

1. Aim: Introduction to Raspberry Pi 5 Model B

1.1. Theory

The **Raspberry Pi 5 Model B** is the latest version of the Raspberry Pi series of single-board computers, designed to offer a powerful and affordable platform for learning, prototyping, and embedded systems. It is widely used in **IoT (Internet of Things)** due to its compact size, GPIO support, low power consumption, and flexibility in running various operating systems.

In a typical IoT system, the Raspberry Pi can act as:

- A **sensor node**, collecting data from the environment.
- A **gateway**, connecting sensors to the cloud or a local network.
- A **controller**, managing other devices or responding to real-time data.
- A **data logger**, storing and analyzing readings locally.

1.2 Features of Raspberry Pi 5 Model B

- **Processor:** 64-bit Quad-core Arm Cortex-A76 CPU @ 2.4GHz
- **RAM:** Available in 4GB and 8GB LPDDR4X memory configurations
- **Graphics:** VideoCore VII GPU supporting dual 4Kp60 display via micro-HDMI
- **Storage:** microSD card slot and PCIe 2.0 for external SSD support
- **Connectivity:**
 - Gigabit Ethernet
 - USB 3.0 and USB 2.0 ports
 - Dual-band 2.4GHz and 5.0GHz IEEE 802.11ac Wi-Fi
 - Bluetooth 5.0
- **Power:** USB-C connector with Power Delivery (PD) support
- **GPIO:** 40-pin GPIO header (backward compatible with previous models)
- **Other Ports:** 2 × Camera Serial Interface (CSI), 2 × Display Serial Interface (DSI)

1.3 Key Components on the Raspberry Pi 5 Board

Component	Description
CPU	Quad-core Cortex-A76 for high performance
RAM	4GB or 8GB LPDDR4X for multitasking and heavy workloads
USB Ports	2 × USB 3.0 and 2 × USB 2.0 for peripherals
HDMI Ports	Dual micro-HDMI for dual display support
GPIO Pins	40-pin header for sensor, actuator, and hardware interfacing
microSD Slot	For OS installation and data storage
Camera and Display Ports	For connecting Pi Camera Module and display screens
Ethernet Port	High-speed networking
Wi-Fi & Bluetooth	Wireless connectivity for IoT and remote access
Power Input (USB-C)	For powering the device safely and efficiently

1.4 Applications of Raspberry Pi in IoT

- **Home Automation:** Smart lighting, door locks, and surveillance systems
 - **Environmental Monitoring:** Temperature, humidity, gas, and air quality sensors
 - **Industrial IoT:** Machine monitoring, predictive maintenance
 - **Smart Agriculture:** Soil moisture sensing, irrigation control
 - **Health Monitoring:** Wearable health devices and data logging
 - **Edge Computing:** Data preprocessing before sending to the cloud
 - **Learning & Prototyping:** Ideal for educational projects, coding, and circuit testing
 - **Robotics:** Used as the brain of robots for control and navigation
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1.5 Diagram

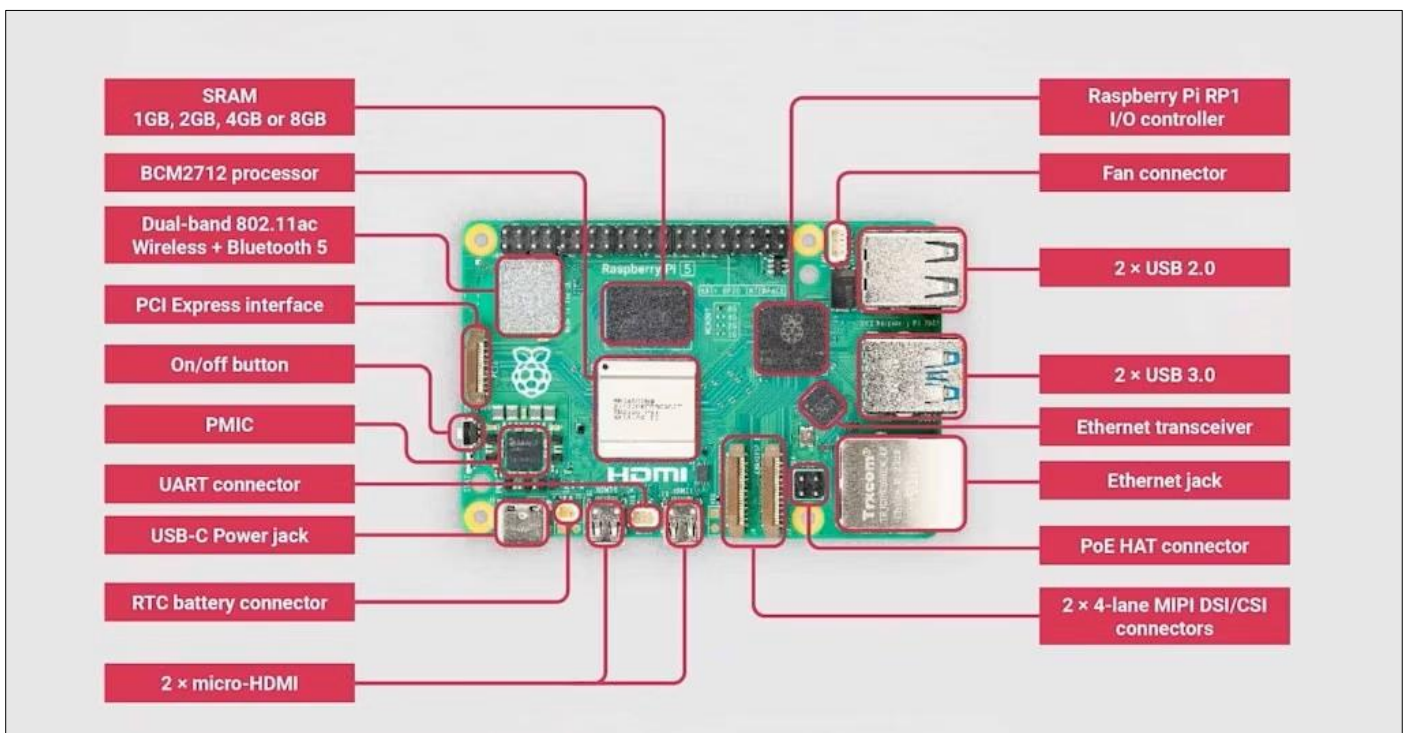


Figure 1: Raspberry Pi 5 Model B

1.6. Conclusion

In this practical, we studied the Raspberry Pi 5 Model B, its setup process, and key features. We learned how it serves as a powerful tool for IoT applications due to its GPIO capabilities, connectivity options, and ease of use. This forms the basis for future experiments involving sensors and automation.
