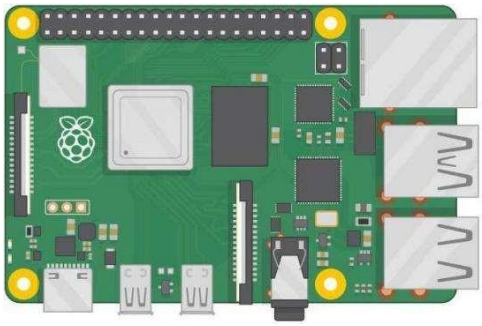
Practical 1)
Aim : Booting Raspberry Pie

Step 1 What you will need

Which Raspberry Pi?

There are several models of Raspberry Pi (https://www.raspberrypi.org /products/), and for most people Raspberry Pi 4 Model B is the one to choose. Raspberry Pi 4 Model B is the newest, fastest, and easiest to use.

Raspberry Pi 4 comes with 2GB, 4GB, or 8GB of RAM. For most educational purposes and hobbyist projects, and for use as a desktop computer, 2GB is enough.

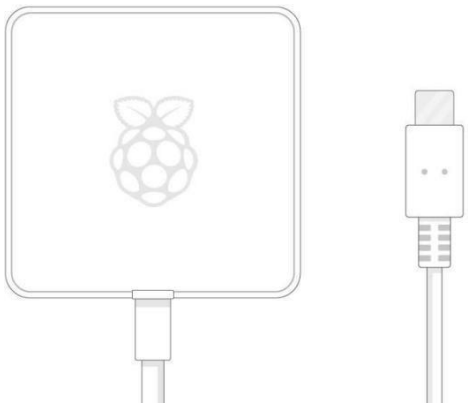


Raspberry Pi Zero, Raspberry Pi Zero W, and Raspberry Pi Zero WH are smaller and require less power, so they're useful for portable projects such as robots. It's generally easier to start a project with Raspberry Pi 4, and to move to Raspberry Pi Zero when you have a working prototype that a smaller Raspberry Pi would be useful for.

If you want to buy a Raspberry Pi, head to rpf.io/products (https://rpf.io/products).

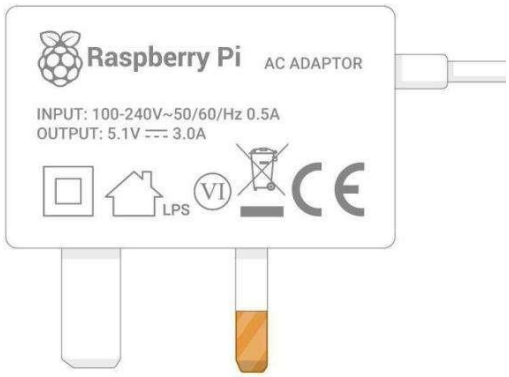
A power supply

To connect to a power socket, all Raspberry Pi models have a USB port (the same found on many mobile phones): either USB-C for Raspberry Pi 4, or micro USB for Raspberry Pi 3, 2, and 1.



You need a power supply that provides:

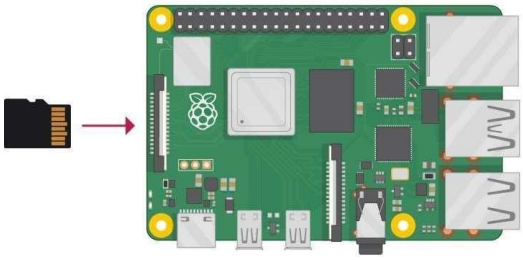
- At least 3.0 amps for Raspberry Pi 4



- At least 2.5 amps for Raspberry Pi 3

A microSD card

Your Raspberry Pi needs an SD card to store all its files and the Raspberry Pi OS operating system.



You need a microSD card with a capacity of at least 8GB.

Many sellers supply SD cards for Raspberry Pi that are already set up with Raspberry Pi OS and ready to go.

A keyboard and a mouse

To start using your Raspberry Pi, you need a USB keyboard and a USB mouse.

Once you've set up your Raspberry Pi, you can use a Bluetooth keyboard and mouse, but you'll need a USB keyboard and mouse for the first setup.

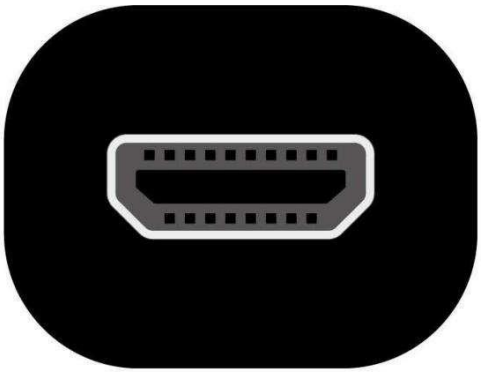
ATV or computer screen

To view the Raspberry Pi OS desktop environment, you need a screen, and a cable to link the screen and your Raspberry Pi. The screen can be a TV or a computer monitor. If the screen has built-in speakers. Raspberry Pi is able to use these to play sound.

HDMI

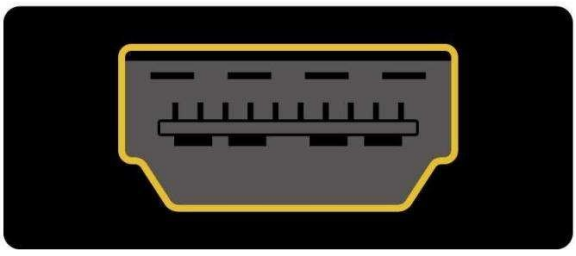
Your Raspberry Pi has an HDMI output port that is compatible with the HDMI port of most modern TVs and computer monitors. Many computer monitors may also have DVI or VGA ports.

Raspberry Pi 4 has two micro HDMI ports, allowing you to connect two separate monitors.



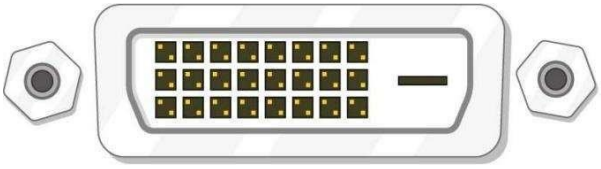
You need either a micro HDMI to HDMI cable. or a standard HDMI to HDMI cable plus a micro HDMI to HDMI adapter, to connect Raspberry Pi 4 to a screen.

Raspberry Pi 1, 2, and 3 have a single full—size HDMI port, so you can connect them to a screen using a standard HDMI to HDMI cable.



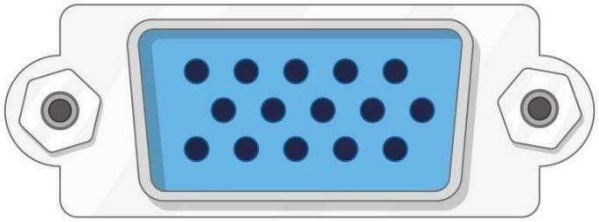
DVI

If your screen has a DVI port, you can connect your Raspberry Pi to it using an HDMI to DVI cable.

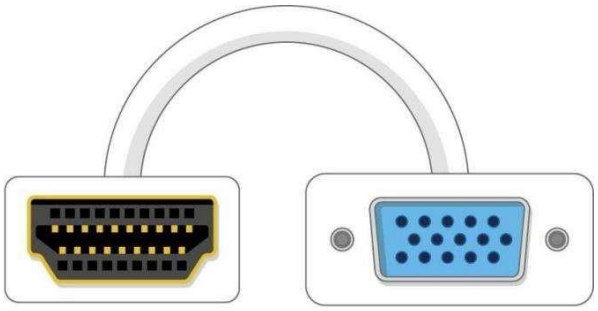


VGA

Some screens only have a VGA port.



To connect your Raspberry Pi to such a screen, you can use an HDMI to VGA adapter.



Headphones or speakers

The large Raspberry Pi models (but not Raspberry Pi Zero or Raspberry Pi Zero W] have a standard audio port like the one on a smartphone or MP3 player. If you want to, you can connect your headphones or speakers so that your Raspberry Pi can play sound. If the screen you're connecting your Raspberry Pi to has built—in speakers, Raspberry Pi can play sound through these.

An Ethernet cable

The large Raspberry Pi models (but not Raspberry Pi Zero or Raspberry Pi Zero W) have a standard Ethernet port to connect them to the internet: to connect Raspberry Pi Zero to the internet. you need a USB to Ethernet adapter.

Raspberry Pi 4, Raspberry Pi 3, and Raspberry Pi Zero W can also be wirelessly connected to the internet

Step 2 Set up your SD card

If you have an SD card that doesn't have the Raspberry Pi OS operating system on it yet, or if you want to reset your Raspberry Pi, you can easily install Raspberry Pi OS yourself. To do so. you need a computer that has an SD card port — most laptop and desktop computers have one.

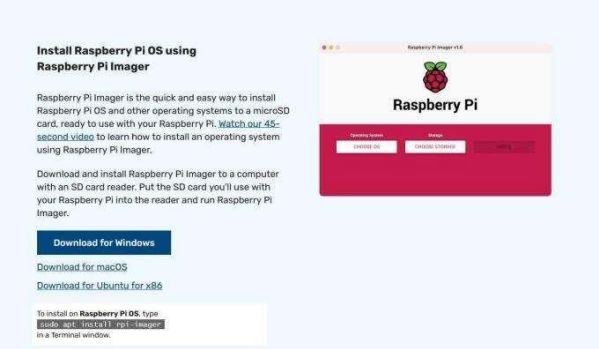
The Raspberry Pi OS operating system via the Raspberry Pi Imager

Using the Raspberry Pi Imager is the easiest way to install Raspberry Pi OS on your SD card.

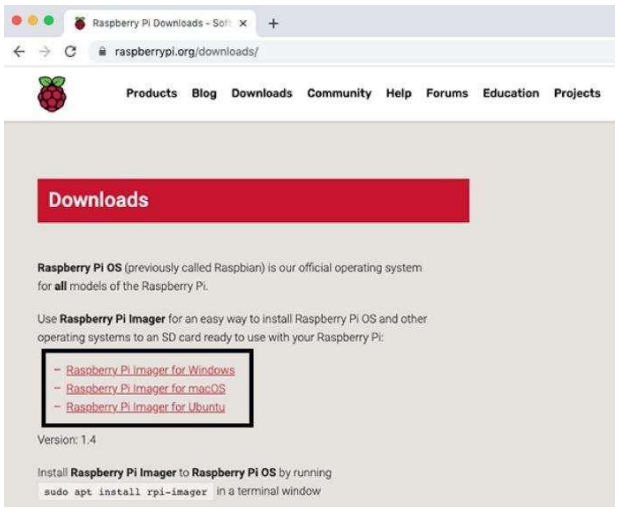
Note: More advanced users looking to install a particular operating system should use this guide to installing operating system images (https://www.raspberrypi.org/documentation/installation/installing-images/ README.md}.

Download and launch the Raspberry Pi Imager

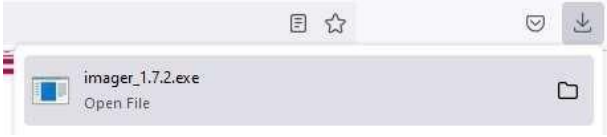
- Visit the Raspberry Pi downloads page (https://www.raspberrypi.org/downloads)



- Click on the link for the Raspberry Pi Imager that matches your operating system



- When the download finishes, click it to launch the installer



Using the Raspberry Pi Imager

Anything that's stored on the SD card will be overwritten during formatting. If your SD card currently has any files on it, e.g. from an older version of Raspberry Pi OS. you may wish to back up these files first to prevent you from permanently losing them.

