UNIVERSITY OF MUMBAI

# DEPARTMENT OF COMPUTER SCIENCE

मुंबई विद्यापीठ
University of Mumbai
Re-accredited with A++ Grade
(CGPA 3.65) by NAAC (3rd Cycle 2021)

M.Sc. Computer Science – Semester IV

Robotics

JOURNAL

2023-2024

Seat No: _____

मुंबई विद्यापीठ
University of Mumbai
Re-accredited with A++ Grade
(CGPA 3.65) by NAAC (3rd Cycle 2021)

UNIVERSITY OF MUMBAI

**DEPARTMENT OF COMPUTER SCIENCE**

# CERTIFICATE

This is to certify that the work entered in this journal was done in the University Department of Computer Science laboratory by Mr/Mrs._____ Seat No._____for the course of M.Sc. Computer Science - Semester IV (CBCS) (Revised) during the academic year 2023- 2024 in a satisfactory manner.

_____ _____

**Subject In-charge** **Head of Department**

_____

**External Examiner**

# INDEX

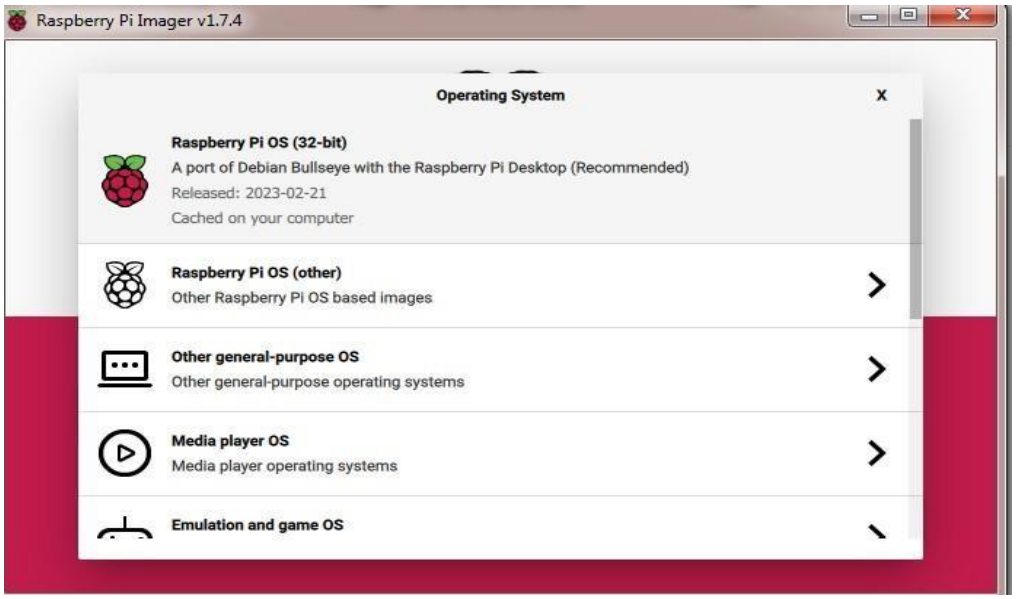
| Sr. No | Practical | Date | Sign |
|---|---|---|---|
| 1 | Making a Raspberry Pi headless, and reaching it from the network using WiFi and SSH. | | |
| 2 | Using sftp upload files from PC. | | |
| 3 | Write Python code to test motors. | | |
| 4 | Develop Python code for testing the sensors. | | |
| 5 | Add the sensors to the Robot object and develop the linefollowing behavior code | | |
| 6 | Add pan and tilt service to the robot object and test it. | | |
| 7 | Create an obstacle avoidance behavior for robot and test it. | | |
| 8 | Detect faces with Haar cascades. | | |

# Practical No. 01

**Aim:** Making Raspberry pi headless, and reaching it from the network using wifi and SSH.

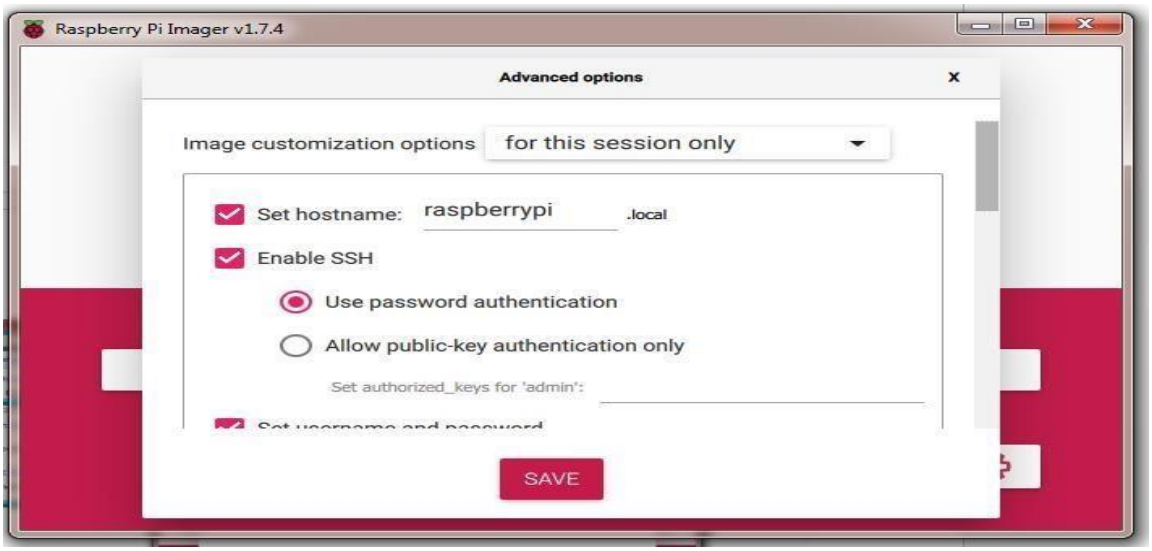
STEP I : Download raspberry pi imager for windows. And connect sd card to laptop.


STEP II : Select operating sysyem (raspberry pi OS 32-bit)

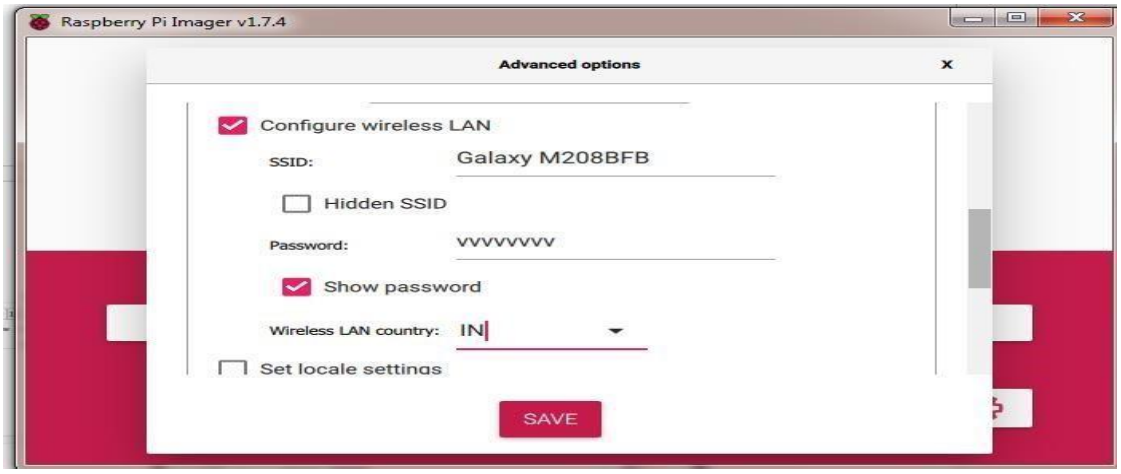


## STEP III : Select Storage.

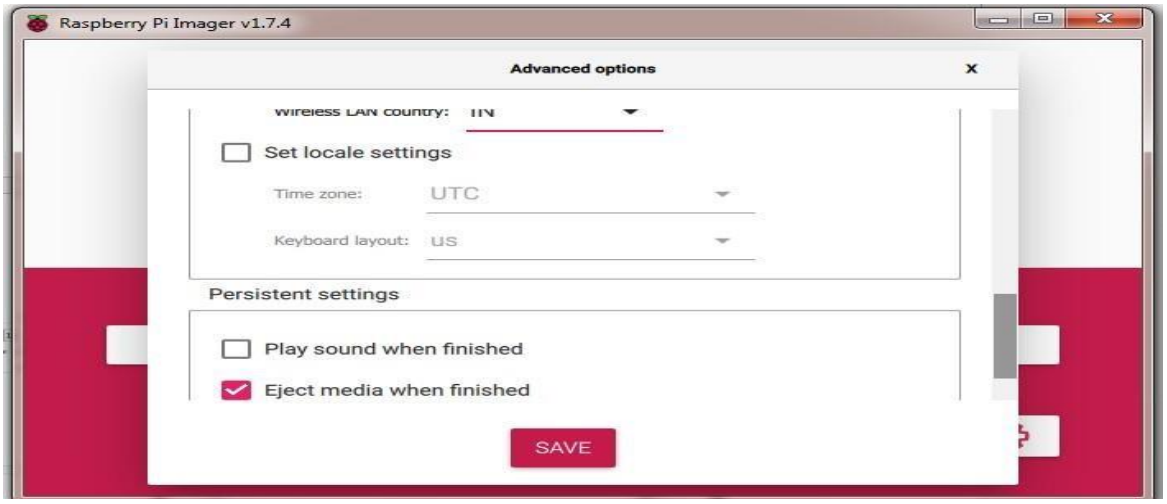

## STEP IV : Click on Setting Icon . and set hostname. Click to enable SSH.



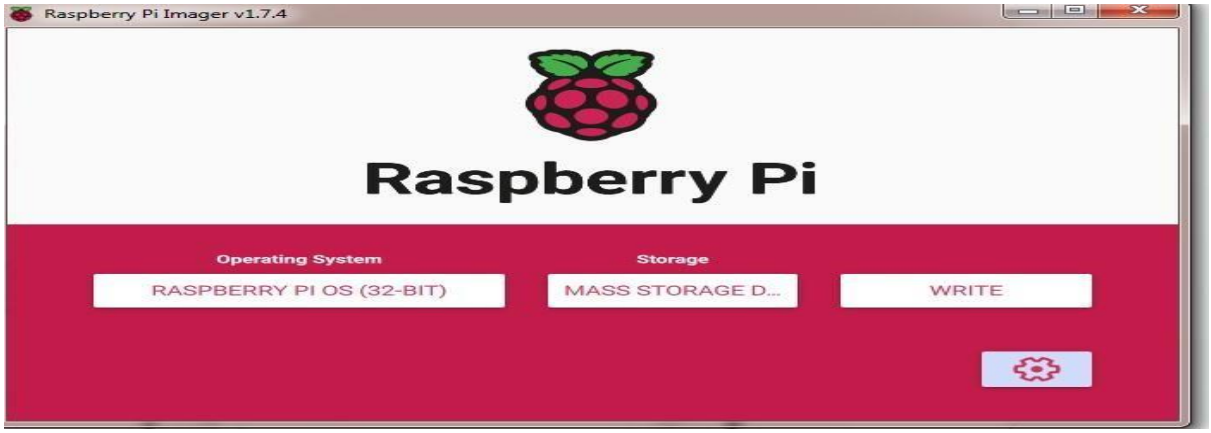
STEP V : Click to configure wireless LAN. And select country.




STEP VI : Click to save.



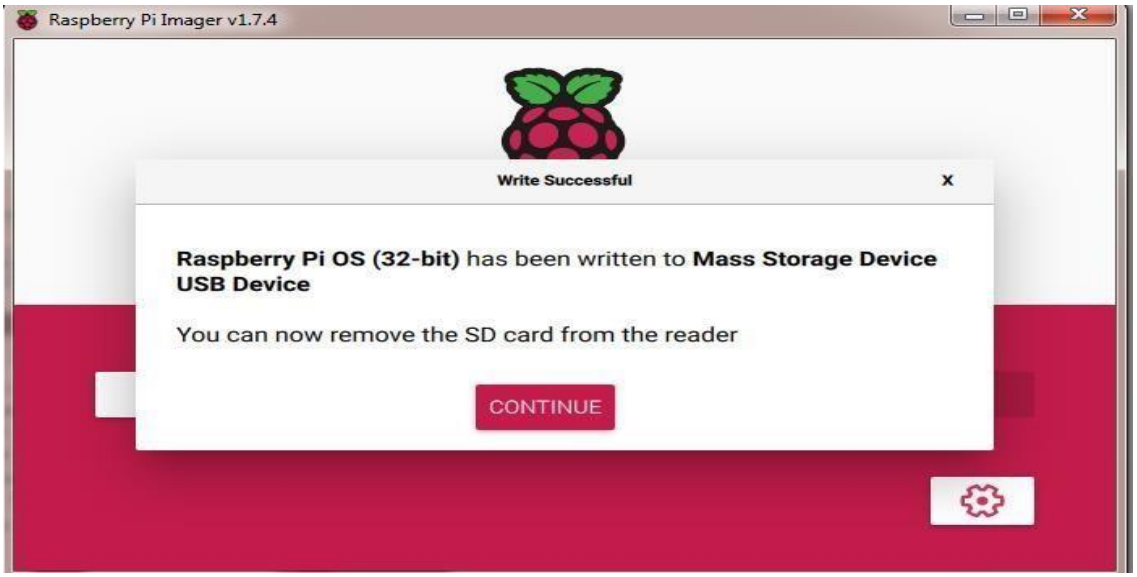
STEP VII : Click on write.



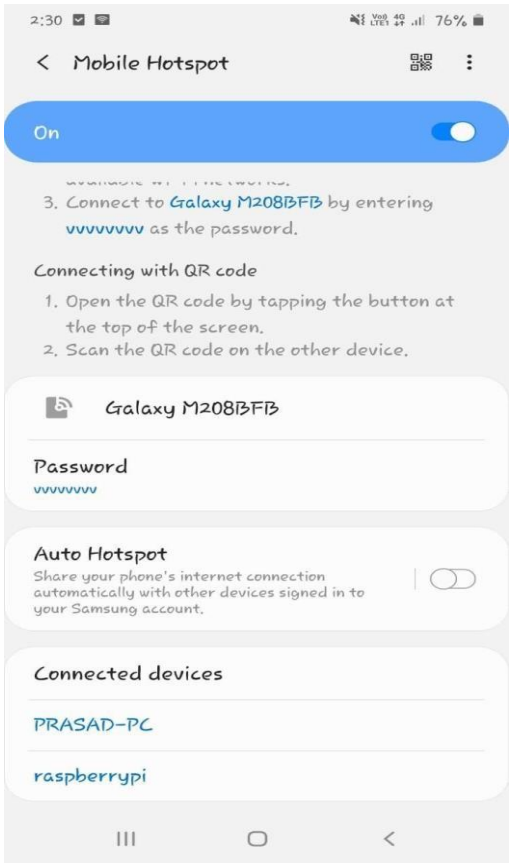

STEP VIII : Click on yes.


STEP IX : Verifying raspberry pi .


STEP X : Click on continue .



