Visvesvaraya Technological University

Belgaum, Karnataka-590 018

A Project Report on

"BIDIRECTIONAL ROTATION OF INDUCTION MOTOR WITH REMOTE CONTROL DEVICE"

Project Report submitted in partial fulfillment of the requirement for the award of the degree of

Bachelor of Engineering
In
Electrical & Electronics Engineering

Submitted by
NAYANA N(1CR16EE049)
SAYYED SANOBAR (1CR16EE071)
SONIKA A V(1CR16EE081)
SWAMI SHAILEJA ASHOK (1CR17EE415)

Under the Guidance of
KEKA MUKHOPADHYAYA
Assistant Professor, Department of Electrical & Electronics Engineering
CMR Institute of Technology

CMR Institute of Technology, Bengaluru-560 037

Department of Electrical & Electronics Engineering

2019-2020

CMR INSTITUTE OF TECHNOLOGY

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

AECS Layout, Bengaluru-560 037

Certificate

Certified that the project work entitled **"BIDIRECTIONAL ROTATION OF INDUCTION MOTOR WITH REMOTE CONTROL DEVICE"** carried out by Ms SONIKA A V, USN 1CR16EE081; Ms. NAYANA N, USN 1CR16EE049; Ms. SAYYED SANOBAR, USN 1CR16EE071; Ms. SWAMI SHAILEJA ASHOK, USN 1CR17EE415 are bonafied students of CMR Institute of Technology, Bengaluru, in partial fulfillment for the award of Bachelor of Engineering in Electrical & Electronics Engineering of the Visvesvaraya Technological University, Belgaum, during the year 2019-2020. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the Report deposited in the departmental library.

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

Signature of the Guide	*Signature of the HOD*	*Signature of the Principal*
Mr.KEKA MUKHOPADHYAYA Assistant Professor , EEE Department CMRIT, Bengaluru	Dr. K. Chitra Professor & HOD EEE Department CMRIT, Bengaluru	Dr. Sanjay Jain Principal, CMRIT, Bengaluru

External Viva

Name of the Examiners	Signature & Date
1.Mrs.Sanitha Michail.C	
2.Mr.Hemachandra G	

CMR INSTITUTE OF TECHNOLOY
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
AECS Layout, Bengaluru-560 037

DECLARATION

We, [Ms **NAYANA N (1CR16EE049),** Ms **SAYYED SANOBAR (1CR16EE071),** Ms **SONIKA A V (1CR16EE081),**Ms **SWAMI SHAILEJA ASHOK(1CR17EE415)],** hereby declare that the report entitled **"BIDIRECTIONAL ROTATION OF INDUCTION MOTOR WITH REMOTE CONTROL DEVICE"** has been carried out by us under the guidance of Ms. **KEKA MUKHOPADHYAYA, Assistant Professor,** Department of Electrical & Electronics Engineering, CMR Institute of Technology, Bengaluru, in partial fulfillment of the requirement for the degree of **BACHELOR OF ENGINEERING in ELECTRICAL & ELECTRONICS ENGINEERING**, of Visveswaraya Technological University, Belagaum during the academic year 2019-20. The work done in this report is original and it has not been submitted for any other degree in any university.

Place: Bengaluru
Date:30/05/2020

SONIKA A V(1CR16EE081)

NAYANA N(1CR16EE049)

SAYYEDSANOBAR(1CR6EE071)

SWAMI SHAILEJA ASHOK(1CR17EE415)

Abstract

The project is designed to drive an induction motor for the required application in forward and reverse directions using wireless technology. For an example, an exhaust fan can be used in both the directions to fresh air in and throw hot air out. This can be used in case of conventional exhaust a fan that rotates in one direction only. This proposed system demonstrates a technology to rotate a squirrel cage induction motor in both clockwise and counter clockwise direction. It also has the provision to control the direction of the motor using a wireless technology. In wireless technology Global System for Mobile (GSM) is used to control the direction of induction motor.

The proposed system it acts as multiple access technique. The proposed system simulation is validated under the proteous software. It contains power supply, controller, relay, AC motor. The proposed system is simulated with the commands input are given into virtual terminal and the three modes of operation are validated with the output of the controller. Controller executes the load to rotate “FORWARD” and “REVERSE” directions.

Acknowledgement

The satisfaction and euphoria that accompany the successful completion of any task would be incomplete without the mention of people, who are responsible for the completion of the project and who made it possible, because success is outcome of hard work and perseverance, but stead fast of all is encouraging guidance. So with gratitude we acknowledge all those whose guidance and encouragement served us to motivate towards the success of the project work.

