**APPENDIX**

**ARDUINO CODE:**

**Traffic control system:**

int Lane1[] = {13,12,11}; // Lane 1 Red, Yellow and Green

int Lane2[] = {10,9,8};// Lane 2 Red, Yellow and Green

int Lane3[] = {7,6,5};// Lane 3 Red, Yellow and Green

int Lane4[] = {4,3,2};// Lane 4 Red, Yellow and Green

void setup()

{

for (int i = 0; i < 3; i++)

{

pinMode(Lane1[i], OUTPUT);

pinMode(Lane2[i], OUTPUT);

pinMode(Lane3[i], OUTPUT);

pinMode(Lane4[i], OUTPUT);

}

for (int i = 0; i < 3; i++)

{

digitalWrite(Lane1[i], LOW);

digitalWrite(Lane2[i], LOW);

digitalWrite(Lane3[i], LOW);

digitalWrite(Lane4[i], LOW);

}

}

void loop()

{

digitalWrite(Lane1[2], HIGH);

digitalWrite(Lane3[0], HIGH);

digitalWrite(Lane4[0], HIGH);

digitalWrite(Lane2[0], HIGH);

delay(7000);

digitalWrite(Lane1[2], LOW);

digitalWrite(Lane3[0], LOW);

digitalWrite(Lane1[1], HIGH);

digitalWrite(Lane3[1], HIGH);

delay(3000);

digitalWrite(Lane1[1], LOW);

digitalWrite(Lane3[1], LOW);

digitalWrite(Lane1[0], HIGH);

digitalWrite(Lane3[2], HIGH);

delay(7000);

digitalWrite(Lane3[2], LOW);

digitalWrite(Lane4[0], LOW);

digitalWrite(Lane3[1], HIGH);

digitalWrite(Lane4[1], HIGH);

delay(3000);

digitalWrite(Lane3[1], LOW);

digitalWrite(Lane4[1], LOW);

digitalWrite(Lane3[0], HIGH);

digitalWrite(Lane4[2], HIGH);

delay(7000);

digitalWrite(Lane4[2], LOW);

digitalWrite(Lane2[0], LOW);

digitalWrite(Lane4[1], HIGH);

digitalWrite(Lane2[1], HIGH);

delay(3000);

digitalWrite(Lane4[1], LOW);

digitalWrite(Lane2[1], LOW);

digitalWrite(Lane4[0], HIGH);

digitalWrite(Lane2[2], HIGH);

delay(7000);

digitalWrite(Lane1[0], LOW);

digitalWrite(Lane2[2], LOW);

digitalWrite(Lane1[1], HIGH);

digitalWrite(Lane2[1], HIGH);

delay(3000);

digitalWrite(Lane2[1], LOW);

digitalWrite(Lane1[1], LOW);

}

**ARDUINO CODE FOR CO2:**

int sensorValue;

int pin8 = 8;

int digitalvalue;

int pin3 = 3;

void setup()

{

Serial.begin(9600);

pinMode(pin8, OUTPUT);

pinMode(pin3, INPUT);

Serial.println("CLEARDATA");

}

void loop()

{

sensorValue = analogRead(0);

Serial.print(sensorValue, DEC);

Serial.print("DATA,TIME,");

Serial.print("");

Serial.print(",");

Serial.println("LABEL,Computer Time,Time (Milli Sec.),");

// prints the value read

Serial.println("ppm");

Serial.println(sensorValue);

if (sensorValue > 500) {

// Activate digital output pin 8 - the LED will light up

digitalWrite(pin8, HIGH);

Serial.println("LABEL,Computer Time,Time (Milli Sec.),");

}

else {

// Deactivate digital output pin 8 - the LED will not light up

digitalWrite(pin8, LOW);

}

delay(1000);

}

**ARDUINO CODE FOR AMMONIA**

#define RL 47 //The value of resistor RL is 47K

#define m -0.263 //Enter calculated Slope

#define b 0.42 //Enter calculated intercept

#define Ro 20 //Enter found Ro value

#define MQ\_sensor A0

//Sensor is connected to A4

#include <LiquidCrystal.h>

const int rs = 8, en = 9, d4 = 10, d5 = 11, d6 = 12, d7 = 13; //Pins to which LCD is connected

LiquidCrystal lcd(rs, en, d4, d5, d6, d7);

int sensorValue;

int digitalValue;

void setup()

{

{

Serial.begin(9600);

Serial.println("CLEARDATA");

}

lcd.begin(16, 2); //We are using a 16\*2 LCD display

lcd.print("NH3 in PPM"); //Display a intro message

lcd.setCursor(0, 1); // set the cursor to column 0, line 1

lcd.print("-CircuitDigest"); //Display a intro message

delay(1000); //Wait for display to show info

lcd.clear(); //Then clean it

}

void loop()

{

Serial.println("LABEL,Computer Time,Time (Milli Sec.),Volt ,VRL,R0");

float analog\_value;

Serial.print("DATA,TIME,");

Serial.print(sensorValue);

float VRL; //Voltage drop across the MQ sensor

float Rs; //Sensor resistance at gas concentration

float ratio; //Define variable for ratio

VRL = analogRead(MQ\_sensor)\*(5.0/1023.0); //Measure the voltage drop and convert to 0-5V

Rs = ((5.0\*RL)/VRL)-RL; //Use formula to get Rs value

ratio = Rs/Ro; // find ratio Rs/Ro

float ppm = pow(10, ((log10(ratio)-b)/m));

Serial.print("NH3 (ppm) = "); //Display a ammonia in ppm

Serial.print(ppm);

lcd.setCursor(0, 1); // set the cursor to column 0, line 1

Serial.print("Voltage = "); //Display a intro message

Serial.print(VRL);

Serial.print(ppm);

delay(1000);

lcd.clear(); //Then clean it

}

**ARDUINO CODE FOR BUTENE:**

void setup()

{

Serial.begin(9600); // sets the serial port to 9600

pinMode(13, OUTPUT);

pinMode( 3, INPUT);

Serial.println("CLEARDATA");

Serial.println("LABEL,Computer Time,Time (Milli Sec.),Volt ,ppm");

}

void loop()

{

sensorValue = analogRead(0); // read analog input pin 0

Serial.print("DATA,TIME,");

Serial.print("");

Serial.print(",");

Serial.println(sensorValue);

digitalValue = digitalRead(2);

if(sensorValue>400)

{

digitalWrite(13, HIGH);

}

else

digitalWrite(13, LOW);

Serial.println(sensorValue, DEC); // prints the value read

Serial.println(digitalValue, DEC);

delay(1000); // wait 100ms for next reading

}