SASI INSTITUTE OF TECHNOLOGY & ENGINEERING
(Approved by AICTE-New Delhi, Affiliated to JNTUK-Kakinada and SBTET-Hyderabad)
TADEPALLIGUDEM - 534101, West Godavari District, Andhra Pradesh
☎ : 08818-244986,987,989,990 Fax:08818-244628 Web : www.sasi.ac.in., hodece@sasi.ac.in
Department of Electronics & Communication Engineering

Academic Year 2014-15

Annexure I

1. Project Title: Automatic toll detection using microcontroller

TABLE OF CONTENTS

1.1	Abstract	2-2
1.2	Motivation	2-2
1.3	Objective	3-3
2.1	Block Diagram and Working	5-5
2.2	Technical specifications	5-11
2.3	Results and Analysis	12-13
3.0	Conclusion	14-14

1. Abstract & Objective

1.1 Abstract

Now a day's toll plazas are mostly managed manually by using barcodes. But this method is time consuming and if the number of vehicles at the toll plazas increases then it takes much time in order to collect the toll tax. However the true automation cannot be realized with barcodes, mainly because the labels need to be scanned manually. RFID is the latest fast growing technology to be used in the toll plaza for providing automation and minimizing the theft of the vehicles. RFID tags can be read remotely without putting the reading device close to the tag. Line of Sight scanning is not necessary because RF signals can pass through most nonmetallic.

"Toll Gate Automation Using Microcontroller". In this project we are seeking to implement that, when a car enters the toll gate it should not feel the wastage of time for the payment of money. All work should be done automatically. RFID tag in the car contains the full information about the car and the driver in the form of digital code. And the amount should be deducted based on the type of the vehicle which is stored in the tag. The message will be sent to the owner using GSM module.

In this project RS232 is used for the compatibility of TTL logic. GSM is used for sending message and buzzer is used for identifying the theft vehicles. Whenever the theft vehicle is identified then the buzzer will be raised.

1.2 Motivation

Now a days we have been seeing the lot of waiting and traffic at toll plaza due to manual collection of money. This process kills valuable time and also wastage of fuel due to slow and stopping movement of vehicles at the toll plaza. This process motivated to design a automatic system to overcome this problems of waiting and fuel consumption at toll plaza. It can be useful to identify theft vehicles also

Main aim of our project:

1. Save the time
2. Avoid the fuel loss
3. Identify theft vehicles
4. To avoid traffic

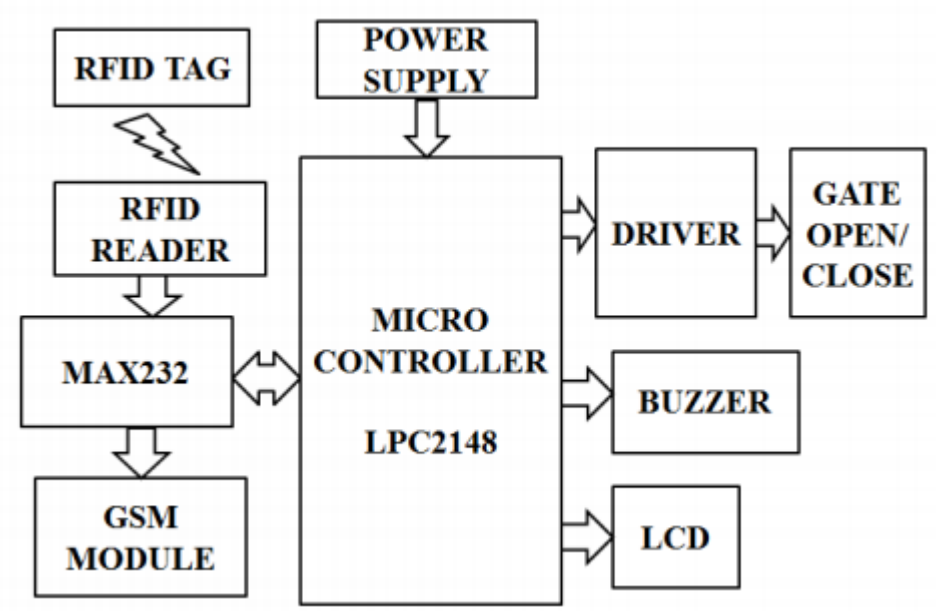
1.3 Objective

Design and develop an Automatic toll plaza using Microcontroller and RFID technology to save time at toll plaza and having cash free operation‖. As the name suggests "Automatic toll detection using Microcontroller" the key theme of our project is automation. So, here we will have the overlook of automation. Automation means to replace the manual work with automatic work. It means what presently the human being doing is onwards done by the machine. In 90's the toll collection was fully based on manual work. It includes two persons for opening and closing the gate and two more persons for reception and data keeping etc. But in 1995 express ways has been developed the semi automated toll plazas were developed in which the data can be stored in the computer and gate will open atomically here we require two people for single booth. But here we are going to see the human less toll plaza.

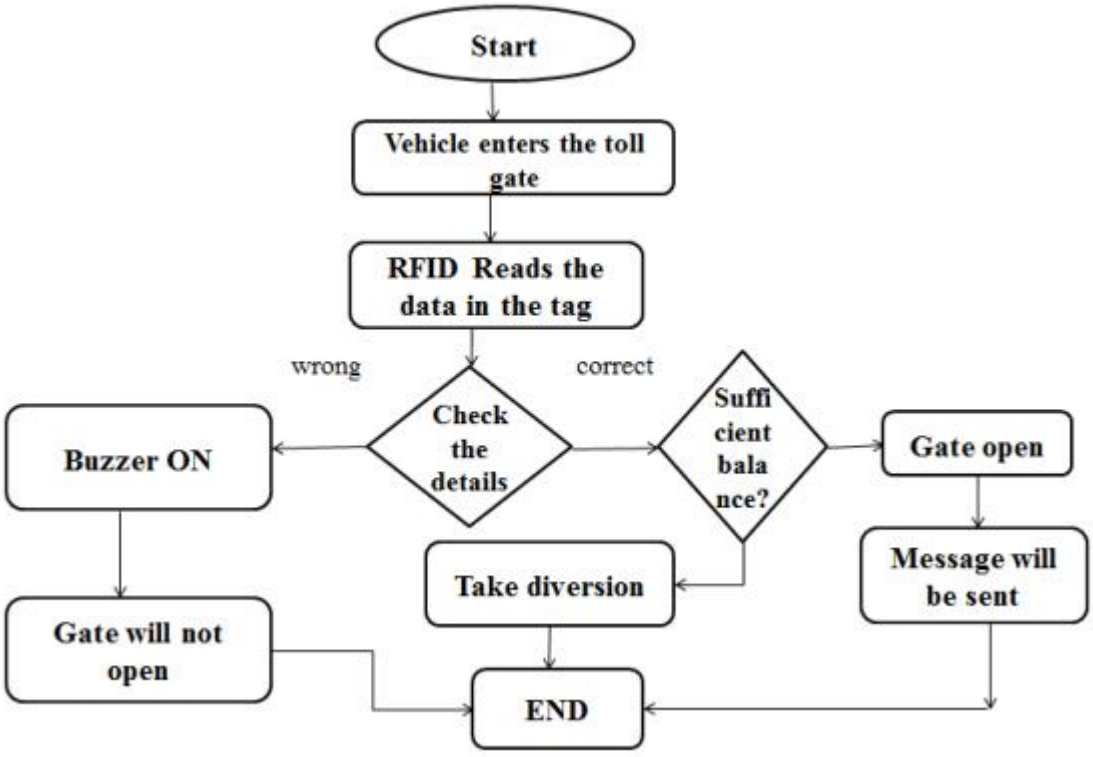
2. Block Diagram & Technical Specifications

2.1 Block Diagram and Working:

2.1.1. Block Diagram:



2.1.2. Flow Chart:



2.1.3. Working:

The above block diagram consists of RFID module, microcontroller, GSM module, LCD and Buzzer. When the car enters the toll plaza then the RF signals from the reader will activates the RFID tag and gets the digital code from the tag. RFID reader then sends the code to the microcontroller and it is compared with the data in the database. If the data is synchronized then the amount will be detected from the respective owner‘s account and gate will be opened. If the data gets mismatch then the buzzer will be activated. LCD is used to display the detected amount and directions in case of no money in the account.