We take great pleasure in expressing our sincere thanks to ***Dr. Sanjay Jain****,* ***Principal, CMR Institute of Technology, Bengaluru*** *for providing an excellent academic environment in the college and for his continuous motivation towards a dynamic career.*

We would like to convey our sincere gratitude to ***Dr. K Chitra****,* ***Head of Electrical and Electronics Engineering Department, CMR Institute of Technology, Bengaluru*** *for her invaluable guidance and encouragement and for providing good facilities to carry out this project work.*

We would like to express our deep sense of gratitude to ***Ms. Keka Mu*****khopadhyaya,** ***Assistant Professor, Electrical and Electronics Engineering, CMR Institute of Technology, Bengaluru*** *for his/her exemplary guidance, valuable suggestions, expert advice and encouragement to pursue this project work.*

We are thankful to all the faculties and laboratory staffs of ***Electrical and Electronics Engineering Department, CMR Institute of Technology, Bengaluru*** *for helping us in all possible manners during the entire period.*

Finally, we acknowledge the people who mean a lot to us, our parents, for their inspiration, unconditional love, support, and faith for carrying out this work to the finishing line. We want to give special thanks to all our friends who went through hard times together, cheered us on, helped us a lot, and celebrated each accomplishment.

Lastly, to the ***Almighty****, for showering His Blessings and to many more, whom we didn't mention here.*

CONTENTS

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

- Bidirectional rotation of an induction motor with a **remote control device** is basically a device that controls the rotation of a single phase ac motor in clock wise and anti clock wise direction. In conventional way, we cannot rotate the single phase ac motor in both direction as well as we can only control this motor with a single phase one way switch.
- In other words, if we want to control the motor in both direction then we must use any sort of motor drive, which could be so much costly, but it would be also operate with single phase one way switch. On concentrating these issues, here we have designed a device that is called a bidirectional rotation of an induction motor with a remote control device.
- This device controls the single phase ac motor in both direction forward and reverse with any type of common TV remote.
- This device has designed with help of single phase ac transformer, bridge rectifier, voltage regulator, IR sensors, single phase relay and microcontroller PIC18F452 belongs to pic family. This device is less costly, more compact and more reliable as compared to other motor drive devices.

1.1 Objectives of the device

- Main objective of this device is to be less costly, more compact and more reliable as compared to other motor drive devices.
- In other words if we want to control the motor in both direction then we must use any sort of motor drive, which could be so much costly.
- It is basically a device that controls the rotation of a single phase ac

motor in clock wise and anti clock wise direction with any type of common TV remote.

- Digital control of induction motors results in much more efficient operation of the motor, resulting in longer life and lower power dissipation.

1.2 Contribution to this project

- This project has replaced wired control technology by wireless technology in household appliances.
- This device is choosen for keeping cool, reliability and compactness in comparison to other electric drive.
- In case of industrial applications, its main objective is to make the rotation of the electric drives easier.
- In order to save on and off switching process this project can be implemented.
- Since this project mainly uses three modes of operation and even easier to design this device.
- In this project, the coding part contain control of both clockwise and anticlockwise rotation of motor.
- The main contributions to the components of this particular project, such as:
    - Requirements specifications.
    - Software design
    - Coding.
    - Debugging, etc.

CHAPTER 2

LITERATURE REVIEW

The electrical direction control has many economical as well as engineering advantages over mechanical direction control. Historically any industrial equipment have its speed change mechanically by means of the gear mechanism. With this proposed system, simply with the command inputs which are given to the input terminals validates and perform three modes of operations in accordance with the validated output of the controller and initially controller is being dumped with input commands inform of hexa-code. Hence the controller executes the load to rotate forward and reverse directions. And we are supposed to implement this technique on dc motor. Further it can extended to ac motors also.

The dc motors are in general much more adaptable speed drives than ac motors which are associated with a constant speed rotating field. Hence this speed of the motor can be controlled by changing the flux. This can be done by using flux control methods. In order to control the direction we are using Arduino micro controller which is being interfaced with the motor driver. Arduino controller is communicated with the IR sensors initially. The field of wireless communication has been in existence since, the first humans learn to communicate.

Now a day's all home appliances are preferred to control wired and wireless mechanism in our project proposed to control the direction of a dc motor high efficiency delivery from input dc to output supply.

CHAPTER 3

BLOCK DIAGRAM OF THE DEVICE

3.1 Block diagram

- The block diagram of this bidirectional rotation of an induction motor with a remote control device with all their essential components is shown in figure 1.