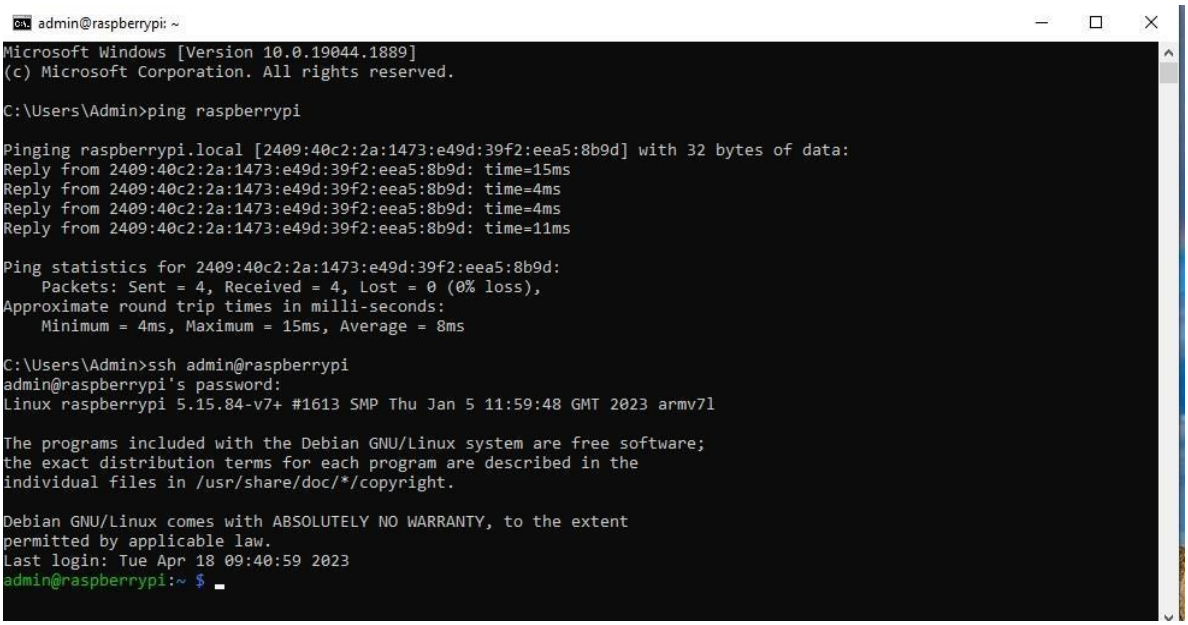

Step XI : check the connection in your mobile hotspot of raspberrypi




# STEP X: On cmdpromt execute these command :

## 1.ping raspberrypi

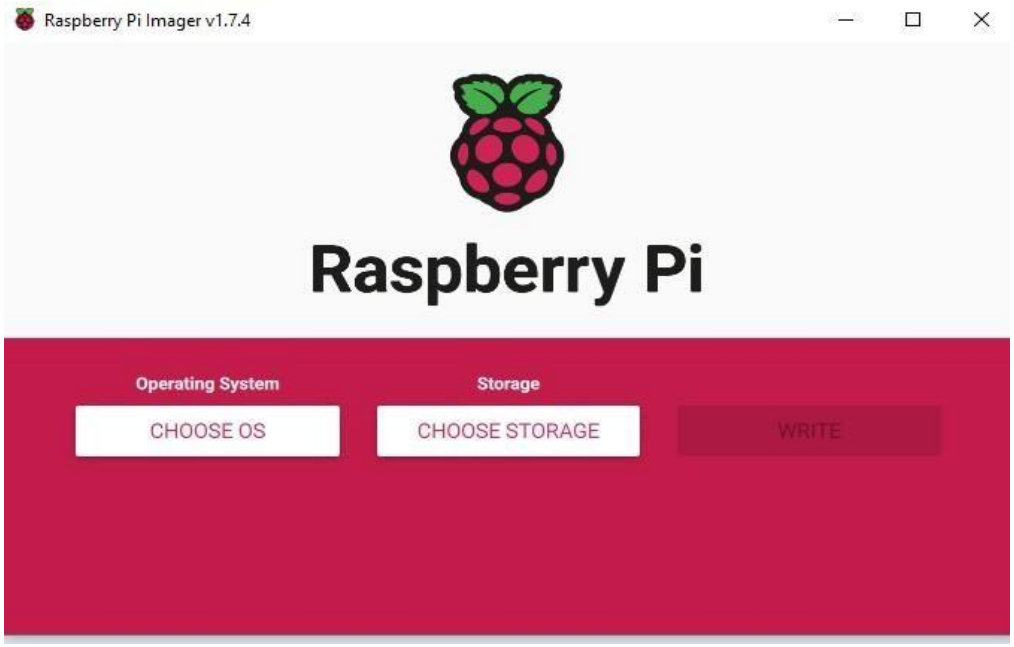
## 2.ssh admin@raspberrypi

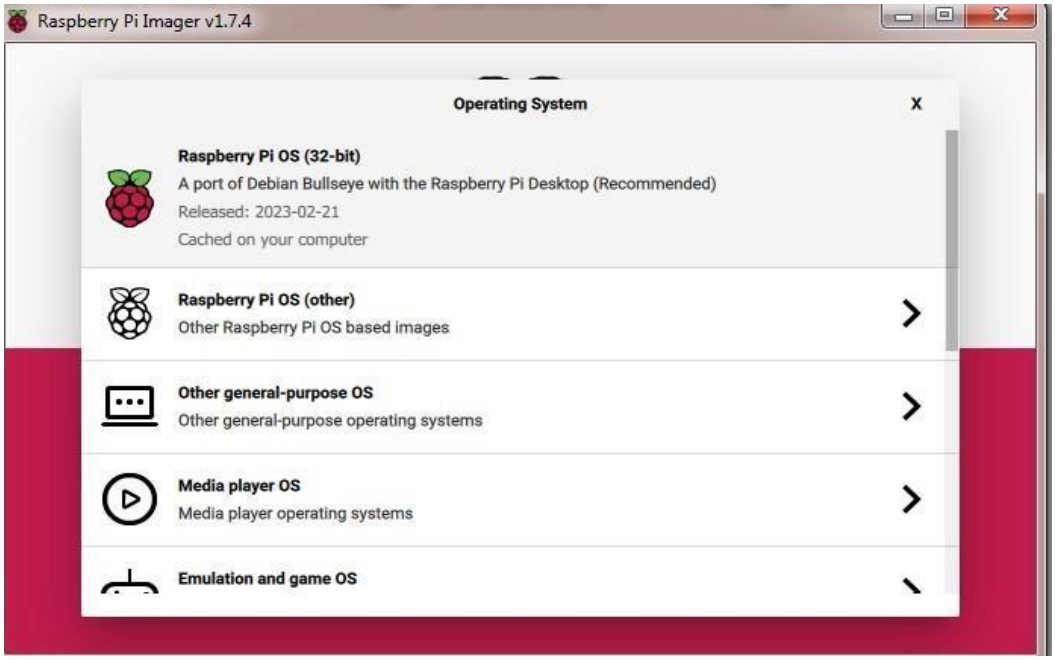


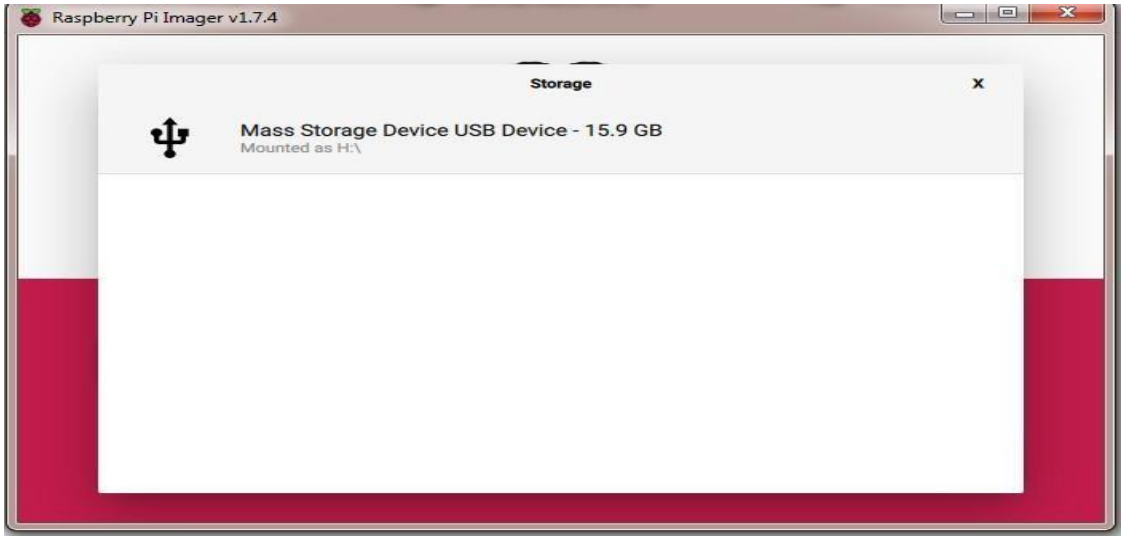
# Practical No 2

**Aim:** Using sftp upload files from PC.

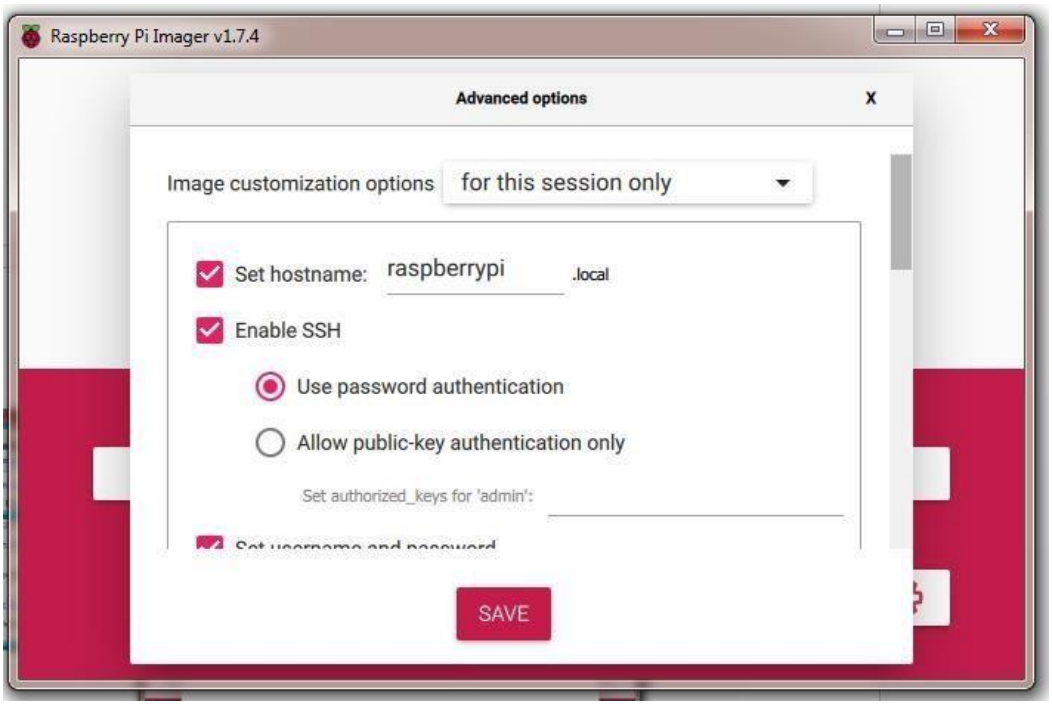
Step 1: Intsall the Raspberry Pi Imager

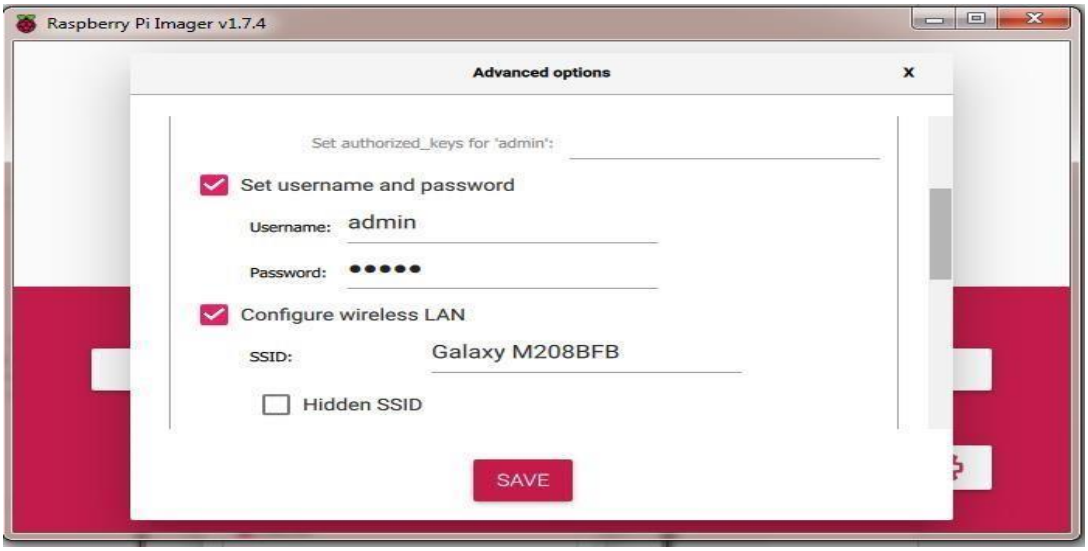


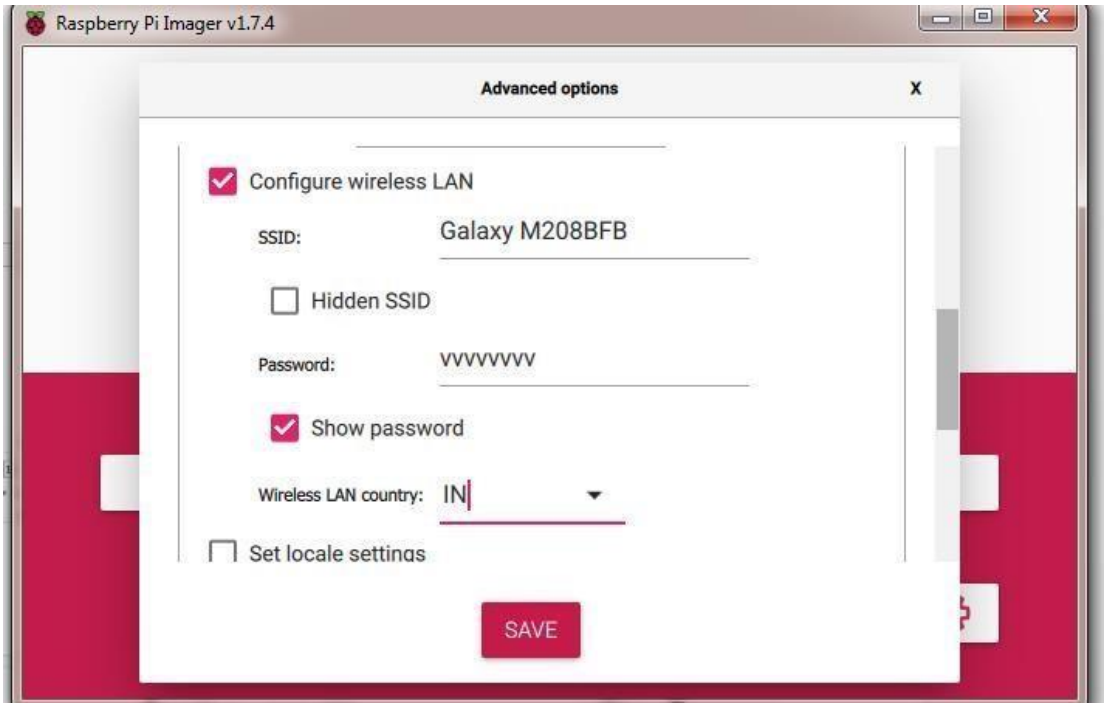


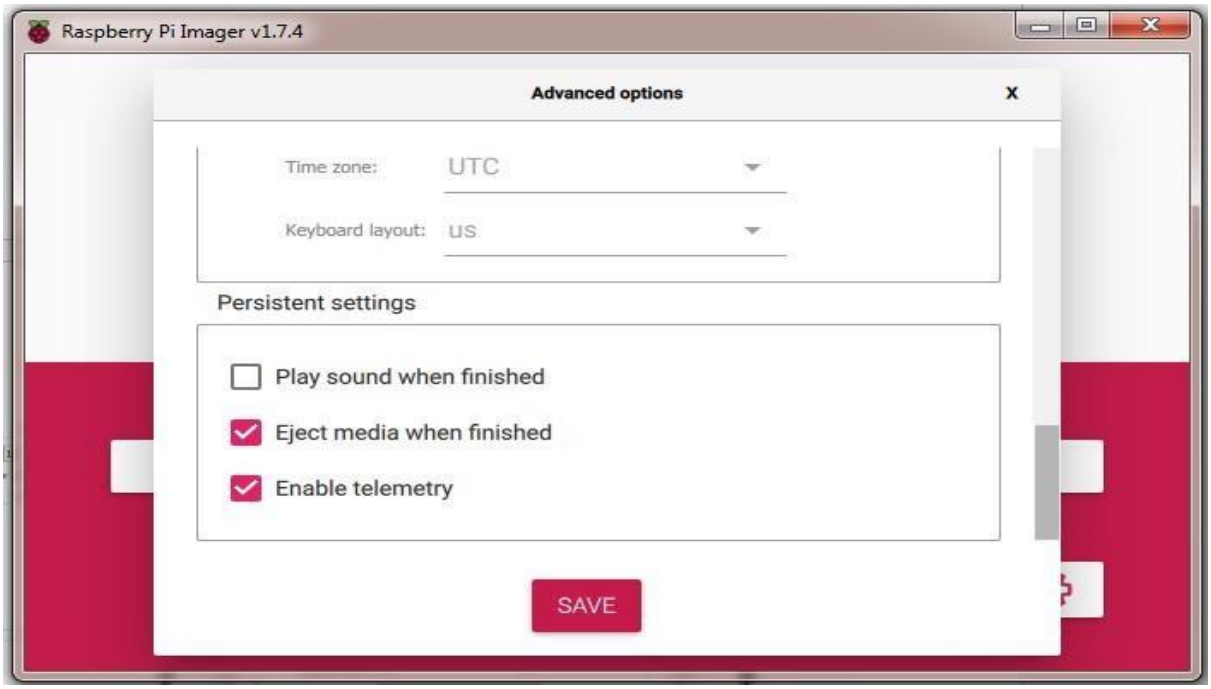

## Step 2: Set Host Name , enable SSH, Set Username and Password.

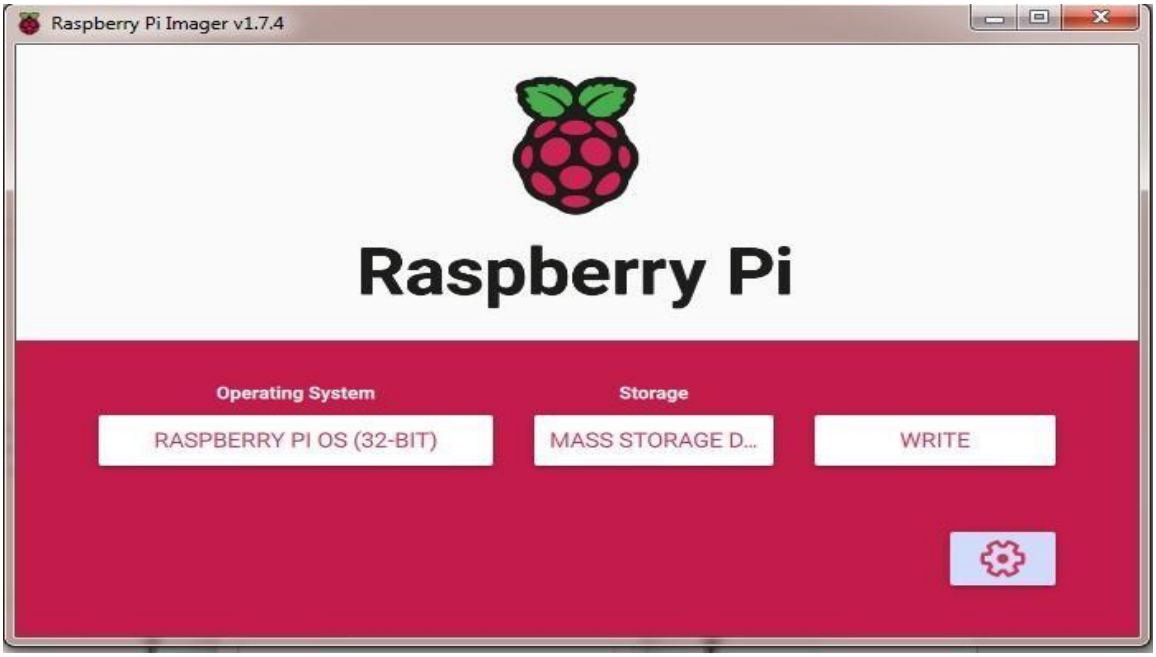


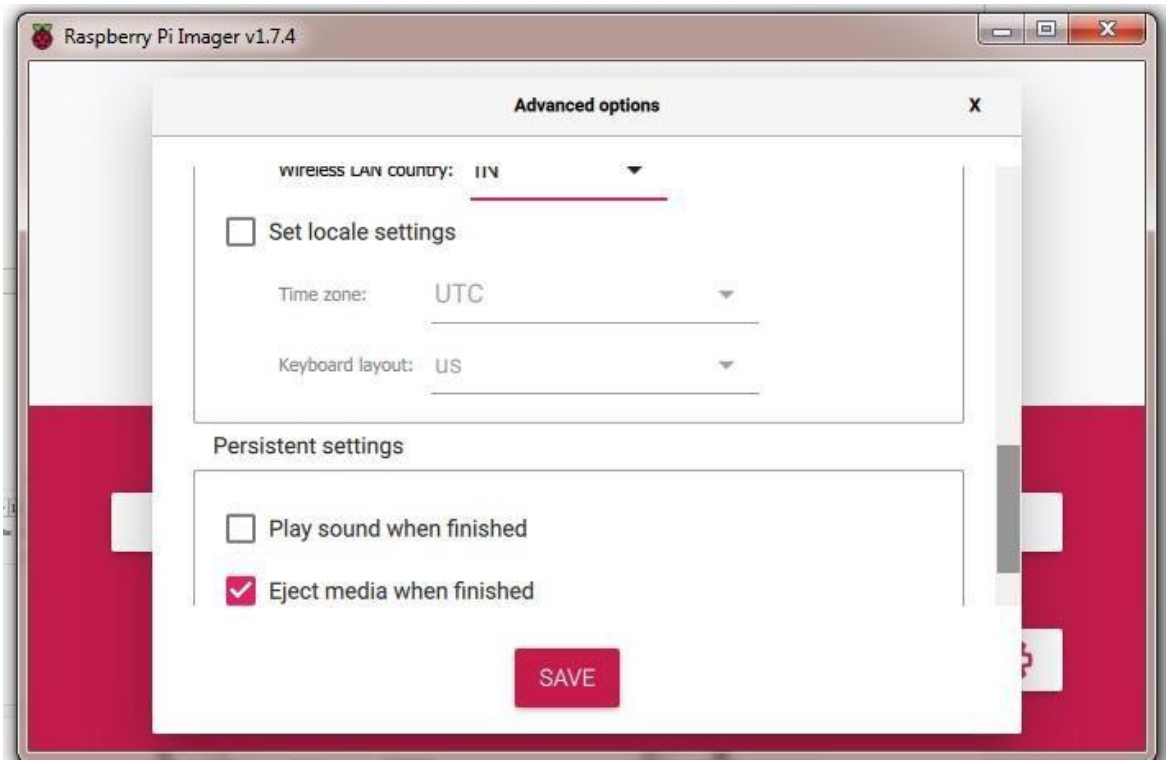



Step 3: Set SSID and Password of hotspot which is used .