When you launch the installer. your operating system may try to block you from running it. For example, on Windows I receive the following message:

- If this pops up. click on more 1nfo and then Run anyway
- Follow the instructions to install and run the Raspberry Pi Imager
- Insert your SD card into the computer or laptop SD card slot
- In the Raspberry Pi Imager, select the OS that you want to install and the SD card you would like to install it on

Note: You will need to be connected to the internet the first time for the the Raspberry Pi Imager to download the OS that you choose. That OS will then be stored for future of ine use. Being online for later uses means that the Raspberry Pi imager will always give you the latest version.

Operating System x

Raspberry Pi Os (32-bft)

A port of Debian Bullseye with the Raspoerry Pi Desktop
(Recommended)
PMea : 2022 04’0”.
Unline - E.8 CB Jo',’ load

Raspberry Pi Os (other)

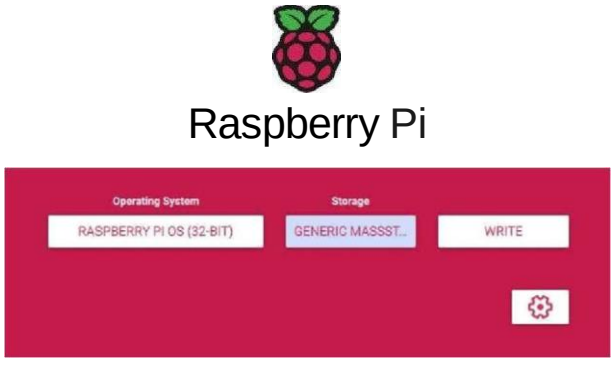
Other Raspoer ry Pi OS based Images

Other general-purpose ɔs

Other genera l ourp ose op eratin g systems

Media olayer OS

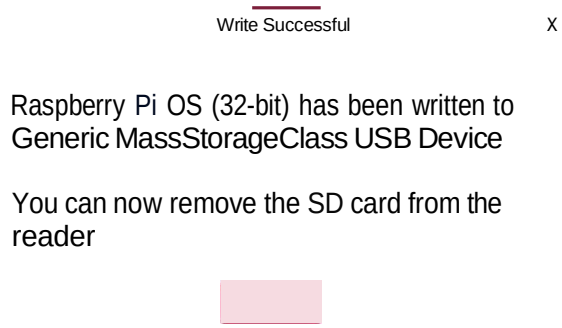
Generic Mass StorageClass USB Device - 15.9 GB



Raspberry Pi

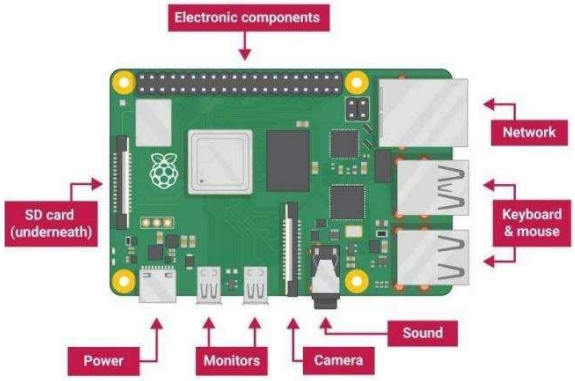
- Then simply click the WRITE button

- Wait for the Raspberry Pi Imager to finish writing
- Once you get the following message, you can eject your SD card

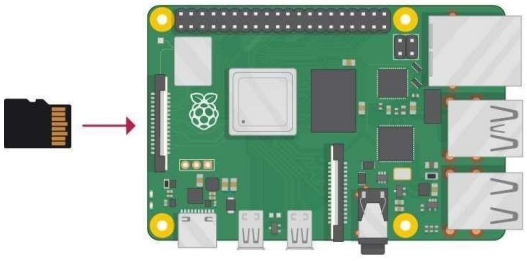


Step 3 Connect your Raspberry Pi

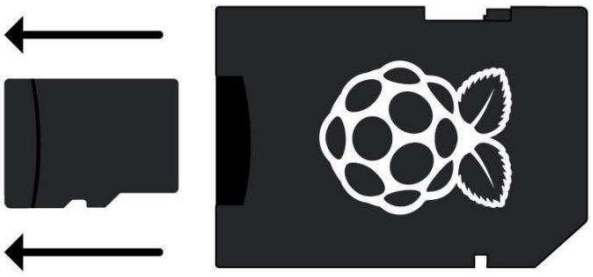
Now get everything connected to your Raspberry Pi. It's important to do this in the right order, so that all your components are safe.



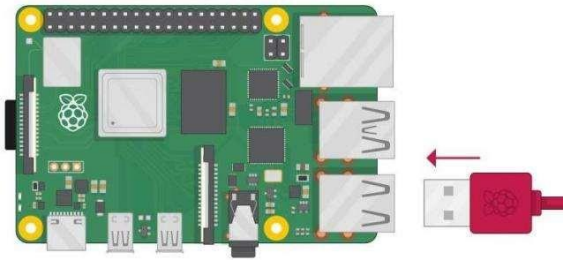
- Insert the SD card you've set up with Raspberry Pi OS into the microSD card slot on the underside of your Raspberry Pi.



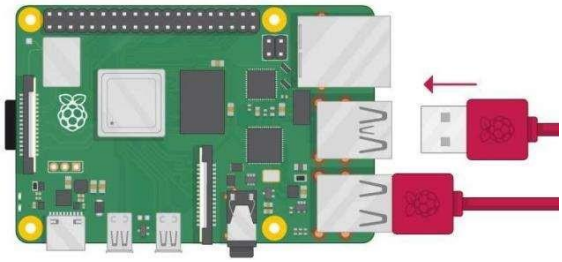
Note: Many microSD cards come inside a larger adapter — you can slide the smaller card out using the lip at the bottom.



- Find the USB connector end of your mouse's cable. and connect the mouse to a USB port on Raspberry Pi (it doesn't matter which port you use).



- Connect the keyboard in the same way.

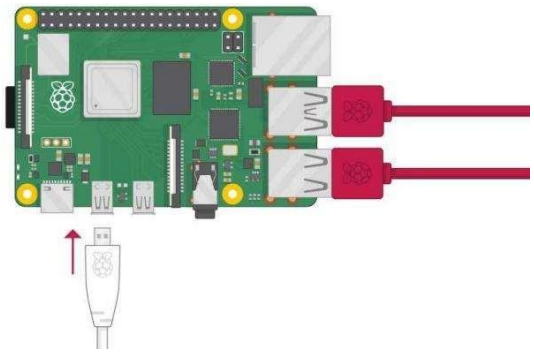


- Make sure your screen is plugged into a wall socket and switched on.
- Look at the HDMI port(s] on your Raspberry Pi — notice that they have a flat side on top.
- Use a cable to connect the screen to Raspberry Pi's HDMI port — use an adapter if necessary.

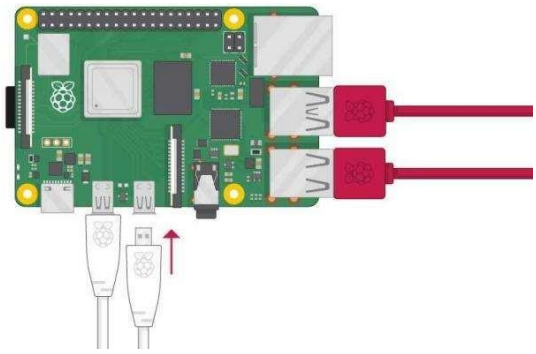
  Raspberry Pi 4

  Connect your screen to the first of Raspberry Pi 4's HDMI ports. labelled HDMIO.

  Note: Make sure you have used HDMIO (nearest the power in port) rather than HDMI1.

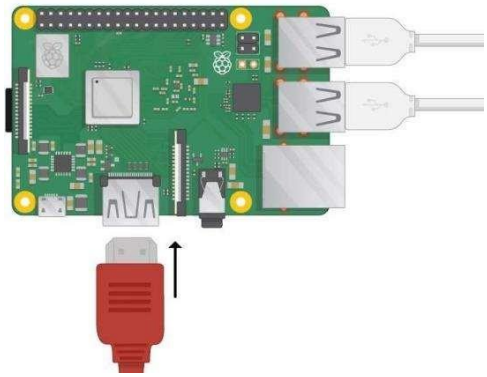


You can connect an optional second screen in the same way.



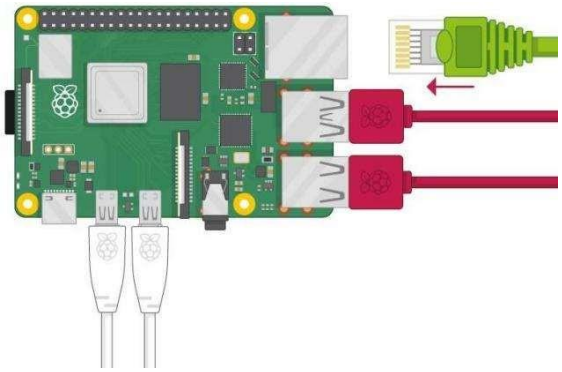
Raspberry Pi 1, 2, 3

Connect your screen to the single HDMI port.



Note: Nothing will display on the screen, because your Raspberry Pi is not running yet.

- If you want to connect your Raspberry Pi to the internet via Ethernet, use an Ethernet cable to connect the Ethernet port on Raspberry Pi to an Ethernet socket on the wall or on your internet router. You don't need to do this if you want to use wireless connectivity, or if you don't want to connect to the internet.

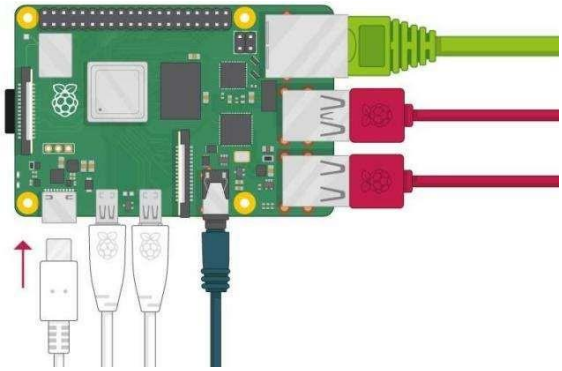


- If the screen you are using has speakers. sound will play through those. Alternatively. connect headphones or speakers to the audio port if you prefer

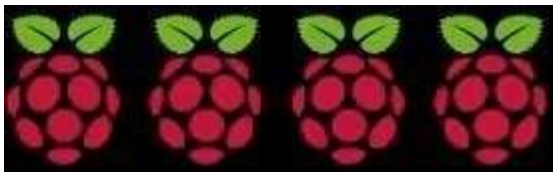
Step 4 Start up your Raspberry Pi

Your Raspberry Pi doesn't have a power switch. As soon as you connect it to a power outlet. it will turn on.

- Plug the power supply into a socket and connect it to your Raspberry Pi's power port.



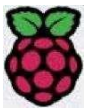
You should see a red LED light up on the Raspberry Pi, which indicates that Raspberry Pi is connected to power. As it starts up (this is also called booting), you will see raspberries appear in the top left-hand corner of your screen.



After a few seconds the Raspberry Pi OS desktop will appear.

Finishing the setup

When you start your Raspberry Pi for the first time, the Welcome to Raspberry Pi application will pop up and guide you through the initial setup.



Welcome to the Raspberry Pi Desktop!

before you start use no rt, there are a le'.'• rhinos to set up

Press 'text' to get started

If yoiJ are us.eg a B.uetooth key box rd or mouse, put then into palrinQ mode and \'/ait for them to connect.

- Click on Next to start the setup.
- Set your Country, Language. and Timezone, then click on Next again.

Set Country

Enter the deta!is of } our loc?.tion Th!s is usPd to set the language, time zone, keyboar‹l and other international settings

COU?tF}'. UnitPd K'nodom •

Language: British ng!ish

T.mezone: Belfast

Use -ng!!sh language Use US keyboard

Press 'text' .when you have me.de vour se.ect!on

Back Next

- Enter a new username and password for your Raspberry Pi and click on Next.