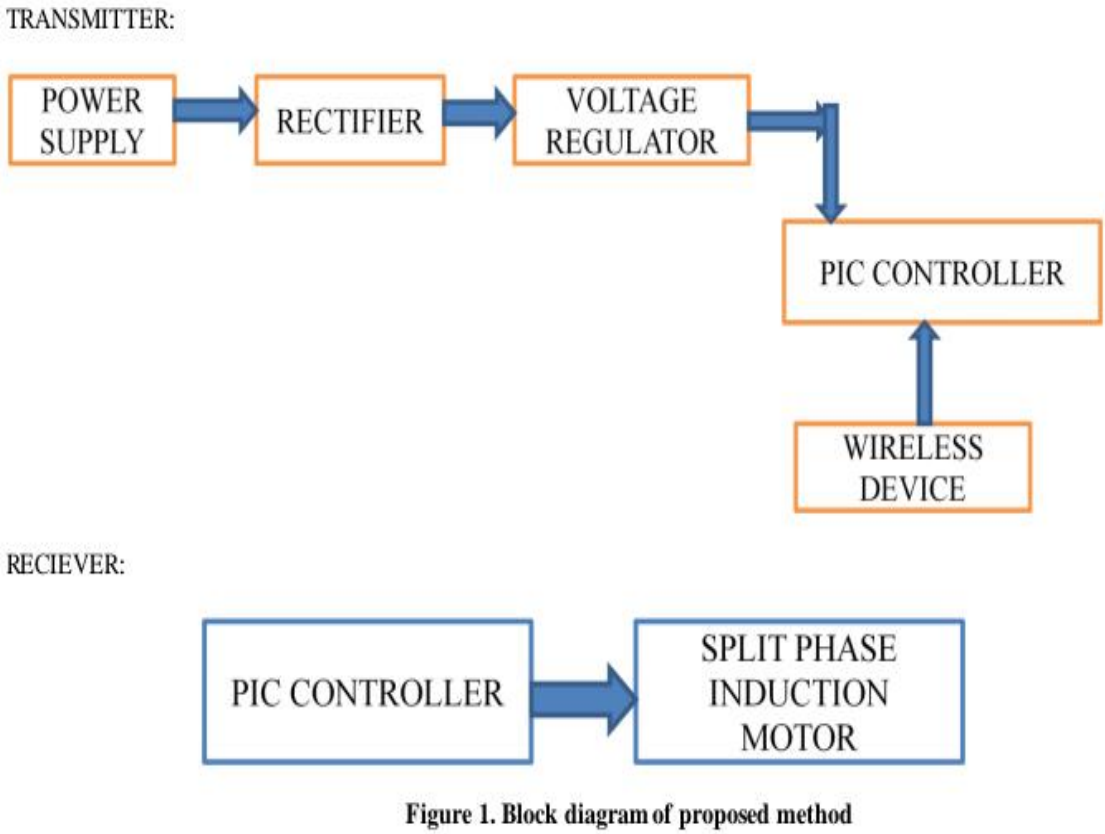

Figure 1. Block diagram of proposed method

- In the present time, in the most of the applications, AC machines are preferable over DC machines due to their simple and most robust construction without any mechanical commutators. Induction motors are the most widely used motors for appliances like industrial control, and automation; hence, they are often called the workhorse of the motion industry.

- As far as the machine efficiency, robustness, reliability, durability, power factor, ripples, stable output voltage and torque are concerned, three- phase induction motor stands at the a top of the order.

- Motor control is a significant, but often ignored portion of embedded applications. Motor control applications span everything from residential washing machines,

fans to hand-held power tools, and automotive window lift, traction control systems and various industrial drives.

- All most in all the applications there is a drastic move away from analog motor control to precision digital control of motors using different processors. Digital control of induction motors results in much more efficient operation of the motor, resulting in longer life, lower power dissipation.

- The field of wireless communications has been in existence since the first humans learned to communicate. In early days of civilization humans would transmit notices of important events, such as enemy invasions or royal births, through the sounding of horns or the lighting of fires.

- While simple messages could be effectively transmitted in this manner, in order to communicate over long distances the manpower expense was great, since watchtowers had to be built within sight of each other and continually manned, and the number of messages was small.

- Now days all home appliances are preferred to control wired and wireless mechanism. In our project we are proposed to control the direction of induction motor high efficiency deliver from input to output supply.

CHAPTER 4

PROPOSED MODEL

4.1 Components required

HARDWARE REQUIREMENTS:

Microcontroller, IR sensors, Relay Driver IC, Relays, Transformer, Diodes, Voltage regulator, Capacitors, LED, Resistors and Remote.

SOFTWARE REQUIREMENTS:

LANGUAGES: Embedded C.

