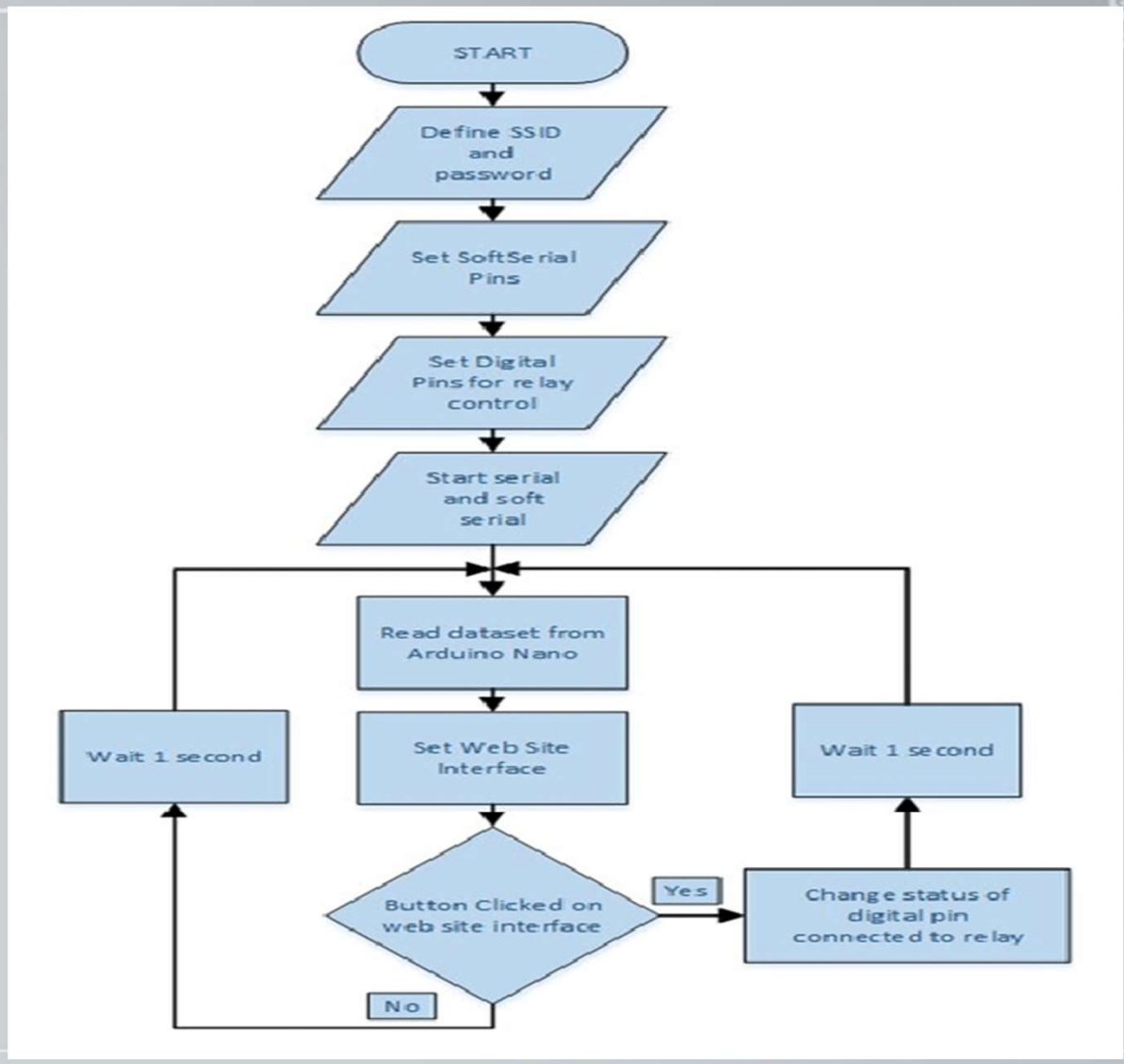
IoT Based DC Motor Control

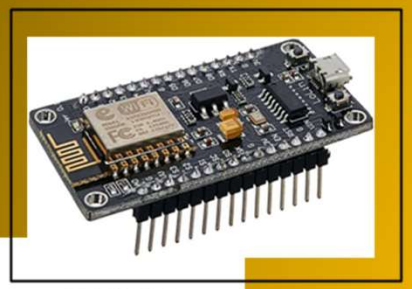
Introduction:

Internet was used in the earlier times only for basic communication and information sharing.However, the evolution of internet has brought about a boom in the world by the concept of Internet of Things. Today the power of internet is applied for doing many tasks like controlling a remotely placed server machine from anywhere in the globe. Supported by the internet, came the concept of smartphones which have aided the same by a great extent. Application specific android applications have been developed which perform tasks and minimize the human effort by a great extent. The proposed system allows the control person to control the system just by a click on his smart-phone. Alternatively, personal computers can also be used for the same. The system consists of very simple and easy to use equipment's which can handle tasks as big as controlling the traction of any machinery using the concept of Internet of Things (IOT).

Flowchart:


START
Define SSID and password
Set SoftSerial Pins
Set Digital Pins for relay control
Start serial and soft serial
Read dataset from Arduino Nano
Set Web Site Interface
Button Clicked on web site interface
Yes
No
Change status of digital pin connected to relay
Wait 1 second
Wait 1 second

Block Diagram / Setup:



Circuitry

Server

(Interrupt signal through Arduino)

DC Motor

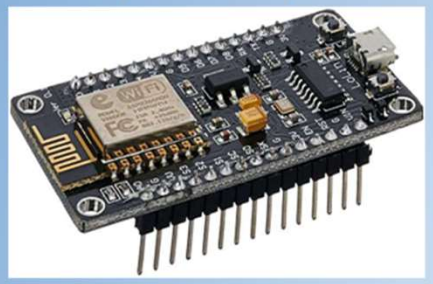
PC / Mobile / Laptop

Theory:

The core concept of IoT is that everyday objects can be equipped with identifying, sensing, networking and processing capabilities that will allow them to communicate with one another and with other devices and services over the Internet to achieve some useful objective . In future, there will be intelligent applications for smarter homes and offices, smarter transportation systems, smarter hospitals, smarter enterprises and factories . IoT holds the promise of improving people's lives through both automation and augmentation. The capabilities offered by the IoT can save people and organizations time and money as well as help improve decision making and outcomes in a wide range of application areas

Hardware Used:

1. Node MCU (ESP8266)



2. Jumper wires & LED

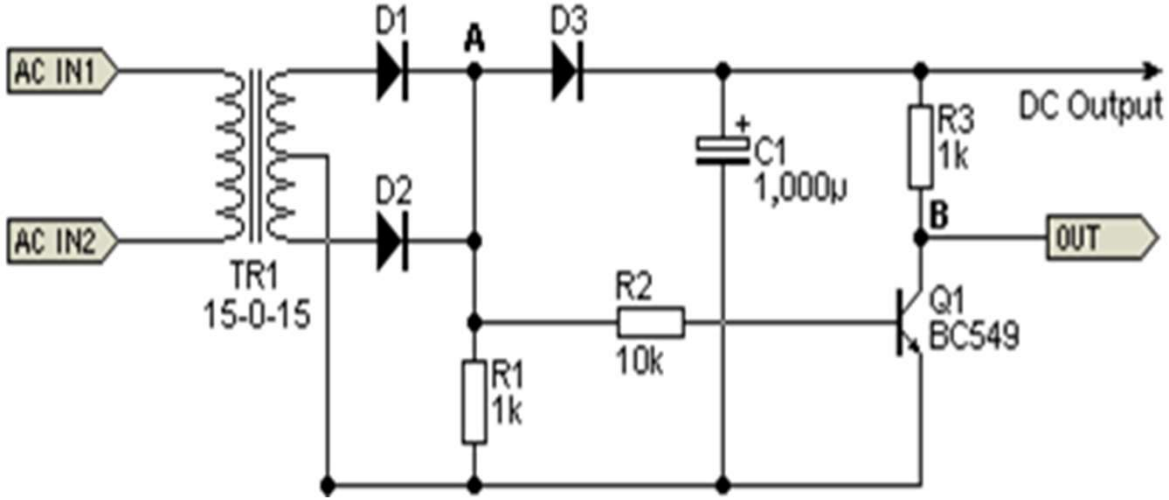
3.Speed Controlling Device

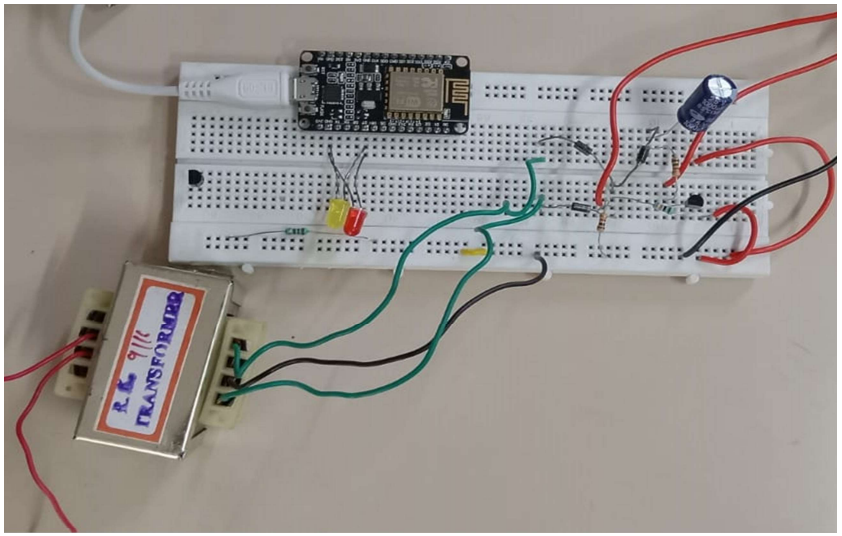
4.Data & Arduino cable

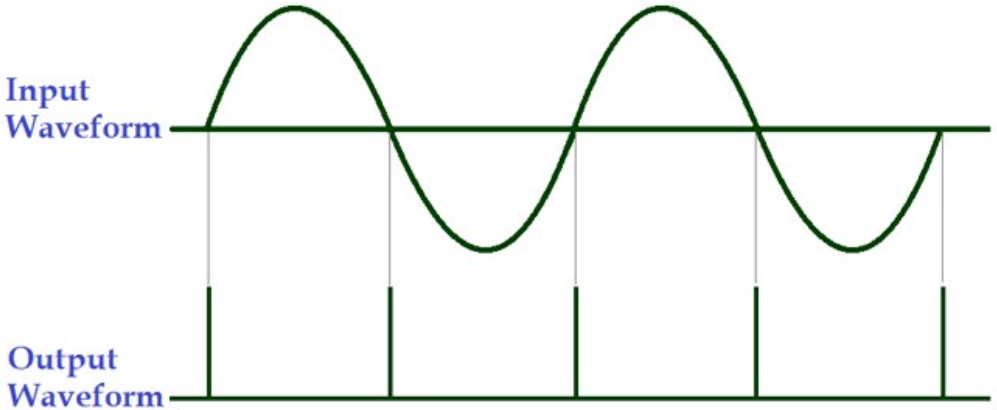
5. Arduino UNO

6. DC motor

Zero crossing circuit :

