Practical 9: Study of Working of Keyboard, Mouse, Scanner, Monitor & Printer with Their Interface Types, and Troubleshooting of Motherboard, Keyboard & Mouse

1. Introduction

Input and output devices are essential components of a computer. They help users interact with the system.
 In this practical, we study the working and interfaces of:

- Keyboard

- Mouse

- Scanner

- Monitor

- Printer

We also learn how to troubleshoot common problems in the motherboard, keyboard, and mouse.

2. Working of Keyboard

A **keyboard** is an input device that converts keypresses into electrical signals understood by the computer.

2.1 Working

1. When a key is pressed, a **circuit completes** beneath the key.

2. A **scan code** is generated.

3. Keyboard controller sends this scan code to the computer through a communication protocol.

4. Operating system converts scan codes into characters or commands.

2.2 Keyboard Interface Types

- **PS/2 Port** → Round purple port (older computers).

- **USB Keyboard** → Most common today.

- **Wireless Keyboard** → Uses Bluetooth or wireless receiver.

- **Mechanical / Membrane Keyboard** → Types based on key switches.

3. Working of Mouse

A **mouse** helps in pointer movement and selection on the screen.

3.1 Working

Optical Mouse:

1. A small LED shines light on the surface.

2. A tiny camera captures images rapidly.

3. The sensor detects movement by comparing image changes.

4. Pointer moves on the screen based on the detected movement.

Laser Mouse:

- Works similarly but uses laser light for higher accuracy.

3.2 Mouse Interface Types

- **USB Mouse**

- **PS/2 Mouse** (green port)

- **Wireless Mouse** (Bluetooth or RF receiver)

4. Working of Scanner

A **scanner** converts physical documents or images into digital form.

4.1 Working

1. A light source illuminates the document.

2. The reflected light is captured by **CCD (Charge Coupled Device)** or **CIS (Contact Image Sensor)**.

3. Light is converted into electrical signals.

4. These signals are processed into digital image data.

4.2 Scanner Interface Types

- **USB Interface** (most common)

- **WiFi / Wireless** → For advanced scanners

- **SCSI / FireWire** → Older high-speed scanners

- **Network Scanner** → Connected via LAN

5. Working of Monitor

A **monitor** is the primary output device for displaying visual information.

5.1 Working

LCD/LED Monitors:

1. Backlight (LEDs) emits white light.

2. Light passes through **liquid crystal cells**.

3. LCD cells block or allow light to create images.

4. Colors are formed using RGB (red, green, blue) sub-pixels.

OLED Monitors:

- Each pixel emits its own light → deeper blacks & high contrast.

5.2 Monitor Interface Types

- **VGA** (Analog)

- **HDMI** (Digital audio + video)

- **DisplayPort** (High refresh rate)

- **DVI** (Digital video)

- **USB-C Display** (Modern laptops)

6. Working of Printer

Printers convert digital text/images into physical printouts.

6.1 Types & Working

1. Inkjet Printer

- Sprays tiny droplets of liquid ink on paper.

- Uses CMYK colored inks.

- Good for photo printing.

2. Laser Printer

1. Laser writes image onto a rotating drum.

2. Drum attracts toner powder using electric charge.

3. Toner is transferred to paper.

4. Fuser rollers heat and permanently fix toner.

3. Dot Matrix Printer

- Uses pins striking ink ribbon.

- Used in billing counters.

6.2 Printer Interface Types

- **USB**

- **Wi-Fi / Wireless Printing**

- **Ethernet (LAN printers)**

- **Bluetooth**

- **Parallel Port** (old printers)

7. Troubleshooting

7.1 Motherboard Troubleshooting

Common Issues & Fixes:

1. **No Power / No Boot**

   - Check SMPS connections.

   - Check 24-pin ATX and 8-pin CPU connector.

   - Verify power switch connection on front panel.

2. **Continuous Beeps**

   - Indicates RAM or GPU problem.

   - Reseat RAM stick & clean contacts.

   - Check if display cable is connected.

3. **CPU Overheating**

   - Check CPU fan connection.

   - Reapply thermal paste.

4. **No Display**

   - Check RAM properly inserted.

   - Try GPU output or motherboard HDMI.

5. **USB Ports Not Working**

   - Verify BIOS settings.

   - Check front panel USB header cables.

7.2 Keyboard Troubleshooting

1. **Keyboard Not Detected**

   - Try different USB port.

   - Check cable damage.

   - Restart system.

2. **Some Keys Not Working**

   - Clean dust under keys.

   - Check for liquid damage.

   - Update keyboard drivers.

3. **Typing Wrong Characters**

   - Change keyboard layout (English US).

   - Check Num Lock/Caps Lock.

7.3 Mouse Troubleshooting

1. **Pointer Not Moving**

   - Clean optical sensor.

   - Change surface/mousepad.

   - Try different USB port.

2. **Mouse Freezes**

- Replace battery (wireless).

- Reconnect receiver.

- Update driver.

3. **Double Click Issue**

   - Adjust click speed in settings.

   - Replace worn-out mouse button switch.