4.2 Proposed Model of this Project

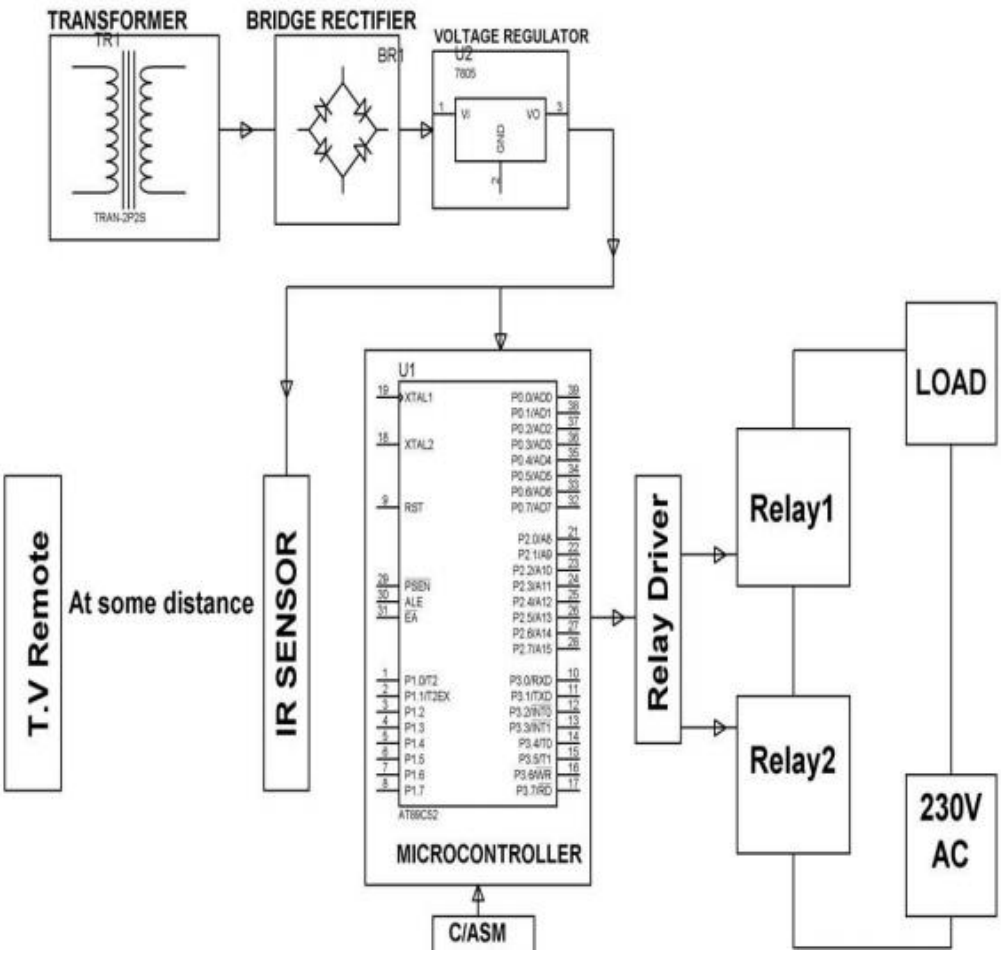

Figure 2: Model

4.3 DESCRIPTION OF COMPONENTS

4.3.1 TRANSFORMER: To step down the given voltage.

A Step down Transformer is a type of transformer, which converts a high voltage at the primary side to a low voltage at the secondary side.

If we speak in terms of the coil windings, the primary winding of a Step down Transformer has more turns than the secondary winding. The following image shows a typical step down transformer is shown in figure3.

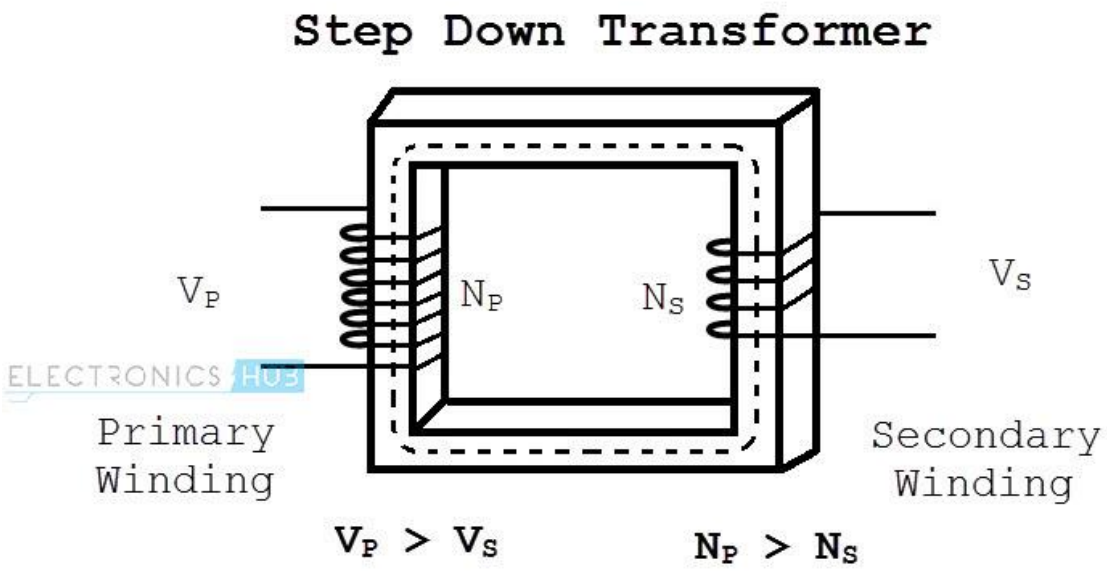

Figure 3: Step down transformer

4.3.2 BRIDGE RECIFIER:

A bridge rectifier circuit is a common part of the electronic power supplies. Many electronic circuits require rectified DC power supply for powering the various electronic basic components from available AC mains supply. We can find this rectifier in a wide variety of electronic AC power devices like home appliances, motor controllers, modulation process, welding applications, etc.

A Bridge rectifier is an Alternating Current (AC) to Direct Current (DC) converter that rectifies mains AC input to DC output. Bridge Rectifiers are widely used in power supplies that provide necessary DC voltage for the electronic components or devices.

They can be constructed with four or more diodes or any other controlled solid state switches is shown in figure 4.