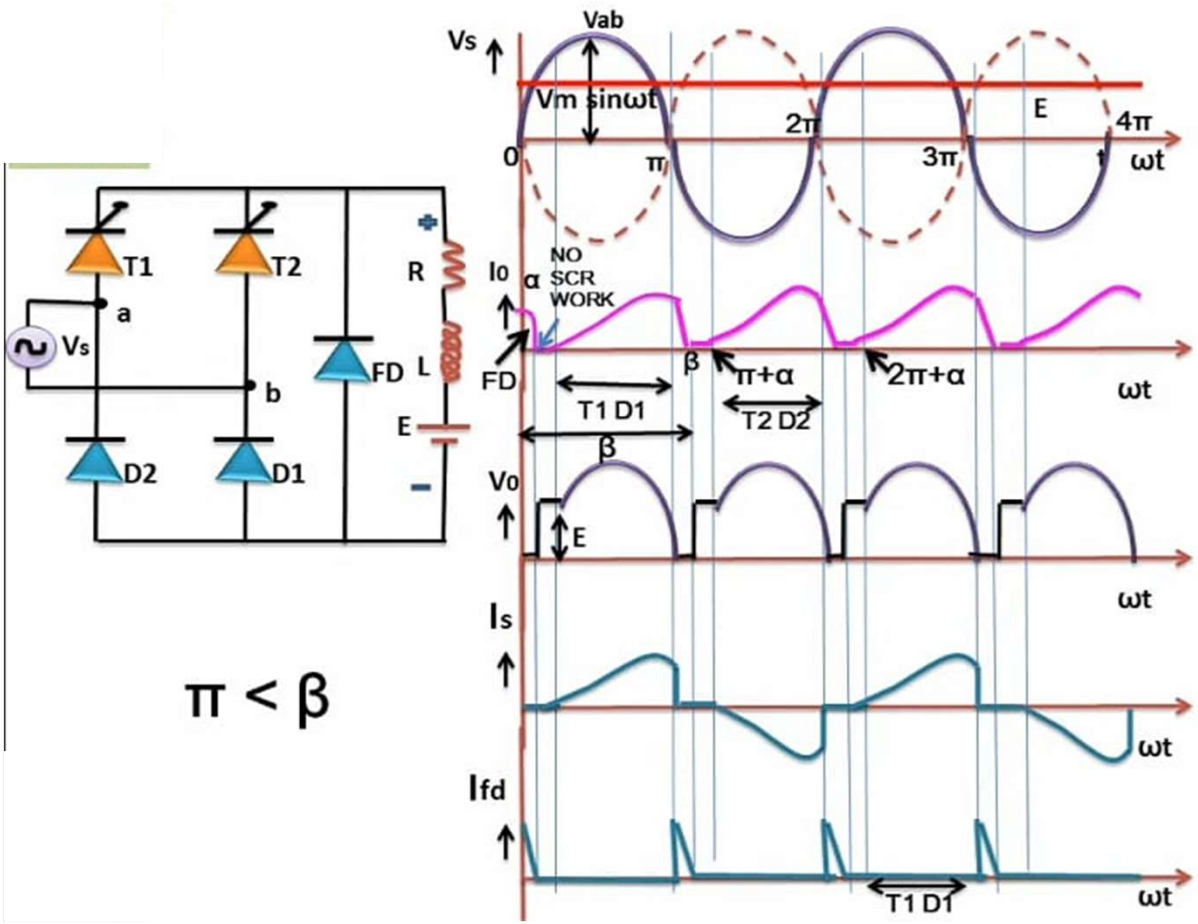


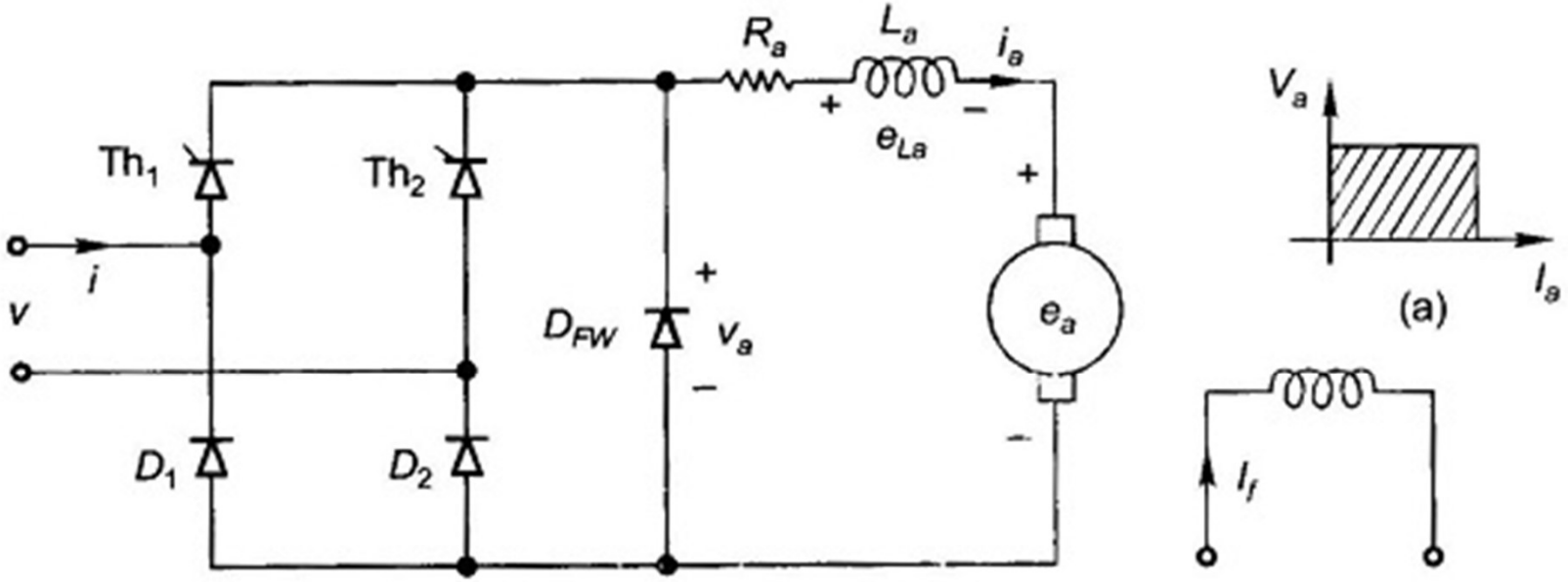




```
#define pot A0
byte ZC = 0;
uint16_t alpha;
 void setup(void) {
  pinMode(9,  OUTPUT);
  pinMode(10, OUTPUT);
  digitalWrite(9,  LOW);
  digitalWrite(10, LOW);

  OCR1A = 50;
  OCR1B = 50;
  TCCR1B = 0x02;
  TCCR1A =  0;
  attachInterrupt(0, ZC_detect, RISING);
}
bool debounce() {
  byte count = 0;
  for(byte i = 0; i < 5; i++)
  {if( digitalRead(2) )
      count++;
      delayMicroseconds(5);
  }
  if(count > 3)
    return 1;
  return 0;
}
```

