique which is one of the steganography methods.
Al-Ali, A.R. Rousan, M.A. Mohandes	GSM-Based Wireless Home Appliances Monitoring & Control System	The paper aimed at the controlling of the home appliances and its monitoring using GSM model
Gyanendra K Verma, Pawan Tripathi	A Digital Security System with Door Lock System Using RFID Technology	In this paper Door lock system mechanism was controlled using RFID model.

Kumar Chaturvedula, U. P	RFID Based Embedded System for Vehicle Tracking and Prevention of Road Accidents	The paper was based on the vehicle tracking using RFID to prevent the Road accident.
Parvathy A, Venkata Rohit Raj, Ven Madhav, Manikanta.	RFID Based Exam Hall Maintenance System	its aim was to look into maintenance of examinations

Table 2.1 Literature review

## 2.2 Methodology

In this proposed method, at first, the RFID reader reads the data from RFID tag and send it to the microcontroller, if the card is registered with the bank, then microcontroller display the account holder name and number otherwise it shows no register found. Then microcontroller sends SMS to registered mobile number of users for real time password generation. Now the user has to send the newly generated password to microcontroller using GSM. After receiving password from user through GSM the system asks user to enter the same password manually through the keypad, if both passwords match the system will allow the user to access his locker or denies access if it doesn't match and it will send warning message to the registered user mobile number. This system is simple as there is no need to remember the password and more secured as there is no involvement of third party like in traditional locker system.

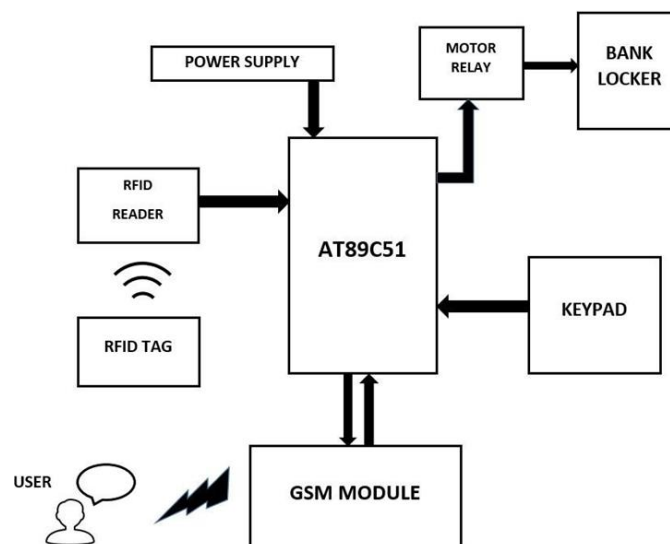


Fig 2.2 Block diagram of bank locker system

## CHAPTER 3

### MATERIALS AND METHODS

#### 3.1 Materials description

##### 3.1.1 AT89S51 Microcontroller:

The AT89S51 is a low-power, high-performance CMOS 8-bit microcontroller with 4K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density non-volatile memory technology and is compatible with the industry-standard 80C51 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S51 is a powerful microcontroller which provides a highly flexible and cost-effective solution to many embedded control applications.

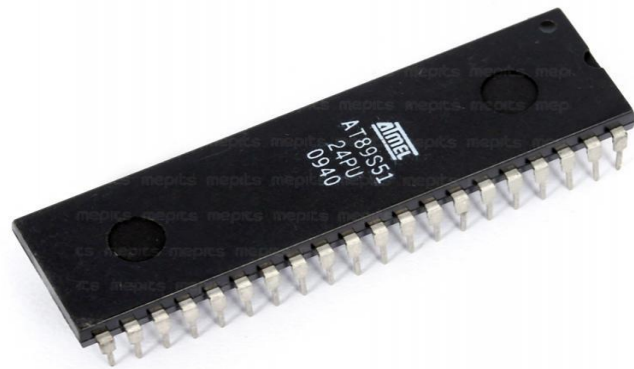
The AT89S51 provides the following standard features: 4K bytes of Flash, 128 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, two 16-bit timer/counters, a five-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S51 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next external interrupt or hardware reset.