Figure 4: Bridge Rectifier

4.3.3 BLOCKING DIODE: The blocking diode is a helpful tool for limiting the direction energy can flow through a wire to just one direction is shown in figure5.

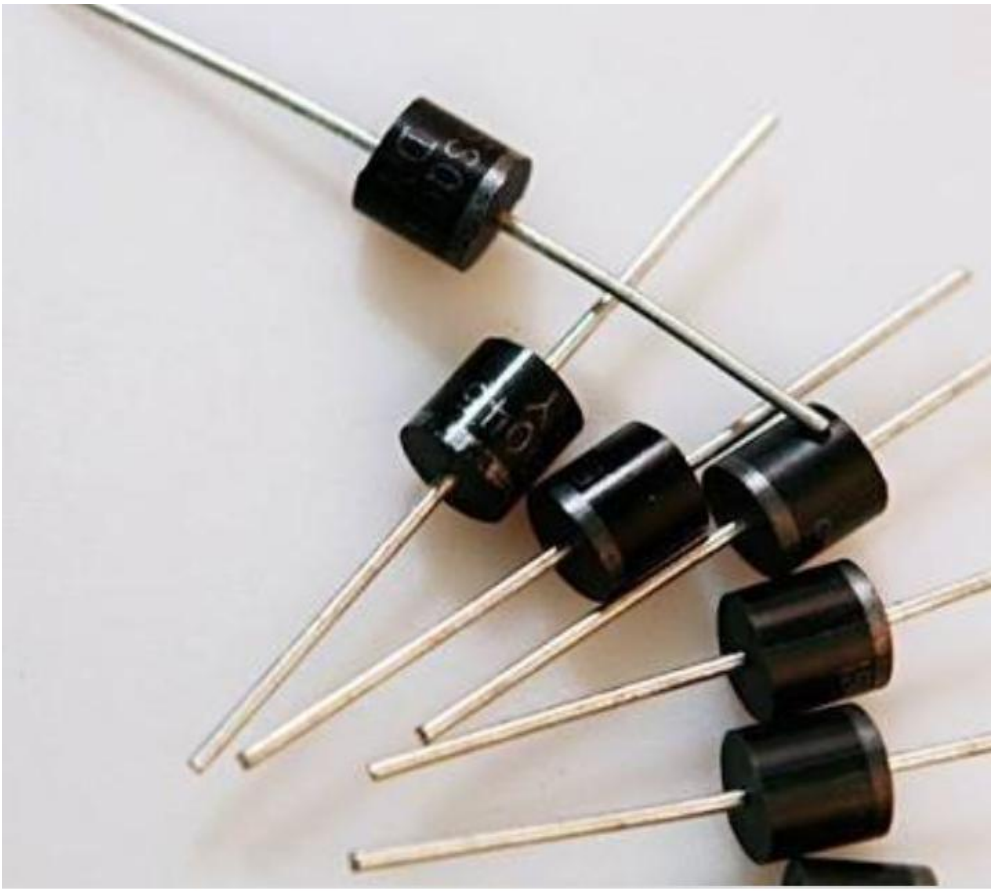

Figure 5:Blocking diode

4.3.4 VOLTAGE REGULATOR: A voltage regulator generates a fixed output voltage of a present magnitude that remains constant regardless of changes to its input voltage or load condition.

It compares the output voltage with a precise reference voltage and adjust the past device to maintain a constant output voltage is shown in figure6.

Figure 6:Voltage Regulator

4.3.5 MICROCONTROLLER:

Microcontrollers(PROGRAMMABLE INTERFACE CONTROLLERS) are electronic circuits that can be programmed to carry out a vast range of tasks. They can be programmed to be timers or to control a production line and much more.

These devices are popular with both industrial developers and hobbyists due to their low cost, wide availability, large user base, serial programming and reprogrammable flash-memory capability.

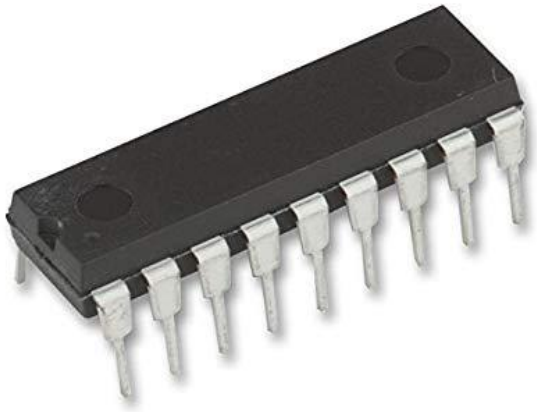

Figure 7:8-Bit Microcontroller

4.3.6 IR SENSORS: An IR red sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of the objects well as detects the motion. These type of sensors measure only infra-red radiations, rather than emitting it that is called a passive IR sensor.