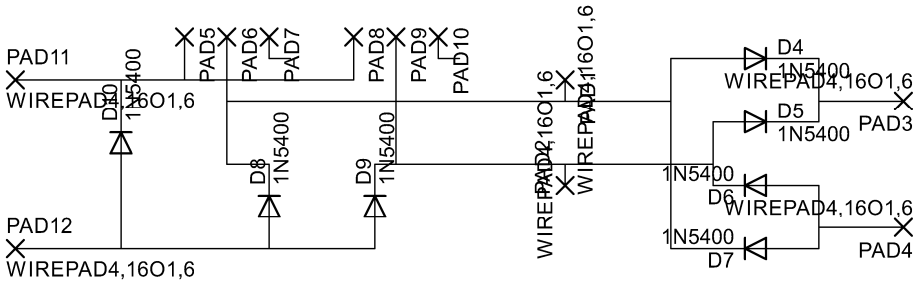
```
void ZC_detect() {
  TCCR1A =  0;
  digitalWrite(9,  LOW);
  digitalWrite(10, LOW);
 if( debounce() )
    ZC = 1;
  else
    ZC = 2;
}
 void loop() {
  if(ZC != 0)
  {   if(alpha < 9500) {
      delayMicroseconds(alpha);
      TCCR1A = (ZC == 1) ? 0x81 : 0x21;}
    ZC = 0;
    alpha = ( 1023 - analogRead(pot) ) * 10;
    if(alpha > 9500)
      alpha = 9500;
    } }
```

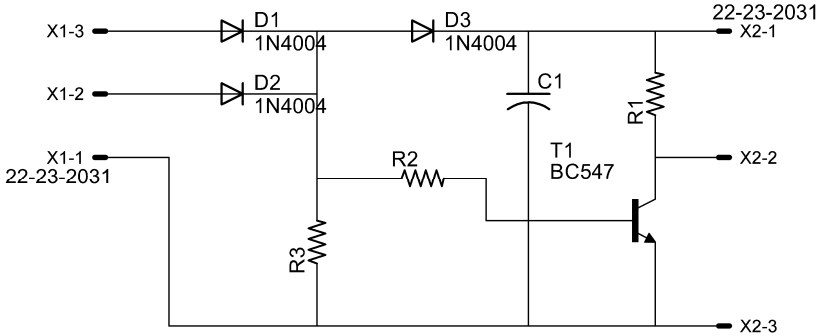

T1
T2
R
a
Vs
FD
L
b
E
D2
D1
π < β
Vs
Vab
Vm sinωt
0
π
2π
3π
4π
E
t
ωt
Io
α
NO
SCR
WORK
FD
β
π+α
2π+α
T1 D1
T2 D2
β
Vo
E
ωt
Is
ωt
Ifd
T1 D1
ωt