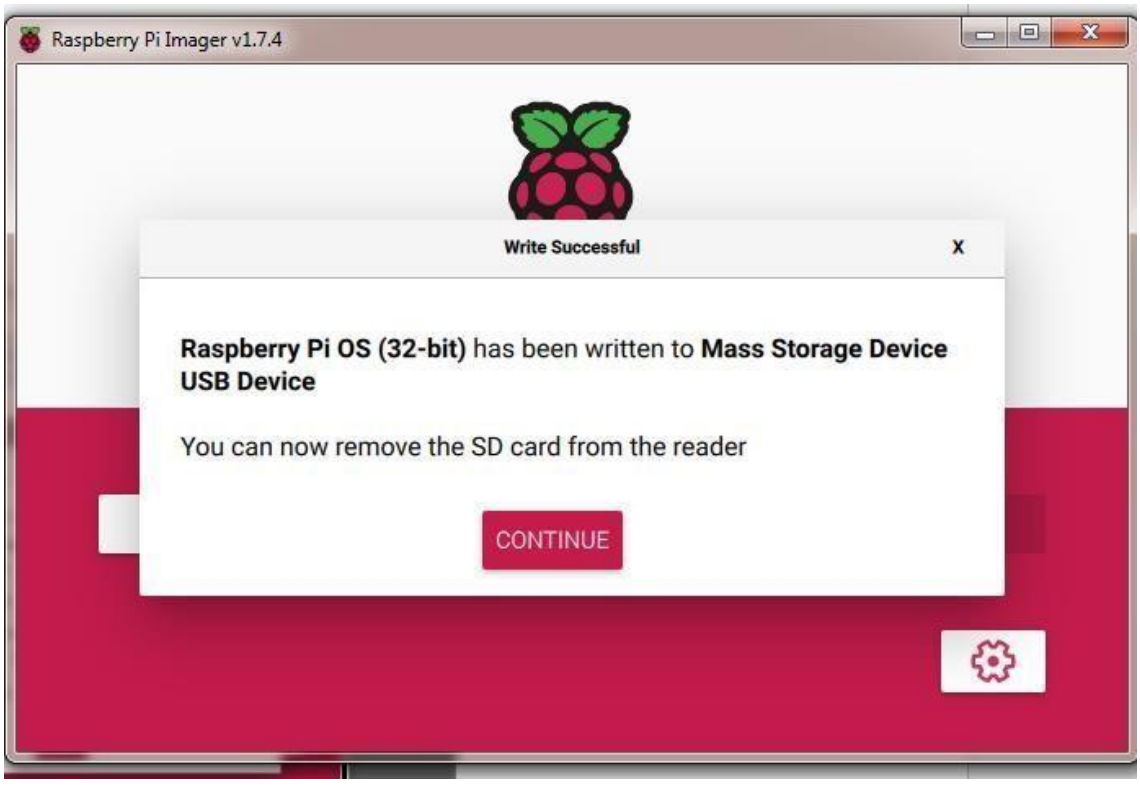

Raspberry Pi Imager v1.7.4
Advanced options
X
Time zone:
UTC
Keyboard layout:
US
Persistent settings
Play sound when finished
Eject media when finished
Enable telemetry
SAVE


Raspberry Pi Imager v1.7.4
Raspberry Pi
Operating System
Storage
RASPBERRY PI OS (32-BIT)
MASS STORAGE D...
WRITE

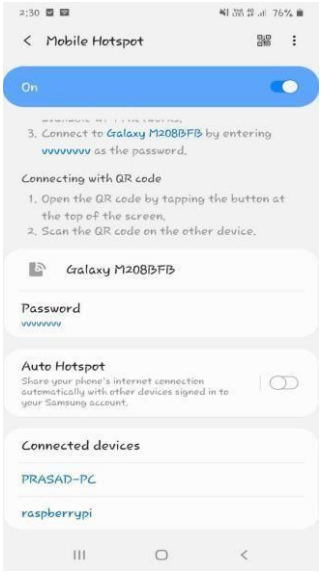

Raspberry Pi Imager v1.7.4
Advanced options
X
Wireless LAN country: IN
Set locale settings
Time zone: UTC
Keyboard layout: us
Persistent settings
Play sound when finished
Eject media when finished
SAVE


Raspberry Pi Imager v1.7.4
Warning
X
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
RASPBERRY PI OS (32-BIT)
MASS STORAGE D...
WRITE
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 Device.



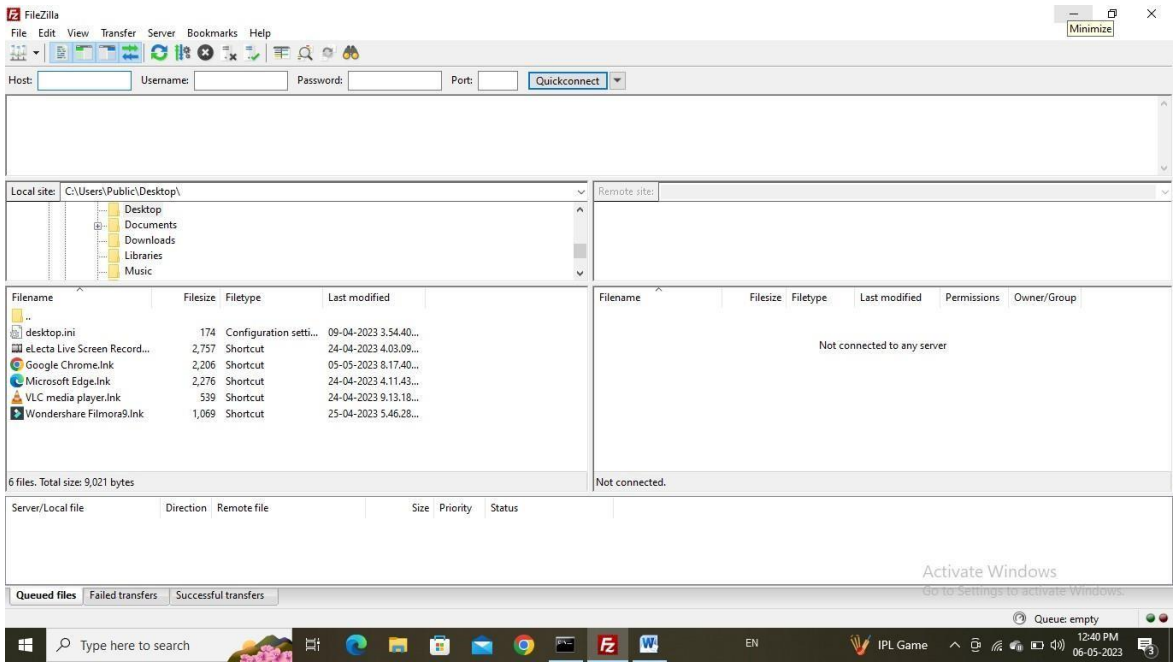

Step 5: Open CMD and tyepe following command

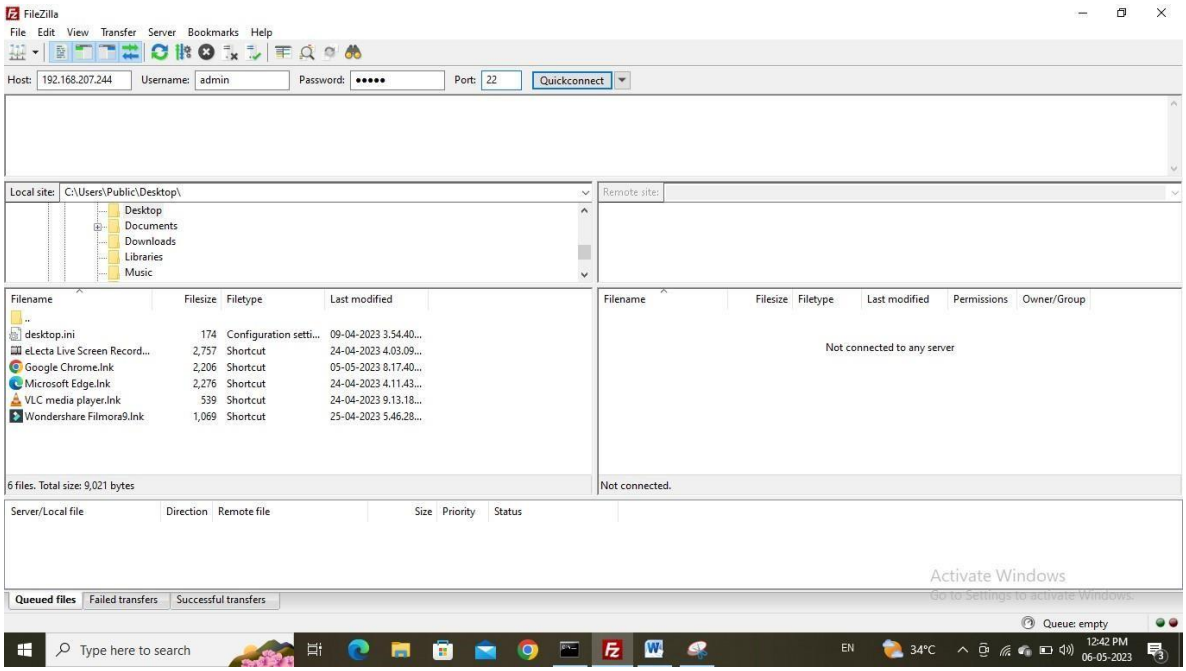
pingraspberrypi or ping 162.168.207.244

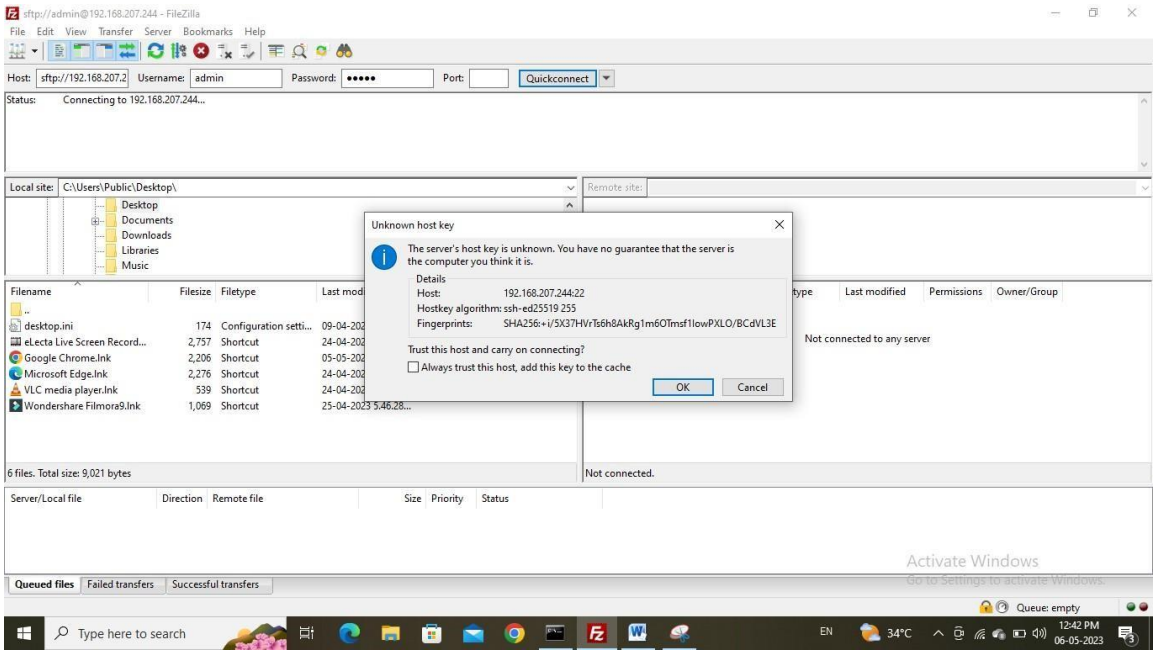
ssh admin@ raspberrypi or ssh admin@ 162.168.207.244 And type password of Admin

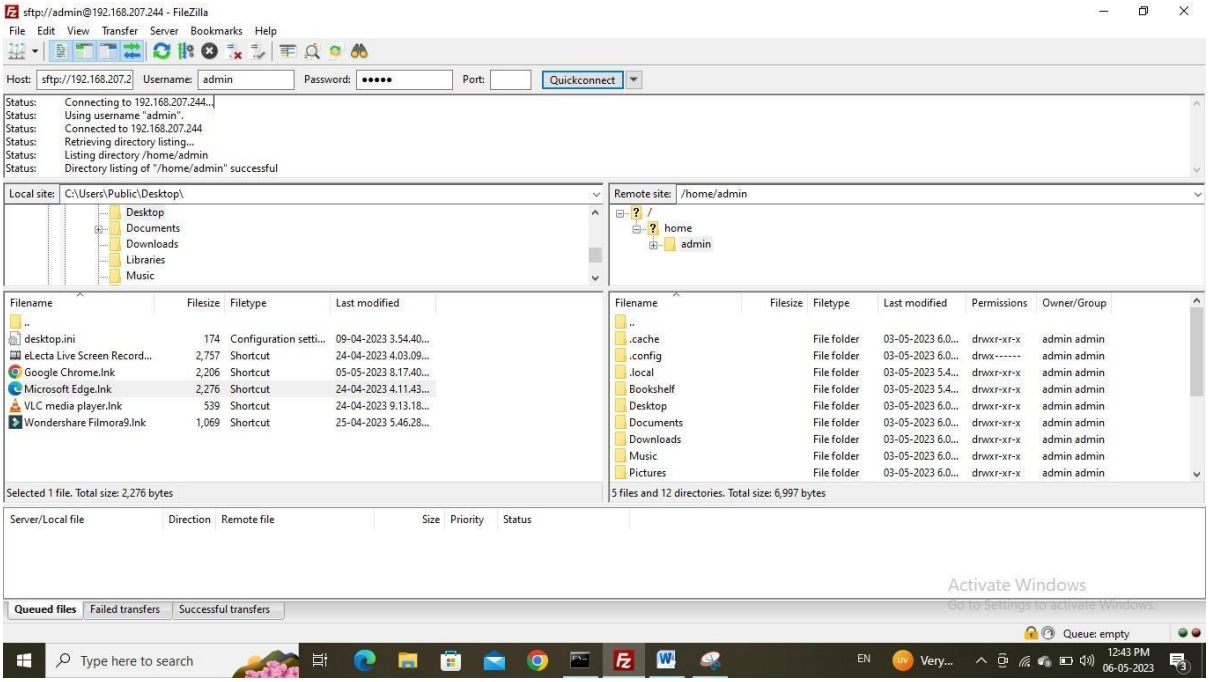
```
admin@raspberrypi: ~
Request timed out.

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:~ $
```

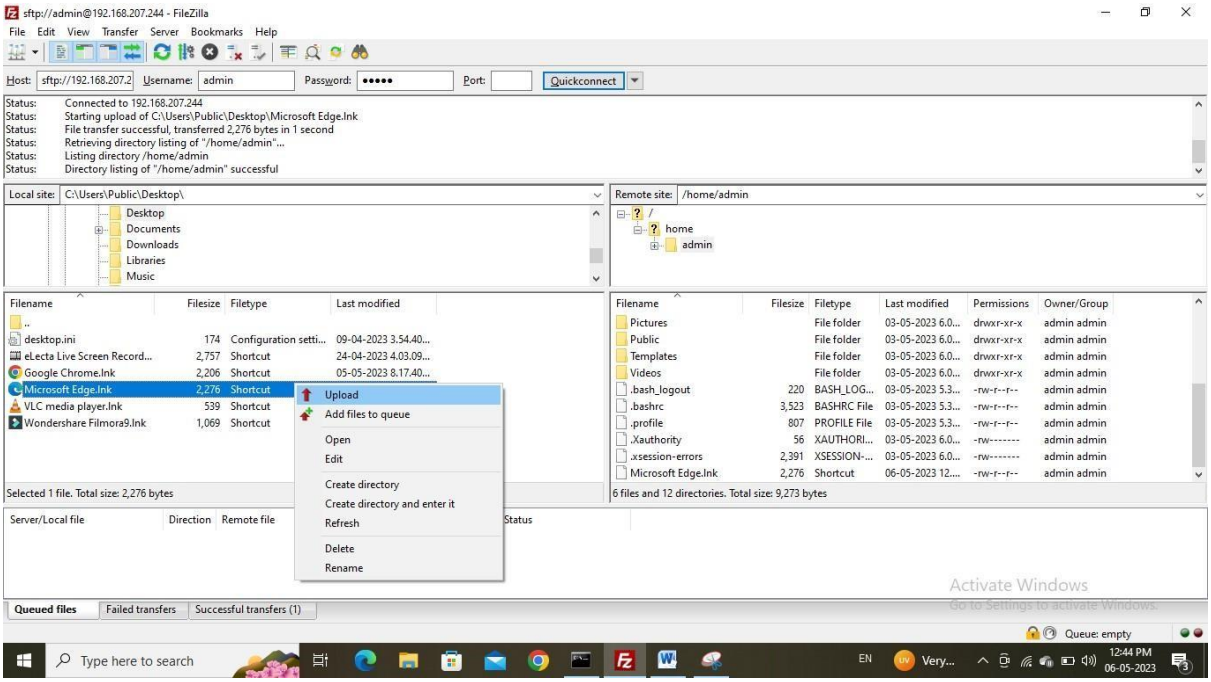
# Step:6 Download the FileZilla (Client)