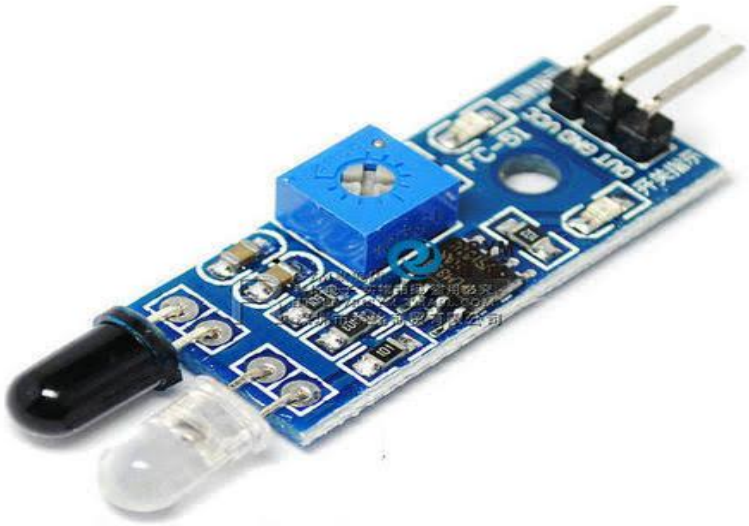

Figure 8: IR Sensor

4.3.7 INDUCTION MOTOR:

An INDUCTION MOTOR is AC electric motor in which the electric circuit is in the rotor needed to produce the torque is obtained by electro magnetic induction from the magnetic field of the stator winding. An INDUCTIN MOTOR can therefore be made without electrical connections to the rotor.

The MOTOR which works on the principle of electro magnetic induction is known INDUCTION MOTOR. The electro magnetic induction is the phenomenon in which the electro motive force induces across the electrical conductor when it is placed in rotating

magnetic field.
The stator and rotor are 2 essential parts of Motor, The stator is stationary part and carries overlapping windings while rotor carries main field windings.

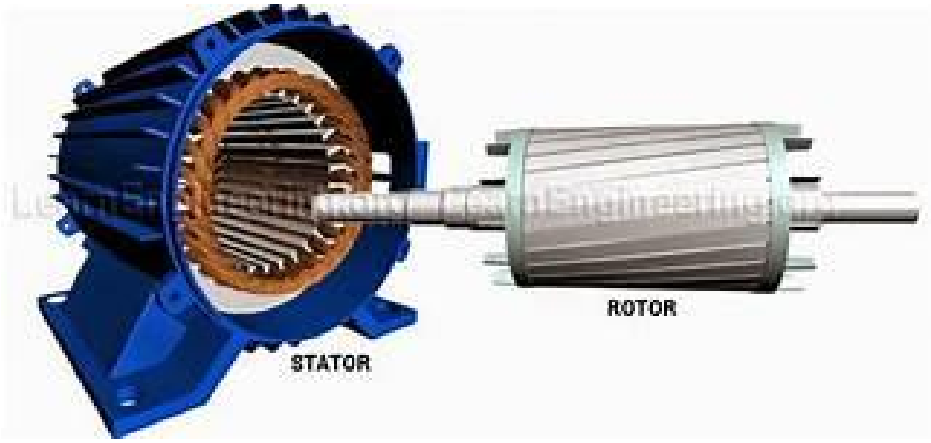

Figure 9: Induction Motor

4.3.8 RELAY:

It works on the principle of an electromagnetic attraction. When the circuit of the relay senses the fault current, it energises the electromagnetic field which produces the temporary magnetic field. This magnetic field moves the relay armature for the opening or closing the connections.
A relay is used to turn on and turn off a circuit by a low power signal, or where several circuits must be controlled by one signal. We know that most of the high-end industrial application devices have relays for their effective working.

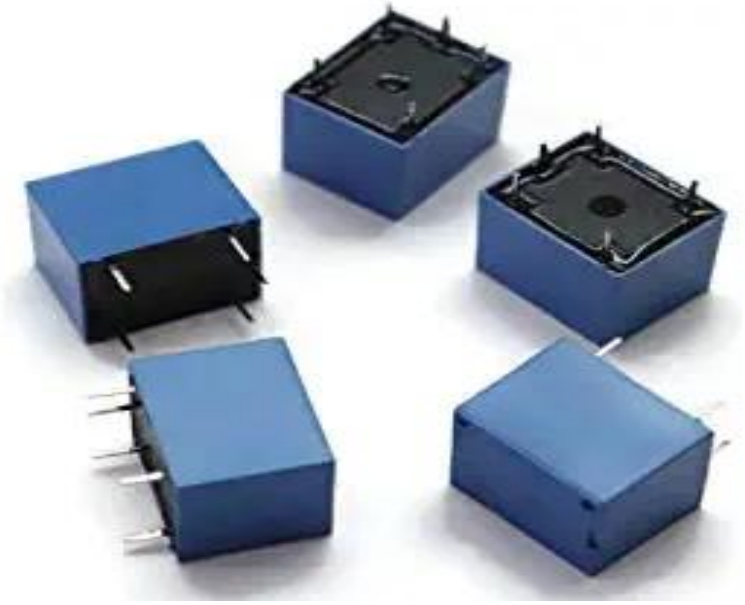

Figure 10: Relays

CHAPTER 5

DESIGN PROCESS

Working of Bidirectional Rotation of an Induction Motor with a Remote Control Device