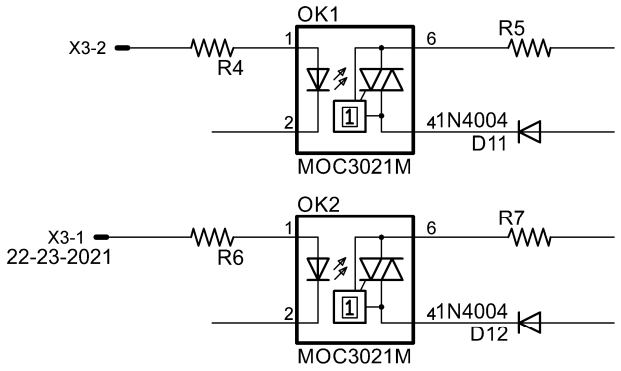


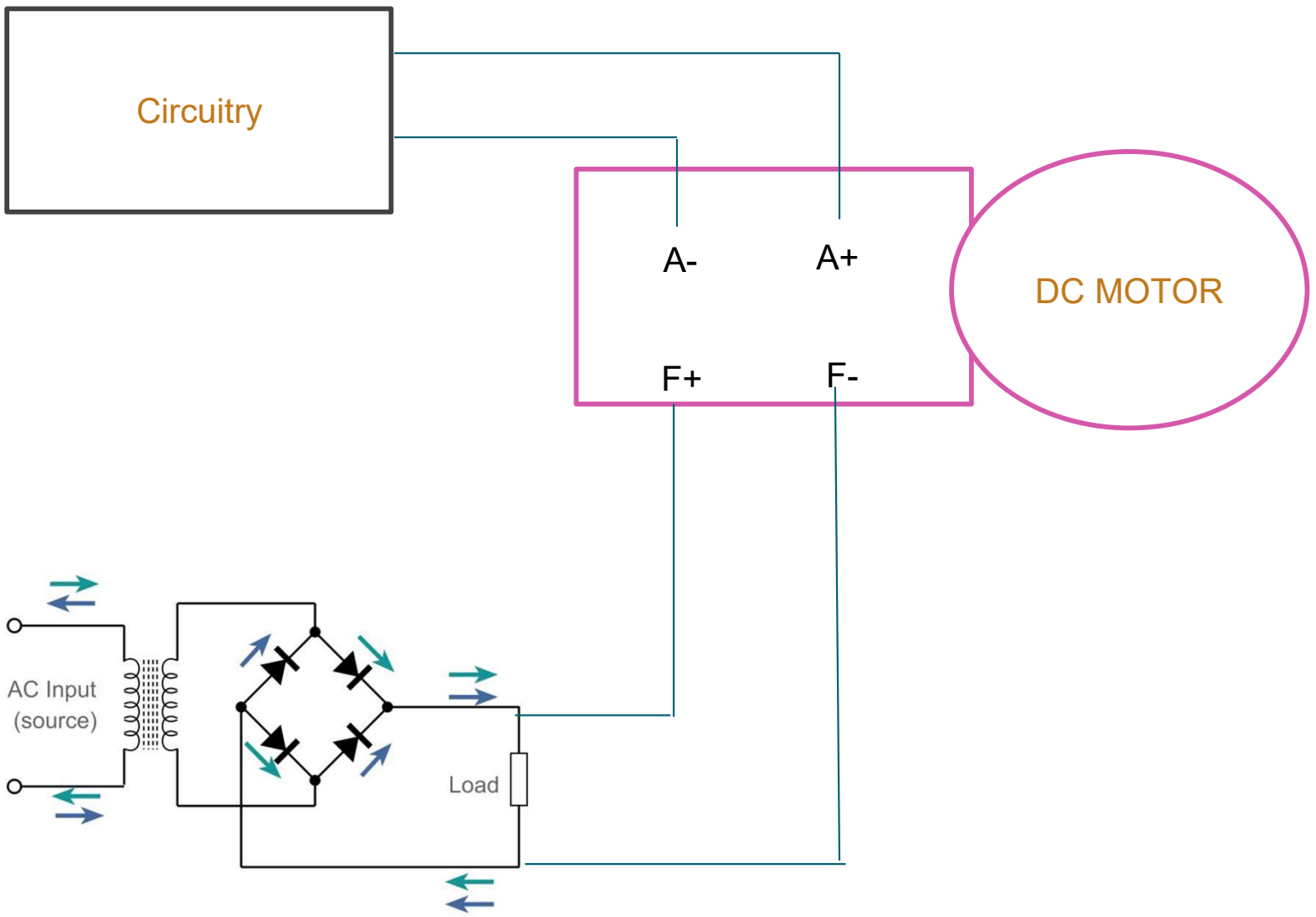
(b) Semi-converter feeding a separately excited dc motor

Fig 11.15


PAD11
WIREPAD4,16O1,6
PAD12
WIREPAD4,16O1,6
PAD5
PAD6
PAD7
PAD8
PAD9
PAD10
D10
1N5400
D8
1N5400
D9
1N5400
D4
1N5400
D5
1N5400
D6
1N5400
D7
1N5400
PAD3
PAD4


X1-3
X1-2
X1-1
22-23-2031
D1
1N4004
D2
1N4004
D3
1N4004
C1
R1
R2
R3
T1
BC547
22-23-2031
X2-1
X2-2
X2-3

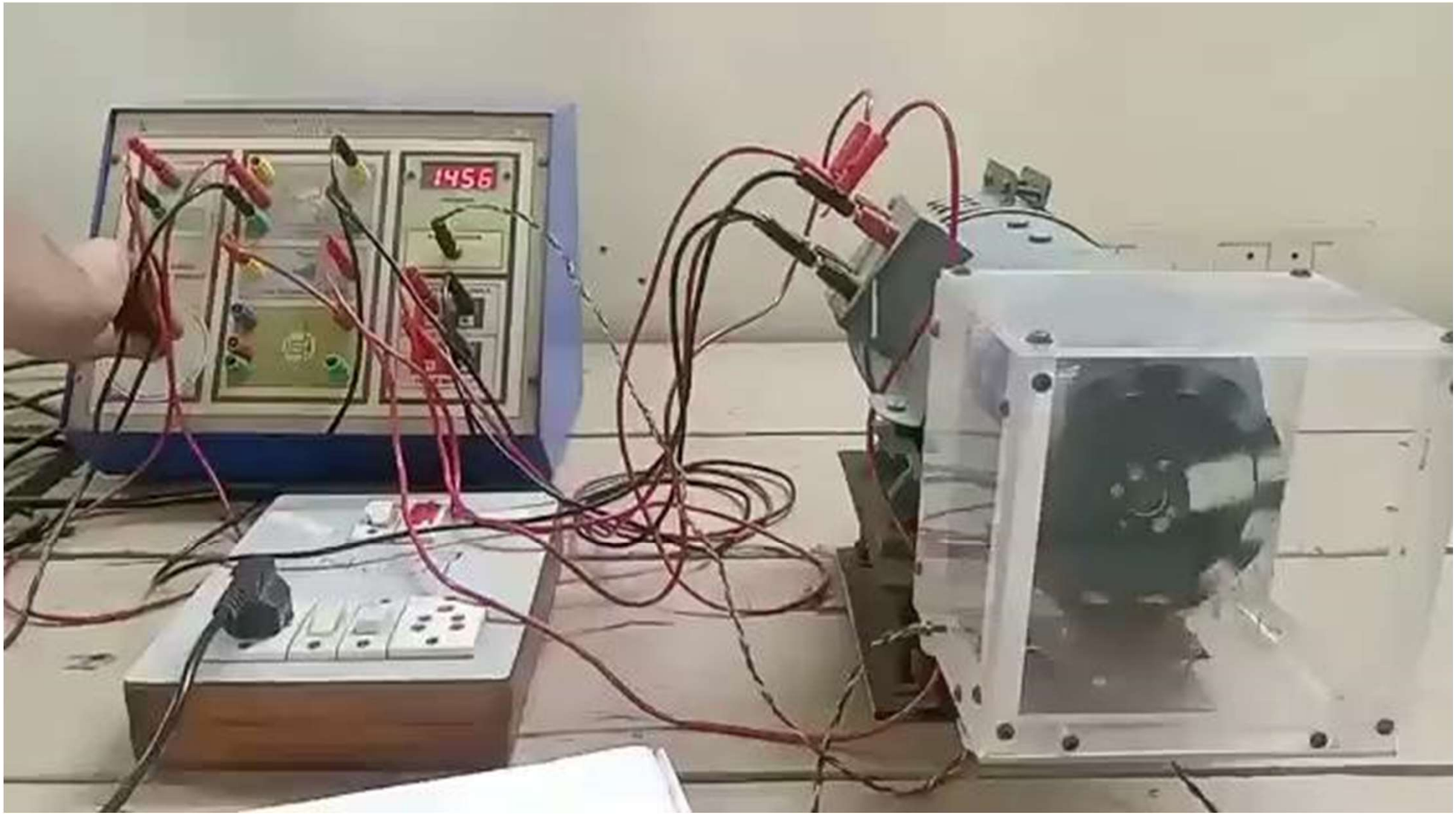

X3-2
R4
OK1
MOC3021M
R5
D11
X3-1
22-23-2021
R6
OK2
MOC3021M
R7
D12


Circuitry
A-
A+
DC MOTOR
F+
F-
AC Input
(source)
Load

ESP-8266 Code to control LED

```
#include "ThingSpeak.h"                  //INCLUDING ThingSpeak lib. and ESP lib.
#include <ESP8266WiFi.h>

const char* ssid     = "SSID";//Replace with your Wifi Name
const char* password = "Password";// Replace with your wifi Password

unsigned long channel =(*****Enter your channel id);
unsigned int led1 = 1;

WiFiClient  client;
void setup()
{
  Serial.begin(115200);  // Used for serial communication.
  delay(100);

  pinMode(D4, OUTPUT);    // LED pin D4 declared

  digitalWrite(D4, 0);  // We start by connecting to a WiFi network
  Serial.println();
  Serial.println();
  Serial.print("Connecting to ");
  Serial.println(ssid);
  WiFi.begin(ssid, password);

  while (WiFi.status() != WL_CONNECTED)
  {
    delay(500);
    Serial.print(".");
  }

  Serial.println("");                              //USED FOR WIFI CONNECTION !
  Serial.println("WiFi connected");
  Serial.println("IP address: ");
  Serial.println(WiFi.localIP());
```

```
  Serial.print("Netmask: ");
  Serial.println(WiFi.subnetMask());
  Serial.print("Gateway: ");
  Serial.println(WiFi.gatewayIP());
  ThingSpeak.begin(client);

}

void loop()

{
  int statusCode = 0;          //get the last data of the fields
  int led_1 = ThingSpeak.readFloatField(channel, led1);
  statusCode = ThingSpeak.getLastReadStatus();
  if(statusCode == 200)
   {
    if(led_1 == 1)
      {
      digitalWrite(D4, HIGH);                                    //USED TO GET REQUEST FROM CLOUD AND ON/OFF LED.
      Serial.println("LIGHT is On");
      }
    else if(led_1 == 0)
