Practical Journal

Robotics

Chembur Trombay Education Society's

N.G Acharya & D.K Marathe

College of Arts Science & Commerce

Chembur Mumbai – 400 071

CERTIFICATE

This is to certify that **Ms. Shivani Anil Borhade**of M.Sc Part II (Computer Science) Sem IV.
Seat Number: **4142333** has successfully completed the necessary course of experiments in the subject of **Robotics** during the academic year 2022 - 2023.

Prof. In Charge **Head of Department**

College Seal

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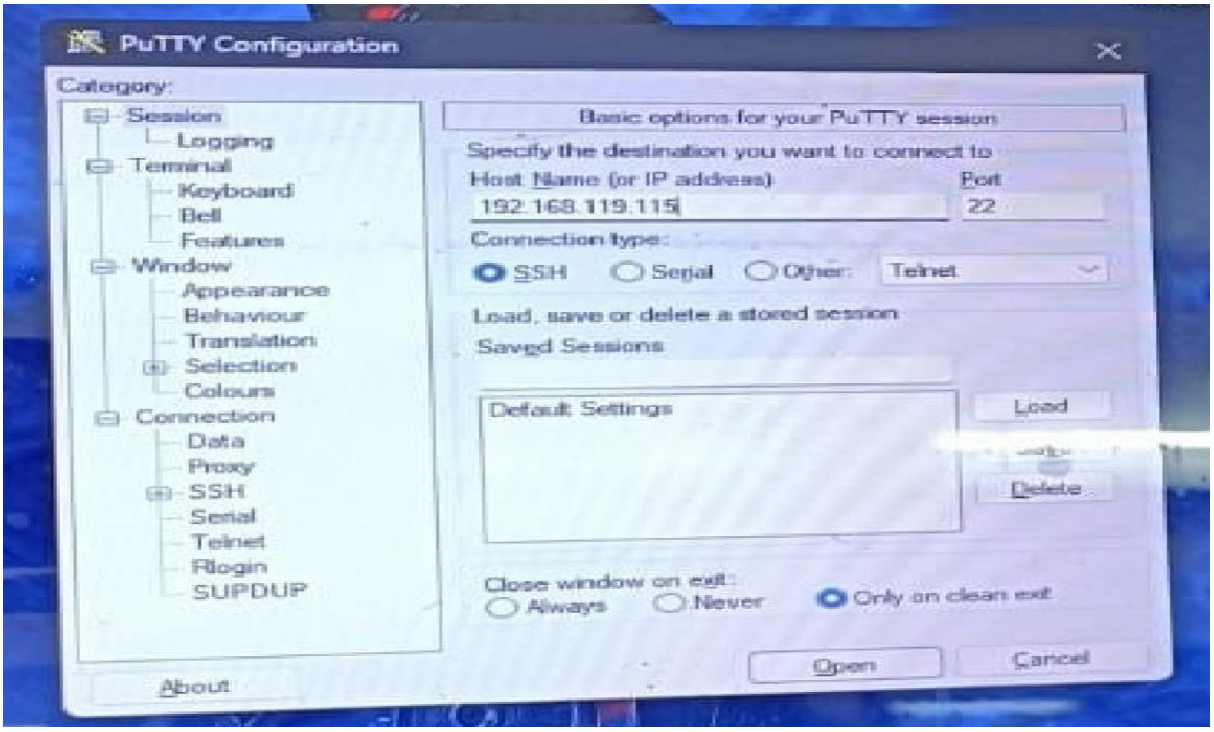
Practical No – 01

Aim - Making a Raspberry Pi headless, and reaching it from the network using WiFi and SSH.

Windows Configuration:

Step 1: Download putty and open, Host application for SSH

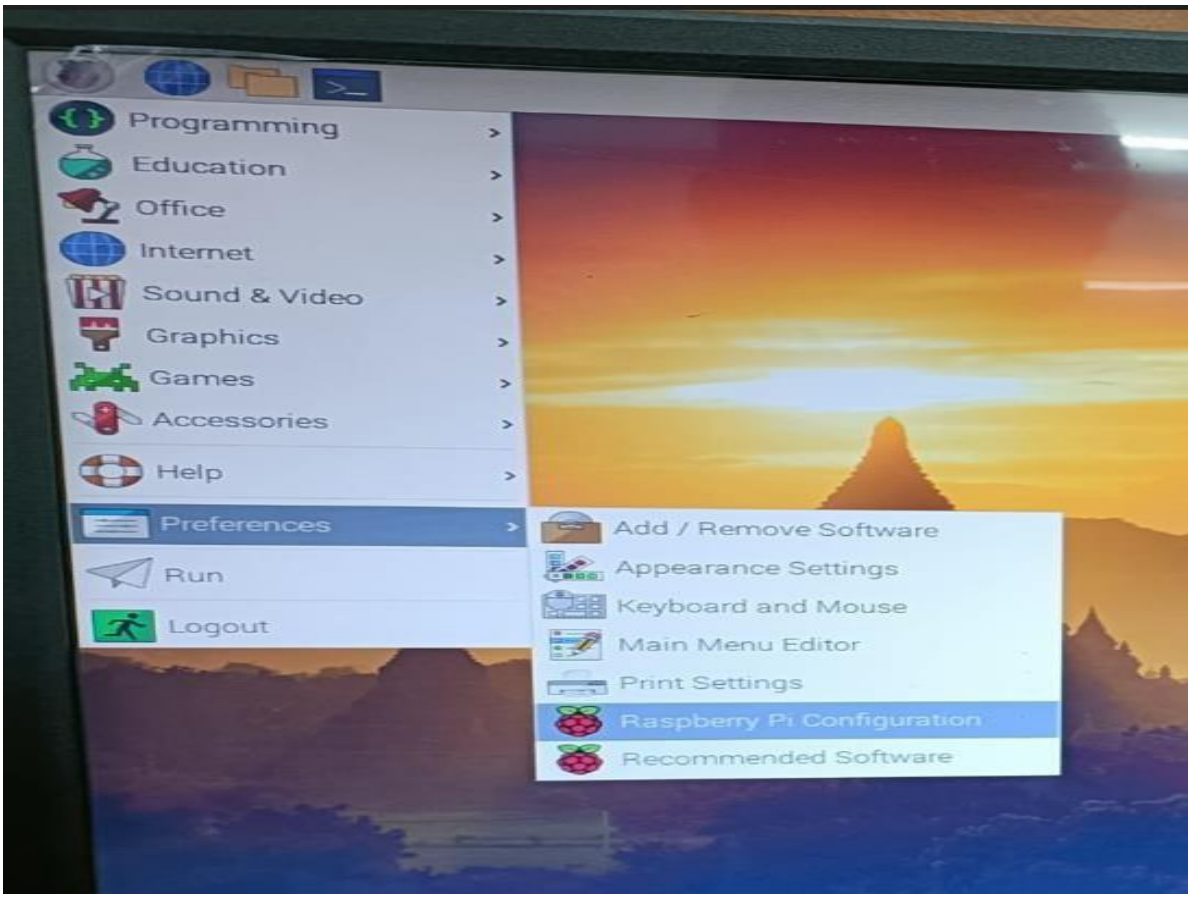
Step 2: Select SSH as connection type,

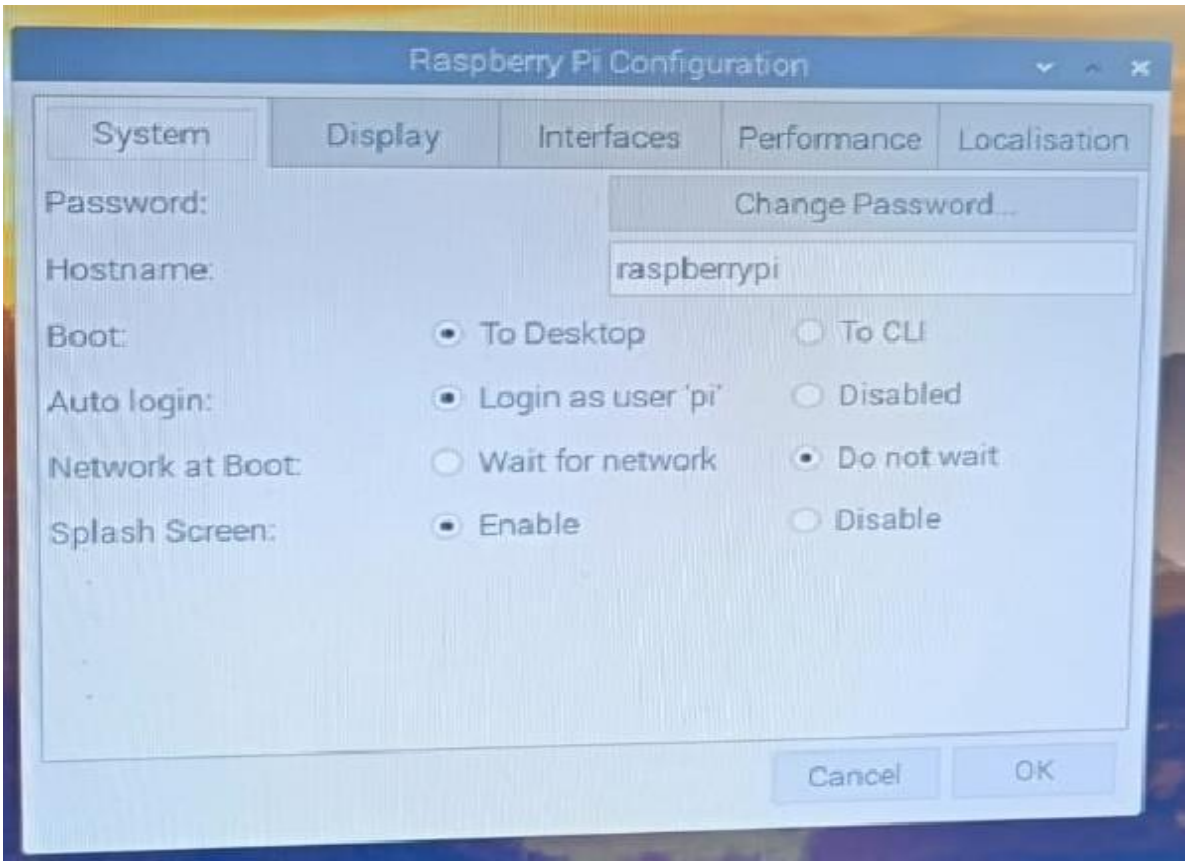


Raspberry pi configuration:

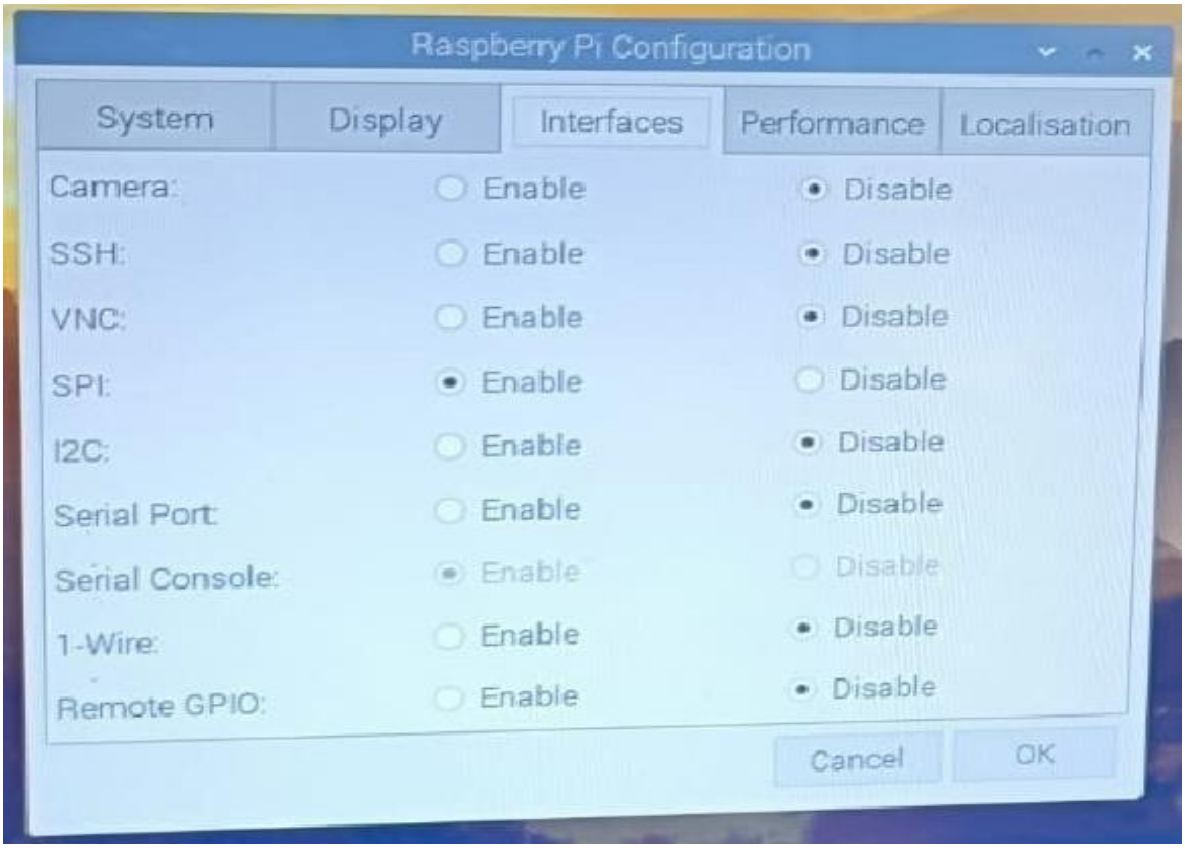
Step 3: Click on start menu,

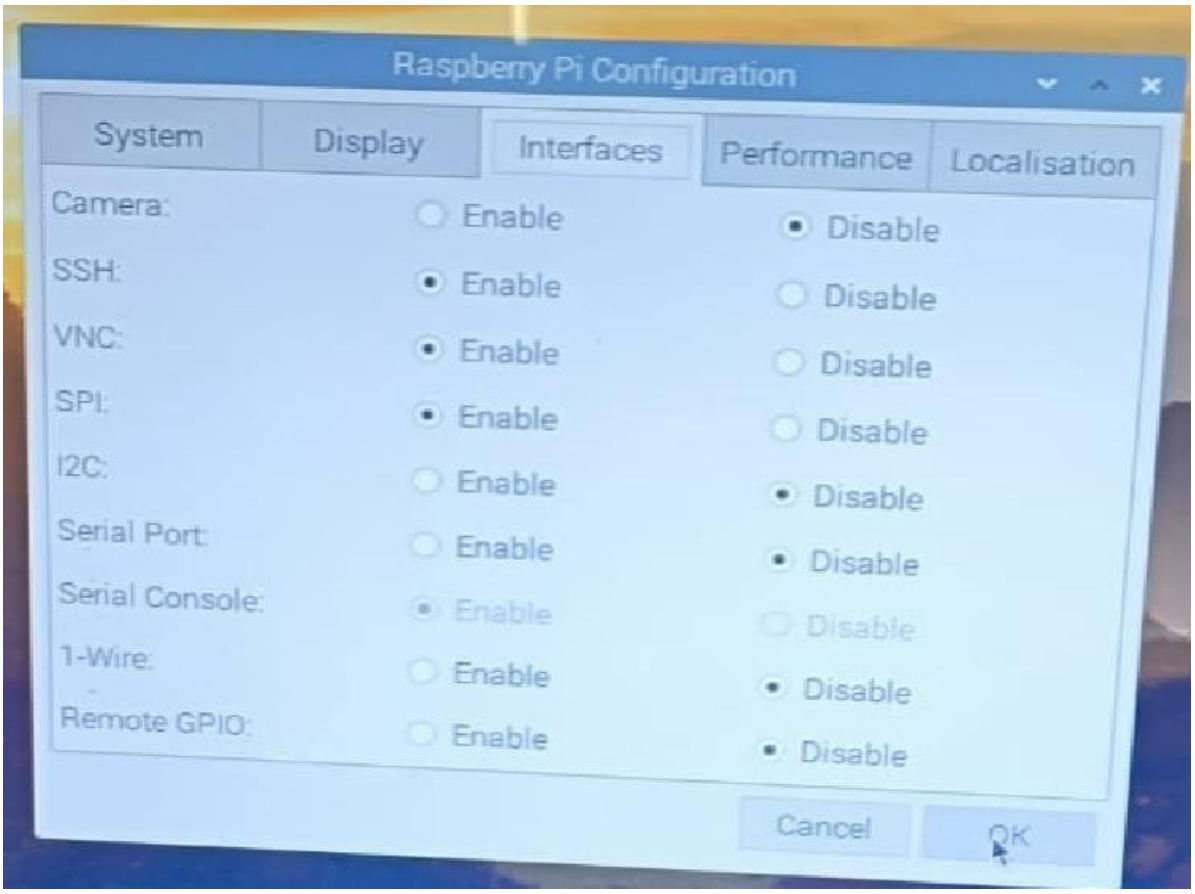
Step 4: Go to Preferences -> Raspberry pi configuration -> Enter





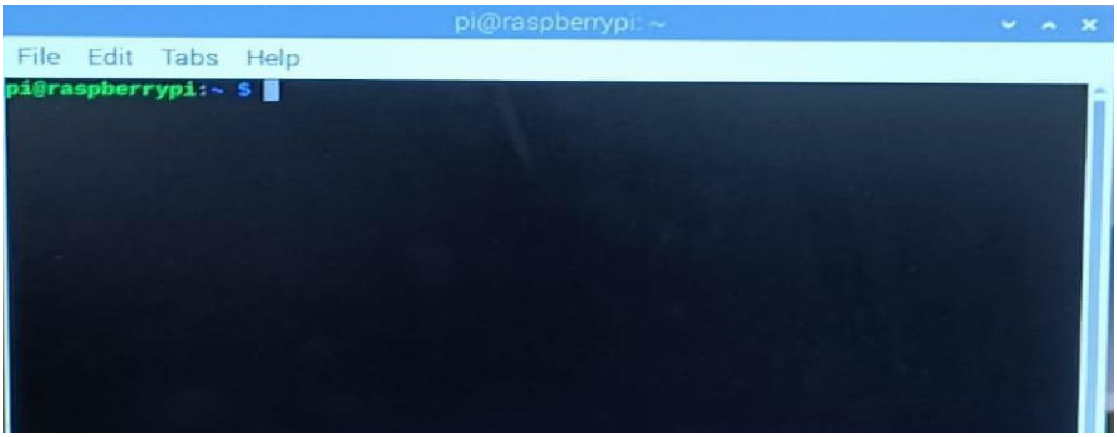
Step 5: Interface -> Enable SSH and VNC Connections press OK.