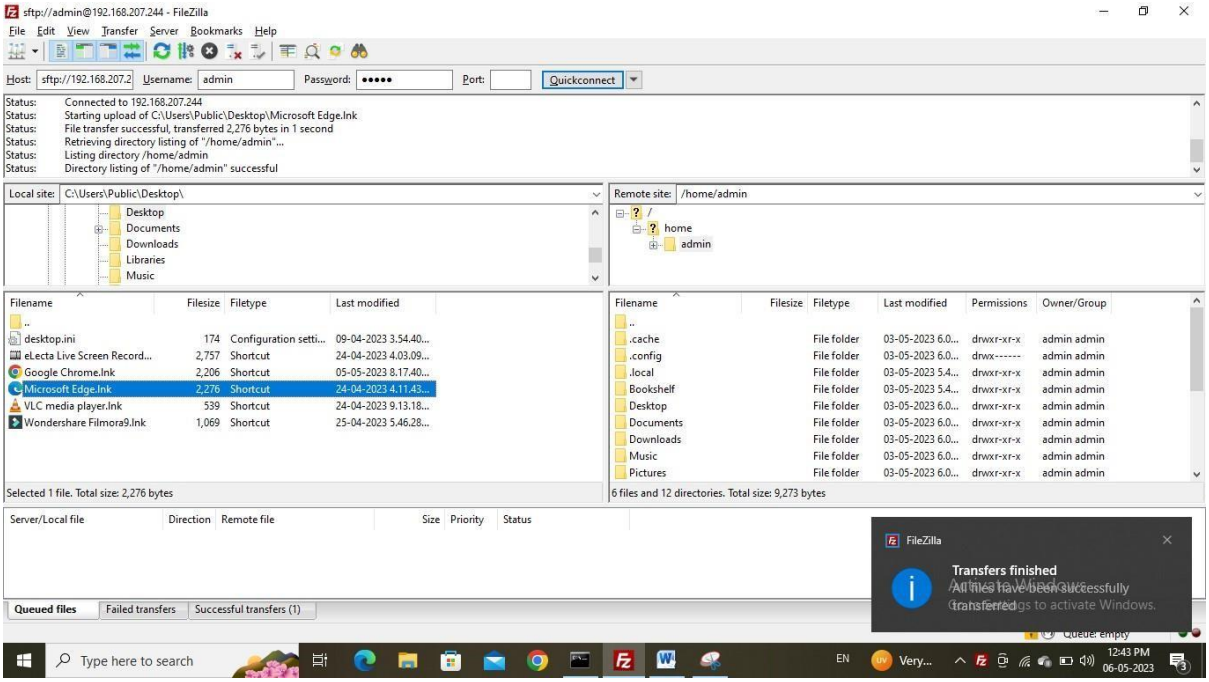


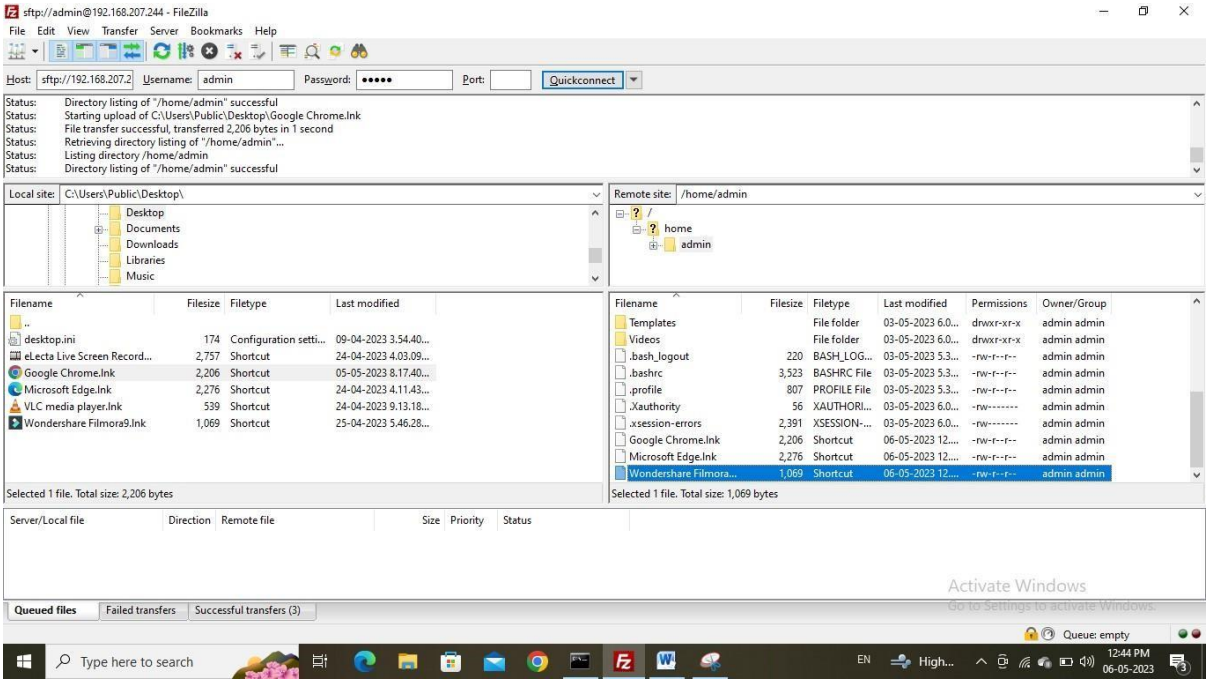

FileZilla
File Edit View Transfer Server Bookmarks Help
Host: 192.168.207.244 Username: admin Password: ••••• Port: 22 Quickconnect
Local site: C:\Users\Public\Desktop\
Desktop
Documents
Downloads
Libraries
Music
Filename Filesize Filetype Last modified
desktop.ini 174 Configuration setti... 09-04-2023 3.54.40...
eLecta Live Screen Record... 2,757 Shortcut 24-04-2023 4.03.09...
Google Chrome.lnk 2,206 Shortcut 05-05-2023 8.17.40...
Microsoft Edge.lnk 2,276 Shortcut 24-04-2023 4.11.43...
VLC media player.lnk 539 Shortcut 24-04-2023 9.13.18...
Wondershare Filmora9.lnk 1,069 Shortcut 25-04-2023 5.46.28...
6 files. Total size: 9,021 bytes
Filename Filesize Filetype Last modified Permissions Owner/Group
Not connected to any server
Not connected.
Server/Local file Direction Remote file Size Priority Status
Queued files Failed transfers Successful transfers
Queue: empty
Activate Windows
Type here to search
EN 34°C 12:42 PM 06-05-2023


sftp://admin@192.168.207.244 - FileZilla
File Edit View Transfer Server Bookmarks Help
Host: sftp://192.168.207.2 Username: admin Password: ••••• Port: Quickconnect
Status: Connecting to 192.168.207.244...
Local site: C:\Users\Public\Desktop\
Desktop
Documents
Downloads
Libraries
Music
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: 192.168.207.244:22
Hostkey algorithm: ssh-ed25519 255
Fingerprints: SHA256:+i/5X37HVrTs6h8AkRg1m6OTmsf1lowPXLO/BCdVL3E
Trust this host and carry on connecting?
Always trust this host, add this key to the cache
OK Cancel
Filename Filesize Filetype
desktop.ini 174 Configuration setti...
eLecta Live Screen Record... 2,757 Shortcut
Google Chrome.lnk 2,206 Shortcut
Microsoft Edge.lnk 2,276 Shortcut
VLC media player.lnk 539 Shortcut
Wondershare Filmora9.lnk 1,069 Shortcut
Last modified Permissions Owner/Group
Not connected to any server
6 files. Total size: 9,021 bytes
Not connected.
Server/Local file Direction Remote file Size Priority Status
Queued files Failed transfers Successful transfers
Queue: empty
Activate Windows
Type here to search
EN 34°C 12:42 PM 06-05-2023


sftp://admin@192.168.207.244 - FileZilla
File Edit View Transfer Server Bookmarks Help
Host: sftp://192.168.207.2 Username: admin Password: ••••• Port: Quickconnect
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
Local site: C:\Users\Public\Desktop\
Remote site: /home/admin
Desktop
Documents
Downloads
Libraries
Music
home
admin
Filename Filesize Filetype Last modified
desktop.ini 174 Configuration setti... 09-04-2023 3.54.40...
eLecta Live Screen Record... 2,757 Shortcut 24-04-2023 4.03.09...
Google Chrome.lnk 2,206 Shortcut 05-05-2023 8.17.40...
Microsoft Edge.lnk 2,276 Shortcut 24-04-2023 4.11.43...
VLC media player.lnk 539 Shortcut 24-04-2023 9.13.18...
Wondershare Filmora9.lnk 1,069 Shortcut 25-04-2023 5.46.28...
Selected 1 file. Total size: 2,276 bytes
Filename Filesize Filetype Last modified Permissions Owner/Group
.cache File folder 03-05-2023 6.0... drwxr-xr-x admin admin
.config File folder 03-05-2023 6.0... drwx------ admin admin
.local File folder 03-05-2023 5.4... drwxr-xr-x admin admin
Bookshelf File folder 03-05-2023 5.4... drwxr-xr-x admin admin
Desktop File folder 03-05-2023 6.0... drwxr-xr-x admin admin
Documents File folder 03-05-2023 6.0... drwxr-xr-x admin admin
Downloads File folder 03-05-2023 6.0... drwxr-xr-x admin admin
Music File folder 03-05-2023 6.0... drwxr-xr-x admin admin
Pictures File folder 03-05-2023 6.0... drwxr-xr-x admin admin
5 files and 12 directories. Total size: 6,997 bytes
Server/Local file Direction Remote file Size Priority Status
Queued files Failed transfers Successful transfers
Activate Windows
Queue: empty
Type here to search
EN Very...
12:43 PM 06-05-2023


sftp://admin@192.168.207.244 - FileZilla
File Edit View Transfer Server Bookmarks Help
Host: sftp://192.168.207.2 Username: admin Password: ••••• Port: Quickconnect
Status: Connected to 192.168.207.244
Status: Starting upload of C:\Users\Public\Desktop\Microsoft Edge.lnk
Status: File transfer successful, transferred 2,276 bytes in 1 second
Status: Retrieving directory listing of "/home/admin"...
Status: Listing directory /home/admin
Status: Directory listing of "/home/admin" successful
Local site: C:\Users\Public\Desktop\
Remote site: /home/admin
Desktop
Documents
Downloads
Libraries
Music
home
admin
Filename Filesize Filetype Last modified
desktop.ini 174 Configuration setti... 09-04-2023 3.54.40...
eLecta Live Screen Record... 2,757 Shortcut 24-04-2023 4.03.09...
Google Chrome.lnk 2,206 Shortcut 05-05-2023 8.17.40...
Microsoft Edge.lnk 2,276 Shortcut
VLC media player.lnk 539 Shortcut
Wondershare Filmora9.lnk 1,069 Shortcut
Upload
Add files to queue
Open
Edit
Create directory
Create directory and enter it
Refresh
Delete
Rename
Selected 1 file. Total size: 2,276 bytes
Filename Filesize Filetype Last modified Permissions Owner/Group
Pictures File folder 03-05-2023 6.0... drwxr-xr-x admin admin
Public File folder 03-05-2023 6.0... drwxr-xr-x admin admin
Templates File folder 03-05-2023 6.0... drwxr-xr-x admin admin
Videos File folder 03-05-2023 6.0... drwxr-xr-x admin admin
.bash_logout 220 BASH_LOG... 03-05-2023 5.3... -rw-r--r-- admin admin
.bashrc 3,523 BASHRC File 03-05-2023 5.3... -rw-r--r-- admin admin
.profile 807 PROFILE File 03-05-2023 5.3... -rw-r--r-- admin admin
.Xauthority 56 XAUTHORI... 03-05-2023 6.0... -rw------- admin admin
.xsession-errors 2,391 XSESSION-... 03-05-2023 6.0... -rw------- admin admin
Microsoft Edge.lnk 2,276 Shortcut 06-05-2023 12.... -rw-r--r-- admin admin
6 files and 12 directories. Total size: 9,273 bytes
Server/Local file Direction Remote file Status
Queued files Failed transfers Successful transfers (1)
Activate Windows
Queue: empty
Type here to search
EN Very...
12:44 PM 06-05-2023


sftp://admin@192.168.207.244 - FileZilla
File Edit View Transfer Server Bookmarks Help
Host: sftp://192.168.207.2 Username: admin Password: ••••• Port: Quickconnect
Status: Connected to 192.168.207.244
Status: Starting upload of C:\Users\Public\Desktop\Microsoft Edge.lnk
Status: File transfer successful, transferred 2,276 bytes in 1 second
Status: Retrieving directory listing of "/home/admin"...
Status: Listing directory /home/admin
Status: Directory listing of "/home/admin" successful
Local site: C:\Users\Public\Desktop\
Remote site: /home/admin
Desktop
Documents
Downloads
Libraries
Music
home
admin
Filename Filesize Filetype Last modified
desktop.ini 174 Configuration setti... 09-04-2023 3.54.40...
eLecta Live Screen Record... 2,757 Shortcut 24-04-2023 4.03.09...
Google Chrome.lnk 2,206 Shortcut 05-05-2023 8.17.40...
Microsoft Edge.lnk 2,276 Shortcut 24-04-2023 4.11.43...
VLC media player.lnk 539 Shortcut 24-04-2023 9.13.18...
Wondershare Filmora9.lnk 1,069 Shortcut 25-04-2023 5.46.28...
Selected 1 file. Total size: 2,276 bytes
Filename Filesize Filetype Last modified Permissions Owner/Group
.cache File folder 03-05-2023 6.0... drwxr-xr-x admin admin
.config File folder 03-05-2023 6.0... drwx------ admin admin
.local File folder 03-05-2023 5.4... drwxr-xr-x admin admin
Bookshelf File folder 03-05-2023 5.4... drwxr-xr-x admin admin
Desktop File folder 03-05-2023 6.0... drwxr-xr-x admin admin
Documents File folder 03-05-2023 6.0... drwxr-xr-x admin admin
Downloads File folder 03-05-2023 6.0... drwxr-xr-x admin admin
Music File folder 03-05-2023 6.0... drwxr-xr-x admin admin
Pictures File folder 03-05-2023 6.0... drwxr-xr-x admin admin
6 files and 12 directories. Total size: 9,273 bytes
Server/Local file Direction Remote file Size Priority Status
FileZilla
Transfers finished
All files have been successfully transferred
Queued files Failed transfers Successful transfers (1)
Queue: empty
Type here to search
EN Very...
12:43 PM 06-05-2023

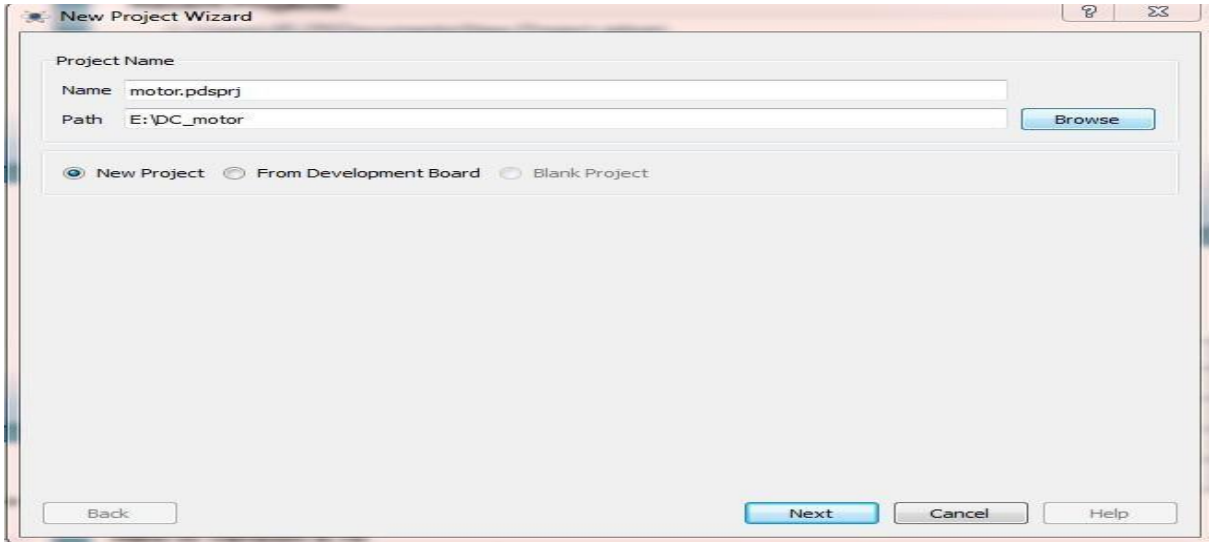

sftp://admin@192.168.207.244 - FileZilla
File Edit View Transfer Server Bookmarks Help
Host: sftp://192.168.207.2 Username: admin Password: ••••• Port: Quickconnect
Status: Directory listing of "/home/admin" successful
Status: Starting upload of C:\Users\Public\Desktop\Google Chrome.lnk
Status: File transfer successful, transferred 2,206 bytes in 1 second
Status: Retrieving directory listing of "/home/admin"...
Status: Listing directory /home/admin
Status: Directory listing of "/home/admin" successful
Local site: C:\Users\Public\Desktop\
Remote site: /home/admin
Desktop
Documents
Downloads
Libraries
Music
home
admin
Filename Filesize Filetype Last modified
desktop.ini 174 Configuration setti... 09-04-2023 3.54.40...
eLecta Live Screen Record... 2,757 Shortcut 24-04-2023 4.03.09...
Google Chrome.lnk 2,206 Shortcut 05-05-2023 8.17.40...
Microsoft Edge.lnk 2,276 Shortcut 24-04-2023 4.11.43...
VLC media player.lnk 539 Shortcut 24-04-2023 9.13.18...
Wondershare Filmora9.lnk 1,069 Shortcut 25-04-2023 5.46.28...
Selected 1 file. Total size: 2,206 bytes
Filename Filesize Filetype Last modified Permissions Owner/Group
Templates File folder 03-05-2023 6.0... drwxr-xr-x admin admin
Videos File folder 03-05-2023 6.0... drwxr-xr-x admin admin
.bash_logout 220 BASH_LOG... 03-05-2023 5.3... -rw-r--r-- admin admin
.bashrc 3,523 BASHRC File 03-05-2023 5.3... -rw-r--r-- admin admin
.profile 807 PROFILE File 03-05-2023 5.3... -rw-r--r-- admin admin
.Xauthority 56 XAUTHORI... 03-05-2023 6.0... -rw------- admin admin
.xsession-errors 2,391 XSESSION-... 03-05-2023 6.0... -rw------- admin admin
Google Chrome.lnk 2,206 Shortcut 06-05-2023 12.... -rw-r--r-- admin admin
Microsoft Edge.lnk 2,276 Shortcut 06-05-2023 12.... -rw-r--r-- admin admin
Wondershare Filmora... 1,069 Shortcut 06-05-2023 12.... -rw-r--r-- admin admin
Selected 1 file. Total size: 1,069 bytes
Server/Local file Direction Remote file Size Priority Status
Activate Windows
Go to Settings to activate Windows.
Queued files Failed transfers Successful transfers (3)
Queue: empty
Type here to search
EN High...
12:44 PM 06-05-2023

# Practical No: 03

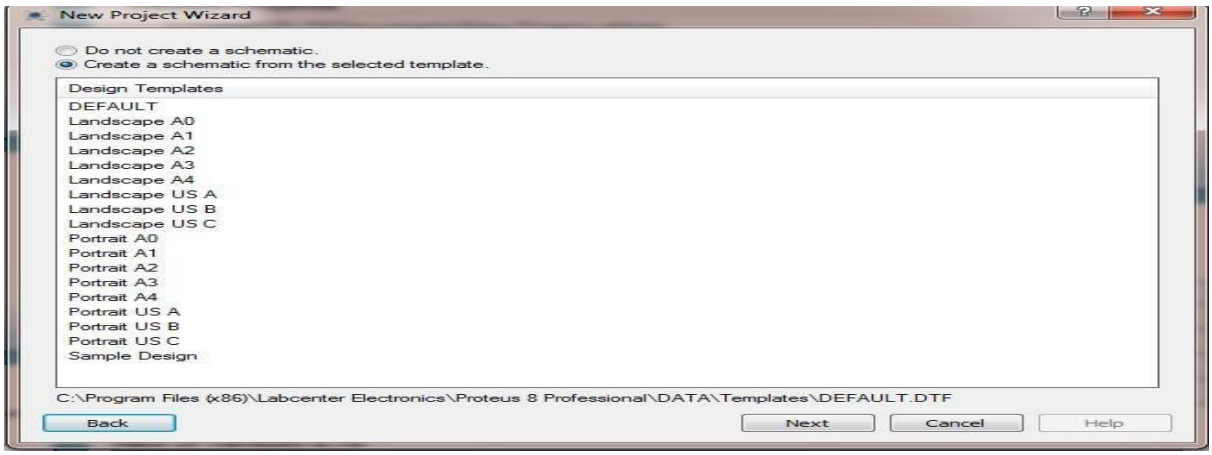
**Aim:** Write python code to test Motors.

OUTPUT:

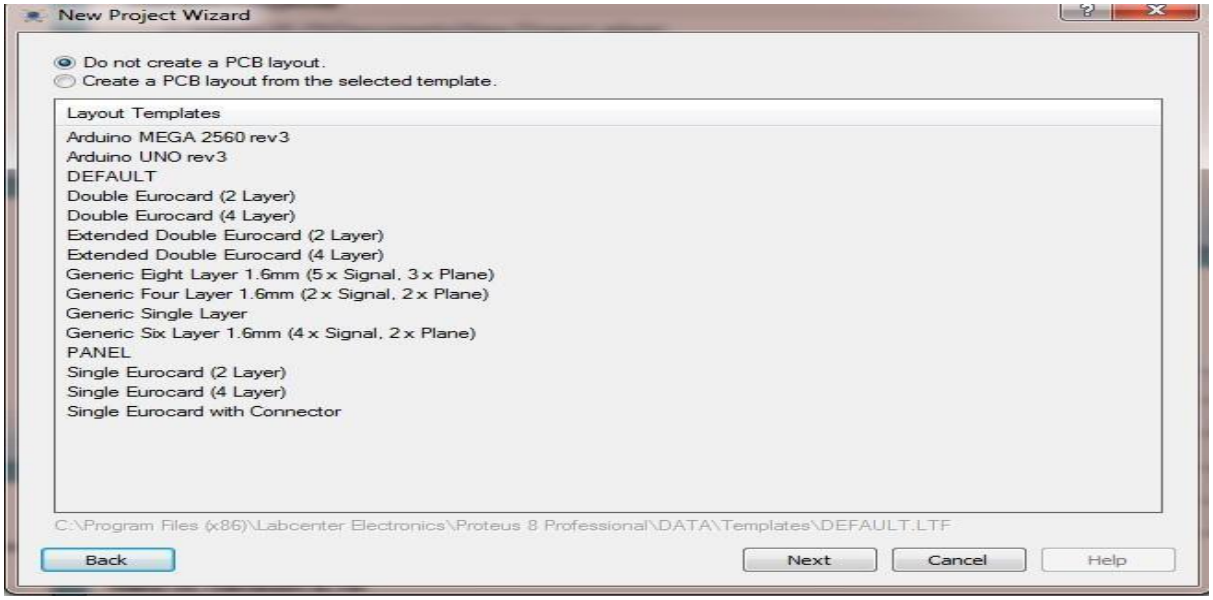
Give project name.



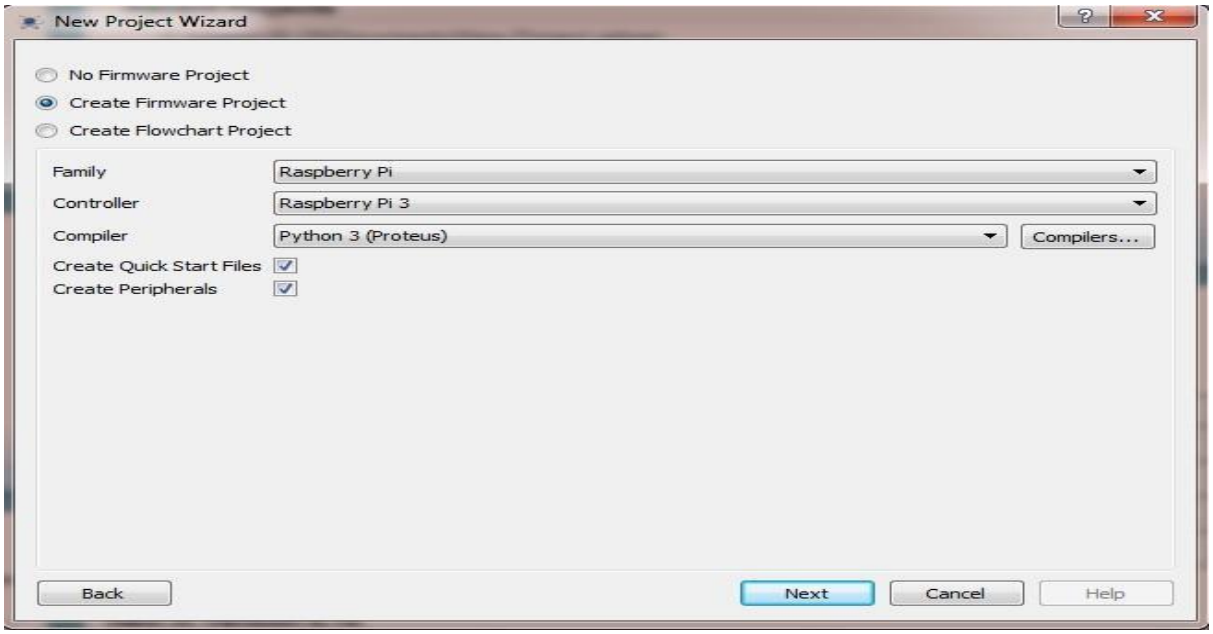

Select “create a schematic from the selected template”.



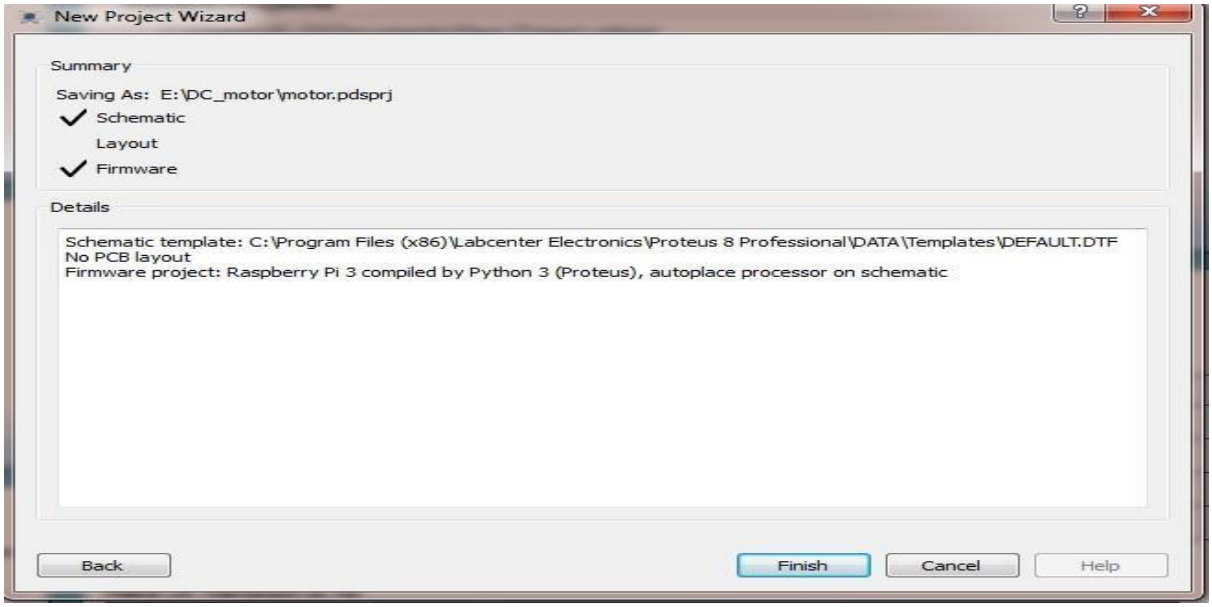
Select “Do not create a PCB layout”



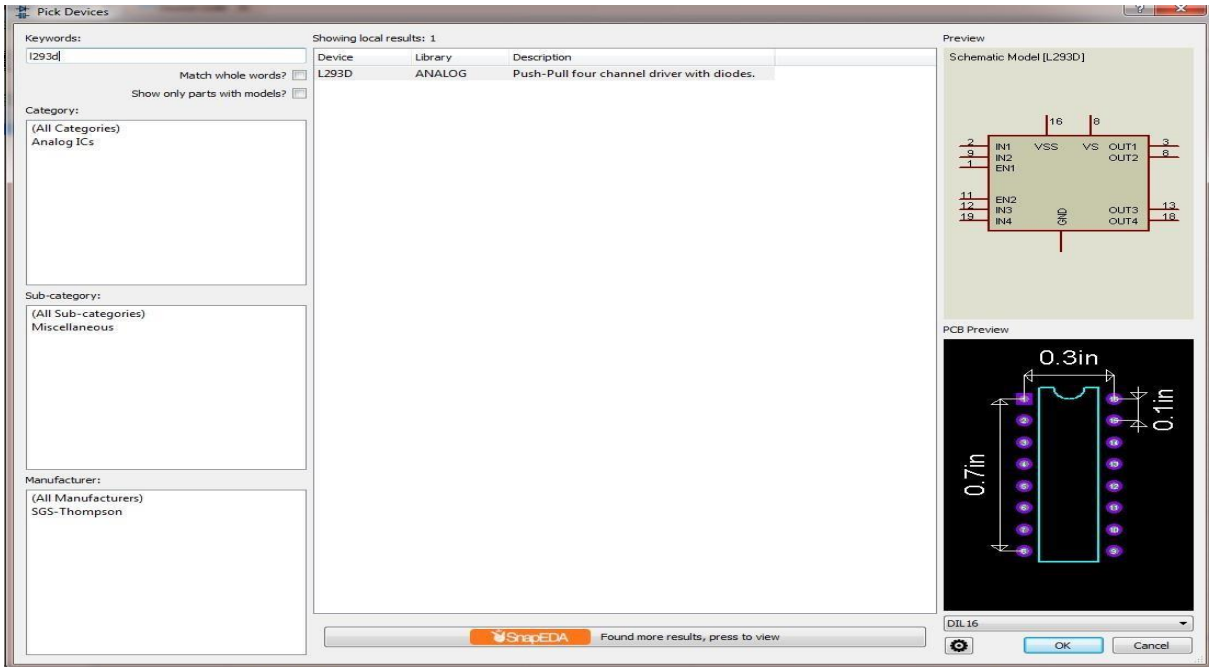

Select “Create firmware project”. and create firmware project in proteus and select Raspberry pi Family.



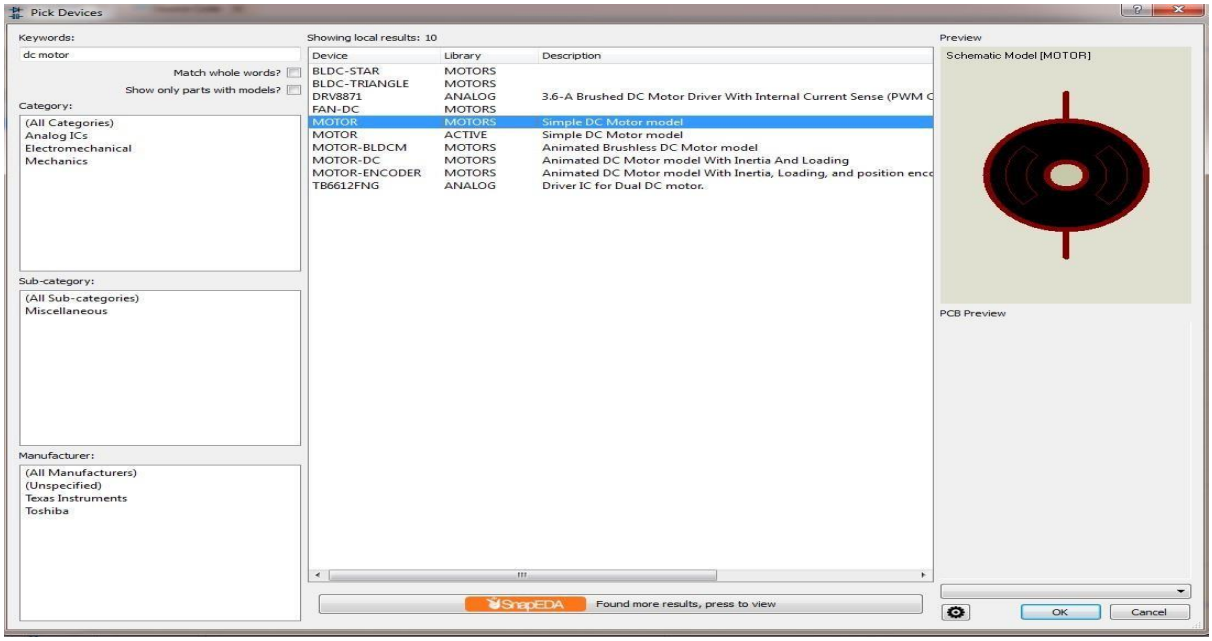
Click on Finish.



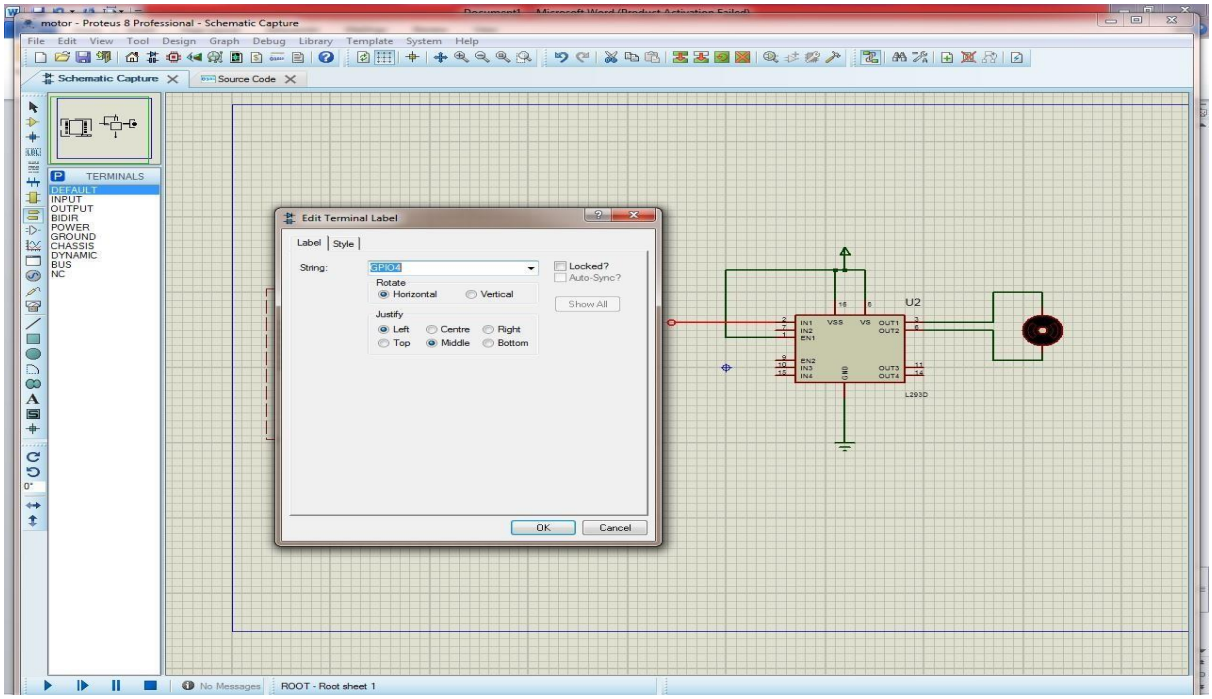

Go to the liabrary>pick devices>L293D



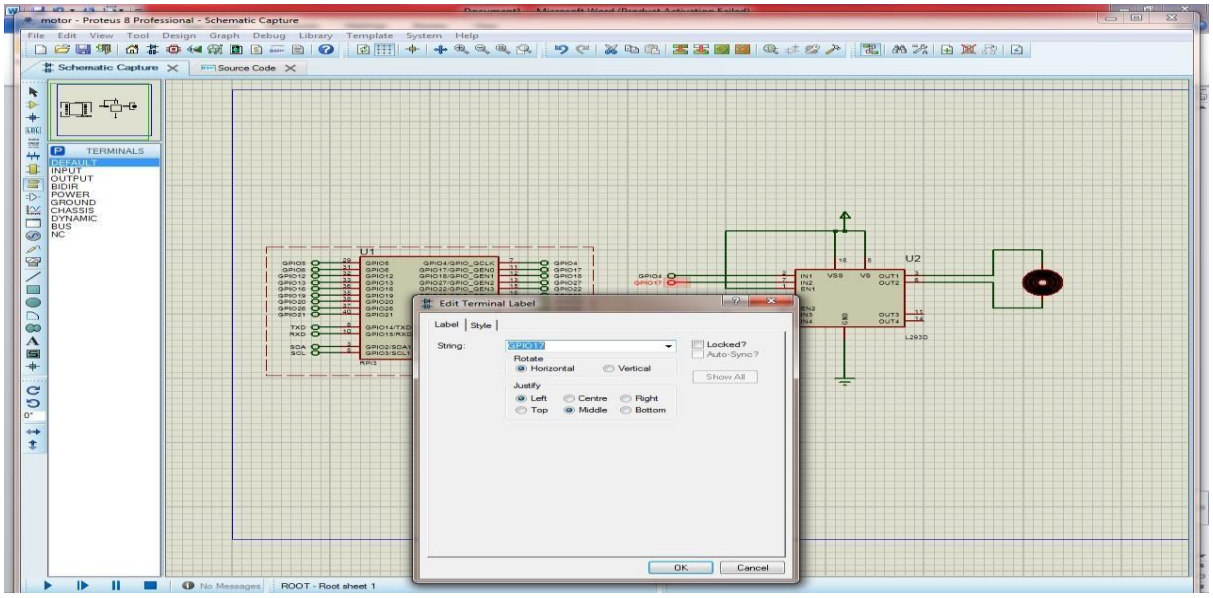
# Select MOTOR



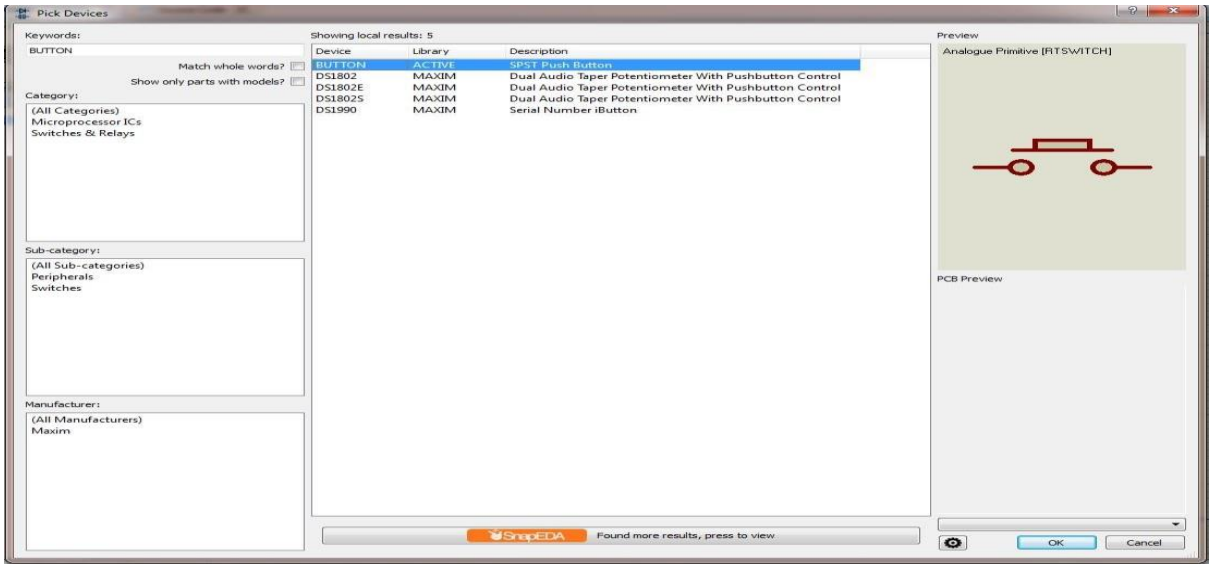

# Edit terminal label as GPIO4



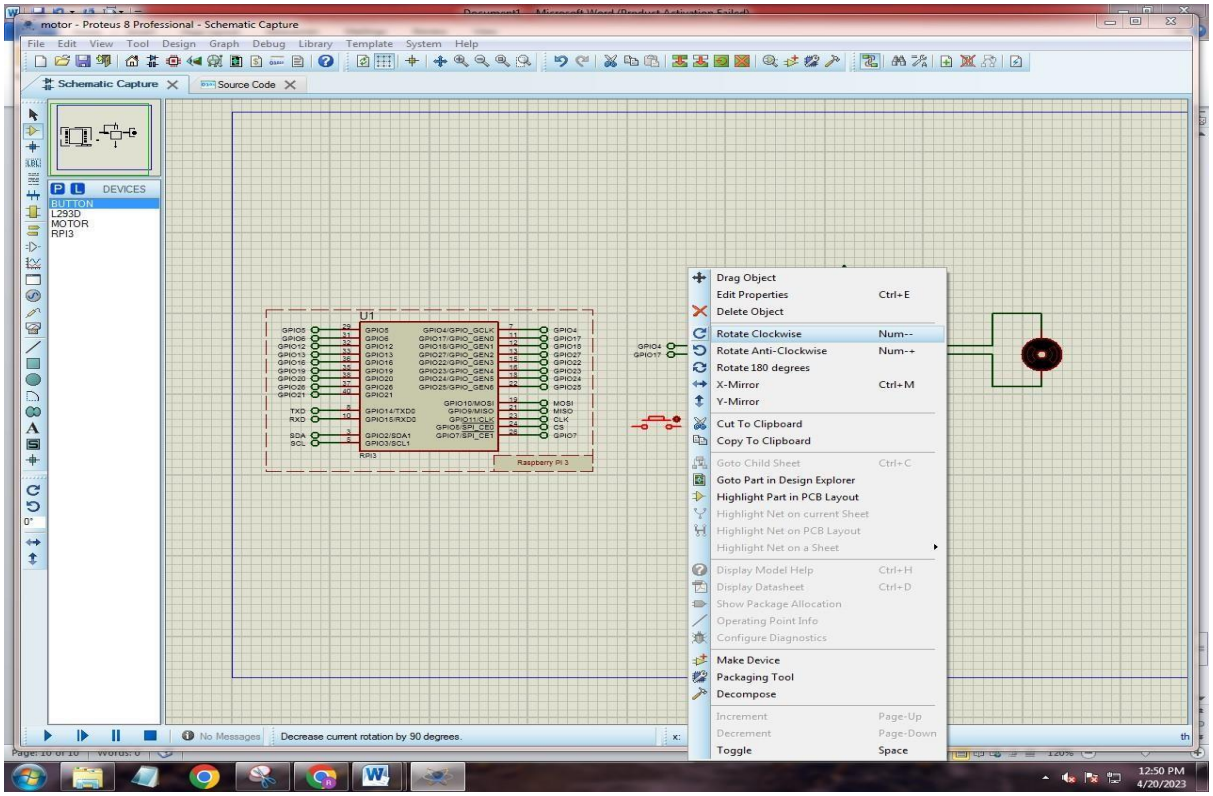
# Edit terminal label as GPIO17



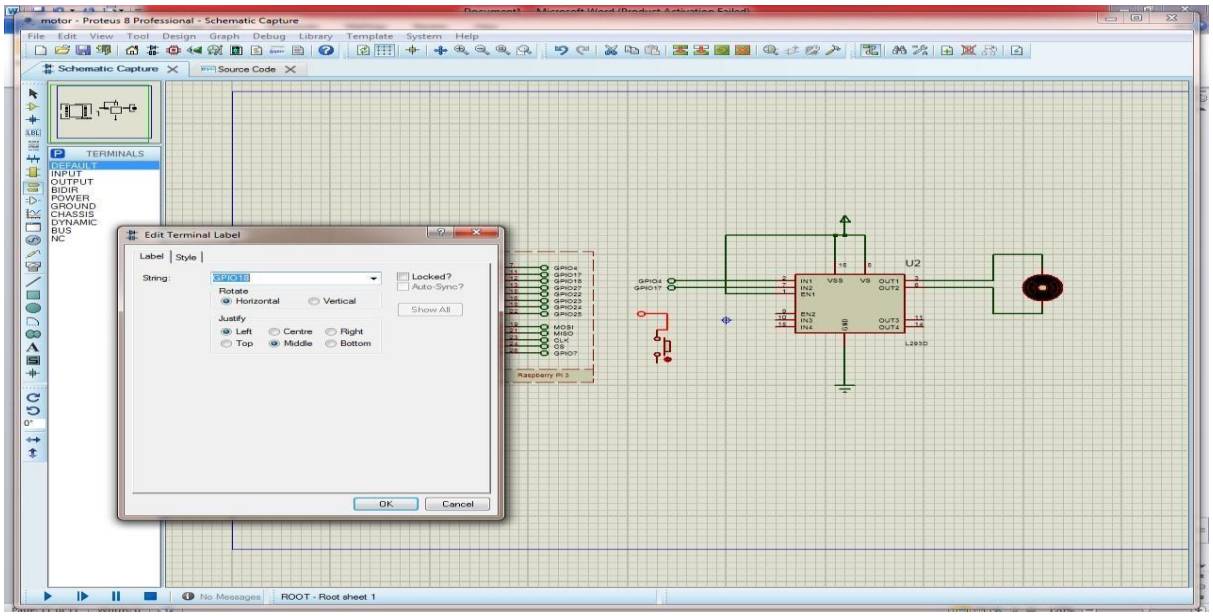

# Select BUTTON



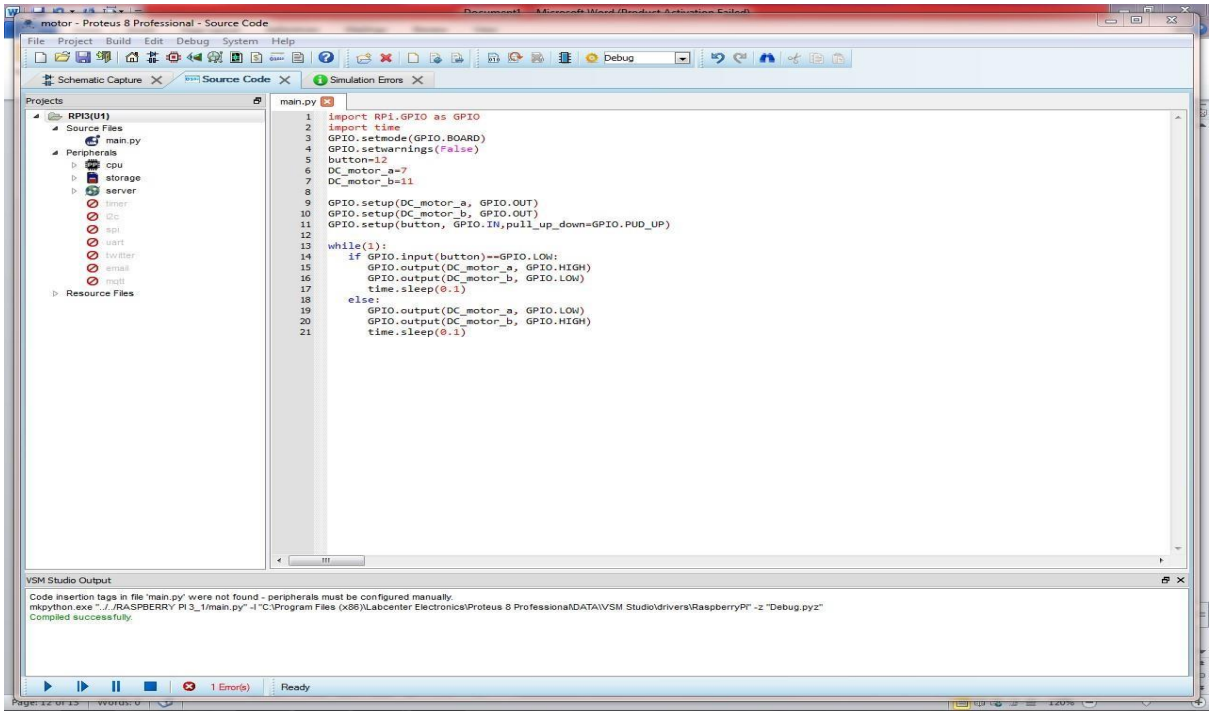
# Rotate button in clockwise



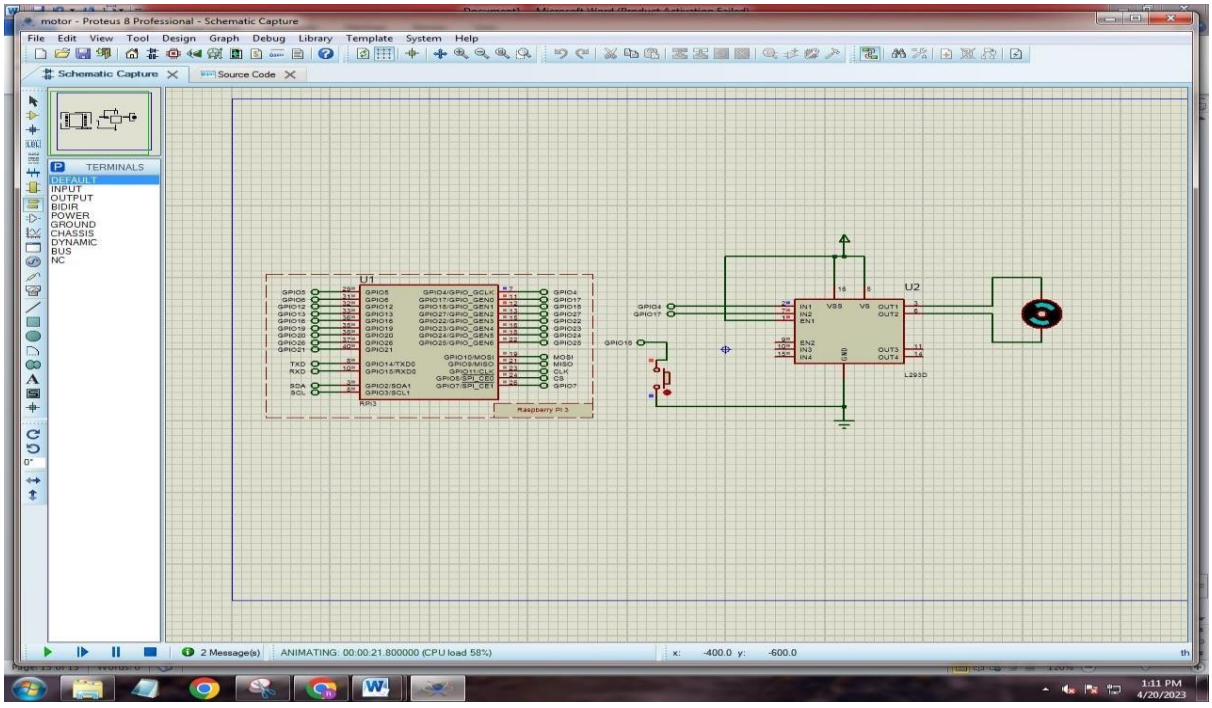

# Edit terminal label as GPIO18

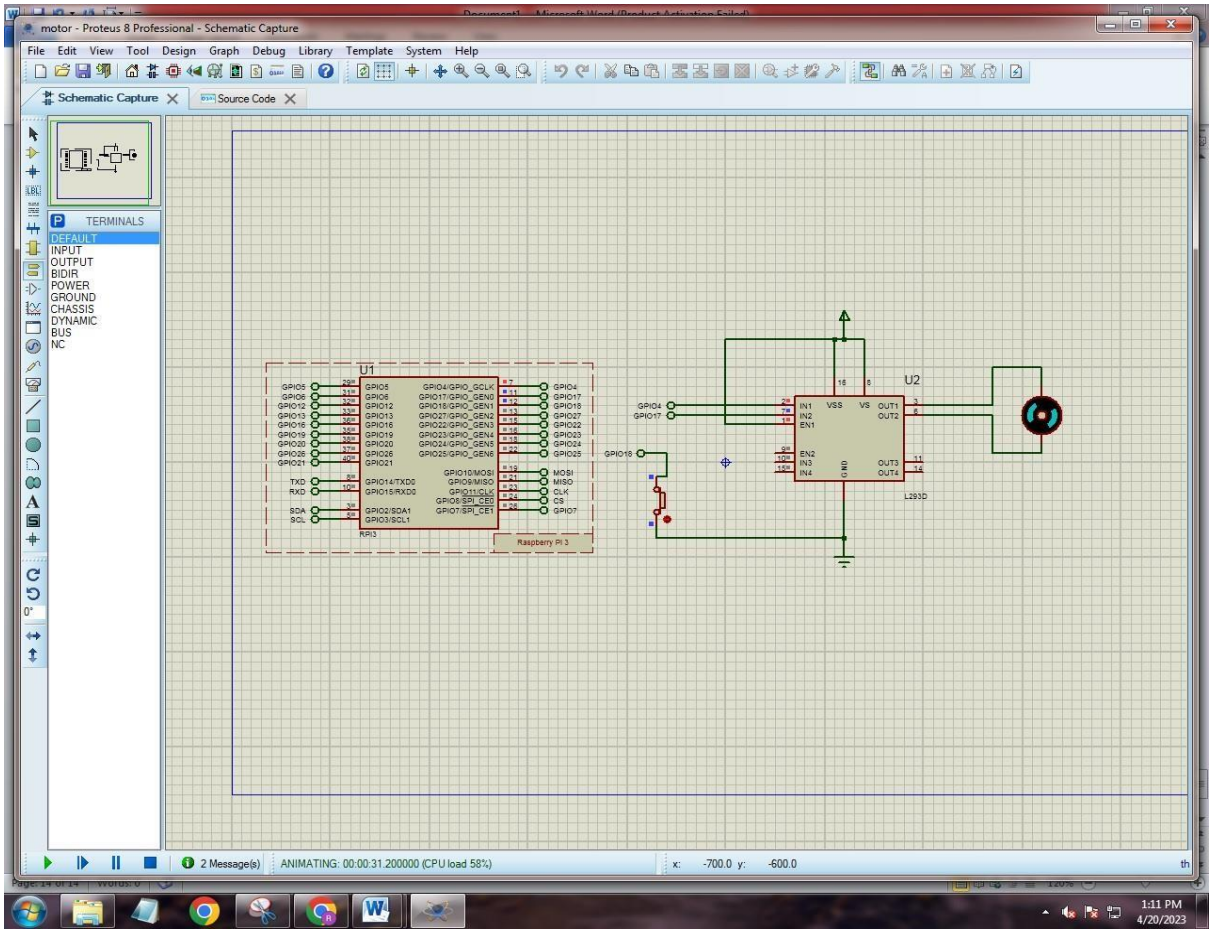


# Type code in proteus source code page




# Start Simulation.




motor - Proteus 8 Professional - Schematic Capture
File Edit View Tool Design Graph Debug Library Template System Help
Schematic Capture
Source Code
TERMINALS
DEFAULT
INPUT
OUTPUT
BIDIR
POWER
GROUND
CHASSIS
DYNAMIC
BUS
NC
U1
U2
GPIO18
GPIO4
GPIO17
L293D
Raspberry Pi 3
2 Message(s)
ANIMATING: 00:00:31.200000 (CPU load 58%)
x: -700.0 y: -600.0
1:11 PM
4/20/2023

# Practical No.4

**Aim:** Develop Python code for testing the sensors.

Step 1: Place the following component in TinkerCard.