Create User

\'ou need to creste e user account to log in to your aspberry

The username can oniy contain !o›°.'er-cnse letters, dl gits un›d hyphens, and must start ',with n letter

Enter username:

Enter password:

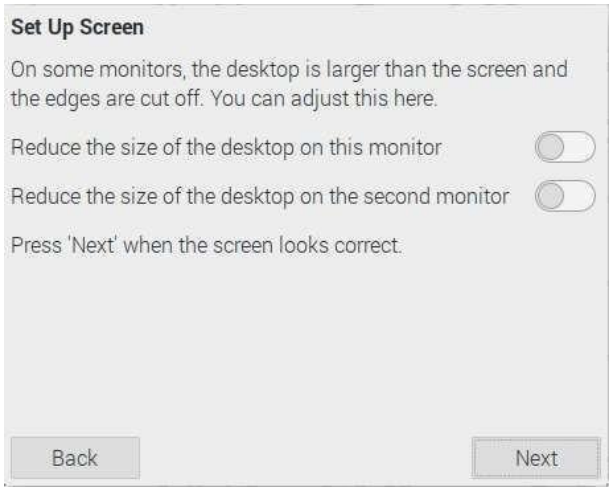
Confirm password

☑ Hide characters

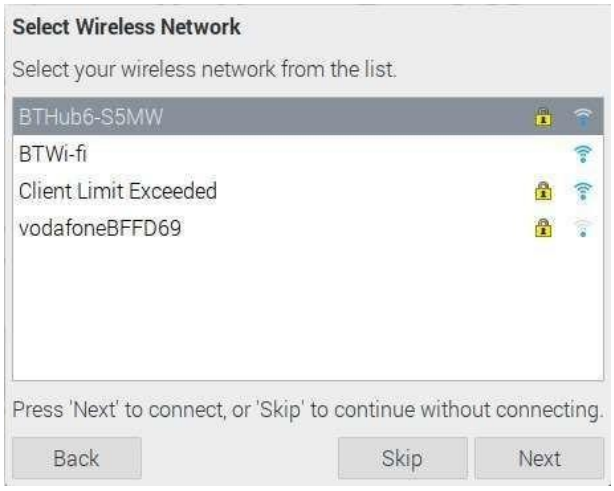
Press 'Next' to create your account.

Back Next

- Set up your screen so that the Desktop completely fills your monitor.

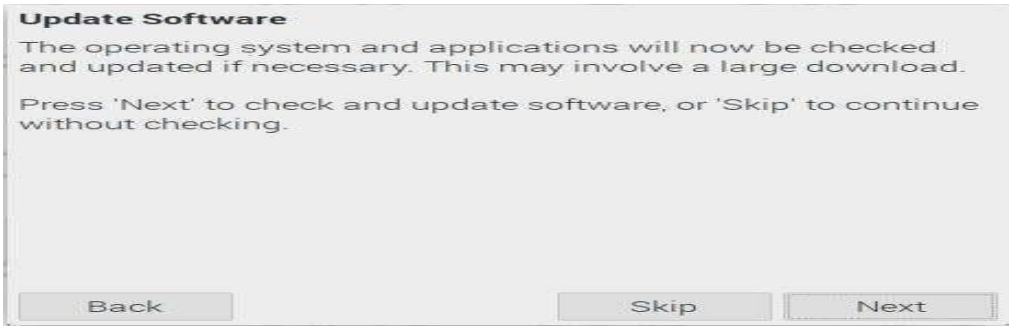


- Connect to your wireless network by selecting its name, entering the password, and clicking on Next.



Note: If your model of Raspberry Pi doesn't have wireless connectivity, you won't see this screen.
Note: Wait until the wireless connection icon appears and the correct time is shown before trying to update the software.

- Click on Next, and let the wizard check for updates to Raspberry Pi OS and install them (this might take a little while).



- Click on Restart to finish the setup.

Practical - 2

Aim: Blinking LED using Raspberry Pi

Hardware Requirements:

1) **Breadboard-** A breadboard is a tool used in electronics to prototype circuits without soldering. It has a grid of interconnected holes for components, power rails, and is reusable for experimenting with circuit designs.

2) **LED-Light-emitting-diode:-** An LED is a small, energy-efficient semiconductor device that emits light when an electric current passes through it. It's used in lighting, displays, indicators, and various electronic applications.

3) **Resistor :-** A resistor is an electrical component that limits the flow of electric current in a circuit, typically used to control voltage levels, current flow, and adjust signal levels in electronics.

4) **Jumper Wire:-** A jumper wire is a short, flexible electrical wire used to establish connections between different points on a breadboard or electronic circuit, allowing for easy and temporary wiring during prototyping and testing.

5) **Raspberry Pi :-** A Raspberry Pi is a small, affordable, single-board computer that's widely used for various DIY projects, education, and prototyping. It can run a variety of operating systems and is popular for programming, learning about computing, and building innovative electronics projects.

6) **Keyboard :-** A keyboard is an input device used to type or enter text and commands into a computer or other digital devices by pressing individual keys, each representing a specific character or function.

7) **Mouse :-** A mouse is a pointing device used to control the movement of a cursor or pointer on a computer screen. It typically has buttons that allow users to interact with graphical user interfaces, select items, and perform actions by clicking or dragging the cursor

8) **HDMI Cable :-** HDMI (High-Definition Multimedia Interface) cables are digital cables used to transmit high-quality audio and video signals between devices, such as TVs, monitors, projectors, and multimedia sources (like laptops, game consoles, or streaming devices)

9) **Ethernet Cable:-** Ethernet cable is used to connect devices in a wired network, enabling data communication, and it comes in different categories for various performance levels.

10) **Power Supply:-** A power supply converts incoming electrical energy into the right form to power electronic device

11) **Male to female Jumper Wire:-** A male-to-female jumper wire is a type of electrical cable with a male connector on one end and a female connector on the other, commonly used for connecting components or devices on a breadboard or in electronics projects.

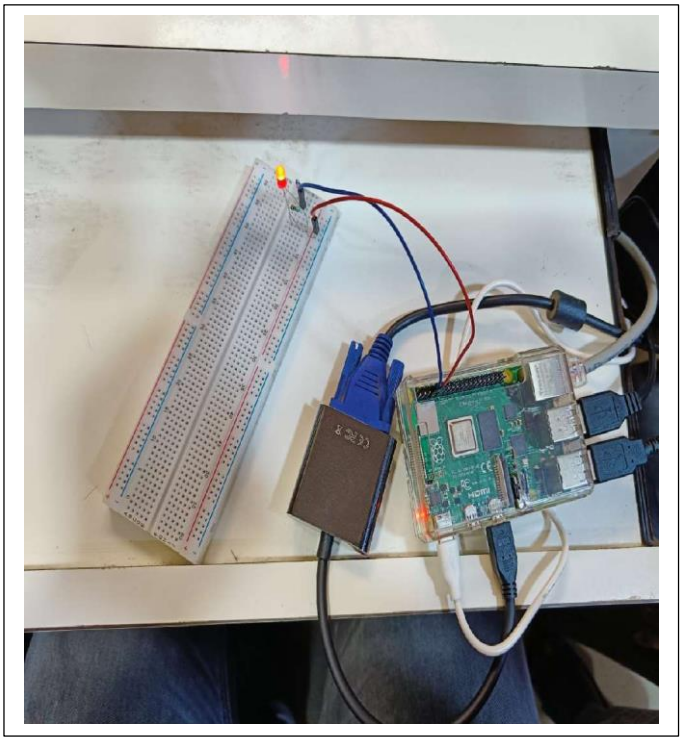
STEPS :-

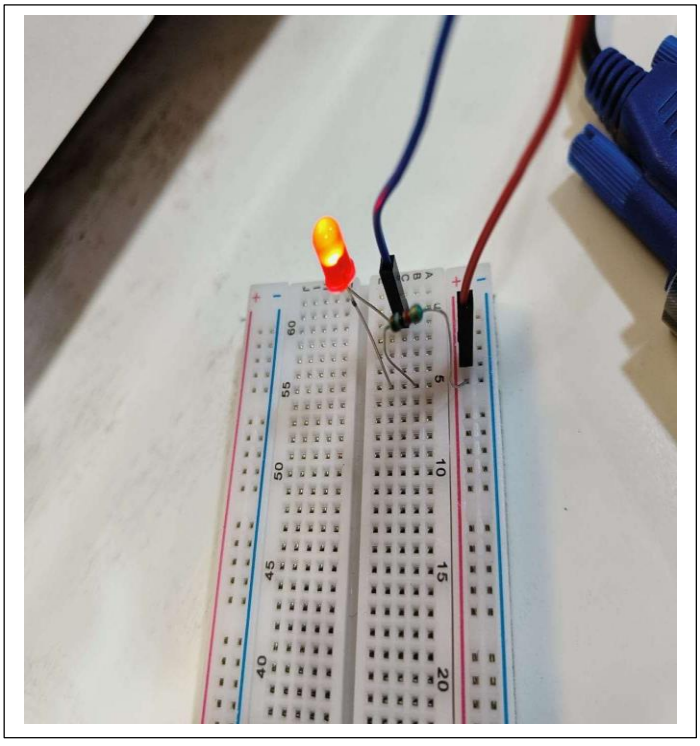
1. Connect the LED to the breadboard.
2. LED had 2 terminals(One is the longer terminal that is positive , second is the shorter terminal that is negative).
3. Connect one side for the jumper wire below the LED positive side on the breadboard connect the jumper wire below the LED longer terminal.
4. Connect one end of the resistor on the breadboard right below the LED negative side.
5. The other end of the resistor connects it anywhere on the breadboard. Now connect another jumper wire right above the second end of the resistor.
6. Connect the positive side of the jumper wire on PIN 7 and the negative side on PIN 9 of the raspberry pi.
    i. Longer terminal = Positive(Raspberry Pi Pin 7)
    ii. Shorter terminal =Negative(Raspberry Pi Pin 9)

Code:-

```
import RPi.GPIO as GPIO
import time
GPIO.setmode(GPIO.BOARD)
GPIO.setup(7,GPIO.OUT)
for i in range(10):
GPIO.output(7,True)
print("LED IS FINALLY ON")
time.sleep(1)
GPIO.output(7,False)
print("LED IS OFF")
time.sleep(1)
print("PROGRAM COMPLETE”)
GPIO.cleanup()
```

Output :-





Practical - 3

Aim: Displaying Different LED Patterns with Raspberry Pi

Hardware Requirements:

1. **Breadboard-** A breadboard is a tool used in electronics to prototype circuits without soldering. It has a grid of interconnected holes for components, power rails, and is reusable for experimenting with circuit designs.
2. **LED-Light-emitting diode :-** An LED is a small, energy-efficient semiconductor device that emits light when an electric current passes through it. It's used in lighting, displays, indicators, and various electronic applications.
3. **Resistor :-** A resistor is an electrical component that limits the flow of electric current in a circuit, typically used to control voltage levels, current flow, and adjust signal levels in electronics.
4. **Jumper Wire:-** A jumper wire is a short, flexible electrical wire used to establish connections between different points on a breadboard or electronic circuit, allowing for easy and temporary wiring during prototyping and testing.
5. **Raspberry Pi :-** A Raspberry Pi is a small, affordable, single-board computer that's widely used for various DIY projects, education, and prototyping. It can run a variety of operating systems and is popular for programming, learning about computing, and building innovative electronics projects.
6. **Keyboard :-** A keyboard is an input device used to type or enter text and commands into a computer or other digital devices by pressing individual keys, each representing a specific character or function.
7. **Mouse :-** A mouse is a pointing device used to control the movement of a cursor or pointer on a computer screen. It typically has buttons that allow users to interact with graphical user interfaces, select items, and perform actions by clicking or dragging the cursor.