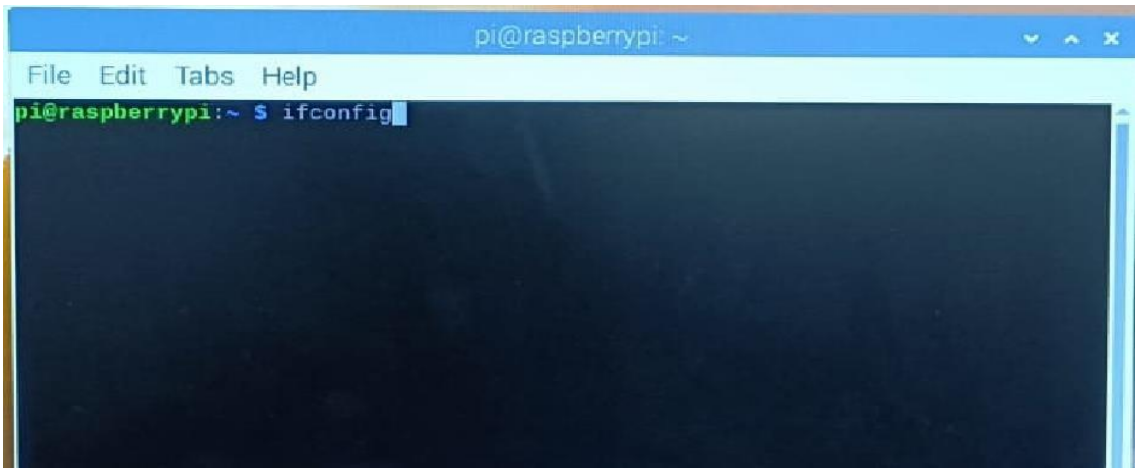


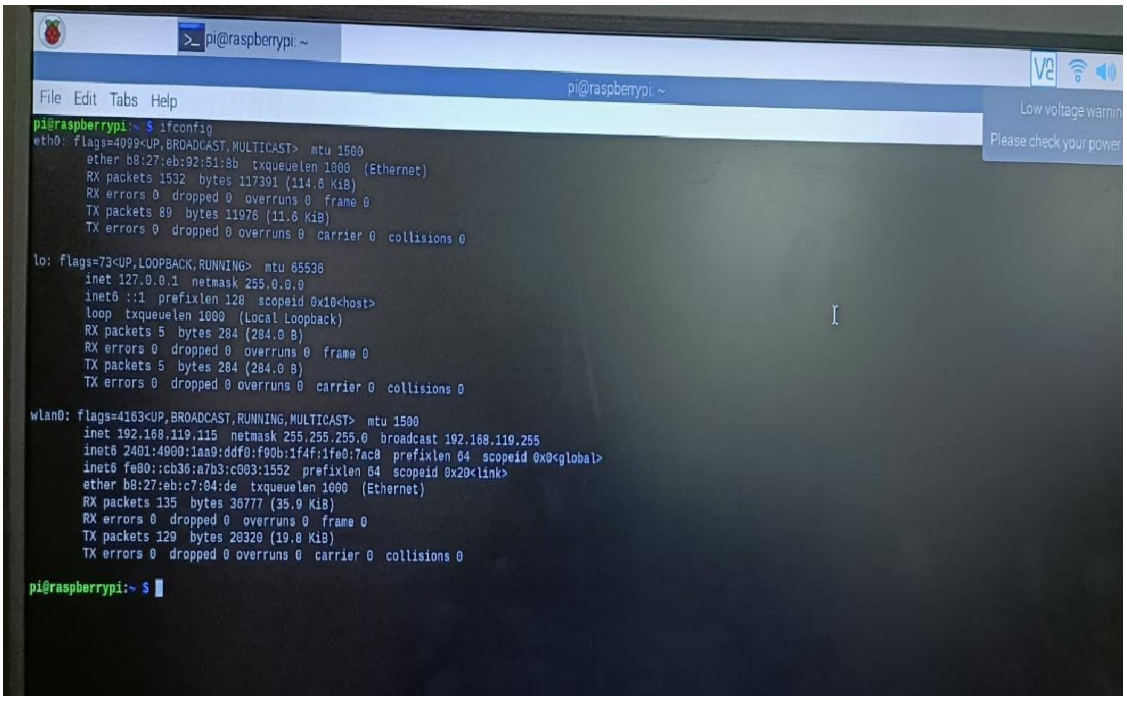


Step 6: Open New terminals and type below command,

>>>ifconfig







Note: Make sure both PCs are connected with same network.

Step 7: Connection Part,

->Go to putty, Enter ip and click on open.

->Enter requested Username(pi) and Password(raspberry):

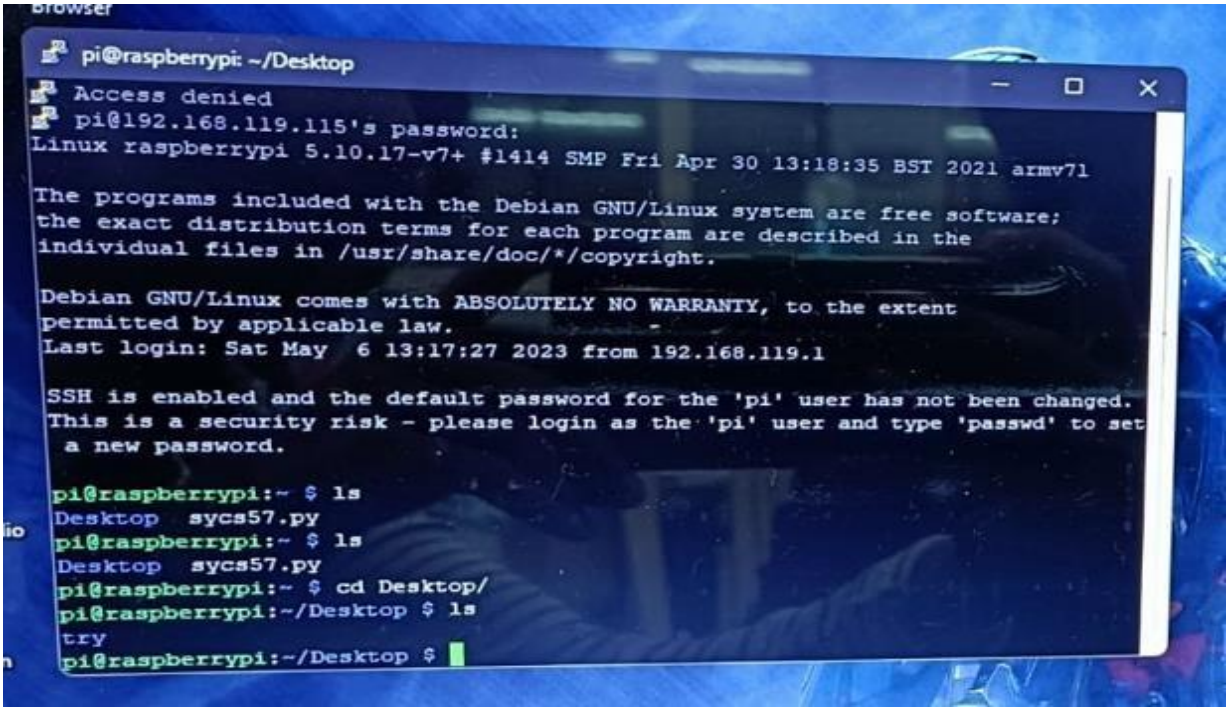
->For finding Username type below command on terminal,

$whoami

Connected Successfully.

Step 8: For checking connection run below commands,

Output: “try” folder name are showing which is present on another system desktop.

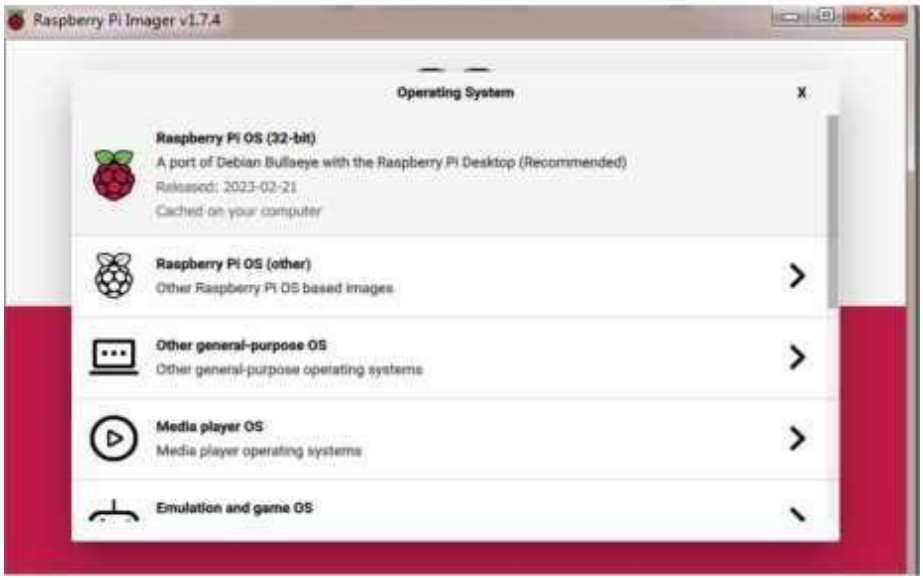


Practical No – 02

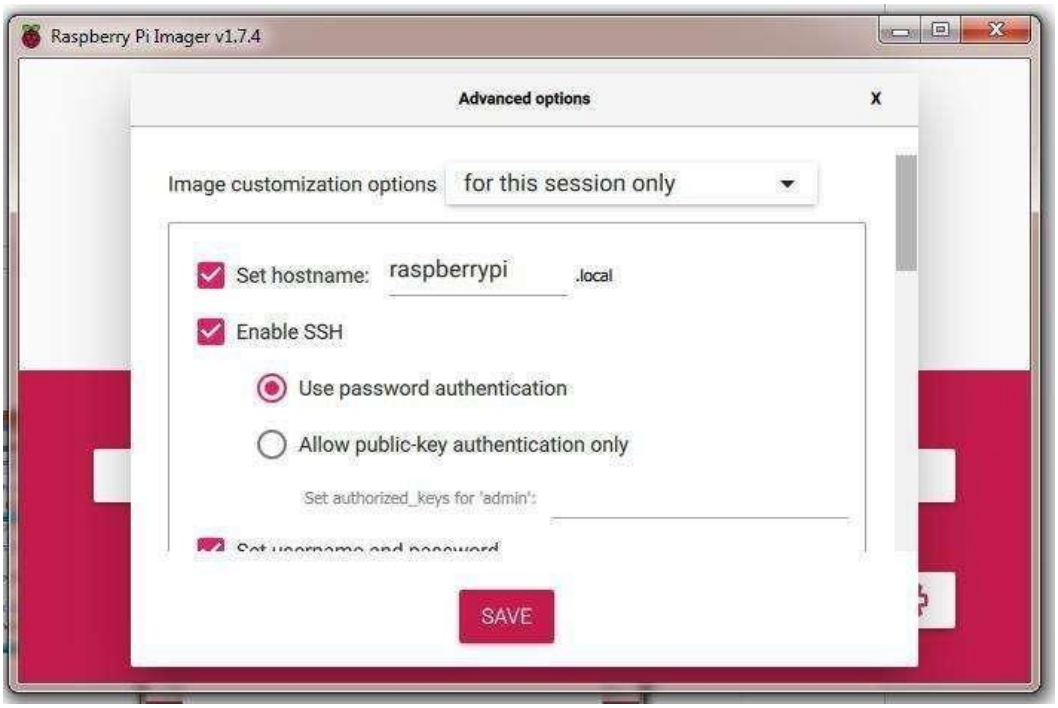
Aim : Using sftp upload files from PC

Software required:-Filezilla, Github

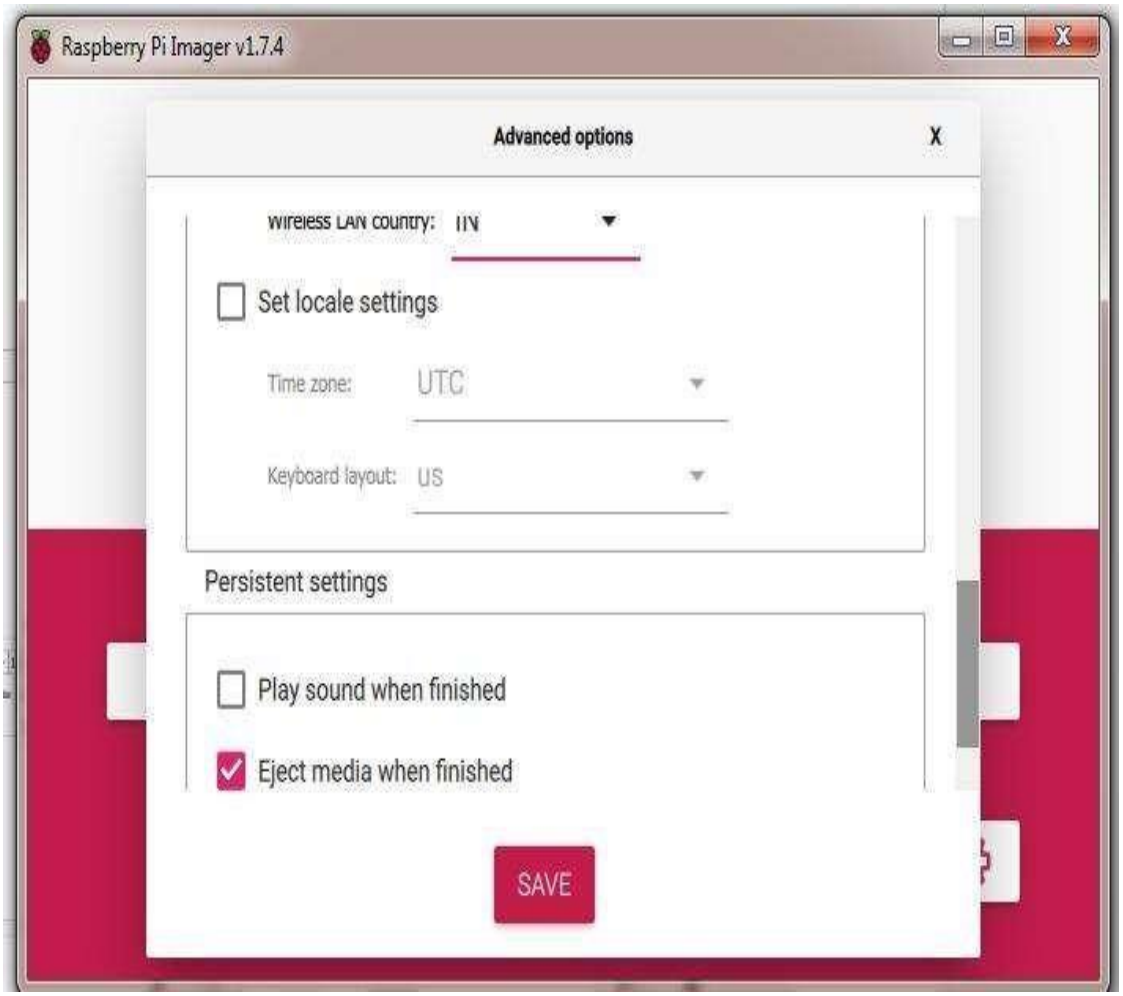
Step 1: Install the Raspberry Pi Imager

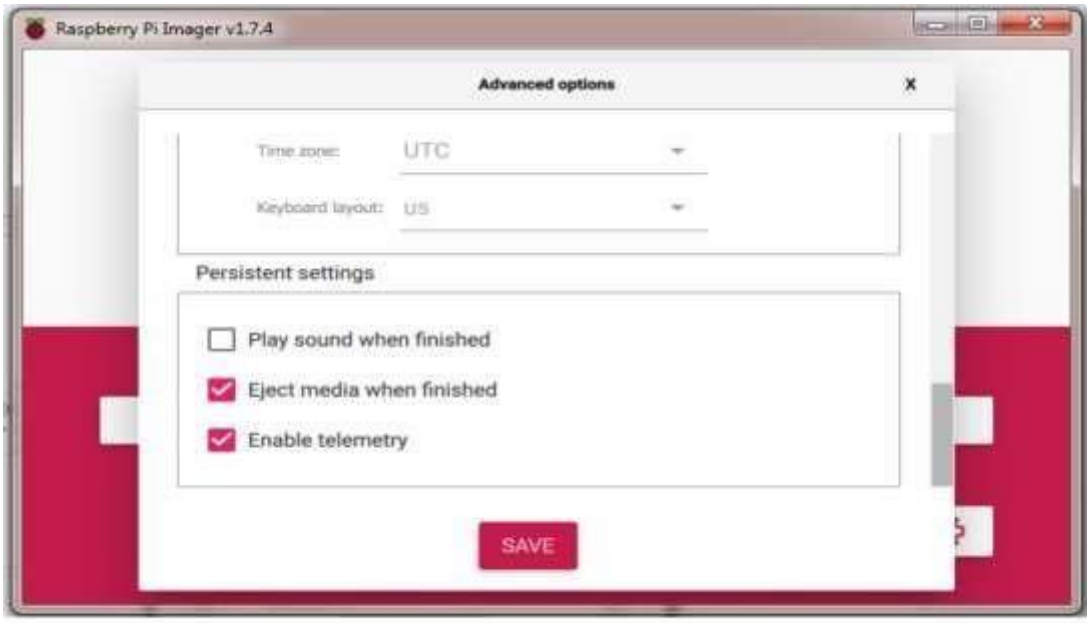


Step 2: Set Host Name , enable SSH, Set Usernameand Password.



Step 3: Set SSID and Password of hotspot which is used .


Raspberry Pi Imager v1.7.4
Advanced options
X
Wireless LAN country:
Set locale settings
Time zone:
UTC
Keyboard layout:
US
Persistent settings
Play sound when finished
Eject media when finished
SAVE

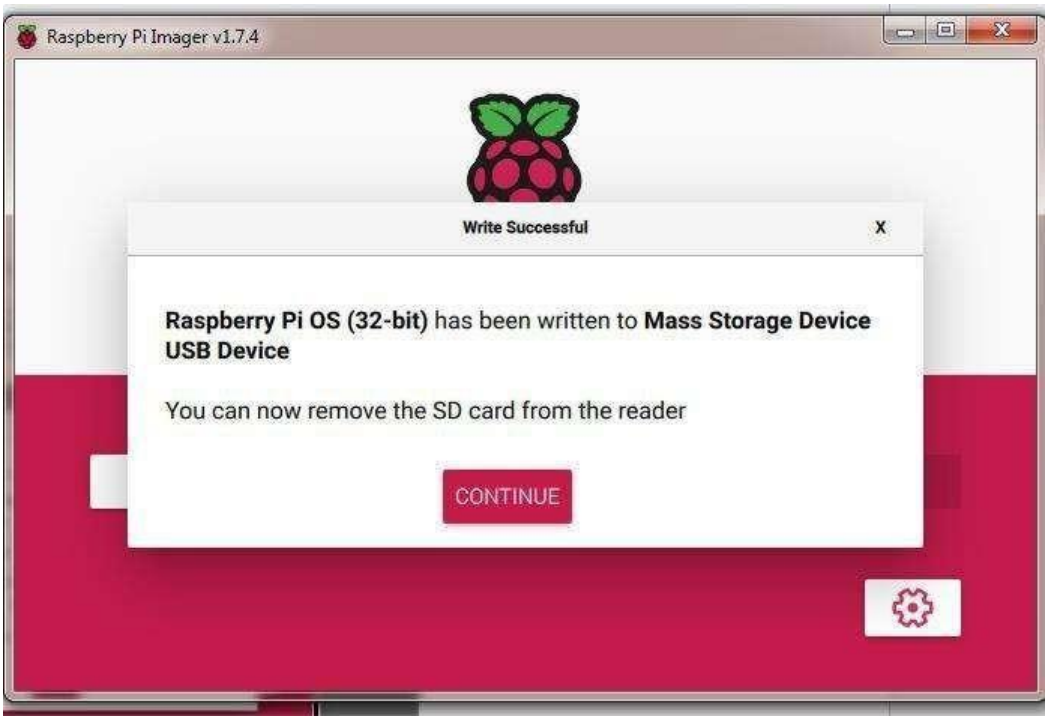

Raspberry Pi Imager v1.7.4
Advanced options
X
Time zone:
UTC
Keyboard layout:
US
Persistent settings
Play sound when finished
Eject media when finished
Enable telemetry
SAVE


Raspberry Pi Imager v1.7.4

on


Raspberry Pi Imager v1.7.4
Warning
All existing data on 'Mass Storage Device USB Device' will be erased.
Are you sure you want to continue?
NO
YES


Raspberry Pi Imager v1.7.4
Raspberry Pi
Operating System
Storage
Verifying... 6%
CANCEL VERIFY


Raspberry Pi Imager v1.7.4
Write Successful
X
Raspberry Pi OS (32-bit) has been written to Mass Storage Device USB Device
You can now remove the SD card from the reader
CONTINUE

Step 4: Connect Raspberry Pi WIFI and Laptop WIFI to Mobile

Step 5: Open CMD and tyepe following command

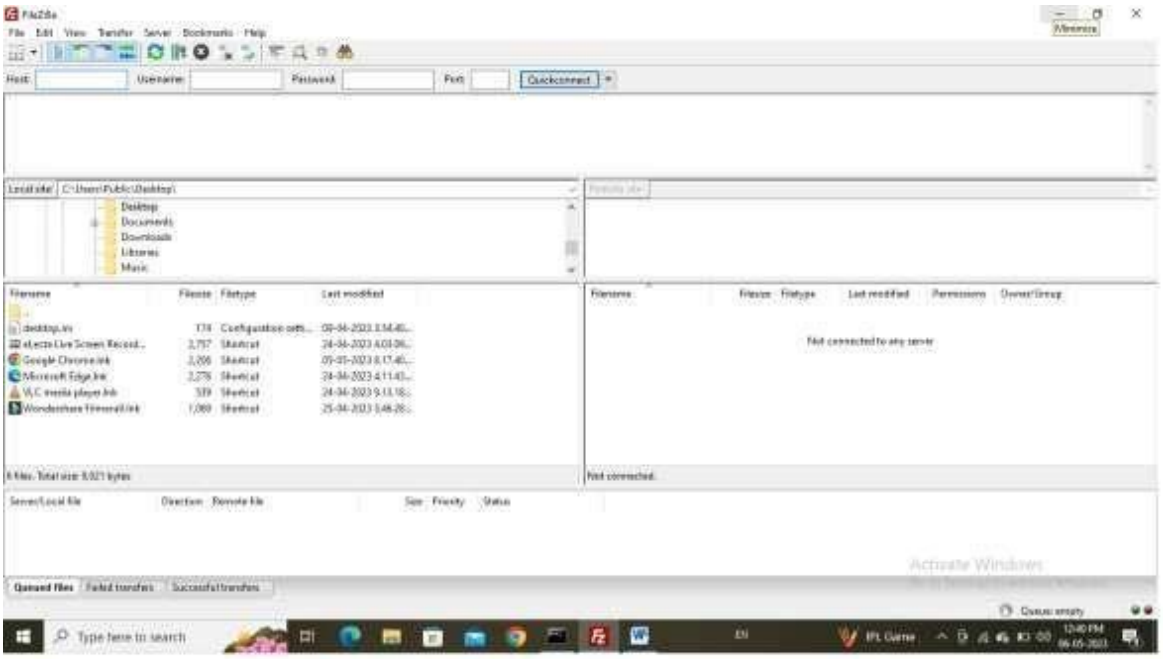
I) ping raspberrypi or ping 162.168.207.244

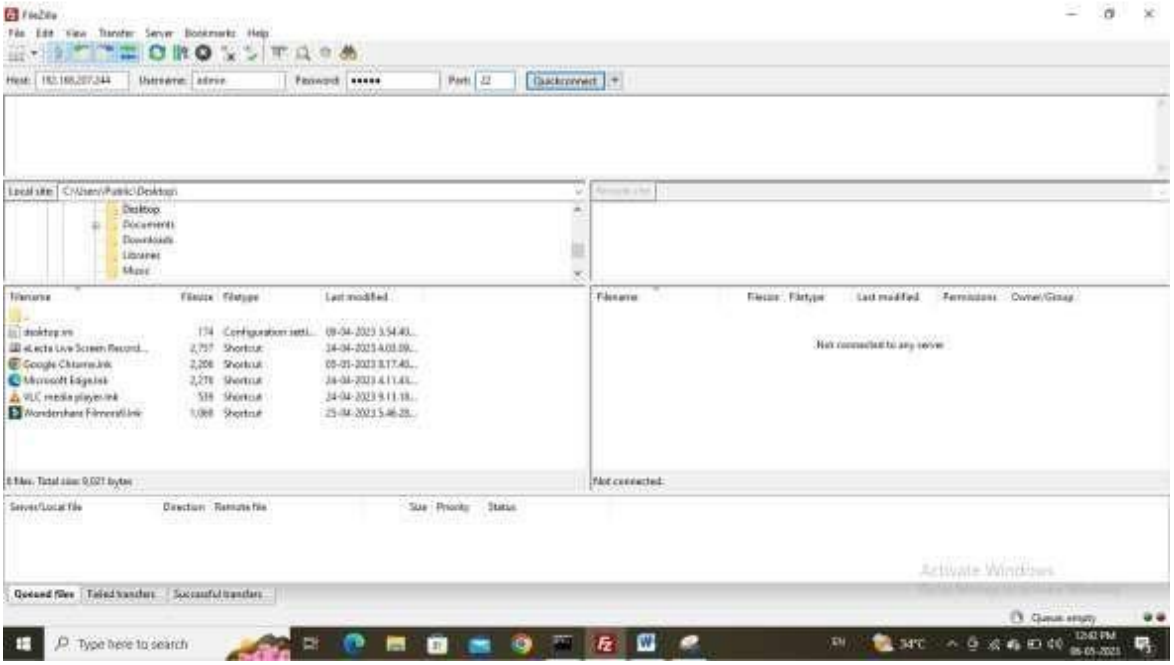
ll) ssh admin@ raspberrypi or sshadmin@ 162.168.207.244

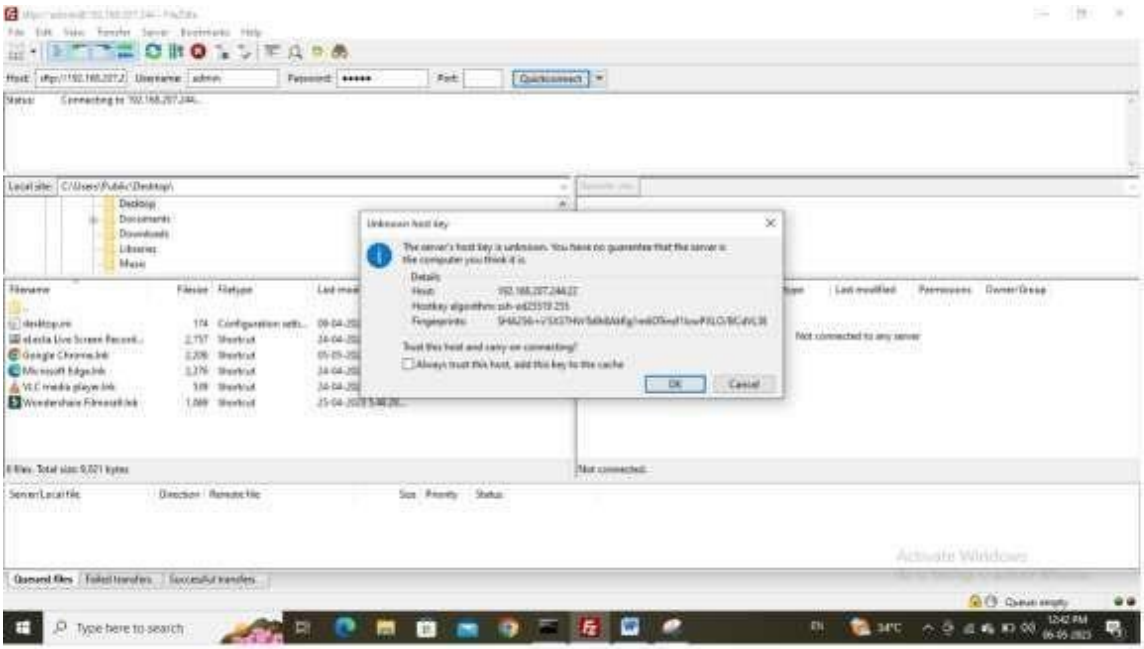
And type the password

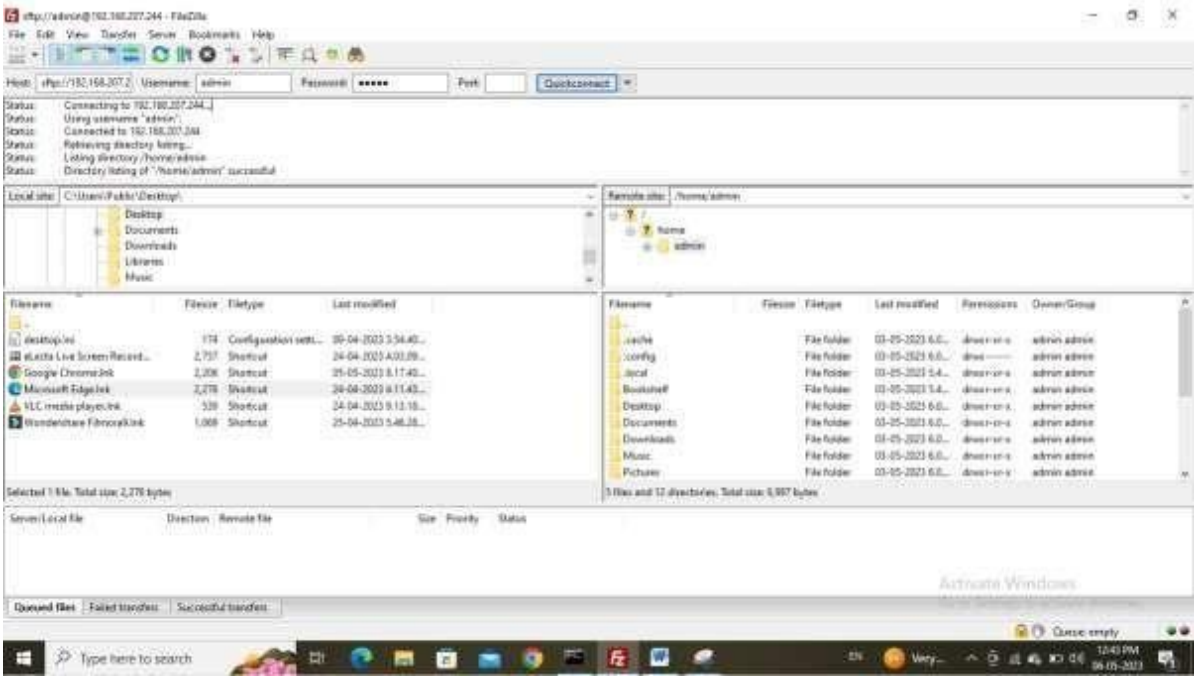
```
admin@raspberrypi: ~
Request timed out.

Ping statistics for 192.168.207.244:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\Users\Admin>ping 192.168.207.244

Pinging 192.168.207.244 with 32 bytes of data:
Reply from 192.168.207.244: bytes=32 time=21ms TTL=64
Reply from 192.168.207.244: bytes=32 time=11ms TTL=64
Reply from 192.168.207.244: bytes=32 time=9ms TTL=64
Reply from 192.168.207.244: bytes=32 time=10ms TTL=64

Ping statistics for 192.168.207.244:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 9ms, Maximum = 21ms, Average = 12ms

C:\Users\Admin>ssh admin@192.168.207.244
The authenticity of host '192.168.207.244 (192.168.207.244)' can't be established.
ECDSA key fingerprint is SHA256:qZw2aLXcb81PnFDfJMHtKANxs5KbGF1/X9PLVqS/Hb0.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.207.244' (ECDSA) to the list of known hosts.
admin@192.168.207.244's password:
Linux raspberrypi 6.1.21-v7+ #1642 SMP Mon Apr  3 17:20:52 BST 2023 armv7l

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Wed May  3 06:07:06 2023
admin@raspberrypi:~ $
```

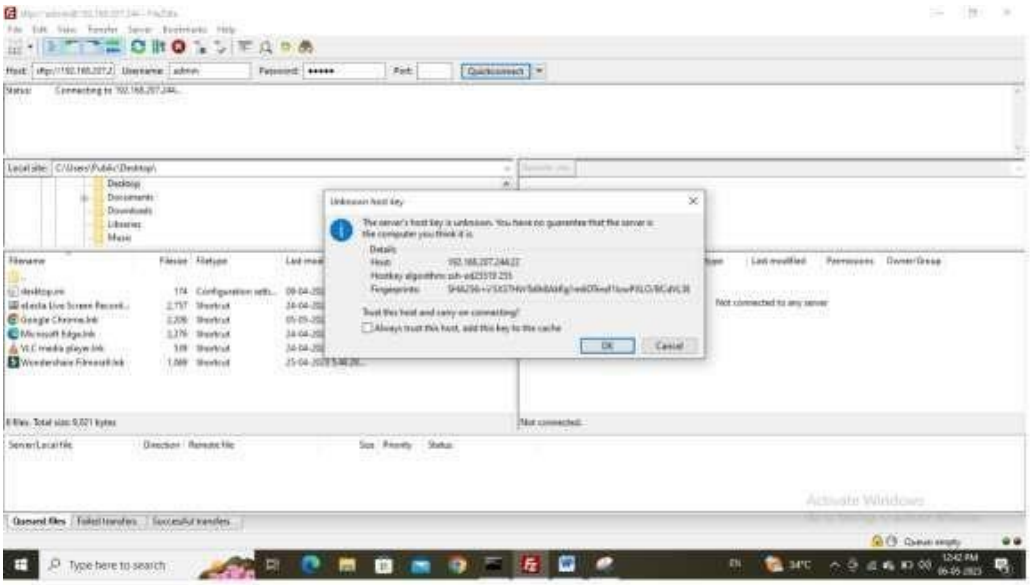
Step:6 Download the FileZilla (Client)

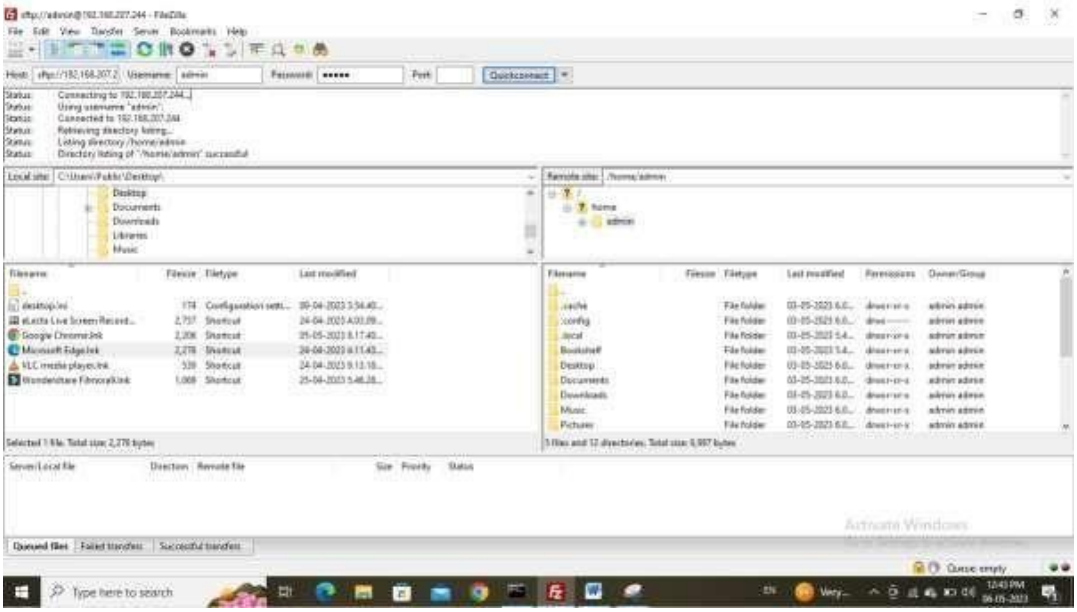


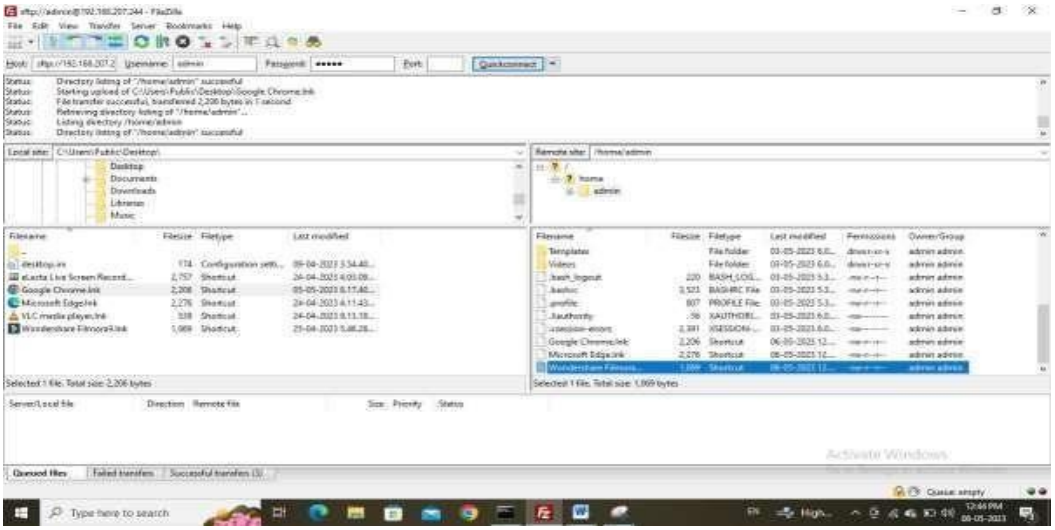



Unknown host key
The server's host key is unknown. You have no guarantee that the server is the computer you think it is.
Details
Host:
Hostkey algorithm:
Fingerprints:
Trust this host and carry on connecting?
Always trust this host, add this key to the cache
OK
Cancel
Not connected to any server
Not connected.
Activate Windows
Type here to search


Status: Connecting to 192.168.207.244...
Status: Using username "admin".
Status: Connected to 192.168.207.244
Status: Retrieving directory listing...
Status: Listing directory /home/admin
Status: Directory listing of "/home/admin" successful
Desktop
Documents
Downloads
Libraries
Music
home
admin
Activate Windows
Type here to search



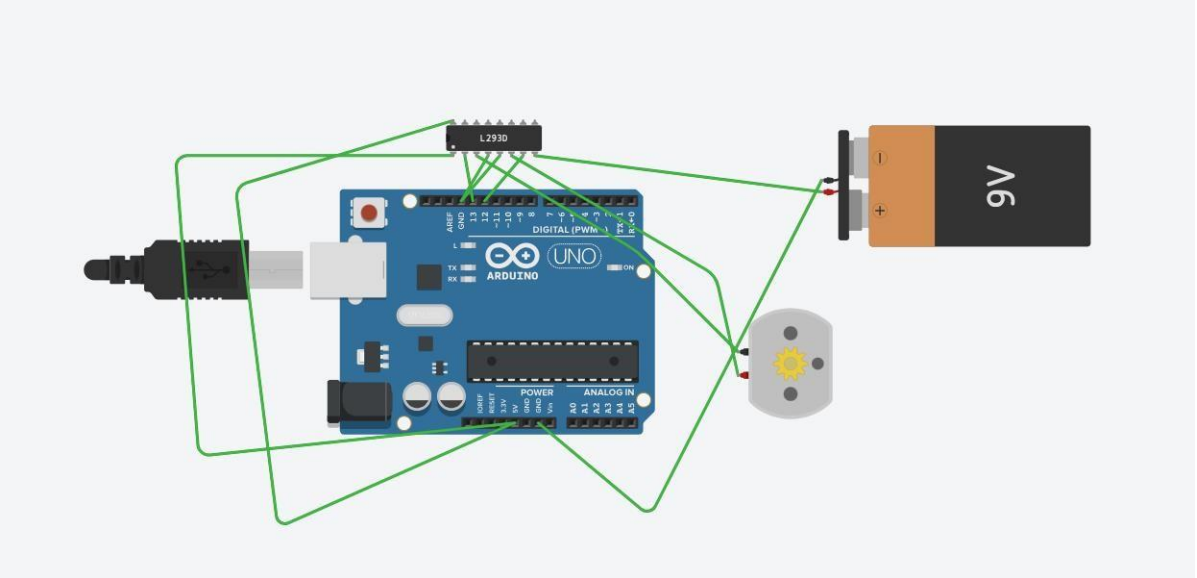




Practical No – 03

Aim: - Write a python code to test motor.

Prequest : THINKERcard make a account on tinkercad



- Arduino UNO
- L293D
- DC MOTOR
- Battery

Code:

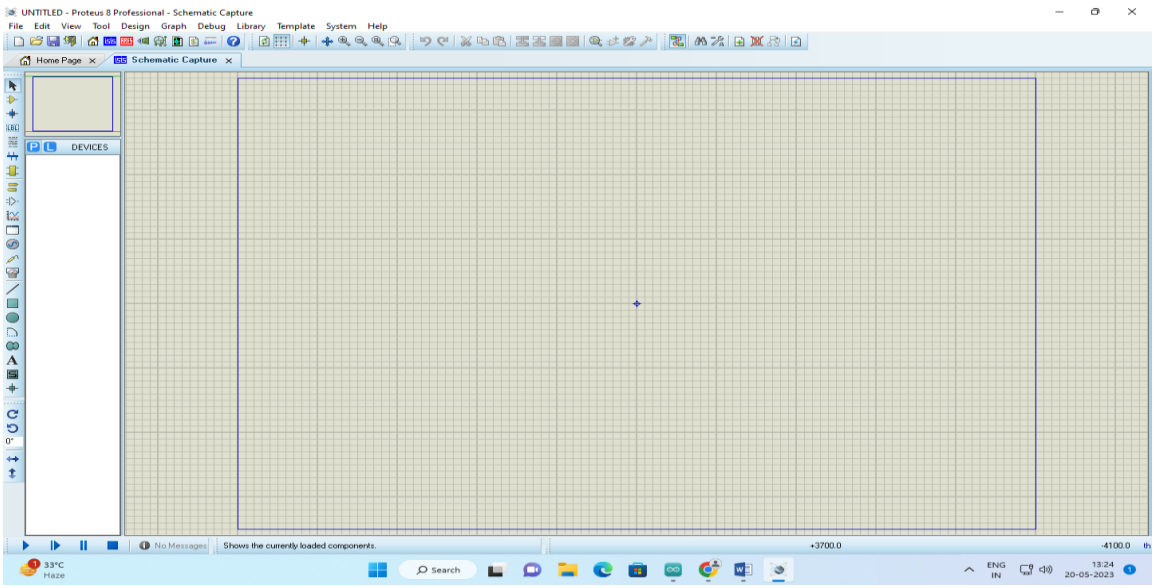
```
// C++ code
//
void setup()
{
  pinMode(LED_BUILTIN, OUTPUT);
}


void loop()
{
  digitalWrite(LED_BUILTIN, HIGH);
  delay(1000); // Wait for 1000 millisecond(s)
  digitalWrite(LED_BUILTIN, LOW);
  delay(1000); // Wait for 1000 millisecond(s)
}
```

Practical no:- 4

Aim:-Write the script to follow the pre-determined path.

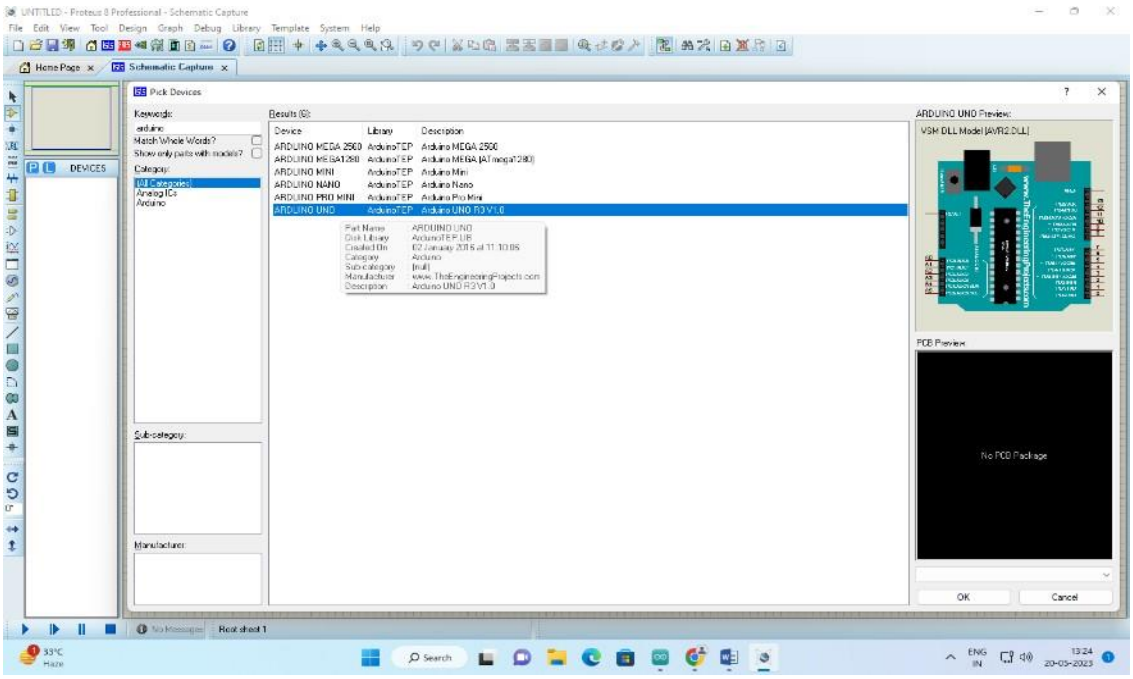
Prequest: Proteus Design Suite, Arduino IDE

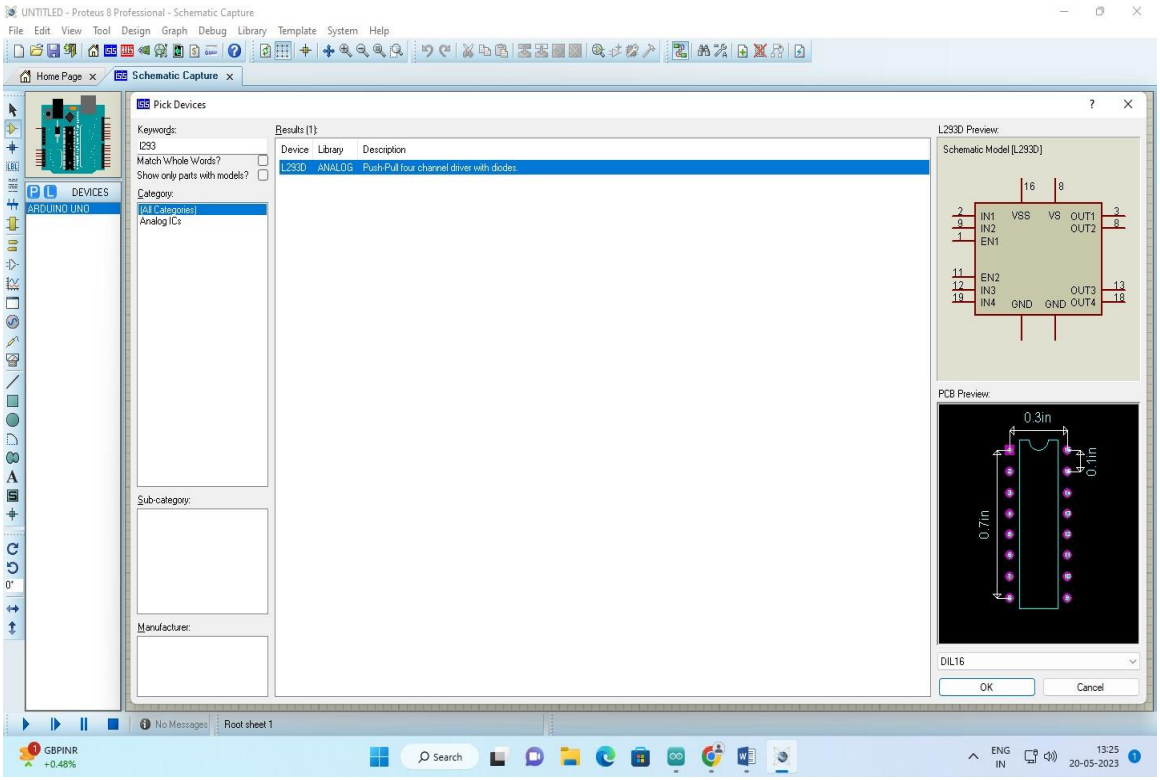
Step 1) First open proteus software and select ISIS and click on it.

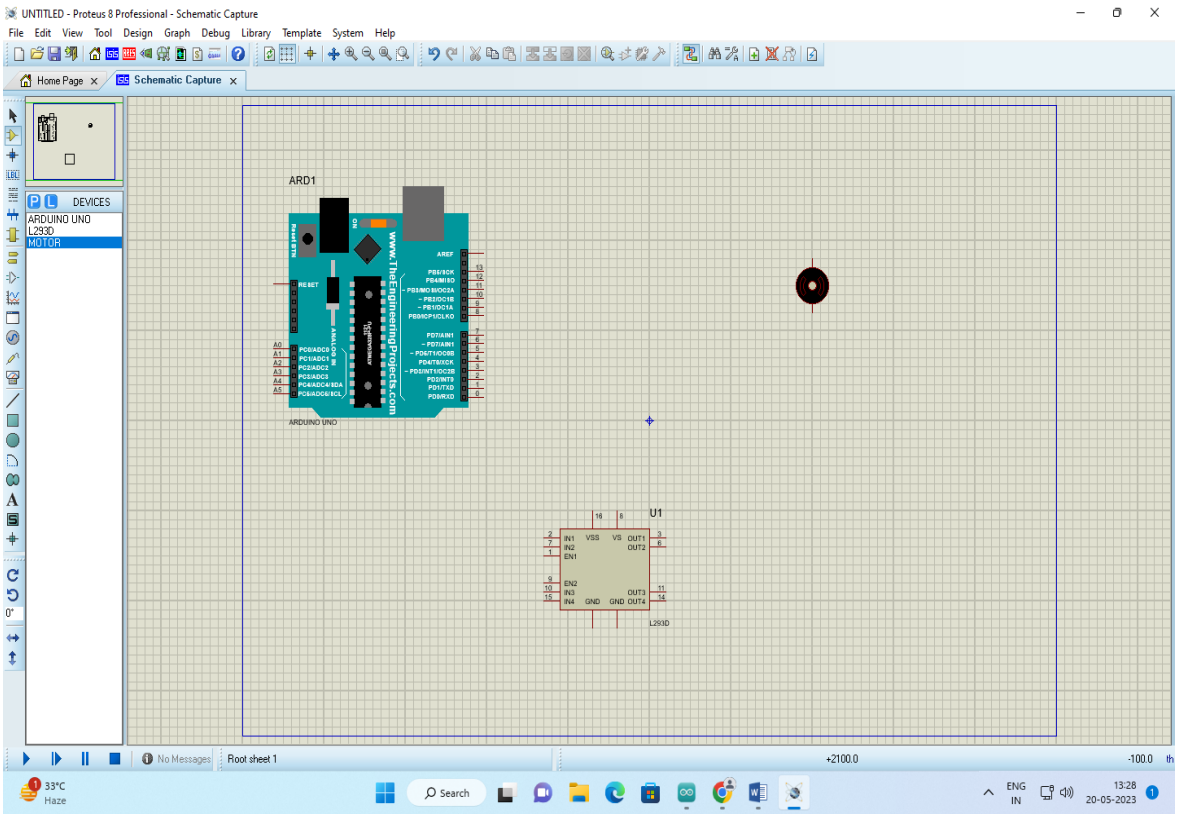


Step 2) Select the following components-

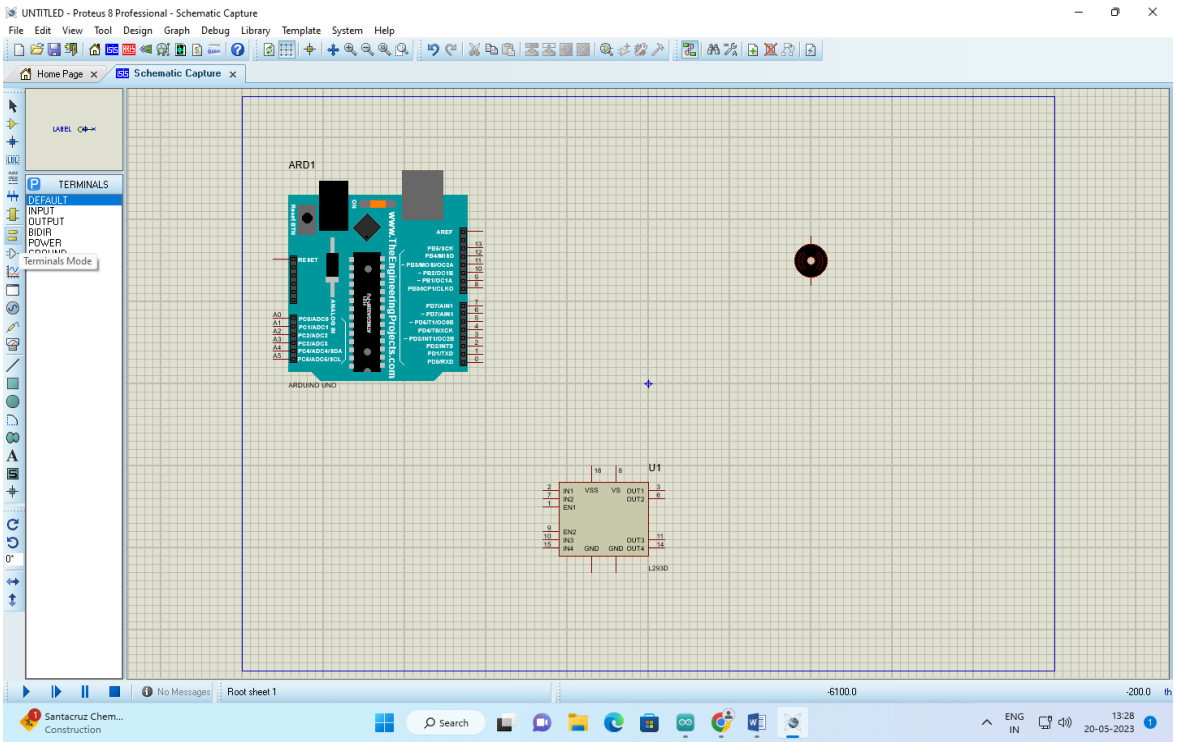
- Arduino UNO
- L293D
- DC MOTOR

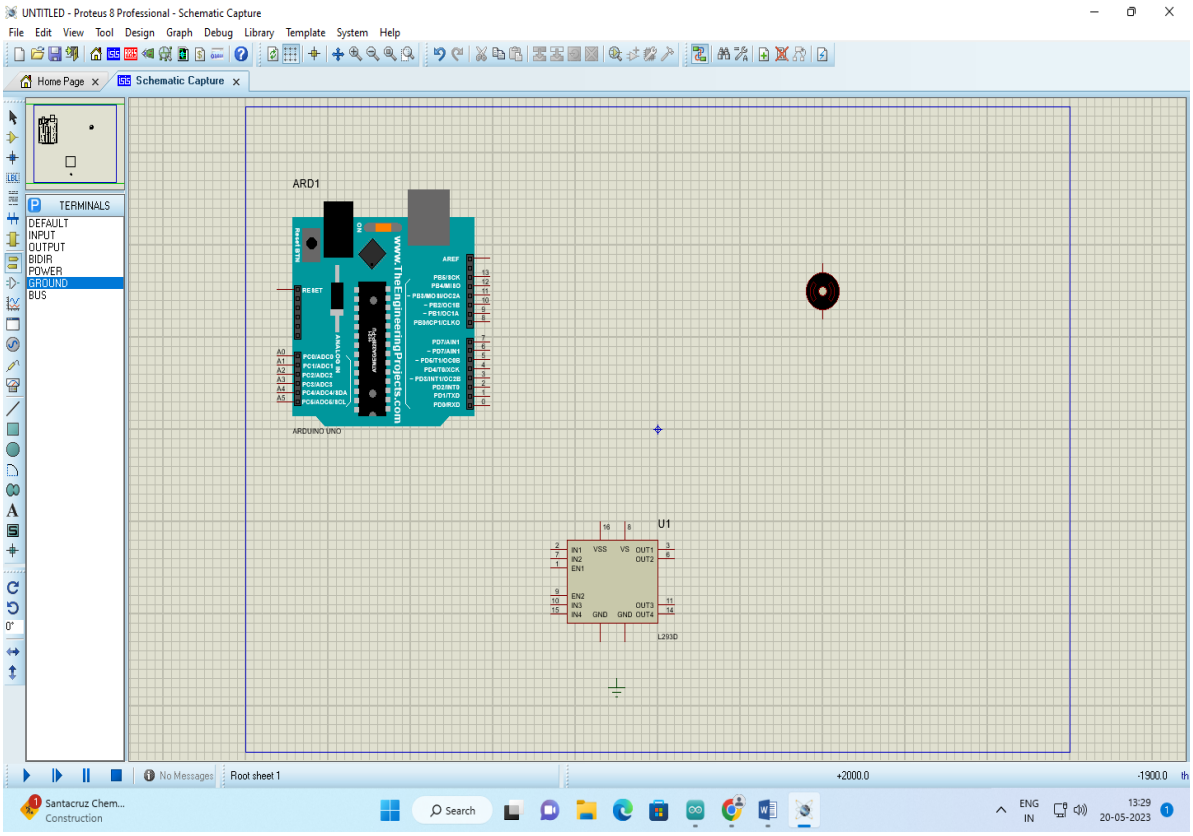

UNTITLED - Proteus 8 Professional - Schematic Capture
File Edit View Tool Design Graph Debug Library Template System Help
Home Page
Schematic Capture
Pick Devices
Keywords:
arduino
Match Whole Words?
Show only parts with models?
Category:
[All Categories]
Analog ICs
Arduino
Sub-category:
Manufacturer:
Results (6):
Device Library Description
ARDUINO MEGA 2560 ArduinoTEP Arduino MEGA 2560
ARDUINO MEGA1280 ArduinoTEP Arduino MEGA (ATmega1280)
ARDUINO MINI ArduinoTEP Arduino Mini
ARDUINO NANO ArduinoTEP Arduino Nano
ARDUINO PRO MINI ArduinoTEP Arduino Pro Mini
ARDUINO UNO ArduinoTEP Arduino UNO R3 V1.0
Part Name ARDUINO UNO
Disk Library ArduinoTEP.LIB
Created On 02 January 2015 at 11:10:05
Category Arduino
Sub-category [null]
Manufacturer www.TheEngineeringProjects.com
Description Arduino UNO R3 V1.0
ARDUINO UNO Preview:
VSM DLL Model [AVR2.DLL]
PCB Preview:
No PCB Package
OK
Cancel
DEVICES
Root sheet 1
33°C Haze
Search
ENG IN
13:24 20-05-2023


UNTITLED - Proteus 8 Professional - Schematic Capture
File Edit View Tool Design Graph Debug Library Template System Help
Home Page
Schematic Capture
Pick Devices
Keywords:
l293
Match Whole Words?
Show only parts with models?
Category:
[All Categories]
Analog ICs
Sub-category:
Manufacturer:
Results (1):
Device Library Description
L293D ANALOG Push-Pull four channel driver with diodes
L293D Preview:
Schematic Model [L293D]
16 8
IN1 VSS VS OUT1
IN2 OUT2
EN1
EN2
IN3 OUT3
IN4 GND GND OUT4
PCB Preview:
0.3in
0.1in
0.7in
DIL16
OK
Cancel
DEVICES
ARDUINO UNO
Root sheet 1
GBPINR +0.48%
Search
ENG IN
13:25 20-05-2023

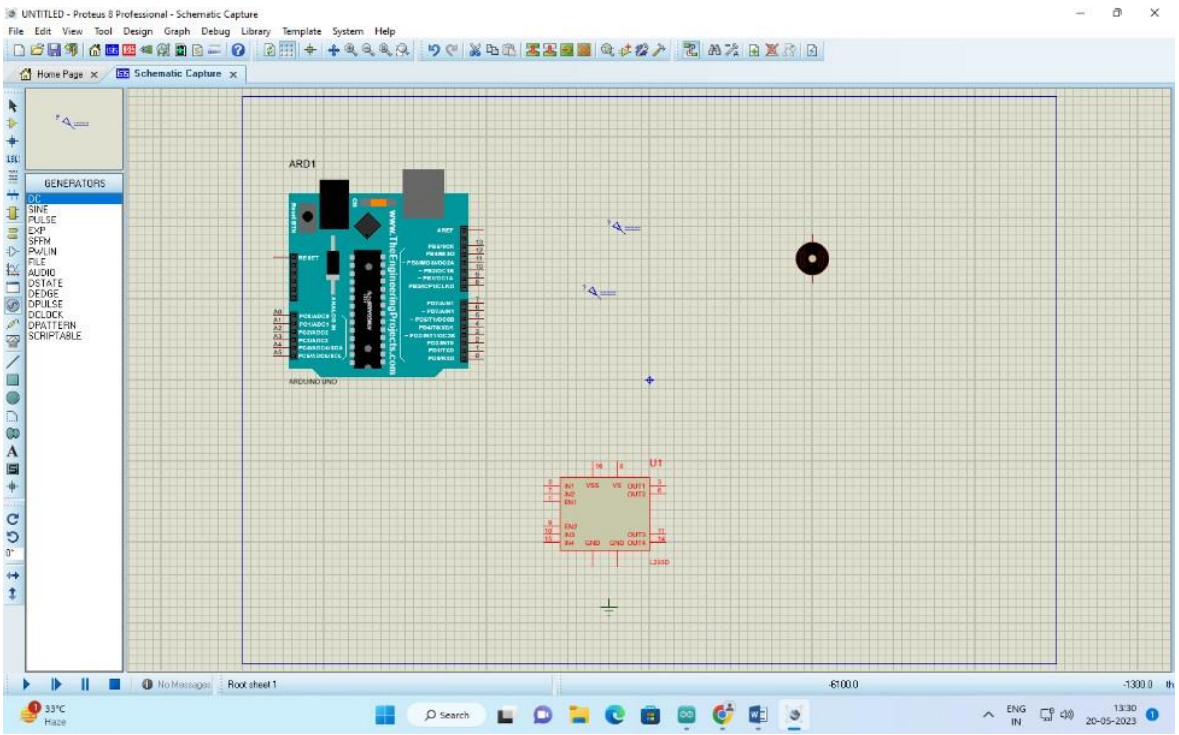


3) Select terminal and choose ground.

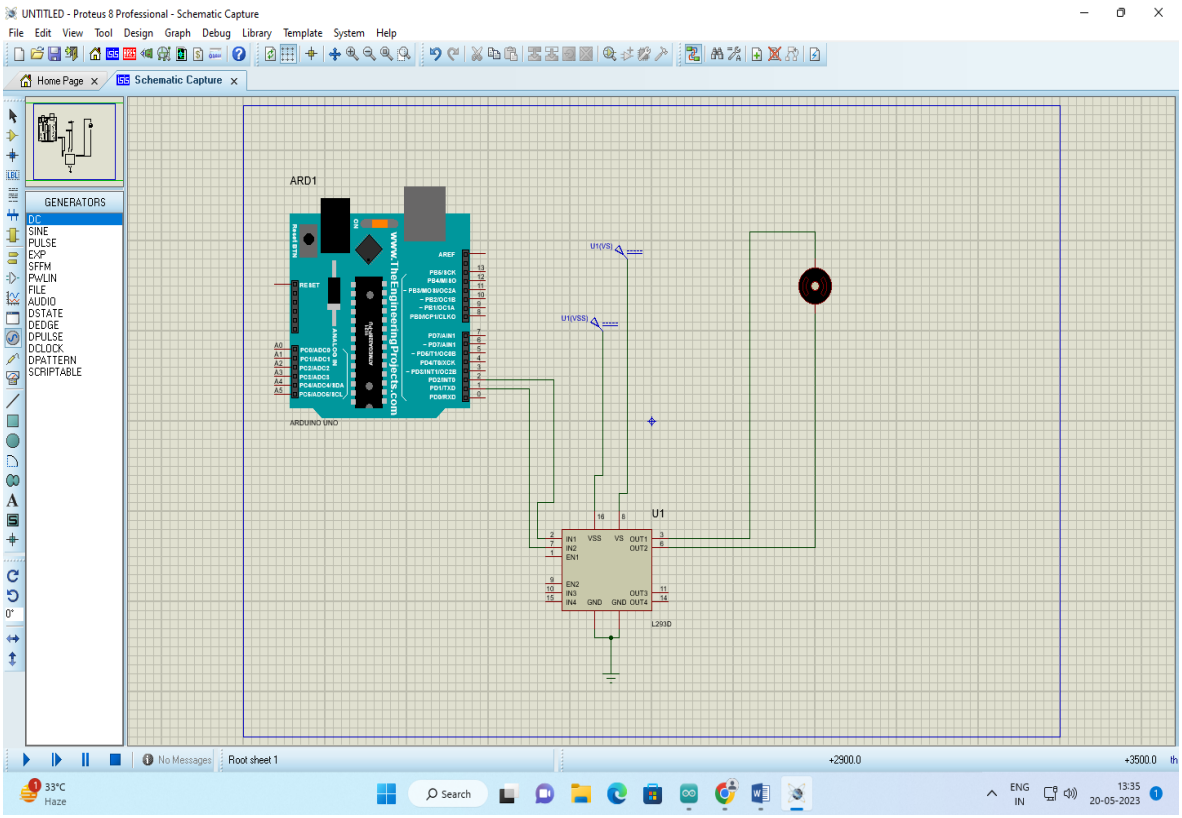




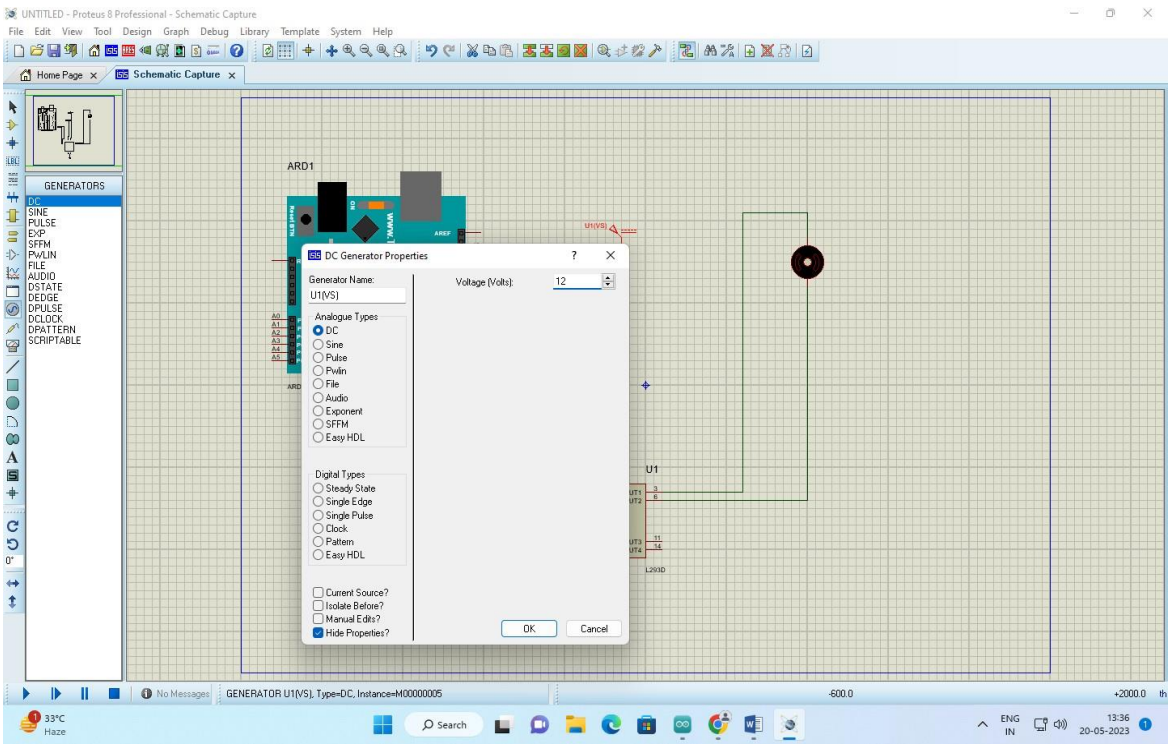
4) Select generators as DC



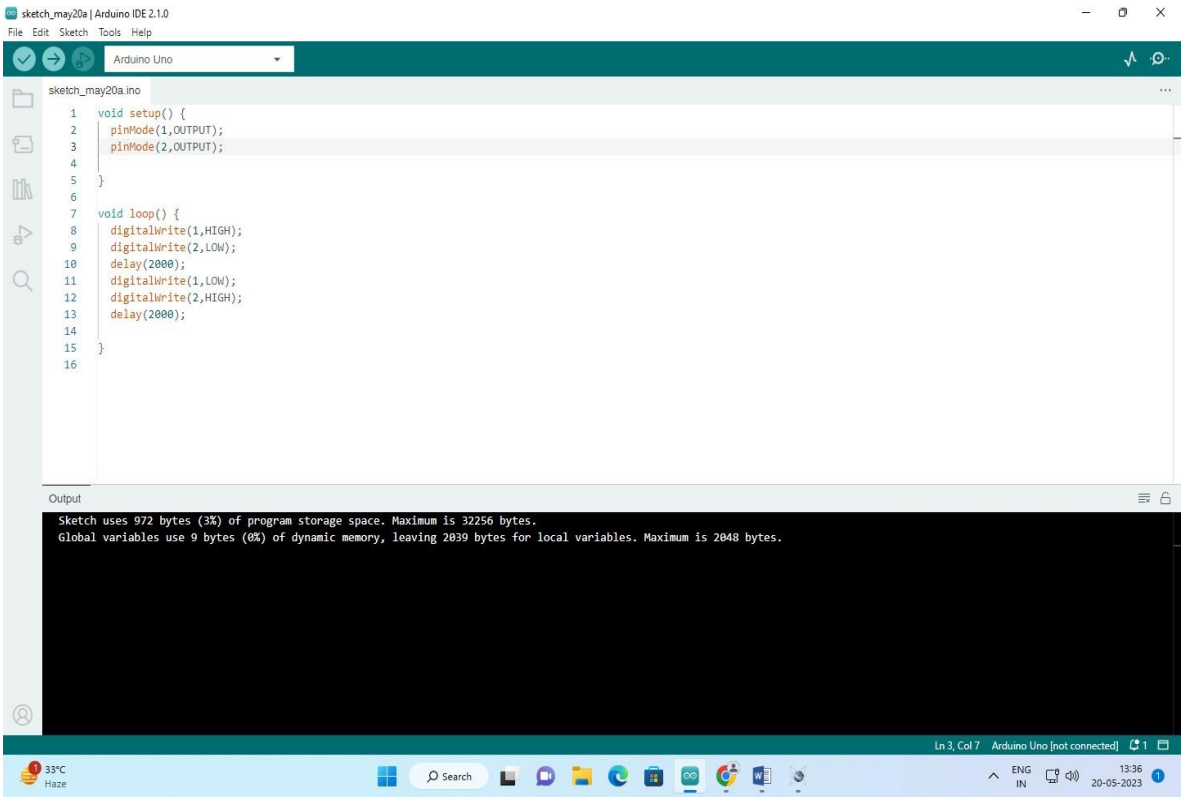
CONNECTION

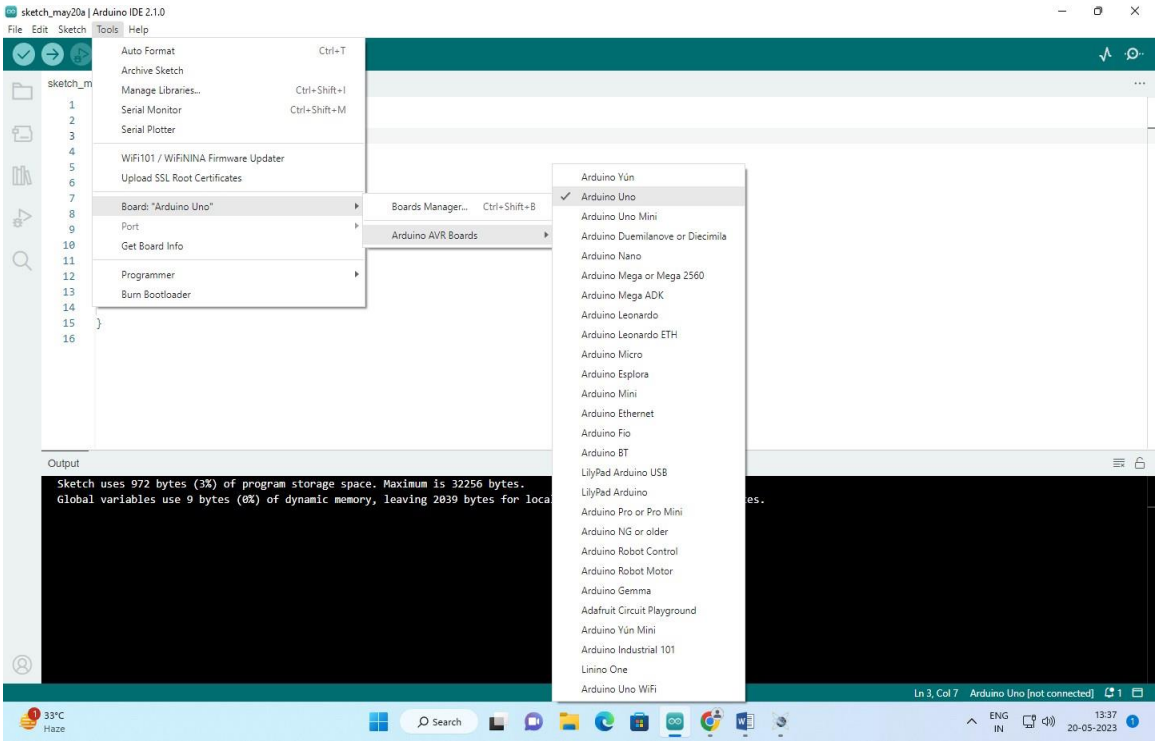


DC generators properties

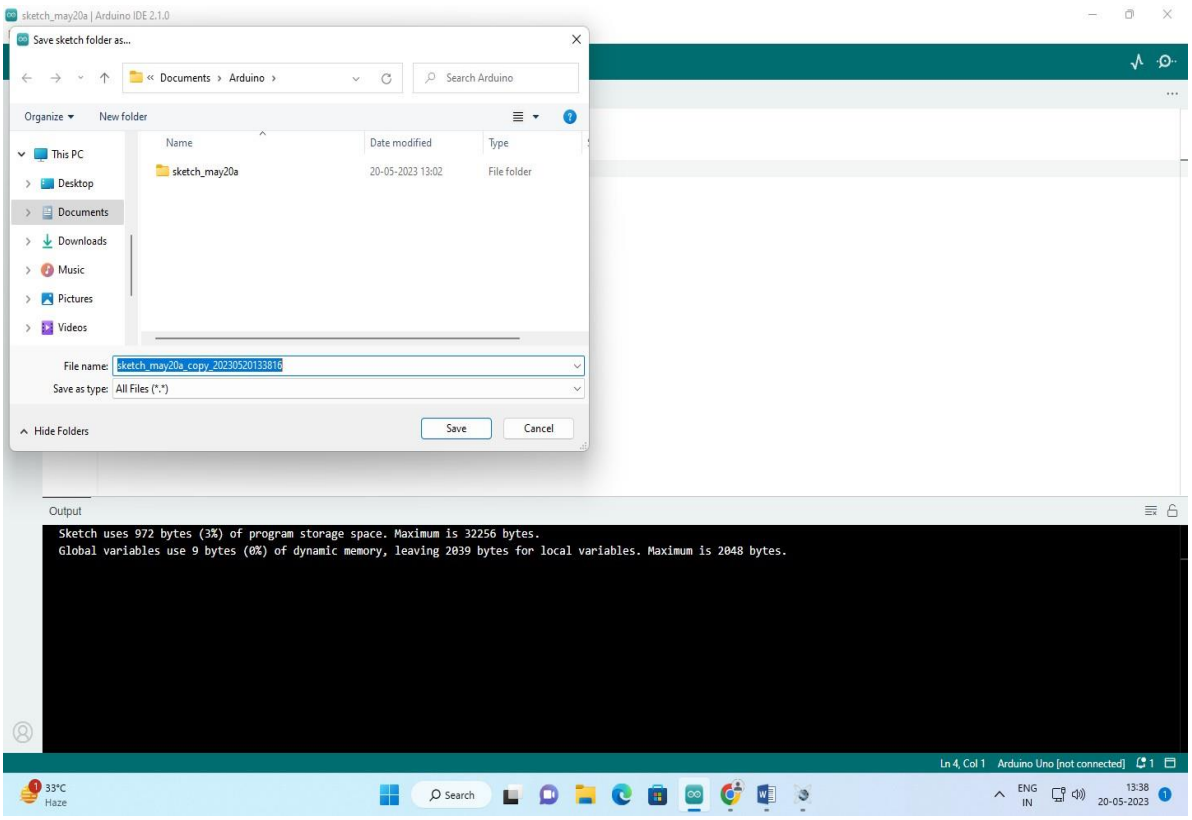


Write code on Arduino

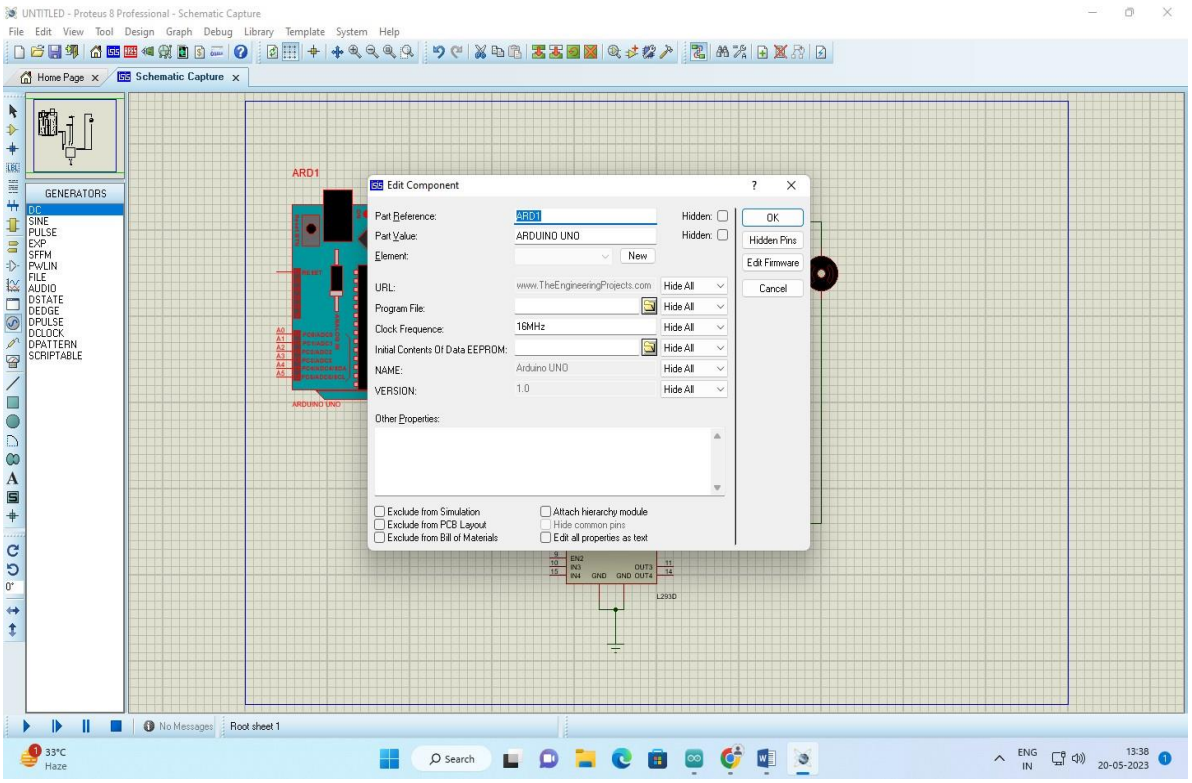


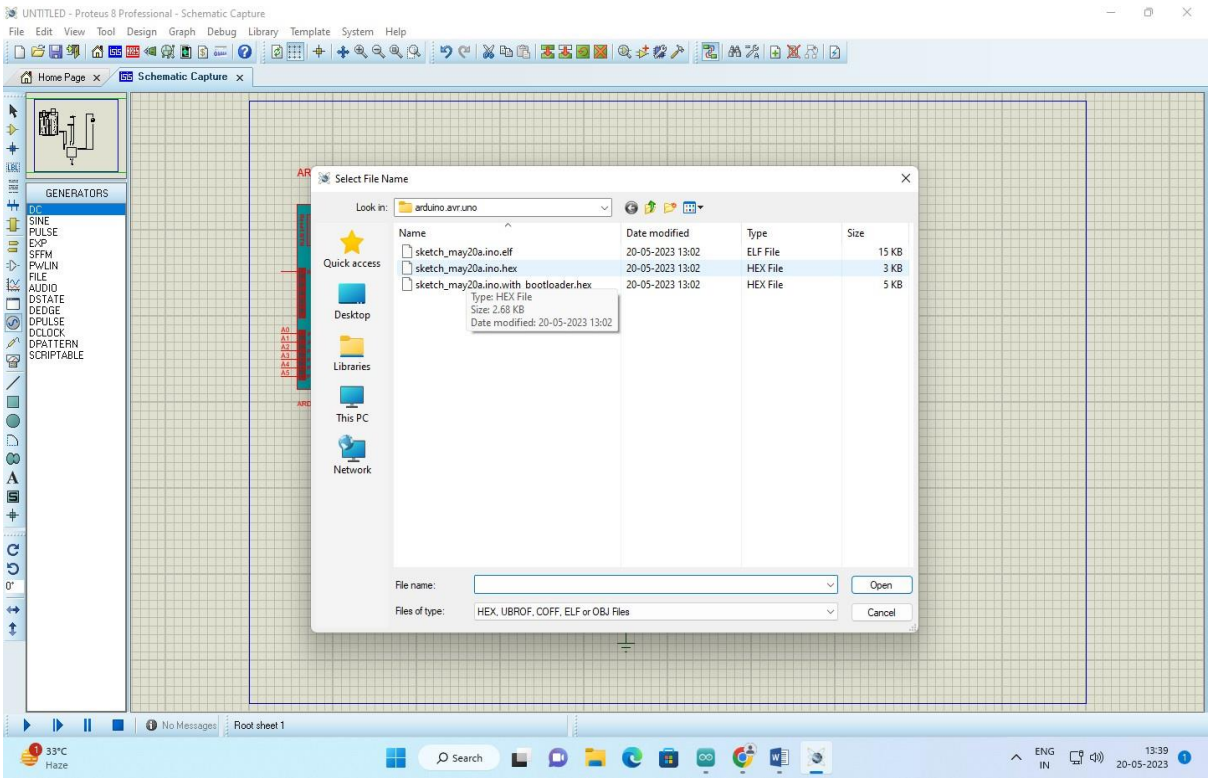


Save file

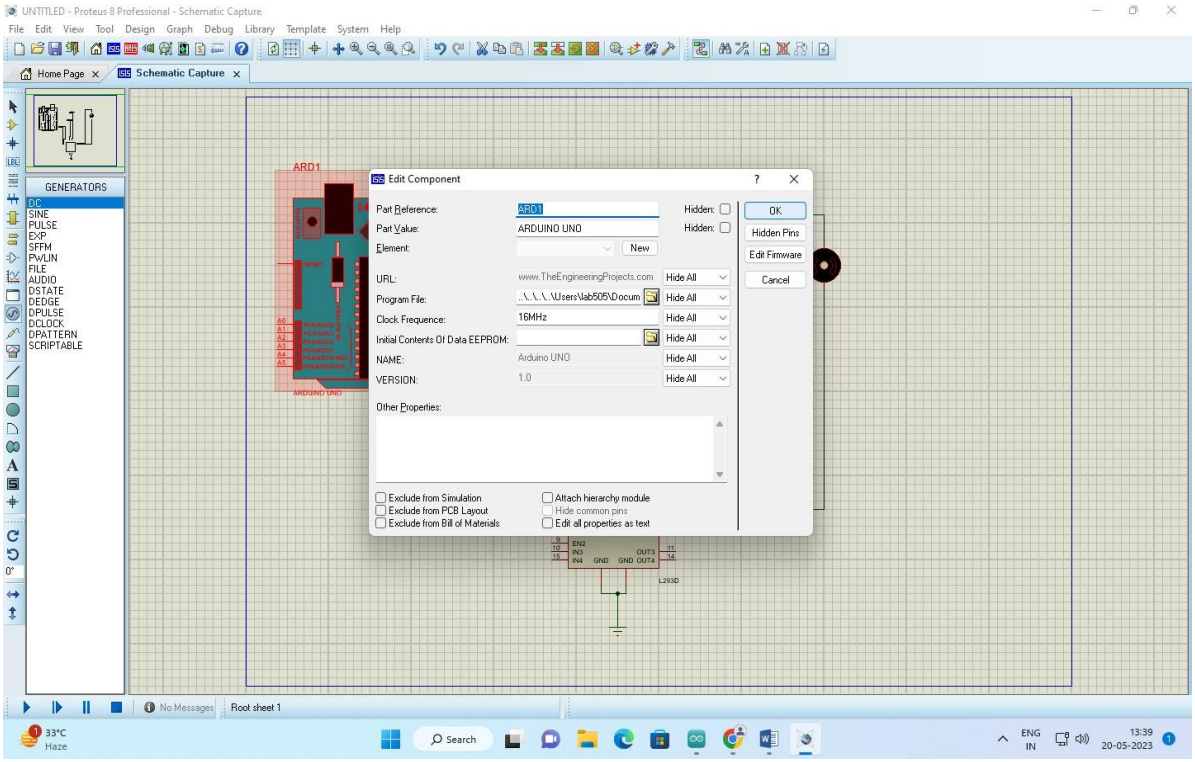


Double click on Arduino and select the path Arduino hex file.

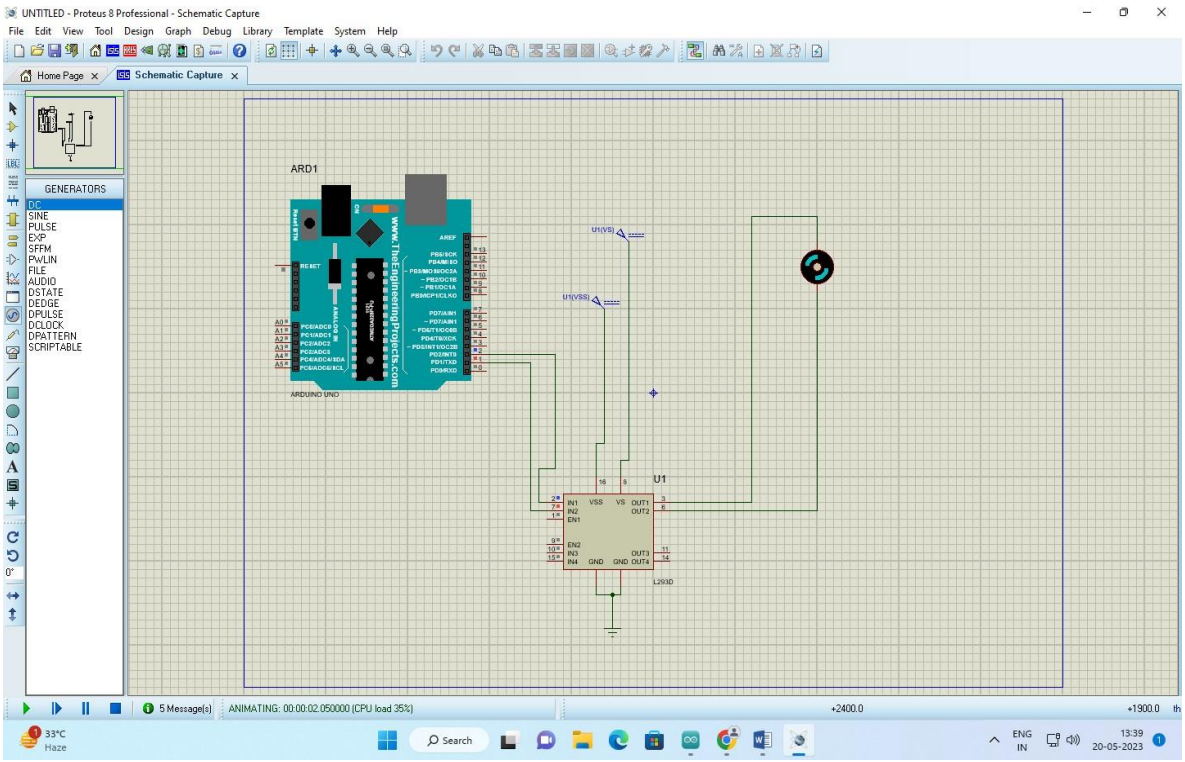




After selecting the path click on “ok”



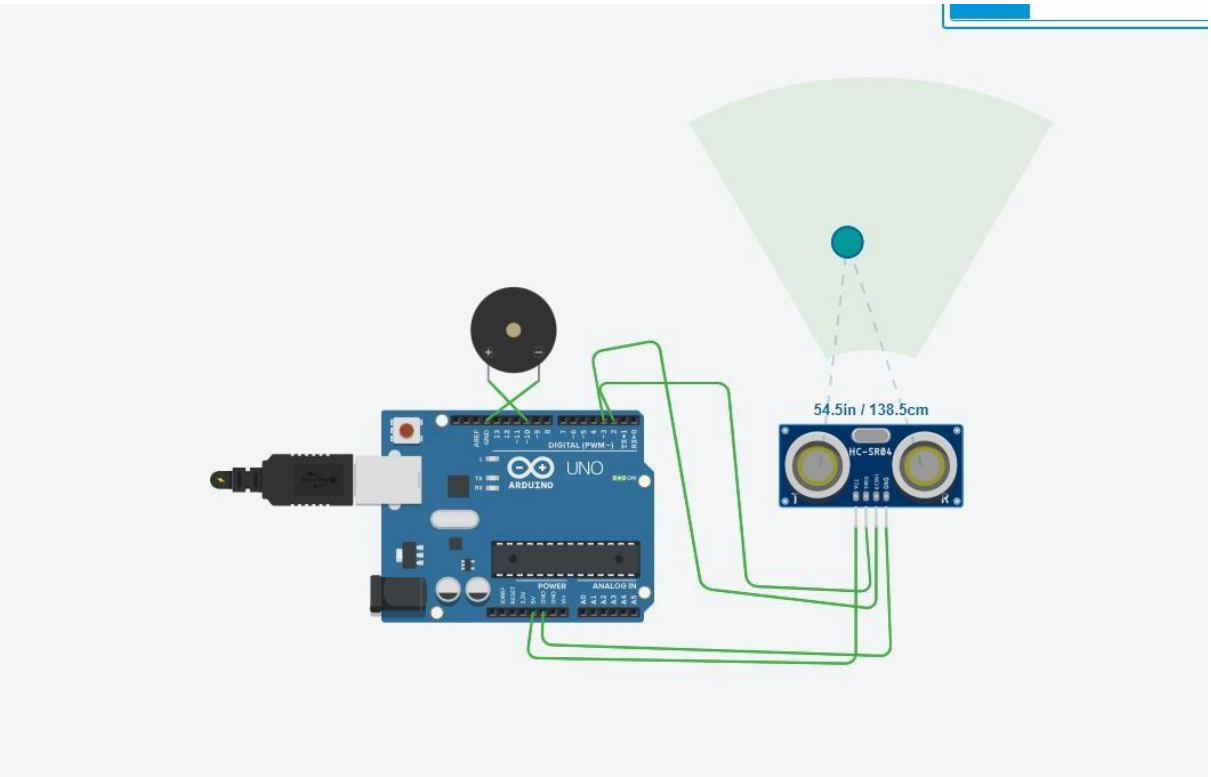
Click on run and you will see the o/p:-


UNTITLED - Proteus 8 Professional - Schematic Capture
File Edit View Tool Design Graph Debug Library Template System Help
Home Page
Schematic Capture
GENERATORS
DC
SINE
PULSE
EXP
SFFM
PWLIN
FILE
AUDIO
DSTATE
DEDGE
DPULSE
DCLOCK
DPATTERN
SCRIPTABLE
ARD1
ARDUINO UNO
U1
L293D
5 Message(s)
ANIMATING: 00:00:02.050000 (CPU load 35%)
+2400.0
+1900.0
33°C
Haze
Search
ENG
IN
13:39
20-05-2023

Practical no:- 5

Aim: Develop Python code for testing the sensors

Prequest : THINKERcard make a account on tinkercad



- Arduino UNO
- Ultrasonic distance sensor
- Piezo

Code:

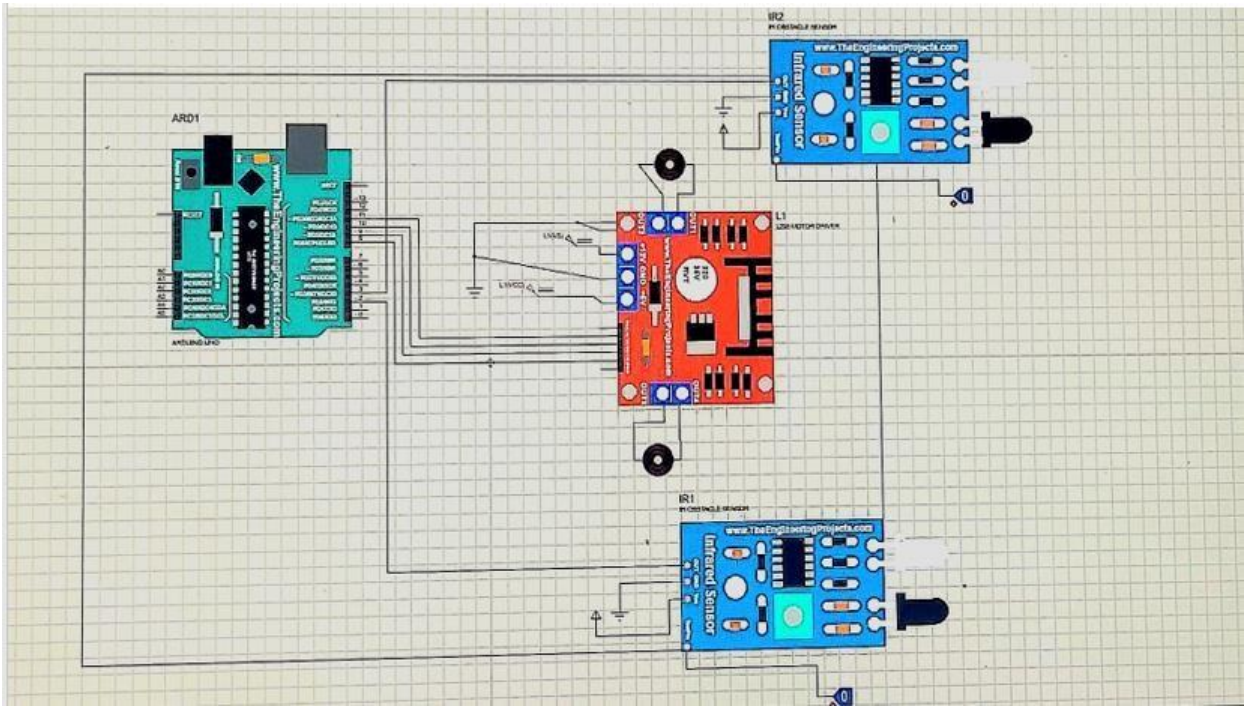
```
int trigger_pin = 2;
int echo_pin = 3;
int buzzer_pin = 10;
int time;
int distance;
void setup()
{
        Serial.begin(9600);
        pinMode (trigger_pin, OUTPUT);
        pinMode (echo_pin, INPUT);
        pinMode (buzzer_pin, OUTPUT);
}
void loop()
{
        digitalWrite (trigger_pin,HIGH);
        delayMicroseconds (10);
        digitalWrite (trigger_pin, LOW);
        time = pulseIn (echo_pin, HIGH);
        distance = (time * 0.034)/2;

  if (distance <= 10)
  {
    Serial.println("Door Open");
    Serial.print ("Distance=");
```

```
    Serial.println (distance);
    digitalWrite (buzzer_pin, HIGH);
    delay (500);
  }
  else
    {
    Serial.println("Door Close");
    Serial.print ("Distance=");
    Serial.println (distance);
    digitalWrite (buzzer_pin, LOW);
    delay (500);
  }
}
```

Practical no:- 6

Aim: Add the sensors to the Robot object and develop the line-following behavior code

Prequest: Proteus Design Suite, Arduino IDE



- Arduino UNO
- L298 Motor Driver
- DC MOTOR
- IR OBSTACLE SENSOR

Code:

```
int IR1 = 2;
int IR2 = 3;
int mt1f = 9;
int mt1b = 8;
int mt2f = 10;
int mt2b = 11;
void setup() {
  // put your setup code here, to run once:

  pinMode(IR1, INPUT);
  pinMode(IR2, INPUT);

  pinMode(mt1f,  OUTPUT);
  pinMode(mt1b, OUTPUT);
  pinMode(mt2f,  OUTPUT);
  pinMode(mt2b, OUTPUT);
}

void loop() {
  // put your main code here, to run repeatedly:
  int st1 = digitalRead(IR1);

  int st2 = digitalRead(IR2);


  if (st1 ==1 && st2==1) {

    digitalWrite(mt1f, HIGH);
    digitalWrite(mt2f, HIGH);
  }
 else if(st1 ==0 && st2==1){

    digitalWrite(mt1b, HIGH);
     digitalWrite(mt2f, HIGH);
```

```
  }
 else if(st1 ==1 && st2==0){

    digitalWrite(mt1f, HIGH);
    digitalWrite(mt2b, HIGH);
  }
else {

    digitalWrite(mt1b, LOW);
    digitalWrite(mt2b, LOW);
  }
}
```

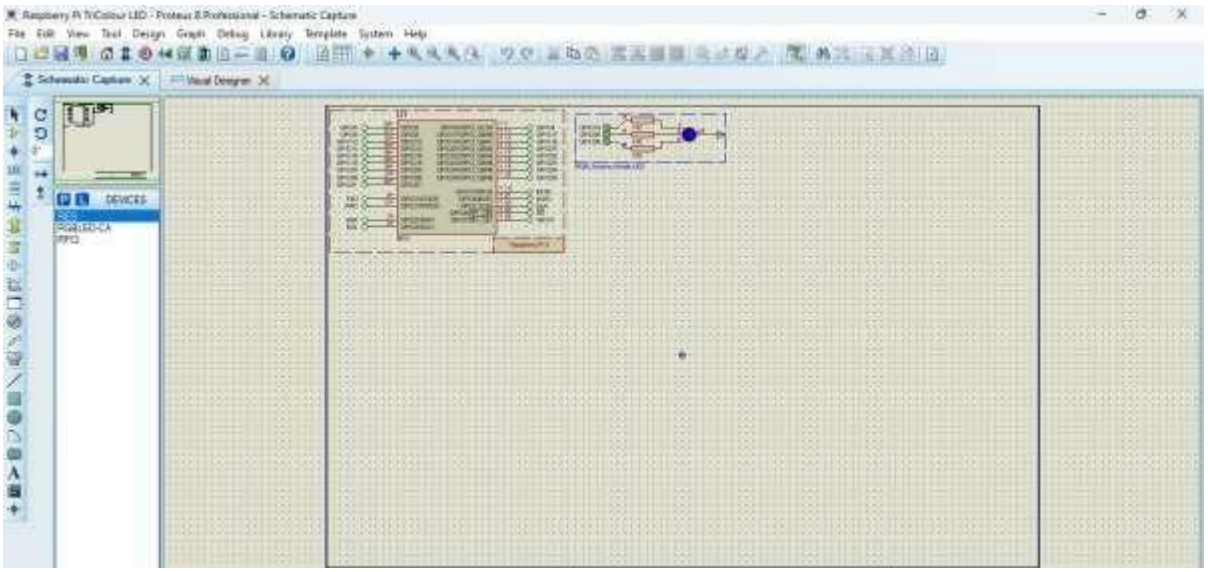
Practical no:- 7

Aim:-Using Light strip to develop and debug the line follower robot

Components required:

Raspberry pr ,Strip rgb led

Circuit connection:-



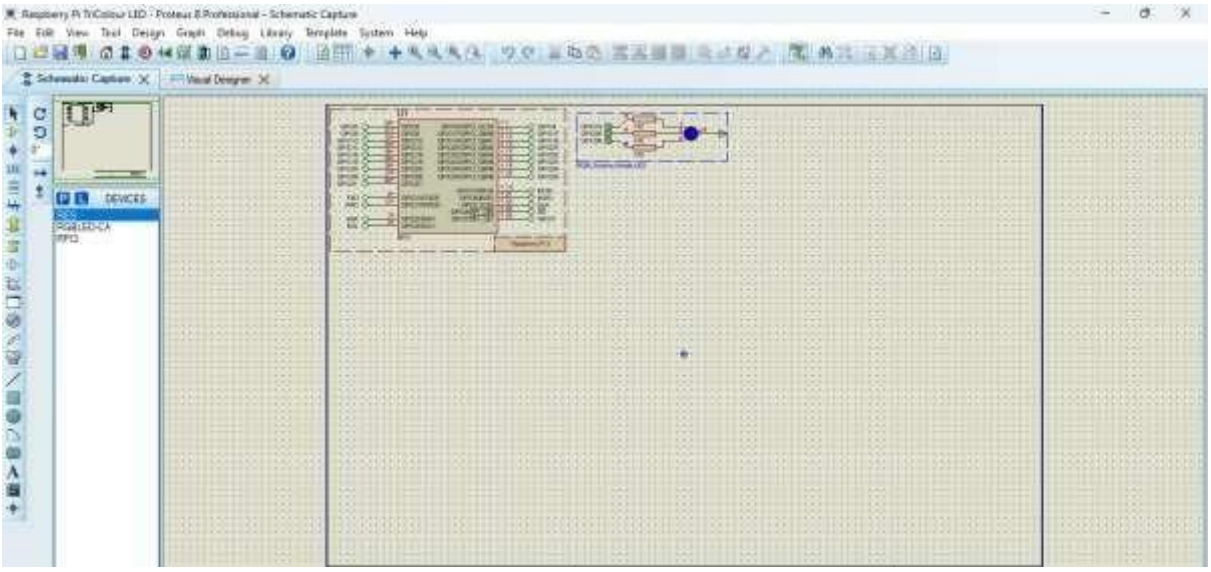
<u>Source Code in python</u>

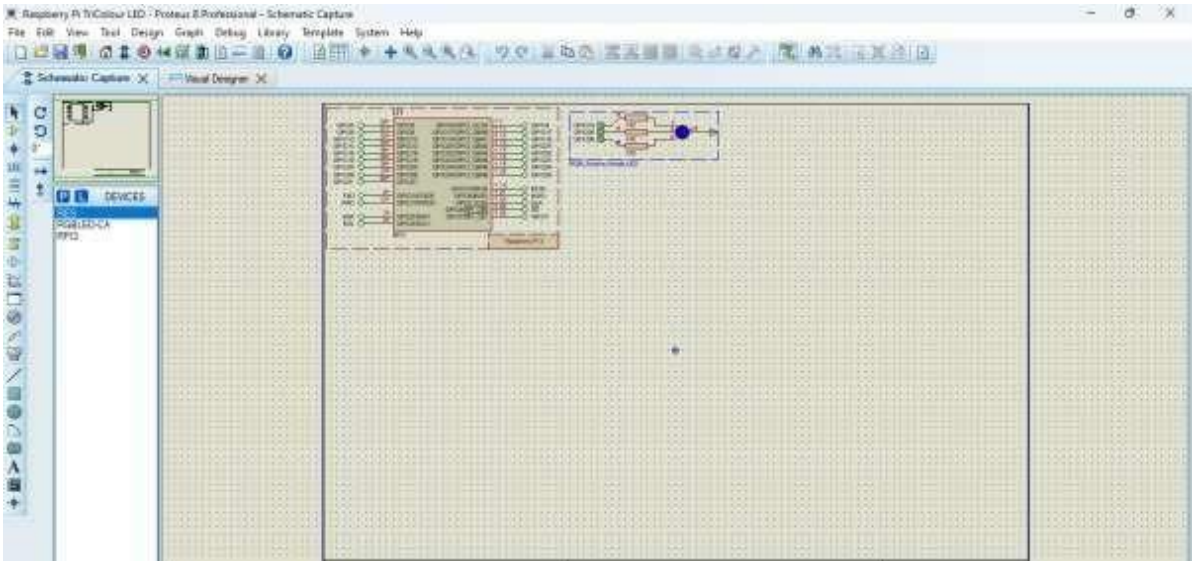
```
from goto import with_goto
from stddef import *
import var
import pio
import resource
from datetime import datetime
# Peripheral Configuration Code (Do Not Edit)
#---CONFIG_BEGIN---
import cpu
import FileStore
import timer
import VFP
import Generic
def peripheral_setup () :
# Peripheral Constructors
 pio.cpu=cpu.CPU ()
 pio.storage=FileStore.FileStore ()
 pio.timer=timer.Timer ()
 pio.server=VFP.VfpServer ()
 pio.RGBLED1=Generic.RgbLedCa (pio.GPIO19, pio.GPIO20, pio.GPIO26)
 pio.storage.begin ()
 pio.server.begin (0)
# Install interrupt handlers

def peripheral_loop () :
 pio.timer.poll ()
 pio.server.poll ()
#---CONFIG_END---
def variables_setup () :
# Flowchart Variables
 pass
# Flowchart Routines
@with_goto
def chart_SETUP () :
 return
@with_goto
def  chart_LOOP () :
 pio.RGBLED1.set (True, True, True)
 sleep((500)*0.001)
 pio.RGBLED1.set (True, False, False)
 sleep((500)*0.001)
 pio.RGBLED1.set (True, True, False)
 sleep((500)*0.001)
 pio.RGBLED1.set (False, True, False)
 sleep((500)*0.001)
 pio.RGBLED1.set (False, True, True)
 sleep((500)*0.001)
 pio.RGBLED1.set (False, False, True)
 sleep((500)*0.001)
 pio.RGBLED1.set (True, False, True)
 sleep((500)*0.001)
 pio.RGBLED1.set (False, False, False)
 sleep((500)*0.001)
 return

# Main function
def main () :
# Setup
 variables_setup ()
 peripheral_setup ()
 chart_SETUP ()
```

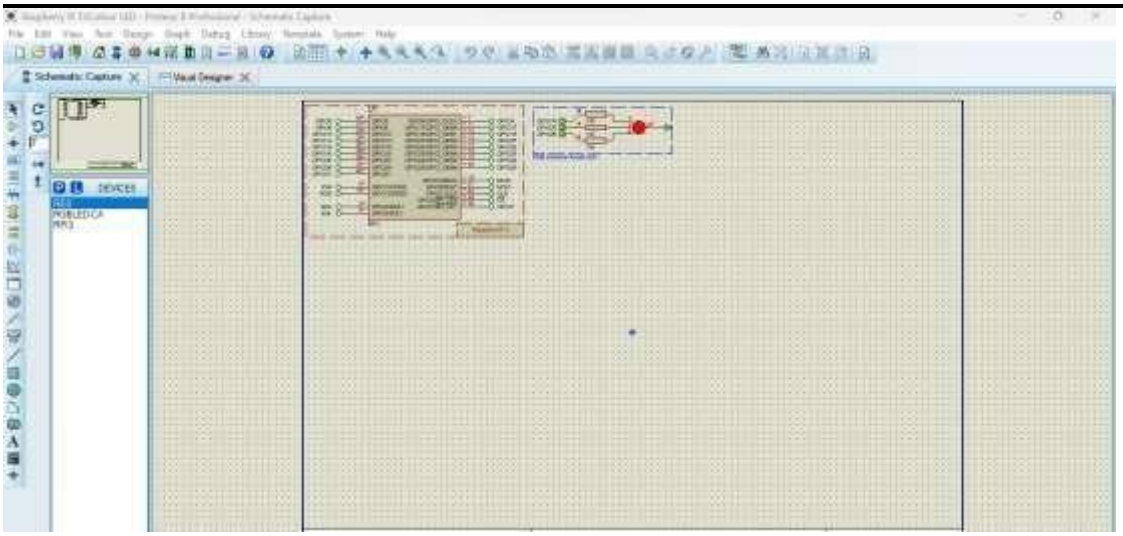
```
# Infinite loop
 while True :
 peripheral_loop ()
 chart_LOOP ()
# Command line execution
if __name__== '_main_' :
   main()
```

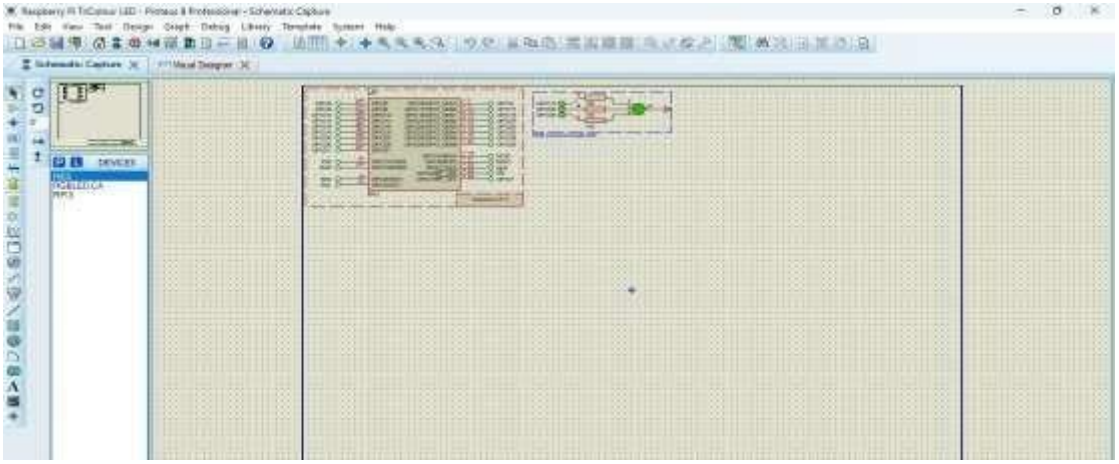
Flowchart of project:

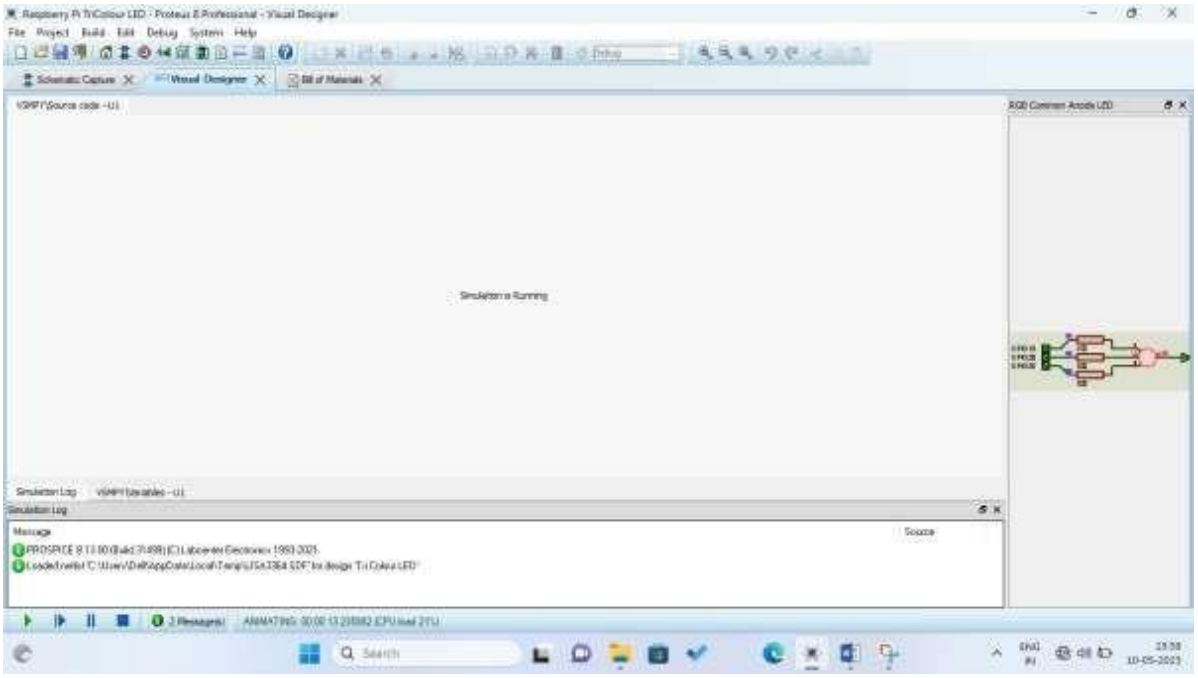
OUTPUT:-

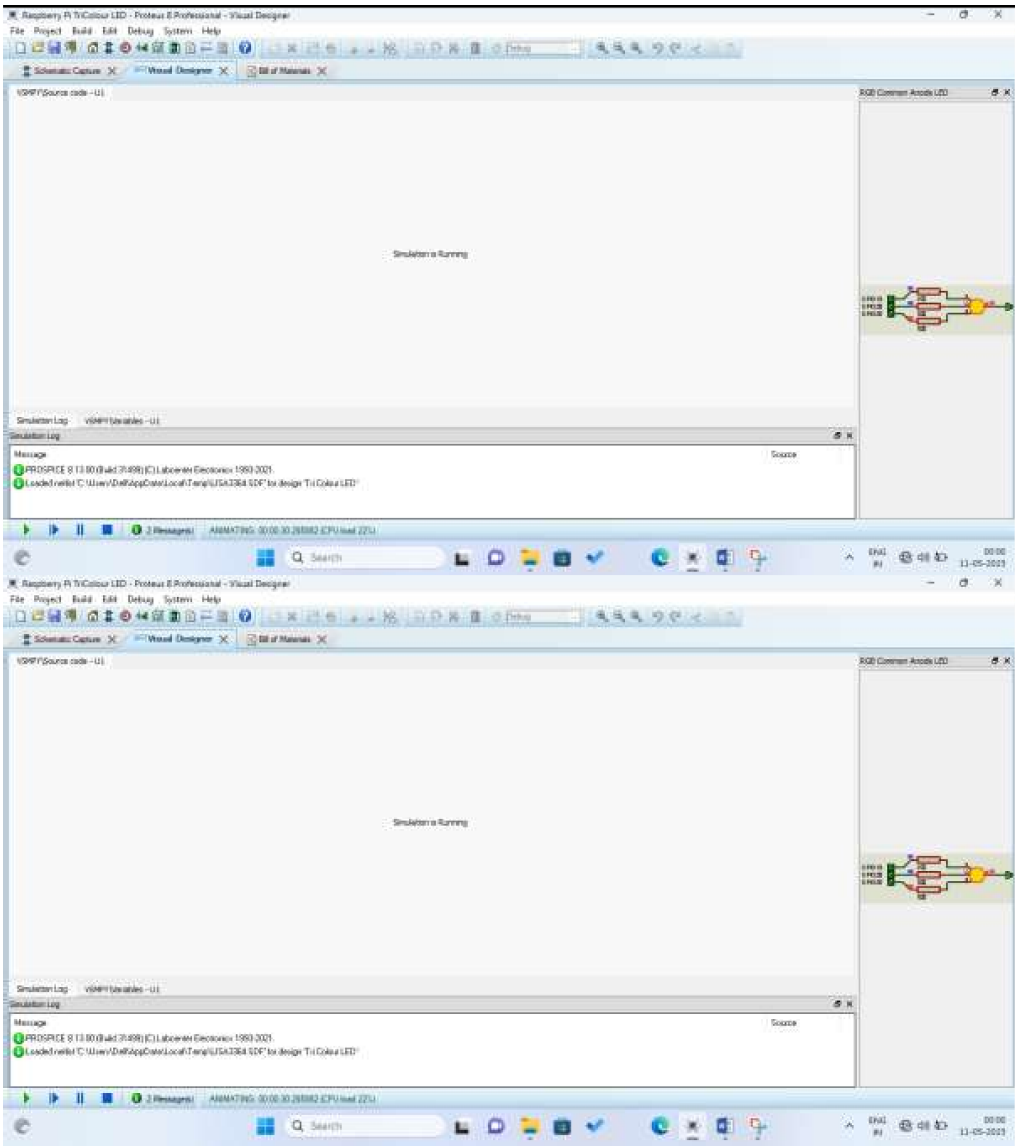


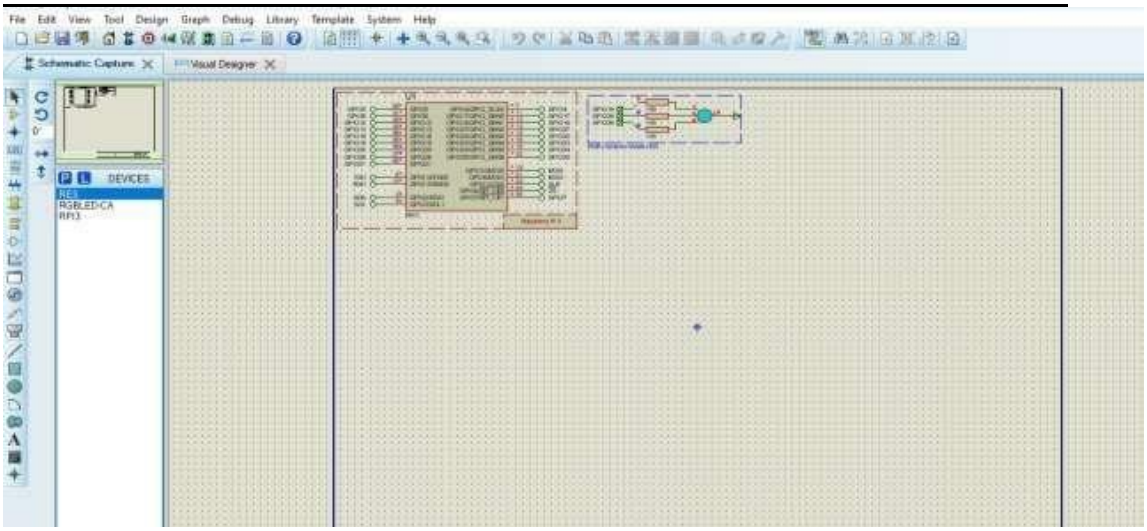












Conclusion:-

Hence we have programmed the rbg strip led for the observation of various colors used to identify the paths.

Practical No – 8

Aim - Detect faces with Haar cascades.

Step 1: Need to be Download “haarcascarde_frontalface_default.xml” in same folder of code file and Web cam connected to system.

Step 2: Install create and activate Virtual Environment by using venv Package.

Use below command to download virtual environment by using CMD,

>>>pip install venv

Command to Create virtual environment,

>>>Virtualenv env

Command to Activation of virtual environment,

For Linux: $sources environment_name/bin/activate

For Windows: >env\scripts\activate

Step 3: Install Open CV Package,

>>>pip install opencv-python

Step 4: Use any Editor for code writing (e.g: VS Code, Python IDLE)

For open VS code type in same CMD shell,

>>>code .

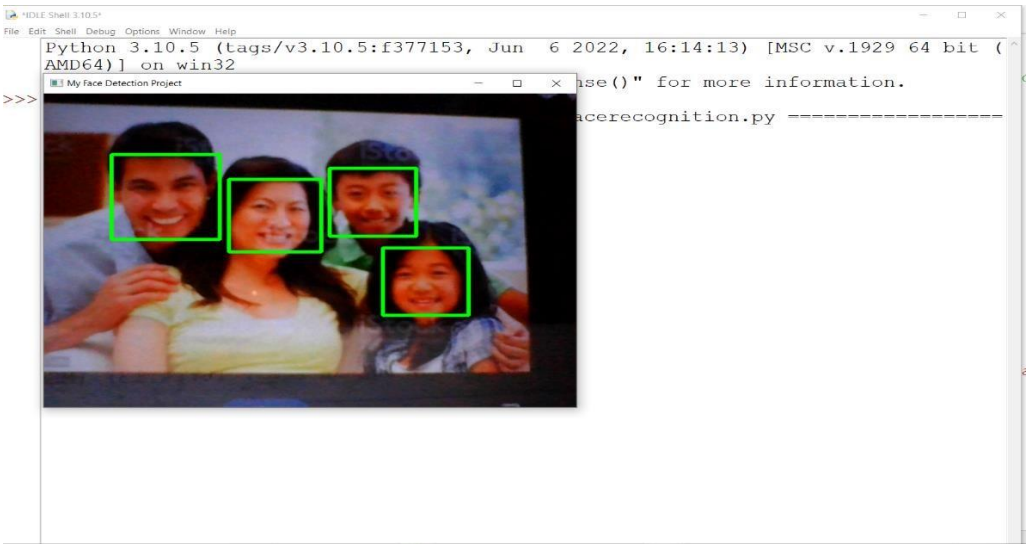
Step 5: For running program here we used VS Code, Write below code and run.

Source Code:

```
import cv2
```

```
face_classifier = cv2.CascadeClassifier(cv2.data.haarcascades
+ "haarcascade_frontalface_default.xml")

video_capture = cv2.VideoCapture(0)

def detect_bounding_box(vid):
    gray_image = cv2.cvtColor(vid, cv2.COLOR_BGR2GRAY)
    faces = face_classifier.detectMultiScale(gray_image, 1.1, 5,
minSize=(40,40))
    for (x,y,w,h) in faces:
        cv2.rectangle(vid, (x,y),(x+w,y+h),(0,255,0),4)
    return faces

while True:
    result, video_frame = video_capture.read() #read frames
from the video
    if result is False:
        break #terminate the loop if the frame is not read
successfully

    faces = detect_bounding_box(video_frame) #apply the
function we created to the video frame
    cv2.imshow("My Face Detection Project",video_frame)
#display the processed frame in a window named "My Face
Detection Project"

    if cv2.waitKey(1)& 0xFF == ord("q"):
        break

video_capture.release()
cv2.destroyAllWindows()
```

Output:


IDLE Shell 3.10.5
File Edit Shell Debug Options Window Help
Python 3.10.5 (tags/v3.10.5:f377153, Jun 6 2022, 16:14:13) [MSC v.1929 64 bit (
AMD64)] on win32
>>>
My Face Detection Project