When the car enters the toll gate the RFID in the car gets activated by using the RF signals from the RFID module. RFID reader gets the data from the tag and then it is checked. If the data is correct then it goes for checking the sufficient balance in the account. If there is sufficient balance in the account then the corresponding amount is detected and message is sent to the particular owner. If there is no sufficient balance then the display shows as take diversion. If the details in the tag are not correct then the buzzer will be activated and gate will not open.

2.2 Technical Specifications:

2.2.1. Arm Controller:

Arm is a 32-bit Reduced Instruction Set Computer (RSIC). Instruction set architecture named as Advanced RISC machine and, before that Acorn RISC machine. The ARM architecture mostly used 32-bit instruction set architecture.

Features

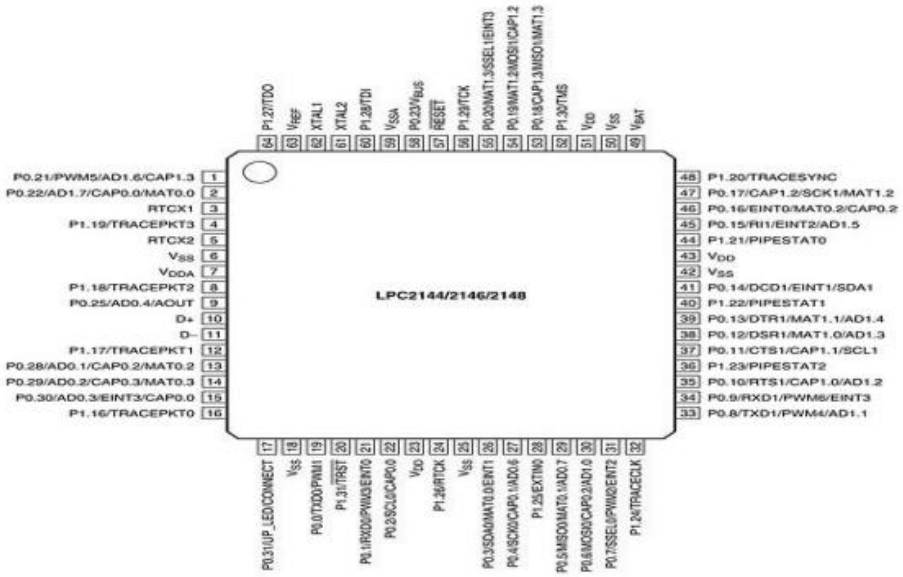
- 32-bit RSIC processor core (32-bit instructions)
- 37 pieces of 32-bit integer registers (16 available)
- Pipelined (includes 3 stages)
- Cached (depending on implementation)
- Von Neumann-type bus structure (ARM7) and Harvard (ARM9)
- 8 or 16 or 32-bit data types
- 7 modes of operation
- Simple structure and reasonably good speed to power consumption.•

LPC2148 is the heart of system. Used in all three modules. It controls all the functions. It is the widely used IC from ARM-7 family. It is manufactured by Philips and it is pre-loaded with many inbuilt peripherals making it more efficient and a reliable option for the beginners as well as high end application developer.

It has the following features:

- 8 to 40 kB of on-chip static RAM. 32 to 512 kB of on-chip flash program memory.
- 128 bit wide interface/accelerator enables high speed 60 MHz operation.

- In-System/In-Application Programming (ISP/IAP) via on-chip boot-loader software
- Single flash sector or full chip erase in 400 ms and programming of 256 bytes in 1ms
- Total 64 I/O pins



2.2.2. RFID Technology:

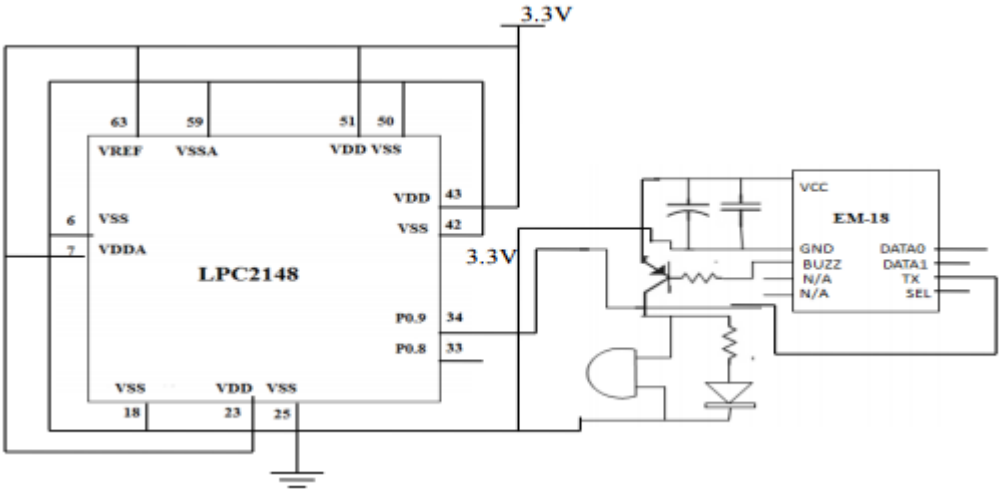
RFID stands for "Radio Frequency Identification". It is a small electronic device that consists of small microchip and antenna. The chip typically is capable of carrying 2,000 bytes of data or less. RFID works same as the barcodes. It provides a unique identifier for that object. Advantage of RFID over barcodes is it does not need to be positioned precisely relative to the scanner. It will work within few feet (up to 20 feet for high frequency)

RFID tags can read in a wide variety of circumstances, where barcodes or other optically read technologies are useless

- The tag need not be on the surface of the object
- The read time is typically less than 100 milliseconds
- Large number of tags can read at once rather than item by item

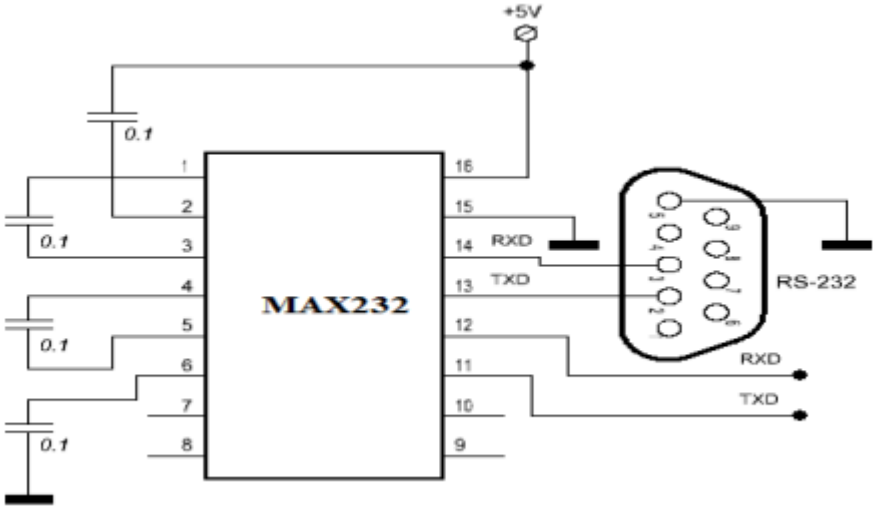
Frequency Range	Frequencies	Passive Read Distance
Low frequency	120-140 KHz	10-20 cm
High frequency	13.56 MHz	10-20 cm
Ultra- High frequency	868-928 MHz	3 meters
Microwave	2.45&5.8 GHz	3 meters
Ultra-Wide Band	3.1-10.6 GHz	10 meters

RFID Interfacing With LPC2148:



2.2.2. Serial Communication

RS232 (Recommended standard-232) is a standard interface approved by the Electronic Industries Association (EIA) for connecting serial devices RS232 is a serial communications standard which enables data to be transferred in serial from between two devices. Data is transmitted and received in serial _bit stream' from one point to another. Standard RS232 is suitable for data transfer to about 50m, although special low-loss cables can be used from extended distance operation. Four parameters specify an RS232 link between two devices.



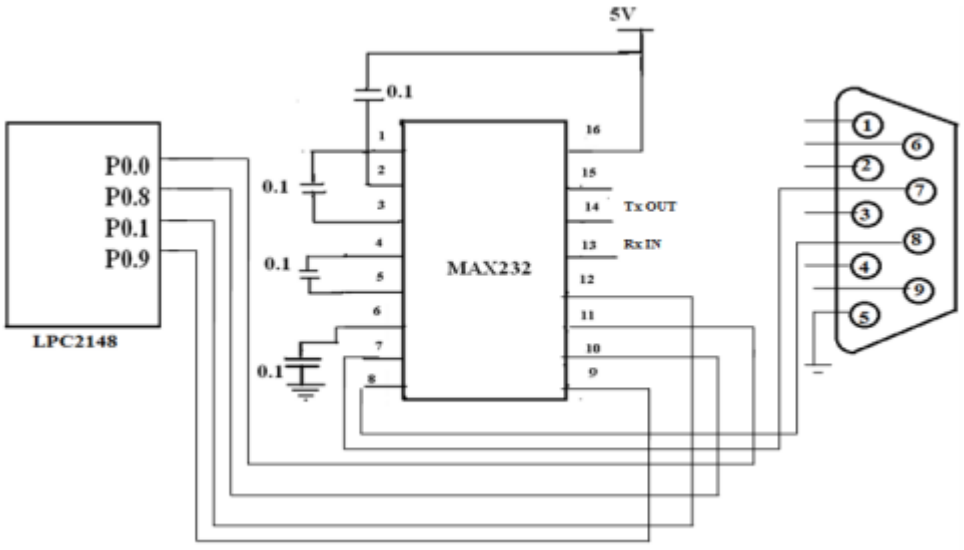
2.2.3. Global System For Mobile Communication

GSM is a digital mobile telephony system. GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band.

Because radio spectrum is a limited resource shared by all users, a method must be devised to divide up the bandwidth among as many users as possible. Chose a combination of TDMA/FDMA as its method. The FDMA part involves the division by frequency of the total 25 MHz bandwidth into 124 carrier frequencies of 200 kHz bandwidth. One or more carrier frequencies are then assigned to each BS. Each of these carrier frequencies is then divided in time, using a TDMA scheme, into eight time slots.

SIM900 General Specification:

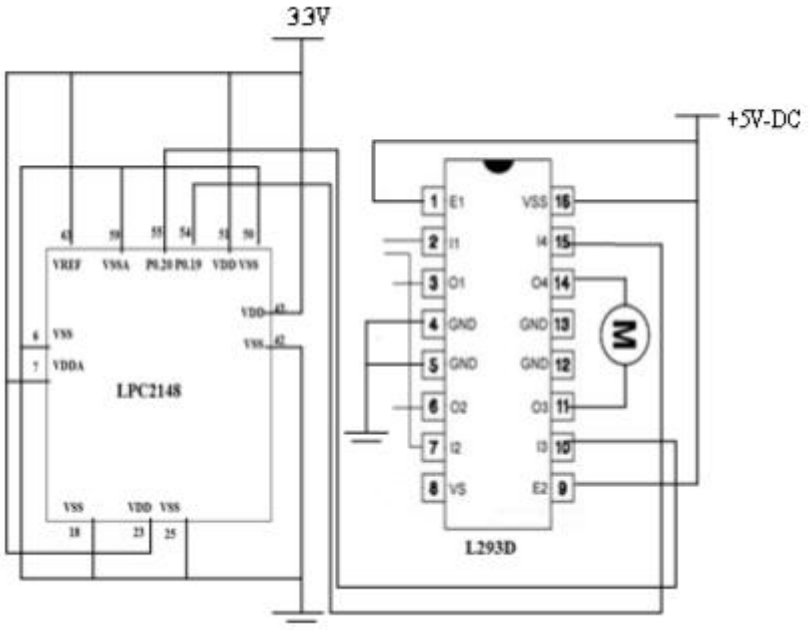
Dual-Band 900/ 1800 MHz GPRS multi-slot class 10/8 GPRS mobile station class B Control via AT commands (GSM 07.07, 07.05 and SIMCOM enhanced AT Commands) SIM application toolkit Supply voltage range: 3.2 ... 4.8V Low power consumption: 1.0mA(sleep mode) Operation temperature: -40°C to +85 °C.



2.2.4. Driver L293D:

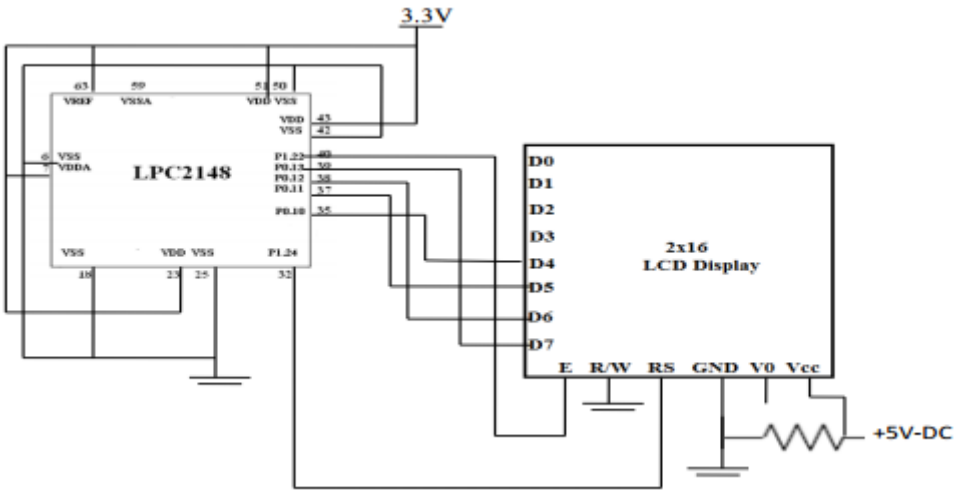
L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Dual H-bridge Motor Driver integrated circuit (IC).

The l293d can drive small and quiet big motors as well. It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, Hence H-bridge IC are ideal for driving a DC motor.



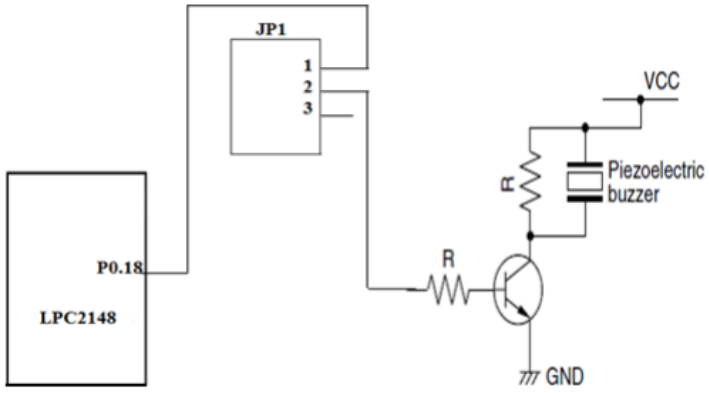
2.2.5. Liquid Crystal Display

LCD is a type of display used in digital watches and many portable computers. LCD displays utilize to sheets of polarizing material with a liquid crystal solution between them. An electric current passed through the liquid causes the crystals to align so that light cannot pass through them. LCD technology has advanced very rapidly since its initial inception over a decade ago for use in laptop computers. Technical achievement has resulted in brighter displace, higher resolutions, reduce response times and cheaper manufacturing process.



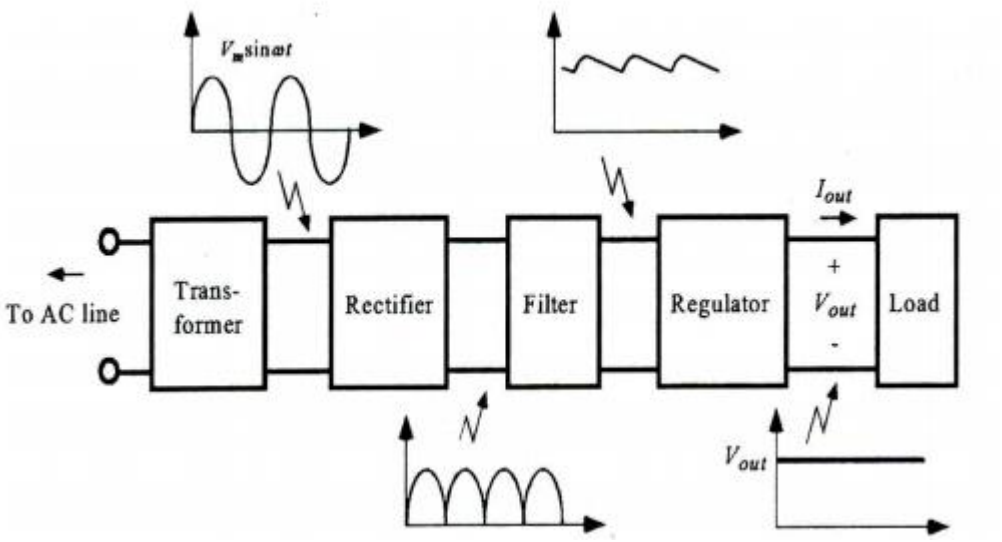
2.2.6. Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke.

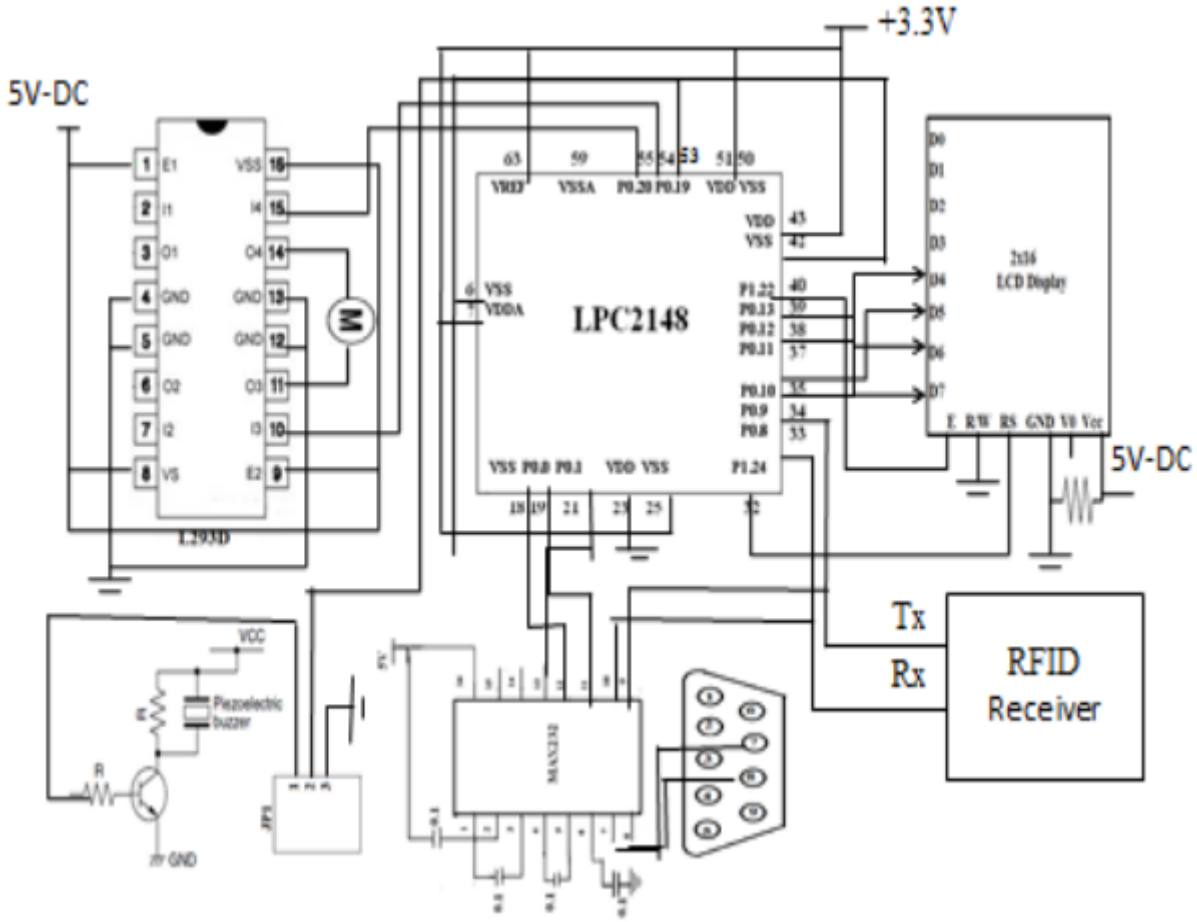


2.2.7. Regulated Power Supply

The power supply is designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can by broken down into a series of blocks, each of which performs a particular function. A d.c power supply which maintains the output voltage constant irrespective of a.c mains fluctuations or load variations is known as ―Regulated D.C Power Supply‖ .For example a 5V regulated power supply system as shown below:

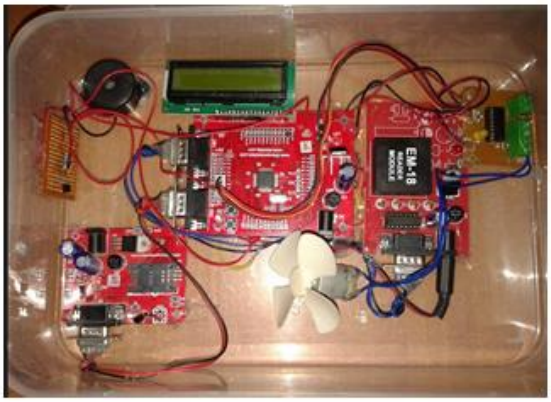


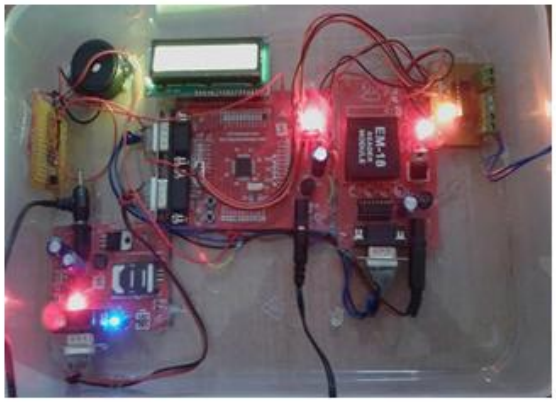
2.2.8. Overall Schematic:



2.3. Results & Analysis

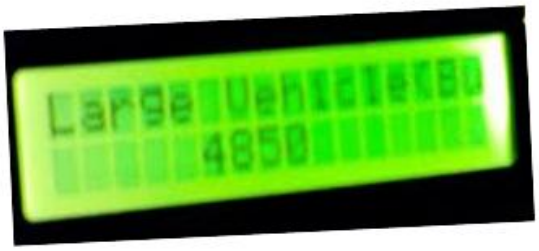
Below diagrams shows the circuit(hardware) setup of automatic toll detection system. programming is done using embedded c.





RFID tags with different vehicle categories are shown in below diagram. Amount will be deducted from the owners account based on the vehicle type.

Following diagrams shows vrious display mechanisms that can be processed through this project



3. Conclusion

3.0. Conclusion

Implementation of this project will enable to detect the money automatically near toll plazas. Money will be detected based on the type of the vehicle from the owner‘s account. This will reduce waiting time of vehicles at the toll plazas. Theft vehicles can also be identified with the help of presence of RFID tag in that vehicle.

This project will definitely provides a better solution for the challenges faced by the toll gate system in India such that it makes processing very easy.