      {
      digitalWrite(D4, LOW);
      Serial.println("LIGHT is Off");
      }
    Serial.print("The latest data from led_1 received is : ");
    Serial.println(led_1);
  }
   else
  {Serial.println("Problem reading channel. HTTP error code " + String(statusCode));
  }
  delay(10000);
}
```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Advantages:

1. Data communication from the field over a secure network is a breeze. An IoT-enabled speed control and monitoring system can transfer data economically across the IoT network.
2. IoT software for monitoring facilitate remote functioning and speed regulation of the motor. It minimizes motor downtime by early fault detection and therefore reduces damage expenses of the motor.
3. IoT ensures uninterrupted industrial processes and avoids overloading and over-current in the motor, resulting in high temperatures. It prevents system failures with automatic 'start and stop' functions.

Disadvantages:

1. They rely heavily on the internet and are unable to function effectively without it.
2. Hackers may gain access to the system and steal personal information. Since we add so many devices to the internet, there is a risk that our information as it can be misused.
3. Unskilled workers are at a high risk of losing their jobs, which could lead to unemployment. Smart surveillance cameras, robots ,Smart washing machines, and other facilities are replacing security guards, maids, and dry-cleaning services etc.

Conclusion:

In the future lot of scope is there for IoT applications. Worldwide wide all overuse the IoT application for human life sophisticated. In 2025 millions of things connect to the cloud. A lot of research also done on IoT and it's more uses for human life's easiest purpose. Some research works on defense services for security and surveillance, some on automatic vehicle control and traffic signal control, some on the medical field for body control and health care, some on electronic devices, smart home, etc.