8. **HDMI Cable :-** HDMI (High-Definition Multimedia Interface) cables are digital cables used to transmit high-quality audio and video signals between devices, such as TVs, monitors, projectors, and multimedia sources (like laptops, game consoles, or streaming devices)
9. **Ethernet Cable:-** Ethernet cable is used to connect devices in a wired network, enabling data communication, and it comes in different categories for various performance levels.
10. **Power Supply:-** A power supply converts incoming electrical energy into the right form to power electronic device
11. **Male to female Jumper Wire:-** A male-to-female jumper wire is a type of electrical cable with a male connector on one end and a female connector on the other, commonly used for connecting components or devices on a breadboard or in electronics projects.

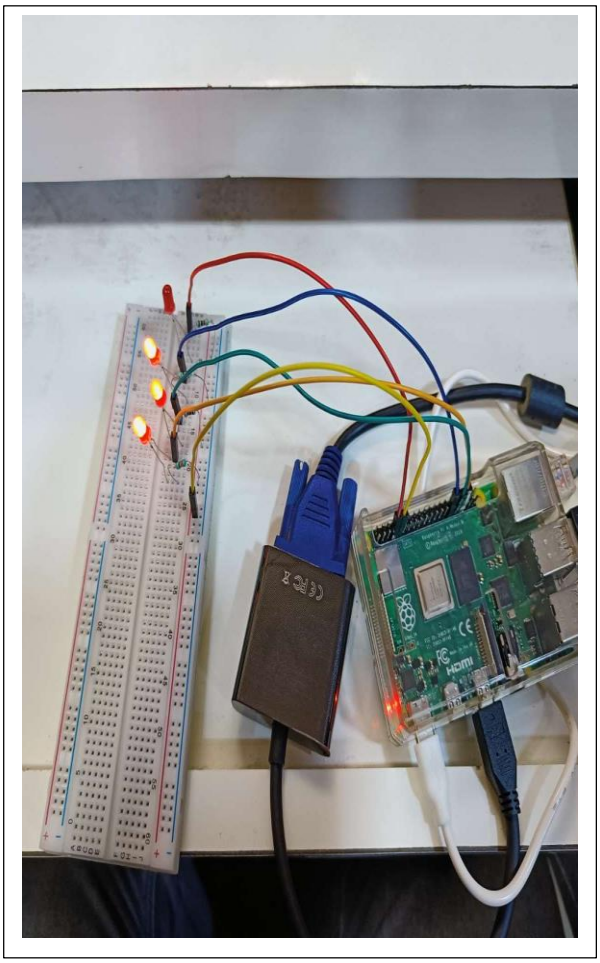
STEPS :-

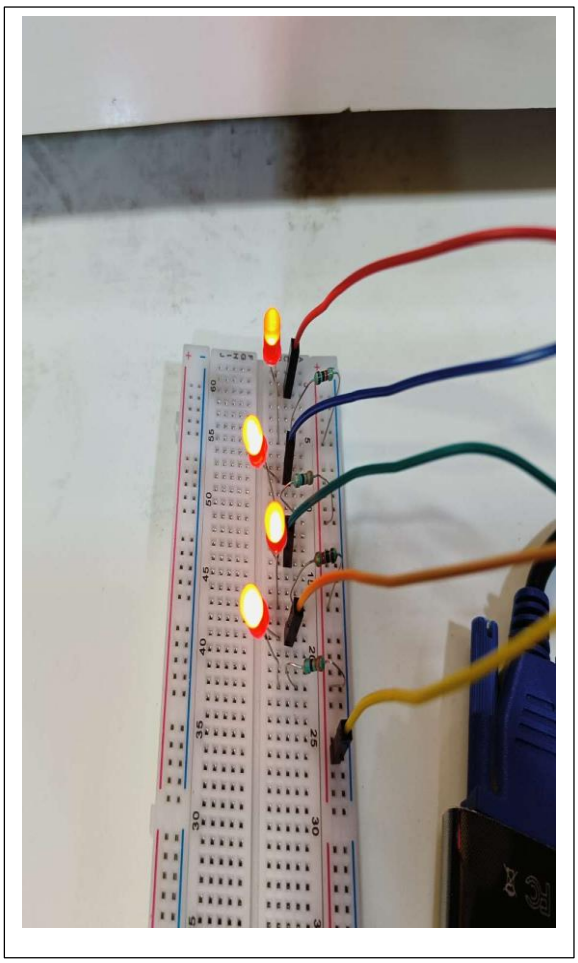
1) Connect the LED to the breadboard.
2) LED had 2 terminals (One is the longer terminal that is positive, second is the shorter terminal that is negative).
3) Connect one side for the jumper wire below the LED positive side on the breadboard connect the jumper wire below the LED longer terminal.
4) Connect one end of the resistor on the breadboard right below the LED negative side.
5) The other end of the resistor connects it anywhere on the breadboard. Now connect another jumper wire right above the second end of the resistor.
6) Connect the positive side of the jumper wire on PIN 7, 29, 31, 33 and the negative side on PIN 9 of the raspberry pi
    i. Longer terminal = Positive (Raspberry Pi Pin7)
    ii. Shorter terminal = Negative (Raspberry Pi Pin 9)

Code:-

```
import RPi.GPIO as GPIO
import time
GPIO.setmode(GPIO.BOARD)
GPIO.setwarnings(False)
GPIO.setup(7,GPIO.OUT)
GPIO.setup(29,GPIO.OUT)
GPIO.setup(31,GPIO.OUT)
GPIO.setup(33,GPIO.OUT)
while(1):
GPIO.output(7,False)
print("LED 1 IS OFF")
time.sleep(1)
GPIO.output(29,False)
print("LED 2 IS OFF")
time.sleep(1.5)
GPIO.output(31,False)

print("LED 3 IS OFF")
time.sleep(2)
GPIO.output(33,False)
print("LED 4 IS OFF")
time.sleep(2.5)

GPIO.output(7,True)
print("LED 1 IS FINALLY ON")
time.sleep(3.5)
GPIO.output(29,True)
print("LED 2 IS FINALLY ON")
time.sleep(4)
GPIO.output(31,True)
print("LED 3 IS FINALLY ON")
time.sleep(4.5)
GPIO.output(33,True)
print("LED 4 IS FINALLY ON")
time.sleep(5)

GPIO.output(7,False)
print("LED 1 IS OFF")
time.sleep(1)
GPIO.output(29,False)
print("LED 2 IS OFF")
time.sleep(1.5)
GPIO.output(31,False)
print("LED 3 IS OFF")
time.sleep(2)
GPIO.output(33,False)
print("LED 4 IS OFF")
time.sleep(2.5)
print("PROGRAM
COMPLETE!")
GPIO.cleanup()
```

Output :-





Practical - 4

Aim: Interfacing Telegram with Raspberry Pi

Hardware Requirements:

1. **Breadboard-** A breadboard is a tool used in electronics to prototype circuits without soldering. It has a grid of interconnected holes for components, power rails, and is reusable for experimenting with circuit designs.
2. **LED-Light-emitting diode :-** An LED is a small, energy-efficient semiconductor device that emits light when an electric current passes through it. It's used in lighting, displays, indicators, and various electronic applications.
3. **Resistor :-** A resistor is an electrical component that limits the flow of electric current in a circuit, typically used to control voltage levels, current flow, and adjust signal levels in electronics.
4. **Jumper Wire:-** A jumper wire is a short, flexible electrical wire used to establish connections between different points on a breadboard or electronic circuit, allowing for easy and temporary wiring during prototyping and testing.
5. **Raspberry Pi :-** A Raspberry Pi is a small, affordable, single-board computer that's widely used for various DIY projects, education, and prototyping. It can run a variety of operating systems and is popular for programming, learning about computing, and building innovative electronics projects.
6. **Keyboard :-** A keyboard is an input device used to type or enter text and commands into a computer or other digital devices by pressing individual keys, each representing a specific character or function.
7. **Mouse :-** A mouse is a pointing device used to control the movement of a cursor or pointer on a computer screen. It typically has buttons that allow users to interact with graphical user interfaces, select items, and perform actions by clicking or dragging the cursor.
8. **HDMI Cable :-** HDMI (High-Definition Multimedia Interface) cables are digital cables used to transmit high-quality audio

and video signals between devices, such as TVs, monitors, projectors, and multimedia sources (like laptops, game consoles, or streaming devices)

9. **Ethernet Cable:-** Ethernet cable is used to connect devices in a wired network, enabling data communication, and it comes in different categories for various performance levels.

10. **Power Supply:-** A power supply converts incoming electrical energy into the right form to power electronic device.

11. **Mobile Phones:-** A mobile phone is a wireless handheld device that allows users to make and receive calls. While the earliest generation of mobile phones could only make and receive calls, today's mobile phones do a lot more, accommodating web browsers, games, cameras, video players and navigational systems.

12. **Male to female Jumper Wire:-** A male-to-female jumper wire is a type of electrical cable with a male connector on one end and a female connector on the other, commonly used for connecting components or devices on a breadboard or in electronics projects.

Steps:-

1. First to start the practical you need 2 LEDs, 2 resistors, and 3 jumper wires.
2. Now connect two LEDs to the breadboard
3. Next connect the 2 resistors, one end to the negative end of the LEDs on the breadboard and the second end to the endpoint of the breadboard.
4. Connect 2 Jumper Wires to the Positive end of the LEDs.
5. For the Ground Connection add the third Jumper Wire to the bottom of the breadboard to connect all the resistors.
6. Turn on your mobile phone and install telegram.
7. Create a bot with the help of botfather
   Commands to create a bot :
   a. Go to telegram and search and open botfather
      i. Type the commands:
      ii. /Start

iii. /newbot

8. Once the bot father is created a bot it will generate a unique id the unique id needs to be added into the code.
9. Open the bot with the name which you have created
   - Give the start command to turn on the bot.
   - Now you can give commands to blink the led's or to create a pattern.

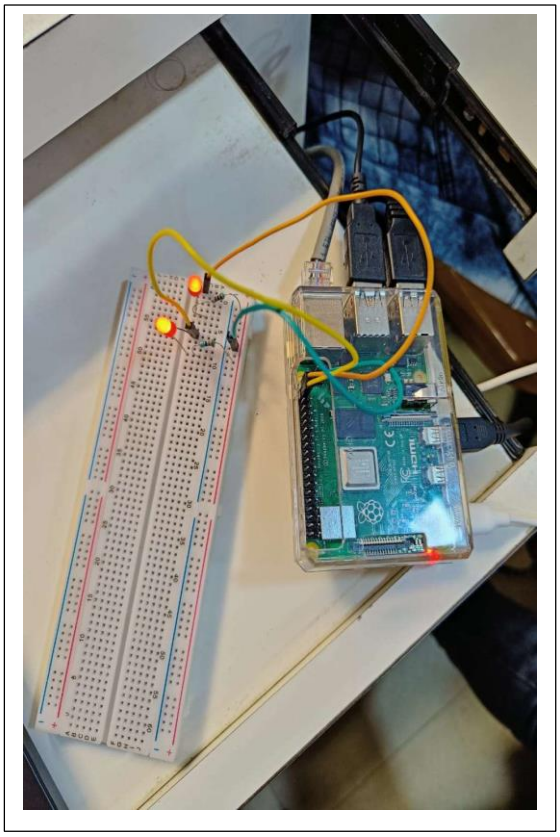
Terminal Command:-

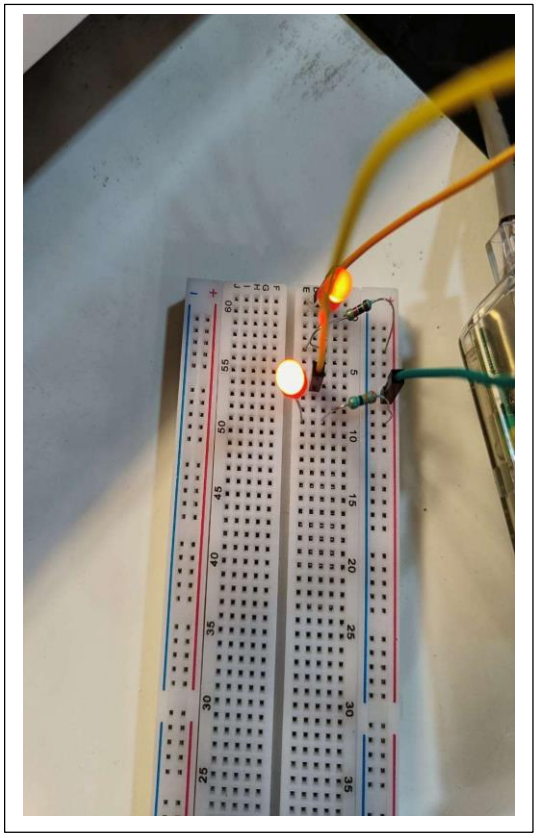
sudo pip3 install telepot

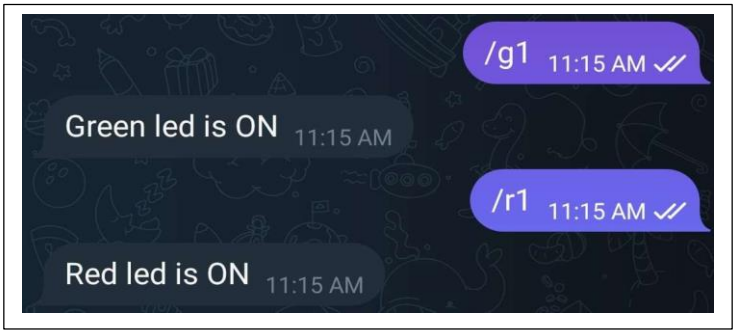
Code:-

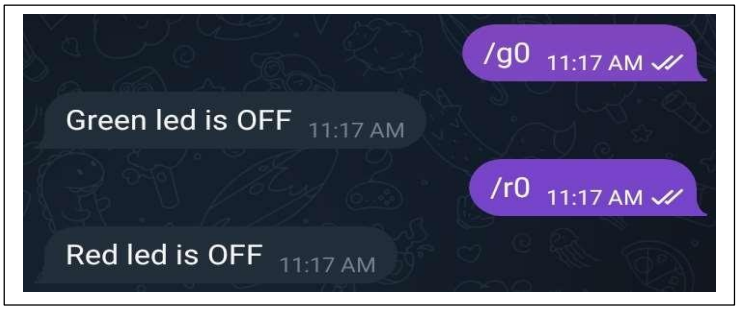
```
import datetime
import telepot
from telepot.loop import MessageLoop
import RPi.GPIO as GPIO
from time import sleep
red_led_pin = 21
green_led_pin = 20
GPIO.setmode(GPIO.BCM)
GPIO.setup(red_led_pin, GPIO.OUT)
GPIO.setup(green_led_pin, GPIO.OUT)
now = datetime.datetime.now()
def handle(msg):
   chat_id = msg['chat']['id']
   command = msg['text']
   print ('Received:')
   print(command)
 if command == '/hi':
    bot.sendMessage (chat_id, str("Hi! "))
 elif command == '/r1':
     bot.sendMessage(chat_id, str("Red
led is ON"))
GPIO.output(red_led_pin, True)
   elif command == '/r0':
     bot.sendMessage(chat_id, str("Red
led is OFF"))
 GPIO.output(red_led_pin, False)
   elif command == '/g1':
     bot.sendMessage(chat_id,
        str("Green led is ON"))
 GPIO.output(green_led_pin, True)
    elif command == '/g0':
      bot.sendMessage(chat_id,
         str("Green led is OFF"))
 GPIO.output(green_led_pin, False)
bot =
telepot.Bot('6558187738:AAHvdvVes5nf
G2RyLWgm7zZrzTU87DzqYiY')
print (bot.getMe())
MessageLoop(bot,
handle).run_as_thread()
print ('Listening....')

while 1:
   sleep(10)
```

Output:-






/g1 11:15 AM
Green led is ON 11:15 AM
/r1 11:15 AM
Red led is ON 11:15 AM


/g0 11:17 AM
Green led is OFF 11:17 AM
/r0 11:17 AM
Red led is OFF 11:17 AM

Practical - 5

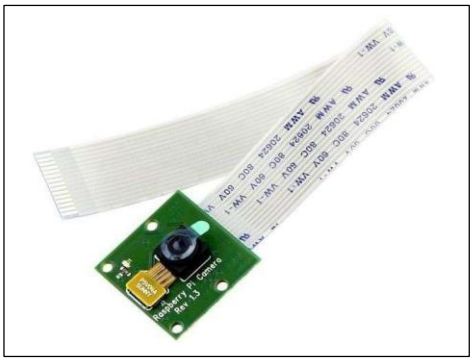
Aim: Click image and video using Raspberry Pi

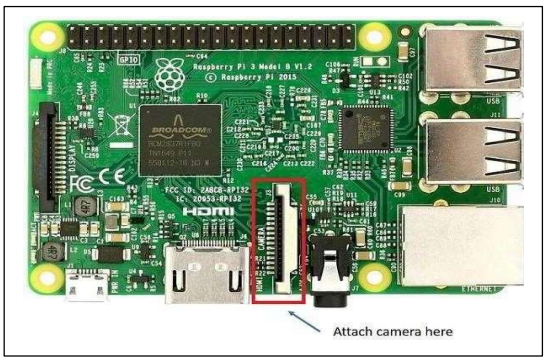
Hardware Requirements:

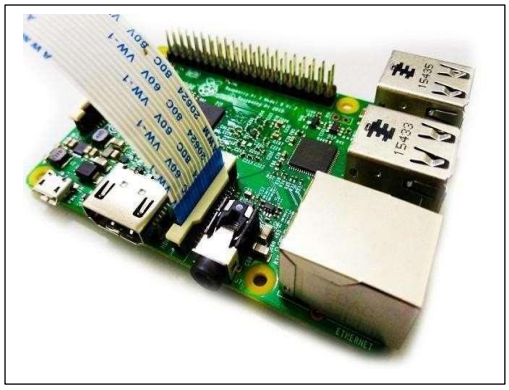
1. **Camera-** It will automatically record, monitor and alert the user.
2. **Raspberry Pi :-** A Raspberry Pi is a small, affordable, single-board computer that's widely used for various DIY projects, education, and prototyping. It can run a variety of operating systems and is popular for programming, learning about computing, and building innovative electronics projects.
3. **Keyboard :-** A keyboard is an input device used to type or enter text and commands into a computer or other digital devices by pressing individual keys, each representing a specific character or function.
4. **Mouse :-** A mouse is a pointing device used to control the movement of a cursor or pointer on a computer screen. It typically has buttons that allow users to interact with graphical user interfaces, select items, and perform actions by clicking or dragging the cursor.
5. **HDMI Cable :-** HDMI (High-Definition Multimedia Interface) cables are digital cables used to transmit high-quality audio and video signals between devices, such as TVs, monitors, projectors, and multimedia sources (like laptops, game consoles, or streaming devices)
6. **Ethernet Cable:-** Ethernet cable is used to connect devices in a wired network, enabling data communication, and it comes in different categories for various performance levels.
7. **Power Supply:-** A power supply converts incoming electrical energy into the right form to power electronic device.

Steps:-

1. Connect Pi Camera to CSI interface of Raspberry Pi board as shown below :







2. Now, we can use Pi Camera for capturing images and videos using Raspberry Pi.
3. Now turn on your Raspberry pi.
4. Before using Pi Camera, we need to enable camera for its working
5. For enabling camera in Raspberry Pi, open raspberry pi configuration using following command :

Terminal Command:-

Sudo raspi-config

6. Then go to interface option, click on camera and enable it.

Code:-

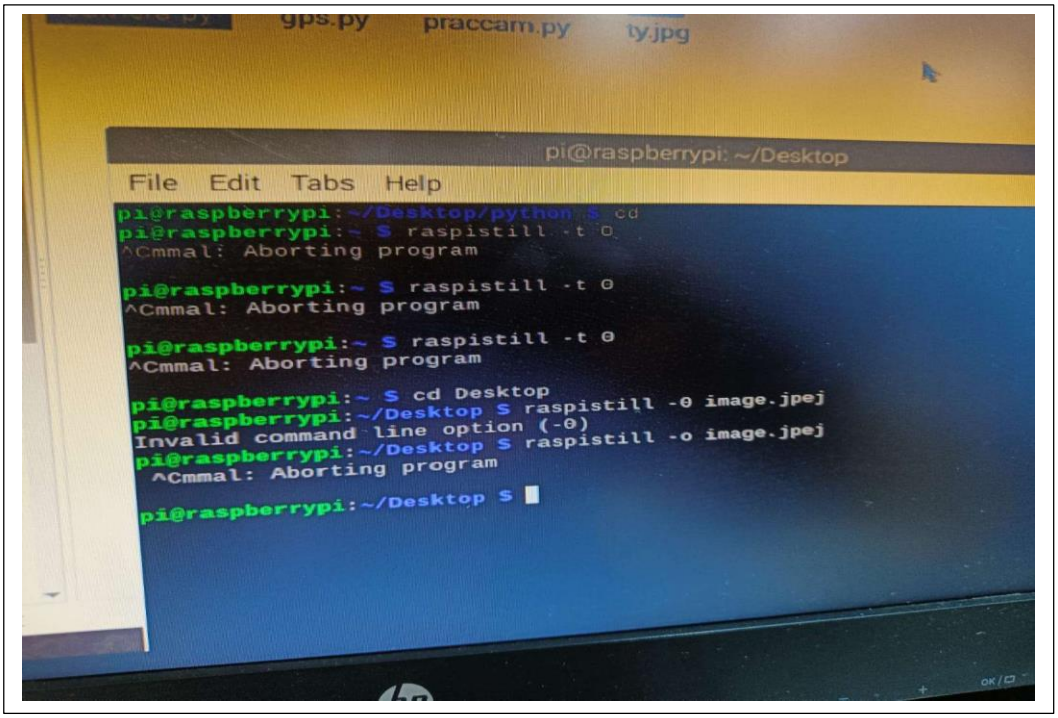
Video1.py

```
import time
from picamera import
PiCamera
camera=PiCamera()
camera.start_preview()
camera.start_recording('home
/pi/Desktop/video1.h264')
camera.wait_recording(5)
camera.stop_recording()
print("finished Recording")
```

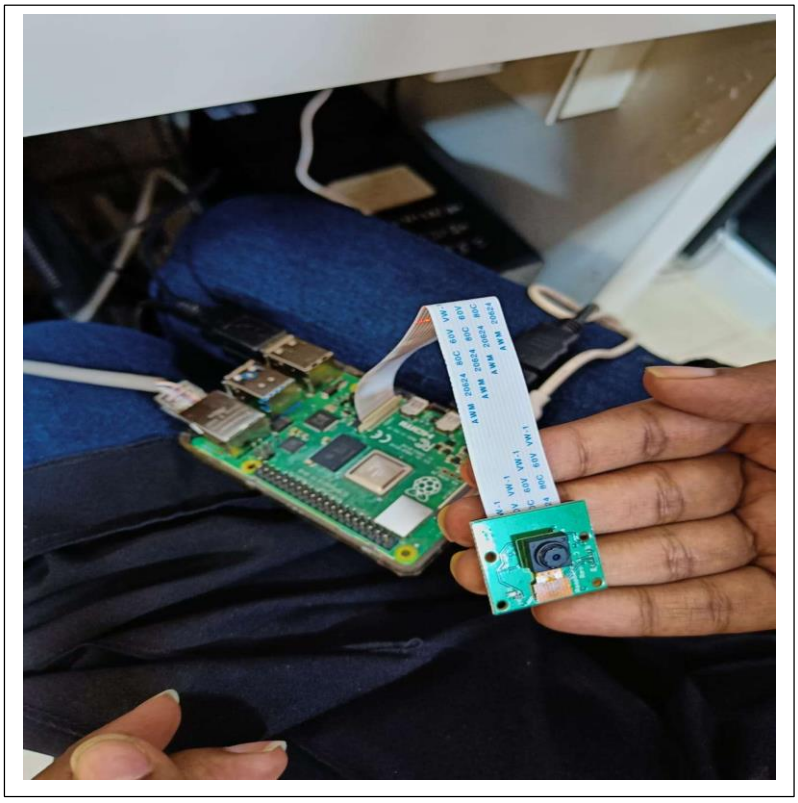
picam.py

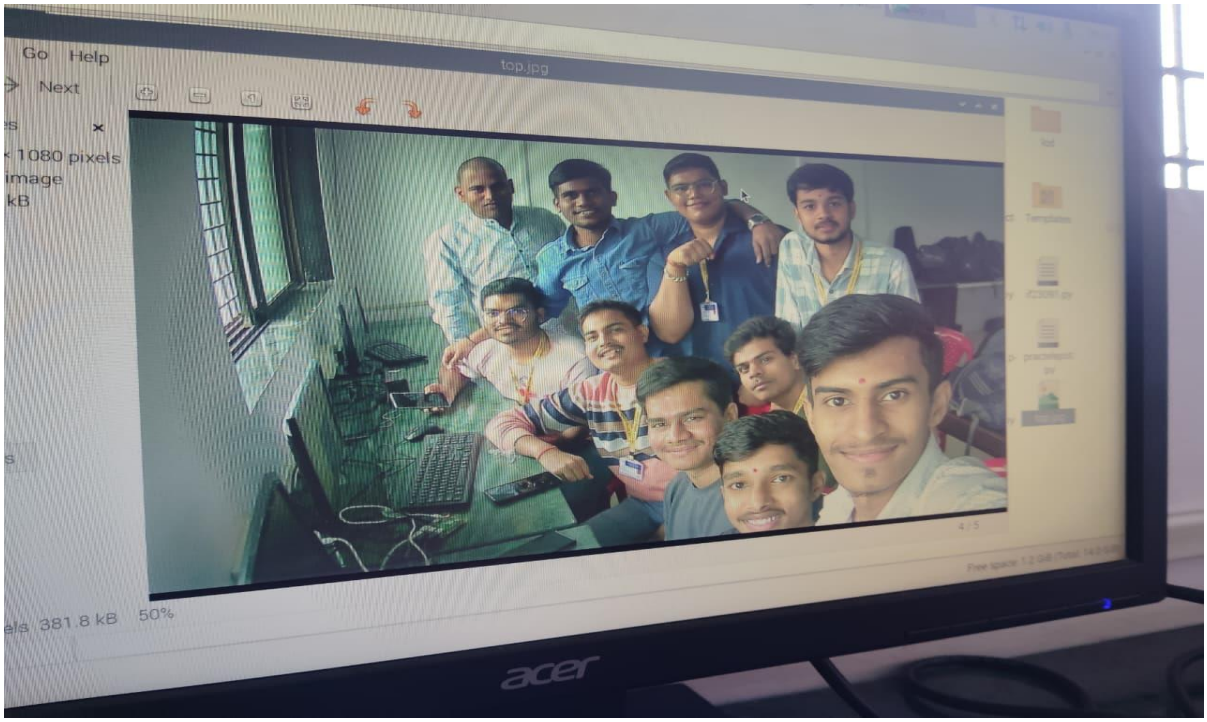
```
import time
from picamera import
PiCamera
camera=PiCamera()
camera.resolution=(1280,7
20)
camera.start_preview()
time.sleep(5)
camera.capture('home/pi/D
esktop/ty2.jpg')
camera.stop_preview()
```

- **Note:-** You can also directly run the camera by using this command :-



Output:-





Practical - 6

Aim: Displaying Time over 4-Digit 7-Segment Display using Raspberry Pi.

Hardware Requirements:

1. **Digit Display:-** In IoT, a digit display is a visual interface that shows numerical data from connected devices or sensors, aiding users in monitoring and interacting with real-time information.
2. **Raspberry Pi :-** A Raspberry Pi is a small, affordable, single-board computer that's widely used for various DIY projects, education, and prototyping. It can run a variety of operating systems and is popular for programming, learning about computing, and building innovative electronics projects.
3. **Keyboard :-** A keyboard is an input device used to type or enter text and commands into a computer or other digital devices by pressing individual keys, each representing a specific character or function.
4. **Mouse :-** A mouse is a pointing device used to control the movement of a cursor or pointer on a computer screen. It typically has buttons that allow users to interact with graphical user interfaces, select items, and perform actions by clicking or dragging the cursor.
5. **HDMI Cable :-** HDMI (High-Definition Multimedia Interface) cables are digital cables used to transmit high-quality audio and video signals between devices, such as TVs, monitors, projectors, and multimedia sources (like laptops, game consoles, or streaming devices)
6. **Ethernet Cable:-** Ethernet cable is used to connect devices in a wired network, enabling data communication, and it comes in different categories for various performance levels.
7. **Power Supply:-** A power supply converts incoming electrical energy into the right form to power electronic device.

8. **Female to Female Jumper Wire:-** A female-to-female jumper wire in IoT is a connector cable with female connectors on both ends, used to link components or sensors with female pins or headers.

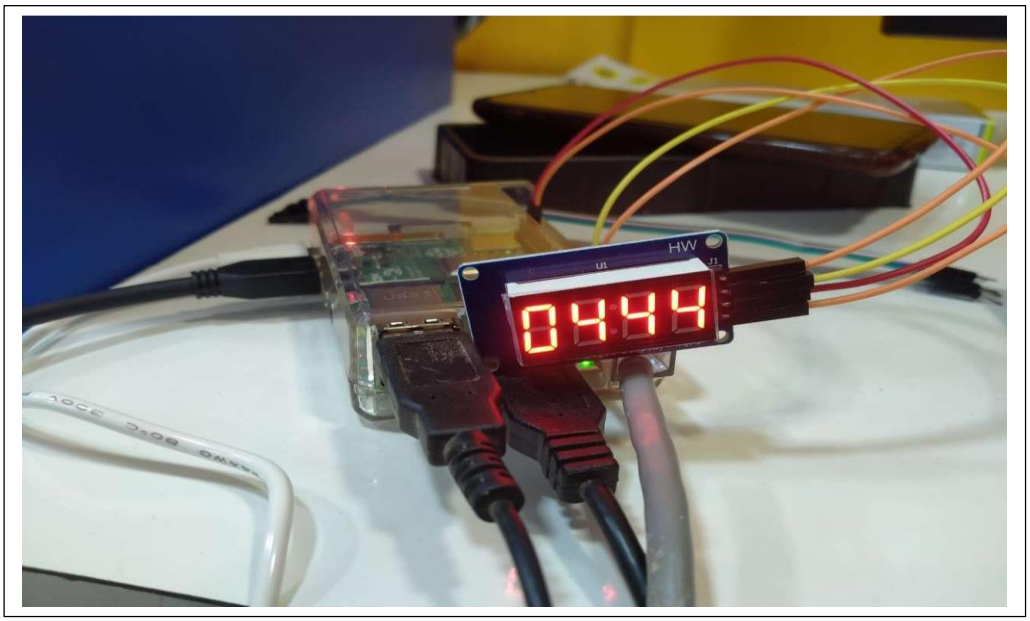
Steps:-

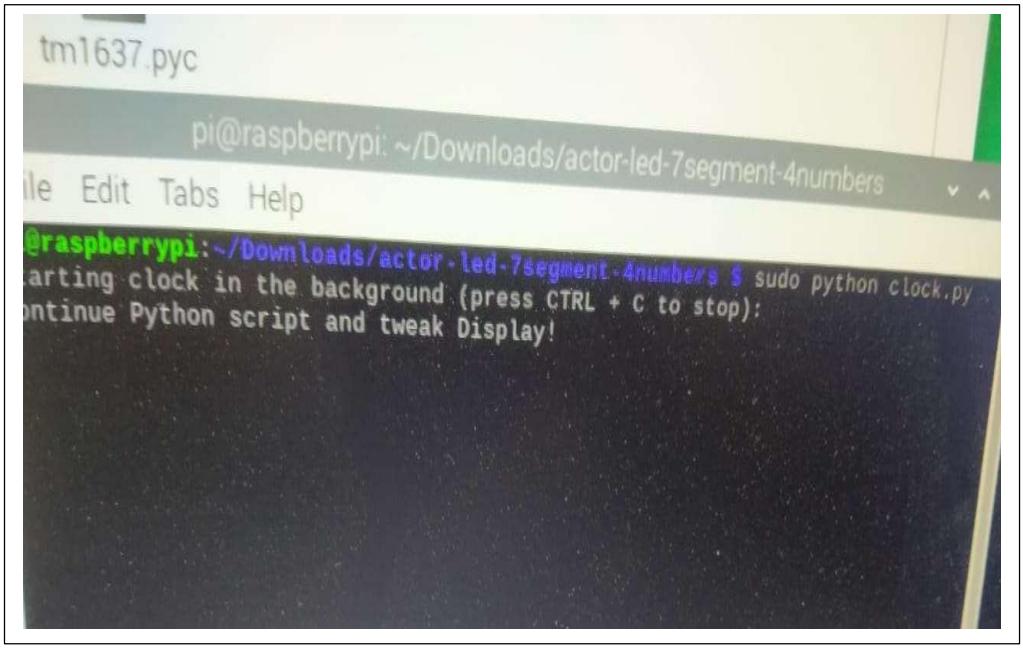
1. Open the web browser and go to the link:
   https://github.com/timwaizenegger/raspberrypi-examples/tree/master/actor-led-7segment-4numbers
2. Click on the actor–>led-7segment-4numbers.zip folder and download the zip file.
3. Go to the File Manager→ Downloads→ unzip the actor led-7 segment- 4 numbers.zip file → documents folder →python projects.
4. Make the connections as follows:
   a. Connect Pin2 (5V) of RPI to VCC PIN of 7 segment module.
   b. Connect Pin6 (Ground) of RPI to Ground pin of 7 Segment Module.
   c. Connect Pin 38 of RPI to DIO pin of 7 Segment Module.
   d. Connect Pin 40 of RPI to CLK of the 7 Segment Module.
5. Go to location where you have downloaded seven segment file, copy the location of that file.
6. Open the terminal and paste your location as “cd location”.
7. After entering location we have to give the command to run seven segment as “sudo python clock.py”

Terminal Commands:-

cd (file location)
sudo python clock.py

Output:-


0444


tm1637.pyc
pi@raspberrypi: ~/Downloads/actor-led-7segment-4numbers
ile Edit Tabs Help
@raspberrypi:~/Downloads/actor-led-7segment-4numbers $ sudo python clock.py
arting clock in the background (press CTRL + C to stop):
ontinue Python script and tweak Display!

Practical - 7

Aim: Interfacing Raspberry Pi with RFID

Hardware Requirements:

1. **RFID Tag:-** RFID tags are a type of tracking system that uses radio frequency to search, identify, track, and communicate with items and people. Essentially, RFID tags are smart labels that can store a range of information from serial numbers, to a short description, and even pages of data. .
2. **Raspberry Pi :-** A Raspberry Pi is a small, affordable, single-board computer that's widely used for various DIY projects, education, and prototyping. It can run a variety of operating systems and is popular for programming, learning about computing, and building innovative electronics projects.
3. **Keyboard :-** A keyboard is an input device used to type or enter text and commands into a computer or other digital devices by pressing individual keys, each representing a specific character or function.
4. **Mouse :-** A mouse is a pointing device used to control the movement of a cursor or pointer on a computer screen. It typically has buttons that allow users to interact with graphical user interfaces, select items, and perform actions by clicking or dragging the cursor.
5. **HDMI Cable :-** HDMI (High-Definition Multimedia Interface) cables are digital cables used to transmit high-quality audio and video signals between devices, such as TVs, monitors, projectors, and multimedia sources (like laptops, game consoles, or streaming devices)
6. **Ethernet Cable:-** Ethernet cable is used to connect devices in a wired network, enabling data communication, and it comes in different categories for various performance levels.
7. **Power Supply:-** A power supply converts incoming electrical energy into the right form to power electronic device.

8. **Female to Female Jumper Wire:-** A female-to-female jumper wire in IoT is a connector cable with female connectors on both ends, used to link components or sensors with female pins or headers.

Code:-

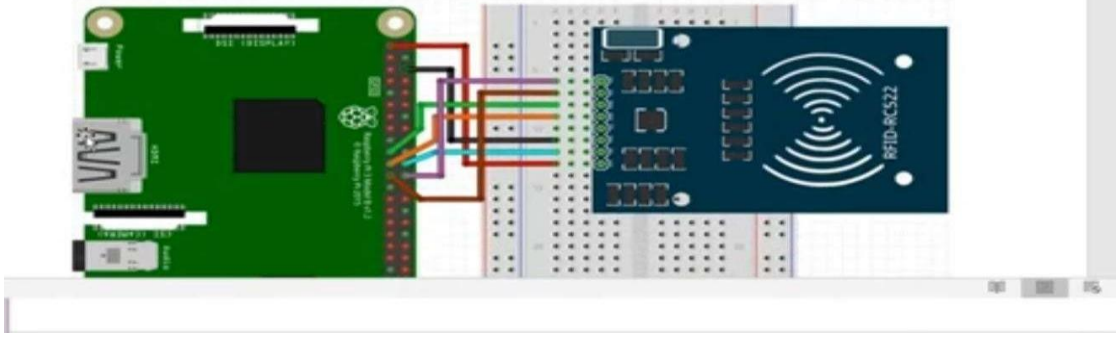
Read.py

```
import RP1.GPIO as GPIO
from mfrc522 import
SimpleMFRC522
reader = SimpleMFRC522()
 try:
        print("place your card:")
        id, text = reader.read()
        print(id)
        print(text)
finally:
        GPIO.cleanup()
```

Write.py

```
import RPi.GPIO as GPIO
from mfrc522 import
SimpleMFRC522
reader = SimpleMFRC522()
try:
        text = input('New data:')
        print("Now place your tag
        to write")
        reader.write(text)
        print("written")
finally:
        GPIO.cleanup()
```

- **SDA** connects to **Pin 24**.
- **SCK** connects to **Pin 23**.
- **MOSI** connects to **Pin 19**.
- **MISO** connects to **Pin 21**.
- **IRQ : Not required**
- **GND** connects to **Pin 6**.
- **RST** connects to **Pin 22**.
- **3.3v** connects to **Pin 1**.



Terminal Commands:-

sudo nano writetest.py

- Copy and paste the write.py code
- Ctrl+O + Enter -> to save the code
- Ctrl + x -> to exit

sudo pip3 install mfrc522

sudo raspi-config

- After that go to interfacing option and enable the SPI and finish

sudo nano read.py

- Copy and paste the read.py
- Ctrl+O + Enter -> to save the code
- Ctrl + x -> to exit

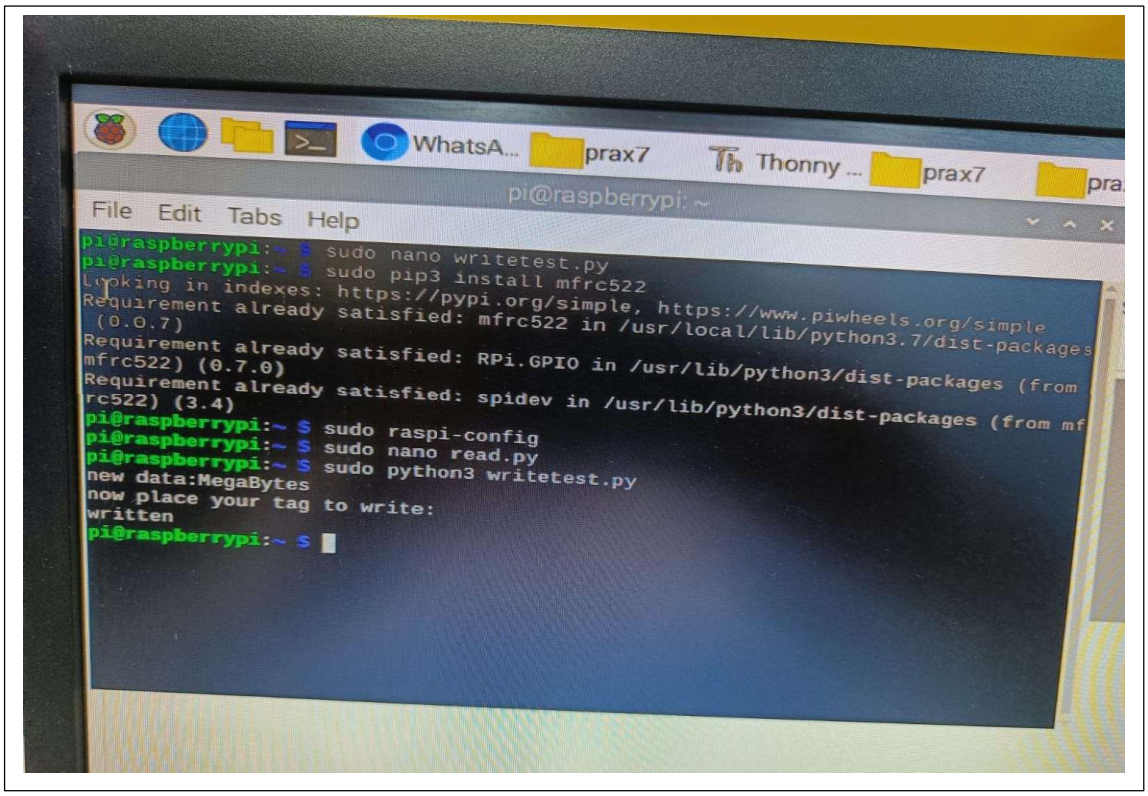
sudo python3 writetest.py

new data**MegaBytes**

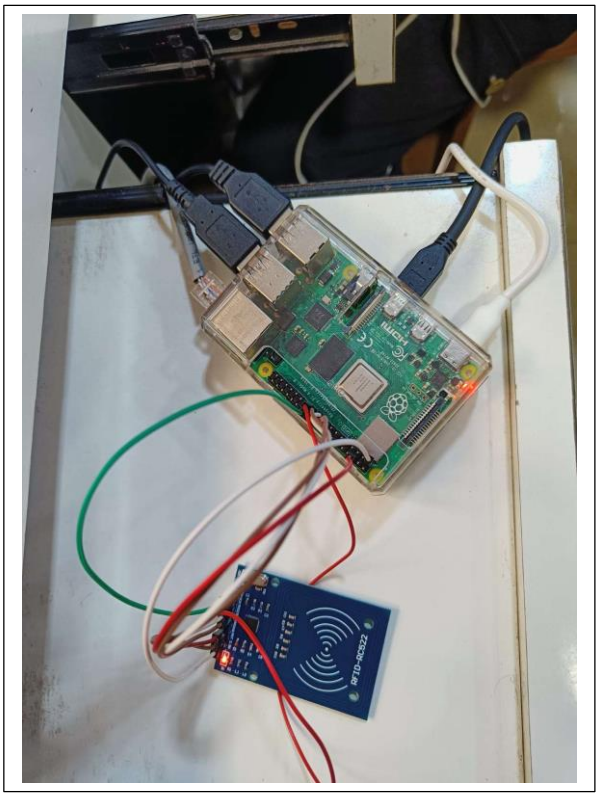
Place your tag and card to read

- **Now place your card or tag on the sensor for output**

Output:-


WhatsA...
prax7
Thonny ...
prax7
pi@raspberrypi: ~
File Edit Tabs Help
pi@raspberrypi:~ $ sudo nano writetest.py
pi@raspberrypi:~ $ sudo pip3 install mfrc522
Looking in indexes: https://pypi.org/simple, https://www.piwheels.org/simple
Requirement already satisfied: mfrc522 in /usr/local/lib/python3.7/dist-packages
(0.0.7)
Requirement already satisfied: RPi.GPIO in /usr/lib/python3/dist-packages (from
mfrc522) (0.7.0)
Requirement already satisfied: spidev in /usr/lib/python3/dist-packages (from mf
rc522) (3.4)
pi@raspberrypi:~ $ sudo raspi-config
pi@raspberrypi:~ $ sudo nano read.py
pi@raspberrypi:~ $ sudo python3 writetest.py
new data:MegaBytes
now place your tag to write:
written
pi@raspberrypi:~ $


RFID-RC522



Practical - 8

Aim: Raspberry Pi GPS Module Interfacing

Hardware Requirements:

1. **GPS:-** GPS (Global Positioning System) is a satellite-based navigation system that provides accurate location and time information to users anywhere on Earth..
2. **Raspberry Pi :-** A Raspberry Pi is a small, affordable, single-board computer that's widely used for various DIY projects, education, and prototyping. It can run a variety of operating systems and is popular for programming, learning about computing, and building innovative electronics projects.
3. **Keyboard :-** A keyboard is an input device used to type or enter text and commands into a computer or other digital devices by pressing individual keys, each representing a specific character or function.
4. **Mouse :-** A mouse is a pointing device used to control the movement of a cursor or pointer on a computer screen. It typically has buttons that allow users to interact with graphical user interfaces, select items, and perform actions by clicking or dragging the cursor.
5. **HDMI Cable :-** HDMI (High-Definition Multimedia Interface) cables are digital cables used to transmit high-quality audio and video signals between devices, such as TVs, monitors, projectors, and multimedia sources (like laptops, game consoles, or streaming devices)
6. **Ethernet Cable:-** Ethernet cable is used to connect devices in a wired network, enabling data communication, and it comes in different categories for various performance levels.
7. **Power Supply:-** A power supply converts incoming electrical energy into the right form to power electronic device.

8. **Female to Female Jumper Wire:-** A female-to-female jumper wire in IoT is a connector cable with female connectors on both ends, used to link components or sensors with female pins or headers.