- The working of this bidirectional rotation of an induction motor with a remote control device is very simple. For controlling the direction of rotation of any type of single phase ac induction motor such as exhaust fan or any motor, this device is connected in series with main supply of that specific single phase motor.
- This device mostly consists of electronic components which are operated at 5 or 6V dc. For making 5or 6V dc, main supply is stepped down to 6 or 9V ac with the help of single phase transformer then these voltages are converted into dc with the help of bridge rectifier. After that, these voltages are regulated into 5V dc with the help of voltage regulator.
- From these regulated voltages the pic microcontroller and IR sensors are powered up. Microcontroller is the main controller of this device. It is programmed in c language with the help of micro/c software.IR sensor are basically the infrared sensors which can be operate with any type of TV remote.
- When TV remote switch is pressed then IR sensors are switched on. When these are switched on, then these gives the logic high signal to pic microcontroller. Then microcontroller efficiently control the direction of rotation of split phase induction motor.
- Split phase induction motor is directly powered up with 230V ac, but its control circuit is made on or off through microcontroller.
- In this bidirectional rotation of an induction motor control device, we have configured the remote switch no.1 for forward direction of rotation of motor, switch no.2 for stop and switch no.3 for reverse direction of rotation of split phase induction motor. This have only done for make the convenient for user interface.

- Two relays have been used for making on or off the split phase induction motor. These relays are derived through relay driver IC ULN 2803.
- ULN 2803 is a high voltage, high current transistor array IC used especially with microcontrollers where we need to drive high power loads. This IC is widely used to drive high loads such lamps, relays, motors, etc. It is usually rated at 50v/500mA.
- As we know it consists of seven NPN Darlington Pairs that functions as an inverter. If the logic at input 1B(pin 1) is high then the output at its corresponding pin 1C (pin 16) will be low.

CHAPTER 6

SOFTWARE CODE

6.1 Algorithm

Algorithm:

- Start.
- Declare the function delay to generate the delay.
- Then declare enabler, motor1, motor2 variables.
- For the rotation of motor in clockwise direction: motor1=1 and motor2=0.
- For the rotation of motor in anti-clockwise direction: motor1=0 and motor2=1.
- Call the delay function.
- Stop.

In delay function:

- Start.
- Declare integer variables x and y.
- By using for loop we can generate delay.

Operation:

If we connect the motor to H-bridge circuit then,

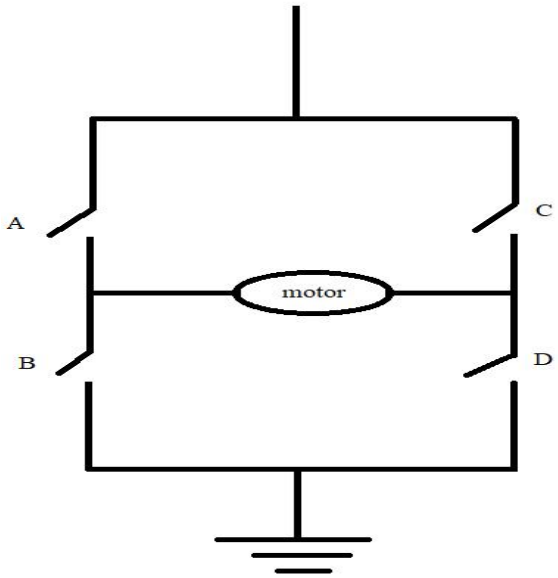

Figure 11: H-Bridge Circuit

- If “A” and “D” are activated then motor rotates clockwise.
- If “B” and “C” are activated then motor rotates anti-clockwise.