Core Processor: 8051

Program Memory Type: Flash

Program Memory Size: 4 KB

RAM Size: 128 B



www.mepits.com

*Fig 3.1.1 AT89S51 microcontroller*

### **3.1.2 Radio-Frequency Identification (RFID):**

Radio frequency Identification (RFID) is a wireless identification technology that uses radio waves to identify the presence of RFID tags. Just like Bar code reader, RFID technology is used for identification of people, object etc. presence. In barcode technology, we need to optically scan the barcode by keeping it in front of reader, whereas in RFID technology we just need to bring RFID tags in range of readers. Also, barcodes can get damaged or unreadable, which is not in the case for most of the RFID. RFID is used in many applications like attendance system in which every person will have their separate RFID tag which will help identify person and their attendance. RFID is used in many companies to provide access to their authorized employees. It is also helpful to keep track of goods and in automated toll collection system on highway by embedding Tag (having unique ID) on them.

**A. RFID tags:** An RFID tag works by transmitting and receiving information via an antenna and a microchip — also sometimes called an integrated circuit or IC. The microchip on an RFID reader is written with whatever information the user wants.

There are two mains types of RFID tags: battery-operated and passive. As the name suggests, battery-operated RFID tags contain an onboard battery as a power supply, whereas a passive RFID tag does not, instead working by using electromagnetic energy transmitted from an RFID reader. Battery-operated RFID tags might also be called active RFID tags.





*Fig 3.1.2 (A) RFID tags*

## **B. RFID reader:**

It is used to read unique ID from RFID tags. Whenever RFID tags comes in range, RFID reader reads its unique ID and transmits it serially to the microcontroller or PC. RFID reader has transceiver and an antenna mounted on it. It is mostly fixed in stationary position.

Basically, RFID systems categorized as active and passive based on how they are powered and their range.

### **I. Active RFID system**

Active RFID tags have their own transmitter and power source (Mostly battery operated). They operate at 455 MHz, 2.45 GHz, or 5.8 GHz, and they typically have a read range of 60 feet to 300 feet (20 meters to 100 meters).

### **II. Passive RFID system**

Passive RFID tags do not have a transmitter, they simply reflect energy (radio waves) back coming from the RFID reader antenna. They operate in Low frequency (~125 KHz) as well as High frequency (~13 MHz) band and have limited read range of up to ~1m.



*Fig 3.1.2 (B) RFID reader*

### 3.1.3 GSM SIM800A:

The SIM800A Quad-Band GSM/GPRS Module with RS232 Interface is a complete Quad-band GSM/GPRS solution in an LGA (Land grid array) type which can be embedded in the customer applications. SIM800A support Quad-band 850/900/1800/1900 MHz, it can transmit Voice, SMS and data information with low power consumption.

With a tiny size, it can fit into slim and compact demands of custom design. Featuring and Embedded AT, it allows total cost savings and fast time-to-market for customer applications.

Applications:

- ❖ AMR (automatic meter reading).
- ❖ Power station monitoring and control.
- ❖ Remote POS (point of sale) terminals.
- ❖ Remote Data Monitor and Control.



*Fig 3.1.3 GSM SIM800A*

### 3.1.4 LCD LM016L:

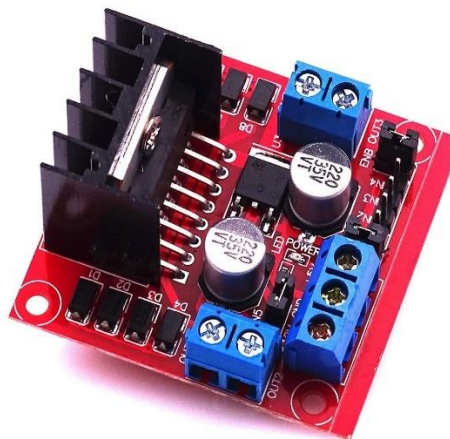
- ❖ 16-character x 2 lines
- ❖ Controller LSI HD44780 is built-in.
- ❖ +5V single power supply.
- ❖ Display colour: LM016L: Gray, LM016XMBL: New-Gray



*Fig 3.1.4 LCD display*

### 3.1.5 L293D Motor Driver IC:

The L293D is a popular 16-Pin **Motor Driver IC**. As the name suggests it is mainly used to drive motors. A single **L293D IC** is capable of running two DC motors at the same time; also, the direction of these two motors can be controlled independently. So, this IC is best suited for motors which have operating voltage less than 36V and operating current less than 600mA, which are to be controlled by digital circuits like Op-Amp, 555 timers, digital gates or even Microcontrollers like Arduino, PIC, ARM etc...



*Fig 3.1.5 Motor driver*

### 3.1.6 Keypad:

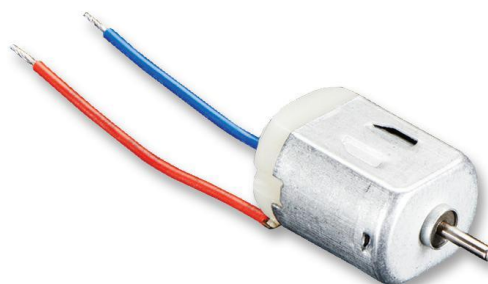
- ❖ Ultra-thin design & adhesive backing provides easy integration to any project.
- ❖ Excellent price-performance ratio.
- ❖ Easy communication with any microcontroller.
- ❖ 5 pins 2.54mm pitch connector, 4x4 type 16 keys.
- ❖ Sticker can peel off for adhesive mounting.
- ❖ Operating Voltage (V): 12 DC.



*Fig 3.1.6 Keypad*

### 3.1.7 DC motor:

- |                                 |      |
|---------------------------------|------|
| ❖ Nominal Voltage (VDC)         | 6    |
| ❖ Voltage Range (VDC)           | 3-12 |
| ❖ Current @ Max. Efficiency (A) | 0.28 |
| ❖ Speed @MAX. Efficiency (RPM)  | 4260 |



*Fig 3.1.7 DC motor*

## 3.2 Methods and setup:

### 3.2.1 Software Setup:

Port 1 of AT89S51 is connected to the LCD display. i.e., LCD Pins D0 to D7 is connected to P2.4 to P2.7 and pins reset and enable pin of LCD is connected to Port 0.1 and Port 0.2 of Microcontroller respectively. Keypad of matrix 4\*3 is connected Port 1 of Microcontroller whereas for GSM module Interfacing TX, RX pin of GSM module is connected to serial ports of microcontroller, i.e., RX pin and TX pin respectively. RFID Receiver Module's TX pin is connected to serial input port RX i.e., port 3.0 of Microcontroller. For Simulation of Locker Operation. We are using a 5V DC motor It is connected with a help of Motor Driver. Port 3.4 and 3.5 of Microcontroller

pins are used to connect IN pins of the Motor Driver and its OUT pins are connected to DC Motor pins. Connections are shown in the figure II given below. The proposed system is designed in proteus software using the inbuilt modules. The software program is written in embedded C.

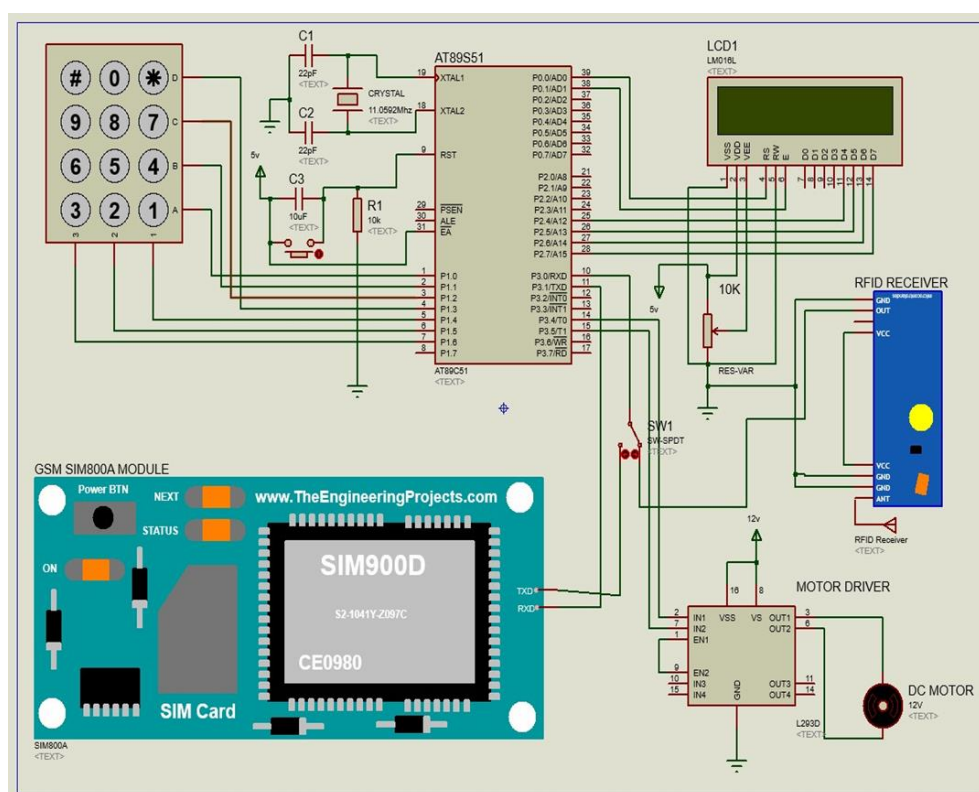


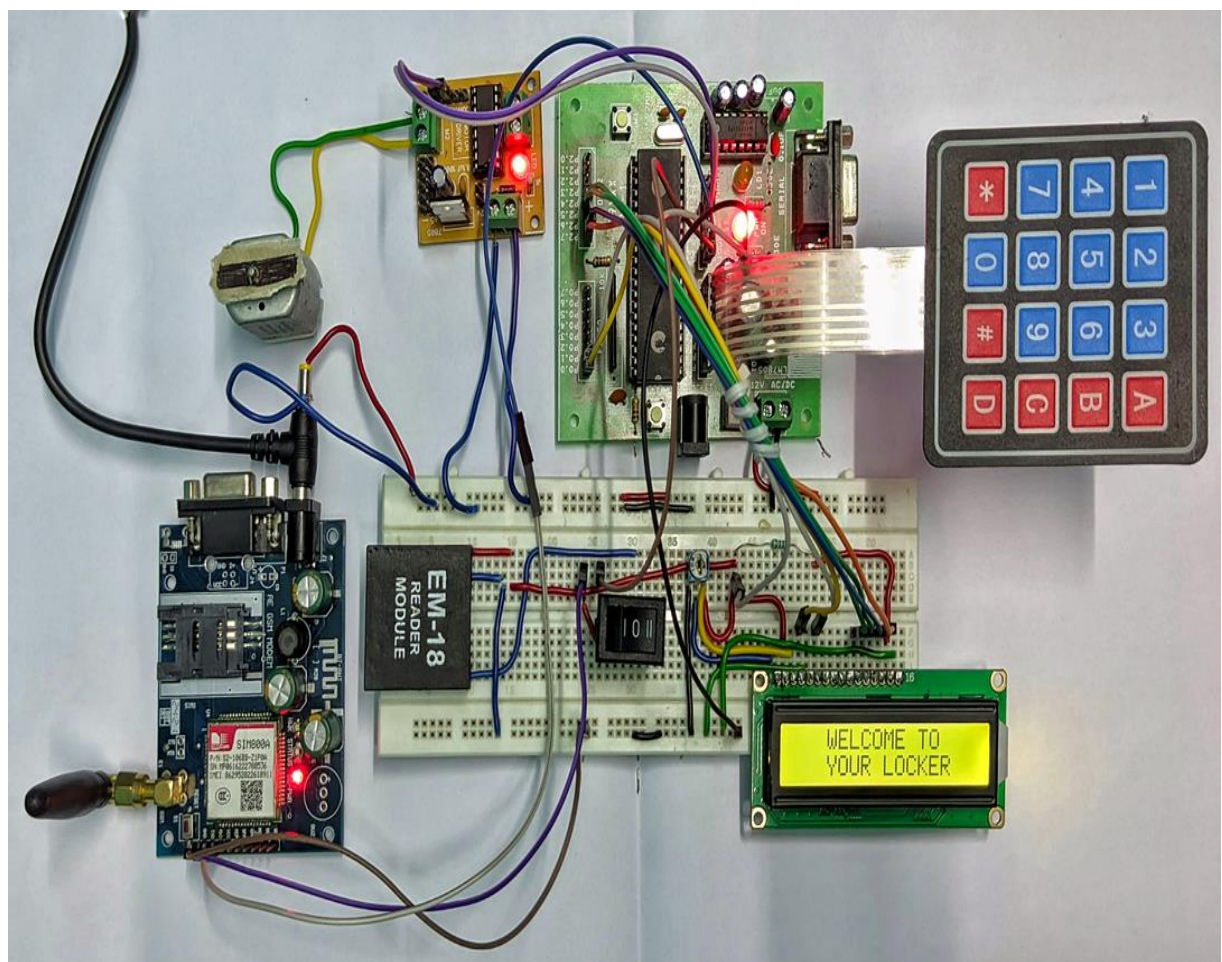
Fig 3.2.1 Proposed circuit diagram simulated in proteus



### 3.2.2 Hardware setup:

The hardware interface has been made just as shown in the software circuit diagram during simulation. The power supply has been given through 12V adapter to microcontroller board, GSM and motor relay. We used LCD in 4bit mode interfacing with 4 pins of port2.

Keypad is interfaced with port1. RFID and GSM's TX connected to RX with a two-way switch and GSM's RX to TX of microcontroller. The 12V motor is connected through L293D motor driver to microcontroller 3.4 and 3.5 ports.



*Fig 3.2.2 Hardware implementation of bank locker system*

## CHAPTER 4

### RESULTS AND ANALYSIS

#### 4.1 Results:

The output of both software simulation and hardware interface are found to be same. As expected, the RFID gives control to microcontroller by reading the cards and it is found efficient and fast when we use delay with the while loop. the motor driver converted the positive signs that is when both passwords matched to 12v as output to drive the motor. The use of 4\*4 keypad gives more combination of password instead of 3\*3 keypad. The GSM is found efficient as it sends and receives messages throughout the world and LCD as it is easy to interface. Analyzing with the other models it is found more securable as it used two step authentication and GSM technology along with RFID technology.

#### 4.2 Comparative study of existing and proposed locker system:

Sl.no	Existing system	Proposed system
1.	RFID technology is used	Both RFID and GSM technology is used
2.	One password is referred	Two password is verified
3.	password is constant	real time password, no need to remember password.
4.	May be in Secured due to robbery of RFID and password	More secured due to double password verification.

*Table 4.2 Comparative study of existing and proposed locker system*

## CHAPTER 5

### CONCLUSION AND RECOMMANDATION

#### 5.1 Conclusion:

We have proposed and implemented a Bank locker security system using passive RFID and GSM which is a low cost and low in power conception design, compact in size and standalone system. The microcontroller compares the passwords generated by the user in real time through GSM and entered by keyboard mobile phone. If these passwords are correct the microcontroller provides necessary control signal to open the bank locker. Warning messages will be sent when number of access attempts are exceeded.

#### 5.2 Future scope:

- ❖ With addition to this project, we can use “FACE” or “IRIS and Retina” Scanning for visual identification of the person
- ❖ If there are unauthorized attempts, user can block the account remotely.
- ❖ We can use multiple gateway (GPRS, 3G, 4G volte) for communication.



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