Steps:-

1. Connect the Pins of the GPS to raspberry Pi by using female to female jumper wire.
    - Follow the ports:-
        VCC- Pin 4
        GND- Pin 6
        RX - Pin 8
        TX- Pin 10

Terminal Commands:-

Sudo raspi-config

- Then go to interface option and enable serial port and finish.
- Install gpsd and the gpsd-client:

sudo apt-get install gpsd gpsd-clients

- Once the installation is done, verify that you can receive data from the GPS module. To do that, output the data that it sends over the serial port:

cat /dev/serial0

- If it goes in loop so do Ctrl+C
- Note that you should be able to run this command without being a superuser. If you can't, add the pi-user to the dialout group:

sudo adduser pi dialout

- Now it's finally time to determine the position of the Raspberry Pi. Type the following command to stop the gpsd service that got started automatically when you installed gpsd earlier. You have to do this because the default options aren't correct for the Pi:

sudo systemctl stop gpsd.socket

- Note that you'll have to type this command every time you boot up the system. Alternatively, you can also disable it entirely:

sudo systemctl disable gpsd.socket

- Start a new gpsd instance that redirects the data of the correct serial port to a socket:

sudo gpsd /dev/serial0 -F /var/run/gpsd.sock

- And then you can run either of the following two commands to display the GPS data:

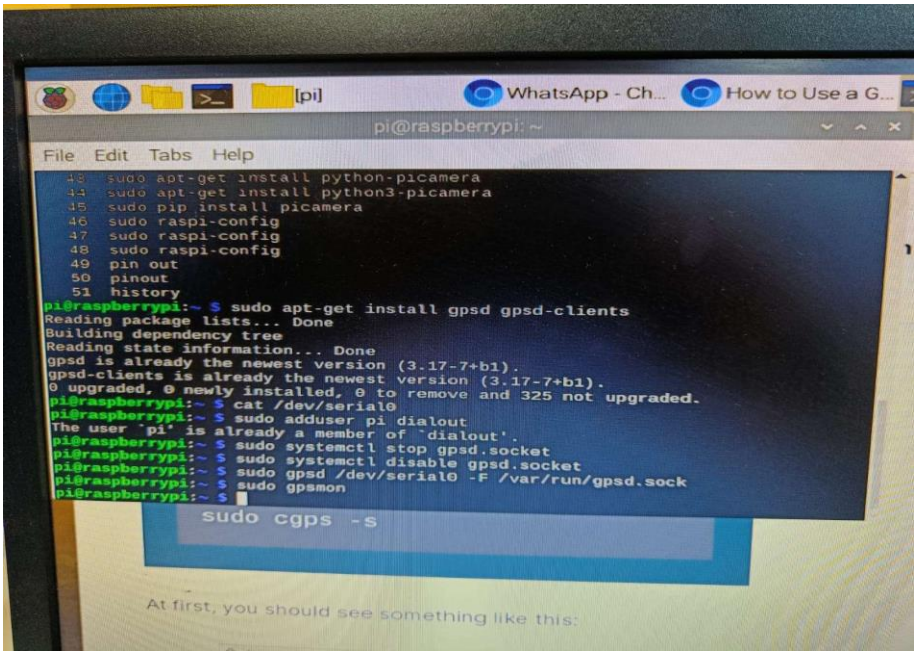
sudo gpsmon

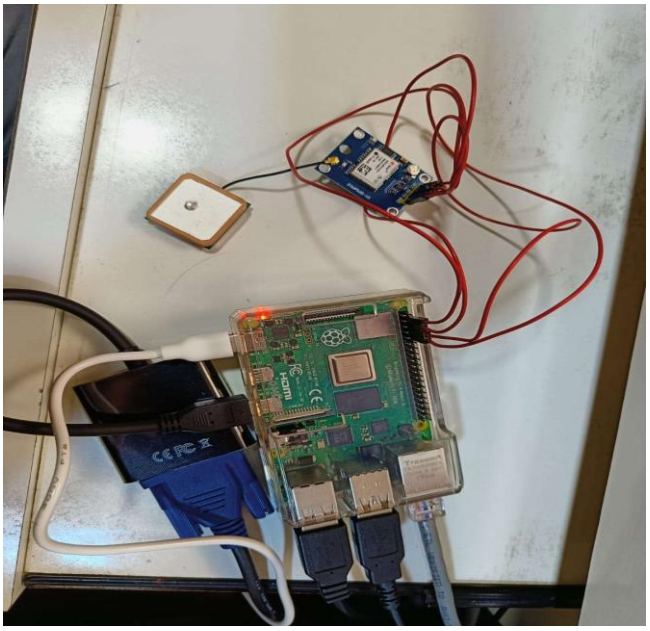
or

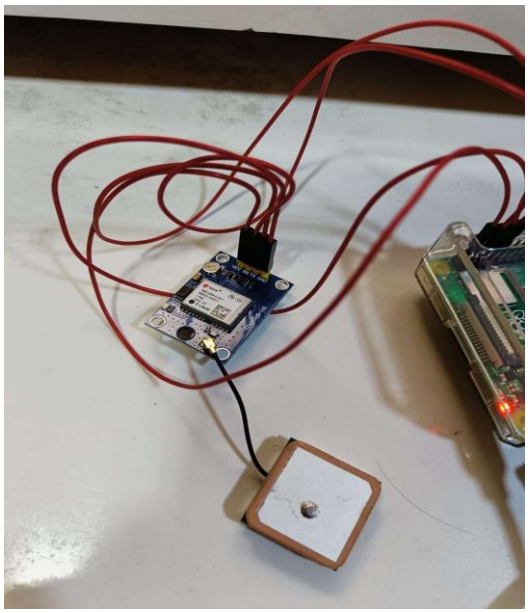
sudo cgps -s

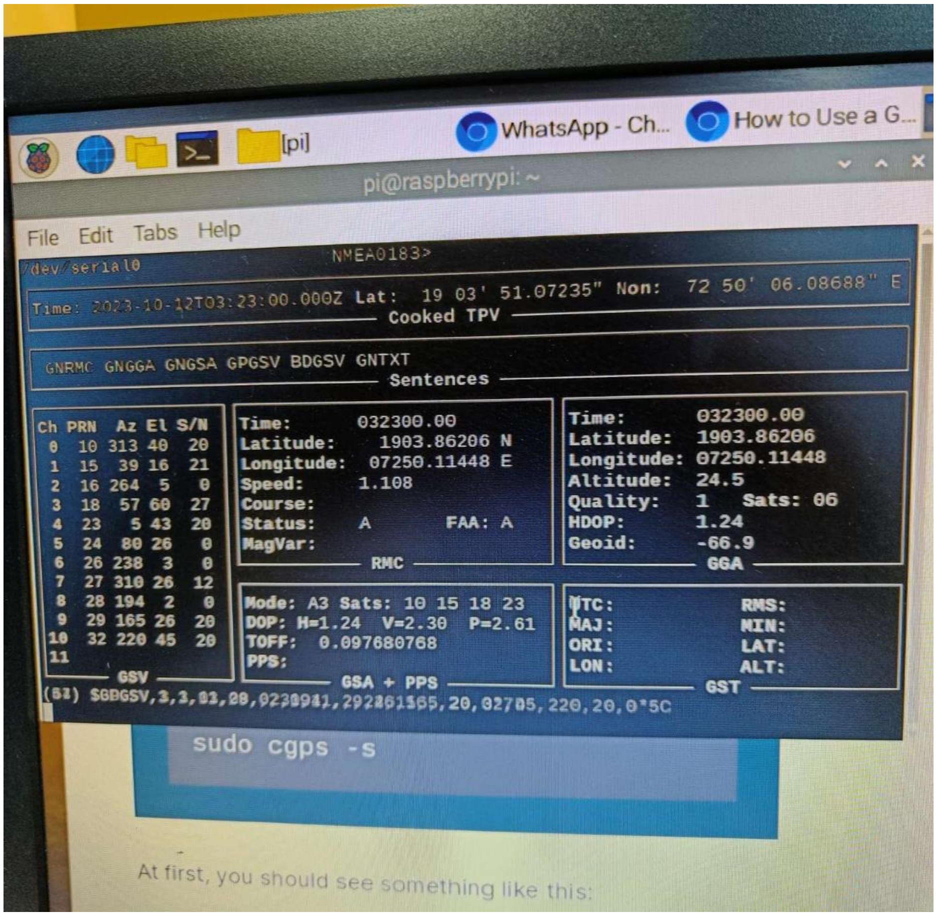
2. Now it will show your latitude and longitude of your current locations on the screen.

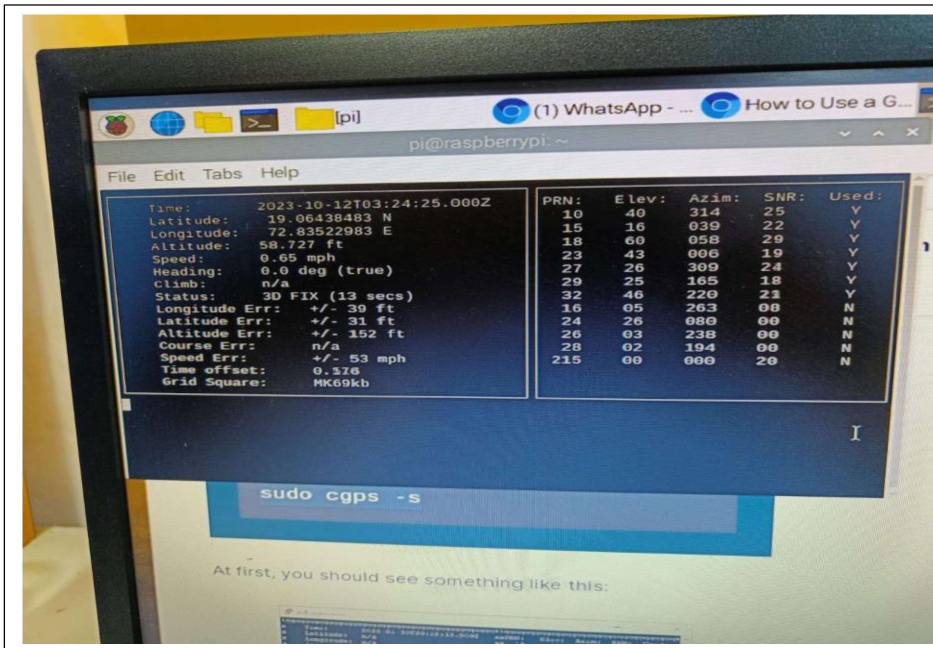
Output:-








WhatsApp - Ch...
How to Use a G...
[pi]
pi@raspberrypi: ~
File Edit Tabs Help
NMEA0183>
Lat: 19 03' 51.07235" Non: 72 50' 06.08688" E
Cooked TPV
GNRMC GNGGA GNGSA GPGSV BDGSV GNTXT
Sentences
Ch PRN Az El S/N
Time: 032300.00
Latitude: 1903.86206 N
Longitude: 07250.11448 E
Speed: 1.108
Course:
Status: A FAA: A
MagVar:
RMC
Time: 032300.00
Latitude: 1903.86206
Longitude: 07250.11448
Altitude: 24.5
Quality: 1 Sats: 06
HDOP: 1.24
Geoid: -66.9
GGA
Mode: A3 Sats: 10 15 18 23
DOP: H=1.24 V=2.30 P=2.61
TOFF: 0.097680768
PPS:
GSA + PPS
RMS:
MAJ:
MIN:
ORI:
LAT:
LON:
ALT:
GST
GSV
sudo cgps -s
At first, you should see something like this:


(1) WhatsApp - ...
How to Use a G...
[pi]
pi@raspberrypi: ~
File Edit Tabs Help
Time: 2023-10-12T03:24:25.000Z
Latitude: 19.06438483 N
Longitude: 72.83522983 E
Altitude: 58.727 ft
Speed: 0.65 mph
Heading: 0.0 deg (true)
Climb: n/a
Status: 3D FIX (13 secs)
Longitude Err: +/- 39 ft
Latitude Err: +/- 31 ft
Altitude Err: +/- 152 ft
Course Err: n/a
Speed Err: +/- 53 mph
Time offset: 0.516
Grid Square: MK69kb
PRN: Elev: Azim: SNR: Used:
10 40 314 25 Y
15 16 039 22 Y
18 60 058 29 Y
23 43 006 19 Y
27 26 309 24 Y
29 25 165 18 Y
32 46 220 21 Y
16 05 263 08 N
24 26 080 00 N
26 03 238 00 N
28 02 194 00 N
215 00 000 20 N
sudo cgps -s
At first, you should see something like this: