PRACTICAL

Internet Of Things (IoT)

SHEKHAR SUMAN

CERTIFICATE

Class: **T.Y.B.Sc.I.T.** Year: **2025 - 2026**

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Of the year **2025 - 2026** in the college laboratory as laid down

By the university.

Head of the Department	External Examiner	Internal Examiner Subject teacher

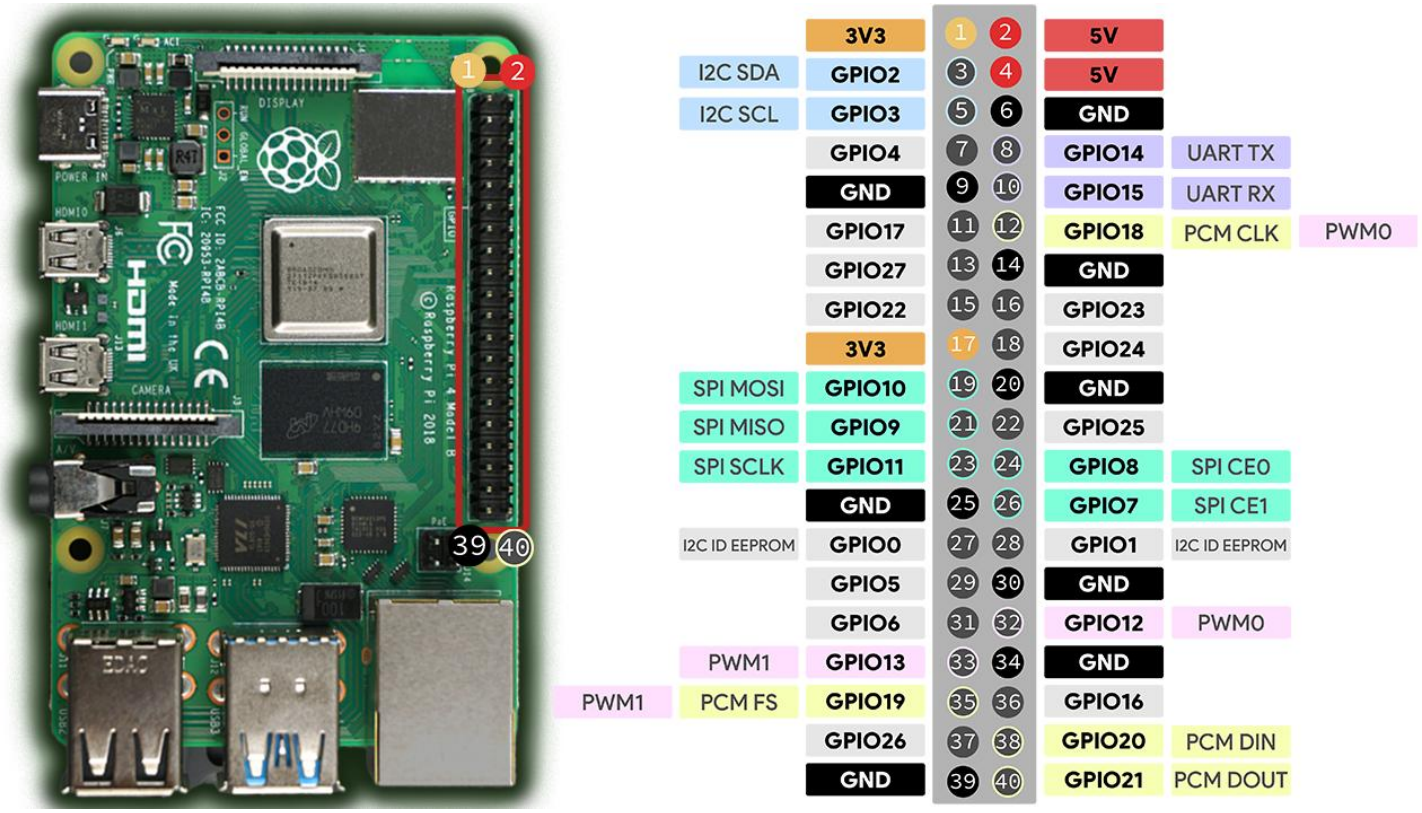
Date:

NAME: SHEKHAR SUMAN		INDEX
CLASS: T.Y.B.Sc.I.T.	**ROLL No**: 47	
SUBJECT: INTERNET OF THINGS (IOT)		
COLLEGE: ST. ROCK'S DEGREE COLLEGE		

PR No:	TITLE	DATE	SIGN
1	Understanding Raspberry Pi and its pins.		
2	Installing operating system NOOBS on SD card and burning it.		
3A	Installing Raspbian OS on raspberry Pi.		
3B	Installing Raspbian OS with the help of virtual machine software.		

PRACTICAL – 1

AIM: Understanding Raspberry Pi and its pins.



Raspberry Pi GPIO Pins Overview

- **Physical Pins:** The header on the Raspberry Pi consists of 40 pins, numbered from 1 to 40 (top left to bottom right in the image).
- **Types of Pins:**
  - **Power Pins:**
    - 3.3V (Pins 1, 17): Orange blocks.
    - 5V (Pins 2, 4): Red blocks.
    - Ground/GND (Pins 6, 9, 14, 20, 25, 30, 34, 39): Black blocks.
  - **GPIO Pins:** Used for input/output operations. Named GPIO followed by a number (e.g., GPIO2, GPIO3).
  - **Special Function Pins:**
    - **I2C:** Pins for communication using Inter-Integrated Circuit protocol (Pins 3 (SDA), 5 (SCL), light blue).
    - **UART:** Pins for serial communication (Pins 8 (TX), 10 (RX), purple).
    - **SPI:** Pins for Serial Peripheral Interface (MOSI, MISO, SCLK, CE0, CE1; green blocks).
    - **PWM:** Pins for Pulse Width Modulation (PWM0, PWM1; light purple).

How to Use These Pins

- **Digital Input/Output:** Most pins labeled GPIO can be programmed to read digital sensors (input) or control devices like LEDs (output).

- **Communication Protocols:** Use the I2C, SPI, and UART specific pins to connect with modules that support these protocols.
- **Power Supply:** Use the 3.3V or 5V pins and GND pins to supply power to your connected components.

Example Practical: Blink an LED

1. **Connect:**
    - LED's positive leg to GPIO17 (Pin 11).
    - LED's negative leg to GND (Pin 6).
2. **Write a Simple Python Code:** Use GPIO17 in your code to turn the LED on/off.

Summary Table (Main Functions)

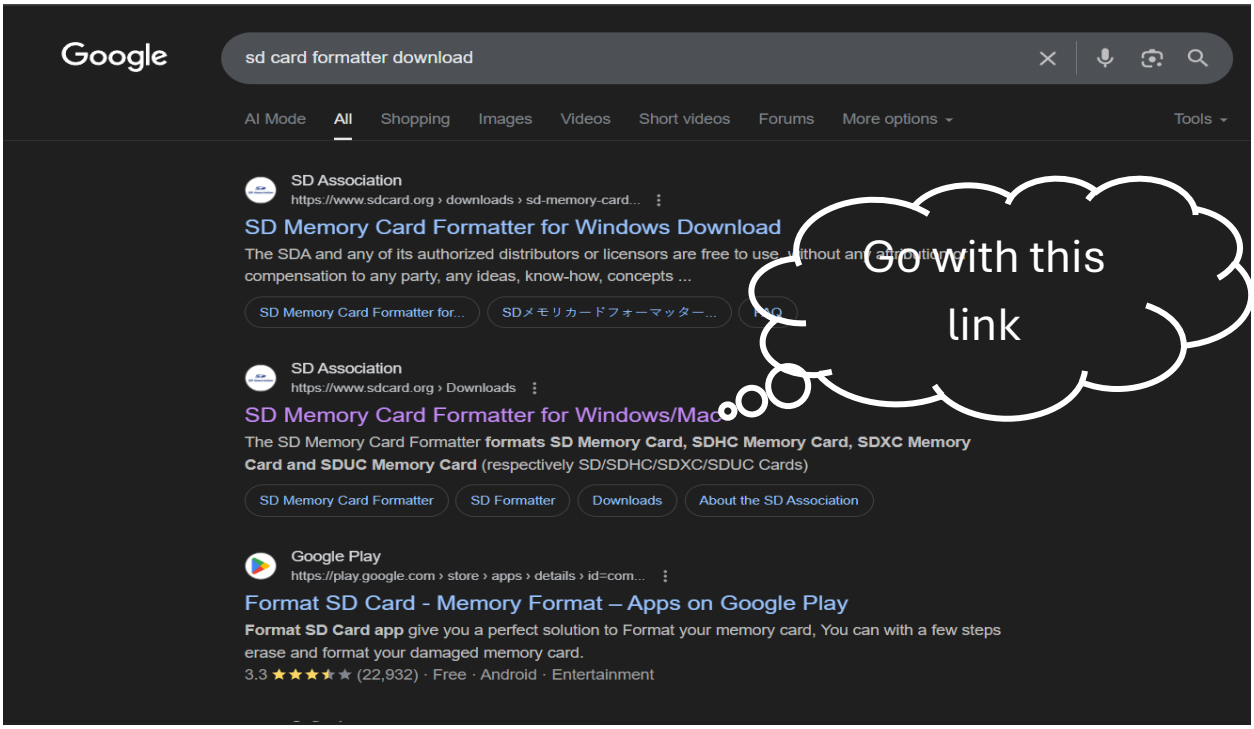
Pin No.	Function	Color Code
1, 17	3.3V Power	Orange
2, 4	5V Power	Red
6, 9...	Ground (GND)	Black
3, 5	I2C SDA/SCL	Light Blue
8, 10	UART TX/RX	Purple
19, 21, 23, 24	SPI (MOSI, MISO, SCLK...)	Green
11, 13, ...	GPIO Pins	Blue, Yellow

PRACTICAL – 2

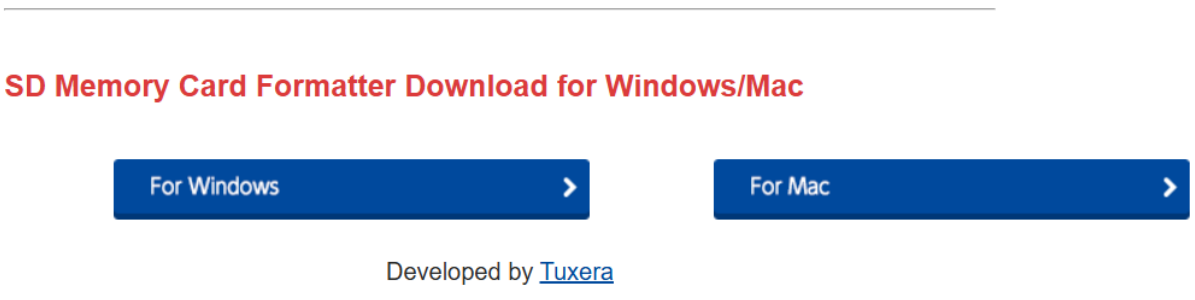
AIM: Installing operating system NOOBS on SD card and burning it.

Downloading the **SD CARD** formatter.

Step 1: Browse the SD card formatter download in your browser and go with the original link.



Step 2: After that scroll down and find this option then choose your operating system, here my operating system is Window so I prefer myself to choose Window option.

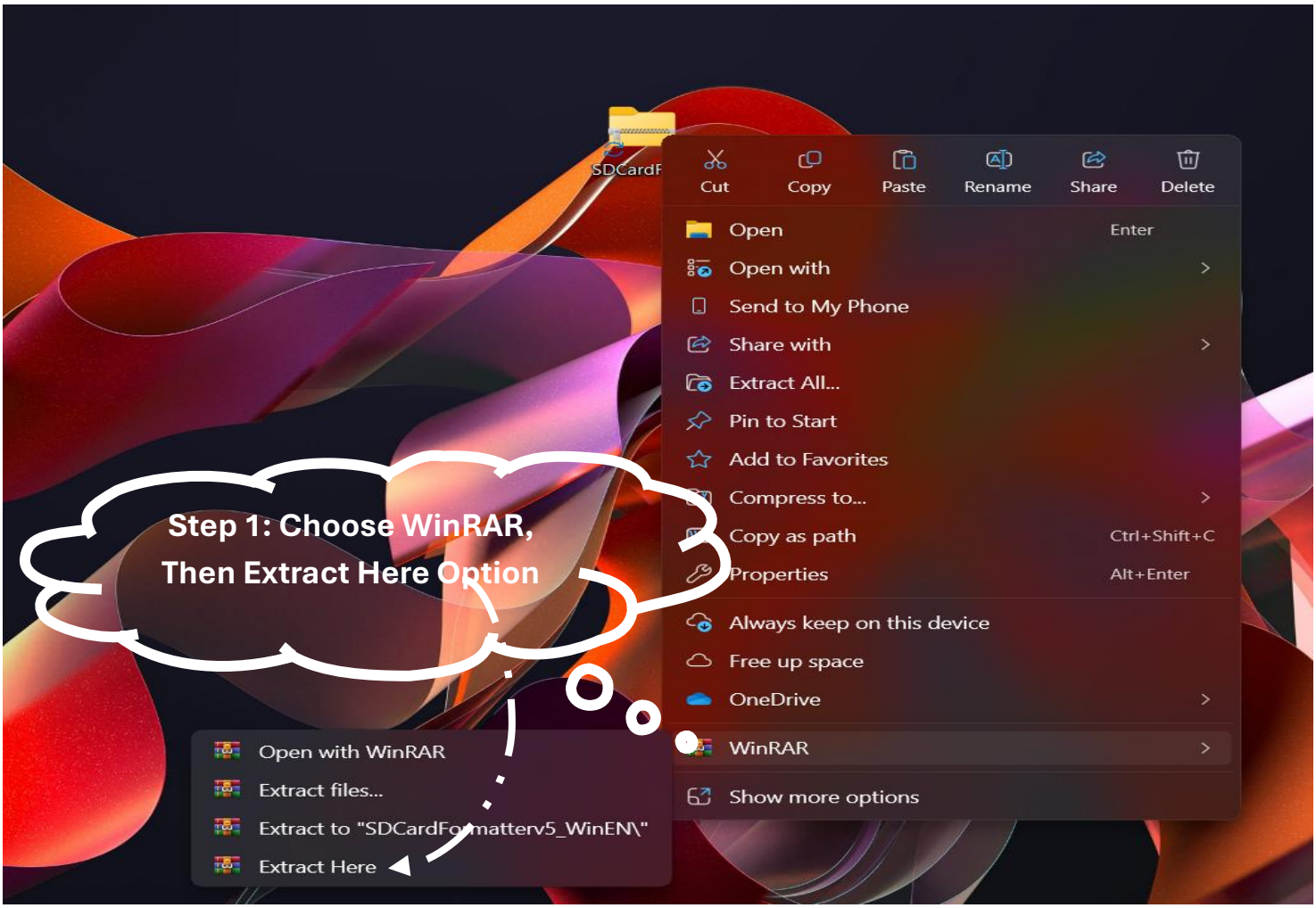


Step 3: On the clicking on Window option, you got the interface of SD card formatter user license and agreement with their notice. Read carefully and scroll down and find this option then click on Accept button. When you click on the Accept button then your file is automatically downloading in the ZIP format.

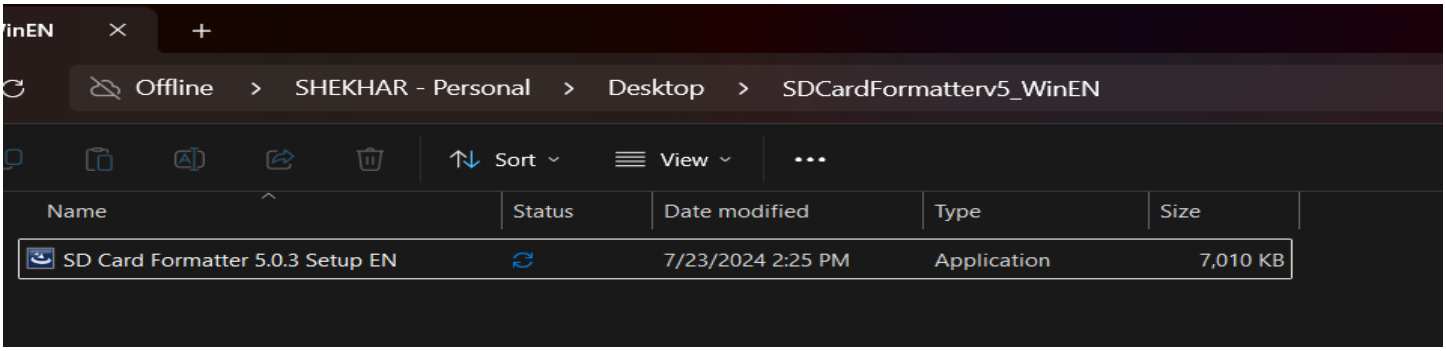
YOU ACKNOWLEDGE AND AGREE THAT YOU HAVE READ THIS AGREEMENT AND INTEND TO BE BOUND AS IF YOU HAD SIGNED THIS AGREEMENT IN WRITING. IF YOU ARE ACTING ON BEHALF OF AN ENTITY, YOU WARRANT THAT YOU HAVE THE AUTHORITY TO ENTER INTO THIS AGREEMENT ON BEHALF OF SUCH ENTITY AND BIND SUCH ENTITY TO THE TERMS OF THIS AGREEMENT.

Decline Accept

Step 4: Once your download is complete then open your file explore and go to the download option find your downloaded file and extract that file.



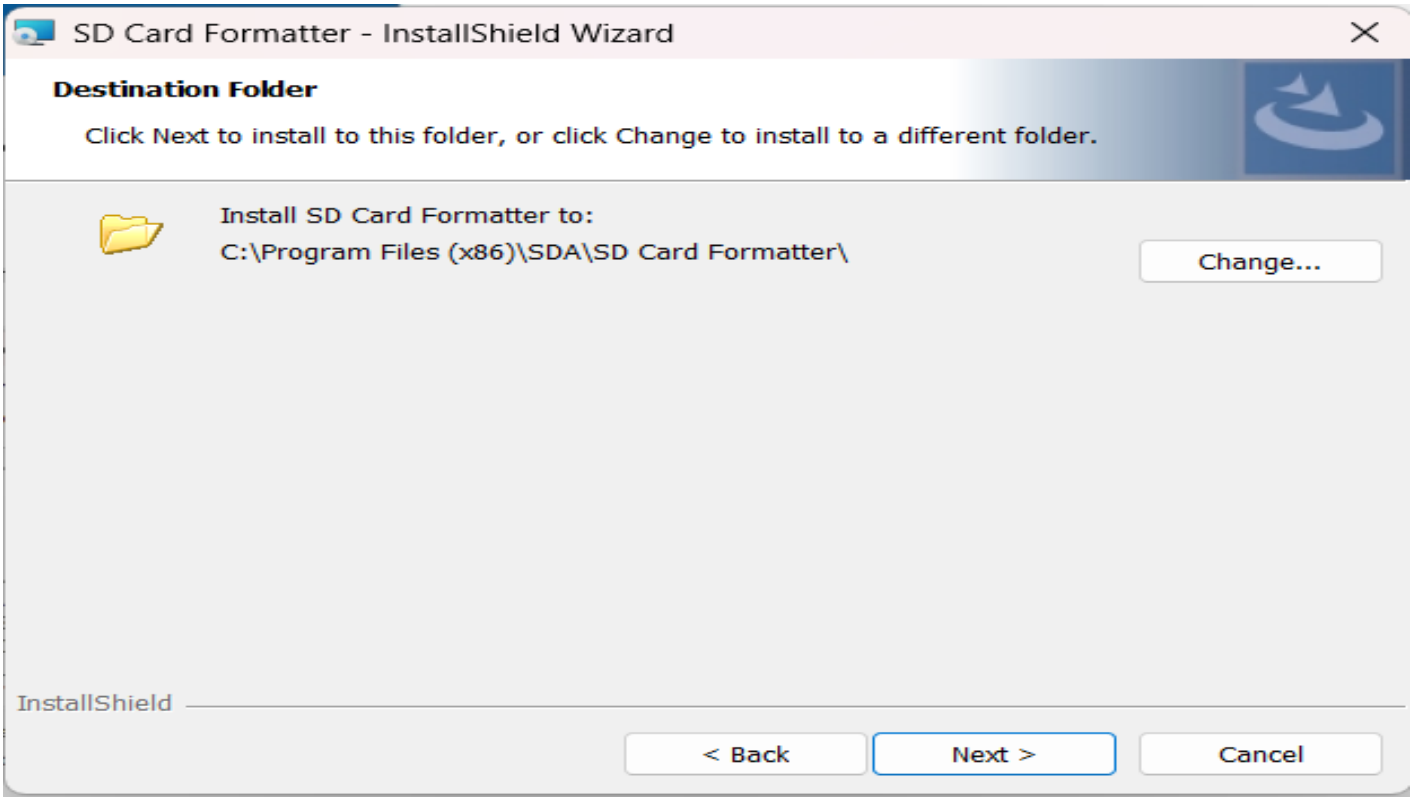
Step 5: When your extraction is complete then you got the new folder with the same name where you extract your folder. Go inside that folder you find the application file.



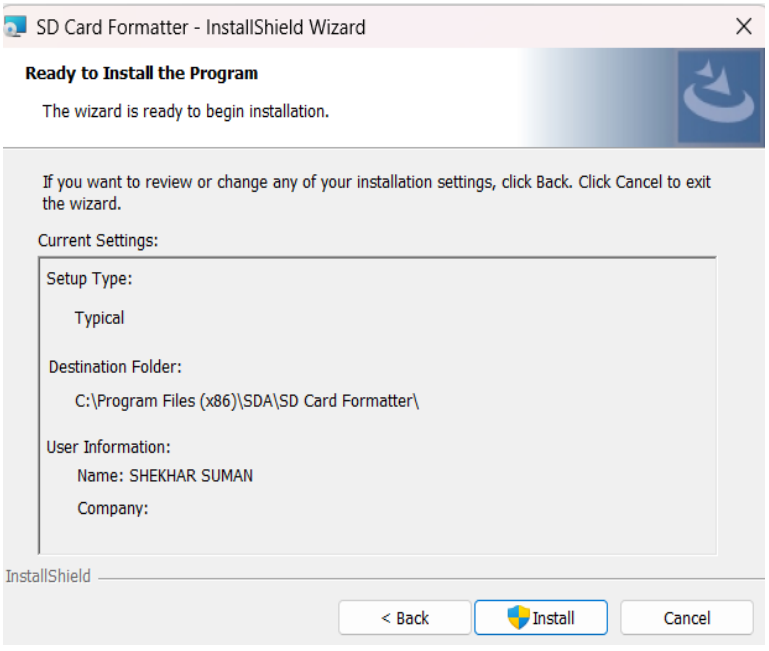
Step 6: Double click on it, it takes few seconds for the preparing your installation. Once your preparing is done then you got the interface of InstallShield Wizard, click on the next button for the next processing.

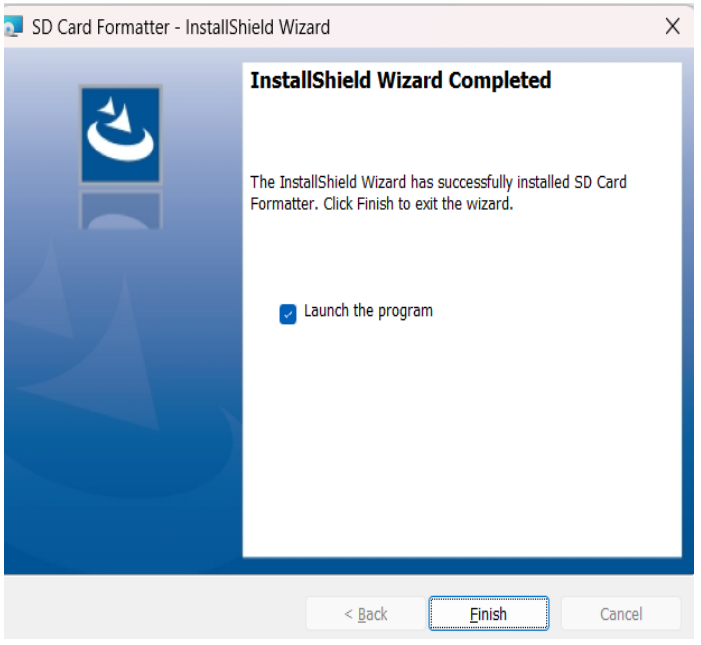
Step 7: Accept the terms and license agreement then click on the next button.

Step 8: Then it asks from you for the application destination, if you want to change your location / destination the browser your destination, here I don't need to change my destination so I go with the default location. Then I click on the next button.

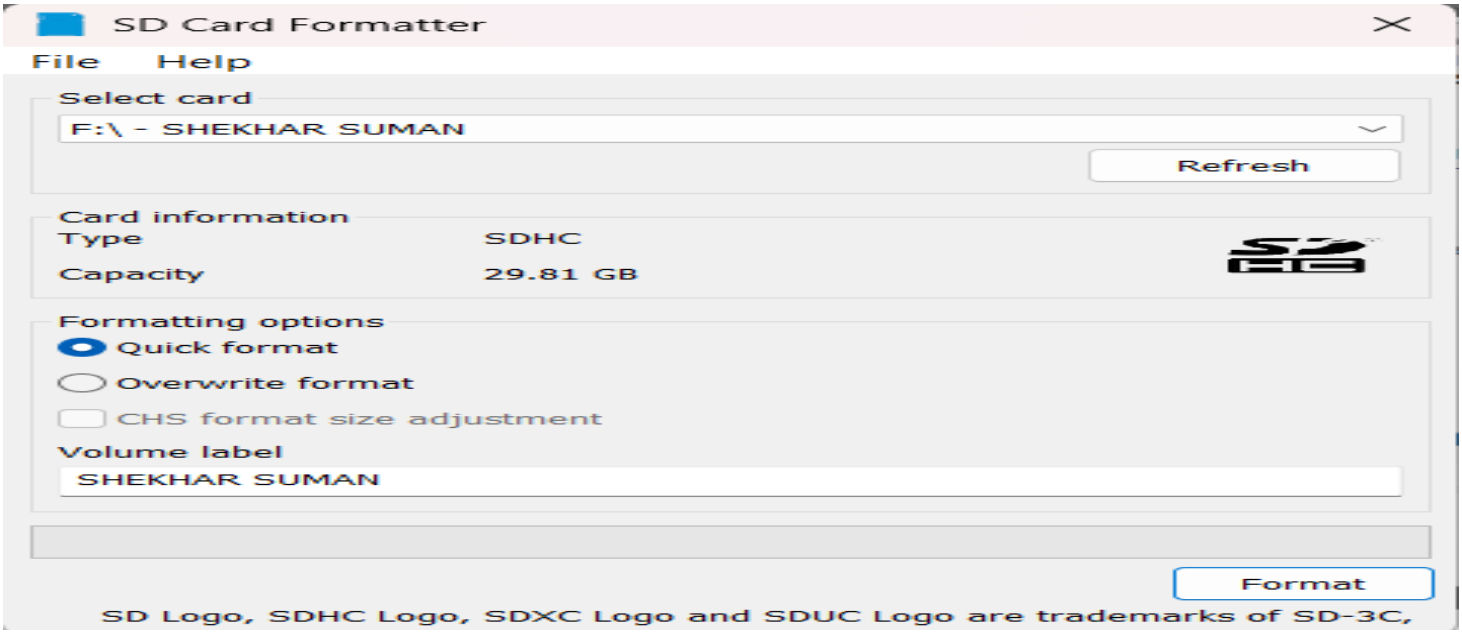


Step 9: Then your application is ready to install, you can see your information about this application click on the install button for the installing your application. When your click on the install button it takes some times for preparing your installation. Once your installation is done then click on the finish button here your SD card formatter in successfully download.

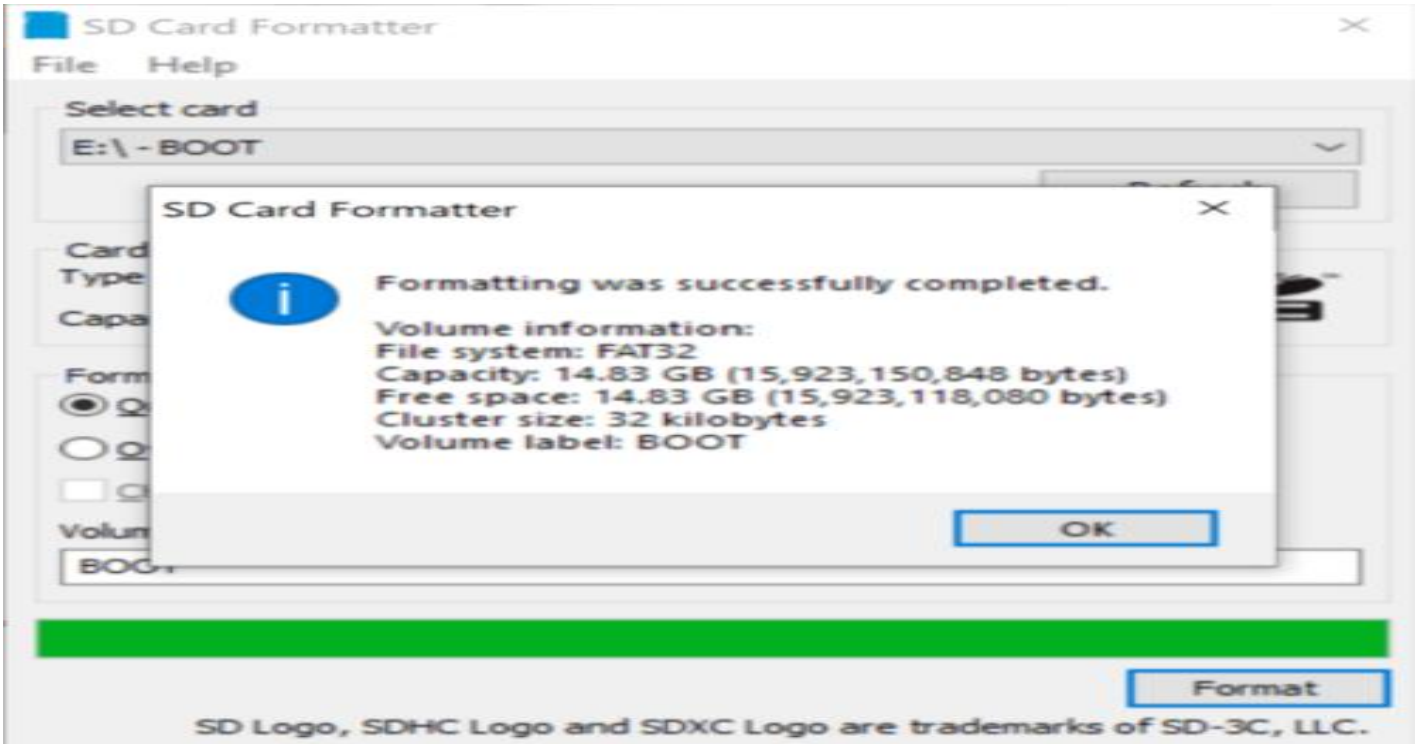




Step 10: Insert your SD card in your laptop / computer with the help of card reader then open the SD card formatter application it automatically detects your SD card. They're you can see your card information and formatting options. In formatting options, you have to choose Quick format, below the formatting options you can see the Volume label here you can give the name of your SD card whatever you want here I give my name "SHEKHAR SUMAN", at first time it detects automatically according to your SD card name. after this process click on the format button.

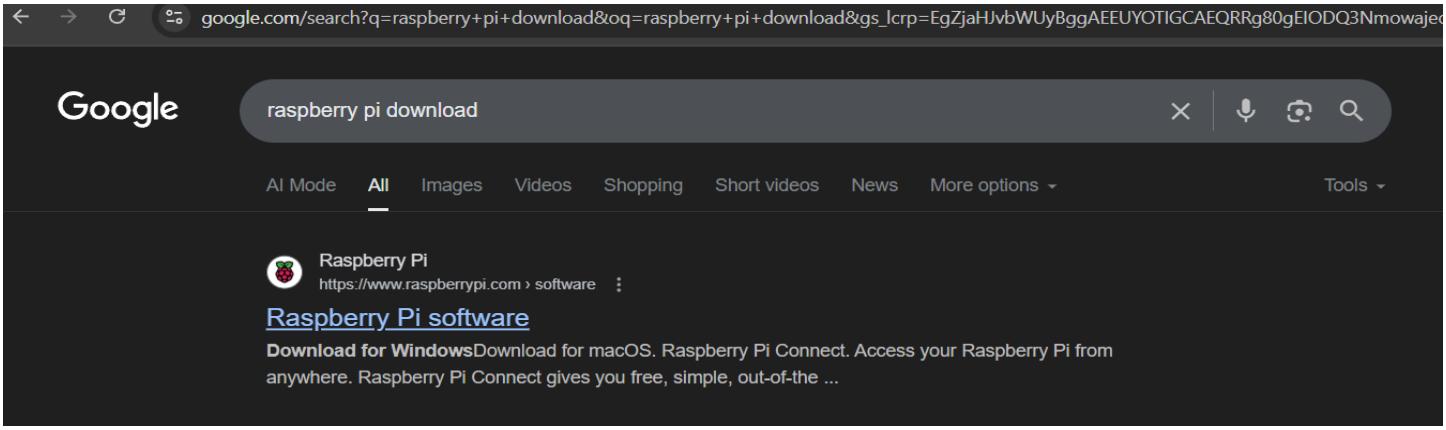


Step 11: Once your format is done then you see the interface of formatting was successfully completed.

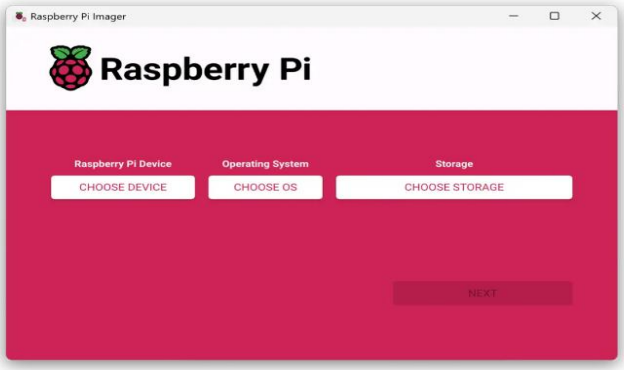


O.S Manager NOOBS Installation

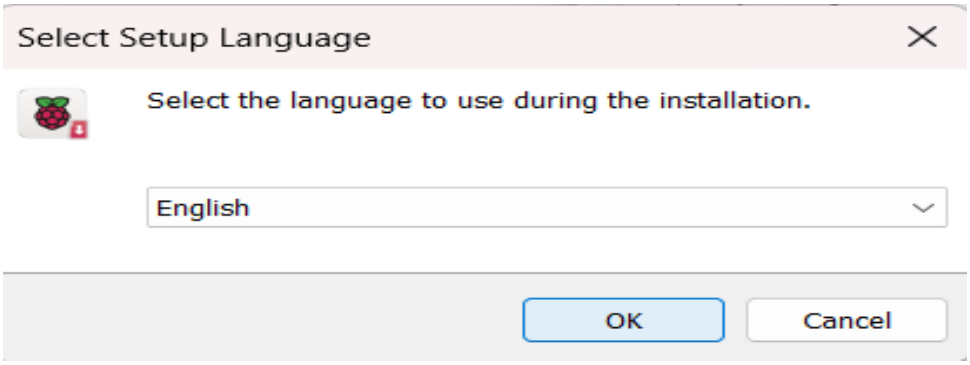
Step 1: Browse in the browser Raspberry pi download go with the first link



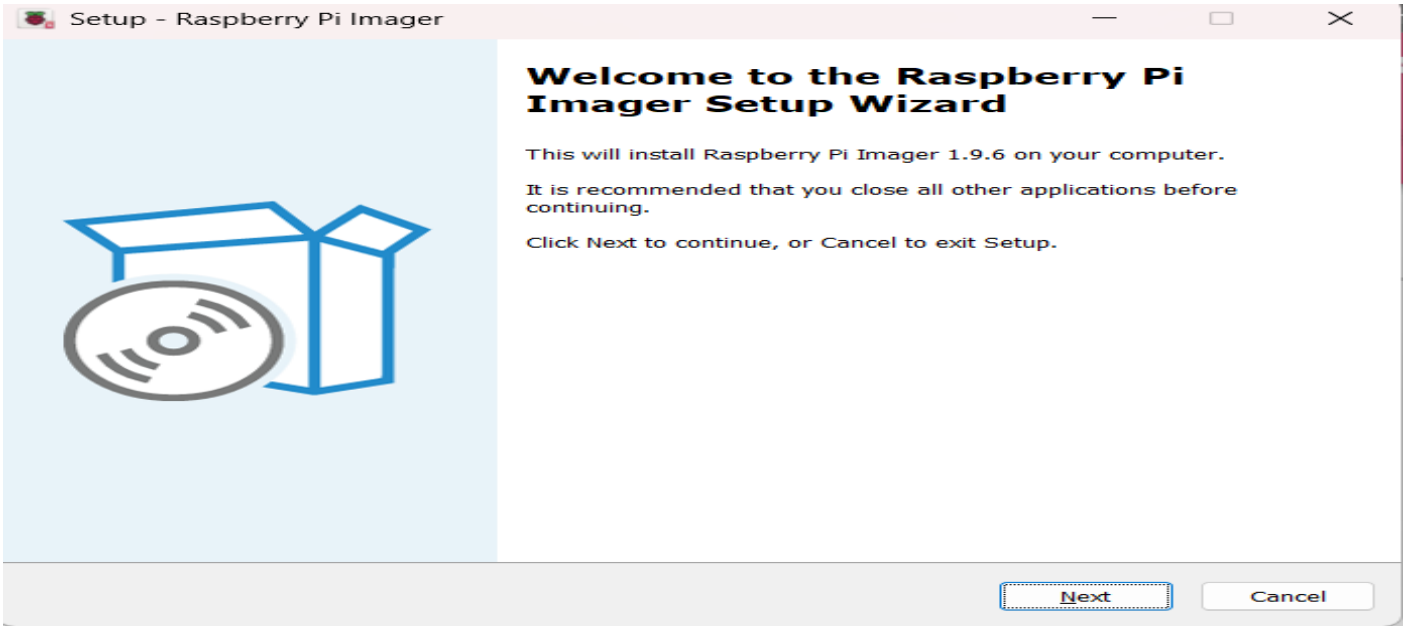
Step 2: Here we can see that raspberry pi software Raspberry pi Imager, then choose your Operating system. When you click on the Download for according to your operating system, then your exe file is start downloading.



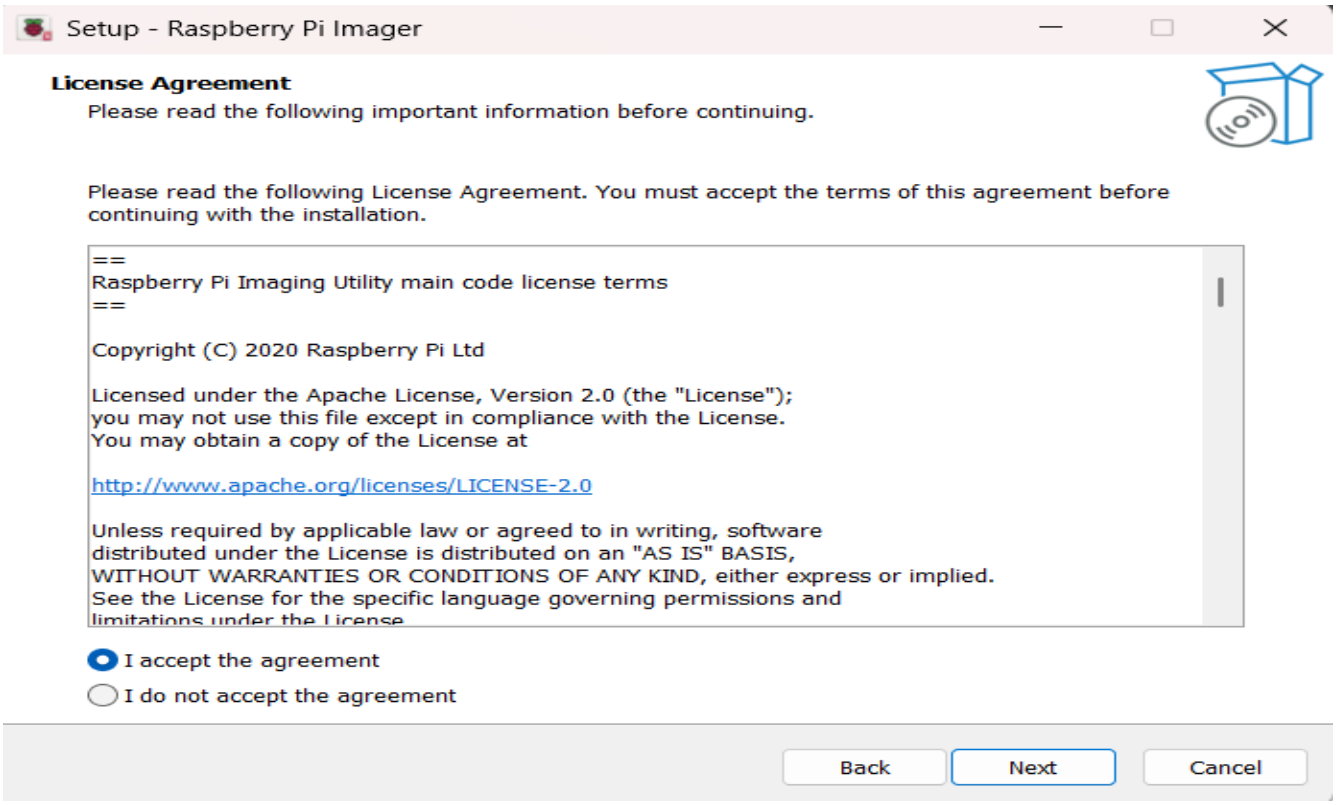
Step 3: After the downloaded of exe file then double click on that file and open it, then its ask from you choose your language then press on the ok button.



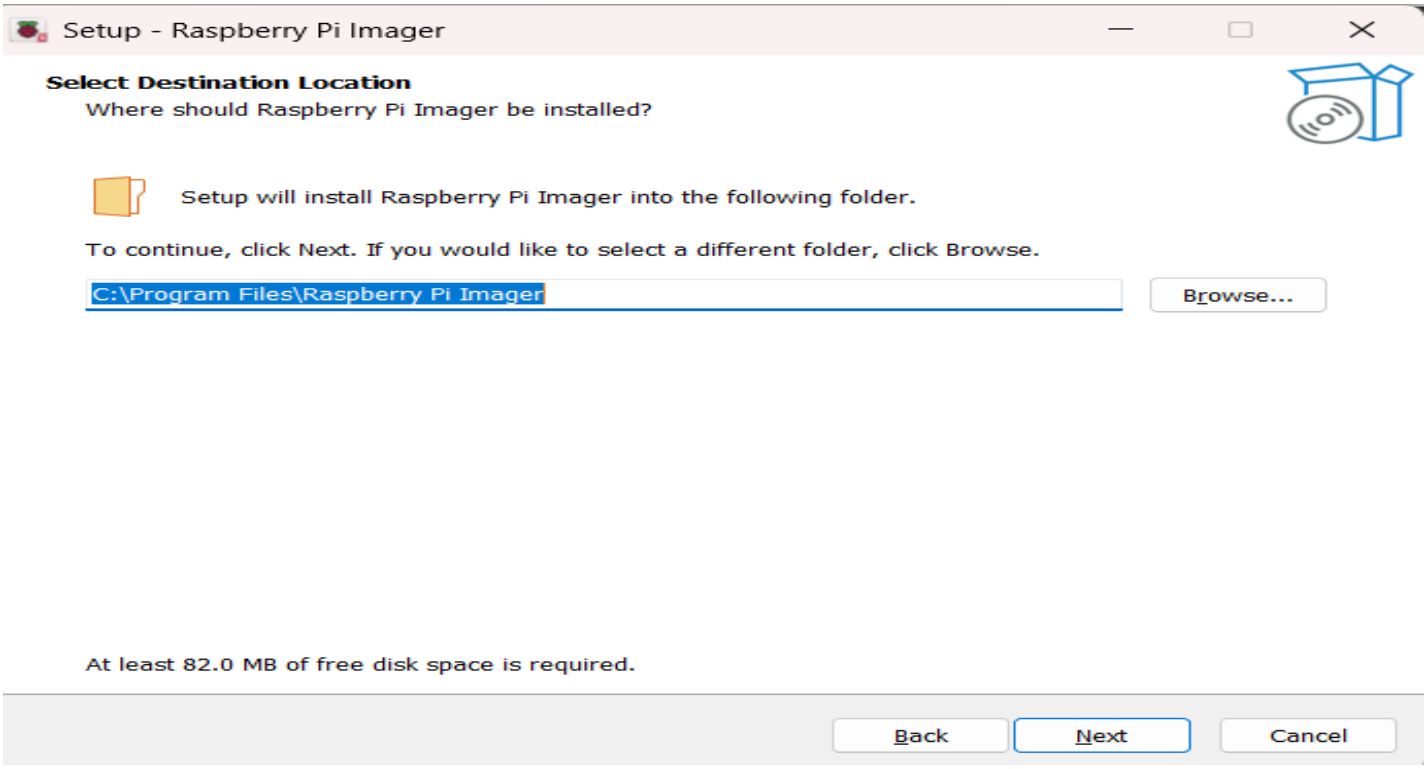
Step 4: Then you redirect on the set-up page on your raspberry imager click on the next button.



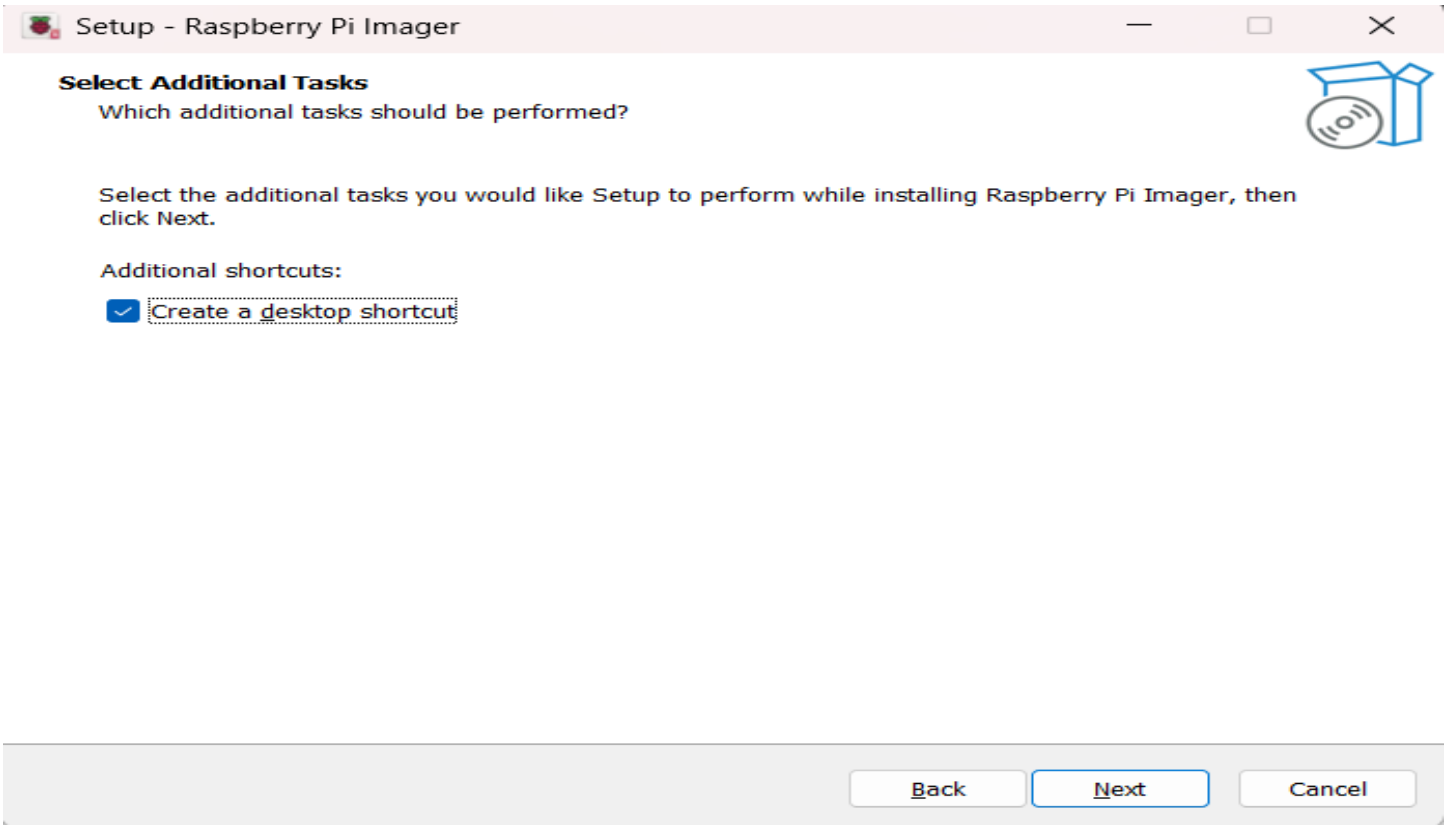
Step 5: Accept the agreement after that then click on the next button.



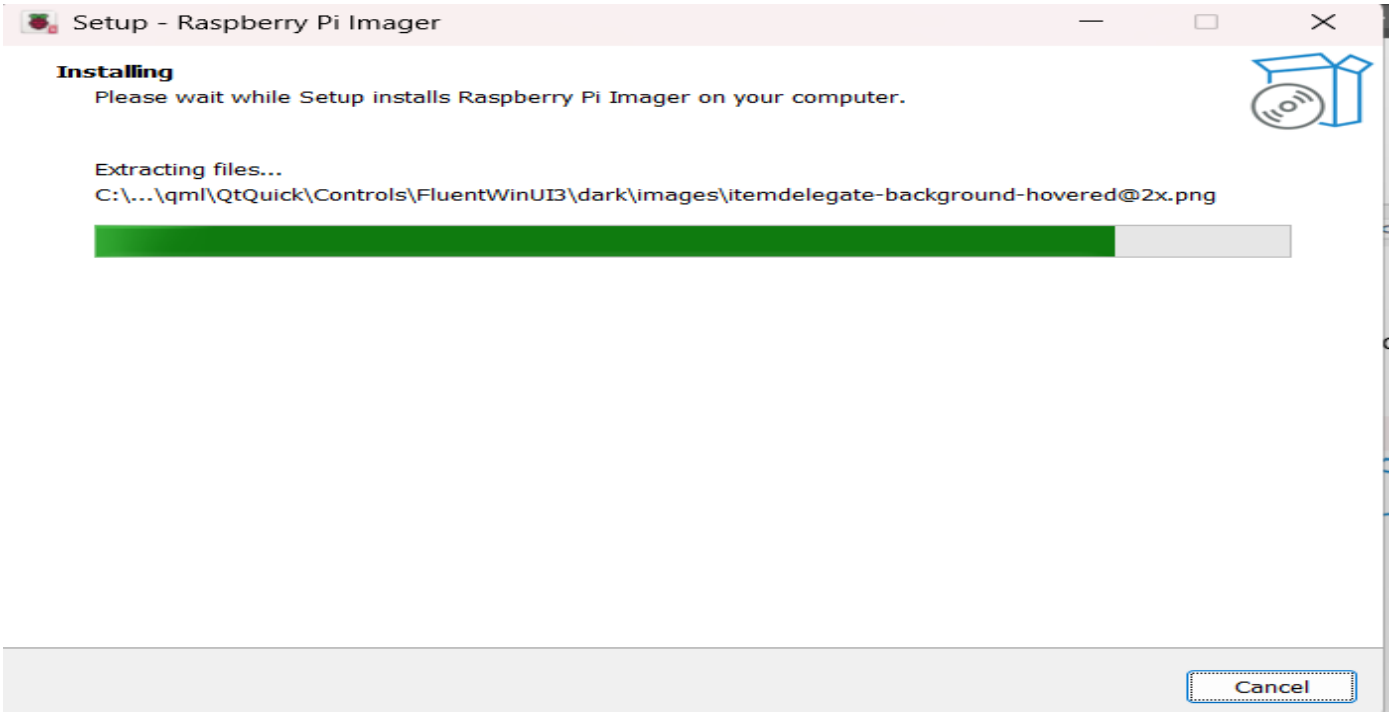
Step 6: Choose the destination location if you want otherwise make it default. Then click on the next button.

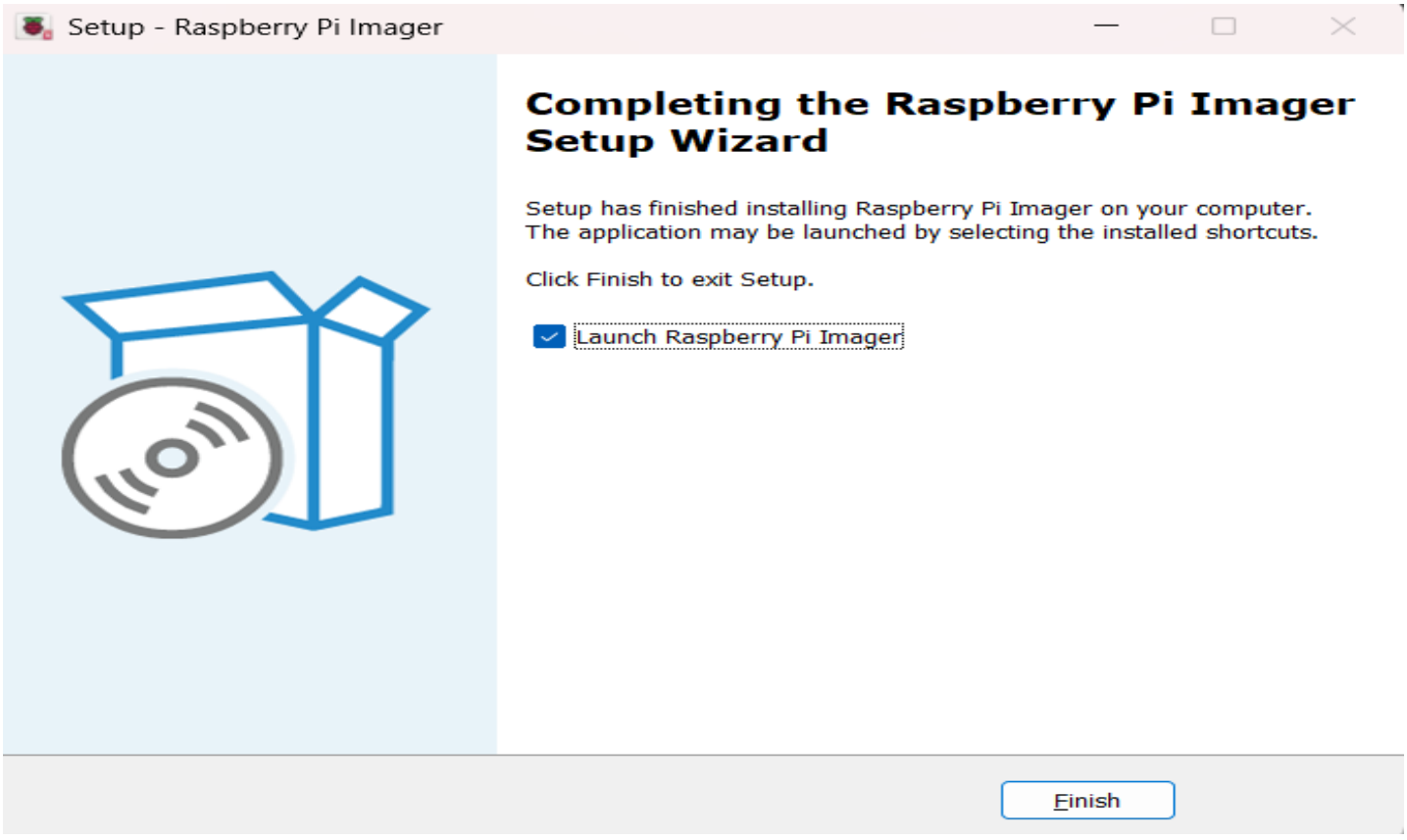


Step 7: Then you got the option for creating desktop shortcuts if you want then check on the checkbox otherwise make it unchecked and click on the next button.

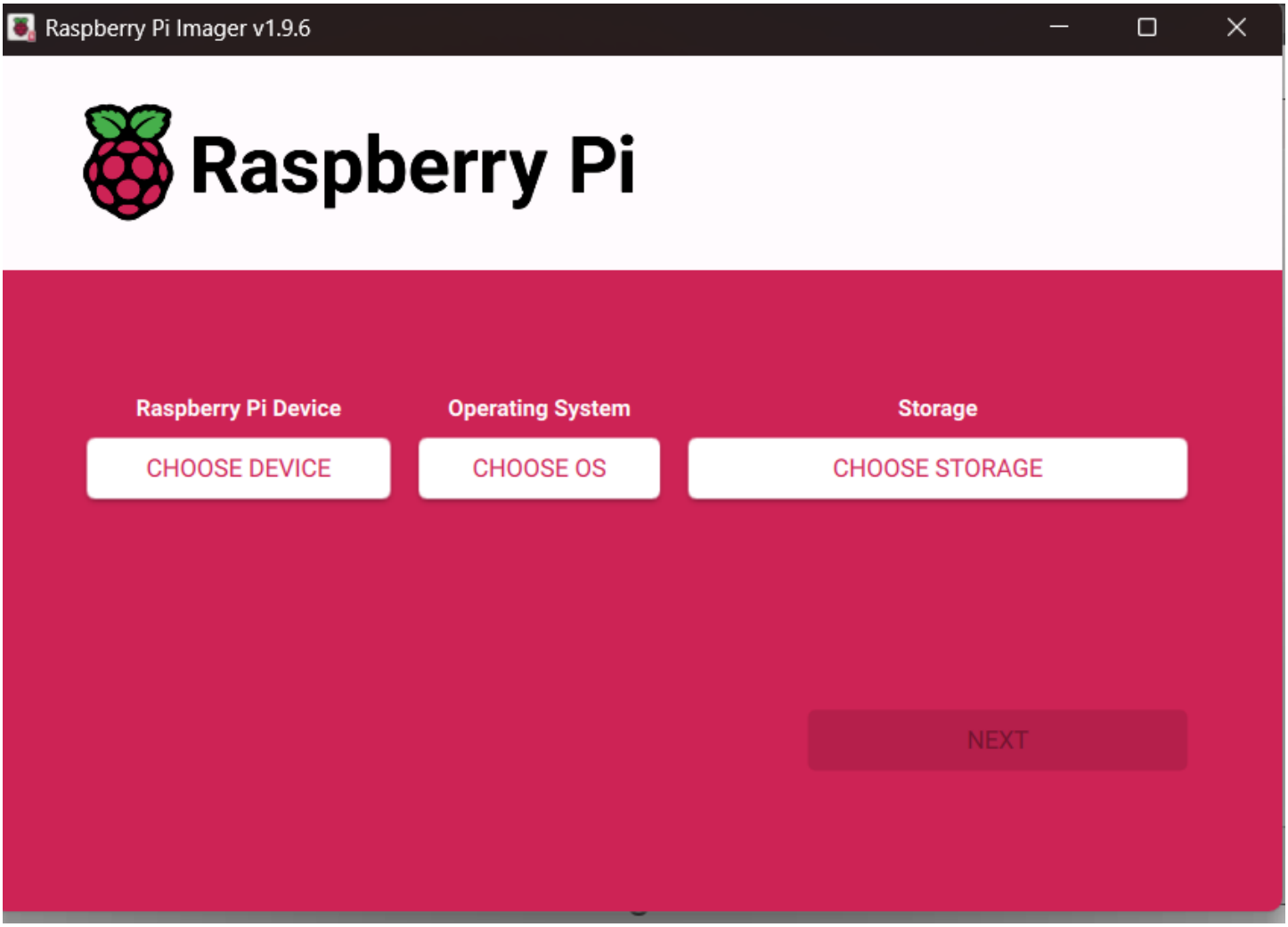


Step 8: It is installing now when it successfully installed on your computer then you got, he completing the Raspberry pi imager set-up wizard. Then you have the click finish button to exit the setup.





The final output of installation is this, this is the interface of the Raspberry Pi imager Application.

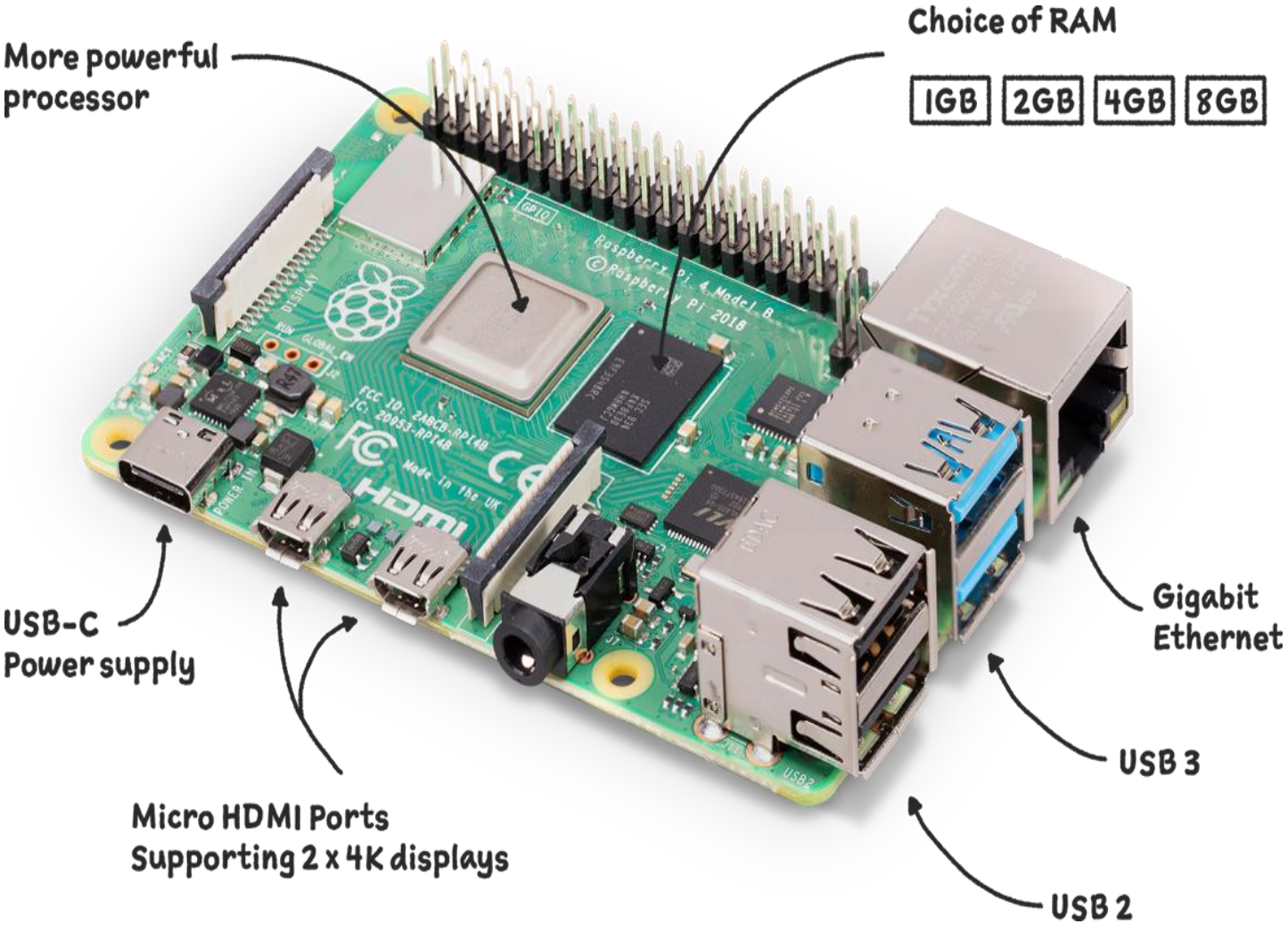


PRACTICAL 3A

AIM: Installing Raspbian OS on raspberry PI

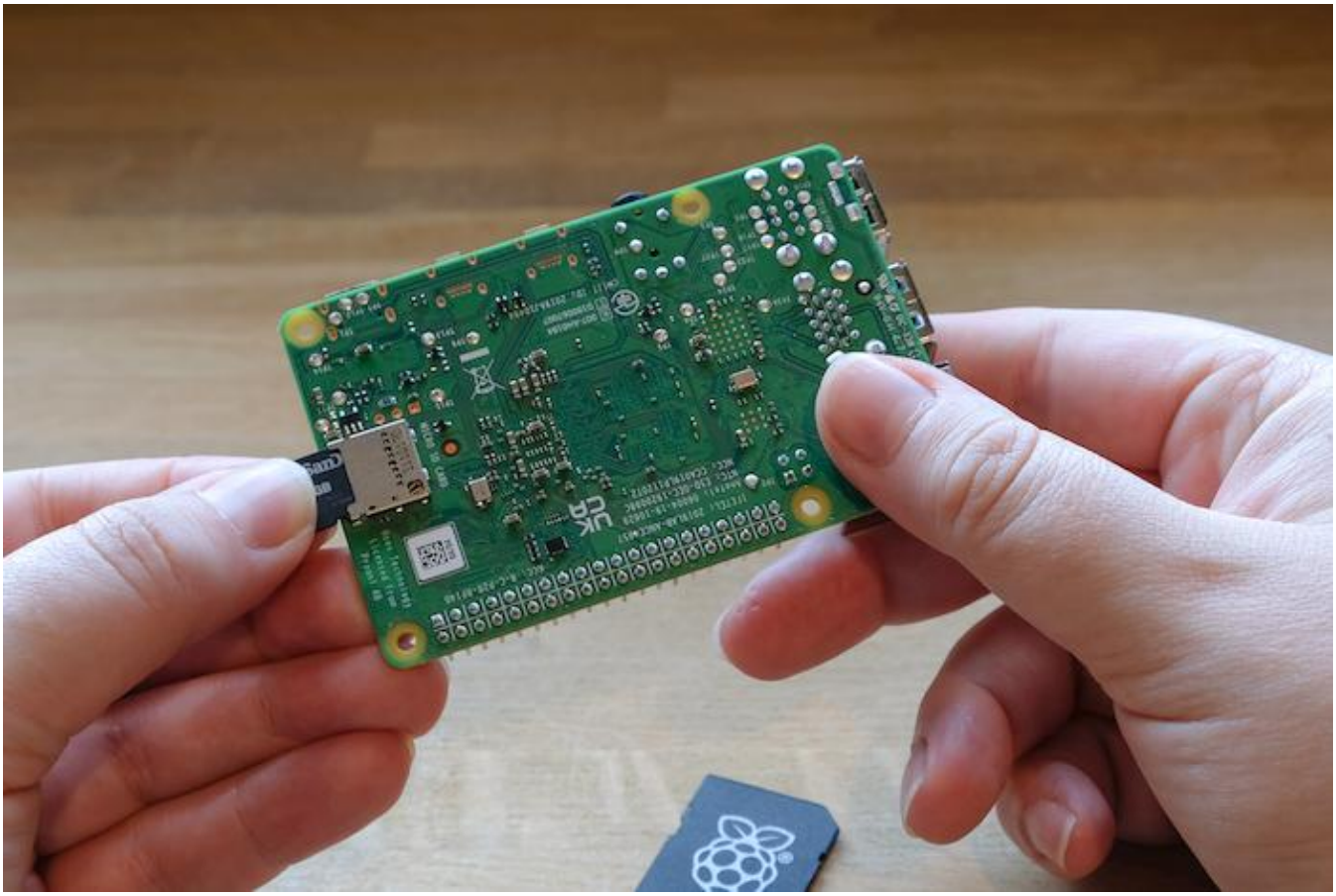
SR.No.	*REQUIREMENTS*	*WORKS*
1	Raspberry Pi	The main mini-computer where the OS runs.
2	SD card	Works as the storage drive to hold Raspberry Pi OS and files.
3	HDMI cable	Connects Raspberry Pi to a monitor/TV for display output.
4	Montier	Displays the Raspberry Pi OS interface.
5	Adaptor	Supplies stable power to the Raspberry Pi.
6	USB Type C cable	Provides power supply to the Raspberry Pi.
7	Key Board & Mouse	Used for input and controlling the Raspberry Pi.

About the Raspberry Pi.



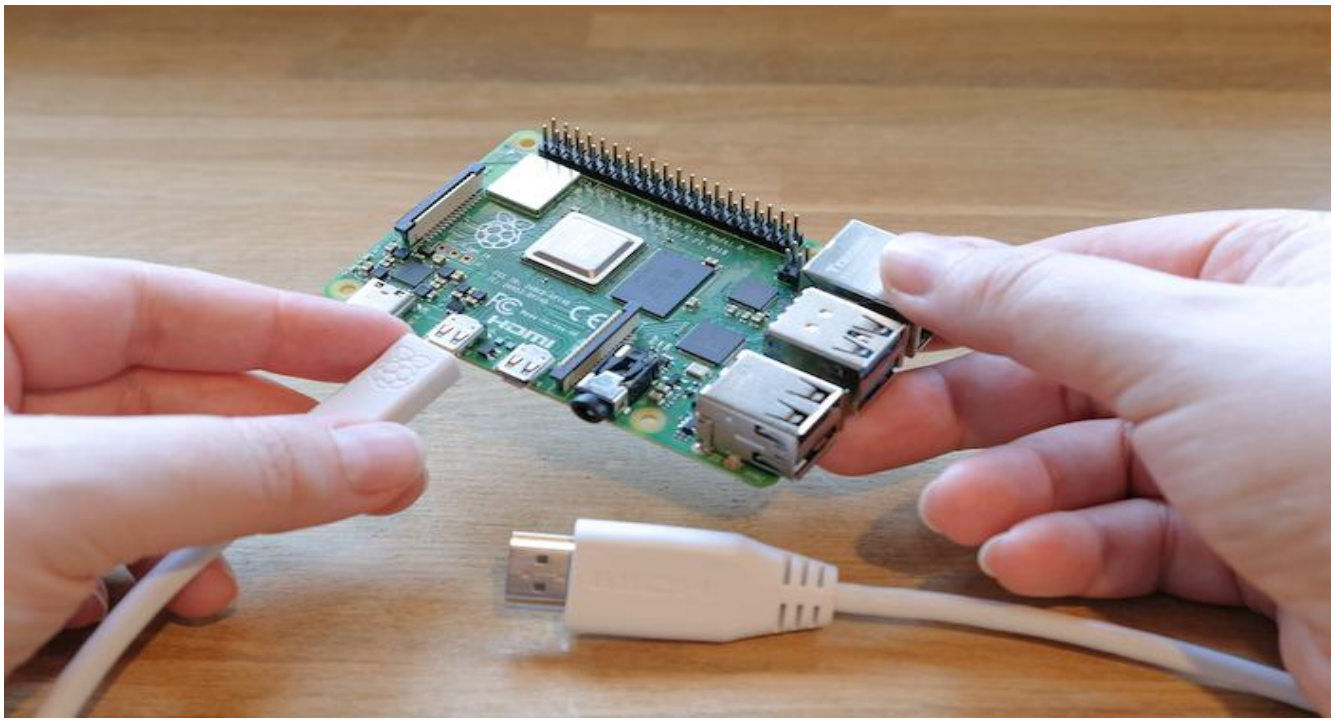
CONNECTION

Step 1: Insert the SD card into the Raspberry Pi, it acts as the main storage, containing the Raspberry Pi OS, and allows the system to boot and run applications properly.

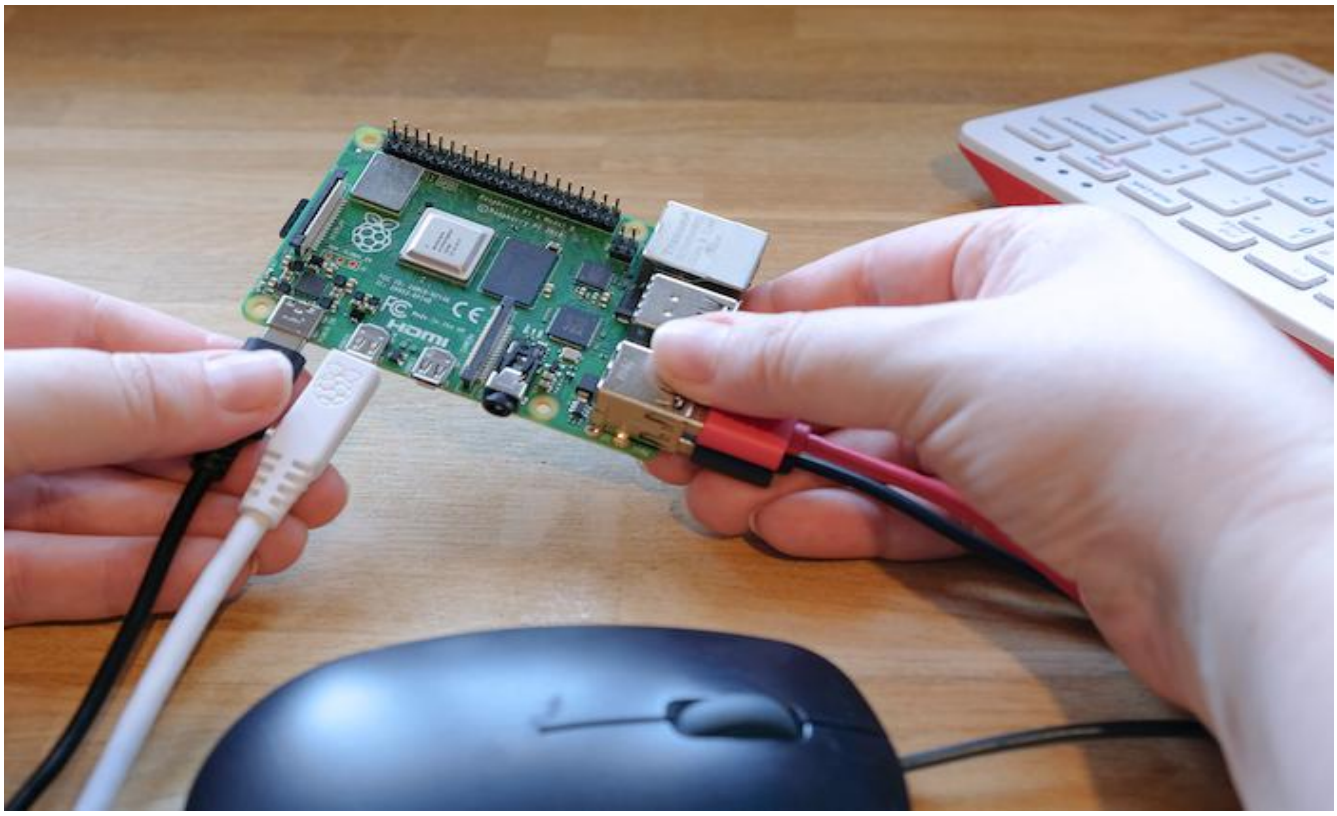


Step 2: Connect the keyboard and mouse to the Raspberry Pi, they provide input control, allowing us to type commands, navigate the desktop, configure settings, and interact with the operating system easily.

Step 3: Connect the HDMI cable to the Raspberry Pi, it transfers both video and audio signals, enabling the monitor or TV to display the operating system and user interface clearly.



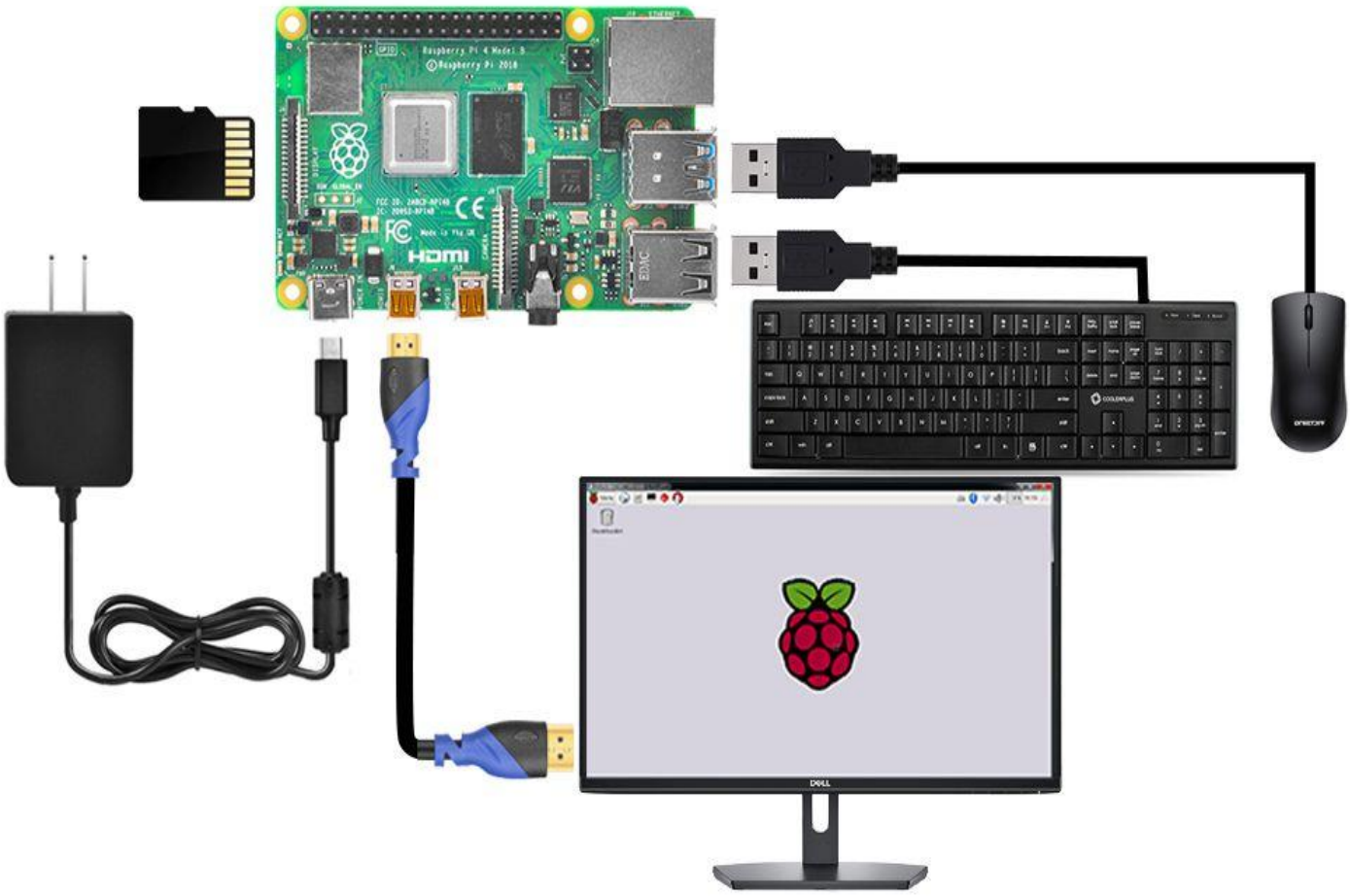
Step 4: Connect the Type-C cable to the Raspberry Pi, it provides the required power supply, ensuring the board starts, runs the operating system, and functions properly for all tasks.



When all connections are done and we power the Raspberry Pi:

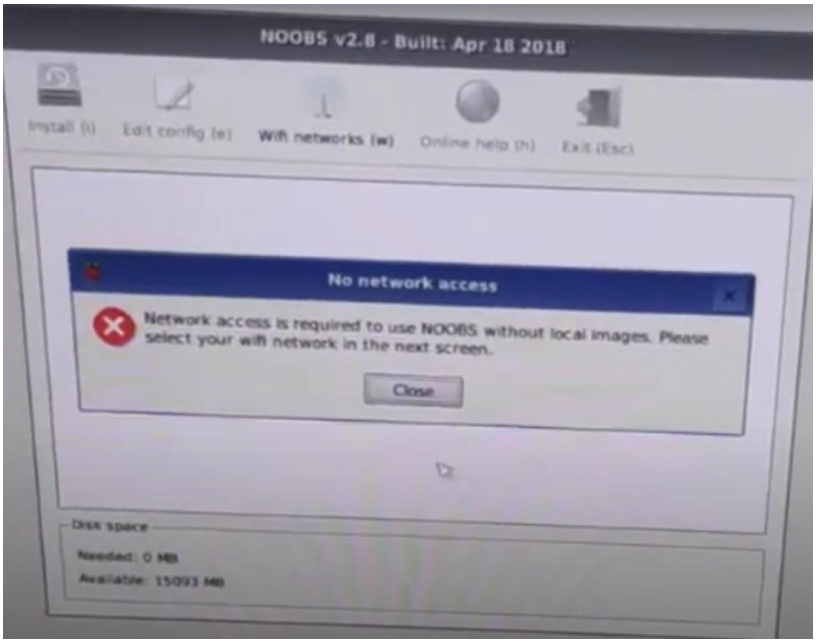
1. **Red LED lights up** → confirms power supply.
2. **Green LED blinks** → Raspberry Pi reads the SD card and boots the OS.
3. **Display appears on monitor via HDMI** → Raspberry Pi OS logo and boot process show up.
4. **Keyboard and mouse become active** → allow you to control and set up the system.
5. **Raspberry Pi is ready to use** → you can start programming, browsing, or running projects.

CONNECTION DIAGRAM

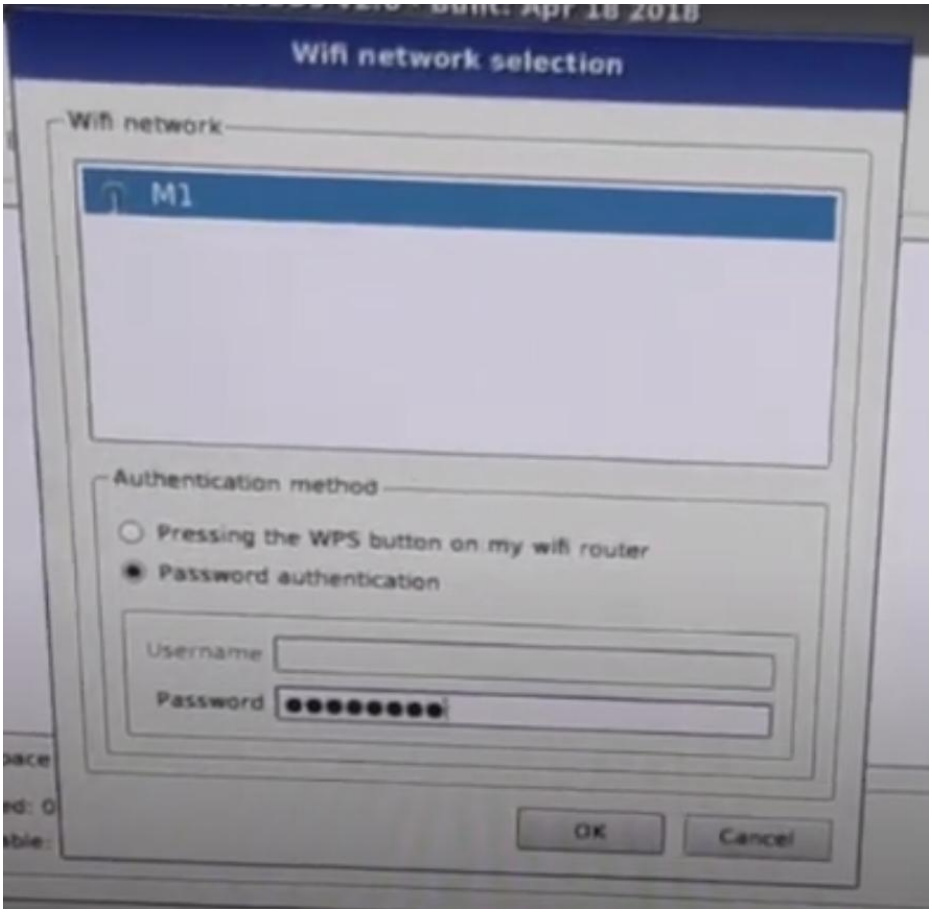


INSTALLATION

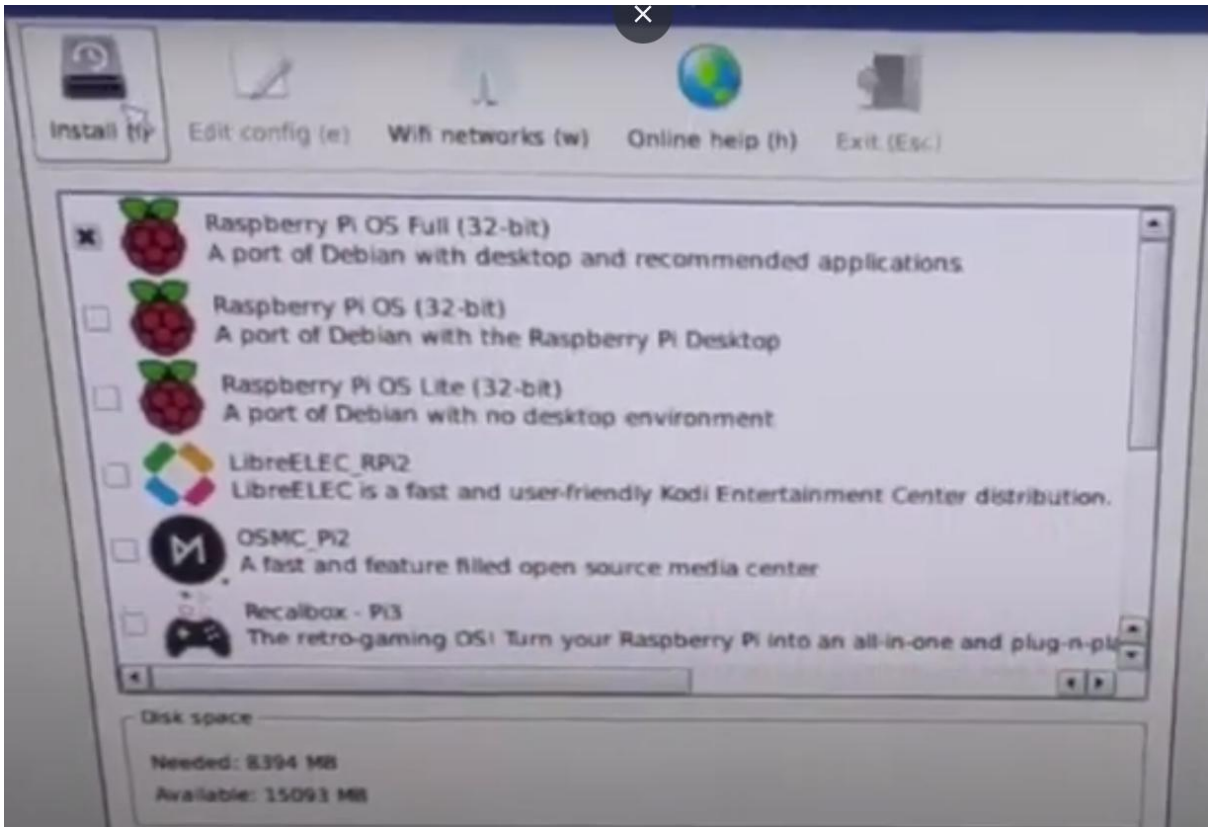
In the beginning it shows the error of the internet connection like this.



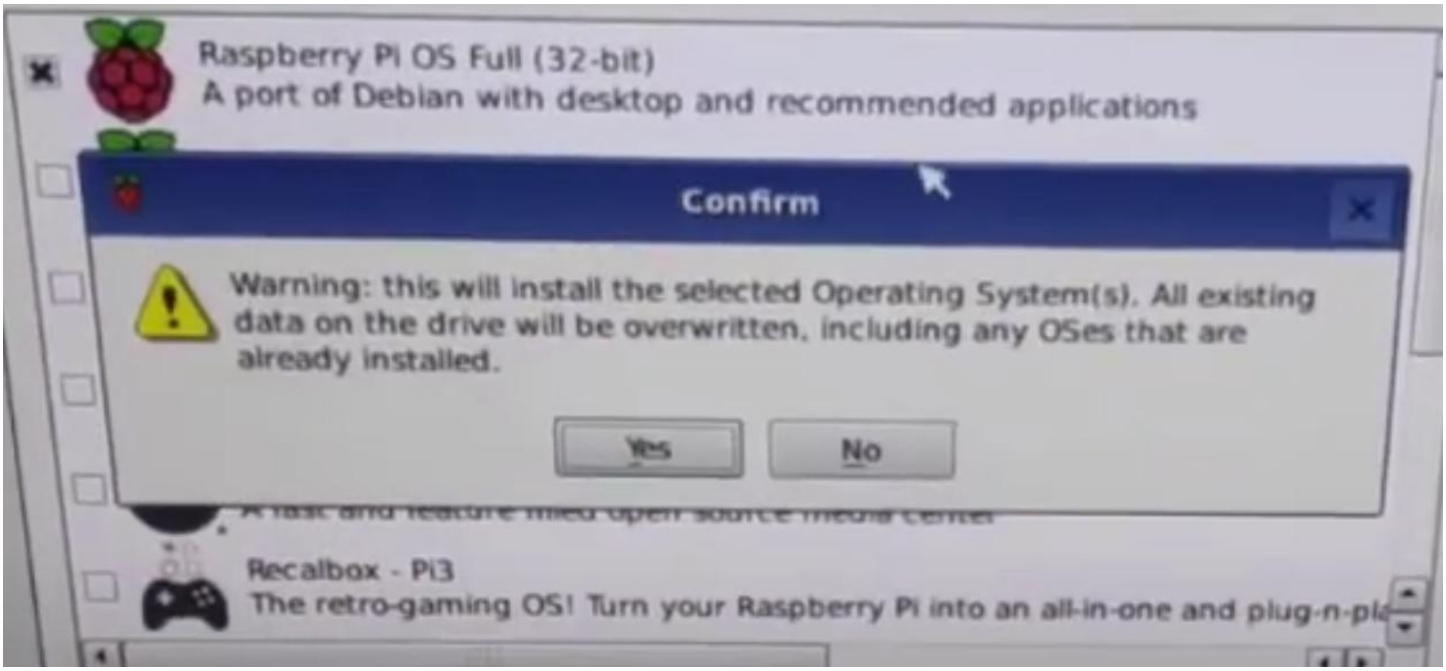
Step 1: Select your Wi-Fi name, after the selection of your Wi-Fi name then enter the password and hit the ok button.



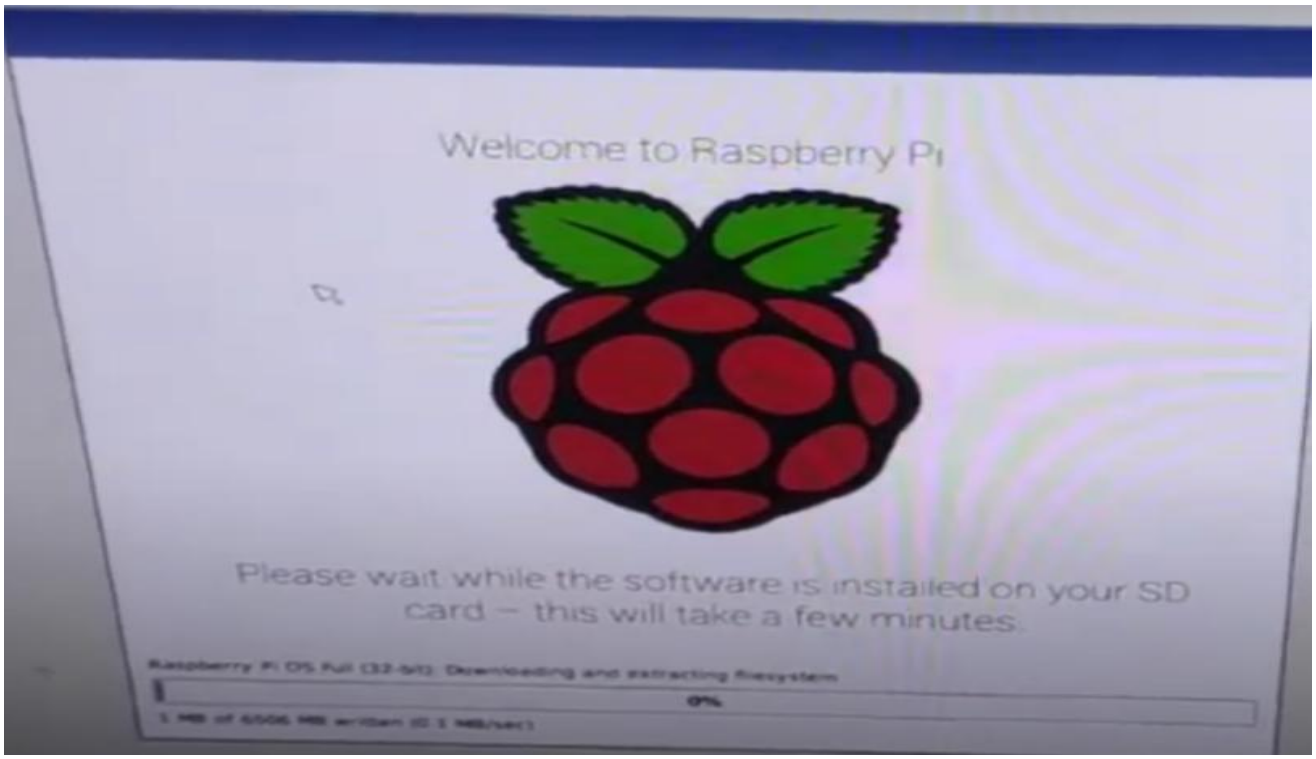
Step 2: Select your preferred operating system from the NOOBS menu, then click “Install.” The Raspberry Pi will automatically install it.



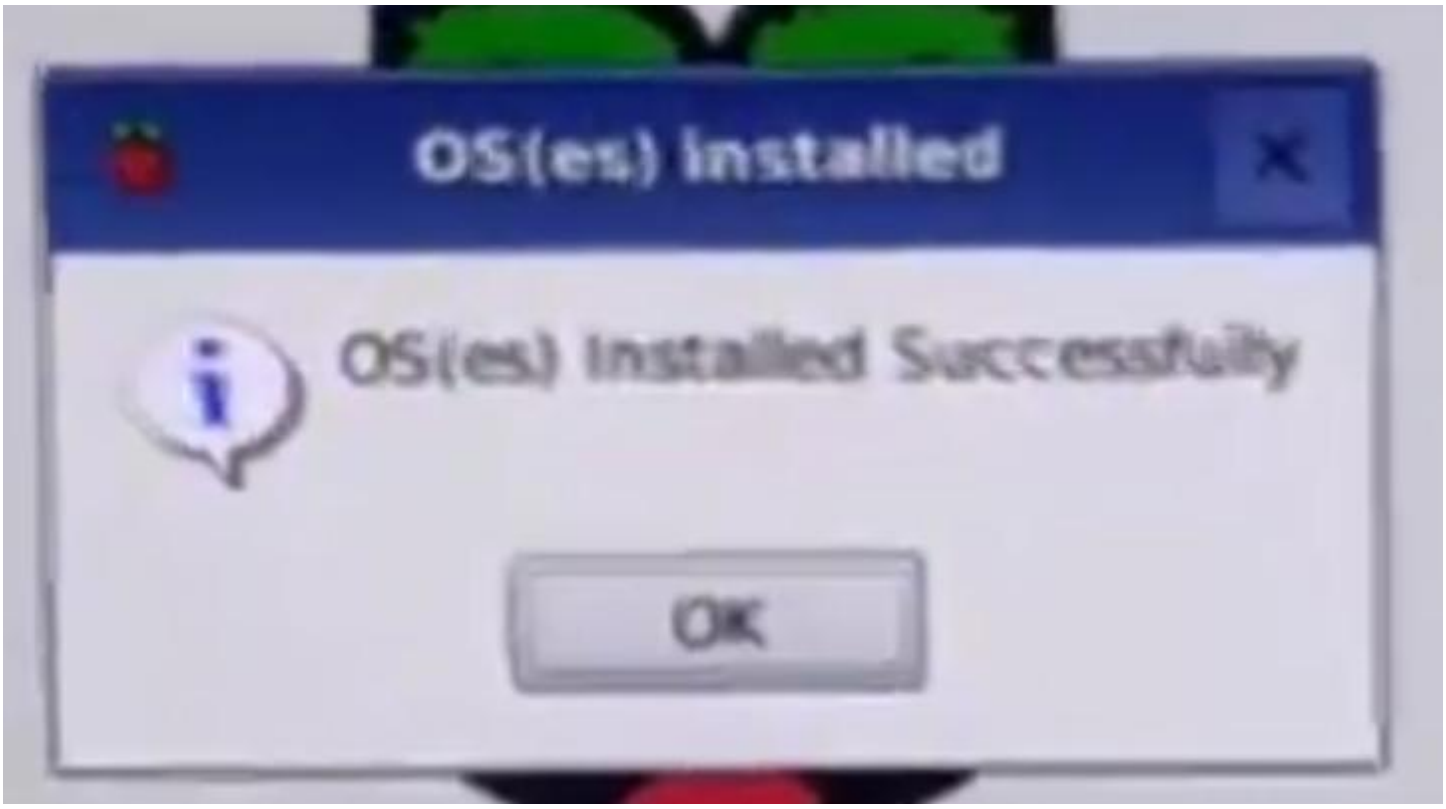
Step 3: After clicking on the install button, it shows a warning click on the Yes button.



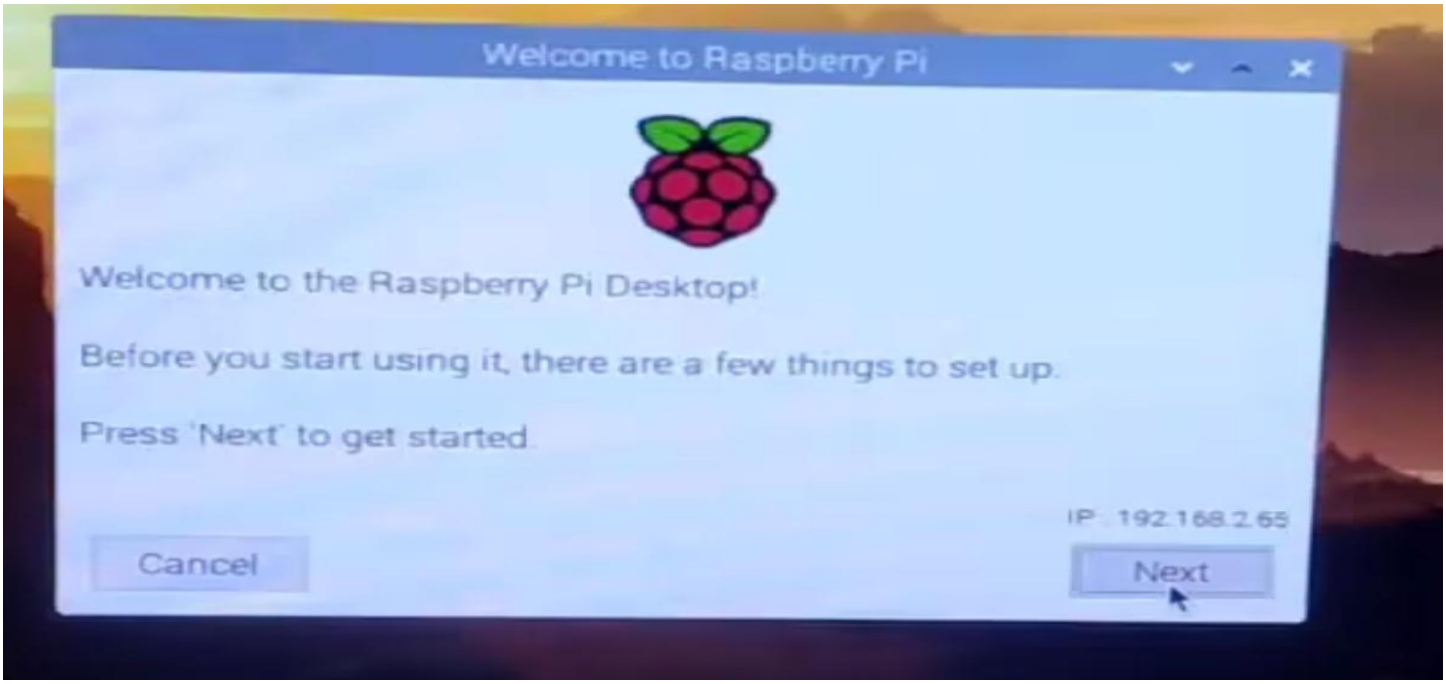
Step 4: Now it is Installing.



Step 5: When this is installed then you show the Installed successfully message, then click on OK button.

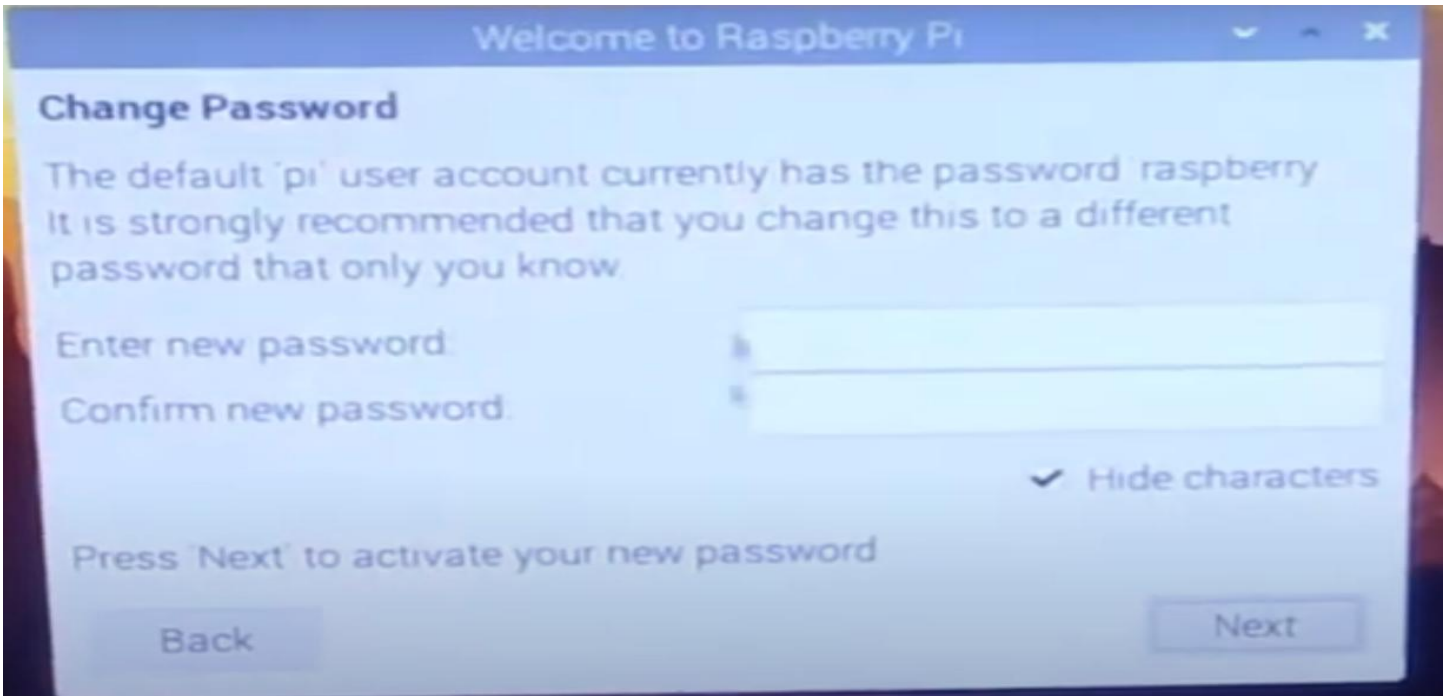


Step 6: After the successfully installation then we have to do some set-up, Now you see the set-up dialog click on the Next button.

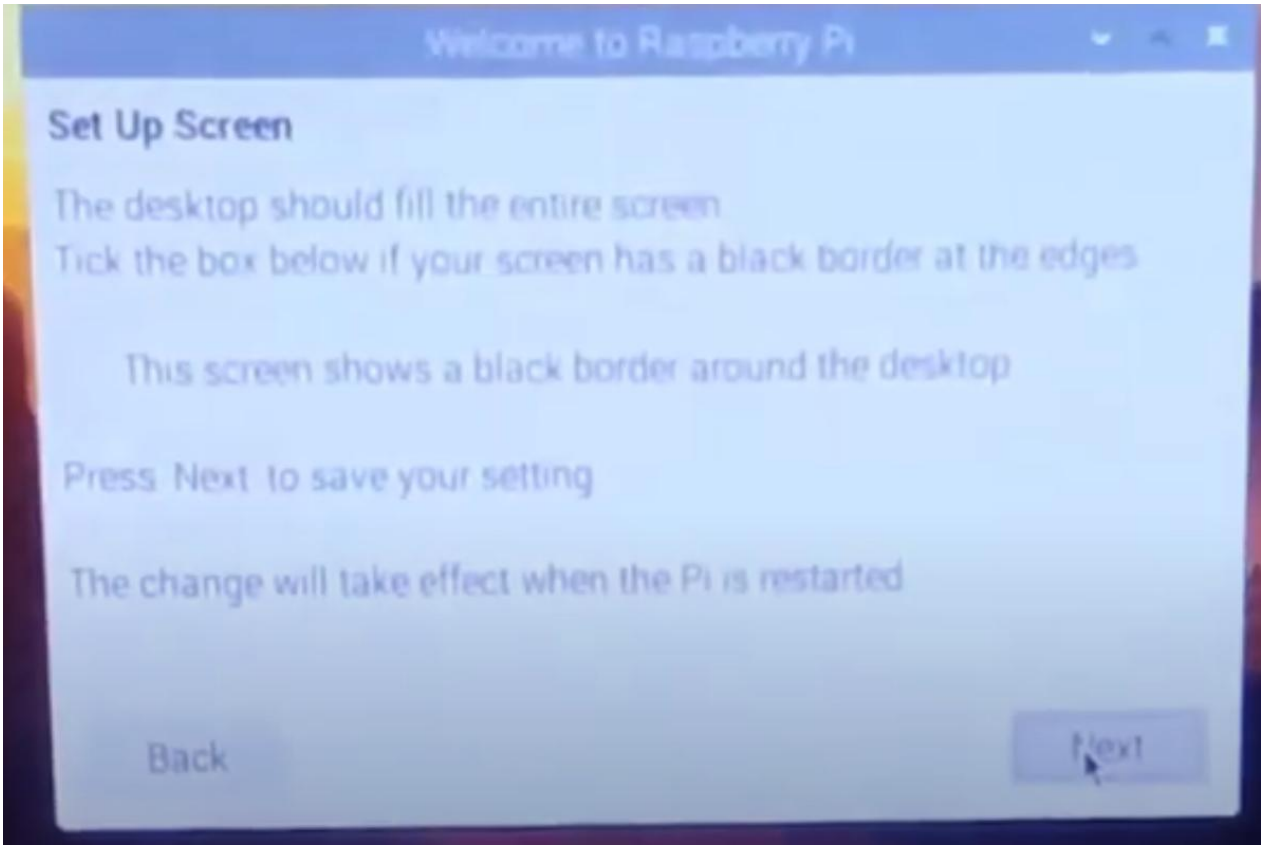


Step 7: Then click on the checkbox of Use English Language and Use US Keyboard

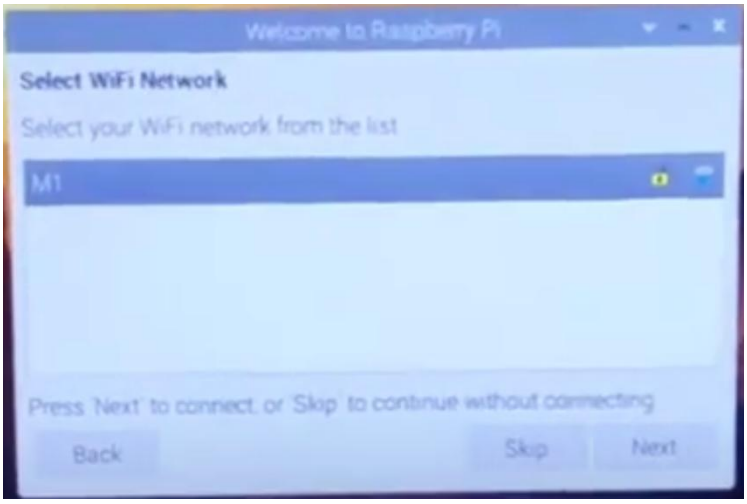
Step 8: After clicking the next button then we show the change password interface, here no need to keep password, if you want then you can choose randomly otherwise the default password is “raspberry”. Then click on the next button.

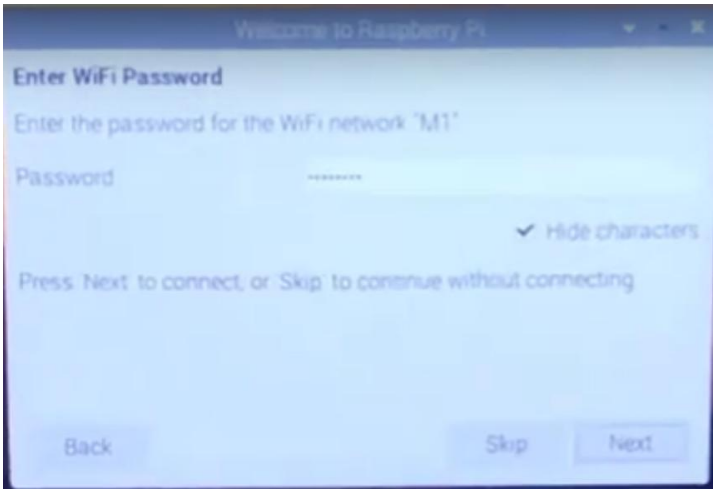


Step 9: Now we show the Setup screen interface, here nothing to do changes then click on the next button.

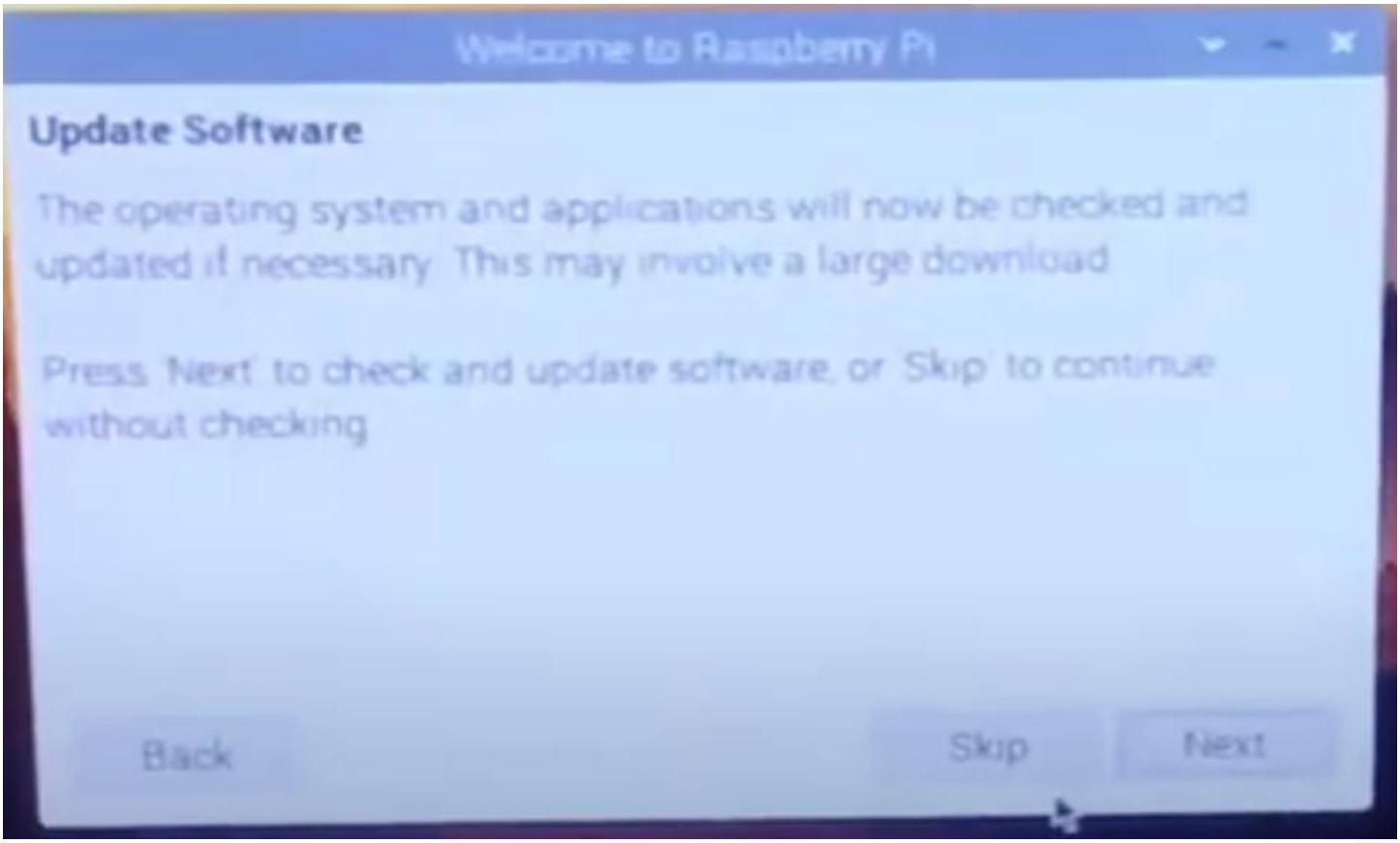


Step 10: Select your Wi-Fi and select Next button then Enter your Wi-Fi password again click on the Next button.

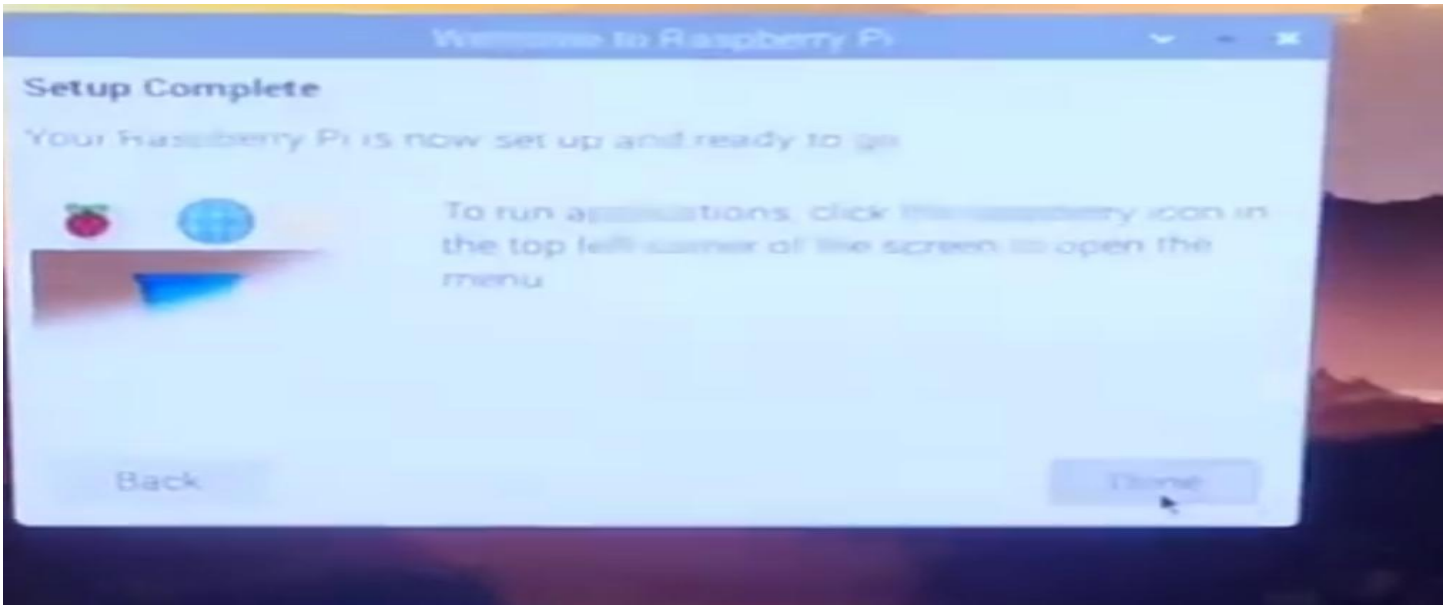




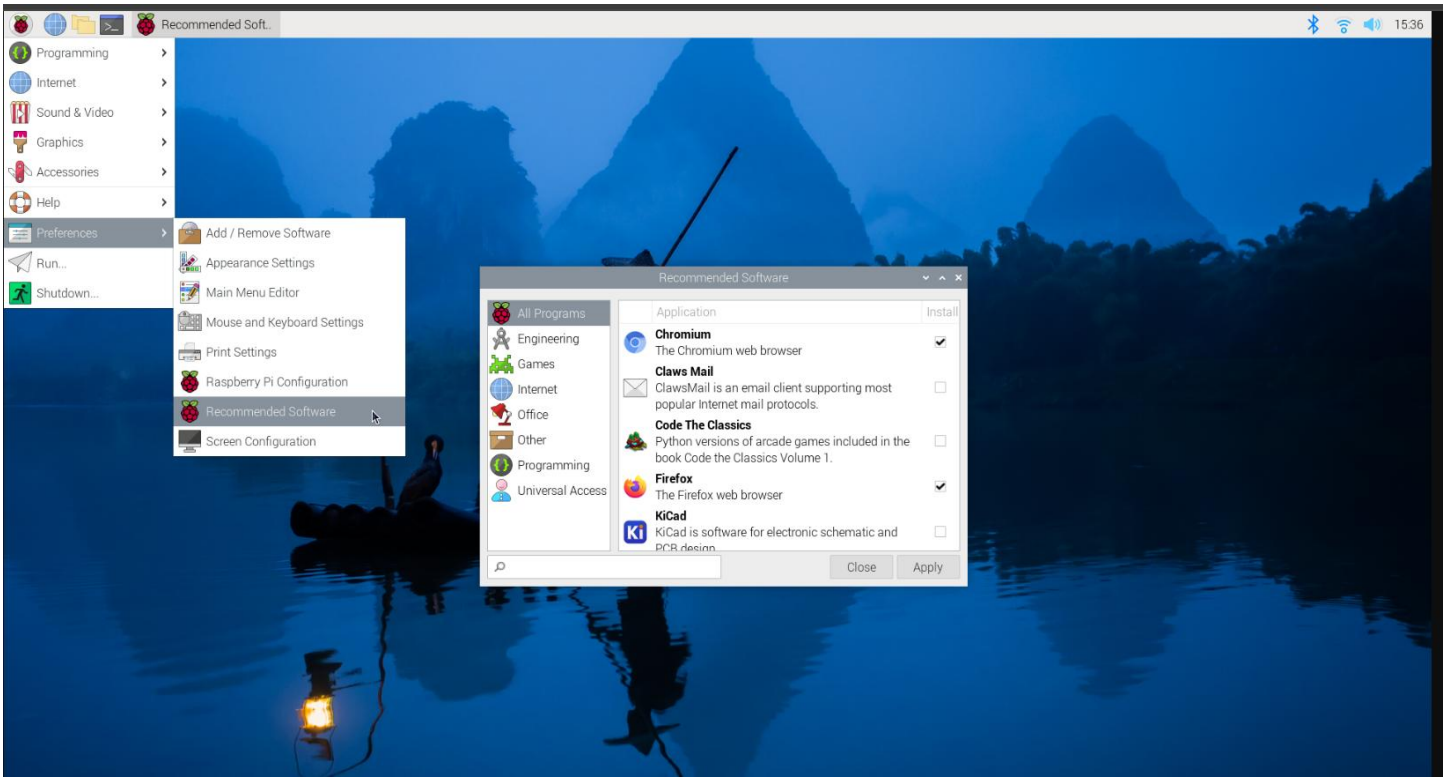
Step 11: Now you see the Update software at this time we don't need to update it takes so many times to update, so we click here **Skip.**



Step 12: Now we have the interface of Setup Complete and click on the Done button.



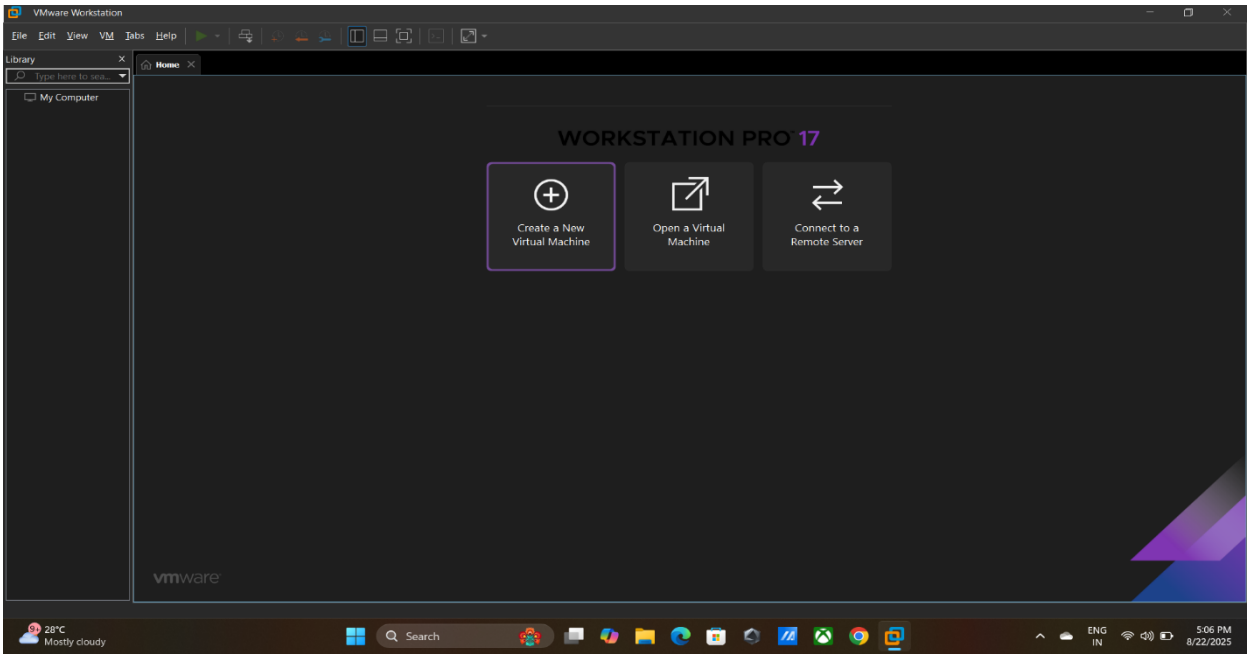
Step 13: Now we are good to go to run our raspberry pi. Here is the final Output of the raspberry pi display.



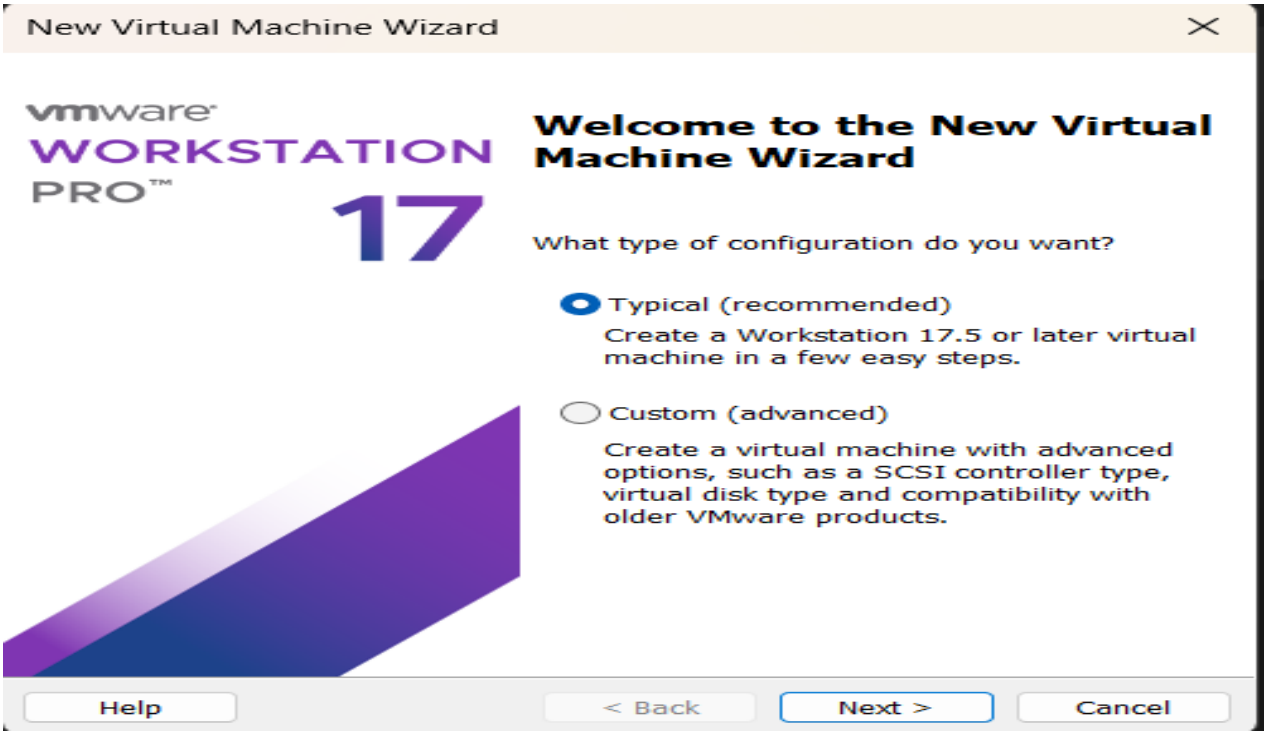
PRACTICAL – 3B

AIM: Installing Raspbian OS with the help of virtual Machine software.

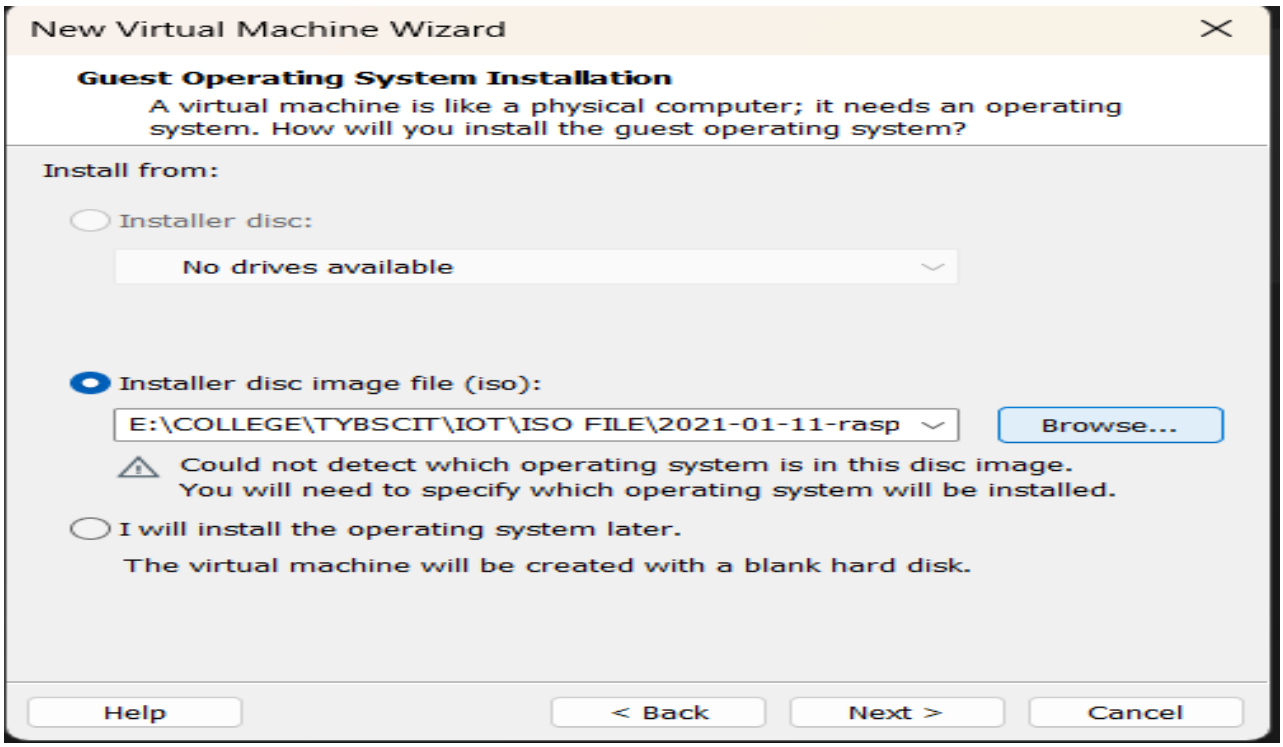
Step 1: Open VMware and click on create new virtual machine



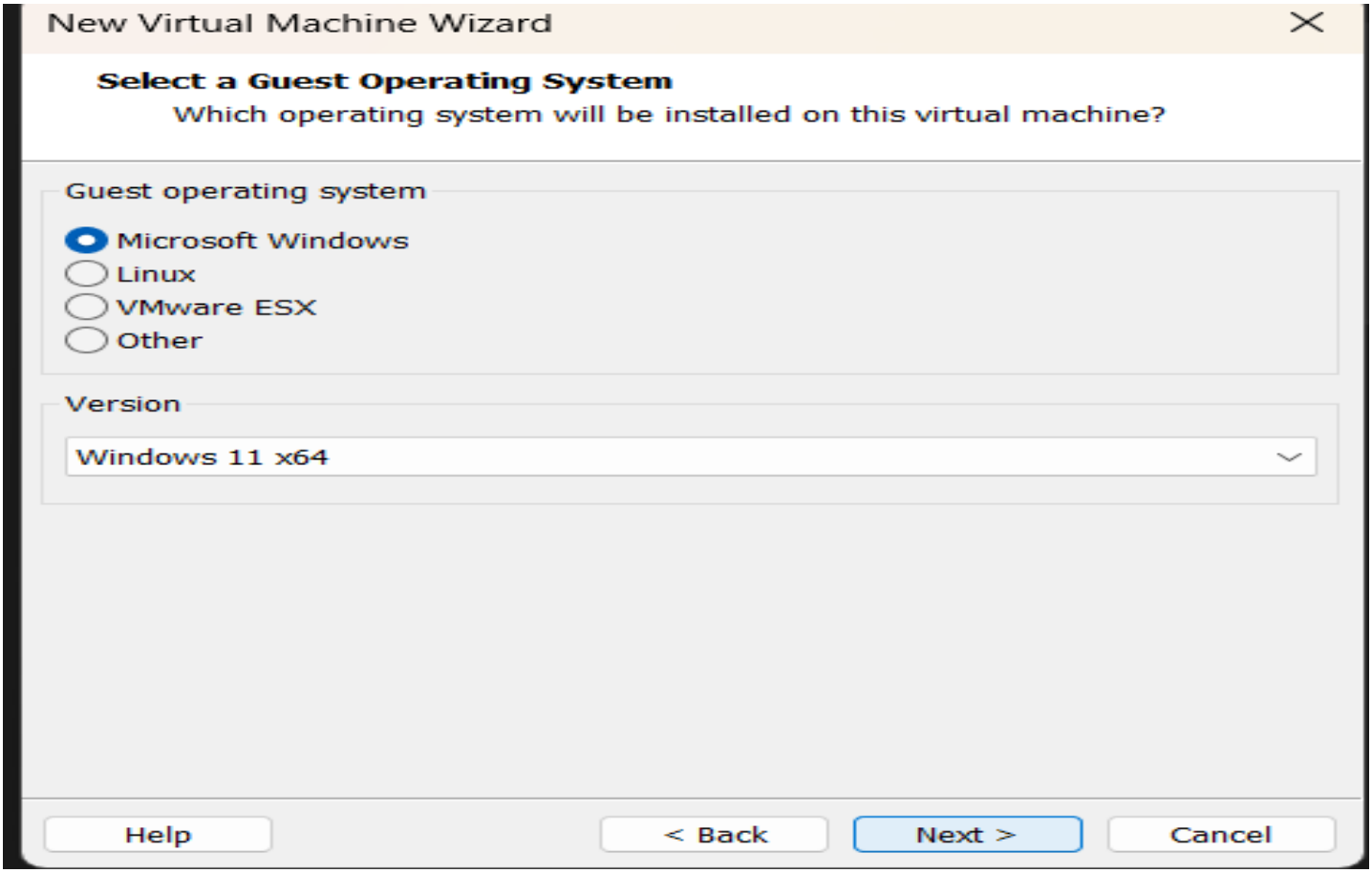
Step 2: Now click on Typical and click on the Next button.



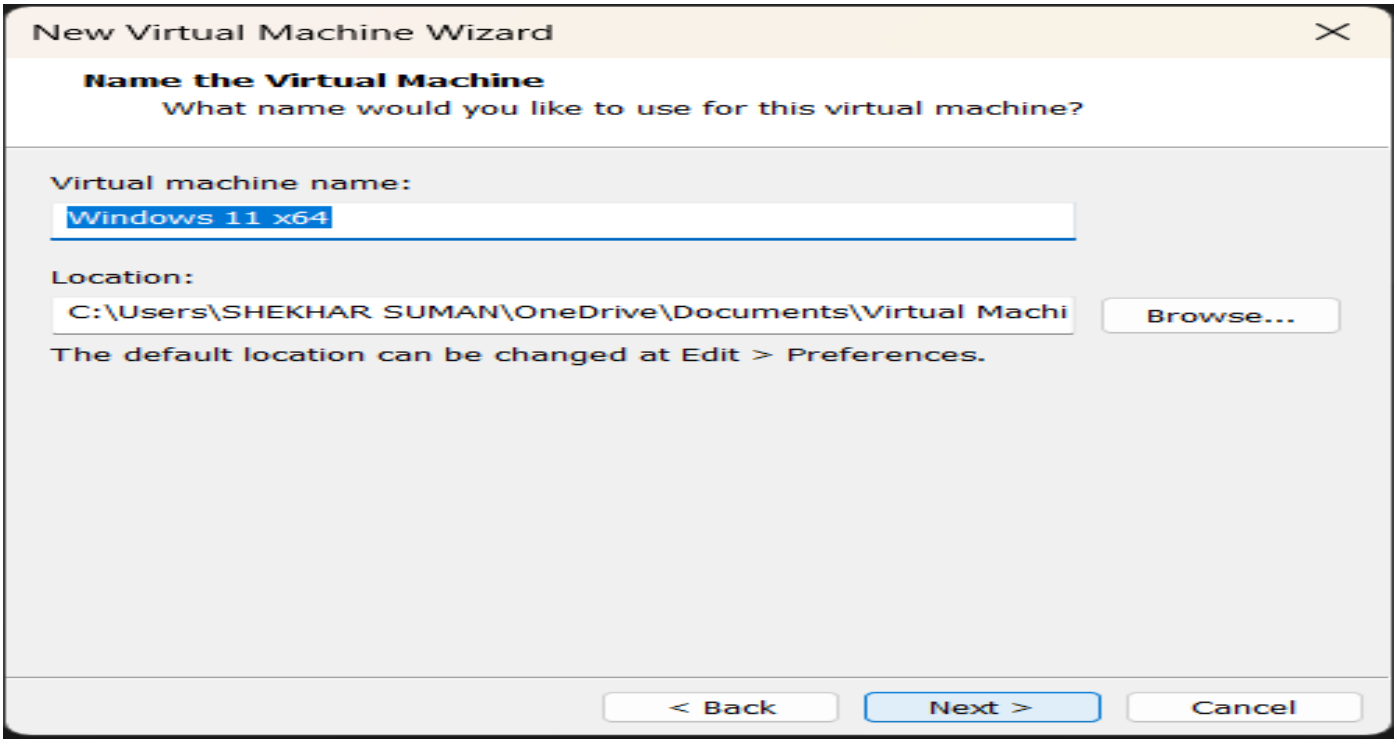
Step 3: Then browse the **ISO** file and again hit the next button.



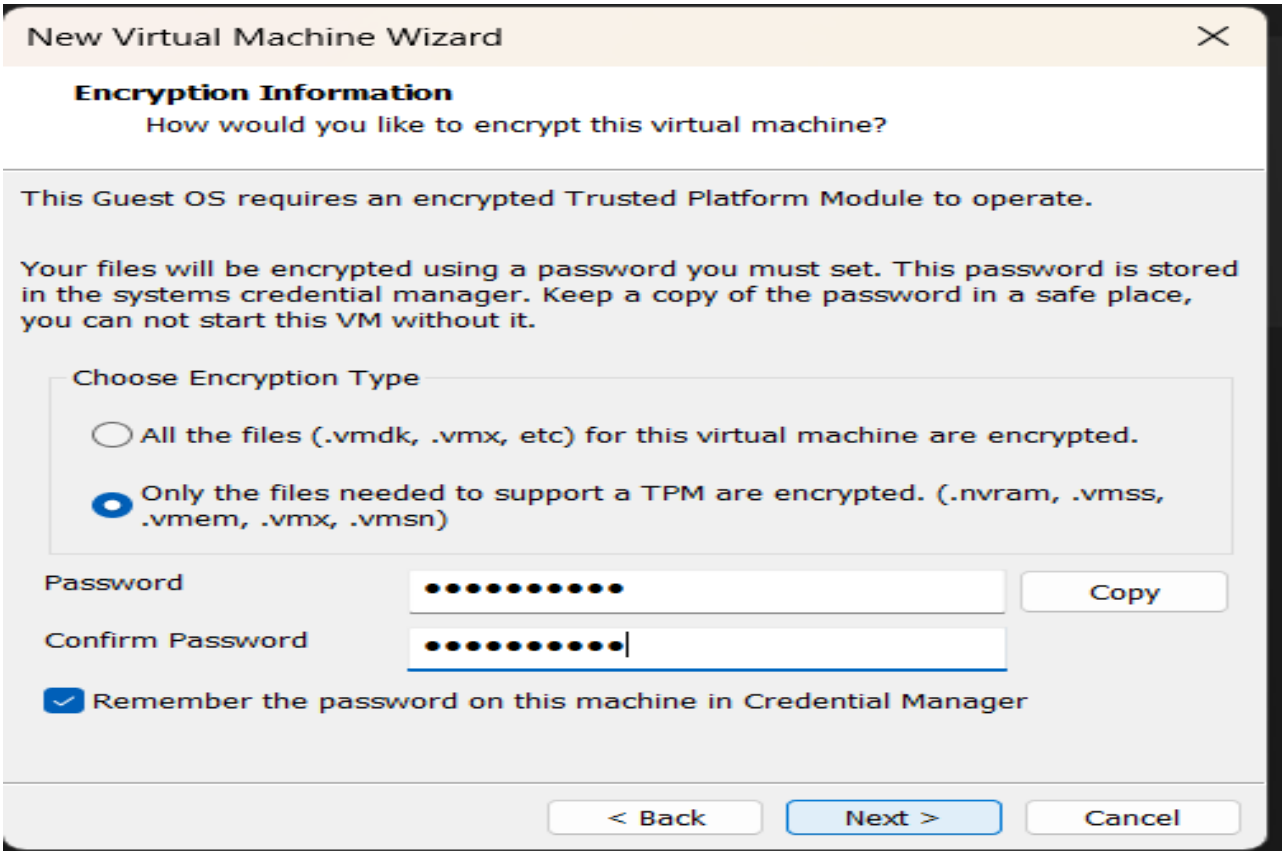
Step 4: Click on the Microsoft window and click on the Next button.



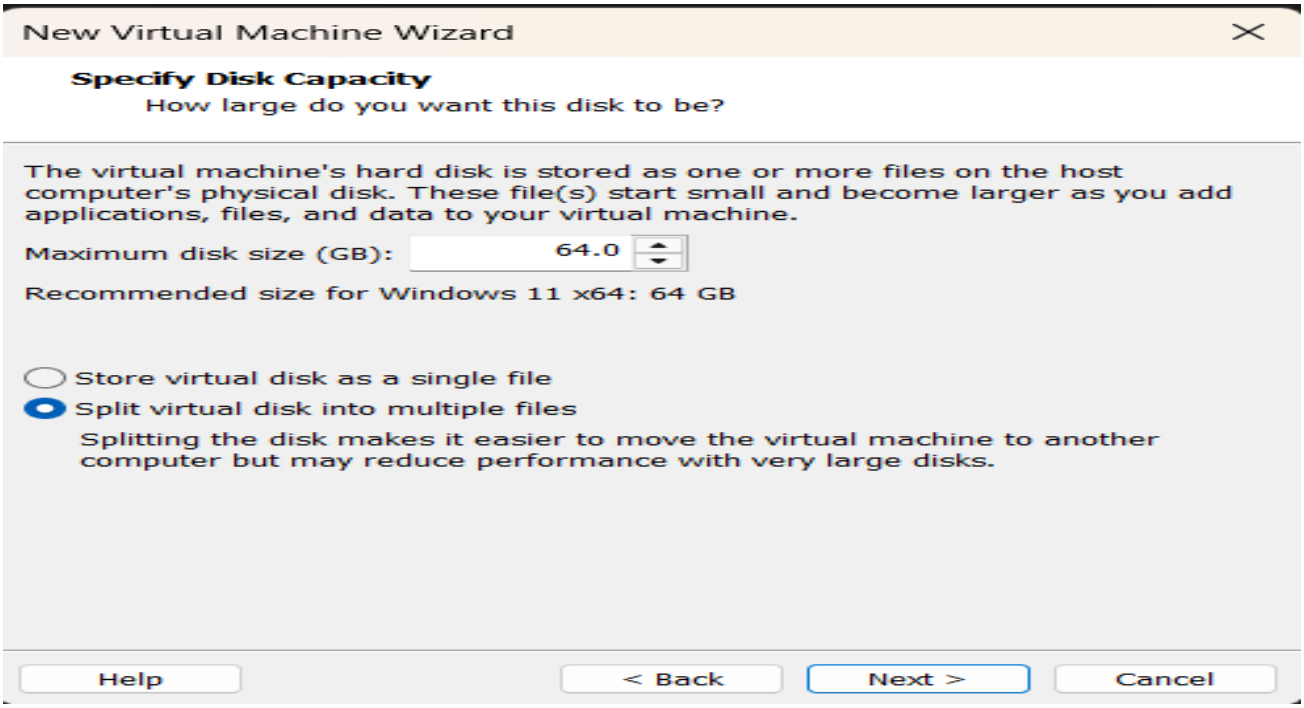
Step 5: Now the system asks the name of our virtual machine, here I don't want to change the name so I go with the default name then click on the next button.



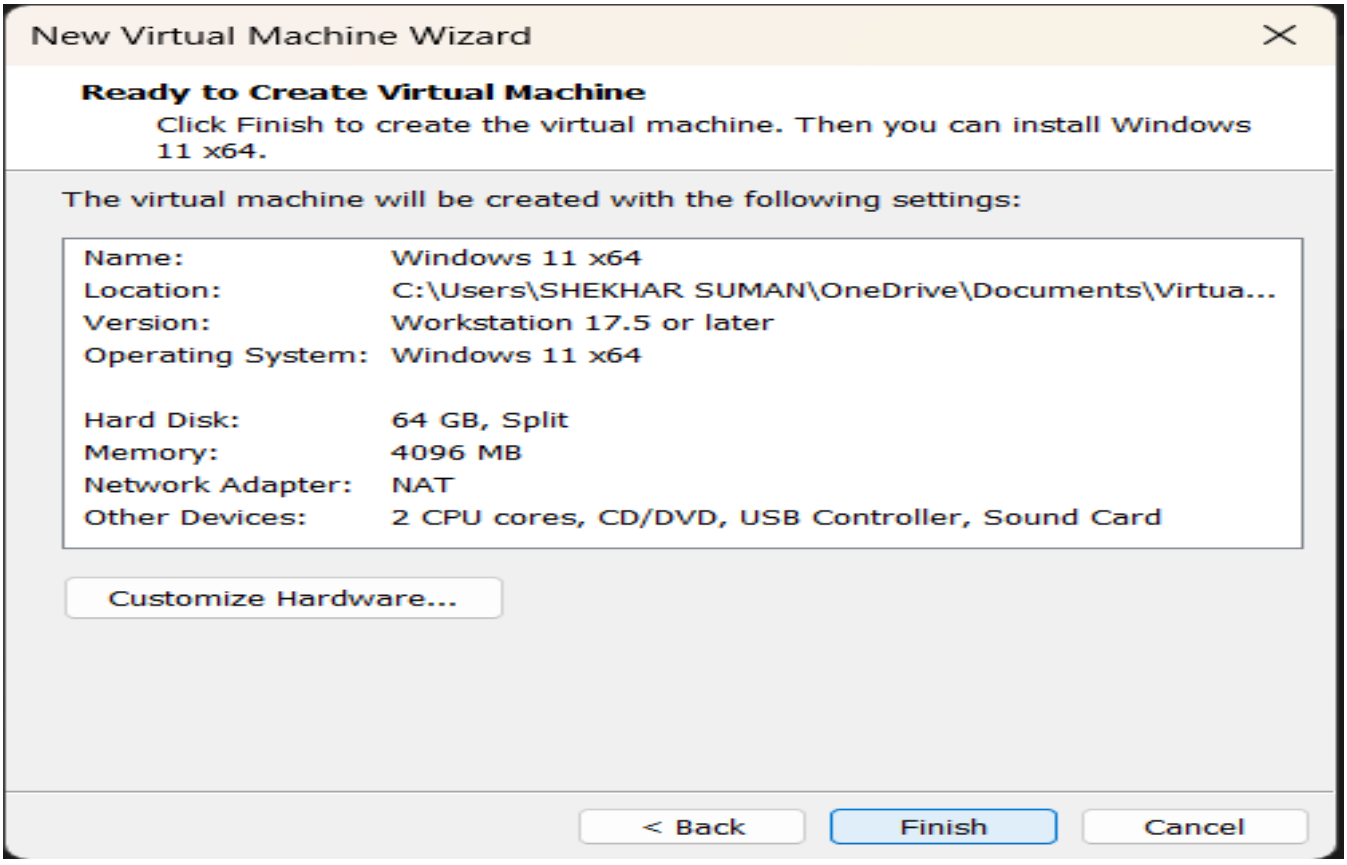
Step 6: Then create your strong password then click on the next button.



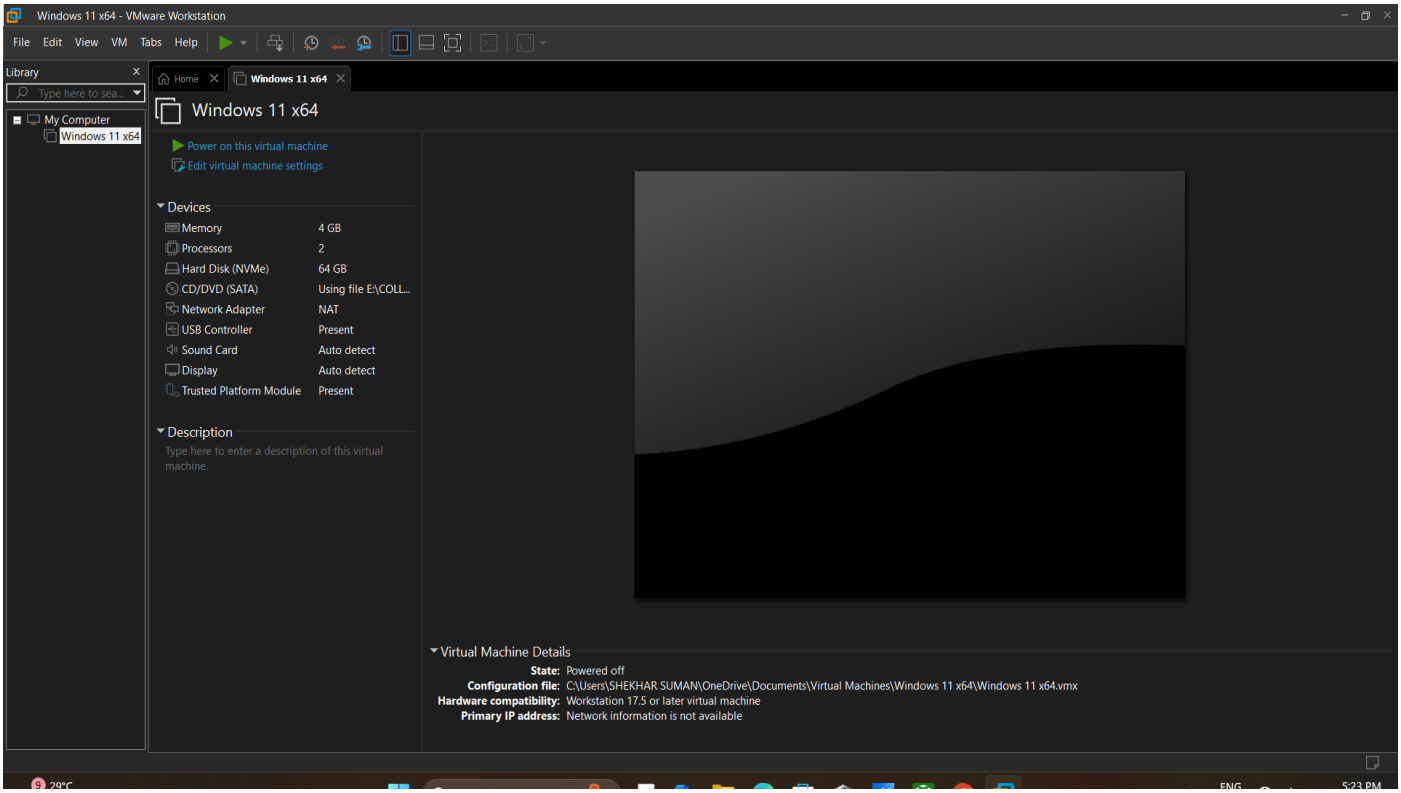
Step 7: Nothing to change here and click on the next button.



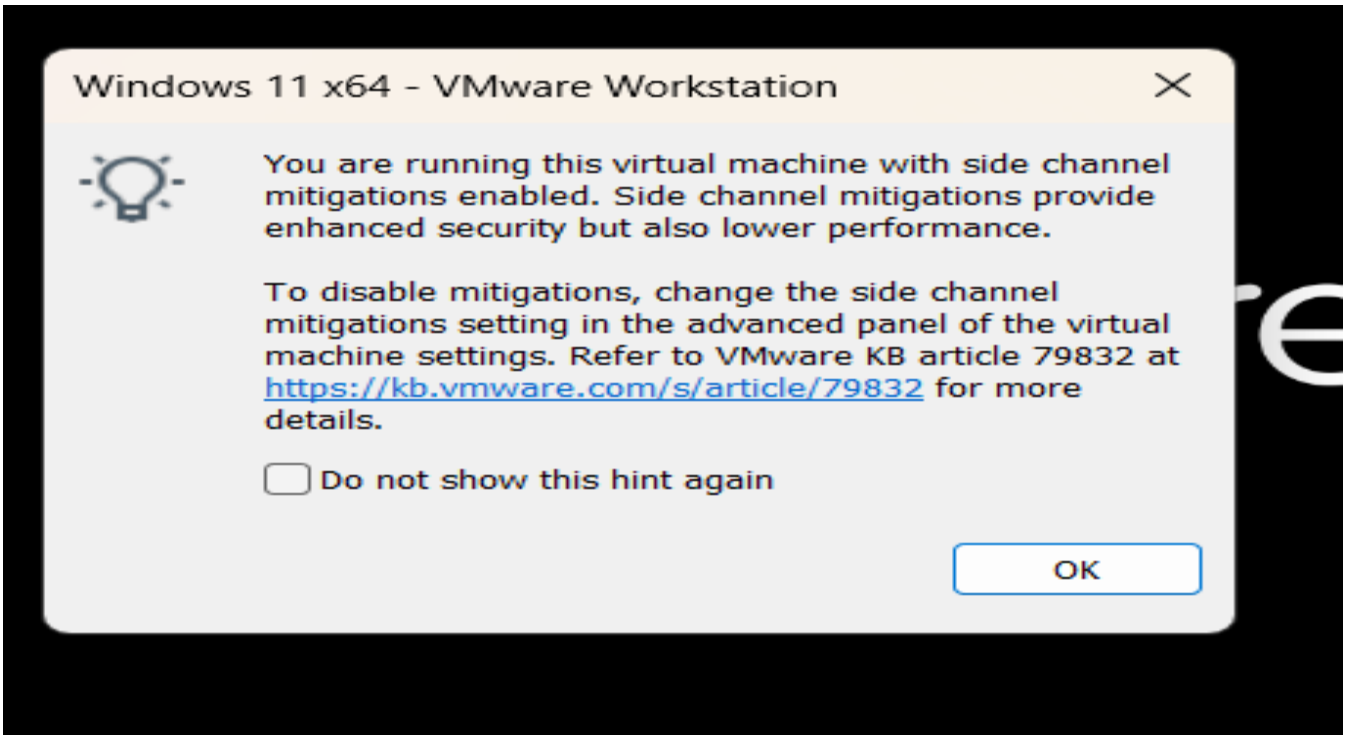
Step 8: Then click on the finish button to finish of the setup Raspbian **ISO** file.



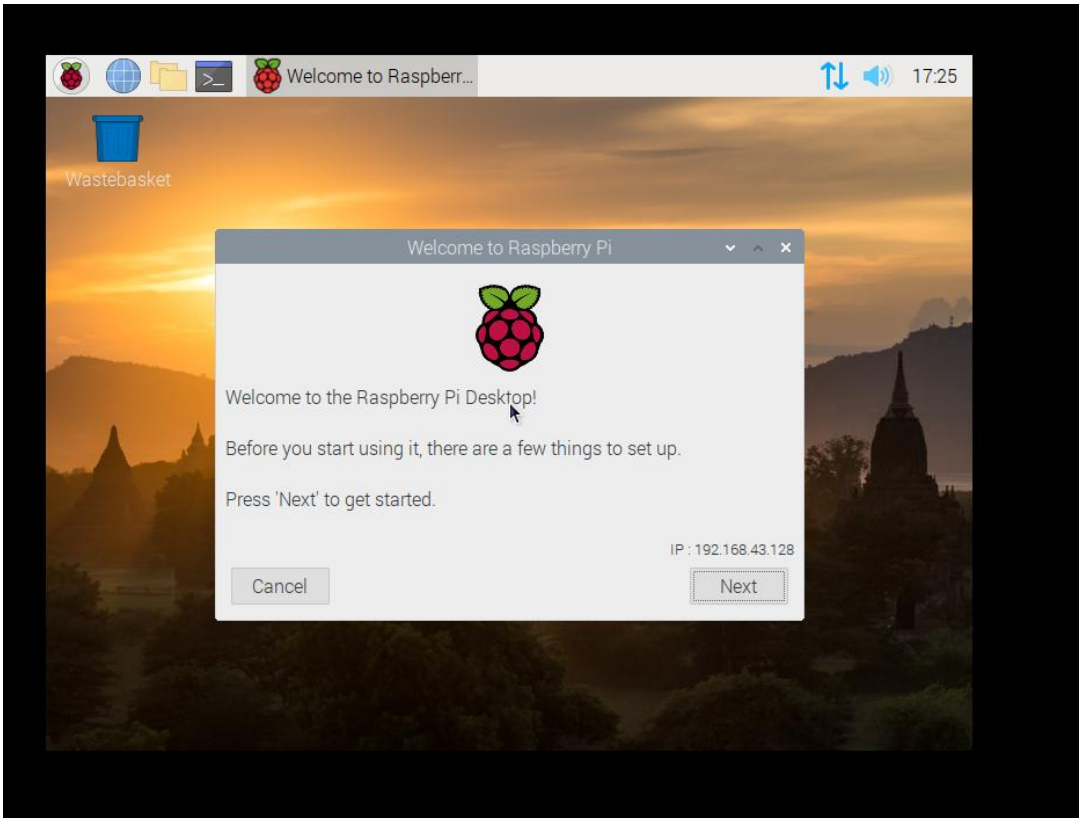
Step 9: Now we automatically redirect on the home interface of the VMware application. Select your machine name and click on the power on this virtual machine. This option is at top left hand side.



Step 10: Now here we show the unwanted option interface click on the OK button for the Next.



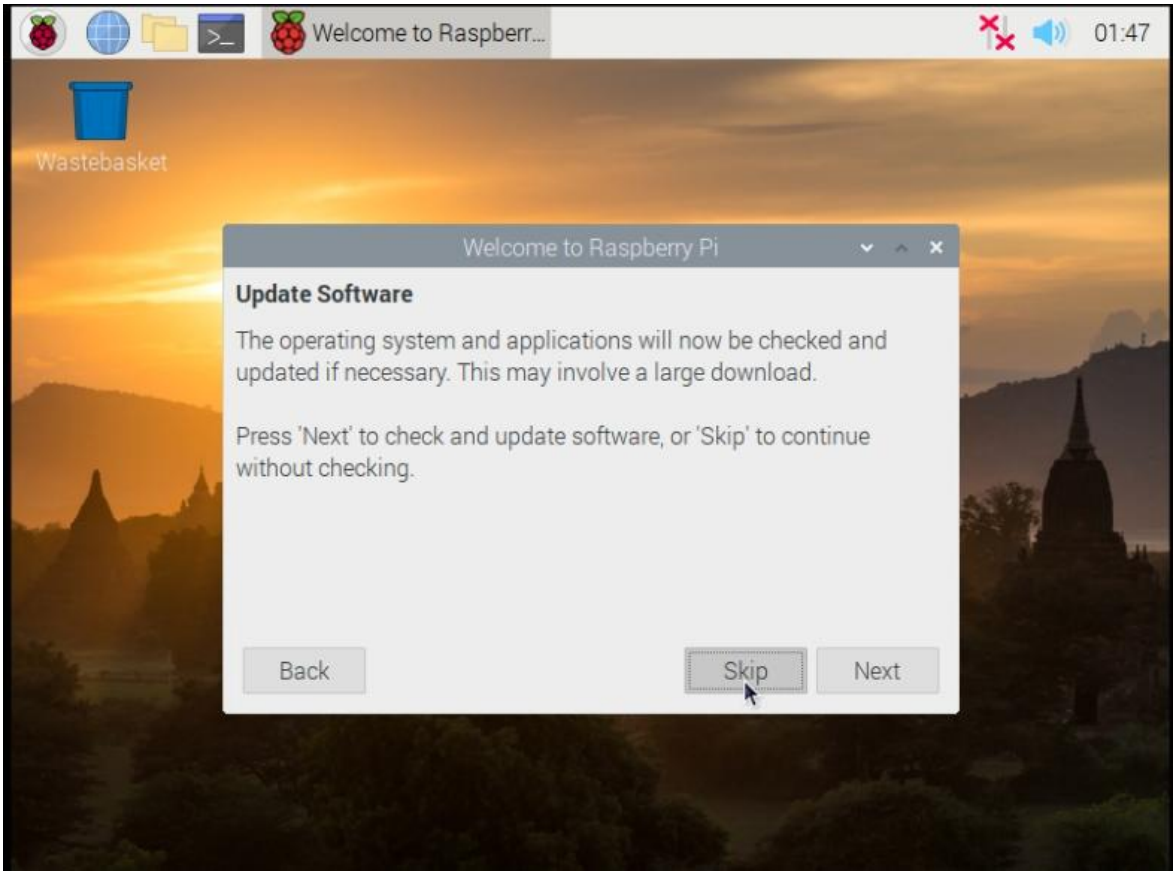
Step 11: Now we redirect to the Set-up the Raspbian O.S on the VMware software. Click on the next button.



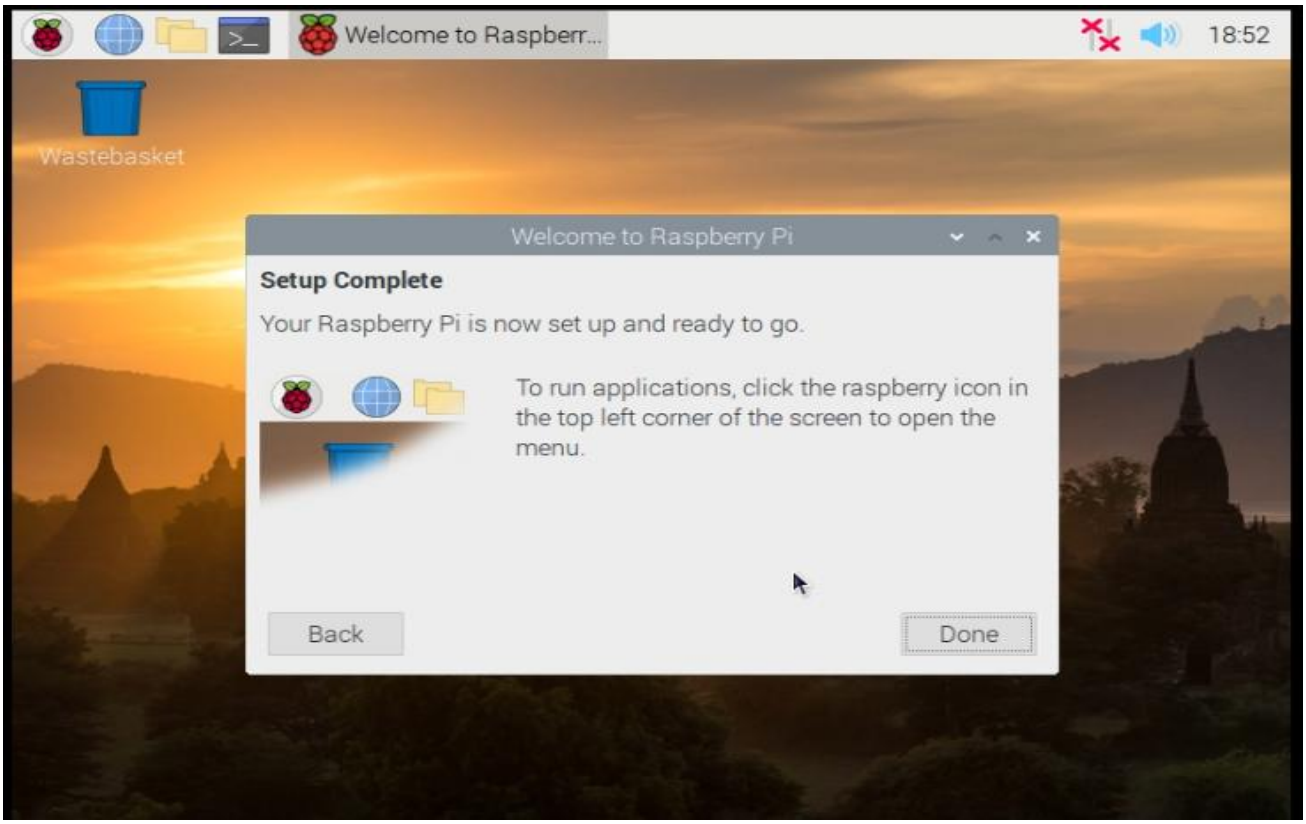
Step 12: After clicking on the Next button then click on the both option Use English language and Use U.S keyboard then click on the Next Button.

Step 13: I don’t want password here so I kept it blanks, if you want your personal password then you can enter the password otherwise, they have their own default password “raspberry”. Then click on the Next button.

Step 14: I don’t want any update right now then I want to choose skip button for the skip the Updates.



Step 15: This is the last and the final process of yours installing the Raspbian O.S on your VMware box. Now you get the interface of Setup complete. Click on done button and Enjoy your Raspbian O.S on your VMware box.



The final desktop of Raspbian O.S in the VMware workstation.