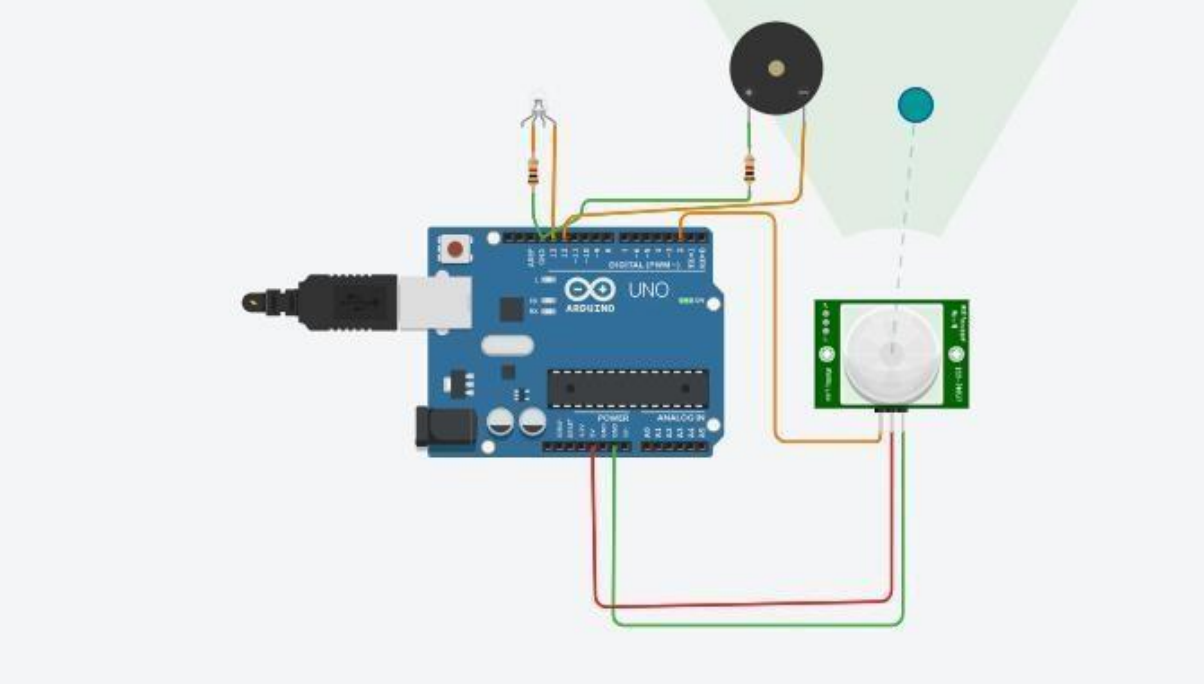
Compontes:

- PIR Sensor
- Resistor
- Piezo
- Arduino Uno R3
- LED RGB

Step 2:Type the following code

```
int pirsensor = 0;
void setup()
{
pinMode(2, INPUT);
pinMode(12, OUTPUT);
pinMode(13, OUTPUT);
}
void loop()
{
pirsensor = digitalRead(2);
if (pirsensor == HIGH)
{
digitalWrite(13,HIGH);
tone(12,500,500);
}
digitalWrite(13,LOW)
}
```

# OUTPUT:



# Practical No: 5

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

Step 1: Download the following libraries

L298 Motor Driver Library for Proteus

Arduino UNO Library for Proteus V2.0

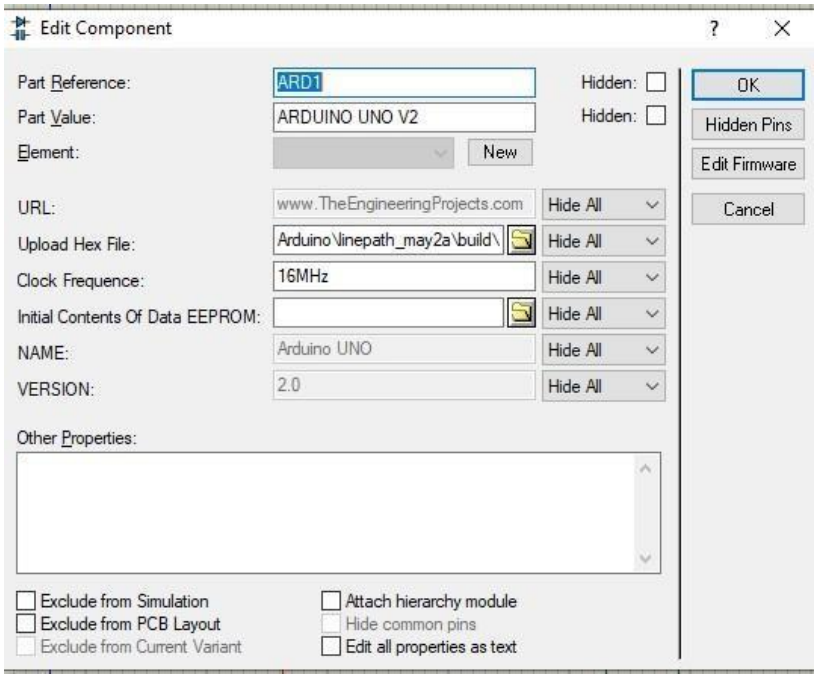
Infrared Sensor Library for Proteus

Step 2: Extract this files and pest it in Proteus libraries folder and restart the Proteus .

Step 3: Download the Proteus IDE and type the following code after that save it and Export Complied

Library

Step 4: Upload this HEX file in Arduino

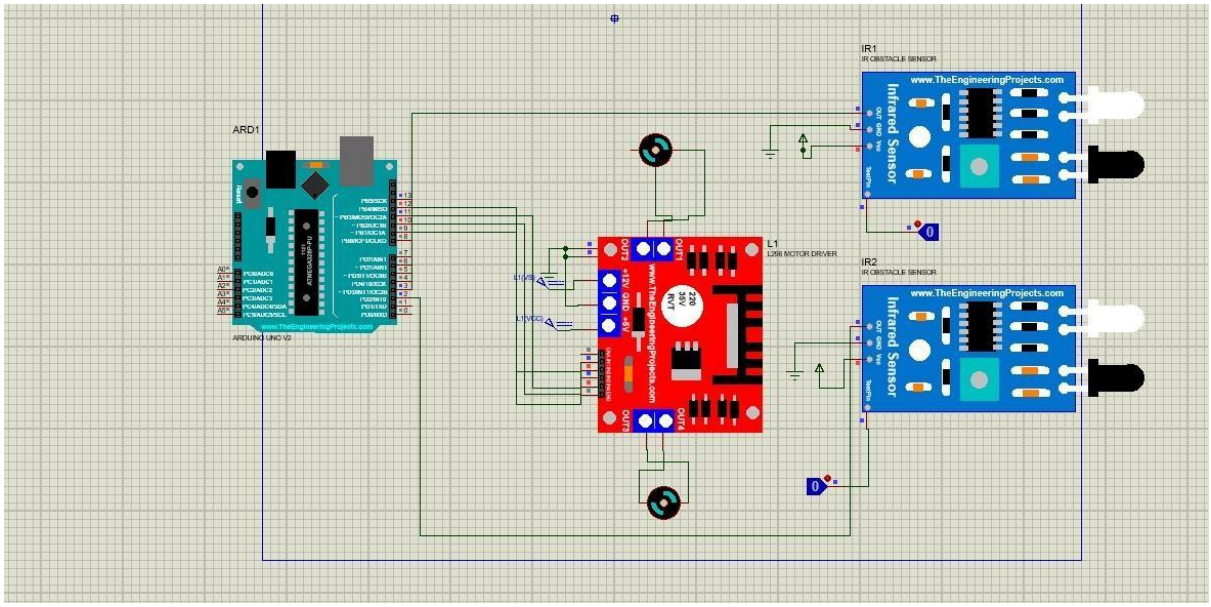


Code: void setup()

```
{
pinMode(2,INPUT); pinMode(3,INPUT);
pinMode(10,OUTPUT); pinMode(11,OUTPUT);
pinMode(12,OUTPUT); pinMode(13,OUTPUT);
}
void loop(){
int v=digitalRead(2); int
s=digitalRead(3);
if(v==1 and s==1){
digitalWrite(13,1); digitalWrite(12,0); digitalWrite(11,1);
digitalWrite(10,0);
}
if(v==1 and s==0){
digitalWrite(13,0); digitalWrite(12,1);
digitalWrite(11,0); digitalWrite(10,1); }
if(v==0 and s==1){

digitalWrite(13,1); digitalWrite(12,0); digitalWrite(11,0);
digitalWrite(10,1);
}
if(v==0 and s==0){
digitalWrite(13,0); digitalWrite(12,1);
```

```
digitalWrite(11,0); digitalWrite(10,1);
}
}
```

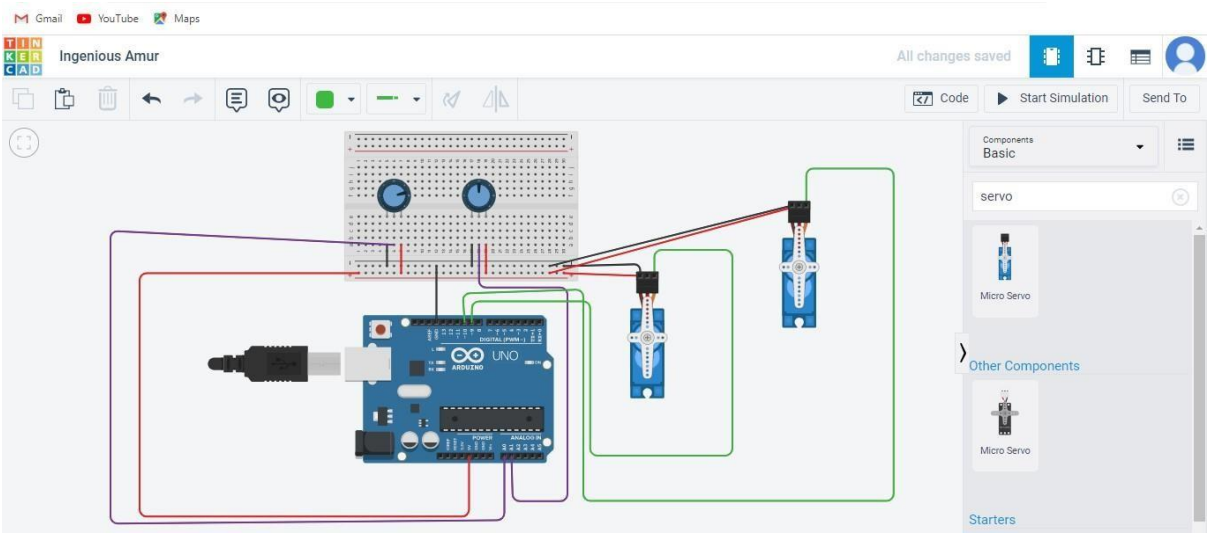
OUTPUT:



# Practical No. 6

**Aim:** Add pan and tilt service to the robot object and test it.

Take Arduino Uno R3 , Breadboard, two Servo motor and make connections: Take two potentiometer and change resistance to 10: Join wires:




Code:

#include <Servo.h> int sensorValue = 0; int outputValue = 0; int sensorValue1 = 0; int outputValue1 = 0; Servo servo_9; Servo

servo_10; void setup()

{

pinMode(A0, INPUT); servo_9.attach(9, 500,

2500); pinMode(A1, INPUT); servo_10.attach(10, 500, 2500); } void loop()

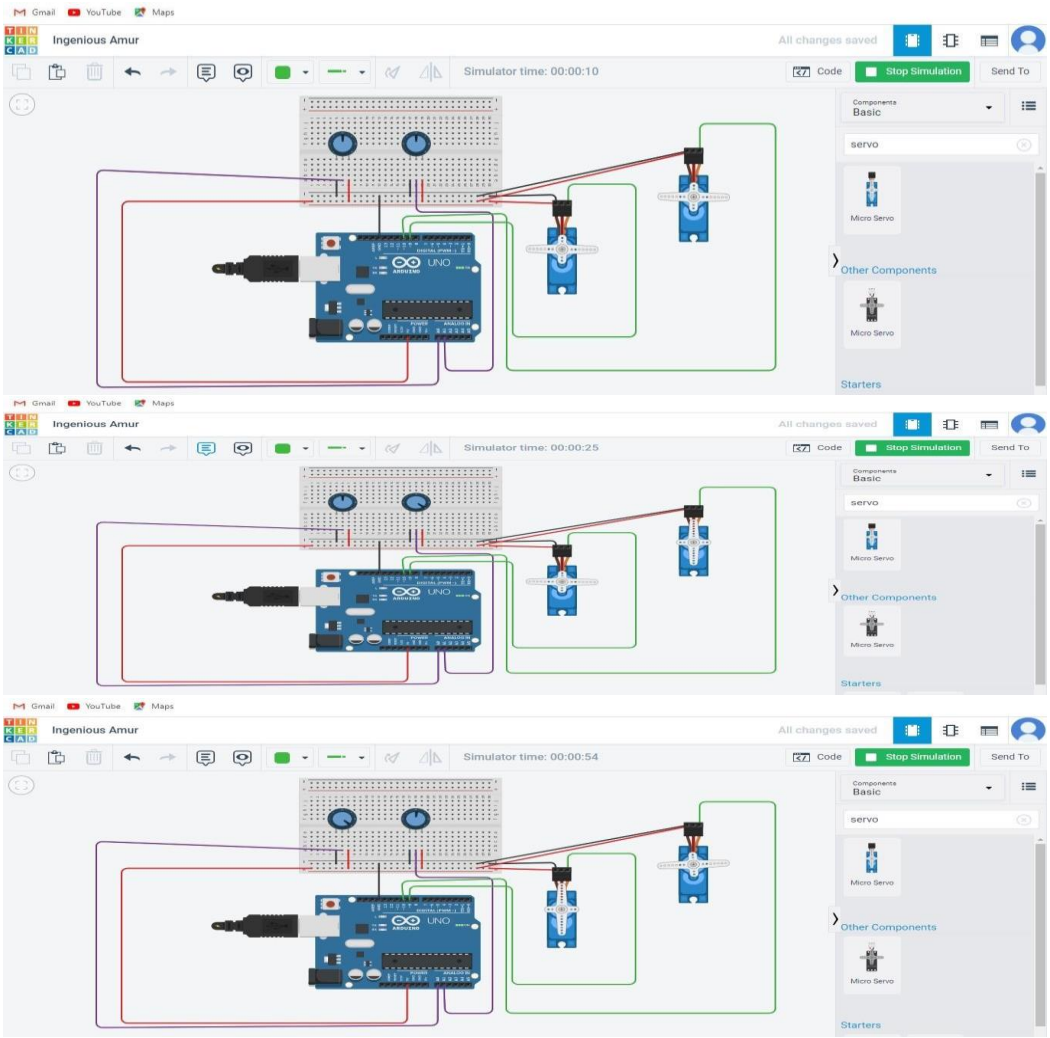
{

sensorValue = analogRead(A0); outputValue = map(sensorValue, 0, 1023, 0, 180);

servo_9.write(outputValue); delay(10); // Delay a little bit to improve simulation performance sensorValue1 = analogRead(A1); outputValue1 = map(sensorValue1, 0, 1023, 0, 180); servo_10.write(outputValue1); delay(10); // Delay a little bit to improve simulation performance

}

OUTPUT:

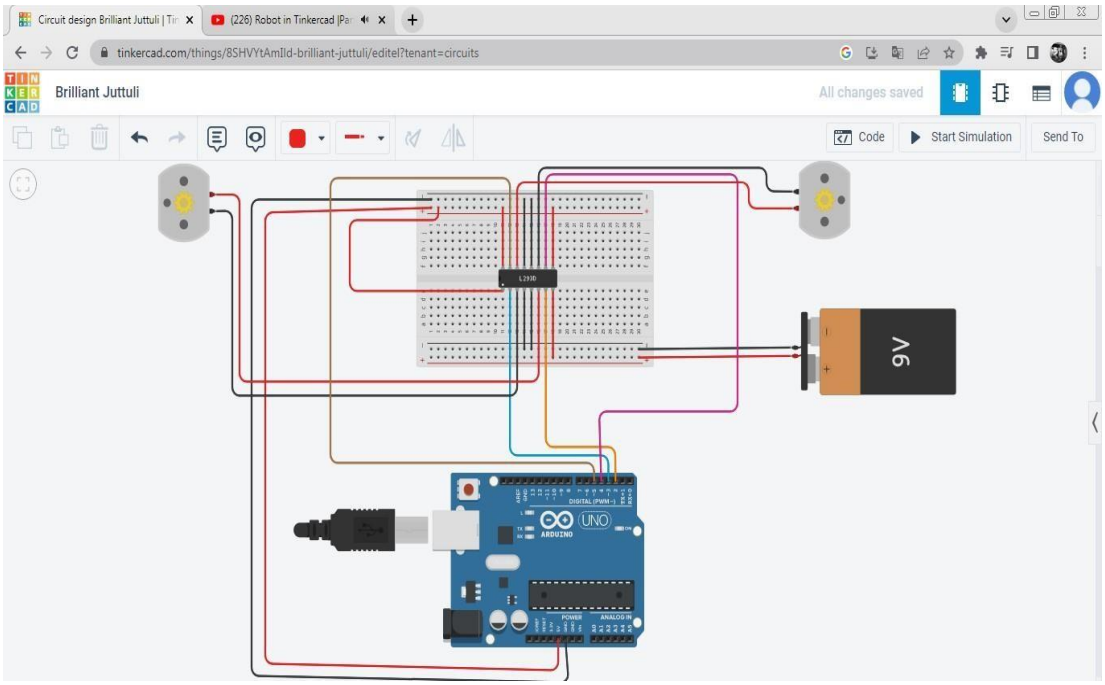


# Practical No. 7

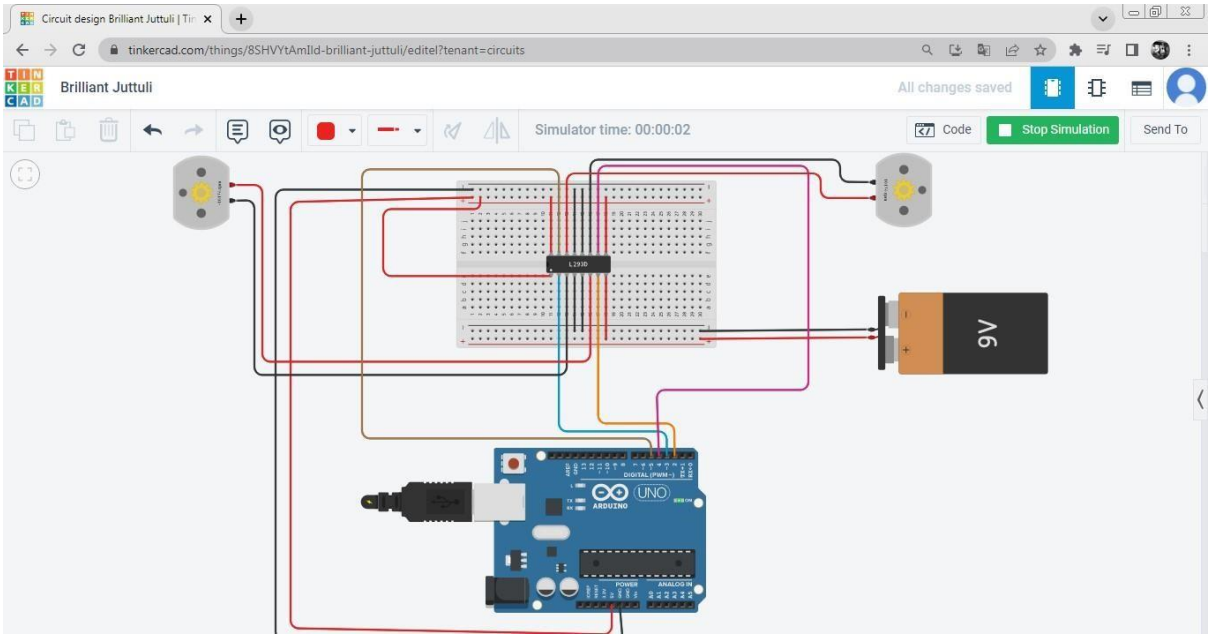
**Aim:** Create an obstacle avoidance behavior for robot and test it.