6.2 Flow Chart

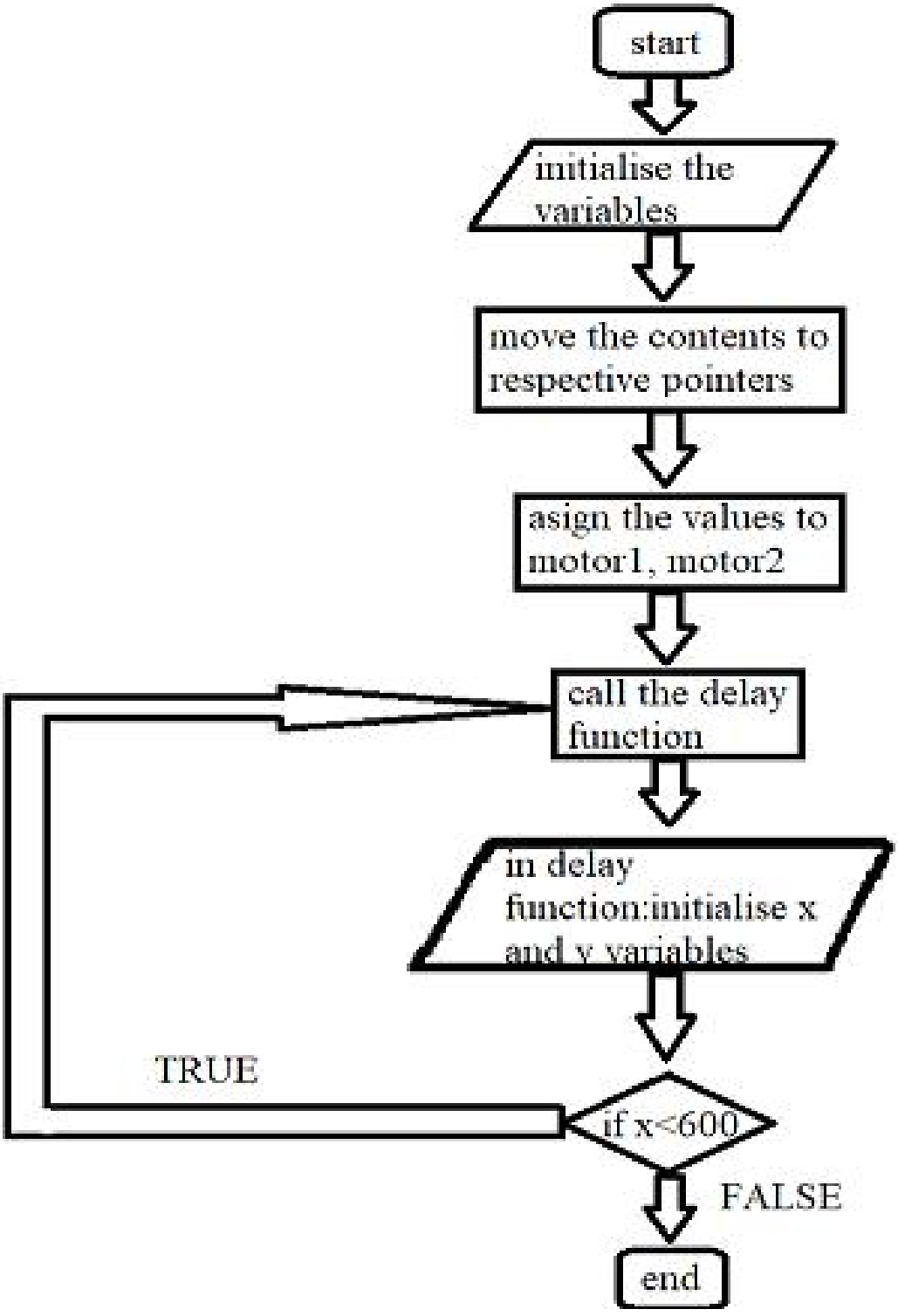

Figure 12: Flow Chart

6.3 Program

▶ For Clockwise Rotation:

```
#include<reg51.h>
void delay (unsigned int);
 Sbit enabler=PO^6;
 Sbit motor1=PO^7;
 Sbit motor2=PO^4;
 void main()
  {
    while (1)
      {
         enabler =1;
        motor1=1;
        motor2=0;
        delay(100);
      }
   }
void delay( unsigned int value)
 {
  unsigned int x , y;
  for(x=0; x<600; x++)
  for(y=0; y<=value; y++);
 }
```

▶ For Anti-clockwise Rotation:

```
#include<reg51.h>
void delay (unsigned int);
Sbit enabler=PO^6;
Sbit motor1=PO^7;
Sbit motor2=PO^4;
 void main()
 {
   while (1)
     {
       enabler =1;
       motor1=0;
       motor2=1;
       delay(100);
     }
  }
void delay( unsigned int value)
 {
   unsigned int x , y;
   for(x=0; x<600; x++)
   for(y=0; y<=value; y++);
 }
```

CHAPTER 7

ADVANTAGES AND APPLICATIONS

Applications and Advantages of Bidirectional Rotation of an Induction Motor with a Remote Control Device are:

1. By using this bidirectional rotation of an induction motor with a remote control device the user can easily rotate the split phase induction motor in either direction.

2. This bidirectional rotation of an induction motor device could be easily used with domestic and industrial exhaust fans for fresh air in and hot air throw out

3. By using bidirectional rotation of an induction motor device, the user can easily on or off the split phase inducing motor with some distance without wasting any time.

CHAPTER 8

CONCLUSIONS

- This proposed system demonstrate a technology to rotate a squirrel cage induction motor in both clockwise and counter clockwise direction.
- It also has the provision to control direction of the motor using a T.V remote.
- In future, it can further be enhanced by controlling the operation of induction motor using thyristors in place of relays for noise free operation.

CHAPTER 9

RESULTS AND DISCUSSIONS

- It is observed that when supply is switched on, the motor starts rotating in clockwise direction, and on pressing the push button present on the TV remote enables the motor to rotate in anti-clockwise direction. Using the microcontroller program enables the motor to rotate in both directions (clockwise and anticlockwise direction).

- It is simpler compared to other methods of rotating motors, flexible in design, lighter in weight and suitable for low power applications.

- In future this idea can be implemented by using ac motors to control the rotation motor in both directions.