Part A

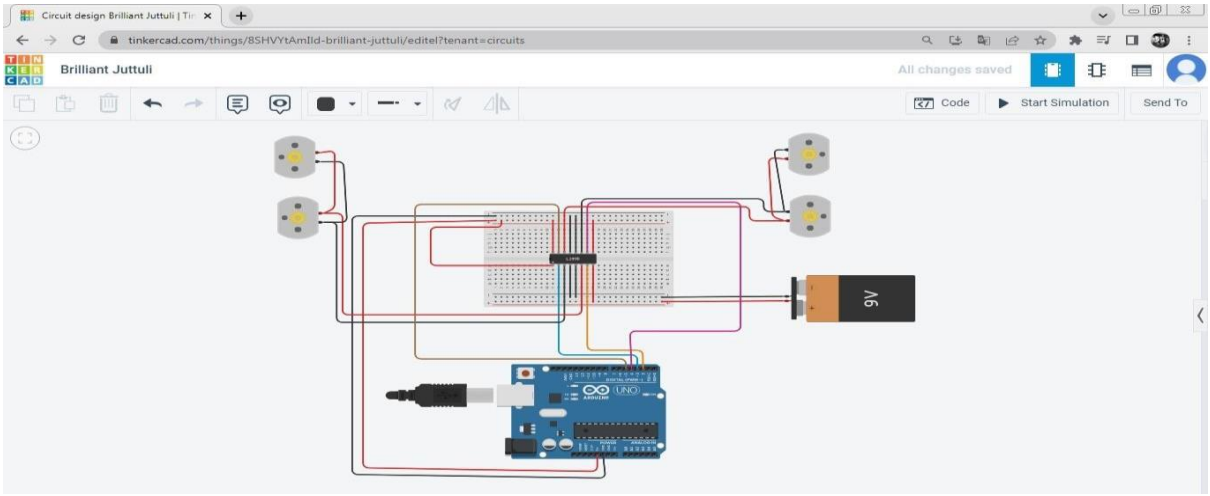
Take DC Motor and 9 Volt Battery, 2 Dc motors, Ardino UNO R3, 9V Battery and Breadboard small: Connect wires:



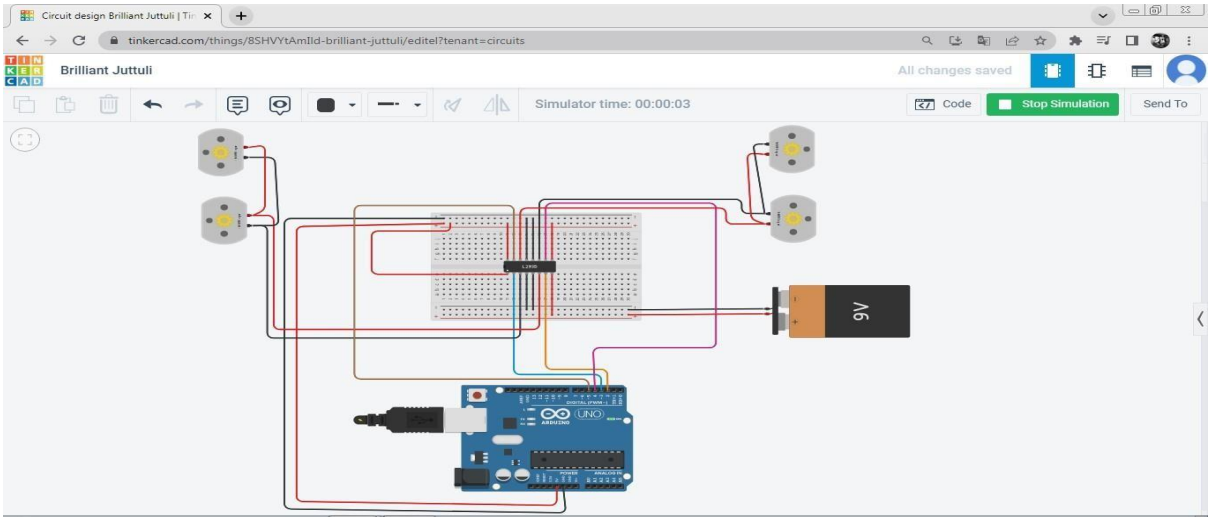

OUTPUT:




Take 2 more motors & connect wires:

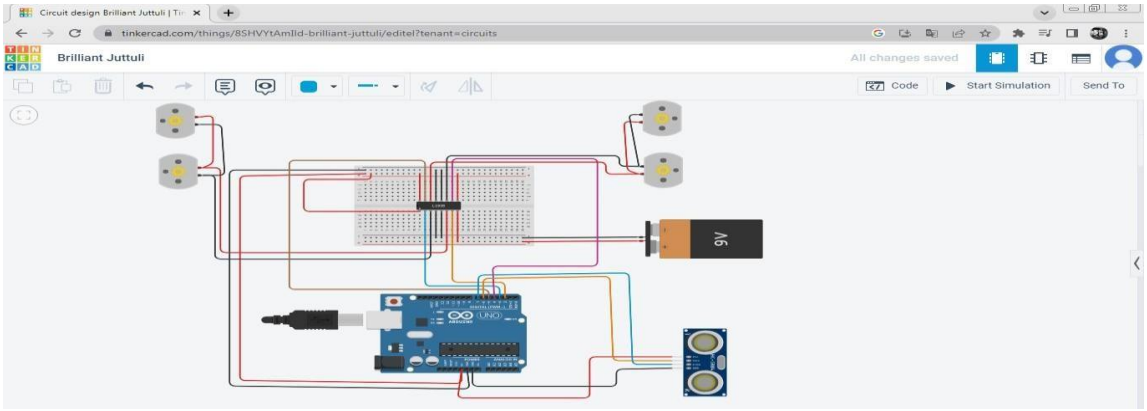



OUTPUT:

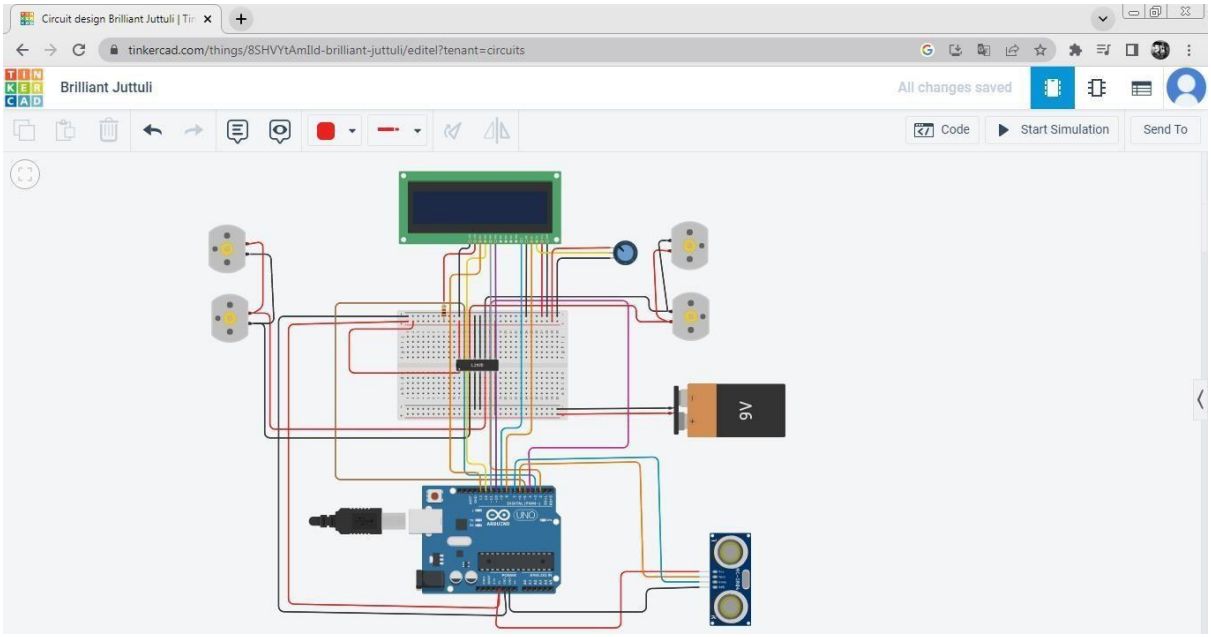


# Part B

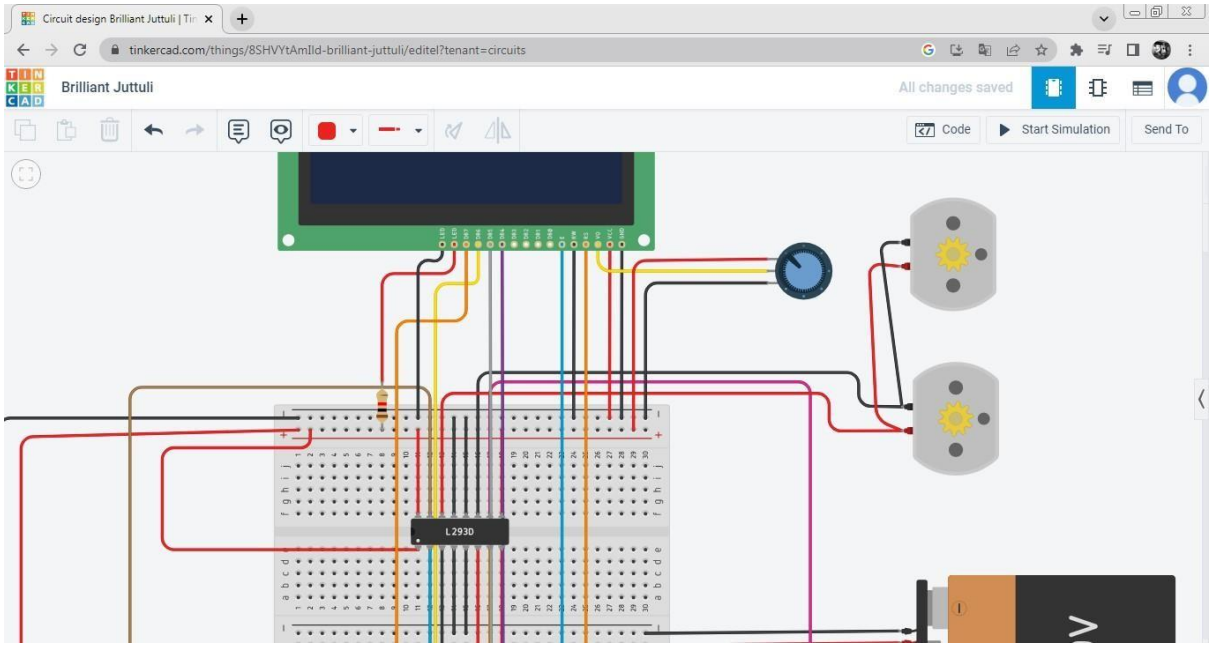
## Take ultrasonic distance and connect :




## Take LCD, Potentiometer and connect devices:




## Take resistor and connect:




Write code:

//code for obstacle avoiding robot #include <LiquidCrystal.h>LiquidCrystal lcd(8,9,10,11,12,13); long cm, duration; const int echoPin = 7; const int trigPin = 6; const int lm1 = 2; const int lm2 = 3; const int rm3 = 4; const int rm4 = 5; void setup()

{

pinMode(lm1, OUTPUT); pinMode(lm2, OUTPUT); pinMode(rm1, OUTPUT); pinMode(rm2, OUTPUT); pinMode(trigPin, OUTPUT); pinMode(echoPin, INPUT); Serial.begin(9600); lcd.begin(16,2);

} void loop()

{ digitalWrite(trigPin, LOW); delayMicroseconds(2); digitalWrite(trigPin, HIGH); delayMicroseconds(5); digitalWrite(trigPin, LOW); duration =

```
pulseIn(echoPin,HIGH);   //converting time into distance in
centimetre     cm = duration*0.034/2;     if(cm < 20)
{  stop_bot();     delay(2000);     go_back();     delay(2000);
stop_again();     delay(1000);     go_left();     delay(1000);
}    else    {     go_straight();     delay(1000);
}
Serial.print("Distance:CM");
Serial.println(cm);
}
void go_straight()
{
lcd.setCursor(0,0); lcd.print("NOTHING AHEAD");
lcd.setCursor(0,1);  lcd.print("MOVING FORWARD");
digitalWrite(lm1,HIGH);   digitalWrite(lm2,LOW);
digitalWrite(rm1,HIGH);
digitalWrite(rm2,LOW);
}  voidgo_back()
{  lcd.clear(); lcd.setCursor(0,0);
lcd.print("TAKING REVERSE"); lcd.setCursor(0,1);
lcd.print(cm);   digitalWrite(lm2,HIGH);
digitalWrite(lm1,LOW);   digitalWrite(rm2,HIGH);
digitalWrite(rm1,LOW);
}
void stop_bot()  { lcd.clear(); lcd.setCursor(0,0);
lcd.print("SOMETHING AHEAD");
```

lcd.setCursor(0,1); lcd.print("STOP!");
digitalWrite(lm1,LOW); digitalWrite(lm2,LOW);
digitalWrite(rm1,LOW);

digitalWrite(rm2,LOW);

} voidstop_again() { lcd.clear(); lcd.setCursor(0,0);
lcd.print("BREAK FOR TURN"); digitalWrite(lm1,LOW);
digitalWrite(lm2,LOW); digitalWrite(rm1,LOW);

digitalWrite(rm2,LOW);

} voidgo_left()

{ lcd.clear(); lcd.setCursor(0,0); lcd.print("TURNING
LEFT"); lcd.setCursor(0,1); lcd.print(cm);
digitalWrite(lm1,LOW); digitalWrite(lm2,LOW);
digitalWrite(rm1,HIGH);

digitalWrite(rm2,LOW);

} voidgo_right()

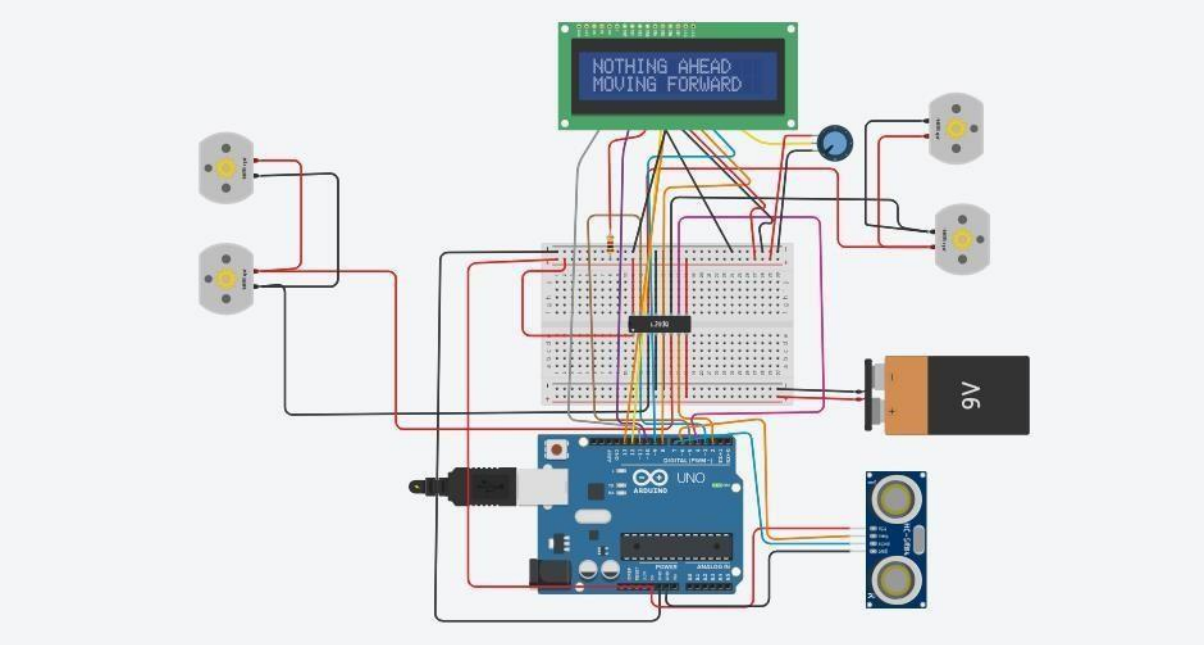
{ lcd.clear(); lcd.setCursor(0,0); lcd.print("TURNING
RIGHT");

lcd.setCursor(0,1); lcd.print(cm);
digitalWrite(lm1,HIGH); digitalWrite(lm2,LOW);
digitalWrite(rm1,LOW);

digitalWrite(rm2,LOW);

}

# OUTPUT:



# Practical No: 8

**Aim**: Detect faces with haar cascades.

CODE:

```
# Importing OpenCV package import cv2


# Reading the image img = cv2.imread('test.jpg')


# Converting image to grayscale  gray_img =
cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)


# Loading the required haar-cascade xml classifier file
haar_cascade = cv2.CascadeClassifier(cv2.data.haarcascades

+ "haarcascade_frontalface_default.xml")  eye_cascade =
cv2.CascadeClassifier(cv2.data.haarcascades +
'haarcascade_eye.xml')


# Applying the face detection method on the grayscale image
faces_rect = haar_cascade.detectMultiScale(gray_img, 1.3, 5)
eyes = eye_cascade.detectMultiScale(gray_img)


# Iterating through rectangles of detected faces for (x, y, w, h)
in faces_rect:      cv2.rectangle(img, (x, y), (x+w, y+h), (0,
255, 0), 2) for (ex,ey,ew,eh) in eyes:
cv2.rectangle(img,(ex,ey),(ex+ew,ey+eh),(0,255,0),2)
```

cv2.imshow('Detected faces', img)

cv2.waitKey(0)

OUTPUT: