

Draft Study Material

FIELD TECHNICIAN COMPUTING PERIPHERALS

(Job Role)

(Qualification Pack: Ref. Id. ELE/Q4601)

Sector: Electronics

(Grade XII)

विद्यया ऽ मृतमश्नुते



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NCERT

PSS CENTRAL INSTITUTE OF VOCATIONAL EDUCATION

(a constituent unit of NCERT, under Ministry of Education, Government of India)

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Preface

Vocational Education is a dynamic and evolving field, and ensuring that every student has access to quality learning materials is of paramount importance. The journey of the PSS Central Institute of Vocational Education (PSSCIVE) toward producing comprehensive and inclusive study material is rigorous and time-consuming, requiring thorough research, expert consultation, and publication by the National Council of Educational Research and Training (NCERT). However, the absence of finalized study material should not impede the educational progress of our students. In response to this necessity, we present the draft study material, a provisional yet comprehensive guide, designed to bridge the gap between teaching and learning, until the official version of the study material is made available by the NCERT. The draft study material provides a structured and accessible set of materials for teachers and students to utilize in the interim period. The content is aligned with the prescribed curriculum to ensure that students remain on track with their learning objectives.

The contents of the modules are curated to provide continuity in education and maintain the momentum of teaching-learning in vocational education. It encompasses essential concepts and skills aligned with the curriculum and educational standards. We extend our gratitude to the academicians, vocational educators, subject matter experts, industry experts, academic consultants, and all other people who contributed their expertise and insights to the creation of the draft study material.

Teachers are encouraged to use the draft modules of the study material as a guide and supplement their teaching with additional resources and activities that cater to their students' unique learning styles and needs. Collaboration and feedback are vital; therefore, we welcome suggestions for improvement, especially by the teachers, in improving upon the content of the study material.

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Module 1**Repair and Maintenance of Desktop Computer and Peripherals****Module Overview**

This module provides learners with essential skills in diagnosing, repairing, and maintaining computer peripherals and hardware. It covers common hardware and software issues, disassembly and reassembly techniques, and preventive maintenance practices. Learners will also explore post-repair testing, documenting work reports, and collecting customer feedback to ensure system reliability and enhance service quality.

Learning Outcomes

After completing this module, you will be able to:

- Identify and perform basic repair and maintenance tasks on computer peripheral devices.
- Diagnose and troubleshoot common hardware and software issues in desktop computers.
- Safely disassemble, reassemble, and apply preventive maintenance techniques on a computer system.
- Verify desktop functionality after repair and prepare work reports and customer feedback documentation.

Module Structure

Session 1. Repair and Maintenance in Computer peripherals

Session 2. Hardware and Software Issues in Computers

Session 3. Disassembly and Reassembly and Preventive maintenance

Session 4. Post-Repair Desktop Functionality & work report, customer feedback

Session 1. Repair and Maintenance in Computer peripherals

In today's digital age, computer peripherals have become indispensable tools for work, education, and entertainment. From keyboards and mice to monitors and printers, these devices significantly enhance our interaction with computers. However, like any other electronic device, computer peripherals are subject to wear and tear, malfunction, and eventual obsolescence. Repair and maintenance of desktop computers and peripherals are essential skills in today's digital world. As technology plays a central role in both personal and professional environments, keeping computers and their associated devices functioning smoothly is crucial. This field involves diagnosing and fixing hardware and software issues, ensuring that desktops, monitors, printers, keyboards, and other peripherals operate efficiently. Basic Key Components of Repair and Maintenance of Desktop Computer. (Figure 1.1)



Fig. 1.1: Computer peripherals

Basic Components of Computer Peripherals

Power Supply Unit (PSU)

The Power Supply Unit (PSU) is a critical component within a computer system. It acts as an intermediary, converting the alternating current (AC) power received from the mains supply into the direct current (DC) power required by various internal components such as the CPU, GPU, RAM, and storage drives. (Figure 1.2)

Hardware Parts: Power Supply Unit

Function: Supplies power to all internal components of the computer.

Maintenance: Regularly check for overheating, loose cables, and signs of wear. Replace if there are issues like sudden shutdowns or failure to power up.



Fig. 1.2: PSU

Motherboard

The motherboard is the central hub of a computer system. Think of it as the backbone that connects and allows communication between all the other components. (Figure 1.3)

Hardware Parts: Motherboard

Function: The main circuit board that connects all internal components, including CPU, RAM, storage devices, and peripherals

Maintenance: Ensure all connections are secure. Look for damaged or burnt components. Clean the motherboard periodically to remove dust buildup



Fig. 1.3: Motherboard

Central Processing Unit (CPU)

The CPU is often referred to as the "brain" of the computer. It's the core component responsible for executing instructions and performing calculations within a computer system. Think of it as the central command center that controls all the operations. (Figure 1.4)

Hardware Parts: Central Processing Unit

Function: The "brain" of the computer, performing calculations and processing instructions.

Maintenance: Clean the CPU cooling fan, check thermal paste for proper application, and monitor temperature. Overheating can cause CPU failure.

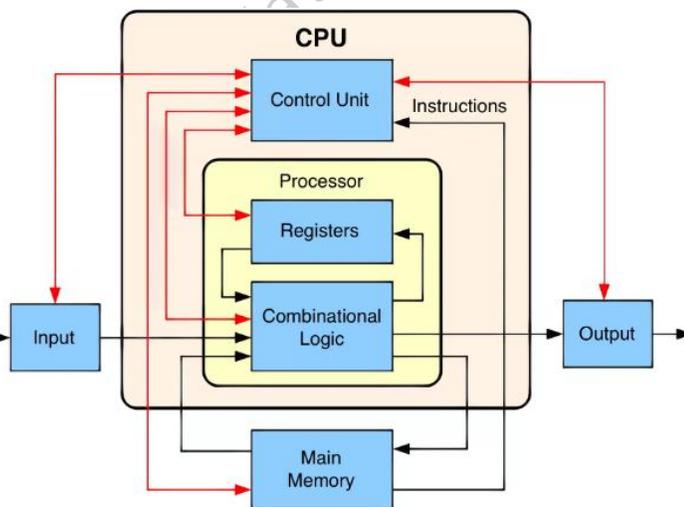


Fig. 1.4: Structure of CUP

Random Access Memory (RAM)

RAM serves as the primary memory of a computer system, acting as a high-speed workspace for the CPU. It's crucial for efficient system operation as it allows for rapid data access and manipulation. (Figure 1.5)

Hardware Parts: Random Access Memory

Function: Temporary memory used to store data that is actively being processed by the CPU.

Maintenance: Check for any errors or faulty RAM using diagnostic software. Ensure RAM is properly seated and free from dust or dirt.



Fig. 1.5: RAM

Storage Drives (HDD/SSD)

Hard Disk Drives (HDDs) and Solid-State Drives (SSDs) serve as crucial components within a computer system, acting as long-term storage repositories for data and software. While both fulfill the fundamental role of storing information. (Figure 1.6)

Hardware Parts: Storage Drives (HDD/SSD)

Function: Used to store data, programs, and the operating system.

Maintenance: Regularly check disk health using tools like *CHKDSK* or third-party software. Ensure there is enough free space to prevent system slowdowns.

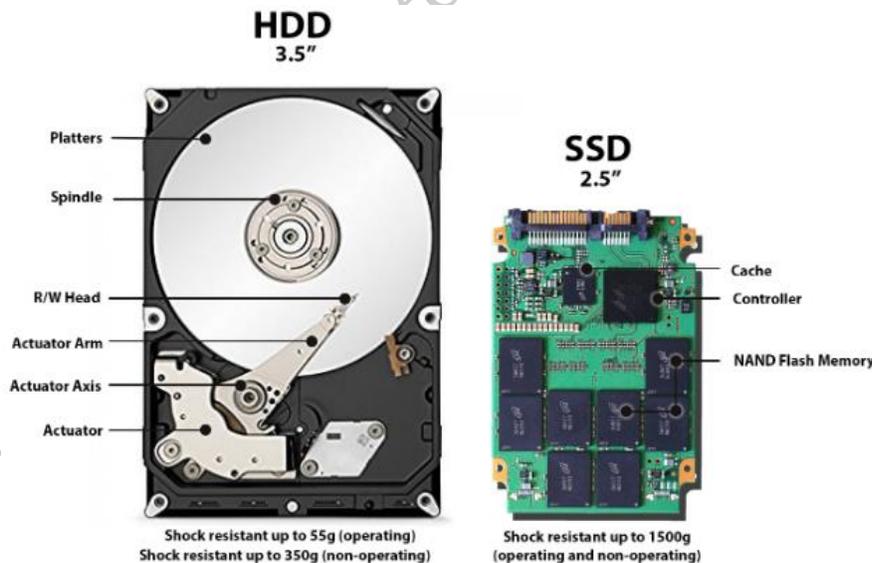


Fig. 1.6: HDD/SSD

Graphics Processing Unit (GPU)

The Graphics Processing Unit (GPU) is a specialized processor dedicated to handling the complex calculations involved in creating and displaying visuals on a computer. Unlike the CPU, which excels at general-purpose computing, the GPU is optimized for parallel processing, making it ideal for tasks like rendering images, videos, and 3D models. By working in tandem with the CPU, the

GPU delivers smooth, realistic visuals in applications such as gaming, video editing, and 3D modeling. (Figure 1.7)

Hardware Parts: Graphics Processing Unit (GPU)

Function: Handles rendering of images and videos, especially important for gaming, video editing, and graphical tasks.

Maintenance: Keep the GPU clean and check for overheating. Make sure the drivers are up to date.

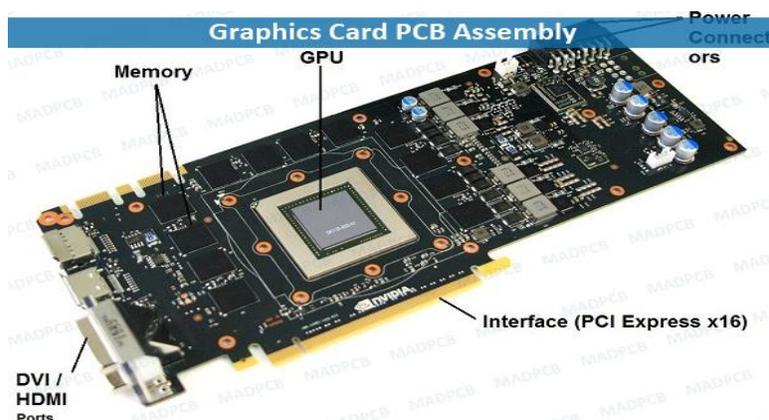


Fig. 1.7: Graphic card

Cooling System (Fans, Heat Sinks)

Computer components, particularly the CPU and GPU, generate significant heat during operation. This heat, if left unchecked, can lead to system instability, performance degradation, and even permanent hardware damage. To prevent overheating, effective cooling systems are essential. These systems typically involve a combination of heat sinks and fans. Heat sinks are passive cooling devices made of materials with high thermal conductivity, such as aluminum or copper. They are designed to efficiently absorb heat generated by components like the CPU and GPU and then dissipate it into the surrounding air. Fans actively circulate air within the computer case, accelerating the cooling process. They work in conjunction with heat sinks by drawing cool air across the heatsink fins, facilitating faster heat dissipation. (Figure 1.8)

Hardware Parts: Cooling System (Fans, Heat Sinks)

Function: Prevents the components from overheating.

Maintenance: Regularly clean the fans and heat sinks from dust. Ensure that airflow is not blocked and that fans are functioning properly.



Fig. 1.8: Cooling Fan

Peripheral Devices

Peripheral devices are the external components that connect to a computer to allow for input, output, and storage of data. These devices expand the functionality of the computer beyond its internal components, enabling users to interact with the system and exchange information with the outside world. (Figure 1.9)

Hardware Parts: Peripheral Devices

Function: Devices like the monitor, keyboard, mouse, printer, etc., that connect to the computer.

Maintenance: Check connections, clean devices, and ensure drivers for peripherals are updated.



Fig. 1.9: External Components

Operating System and Software

The operating system is the foundation of a computer system, acting as an intermediary between the user and the hardware. It manages all the resources of the computer, including memory, processor time, and peripheral devices, allowing users to interact with the computer and run applications. Software, on the other hand, encompasses all the programs and applications that run on top of the operating system, enabling users to perform specific tasks such as browsing the internet, creating documents, editing photos, and playing games. (Figure 1.10)

Hardware Parts: Operating System and Software

Function: The OS manages the hardware and software, and software provides the tools and programs used by the user.

Maintenance: Regularly update the operating system and software. Run disk cleanup tools to remove unnecessary files and prevent system slowdown.



Fig. 1.10 Operating system

Cables and Connectors

Cables and connectors are the essential pathways for data transmission and power flow within a computer system and between devices. Cables act as conduits for electrical signals, transmitting data between components like the CPU, RAM, and peripherals, while connectors facilitate the physical connection between cables and devices. The types of cables and connectors used vary depending on the specific application and the devices being connected. For example, USB cables are used for connecting peripherals like keyboards, mice, and external drives, while HDMI cables are used for transmitting high-definition video and audio signals to displays. The reliability and quality of cables and connectors significantly impact the overall performance and stability of a computer system. (Figure 1.11)

Hardware Parts: Cables and Connectors

Function: Connects all the components to each other (power cables, data cables, USB cables, etc.).

Maintenance: Inspect cables for wear, fraying, or damage. Ensure proper connections and replace damaged cables.



Fig. 1.11 Cables and Connectors

11. BIOS/UEFI Firmware: BIOS (Basic Input/output System) and its successor, UEFI (Unified Extensible Firmware Interface), are essential firmware interfaces that reside on the motherboard. They act as the intermediary between the computer's hardware and the operating system. During the boot process, BIOS/UEFI initializes and tests the computer's hardware components, loads the operating system from storage, and provides a basic interface for users to configure system settings. UEFI, a more modern standard, offers several advantages over BIOS, including faster boot times, support for larger hard drives, and enhanced security features. (Figure 1.12)

Hardware Parts: BIOS/UEFI Firmware

Function: Low-level software that helps the motherboard communicate with the operating system.

Maintenance: Update BIOS/UEFI if needed to fix bugs, improve performance, or support newer hardware.

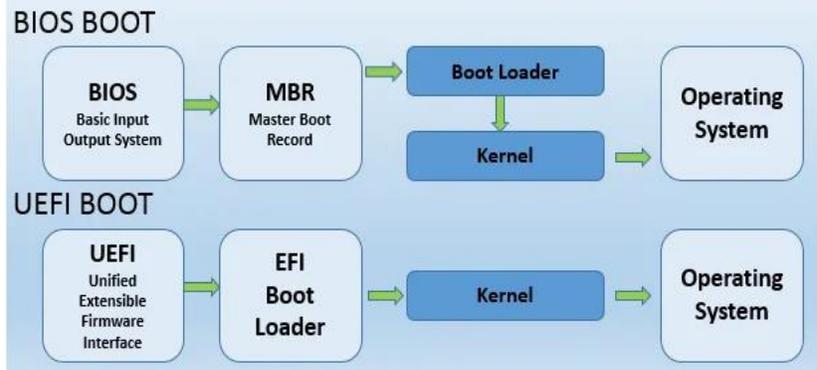


Fig. 1.12 Structure of BIOS

Methods of detect problems a computer system & peripheral

Detecting problems with a computer system and its peripherals is essential for maintaining their performance and functionality. It involves identifying issues that may arise due to hardware faults, software errors, or external factors. By using diagnostic tools, inspecting physical components, and performing systematic checks, users can pinpoint the source of the problem. This process ensures timely troubleshooting, reduces downtime, and helps in maintaining the overall efficiency of the system. Here are some common methods to detect problems with a computer system and its peripherals, divided into internal and external checks:

Internal Methods

Internal Methods to Detect Problems in a Computer System and Its Peripherals involve using software tools, system logs, and diagnostic utilities to identify and resolve issues within the computer. These methods focus on detecting problems related to the internal components, such as the motherboard, CPU, memory, hard drive, and software. Here are key internal methods:

1. System Diagnostic Tools

Use built-in diagnostics (e.g., Windows Memory Diagnostic, BIOS/UEFI tests) to check hardware performance and identify potential issues as shown in Figure 1.13.

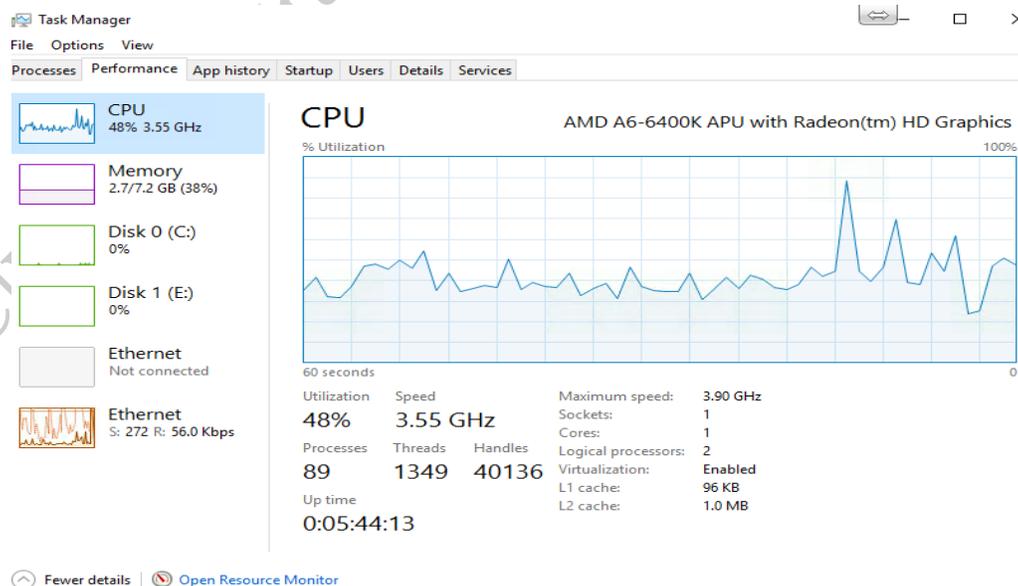


Fig. 1.13: Task manager

2. Event Logs

Analyze system logs, such as the Event Viewer in Windows, to detect errors, warnings, or malfunctions in hardware and software as shown in Figure 1.14.

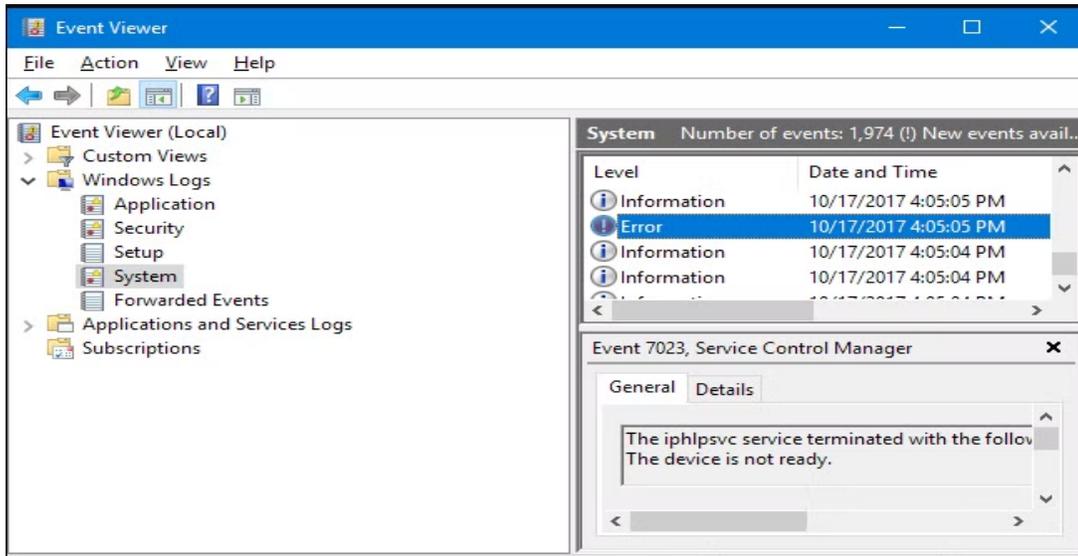


Fig. 1.14: Event Viewer

3. Antivirus and Malware Scans

Run antivirus software to detect and remove malware or viruses that may cause system or peripheral issues as shown in Figure 1.15.

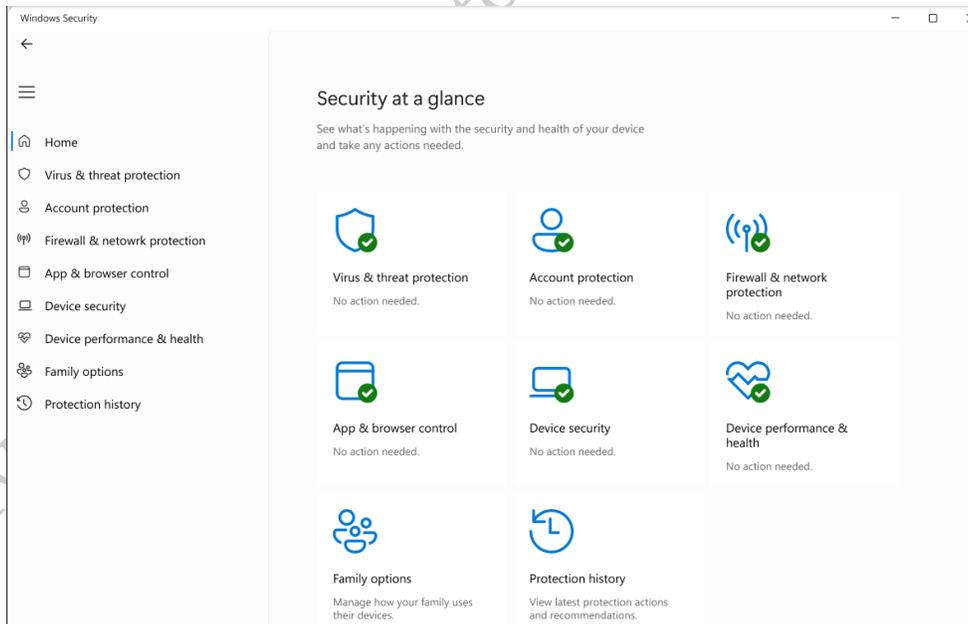


Fig. 1.15: Security

4. Driver Checks

Inspect and update device drivers via the Device Manager to ensure they are not outdated or corrupted as shown in Figure 1.16.

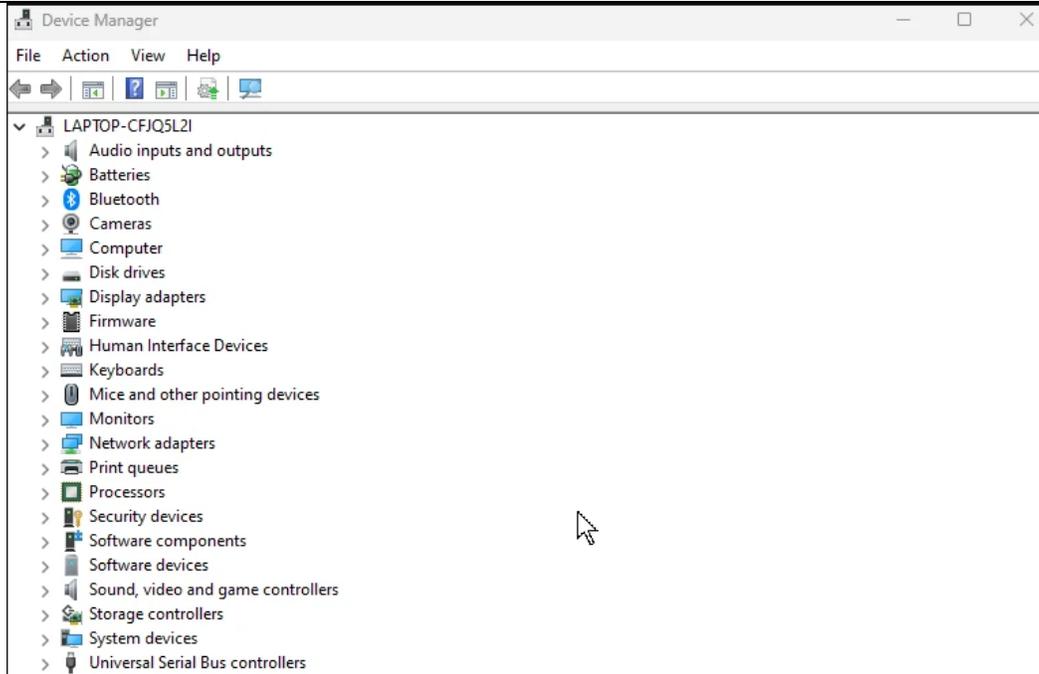


Fig. 1.16: Device manager

5. Performance Monitoring

Use tools like Task Manager or Resource Monitor to track CPU, memory, disk, and network usage, which can indicate problems like overheating or overloading as shown in Figure 1.17.

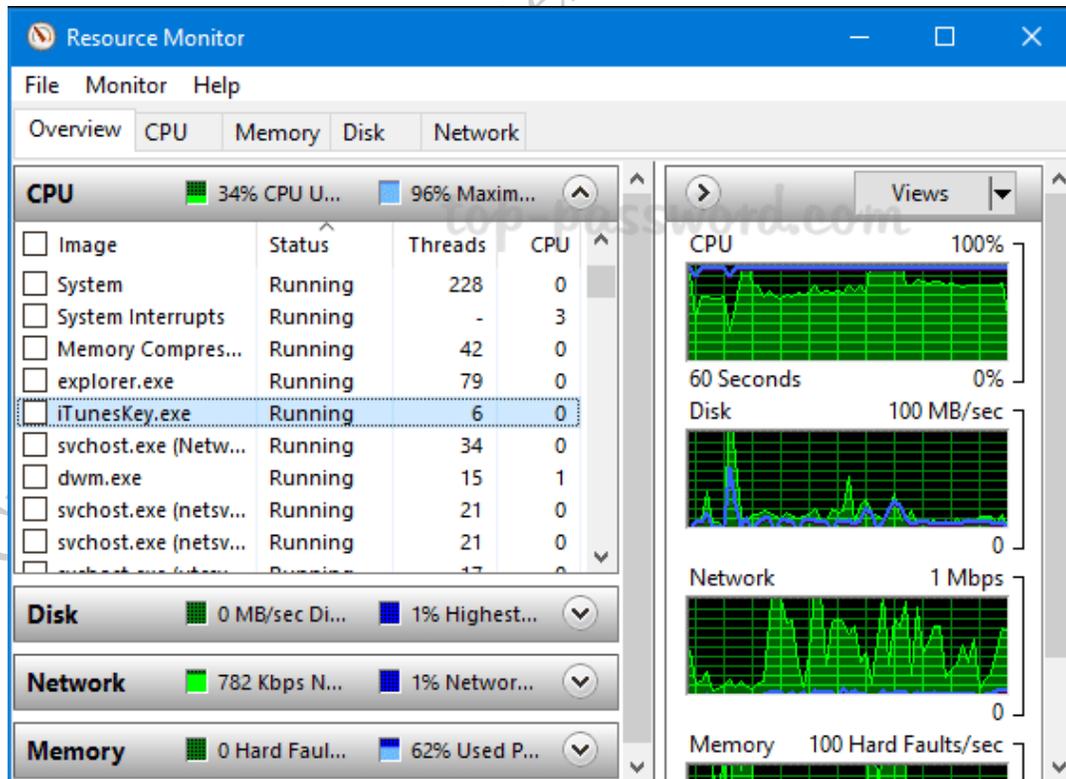


Fig. 1.17: Resource Monitor

6. Stress Testing

Perform stress tests on components like CPU, GPU, and RAM to identify overheating, bottlenecks, or instability as shown in Figure 1.18.

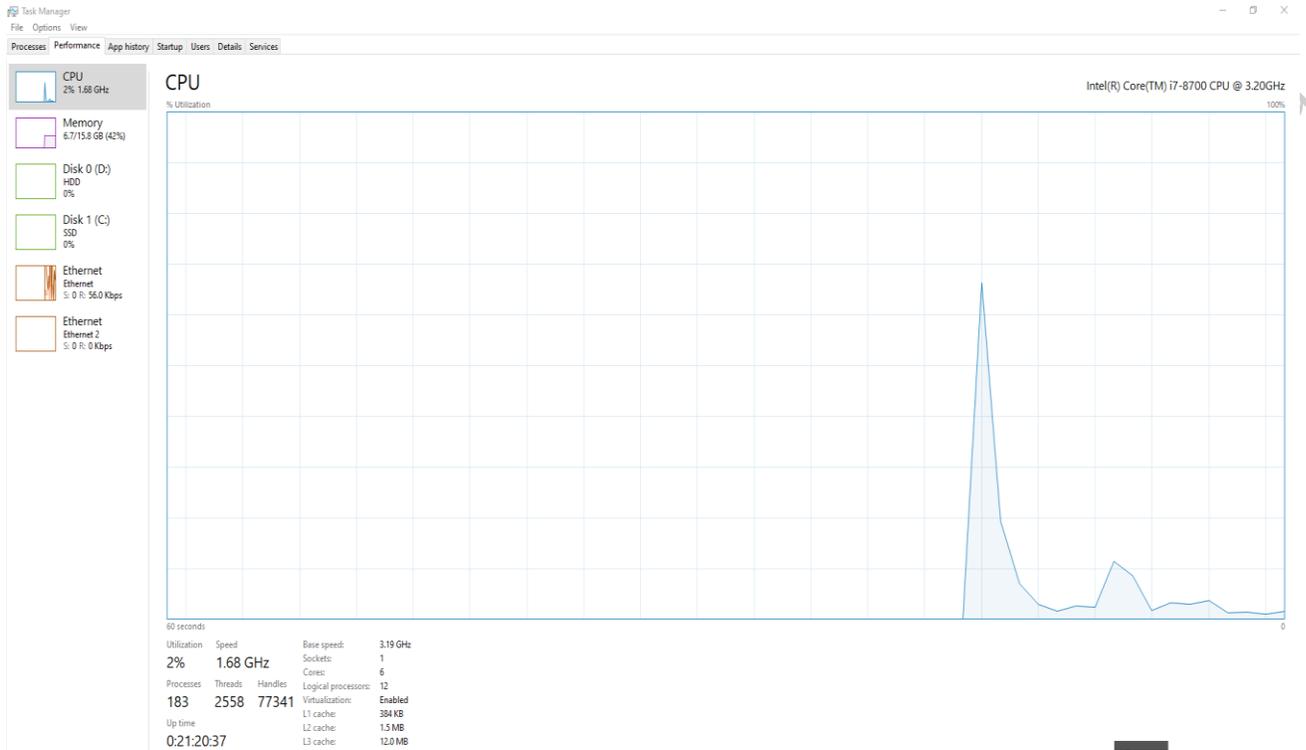


Fig. 1.18: Performance checking in Task Manager

7. Firmware Updates

Check and update the firmware of devices, including motherboards and connected peripherals, to fix compatibility or performance issues as shown in Figure 1.19.

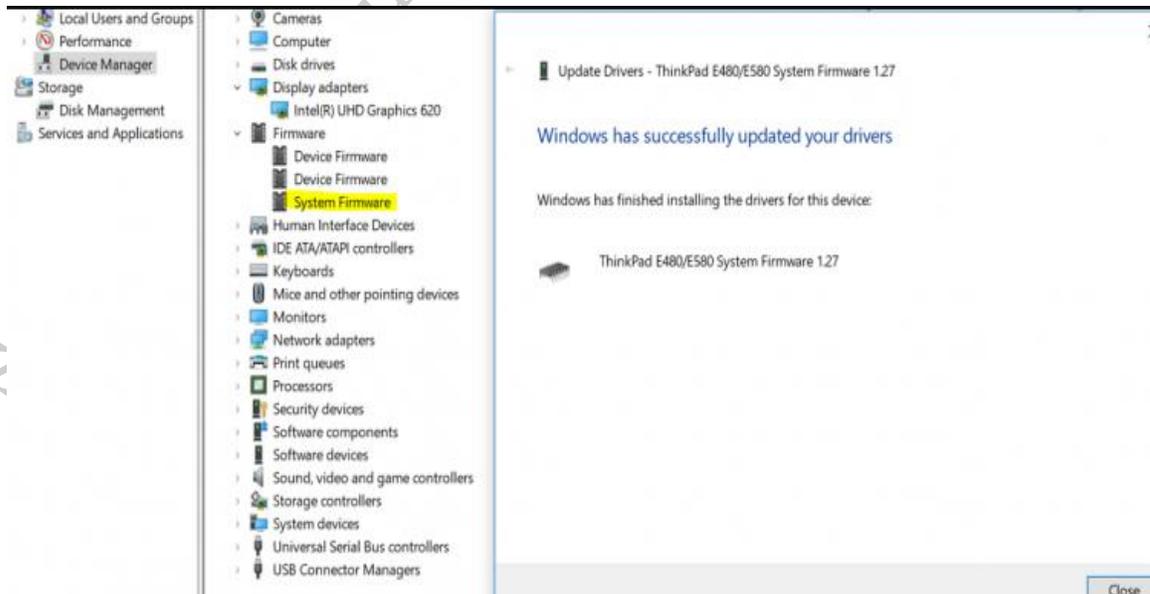


Fig. 1.19: Check and update the firmware

External Methods

External Methods to Detect Problems in a Computer System and Its Peripherals refer to the troubleshooting steps that involve inspecting and testing the physical components, connections, and external devices connected to the computer. These methods help identify issues that may not be visible through internal diagnostics. Here are key external methods:

1. Physical Inspection

Check cables, connectors, and power sources for visible damage, loose connections, or wear that could affect performance.

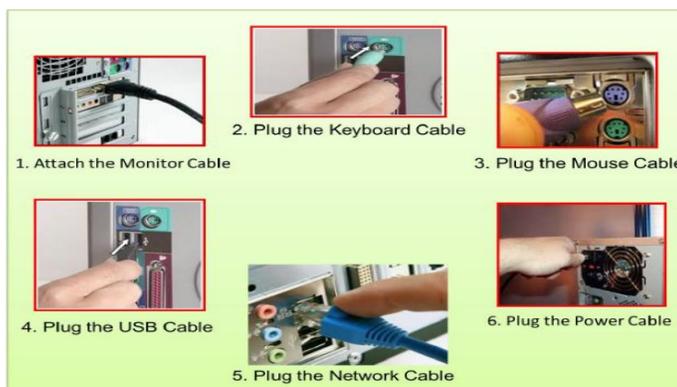


Fig. 1.20: Checking cabling and ports

2. Peripheral Testing

Test external devices like keyboards, mice, printers, and monitors by connecting them to another working system. This helps identify whether the problem lies with the peripheral or the computer. As shown in Figure 1.21.



Fig. 1.21: Testing for external devices

3. Testing for External devices

Test USB, HDMI, or other ports by plugging in known working devices. If the device works on another computer or port, the issue may be with the original port.



1.22 Testing for USB, HDMI, or other ports

4. External Diagnostic Tools

Use tools like a multimeter to test power supplies or voltages to ensure they meet the required specifications for the computer and its peripherals as shown in Figure 1.23.



Fig. 1.23: Using tools

5. Environmental Checks

Make sure the computer and peripherals are in a dust-free, cool environment. Dust or heat buildup can cause hardware failure as shown in Figure 1.24.



Fig. 1.24: Dusting

6. Testing with Different Power Sources

If the computer or peripherals aren't working, try connecting them to different power cables, outlets, or surge protectors to rule out power supply problems as shown in Figure 1.25.



Fig. 1.25: Testing Power cables

7. Monitor Display Check

If the monitor shows no display, try connecting it to another computer or use a different monitor to identify if the issue is with the monitor or the computer's video output as shown in Figure 1.26.

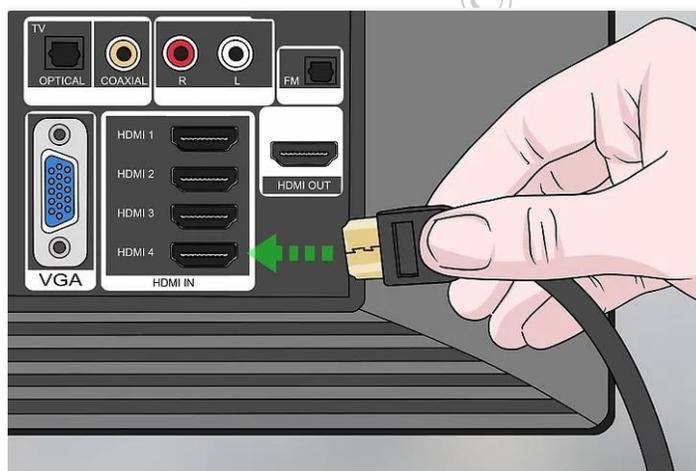


Fig. 1.26: HDMI cable checking for Display

Time Required for repair and maintenance

The process of repairing a computer can frequently require a substantial amount of time, primarily due to factors such as the type of repair essential, availability of spare parts, severity of the complication, and the skill level of the technician.

Factors Affecting Computer Repair Time

Type of Repair

The time it takes to fix a computer depends on the problem. Small problems like software errors, driver issues, or removing viruses can usually be solved in a few hours. However, fixing hardware issues, like replacing a damaged part or repairing a broken screen, takes more time because it needs careful checking and part replacement. (Figure 1.27)



Fig. 1.27: Work for Repairing

Availability of Spare Parts

If a computer needs new parts, the time to fix it depends on how easy it is to find those parts. Common parts like RAM or hard drives are easy to get and replace quickly. But rare or old parts can take longer to find, which might delay the repair. (Figure 1.28)



Fig. 1.28: Common Parts in Computer system

Complexity of the Issue

The time to fix a problem depends on how difficult it is. Easy software problems can be solved quickly. But harder issues, like fixing a broken motherboard or recovering data from a damaged hard drive, need more time to figure out and repair. (Figure 1.29)

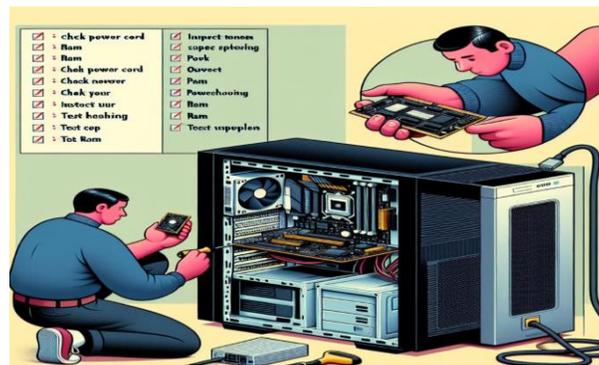


Fig. 1.29: Solving Problem

Technician's Skill and Experience

The skill and experience of the technician fixing the computer can affect how long the repair takes. An experienced technician who knows computer repair well can quickly find and fix problems. However, a less experienced technician may take more time to figure out and solve the issue. (Figure 1.30)

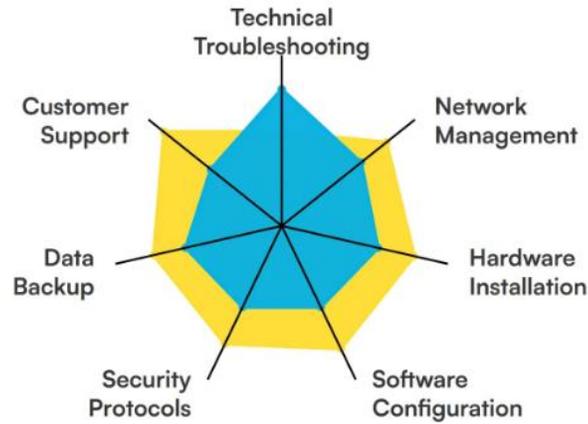


Fig. 1.30: Technical Troubleshooting

Concept of Turnaround Time (TAT)

Turnaround Time (TAT) refers to the amount of time taken to complete a specific task or process. In the context of hardware and peripherals of a computer system, Turnaround Time (TAT) is the period between when a customer reports a problem or submits a device for repair and when the issue is resolved, and the device is returned to the customer in working condition. TAT in the context of computer hardware refers to the total time from when the customer hands over the faulty hardware or peripherals (such as a computer, printer, mouse, keyboard, or monitor) for repair until it is fixed and returned. Calculating $TAT = \text{Completion Time} - \text{Arrival Time}$ (Figure 1.31 & 1.32)

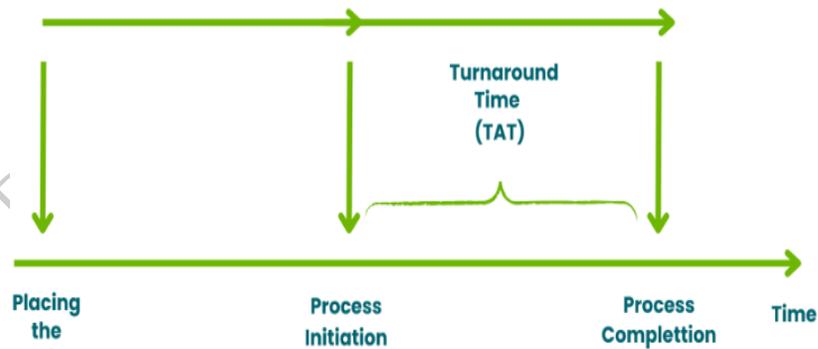


Fig. 1.31 Turnaround Time

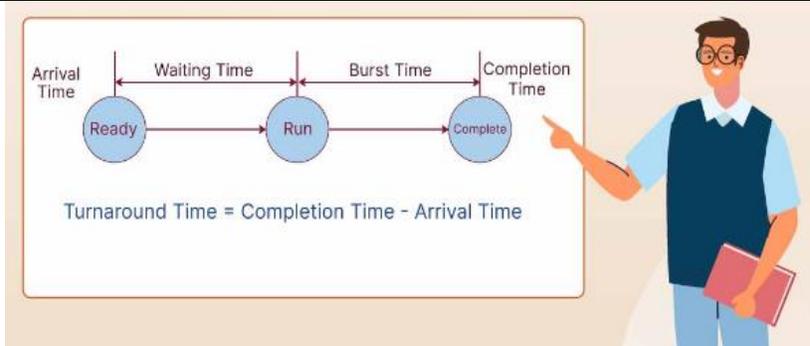


Fig. 1.32 Calculating TAT

Factors Affecting TAT

1. Nature of the Problem: Simple issues like software glitches or loose connections take less time, while more complex issues like motherboard failures or data recovery take longer.
2. Availability of Spare Parts: If replacement parts are easily available, the repair will be faster. If rare or outdated parts are needed, it may take longer to find replacements.
3. Technician's Skill and Experience: Experienced technicians can complete repairs faster and more accurately, reducing TAT. Novice technicians may require more time to troubleshoot.
4. Repair Process Complexity: Some repairs, such as replacing a faulty power supply or fixing a cracked screen, are straightforward, while others, like fixing motherboard damage or recovering data from a failing hard drive, require more detailed work.
5. External Factors: Environmental factors, such as the workload in the service center, workload of the technician, and availability of tools, can also influence TAT.

Types of TAT Metrics

Standard TAT: Service centers often have a standard turnaround time, which could range from a few hours to several days, depending on the complexity of the issue.

Critical TAT: In urgent cases, where the customer needs the repair done quickly, a faster turnaround time might be prioritized, sometimes involving additional costs for expedited service.

Importance of TAT:

- A shorter TAT increases customer satisfaction, as they can get their devices back quickly and minimize downtime.
- TAT is a critical metric used by service centers to measure their operational efficiency and improve service quality.
- Faster repair times can lead to higher customer loyalty and positive reviews, while long TATs can cause dissatisfaction and lead to customers seeking alternative service providers.

Final TAT:

Total Turnaround Time (TAT) = 3 business days.

In this case, the TAT promised to the customer was 3 days, and the service was completed on time, ensuring customer satisfaction.

Practical Activity: Give the list of established methods to detect problems with a computer system and peripherals.

Objective: To gain hands-on experience in detecting and resolving common computer and peripheral issues.

Materials:

A computer system with various peripherals keyboard, mouse, monitor, speakers, etc.

Access to the internet.

A list of common computer problems.

Step	Activity	Observations/Actions
1.	Problem Identification	
2.	Visual Inspection	
3.	Basic Checks	
4.	Software Checks	
5.	Peripheral-Specific Checks	
6.	Diagnostic Tools	
7.	Event Log Review	
8.	System Monitoring	
9.	Troubleshooting and Resolution	
10.	Documentation	

Check Your Progress

A. Multiple-choice questions (MCQs)

- Which of the following is NOT a common preventative maintenance task for a desktop computer? (a) Cleaning the keyboard and mouse (b) Defragmenting the hard drive (c) Replacing the motherboard (d) Running antivirus scans
- What is the purpose of thermal paste on a CPU? (a) To increase CPU speed (b) To improve CPU aesthetics (c) To prevent overheating (d) To reduce CPU noise
- What is the most common cause of a computer overheating? (a) Insufficient power supply (b) Faulty RAM (c) Dust accumulation (d) Outdated drivers
- Which of the following is a common symptom of a failing hard drive? (a) Slow startup times (b) Frequent system crashes (c) Clicking or grinding noises (d) All of the above
- What is the best way to clean a computer monitor screen? (a) Use a dry cloth (b) Use a damp cloth with glass cleaner (c) Use a paper towel (d) Use a microfiber cloth with screen cleaner
- Which of the following is NOT a common input device? (a) Keyboard (b) Mouse (c) Monitor (d) Scanner
- What is the purpose of a UPS (Uninterruptible Power Supply)? (a) To protect the computer from power surges (b) To increase internet speed (c) To improve computer performance (d)

To reduce noise pollution

8. Which of the following is a common output device? (a) Printer (b) Microphone (c) Webcam (d) Joystick
9. What is the best way to dispose of old computer components? (a) Throw them in the trash (b) Recycle them at an electronics recycling center (c) Burn them (d) Bury them in the ground
10. What is the first step in troubleshooting a computer problem? (a) Replacing the motherboard (b) Reinstalling the operating system (c) Checking for physical damage (d) Updating drivers

B. True or False

1. Dust accumulation inside a computer can cause overheating.
2. A UPS (Uninterruptible Power Supply) protects a computer from power surges.
3. Defragmenting a hard drive can improve computer performance.
4. It is safe to dispose of old electronics in the regular trash.
5. Drivers are software that allow the operating system to communicate with hardware devices.
6. The CPU is the primary storage device for a computer.
7. A virus scan is a crucial part of regular computer maintenance.
8. Cleaning the outside of a monitor with any household cleaner is safe.
9. The BIOS is responsible for loading the operating system when the computer starts.
10. Overheating can damage the CPU and other components.

C. Short Questions

1. What is the purpose of thermal paste on a CPU?
2. List two common causes of computer overheating.
3. What is the function of RAM in a computer?
4. Why is it important to keep your computer's drivers updated?
5. What is the purpose of a UPS (Uninterruptible Power Supply)?
6. Name two common input devices and two common output devices.
7. What is the best way to clean a computer monitor screen?
8. How often should you perform basic computer maintenance tasks (e.g., dusting, virus scans)?
9. What are some signs that your hard drive might be failing?
10. Why is it important to properly dispose of old electronic equipment?

Session 2. Hardware and Software Issues in Computers

Desktop computers and their peripherals are susceptible to a wide range of issues that can significantly impact their performance and functionality. Hardware problems encompass a spectrum of issues, including component failures such as malfunctioning hard drives, failing RAM modules, overheating CPUs due to inadequate cooling, and power supply issues. Loose or damaged connections, both internal and external, can also lead to intermittent or complete loss of functionality. Software-related problems are equally prevalent, ranging from malware infections

and software conflicts to driver incompatibility, outdated operating systems, and software bugs. These issues can manifest in various ways, including system crashes, slow performance, unexpected shutdowns, display problems, connectivity issues with peripherals, and data loss. Identifying and resolving these issues effectively requires a combination of diagnostic skills, troubleshooting techniques, and a thorough understanding of computer hardware and software. (Figure 2.1)



Fig. 2.1: Desktop computers and Peripherals

Types of faults in the computer system and peripherals

Faults in computer systems and peripherals refer to problems or malfunctions that disrupt the normal operation of hardware and software components. These faults can occur due to various reasons, such as wear and tear, environmental factors, software errors, or improper usage. Understanding the types of faults is essential for troubleshooting, as it helps identify the root cause and implement appropriate solutions to restore functionality. Faults are generally classified into two main categories: hardware faults and software faults.

Hardware faults

involve physical components like the motherboard, RAM, hard drive, power supply, or peripherals such as printers, keyboards, and monitors. These faults can result from overheating, electrical surges, or physical damage.

Software faults

on the other hand, relate to issues within the operating system, drivers, or installed applications, such as corrupted files, misconfigurations, or malware infections.

Practical Activity 2.1: Identifying and Troubleshooting Faults in a Computer System and Peripherals.

Objective

Learn to identify and troubleshoot common hardware and software faults in a computer system and peripherals.

Materials Needed

- Desktop or laptop computer
- Basic troubleshooting tools (screwdriver, multimeter)
- Internet access for downloading diagnostic tools

- Peripheral devices (printer, mouse, keyboard)

1. Identifying Hardware Faults

Step 1. Check the power supply. Attempt to turn on the computer. If it doesn't power up, test the power supply using a multimeter or replace it with a known working one. If the power supply is faulty, replacing it should resolve the issue. (Figure 2.2)



Fig. 2.2: Checking for Power supply

Step 2. Inspect internal hardware connections. Open the computer case and check if components like RAM, hard drive, and cables are properly connected. Loose connections should be secured to restore functionality. (Figure 2.3)



Fig. 2.3: Inspect of internal hardware connection

Step 3. Test peripherals. Connect peripherals like the keyboard and mouse to another computer to verify their functionality. they work on another device; the fault is in the original computer's ports. (Figure 2.4)



Fig. 2.4: Testing for connected peripherals devices

2. Identifying Software Faults

Step 1. Diagnose startup issues. Restart the computer and observe for error messages or boot failures. Errors like "Operating System Not Found" may indicate corrupted files or hard drive issues.

Step 2. Check for driver problems. Open Device Manager and look for warning signs (yellow exclamation marks). Missing or outdated drivers should be updated to fix device functionality.

Step 3. Run a virus scan. Use antivirus software to scan the system for malware. Malware should be removed to restore normal system behavior.

3. Troubleshooting Peripheral Devices

Step 1. Verify connections. USB or wireless connections of peripherals like printers or external hard drives. Reconnecting or changing ports may fix connection issues.

Step 2. Perform a print test (for printers). Print a test page to ensure proper functioning. Any errors (e.g., paper jam or low ink) should be resolved by addressing the specific issue.

Diagnosis of Faults in the Computer and Peripherals

Diagnosing faults in a computer system and its peripherals is a critical skill for identifying and resolving hardware and software problems. Faults in computers or peripherals can disrupt normal operations, leading to reduced performance or complete system failure. These issues can be categorized into hardware faults (e.g., power supply issues, hard drive failures, or faulty peripherals like printers and keyboards) and software faults (e.g., driver errors, corrupted files, or malware infections). Effective diagnosis involves systematic troubleshooting, using tools and techniques to pinpoint the root cause of the problem and apply appropriate solutions. By understanding common issues and learning practical diagnostic steps, students can develop the skills needed to maintain and repair computer systems effectively.

Steps for Diagnosing Faults

Diagnosing faults in computers and peripheral devices involves a structured approach to identify and troubleshoot the issue.

Step 1. Initial Checks of computers and peripheral devices.

- **Power Supply-** Make sure that the computer and peripherals are plugged in and powered on. Check for a power light on the device and confirm that the power cord is properly connected.
- **Cables and Connections** -Inspect all cables connecting the peripherals to the computer (e.g., USB, HDMI, VGA, etc.). Ensure the connections are firm and not damaged.

Step 2. Visual Inspection computers and peripheral devices.

- **Physical Damage** -Look for any signs of physical damage, like frayed wires, broken components, or burn marks, especially on power supplies or motherboards.
- **LED Indicators-** Many peripherals like printers, external drives, and even monitors have LED lights. If a light is blinking or red, it could indicate a problem.

Step 3. Hardware Diagnosis computers and peripheral devices.

- **Memory (RAM)-** If the computer fails to boot, it may be a memory issue. Try reseating the RAM or using a different slot. You can also use memory diagnostic tools (like Windows

Memory Diagnostic) to check for issues.

- **Hard Drive-** If the computer is slow or crashes often, your hard drive may be failing. Use tools like CHKDSK (for Windows) or Disk Utility (for Mac) to scan for errors. A SMART status check can also give insights into hard drive health.
- **Power Supply-** A faulty power supply can cause random shutdowns or failure to boot. Ensure that your power supply is delivering the correct voltage.
- **Overheating-** Overheating can lead to system crashes. Check for dust buildup inside the case or faulty cooling fans. Clean the fans and ensure proper ventilation.

Step 4. Peripheral Device Troubleshooting.

- **Keyboard/Mouse-** If the keyboard or mouse is unresponsive, check the connections, replace the batteries (for wireless devices), or try the device on another computer to rule out issues with the peripherals.
- **Monitor-** If the screen is blank or flickering, check the cable connection between the monitor and the computer. Test the monitor with another device to ensure it's functioning.
- **Printers-** For printer issues, check for paper jams, toner/ink levels, and ensure the printer is connected to the network (for wireless printers). Try restarting the printer and the computer.
- **Speakers-** If there is no sound, check the speaker connections and settings. Ensure that the sound output is set to the correct device.

Step 5. Software and Driver Issues of computers and peripheral devices.

- **Device Manager (Windows)-** Check for yellow exclamation marks or unknown devices, which may indicate a driver or hardware issue.
- **System Preferences (Mac)-** On a Mac, check the System Information app for any hardware problems or missing drivers.
- **Driver Updates-** Ensure that the latest drivers for all peripherals are installed. Check the manufacturer's website for updated drivers or use the built-in Windows Update or Apple Software Update.
- **System Conflicts-** In some cases, conflicts between devices or software can cause problems. Uninstalling recently installed programs or drivers can help.

Step 6. Advanced Diagnostic Tools of computers and peripheral devices.

- **BIOS/UEFI-** Check the BIOS/UEFI for system diagnostics if the computer fails to boot. Some motherboards provide diagnostic codes or beeps to indicate hardware issues.
- **Third-Party Tools-** There are diagnostic tools like Monitor (for hardware health monitoring), CrystalDiskInfo (for hard drive health), or Prime95 (for CPU stress testing) that can help with more advanced diagnostics.

Step 7. Isolate the Fault of computers and peripheral devices.

- **Process of Elimination-** Disconnect all peripherals and test the computer. If it works, reconnect one device at a time to identify the faulty one.
- **Test on Another System-** If possible, try the suspected faulty peripheral on another computer to see if the issue persists.

- **Component Swap-** Swap out components like RAM, hard drive, or power supply with known good ones to identify the faulty part.

Step 8. Error Codes and Beep Codes of computers and peripheral devices: Many computers give error codes or beep sequences during boot-up that indicate specific hardware issues. For example.

- **No Beep:** Power or motherboard issue.
- **Continuous Beep:** RAM failure.
- **Single Beep:** Normal POST (Power-On Self-Test).

Different types of Issues in Desktop Computers and Peripherals

1. Hardware Issues

2. Software Issues

1. Hardware Issues – These are problems with the physical components of the computer or its connected devices. Common Hardware Issues.

Power Supply Problems

The Power Supply Unit (PSU) in a computer is a critical component that converts the incoming AC power from the wall outlet into the DC power required by internal components as shown in Figure 2.5. It's essentially the lifeblood of the system, providing the necessary energy for all operations.

Symptoms

- The computer does not power on, shuts down unexpectedly, or restarts randomly.

Causes

- A failing or faulty power supply unit (PSU).
- Damaged power cables or connectors.
- 3.Power surges or electrical faults.

Resolution

- Check the power cable and connections.
- Test the PSU with a multimeter or use a PSU tester.
- Replace the faulty PSU if necessary.



Fig. 2.5: Power supply unit

Motherboard Failures

Motherboard failures are a significant concern in computer systems, as the motherboard serves as the central hub connecting all other components as shown in Figure 2.3. These failures can stem from various causes, including.

Symptoms

- The system fails to boot, freezes, or devices are not recognized.

Causes

- Faulty or damaged motherboard (e.g., due to power surge, overheating).
- Faulty or improperly seated components (RAM, CPU, GPU).

Resolution

- Inspect the motherboard for visible damage like burnt areas or damaged capacitors.
- Reseat components (RAM, CPU, GPU) and try to boot again.
- If damaged, the motherboard may need to be replaced.

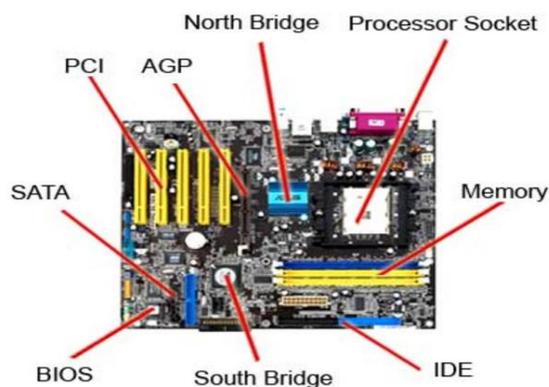


Fig. 2.6: Connected all other components in motherboard

Component Failures of motherboard

- **CPU Socket Issues:** The CPU socket, where the processor is inserted, can become damaged or lose contact, preventing proper communication.
- **Capacitor Failure:** Electrolytic capacitors on the motherboard can dry out or leak over time, leading to instability and malfunctions.
- **Chipset Failure:** The chipset, which controls communication between the CPU and other components, can fail due to overheating, manufacturing defects, or aging.

Power Supply Issues

- **Voltage Fluctuations:** Sudden power surges or drops can damage sensitive components on the motherboard.
- **Insufficient Power:** Inadequate power delivery from the PSU can starve the motherboard and cause instability or malfunctions.

Overheating

- **Inadequate Cooling:** Insufficient airflow or a faulty cooling system can lead to excessive heat buildup on the motherboard, causing component damage.
- **Thermal Throttling:** To prevent damage, the CPU may automatically reduce its clock speed (throttling) when it overheats, leading to significant performance degradation.

Physical Damage

- **Bending or Warping:** Physical impacts or improper handling can bend the motherboard or damage its delicate circuitry.

- **Liquid Spills:** Spilled liquids can short-circuit components, causing irreversible damage to the motherboard.

Aging and Wear and Tear

- Over time, components on the motherboard can degrade due to normal wear and tear, leading to intermittent failures and eventual malfunction.

Faulty RAM (Random Access Memory)

Faulty RAM (Random Access Memory) can significantly impact a computer's performance and stability. RAM is crucial for a computer's operation, acting as temporary storage for the data and instructions that the CPU needs to access quickly. When RAM modules malfunction, they can introduce errors into the system, leading to a range of issues. These issues can manifest in various ways, including system crashes, application freezes, random reboots, blue screen of death errors, and data corruption. Faulty RAM can also cause performance bottlenecks, resulting in slowdowns, sluggish responsiveness, and difficulties in running demanding applications. Identifying and replacing faulty RAM modules is crucial for restoring system stability, improving performance, and ensuring data integrity. (Figure 2.4)

Symptoms

- Frequent system crashes, blue screen errors, or slow performance.

Causes

- Faulty RAM stick or slots.
- Improperly seated RAM modules.

Resolution

- Reseat or replace the RAM.
- Run memory diagnostic tools (e.g., Windows Memory Diagnostic or MemTest86).
- Test with known working RAM if possible.

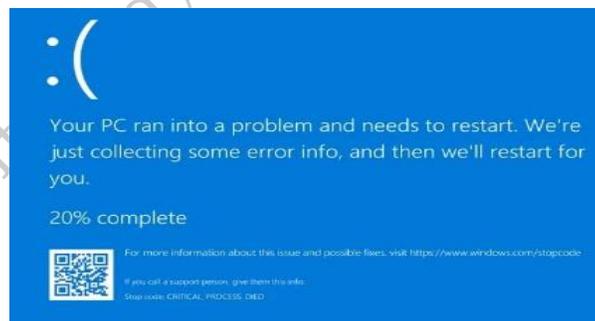


Fig. 2.7: Process of restart

Hard Drive Failures

Hard drive failures, while becoming less frequent with advancements in technology, remain a significant concern for computer users. These failures can occur due to a variety of factors, including mechanical issues, electronic malfunctions, and environmental factors. Mechanical failures can arise from the wear and tear of moving parts within the hard drive, such as the spinning platters and read/write heads. These components are constantly in motion, and over time, friction and vibration can lead to physical damage, causing read/write errors and ultimately data loss. Electronic failures can stem from issues with the drive's circuitry, power supply, or

firmware. Environmental factors such as physical shocks, extreme temperatures, and exposure to moisture can also contribute to hard drive failures. The consequences of hard drive failures can be severe, including data loss, system instability, and the inability to boot the operating system. Therefore, proactive measures such as regular backups, monitoring drive health, and maintaining a cool and stable operating environment are crucial for preventing data loss and ensuring the longevity of the hard drive. (Figure 2.5)

Symptoms

- Slow performance, system freezes, or failure to boot.

Causes

- Failing or damaged hard drive/SSD.
- Bad sectors or file system corruption.

Resolution

- Use disk-checking tools like CHKDSK (Windows) or Disk Utility (Mac).
- Backup data and replace the failing hard drive or SSD.
- If the SSD is dying, migrate the data to a new drive.



```

Hard Disk Error

Please run the Hard Disk Test in System Diagnostics.

Hard Disk # (xxx)

F2 - System Diagnostics

For more information, please visit:
http://www.hp.com/go/techcenter/startup

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Fig. 2.8: Program for Hard disk Error

Graphics Card (GPU) Issues

The Graphics Processing Unit (GPU) is a critical component in modern computing, responsible for rendering and displaying visuals on the screen. However, like any other complex piece of hardware, GPUs can encounter various issues that can significantly impact system performance and user experience. These issues can stem from a variety of factors, including hardware malfunctions, driver problems, overheating, and software conflicts. Hardware malfunctions can include physical damage to the GPU chip itself, faulty memory modules on the graphics card, or issues with the power delivery system. Overheating can also be a major concern, as GPUs generate significant heat during operation. Inadequate cooling can lead to thermal throttling, where the GPU's performance is artificially limited to prevent damage, resulting in reduced frame rates, artifacts, and even system crashes. Driver issues are another common source of GPU problem. Outdated, corrupted, or incompatible drivers can cause a wide range of issues, including display errors, crashes, and poor performance. Software conflicts, such as incompatibilities between the GPU and other hardware or software components, can also lead to instability and unexpected behavior. Identifying and resolving GPU issues can be challenging, often requiring a combination of troubleshooting steps, including updating drivers, checking for overheating, and performing hardware diagnostics. (Figure 2.9)

Symptoms

- No display, distorted visuals, screen flickering, or graphical glitches.

Causes

- Faulty or overheating graphics card.
- Loose connections or incompatible drivers

Resolution

- Reseat the GPU in its PCIe slot.
- Check the monitor and cable connections.
- Test with a different graphics card if available.
- Install or update drivers to ensure compatibility.



Fig. 2.9: without Graphics card of Issue

Overheating issue

Overheating is a critical issue in computer systems, as excessive heat can significantly impact performance, stability, and even cause permanent damage to hardware components. When internal temperatures rise above safe operating limits, the computer may exhibit a range of symptoms, including system crashes, unexpected shutdowns, performance throttling, and in severe cases, irreversible damage to the CPU, GPU, or other components. Overheating can be caused by various factors, including inadequate cooling, excessive dust accumulation within the system, faulty fans, and demanding workloads that generate excessive heat. (Figure 2.10)

Symptoms

- The system crashes unexpectedly, shuts down suddenly, or runs very slowly.

Causes

- Dust buildup in the cooling system.
- Malfunctioning cooling fans or inadequate airflow.

Resolution

- Clean the fans, CPU heatsink, and ventilation areas to improve airflow.
- Ensure all fans are working and properly connected.
- Consider upgrading the cooling system or adding additional fans.



Fig. 2.10: Problem of Overheating

Peripheral Device Failures

Peripheral device failures can significantly disrupt a user's workflow and overall computing experience. These issues can arise from a variety of sources, including hardware malfunctions, software conflicts, connectivity problems, and environmental factors. Hardware malfunctions can encompass issues such as broken keys or buttons on keyboards, faulty sensors in mice, and mechanical problems with printers, such as paper jams or print head failures. Software conflicts, such as driver incompatibility or outdated firmware, can also cause peripherals to malfunction or behave erratically. Connectivity problems, including loose or damaged cables, faulty ports, and interference with wireless signals, can prevent proper communication between the peripheral and the computer. Environmental factors, such as extreme temperatures, humidity, and physical damage, can also contribute to peripheral failures. For example, exposure to moisture can damage electronic components within a speaker or headset, while physical shocks can dislodge internal components within a hard drive. Identifying and resolving peripheral device failures often involves a combination of troubleshooting steps, including checking connections, updating drivers, and identifying and addressing potential software conflicts. In some cases, repairs or replacements may be necessary to restore the functionality of the affected device.

- **Mouse/Keyboard** - Not responding or malfunctioning.
- **Causes** - Damaged cables, faulty USB ports, or low battery in wireless devices.
- **Printer** - Not printing or showing error messages.
- **Causes** - Connectivity issues, outdated drivers, or paper jams.

Connectivity Problems

Connectivity problems are a common and frustrating issue for computer users. These problems can manifest in various ways, such as slow internet speeds, intermittent connection drops, difficulty connecting to Wi-Fi networks, and an inability to access online resources. The causes of these connectivity issues can be diverse, ranging from physical cable damage and faulty network hardware (routers, modems, network cards) to software conflicts, driver issues, and interference from other devices. Furthermore, external factors such as electromagnetic interference, distance from the router, and network congestion can significantly impact network connectivity. Identifying and resolving these issues often requires a systematic approach, including checking physical connections, troubleshooting network settings, updating drivers, and identifying and resolving software conflicts.

- **USB Ports Not Working**- Devices do not get recognized.
- **Causes**- Faulty USB ports, driver issues, or physical damage to the motherboard.

2. Software Issues- These are problems related to the operating system, drivers, or applications installed on the computer. Common Software Issues.

Operating System Errors

Operating system errors can significantly disrupt a computer's functionality, leading to instability, performance issues, and even data loss. These errors can stem from various sources, including software conflicts, hardware incompatibilities, driver issues, malware infections, and corrupted system files. Software conflicts can arise when incompatible applications or drivers are installed, leading to system instability, crashes, and unexpected behavior. Hardware incompatibilities, such as faulty RAM, a failing hard drive, or an overheating CPU, can also trigger operating system errors. Driver issues, such as outdated, corrupted, or incompatible drivers for hardware devices, can cause a range of problems, including system crashes, device malfunctions, and performance degradation. Malware infections can compromise system stability, disrupt normal operations, and even steal or corrupt data. Corrupted system files, often caused by improper software installations, power outages, or hardware failures, can prevent the operating system from functioning correctly, leading to boot failures and other critical errors. Identifying and resolving operating system errors often requires a combination of troubleshooting techniques, including checking system logs, running diagnostic tests, updating drivers, and repairing or replacing faulty hardware. (Figure 2.11)

- **Symptoms** - System crashes, slow performance, or failure to boot.
- **Causes** - Corrupted system files, outdated OS, or failed updates.

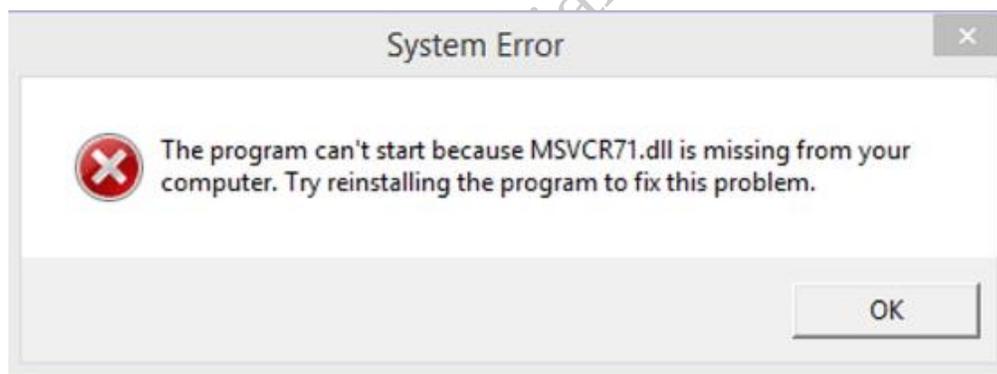


Fig. 2.11: Problem of Operating system

Driver Conflicts or Errors

Driver conflicts or errors are a common source of frustration for computer users. Drivers are specialized software programs that enable the operating system to communicate with and control hardware devices such as printers, graphics cards, sound cards, and input devices (keyboard, mouse). When drivers are outdated, corrupted, or incompatible with the operating system or other hardware, they can cause a wide range of issues. (Figure 2.12)

- **Symptoms** -Peripheral devices not working, blue screen errors, or slow performance.
- **Causes** -Outdated, corrupted, or incompatible drivers for devices such as printers, graphics cards, or USB devices.

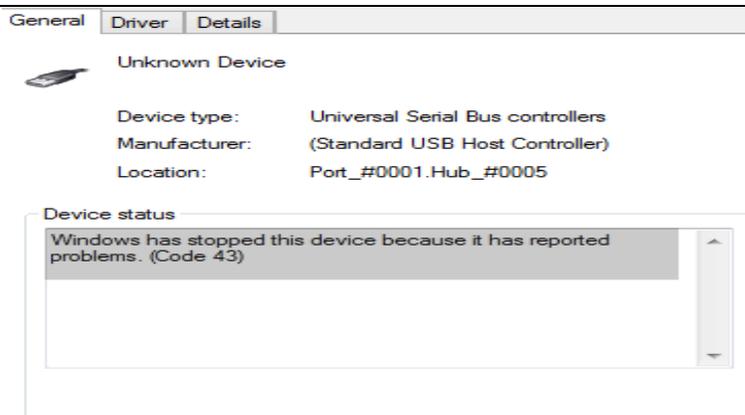


Fig. 2.12: Problem of device conflict

Virus/Malware Infections

Malware, short for malicious software, poses a significant threat to computer systems today. This umbrella term encompasses a wide range of harmful programs designed to infiltrate and damage computers, steal sensitive data, or disrupt normal system operation. Malware can manifest in various forms, including viruses, worms, Trojans, ransomware, spyware, and adware. Viruses are self-replicating programs that attach themselves to other files and spread throughout a computer system. Worms can replicate themselves independently and spread across networks, often causing significant disruption. Trojans are malicious programs disguised as legitimate software, often used to steal data or grant unauthorized access to the infected system. Ransomware encrypts user data and demands a ransom payment for its release. Spyware secretly monitors user activity, collecting sensitive information such as passwords and browsing history. Adware displays unwanted advertisements on the user's computer. The consequences of malware infections can be severe, including data loss, system instability, performance degradation, identity theft, and financial loss. Effective cybersecurity measures, such as installing and updating antivirus software, regularly patching software vulnerabilities, exercising caution when opening emails and downloading files, and using strong passwords, are crucial for preventing and mitigating the risks associated with malware infections. (Figure 2.13)

- **Symptoms** -Slow performance, pop-up ads, or unusual system behavior.
- **Causes** -Malware, adware, or viruses affecting system files, causing instability.



Fig. 2.13: Process of Antivirus updated

Software Crashes or Freezing

Software crashes and freezes are frustrating occurrences that can significantly disrupt a user's workflow and productivity. These events, where a program suddenly stops responding or unexpectedly closes, can stem from a variety of factors. Software bugs or coding errors within the application itself can lead to instability and crashes. Insufficient system resources, such as inadequate RAM or CPU power, can also strain the system and cause programs to freeze or become unresponsive. Resource conflicts, where multiple programs compete for the same system resources, can also trigger crashes. (Figure 2.14)

Furthermore, hardware issues, such as overheating components, failing hardware, or driver conflicts, can indirectly contribute to software crashes. In some cases, malware infections can interfere with normal program operation, leading to instability and crashes.

- **Symptoms-** Applications crash unexpectedly, freeze, or fail to open.
- **Causes-** Software bugs, corrupted files, or compatibility issues between the software and OS.



Fig. 2.14: Issue of software

Network Issues

Network issues refer to problems that affect the connectivity, performance, or functionality of a computer network, making it difficult or impossible for devices to communicate with one another effectively. These issues can arise in various forms, ranging from a complete lack of connectivity to intermittent disruptions or slow data transfer speeds. Network problems are often caused by hardware malfunctions, software misconfigurations, or external factors such as interference or outages. For example, a faulty router or damaged cables can disrupt the flow of data, while outdated drivers or incorrect network settings may prevent devices from connecting to the internet. External factors, such as bad weather or service provider outages, can also contribute to connectivity problems. Network issues can manifest in both wired and wireless connections, affecting not only computers but also connected peripherals like printers, cameras, and other Internet of Things (IoT) devices.

Diagnosing and resolving these problems often involves troubleshooting steps like testing cables, rebooting devices, updating software, or adjusting network settings. In some cases, advanced diagnostic tools or professional assistance may be needed to identify and fix complex problems. Understanding the causes and types of network issues is crucial for maintaining seamless communication and ensuring the efficient operation of both personal and business networks. (Figure 2.15)

- **Symptoms** -Internet connection problems, slow speeds, or disconnection.
- **Causes-** Incorrect network settings, corrupted network drivers, or interference with Wi-Fi signals.

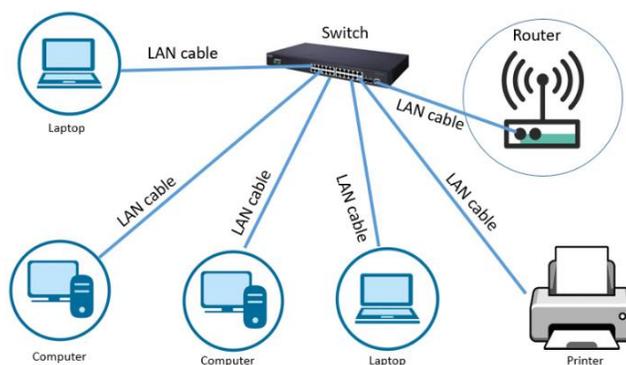


Fig. 2.15: Process of Network Issue

Blue Screen of Death (BSOD)

The Blue Screen of Death (BSOD) is a dreaded sight for any computer user. It's a critical error screen that appears on Windows computers when something serious goes wrong. Imagine your computer as a complex machine with many interconnected parts. When one of those parts malfunctions, the entire system can come to a screeching halt.

The BSOD is like a flashing red light, signaling a major problem and forcing the computer to shut down to prevent further damage. These errors can be caused by various issues, such as faulty hardware like RAM or the hard drive, outdated or incompatible drivers, malware infections, or even overheating. The BSOD can be quite intimidating, but understanding the potential causes can help you troubleshoot and resolve these critical errors. (Figure 2.16)

- **Symptoms** - A blue screen appears with an error message, and the system crashes.
- **Causes** - Hardware issues, driver conflicts, or corrupted system files.

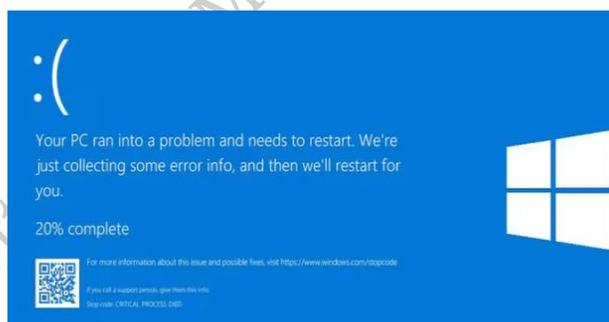


Fig. 2.16: Issue of Blue screen of Death

Peripheral Software Conflicts

Peripheral software conflicts occur when two or more peripheral devices, or their associated software drivers, interfere with each other's operation. Imagine a busy highway with many cars trying to merge and exit. If the traffic signals are not coordinated properly, it can lead to traffic jams, accidents, and delays. Similarly, when peripheral devices try to access shared resources like the CPU, memory, or the operating system itself, conflicts can arise. For example, if two different sound cards are installed, their drivers might try to control the same audio output, leading to distorted sound, no sound at all, or even system crashes. Similarly, conflicting drivers for a printer and a scanner might cause printing issues or prevent the scanner from functioning correctly. These conflicts can manifest in various ways, including device malfunction, system instability, and

unexpected errors. (Figure 2.13)

- **Symptoms**- Peripheral devices like printers, scanners, or speakers are not functioning properly.
- **Causes** - Conflicts between software or missing driver updates.

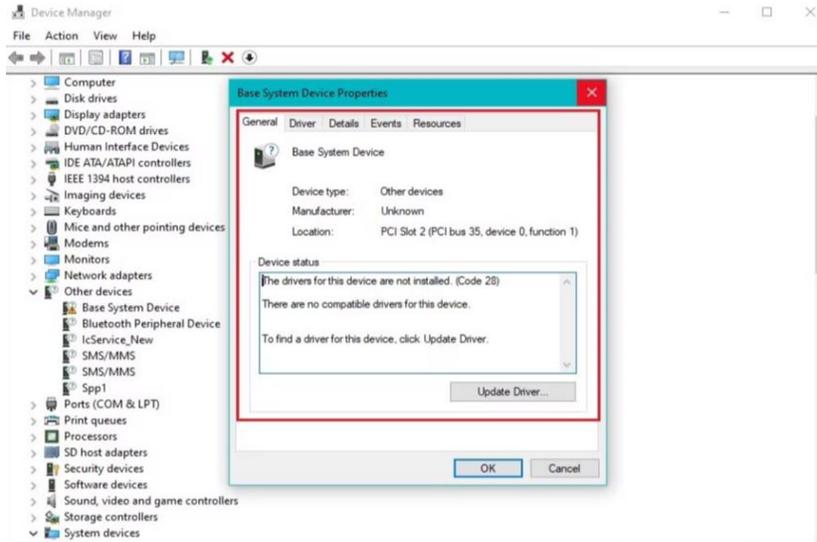


Fig. 2.13: Issue of peripheral Software in Device Manager

Practical Exercise 2.2 List the different types of hardware issues encountered with a desktop computer and its peripherals.

Hardware Component	Identify
Power Supply Issues	
Graphics Card Issue	
Peripheral Device	
Network Interface Card (NIC)	
Battery or UPS Failures	
Wi-Fi and Bluetooth Connectivity	

Practical Exercise 2.3. List the different types of Software issues encountered with a desktop computer and its peripherals

Software	Identify
Operating system Driver	
Software Compatibility Issues	
Operating System Bugs or Errors	
Malware or Virus Infections	
Corrupted or Missing System Files	
Software Crashes or Freezes	

Check Your Progress

A. Multiple-choice questions (MCQs)

1. Which of the following is NOT a common symptom of failing RAM? (a) Blue Screen of Death (BSOD) errors (b) System freezes or crashes (c) Slow internet speeds (d) Corrupted data
2. A computer is turning on, but the monitor remains blank. Which is the LEAST likely cause? (a) Faulty power supply (b) Loose video cable (c) Incorrect monitor input selection (d) Corrupted operating system files
3. What is a common symptom of a failing hard drive? (a) Distorted audio output (b) Clicking or grinding noises (c) Slow mouse movement (d) Inability to print
4. Which component is most likely responsible for a computer overheating? (a) Hard drive (b) CPU (c) Mouse (d) Keyboard
5. A peripheral device is not being detected by the computer. What is the first thing you should check? (a) The device drivers (b) The power cord and connections (c) The operating system updates (d) The BIOS settings
6. Which of the following is a common symptom of a software conflict? (a) The computer won't turn on (b) Applications crash or freeze (c) The monitor displays distorted images (d) The keyboard stops responding
7. What is a common cause of slow system performance? (a) Too much empty space on the hard drive (b) Too many startup programs (c) A clean and organized desktop (d) Frequent system restarts
8. Which of the following is NOT a typical symptom of a malware infection? (a) Slow system performance (b) Unexpected pop-up ads (c) Improved system performance (d) Missing or corrupted files
9. What is a common solution for resolving driver issues? (a) Defragmenting the hard drive (b) Updating or reinstalling the drivers (c) Formatting the hard drive (d) Changing the BIOS settings
10. What is a common way to resolve software compatibility issues? (a) Physically cleaning the computer's components (b) Running the program in compatibility mode (c) Increasing the room temperature (d) Disconnecting all peripherals

B. Fill in the Blank

1. A common symptom of failing RAM is the occurrence of frequent _____ errors, often displaying a blue screen.
2. If a computer turns on but the monitor remains blank, one possible cause is a loose or faulty _____ connecting the computer to the monitor.
3. Clicking or grinding noises coming from inside the computer case often indicate a problem with the _____.
4. Overheating of the _____ can cause system instability and slowdowns.
5. If a peripheral device is not being detected, checking the _____ and connections is the first troubleshooting step.
6. Software _____ can lead to applications crashing or freezing.
7. Too many _____ programs can significantly slow down the computer's boot time.
8. A _____ infection can cause slow system performance, unexpected pop-ups, and

missing files.

9. _____ are software programs that allow the operating system to communicate with hardware devices.
10. Running a program in _____ mode can sometimes resolve software compatibility issues with older programs.

C. Short Questions

1. What do you plug your monitor into on the back of your computer?
2. What is the main job of the computer's power supply?
3. If your keyboard isn't working, what's the first thing you should check?
4. What do you call the device you use to move the cursor on the screen?
5. What is a USB port used for?
6. What is a computer program?
7. What does it mean to "restart" your computer?
8. What is a common way to get new software onto your computer?
9. What is an "icon" on your computer screen?
10. What do you call the main software that runs your computer?

Session 3. Disassembly and Reassembly and Preventive maintenance

Reassembling and disassembling a personal computer (PC) requires a methodical approach, a solid understanding of its components, and adherence to safety precautions. It involves carefully installing and connecting various hardware components like the motherboard, CPU, RAM, storage drives, and peripherals, while disassembly entails the reverse process. These skills are crucial for computer technicians, enthusiasts, and anyone seeking to upgrade or repair their own PC, offering a deeper understanding of computer hardware and the opportunity to customize and optimize their system.

Example

In the heart of India, two tech-savvy boys named Kunal and Rajesh shared a passion for all things computers as shown in figure 3.1. They spent countless hours tinkering with their machines, exploring the depths of their inner workings. One day, they decided to take on a challenging project: completely disassembling and then reassembling a PC. With a sense of excitement and a touch of nervousness, they set to work.

First, they carefully unplugged the computer and laid out all the tools they would need: screwdrivers, tweezers, and a non-conductive mat to protect the delicate components. Following a step-by-step guide, they found online, they began the disassembly process. With steady hands and focused minds, they removed the side panel, disconnected the cables, and carefully extracted each component, placing them in labeled containers to avoid confusion. As they worked, they marveled at the intricate design of the motherboard, the delicate circuitry of the graphics card, and the intricate workings of the cooling system.

They learned about the different types of RAM, the role of the CPU, and the importance of proper

grounding. With the disassembly complete, they faced the more daunting task of reassembly. They followed the guide in reverse, carefully aligning the components and securing them with screws. They double-checked every connection, ensuring that nothing was loose or misaligned. Finally, with bated breath, they plugged the computer back in and pressed the power button. The fans whirred to life, the lights flickered, and the familiar Windows startup sound filled the room.

They had done it! They had successfully disassembled and reassembled a PC. Kunal and Rajesh's accomplishment was a testament to their curiosity, patience, and teamwork. They had not only learned about the inner workings of a computer but also gained valuable problem-solving skills and a deeper appreciation for the technology that powers their world.



Fig. 3.1: Example of Reassembling and disassembling a personal computer

Tools and Equipment for Desktop PC Reassembling and disassembling

1. Screwdriver Set: A precision screwdriver set with various head types (Phillips, flathead, and Torx) is vital for securing components like the motherboard, power supply, and storage drives as shown in figure 3.2.



Fig. 3.2: Screwdriver set

2. Anti-Static Wrist Strap: This strap prevents electrostatic discharge (ESD) that can damage sensitive PC components by grounding static electricity from your body. Attach it to your wrist and secure it to the PC case as show in figure 3.3.



Fig. 3.3: Screwdriver set

3. Cable Ties or Velcro Straps: Essential for organizing cables and improving airflow within the PC case by keeping cables tidy and secure as show in figure 3.4



Fig. 3.4: Cable Ties or Velcro Straps

4. Needle-Nose Pliers: Useful for reaching tight spaces, securing small components, or adjusting metal parts like CPU cooler brackets as show in figure 3.5

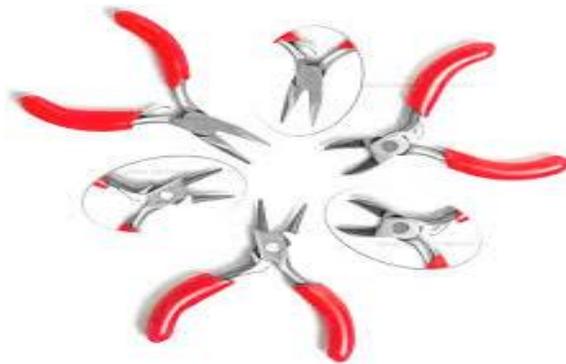


Fig. 3.5: Cable Ties or Velcro Straps

5. Flashlight or Headlamp: Adequate lighting is critical for identifying connectors and components, particularly in tight or dimly lit areas within the PC case as show in figure 3.6



Fig. 3.6: Flashlight or Headlamp

6. Cable Management Clips: These help route and secure cables neatly, enhancing both the appearance and airflow of the PC case as show in figure 3.7



Fig. 3.7: Cable Management Clips

7. PC Toolkit: Often includes specialized tools like a CPU application tool, case speaker, and other accessories essential for assembly or troubleshooting as show in figure 3.8



Fig. 3.8: PC Toolkit

8. Thermal Paste: Required for ensuring proper heat transfer between the CPU and cooler if the cooler doesn't come with pre-applied thermal paste as show in figure 3.9



Fig. 3.9: Thermal Paste

9. Workspace Essentials: A clean, well-lit, and spacious workspace with a grounded power outlet is critical. Using an anti-static mat adds an extra layer of protection for components as show in figure 3.10



Fig. 3.10: Workspace Essentials

10. Documentation and Labels: Keep manuals for the motherboard and other components handy, as they contain vital information for installation and troubleshooting as show in figure 3.11



Fig. 3.11: Documentation and Labels

11. Spare Screws and Standoffs: Spare screws and motherboard standoffs are invaluable in case any are lost during the assembly process as show in figure 3.12



Fig. 3.12: Spare Screws and Standoffs

12. Cleaning Supplies: Use compressed air canisters or an electric air blower to remove dust from components and maintain a clean PC case as show in figure 3.13



Fig. 3.13: Cleaning Supplies

Safety Procedures for Desktop PC Assembling and disassembling

When assembling or disassembling a desktop PC, it is vital to work in a clean, static-free environment. Always unplug the computer from the power source and press the power button to discharge any residual electricity. Use a non-conductive mat and wear an anti-static wrist strap to prevent electrostatic discharge (ESD), which can damage sensitive components like the motherboard, CPU, and RAM. Handle all parts by their edges to avoid transferring oils from your skin, and follow manufacturer instructions carefully when installing or removing components.

Use appropriate tools, such as a Phillips screwdriver, and avoid forcing parts into place to prevent damage. Ensure all components are compatible with your system and manage cables neatly with cable ties to maintain airflow and reduce overheating risks. Before closing the case, double-check that all connections are secure, especially power cables to the motherboard, drives, and peripherals. Documenting the disassembly process with notes or photos can make reassembly much easier.

Store small parts like screws in labeled containers to avoid misplacing them. Clean components such as fans and heat sinks using compressed air or a soft brush to maintain performance. After reassembly, ensure proper ventilation and cooling, then power on the system to verify that all components are recognized in the BIOS. If issues occur, turn off the system immediately and recheck all connections. Following these safety steps ensures a smooth and damage-free PC assembly or disassembly process, as shown in Figure 3.14.



Fig. 3.14: Safety Procedures for Desktop PC

Following Safety Procedures Steps for Desktop PC Assembling and disassembling are:

- **Static Electricity Precautions:** Attach the strap to your wrist and connect it to a grounded metal part of the PC case. This prevents static discharge that could damage sensitive components. If available, use an anti-static mat to further reduce the risk of static electricity buildup.
- **Disconnect Power:** Before starting any work, ensure the PC is completely powered off and disconnected from the electrical outlet
- **Clean workspace:** Keep your workspace clean and clutter-free to prevent accidental damage or disorganization. Use a clean, dry, and non-conductive surface, such as a wooden table
- **Proper Handling:** Handle components with care. Avoid touching sensitive parts, such as the pins on CPUs and GPUs. Hold components by their edges or designated handling areas. Avoid placing components on surfaces that could generate static electricity (e.g., carpets).
- **Tools and Equipment:** Use the right tools for the job. Ensure screwdrivers fit the screws snugly to prevent stripping. Double-check that your tools are in good condition, with no loose or damaged parts.
- **Organize and Label Cables:** Before disconnecting cables, take pictures or label them to ensure proper reconnection later. Use cable ties or Velcro straps to keep cables organized and prevent clutter inside the case.
- **Lifting and Positioning:** Lift and move the PC case and components with care to avoid dropping or bumping them.
- **Cleanliness:** Keep your hands clean and free from oils, grease, or dirt to avoid transferring contaminants to components. Use compressed air or an air blower to remove dust from components before installation.
- **Power Supply Precautions:** When working inside the PC case, never touch the power supply unit (PSU) without disconnecting it from the electrical outlet and turning off the power switch. Wait for a few minutes after disconnecting the PSU to allow capacitors to discharge before handling components.
- **Safety Glasses and Gloves:** If you're handling sharp metal edges or breaking down an old PC, safety glasses and gloves can protect against accidental cuts and injuries.
- **Avoid Working Alone:** If possible, have a friend or family member present, especially when handling heavy components or working in tight spaces.

Process of assembling various desktop computer components

Assemble is the act of connecting together the different parts of a computer. Assembling a computer involves connecting and putting together all the necessary hardware components to create a fully functional system. This process includes installing parts like the motherboard, CPU, RAM, storage devices, power supply, and peripherals into a computer case. Proper assembly ensures optimal performance, better airflow, and a reliable setup for the user.

Practical Activity 3.1: Process of assembling various desktop computer components and Peripherals.

Materials need

Computer Case with Power Supply Installed, Motherboard, CPU Heat Sink/Fan Assembly, Thermal Compound, RAM Module(s), Motherboard Standoffs and Screws, Anti-static Wrist Strap, Anti-static Mat and Tool Kit.

Procedure

Step 1: The First Step in Assembling A Computer Is to Open the Computer Case. To Open the Case, First Remove the Screws of The Left Side Cover and Slide the Side Cover.

Step 2: Install the Power Supply. The Next Step Is to Install A Power Supply. There Are Usually Four Screws That Attach the Power Supply to The Case as show in figure 3.16.



Fig. 3.16: Install the Power Supply

Step 3. The Motherboard Has to Be Prepared Before Its Installation. To Prepare the Motherboard, You First Need to Install The CPU, Then the Heat Sink on The CPU And CPU Fan as show in figure3.17.

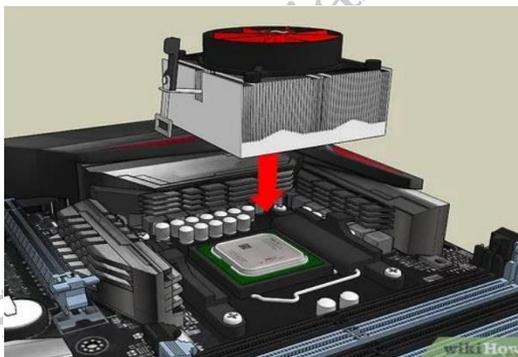


Fig. 3.17: Motherboard Installation

Step 4. A CPU Socket Uses A Series of Pins to Connect A CPU's Processor to The Pc's Motherboard. If A CPU Is Connected Via A CPU Socket as show in figure3.18.

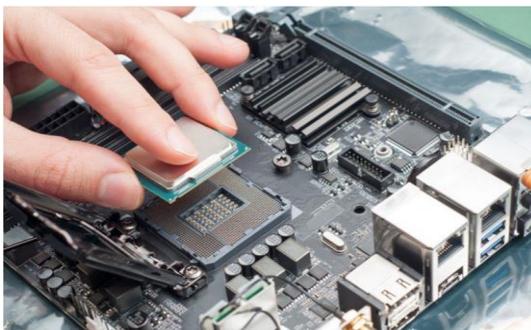


Fig. 3.18: CPU Socket

Step 5. Heat Sink and Fan (HSF) Is an Active Cooling Solution Used to Cool Down Integrated Circuits in Computer Systems, Commonly the Central Processing Unit (CPU) as show in figure 3.19.



Fig. 3.19: Heat Sink and Fan

Step 6. Connect the Assembly Power Cable to The CPU Fan Connector on The Motherboard as show in figure 3.20.

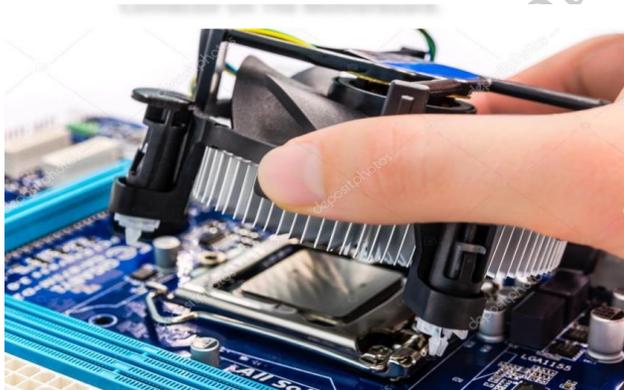


Fig. 3.20: CPU Fan Connector

Step 7. To Install the RAM First on The Motherboard and Then Fix the Motherboard in The Case. To Install RAM, First Ensure Its Compatibility with The Motherboard as show in figure 3.21.

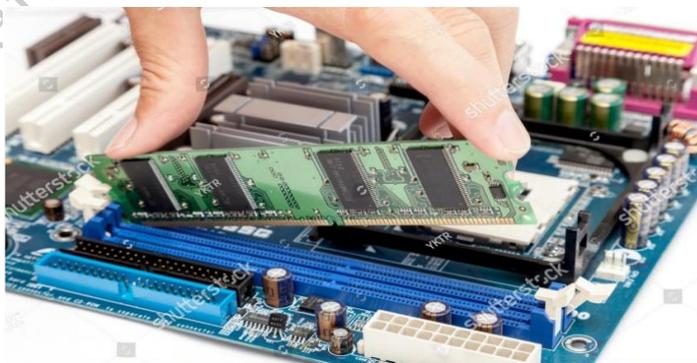


Fig. 3.21: RAM Install on The Motherboard

Step 8. Install motherboard. After Preparing the Motherboard, You Can Install in The Computer Case as show in figure 3.22.



Fig. 3.22: Motherboard install

Step 9. Install internal drives. The Hard Drive Is the Device Which Stores All the Data. Connect the Power Cable Coming from The SMPS To the Power Socket of Hard Disk Drive. Connect SATA Data Cable from Hard Disk Drive Socket to The Motherboard Socket as show in figure 3.23.



Fig. 3.23: Hard Drive

Step 10. Connect all internal cables. Power Cables Are Used to Distribute Electricity from The Power Supply to The Motherboard and Other Components. Data Cables Transmit Data Between the Motherboard and Storage Devices, Such as Hard Drives as show in figure 3.24.

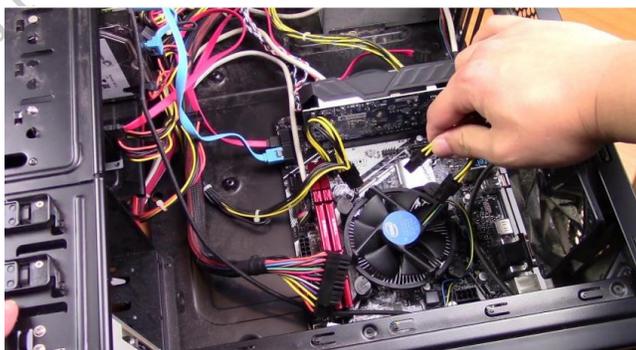


Fig. 3.24: Data Cables

Step 11. Install motherboard power connections. The Advanced Technology Extended (ATX) Main Power Connector Will Have Either 20 Or 24 Pins as show in figure 3.25.



Fig. 3.25: Power Connector

Step 12. Connect external cables to the computer as show in figure 3.26.



Fig. 3.26: External cable

Step 13. Starting the computer. Always Remember That the First Step Is to Push Power Button of The CPU Than the Monitor's. An Operating System Or System Software Like Window Or Linux Will Start Loading, Now Your Computer Is Ready to Use as show in figure 3.27.

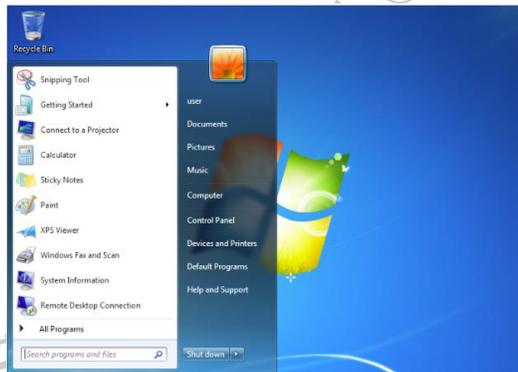


Fig. 3.27: shutdown PC

3.3.4 Process of Disassembling various desktop computer components

Disassemble is the process of breaking down a device into separate parts to help determine a problem, to replace a part, or take the parts and use them in another device or sell them individually. Disassembling a computer involves carefully taking apart its components to troubleshoot hardware issues, upgrade parts, clean internal components, or repurpose hardware. This process includes removing parts like the motherboard, CPU, RAM, storage devices, and peripherals from the computer case while ensuring each component is handled safely.

Practical Activity 3.2: Process of Disassembling various desktop computer components and Peripherals.

Material Required

One Working PC, An Anti-static Wrist Strap, An Anti-static Mat, Anti-static Bags of Various Sizes, Technician's Toolkit, A Plastic Cup or Box to Organize Screws, Nuts, And Bolts.

Procedure

Step 1. Unplugging. Unplug the Power Cord from the PC. Unplug All the Peripherals Attached to The Computer, Such as The Keyboard, Mouse, Monitor, Headphones.

Step 2. Open the Case First Remove the Screws of The Left Side Cover and Slide the Side Cover as show in figure 3.28.



Fig. 3.28: Case First Remove the Screws

Step 3. Disconnect All the Connectors Disconnect All the Connectors Connected to The Motherboard. These Include SATA Power Cable and Data Cable of HDD As Well As SATA Cable of Optical Drive as show in figure 3.29.



Fig. 3.29: SATA Power Cable

Step 4. Remove the Fan as show in figure3.30.

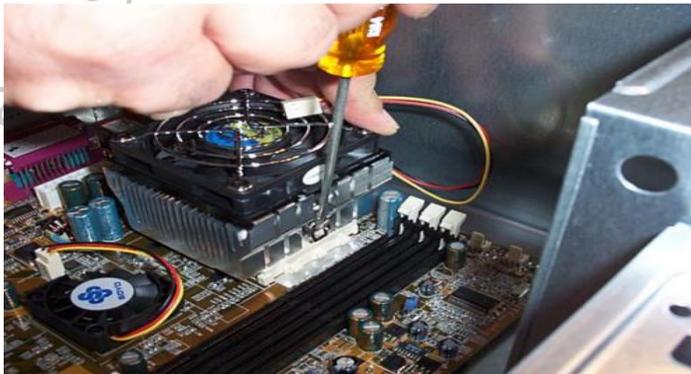


Fig. 3.30: Remove Fan

Step 5. Remove the Power Supply Is Connected to The Motherboard by A 20-pin Connector And 4-pin Connector as show in figure 3.31.



Fig. 3.31: Remove Connector

Step 6. Remove the SATA Cable Connecting to The HDD And Optical Drive in Motherboard as show in figure 3.32.



Fig. 3.32: SATA cable connect HDD

Step 7. Remove RAM (Random Access Memory) Modules as show in figure 3.33.

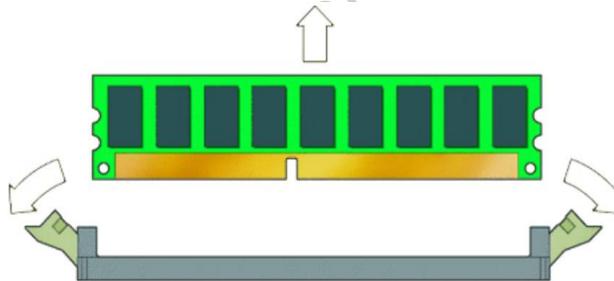


Fig. 3.33: Remove RAM

Step 8. To Remove the Expansion Cards, Disconnect the Cables Attached to It as show in figure 3.34.

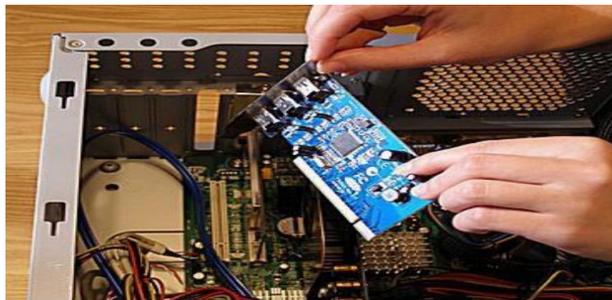


Fig. 3.34: Expansion Cards

Step 9. To Remove the Motherboard, Disconnect All the Cables from The Motherboard as show in figure 3.35.



Fig. 3.35: Remove Connector

Step 10. Reassemble the Components. After Identification of Each Component, Put All the Components Back in Their Place and Ensure That All Cables and Wires Are Connected at The Right Place.

Preventive maintenance

Maintaining a desktop computer and its peripherals is crucial for ensuring optimal performance, longevity, and data security. This involves a proactive approach to identify and address potential issues before they escalate into major problems. This comprehensive guide will delve into the practical aspects of demonstrating and implementing effective maintenance strategies, encompassing both hardware and software components. We will explore essential steps such as regular cleaning, driver updates, software optimization, and preventative measures like proper ventilation and surge protection. By adhering to these guidelines, users can significantly enhance the reliability and lifespan of their computer systems while minimizing downtime and potential data loss as shown in figure 3.36.



Fig. 3.36: Desktop computers and Peripherals

Standard Process for Repair and Maintenance of Desktop Peripherals

The standard process for repairing and maintaining desktop peripherals begins with a thorough assessment of the issue and the specific device, prioritizing safety by disconnecting power and using anti-static measures. Routine maintenance involves regular cleaning of external surfaces and internal components (where accessible), proper cable management, and keeping device drivers updated. When a problem arises, basic troubleshooting steps include checking connectivity, restarting the system, reinstalling drivers, and performing component-specific checks. If these steps fail to resolve the issue or if the problem appears complex, it's crucial to recognize limitations and seek professional help from qualified technicians to avoid further damage. Documenting issues and maintenance schedules can also aid in future troubleshooting and preventative care.

Following are the standard process:

Step 1: Preparation

- **Gather Tools and Resources:** Collect necessary tools (multimeter, screwdriver set, cleaning supplies like microfiber cloths and compressed air) and any relevant resources such as diagnostic software or manufacturer utilities, user manuals, and technical documentation as shown in figure 3.37.
- **Ensure Safety:** Disconnect all peripherals from their power sources. Wear an anti-static wrist strap to prevent ESD damage.
- **Identify the Peripheral:** Clearly determine the type of device (e.g., printer, scanner, monitor) you will be working on.



Fig. 3.37: Gathering Tools (multimeter, screwdriver set, cleaning supplies)

Step 2: Visual Inspection

- **Check for Physical Damage:** Examine the peripheral for any broken or bent connectors, cracked casings, or visible damage to cables as show in figure 3.38.
- **Inspect Power and Connectivity:** Verify that the device is correctly connected to both the power outlet and the computer. Check for any loose or damaged cables.
- **Perform Peripheral-Specific Checks:**
 - **Printers:** Inspect paper trays, rollers, and ink/toner cartridges.
 - **Keyboards:** Check for stuck or damaged keys.
 - **Monitors:** Look for screen cracks, dead pixels, or discoloration.



Fig. 3.38: Visual Inspection of Physical Damage

Step 3: Functional Testing

- **Test Device Power and Recognition:** Verify if the peripheral powers on and is correctly recognized by the computer system. For USB devices, try connecting to different USB ports as show in figure 3.39.
- **Run Diagnostic Tools:** Utilize any built-in diagnostic utilities (e.g., printer self-test, monitor test patterns). Install and run manufacturer-provided drivers or troubleshooting software.



Fig. 3.39: Functional Testing of USB Port

Step 4: Cleaning and Basic Maintenance

- **Clean the Device:** Use compressed air to remove dust from vents, ports, and internal areas. Wipe external surfaces with a microfiber cloth and appropriate cleaning solutions as show in figure 3.40.
- **Lubricate Moving Parts (If Applicable):** For devices like printers or scanners, lubricate specified moving parts according to the manufacturer's guidelines.
- **Replace Consumables:** Replace empty or low ink/toner cartridges, paper, or depleted batteries.



Fig. 3.40: Clean the Device

Step 5: Software and Driver Management

- **Update Drivers:** Download and install the latest drivers for the peripheral from the manufacturer's official website as show in figure 3.41.
- **Check Software Compatibility:** Ensure that any software used to control the peripheral is compatible with the computer's operating system.
- **Update Firmware (Advanced Peripherals):** For more complex peripherals, check for and install any available firmware updates that might improve performance or resolve issues.

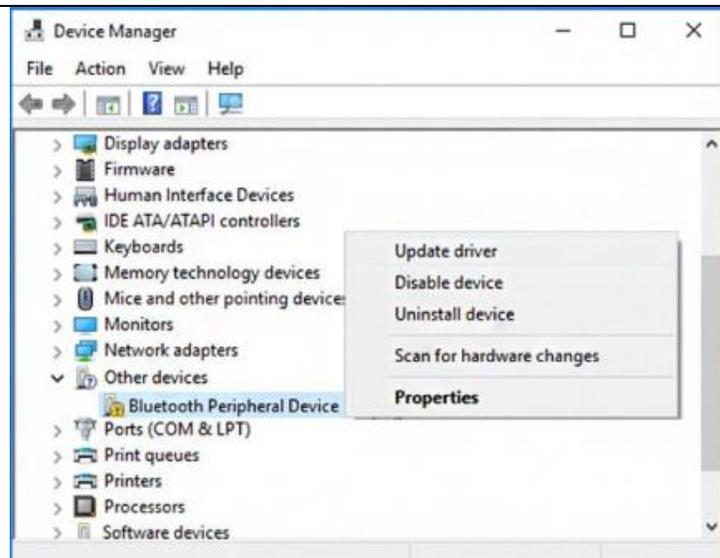


Fig. 3.41: Device Manager

Step 6: Troubleshooting and Repairs

- Perform Basic Troubleshooting: Restart both the peripheral and the computer. If configuration issues are suspected, try resetting the peripheral to its factory default settings.
- Replace Faulty Components (Simple Replacements): Replace easily swappable damaged parts like cables, power adapters, or small internal components (if you have the expertise) as show in figure 3.42.
- Test with Another System: Connect the peripheral to a different computer to determine if the issue is with the peripheral itself or the original computer system.

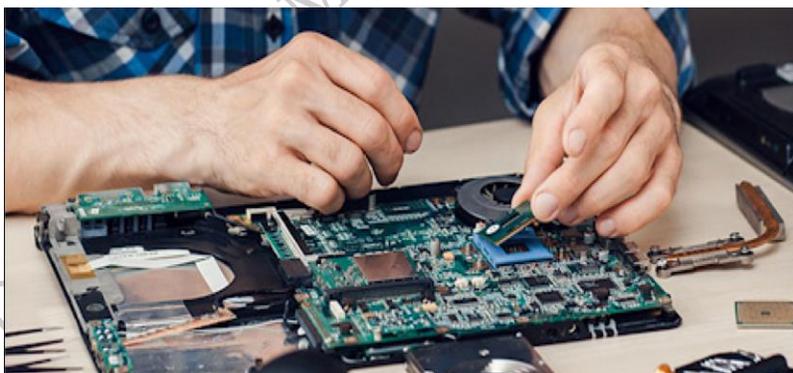


Fig. 3.42: Replace Faulty Components

Step 7: Documentation

- Record Issues and Solutions: Document the initial problem, the steps taken during the repair process, and any parts that were replaced as show in figure 3.43.
- Maintain a Service Log: Keep a record of all regular maintenance activities and any repairs performed on the peripheral over time.

Equipment Maintenance Log					
Name of equipment		Date of purchase			
Serial number		Date of service			
Manufacturer		Technician			
Manufacturer contact details		Due date			
#	Date	Maintenance description	Inventory used	Hours spent	Notes
Additional Remarks					
Initials					

Fig. 3.43: Equipment Maintenance Log Repots

Step 8: Post-Repair Testing

- Perform Functional Tests: Thoroughly test the repaired peripheral to confirm that it is now working correctly and as expected.
- Check Compatibility: Verify that the device is recognized and functions properly across different systems or configurations if applicable.
- Run Stress Tests (If Applicable): For devices like printers or scanners, perform extended operation tests (e.g., printing multiple pages, scanning several documents) to ensure consistent performance as show in figure 3.44.

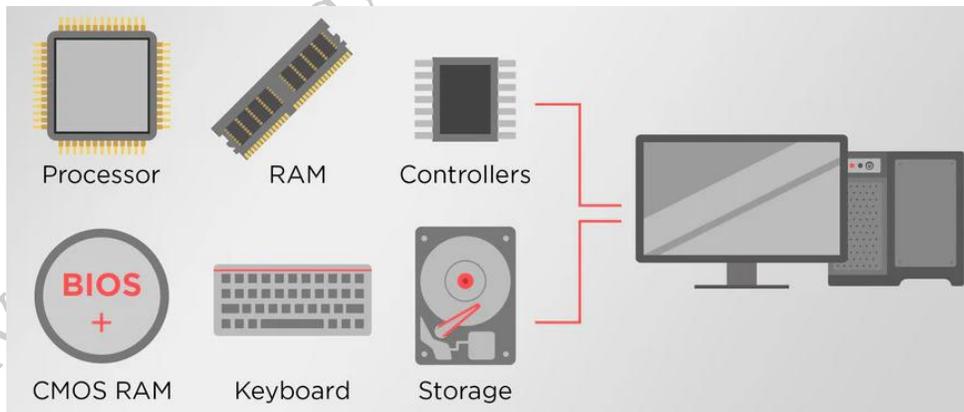


Fig. 3.44: Desktop computers and Peripherals

Step 9: Preventive Maintenance

- Schedule Regular Cleaning: Implement a schedule for regularly cleaning peripherals to prevent dust buildup and maintain optimal performance as show in figure 3.45.
- Educate Users: Train users on the correct handling and usage of the devices to minimize wear and tear and prevent common issues.

- **Backup Drivers and Configurations:** Create backups of device drivers and any custom configurations to allow for quick restoration if needed.



Fig. 3.45: Regular Cleaning

Step 10: Responsible Disposal

- **Dispose Responsibly:** Recycle or dispose of any damaged or unusable components following local electronic waste disposal regulations as show in figure 3.46.
- **Use Genuine Parts:** When replacing components, prioritize using original or manufacturer-recommended parts to ensure compatibility and optimal performance.



Fig. 3.46: Waste disposal regulation

Purpose of Preventive Maintenance

Preventive maintenance is like giving your computer a regular health checkup to keep it running well and avoid problems in the future. Instead of waiting for something to break down, you take steps to ensure everything stays in good condition. The primary purpose of preventive maintenance for computers is to extend their lifespan, improve performance, and minimize the risk of hardware and software failures, ultimately saving money and reducing downtime. By proactively addressing potential issues, preventive maintenance ensures the computer operates at optimal efficiency and reduces the chances of costly repairs or data loss as show in figure 3.47. Here's a more detailed breakdown of the purpose:



Fig. 3.47: Preventive Maintenance

This image illustrates the key principles and practices of **Preventive Maintenance**. The central yellow circle clearly states "PREVENTIVE MAINTENANCE," and radiating outwards are eight key actions or considerations that contribute to an effective preventive maintenance program. Let's break down each element:

1. **Embrace Technology:** This suggests leveraging technological tools and software to aid in preventive maintenance. This could include:
 - a. **Computerized Maintenance Management Systems (CMMS):** Software for scheduling, tracking, and managing maintenance tasks, inventory, and work orders.
 - b. **Internet of Things (IoT) sensors:** Devices that can monitor equipment conditions in real-time (e.g., temperature, vibration) and provide early warnings of potential issues.
 - c. **Mobile apps:** Tools for technicians to access schedules, record data, and complete tasks on the go.
2. **Train Your Team:** A well-trained maintenance team is crucial for effective preventive maintenance. This involves:
 - a. Providing thorough training on maintenance procedures, equipment operation, and safety protocols.
 - b. Keeping the team updated on new technologies, techniques, and best practices.
 - c. Empowering technicians with the knowledge and skills to identify potential problems early.
3. **Conduct Regular Inspections:** Routine inspections are a cornerstone of preventive maintenance. This involves:
 - a. Visually inspecting equipment for wear and tear, leaks, damage, or other anomalies.
 - b. Using diagnostic tools to assess the condition of components (e.g., checking fluid levels, measuring pressure, testing electrical connections).
 - c. Following a predefined schedule of inspections based on equipment type, usage, and manufacturer recommendations.
4. **Keep Detailed Records:** Maintaining accurate and comprehensive records is essential for analyzing maintenance trends and improving the program. This includes:
 - a. Logging all maintenance activities, including inspections, repairs, and replacements.
 - b. Tracking equipment history, including purchase date, installation date, and past maintenance.

- c. Recording any failures or issues and their root causes.
 - d. Analyzing data to identify recurring problems, optimize maintenance schedules, and predict future needs.
5. **Avoid Over Maintenance:** While it's important to be proactive, performing maintenance too frequently or unnecessarily can be inefficient and costly. This principle emphasizes:
- a. Finding the right balance in maintenance schedules based on data analysis, manufacturer recommendations, and equipment condition.
 - b. Avoiding unnecessary tasks that don't add value or reduce the risk of failure.
 - c. Implementing condition-based maintenance (CBM) where possible, triggering maintenance based on the actual condition of the equipment rather than fixed intervals.
6. **Track Inventory:** Efficiently managing spare parts and maintenance supplies is vital for minimizing downtime. This involves:
- a. Maintaining an adequate stock of critical spare parts.
 - b. Implementing a system for tracking inventory levels and reordering supplies promptly.
 - c. Organizing the inventory for easy access.
 - d. Avoiding both stockouts (leading to delays) and excessive inventory (tying up capital).
7. **Stay on Schedule:** Adhering to the established preventive maintenance schedule is crucial for its effectiveness. This requires:
- a. Developing a realistic and well-organized maintenance calendar.
 - b. Prioritizing tasks and allocating resources effectively.
 - c. Monitoring schedule adherence and addressing any delays or roadblocks.
8. **Prioritize Your Assets:** Not all equipment is equally critical to operations. This principle highlights the need to:
- a. Identify and classify assets based on their importance and potential impact of failure.
 - b. Focus more intensive preventive maintenance efforts on critical assets that would cause significant disruption or cost if they failed.
 - c. Adjust maintenance strategies for less critical assets accordingly.

Concept of Preventive Maintenance Tasks:

The concept of Preventive Maintenance for computers by outlining several key tasks and their intended outcomes as show in figure 3.38. Let's break down each part in detail:

1. **Regular Cleaning (Dust removal):** This represents the physical act of cleaning the computer's components, both internal and external, to remove dust and debris. The arrow indicates that this is an initial step in preventive maintenance.
2. **Software Updates (OS, Applications):** This refers to the process of installing the latest updates for the computer's operating system (OS, like Windows, macOS, Linux) and the various software applications installed on it. The arrow signifies that this is another important initial maintenance task.
3. **Hardware Checks (Fans, Cables):** This involves the physical inspection of the computer's hardware components. The examples given are checking the functionality of cooling fans and ensuring that all cables are securely connected. The arrow indicates this as another primary preventive action.

4. **Antivirus Scans (Malware removal):** This represents the action of using antivirus software to scan the computer for and remove malicious software (malware) such as viruses, worms, and Trojans. The downward arrow from "PREVENTIVE MAINTENANCE" suggests that this is a consequence or a further step resulting from the overall maintenance effort.
5. **Data Backups (Saving your files):** This refers to the process of creating copies of important data and storing them in a separate location (e.g., external hard drive, cloud storage). The downward arrow from "PREVENTIVE MAINTENANCE" indicates that regular backups are a vital outcome and a crucial part of preventing data loss.
6. **Disk Optimization (Speed improvement):** This encompasses various techniques aimed at improving the performance and efficiency of the computer's storage drive (usually a hard disk drive or solid-state drive). This can include tasks like defragmentation (for HDDs) or other optimization processes. The downward arrow from "PREVENTIVE MAINTENANCE" shows that this is another benefit or subsequent action related to maintaining the computer.

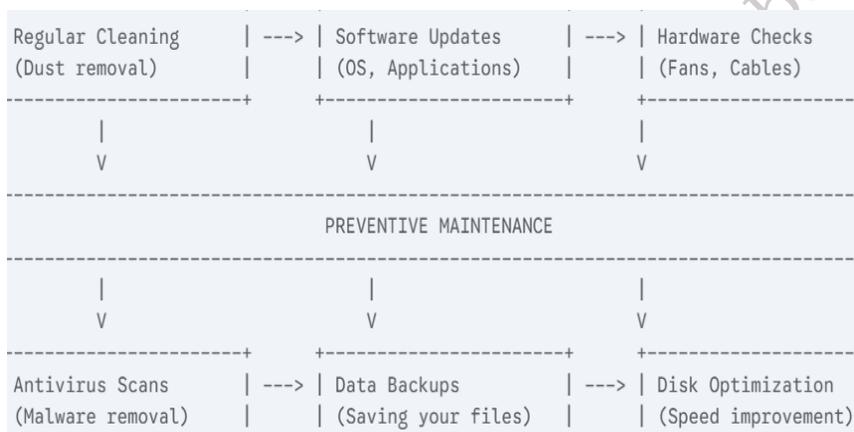


Fig. 3.38: Several Keys of Preventive Maintenance Tasks

Assignments

1. Illustrating the Process of Disassembling Desktop Computer Components for Repair and Maintenance.
2. Process of Reassembling Various Desktop Computer Components for Repair and Maintenance.
3. Demonstrate the process of repair and maintenance of a desktop peripherals
4. Demonstrate the process of preventive maintenance process of desktop peripherals

Check Your Progress

A. Multiple-choice questions (MCQs)

1. What is the first step you should take when disassembling a desktop computer? (a) Disconnect the monitor (b) Open the case (c) Turn off the computer and unplug it from the power source (d) Remove the hard drive
2. What tool is most commonly used to remove screws in a desktop computer? (a) Flathead screwdriver (b) Phillips screwdriver (c) Prying tool (d) Wrench

3. Which of the following components should be removed first when disassembling a desktop computer? (a) Power supply (b) RAM (c) Hard drive (d) Optical drive
4. When removing a RAM stick from a motherboard, what should you do first? (a) Unscrew the RAM module from the motherboard (b) Release the latches on both sides of the RAM slot (c) Disconnect the power cables (d) Remove the motherboard from case
5. What safety measure should be taken to avoid damaging computer components due to static electricity? (a) Wear rubber gloves (b) Keep the case open to allow airflow (c) Use an anti-static wrist strap (d) Keep the computer plugged in
6. What is the proper order for reassembling a desktop computer? (a) Reconnect the power supply, then reinstall the motherboard, followed by the hard drive and RAM (b) Reinstall the motherboard first, then the power supply and peripherals (c) Install the CPU, then the power supply, and finally the optical drive (d) Reconnect the monitor, keyboard, and mouse before reinstalling any components
7. What should you do if you need to remove a GPU (Graphics Processing Unit) from the motherboard? (a) Remove the PCIe slot locking mechanism and pull the card gently out (b) Unplug the power cables from the GPU and unscrew the case fan (c) Remove the RAM first to make space (d) Pull the GPU without unlocking it
8. Which of the following is an important step when removing the power supply from a desktop computer? (a) Disconnecting all peripheral devices before unplugging the PSU (b) Removing the motherboard before the PSU (c) Disconnecting the PSU from the motherboard and storage drives (d) Disconnecting the monitor from the PSU
9. What is the most common reason for disassembling a computer? (a) Upgrading RAM (b) Fixing physical damage to the case (c) Cleaning dust buildup and improving airflow (d) Changing the operating system
10. What should you do if a component doesn't fit back into the case or slot during reassembly? (a) Force it in gently (b) Check for alignment and ensure there are no obstructions (c) Ignore the issue and proceed (d) Use a hammer to secure it
11. Which of the following is NOT a benefit of preventive maintenance? (a) Improved data protection (b) Increased risk of equipment failure (c) Extended component lifespan (d) Reduced downtime and repair costs
12. What is the first step in the preventive maintenance process for a desktop computer? (a) Cleaning the keyboard and mouse (b) Running a disk cleanup utility (c) Updating software and drivers (d) Unplugging the computer from the power source
13. Which of the following factors should be considered when developing a preventive maintenance plan? (a) The user's skill level (b) The computer's brand and model (c) The computer's location and environment (d) The cost of replacement parts
14. Which of the following is NOT a common task in hardware maintenance? (a) Removing dust from internal components (b) Checking for loose cables (c) Installing new software (d) Cleaning the mouse and keyboard
15. How often should preventive maintenance tasks be performed? (a) Daily (b) Weekly (c) Monthly (d) Annually

B. Fill in the Blank

1. Before disassembling a desktop computer, you should always _____ to avoid electrical damage or shock.
2. The component that provides power to the motherboard, storage devices, and other parts of the computer is called the _____.
3. To prevent damage from static electricity, it is important to use a _____ when working with sensitive computer components.
4. When removing the hard drive, you need to disconnect both the _____ and _____ cables.
5. The _____ slot is typically used to install the Graphics Processing Unit (GPU) in a desktop computer.
6. _____ is the key to ensuring the longevity and optimal performance of your desktop peripherals.
7. Before starting any maintenance, always _____ the device from the power source.
8. Use a _____ to clean the screen of your monitor.
9. Regularly _____ the keyboard to remove dust and crumbs.
10. Keeping your computer in a _____ and _____ area helps prevent overheating.

C. Short Questions

1. Why is it important to unplug a computer before disassembling it?
2. What is the purpose of using an anti-static wrist strap during computer disassembly?
3. Which tool is most commonly used to remove screws in a desktop computer?
4. How do you safely remove a RAM stick from the motherboard?
5. What is the function of the PCIe slot in a desktop computer?
6. What is the purpose of preventive maintenance for computer peripherals?
7. List two common cleaning tools used for peripheral maintenance.
8. Why is it important to unplug a peripheral before cleaning it?
9. How can you protect your computer from power surges?
10. Name one benefit of regularly updating software and drivers.

Session 4. Post-Repair Desktop Functionality & work report, customer feedback

A desktop computer is a powerful device used for tasks ranging from basic computing to advanced activities like gaming and video editing. Its performance depends on key components like the CPU, RAM, storage, motherboard, PSU, and GPU, along with peripherals like the monitor, keyboard, and printer. Over time, these parts can wear out or malfunction. Regular repair and maintenance, such as replacing faulty components, cleaning dust, and updating drivers, help keep the system running efficiently. After any maintenance or repair, it's important to test all functions, including booting, file access, peripheral usage, and system stability. This ensures reliability, boosts

performance, and extends the computer's lifespan.

Key steps to verify correct functioning after computer repair:

Following computer repairs, it's crucial to confirm everything is working as expected. Therefore, a straightforward guide to the key steps involved in verifying the correct functioning of your desktop:

Step 1. Turn on the computer to ensure it boots successfully and completes the POST (Power-On Self-Test) without errors or warning beeps as shown in figure 4.1.

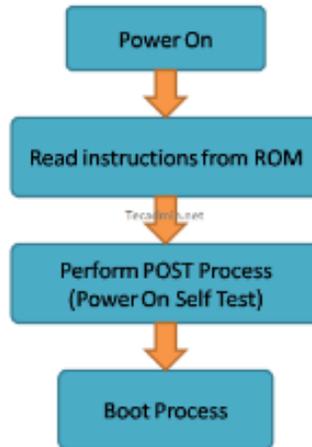


Fig. 4.1: Power-On Self-Test

Step 2. Confirm that the repaired or replaced components are installed securely and functioning as expected.

Step 3. Run stress tests on critical components like the CPU, GPU, and RAM to check for stability under load. Use tools like Prime95, FurMark, or MemTest86 as shown in figure 4.2.

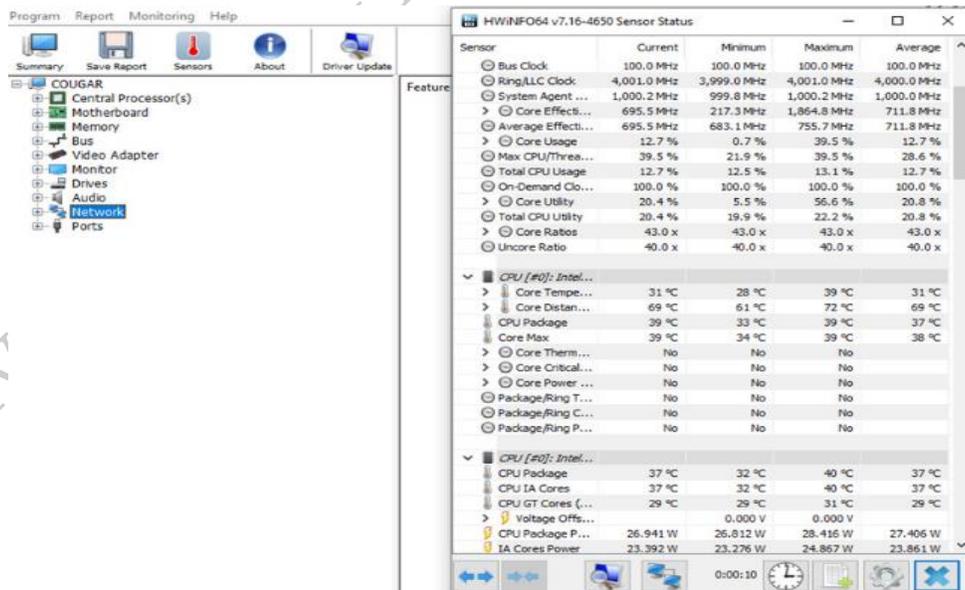


Fig. 4.2: Use tools like Prime95, FurMark, or MemTest86

Step 4. Test hard drives and SSDs for read/write speeds, errors, and overall health using diagnostic software like CrystalDiskInfo or CHKDSK as shown in figure 4.3.

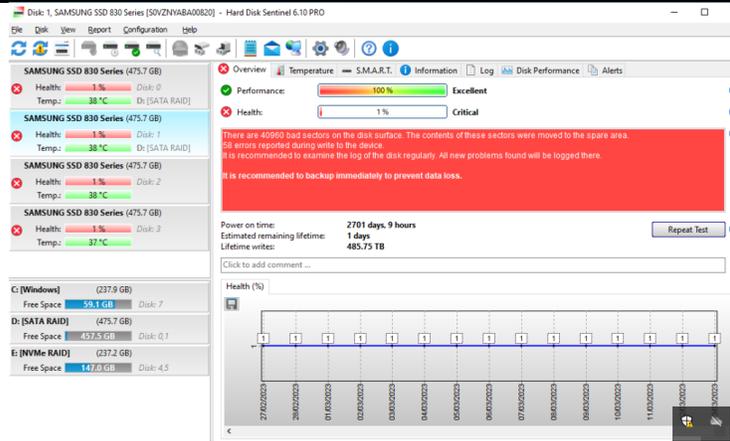


Fig. 4.3: Test hard drives using software

Step 5. Measure PSU voltage levels with a multimeter or PSU tester to confirm consistent and correct power delivery as shown in figure 4.4.



Fig. 4.4: Multimeter

Step 6. Test all connected peripherals, including the monitor, keyboard, mouse, printer, and external devices, for proper operation as shown in figure 4.5.

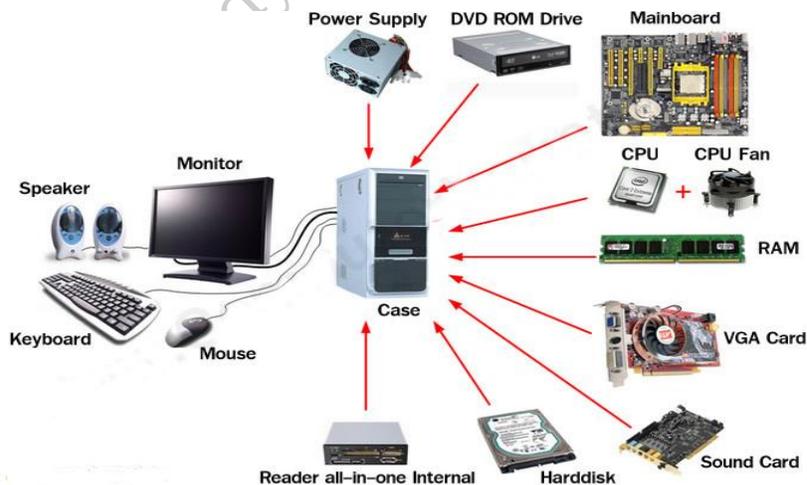


Fig. 4.5: Peripherals Devices

Step 7. Verify network connectivity and speed by running tests for LAN or Wi-Fi performance, checking for packet loss or connection drops as shown in figure 4.6.

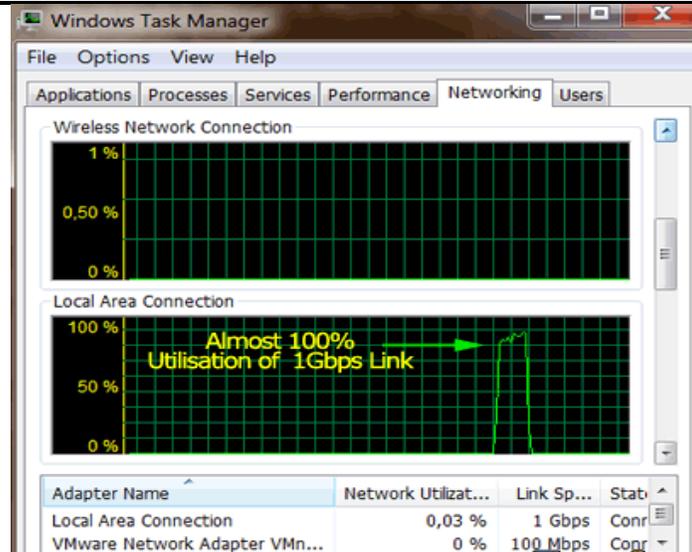


Fig. 4.6: Windows Task Manager

Step 8. Ensure all drivers, firmware, and the operating system are updated to the latest versions to avoid compatibility issues as shown in figure 4.7.

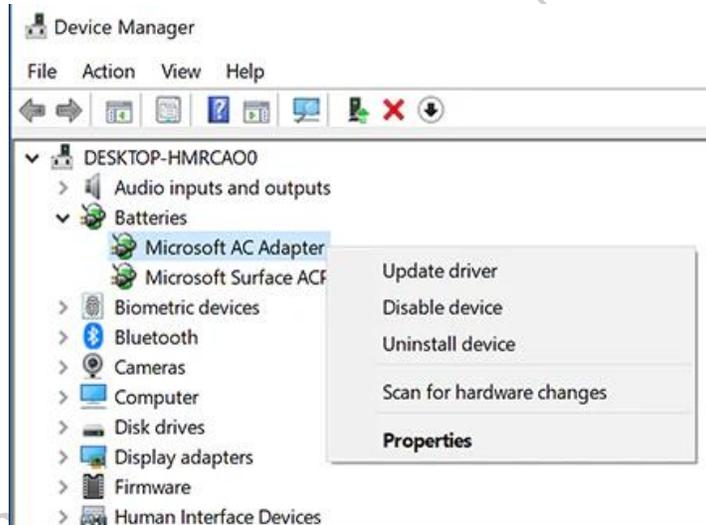


Fig. 4.7: Device Manager

Step 9. Use built-in or third-party diagnostic tools to identify any underlying issues or potential conflicts in hardware or software.

Step 10. Check component temperatures during idle and load conditions to ensure proper cooling and avoid overheating.

Step 11. Physically inspect all cables, connectors, and ports to ensure secure connections and detect any visible damage.

Step 12. Run a benchmarking tool to evaluate overall system performance and compare it to expected results.

Step 13. Test any user-specified software or applications to ensure compatibility and functionality.

4.2. Testing for various parts and components

Testing is a crucial step in ensuring the quality, reliability, and optimal performance of a desktop computer and its peripherals. Therefore, a breakdown of its significance:

1. Quality Assurance: Quality assurance for desktop computers involves a comprehensive approach that covers design, manufacturing, assembly, testing, and even post-market support as show in figure 4.8. Here are some key areas and considerations:

- Identify Defects: Testing helps uncover manufacturing defects, design flaws, and other issues early in the development or production process. This allows for timely corrections, preventing costly repairs or recalls later on.
- Prevent Failures: Rigorous testing minimizes the risk of hardware failures after the product reaches the user. This leads to increased customer satisfaction and reduces support costs for manufacturers.
- Ensure Reliability and Durability: Testing under various conditions (temperature extremes, vibration, humidity) ensures the hardware can withstand real-world usage and maintain consistent performance over time.

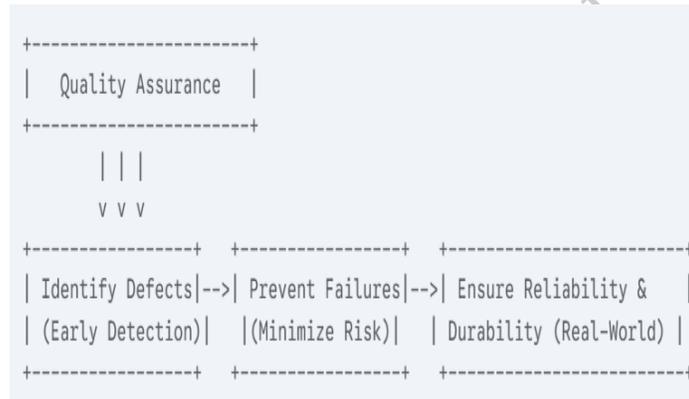


Fig. 4.8: Block Diagram of Computer Quality Assurance Testing

2. Performance Optimization: Optimizing your desktop computer's performance involves addressing potential bottlenecks in various areas. Here's a breakdown of key strategies as show in figure 4.9:

- Benchmarking: Testing allows for performance comparisons between different components and configurations. This data guides design decisions and helps optimize performance for specific applications (gaming, data centers, etc.).
- Identify Bottlenecks: Performance testing can pinpoint bottlenecks in the system, such as slow memory speeds or inadequate cooling, enabling targeted improvements.

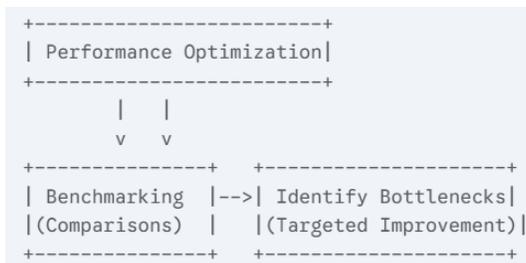


Fig. 4.9: Block Diagram of Computer Performance Optimization Testing

3. Safety and Compliance: Ensuring the safety and compliance of desktop computers and peripherals is paramount to protect users, prevent damage, and meet regulatory requirements. This involves adhering to safety guidelines, complying with relevant standards, and implementing best practices as show in figure 4.10.

- Meet Standards:** Many industries have strict safety and regulatory requirements. Testing ensures compliance with these standards, which is crucial for product approval and market entry.
- Minimize Risks:** In safety-critical applications (medical devices, aerospace), thorough testing is essential to minimize risks and ensure the safety of users.

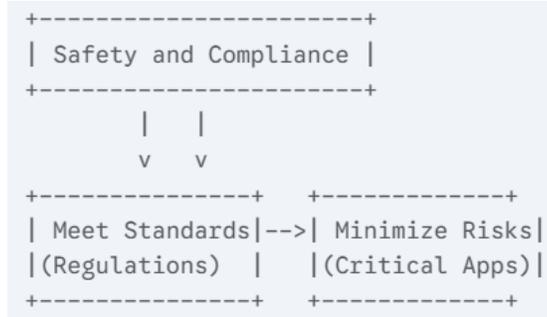


Fig. 4.10: Block Diagram of Computer Safety and Compliance Testing

4. Customer Satisfaction: Customer satisfaction with desktop computers and peripherals is a critical aspect of the overall user experience. It influences brand loyalty, repeat purchases, and positive word-of-mouth as show in figure 4.11.

- Enhanced User Experience:** Reliable and well-tested hardware provides a positive user experience, leading to increased customer satisfaction and brand loyalty.
- Reduced Support Costs:** By minimizing hardware failures, testing helps reduce the need for customer support, repairs, and warranty claims, saving companies significant costs.

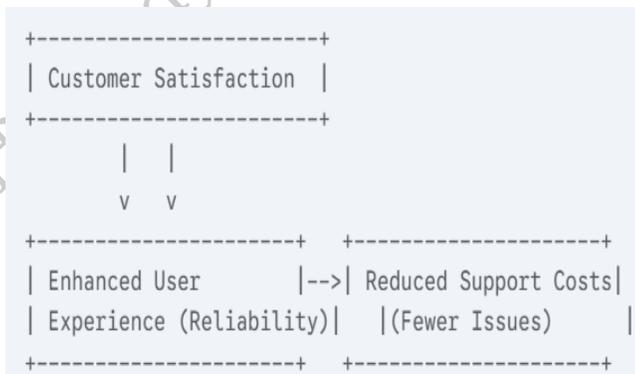


Fig. 4.11: Block Diagram of Customer Satisfaction Testing

4.3. Testing Process and Parameters of Computer and peripherals:

Testing Process and Parameters of Desktop Computer Components & Peripherals are following steps:

1. CPU (Central Processing Unit): CPU testing is crucial for ensuring a computer's reliability and performance. It verifies that the processor functions correctly and stably under various loads, identifies potential hardware faults, and evaluates its performance capabilities through

benchmarks. Additionally, it helps assess thermal management and the stability of overclocked systems, ultimately ensuring a smooth and efficient computing experience as show in figure 4.12. It involves several stages:

1) **Testing Process**

a. **Stress Tests**

- Purpose: Evaluate performance under heavy workloads, identify thermal throttling issues.
- Tools: Prime95, Cinebench, OCCT, Intel Extreme Tuning Utility, AMD Ryzen Master
- Parameters: CPU temperature, clock speed under load, power consumption, stability over extended periods.

b. **Benchmarking**

- Purpose: Compare performance across different CPUs, identify bottlenecks.
- Tools: Cinebench, Geekbench, UserBenchmark, 3DMark CPU Profile
- Parameters: Single-core and multi-core performance scores, clock speed, instruction per cycle (IPC).



Fig. 4.12: CPU with heat sink and fan, with arrows indicating temperature sensors, power delivery, and data flow.

2. RAM (Random Access Memory): RAM (Random Access Memory) testing is essential to ensure the stability and integrity of your computer system. It verifies that the memory modules can reliably store and retrieve data without errors. By testing RAM, you can identify faulty modules that might cause system crashes, data corruption, and overall poor performance, allowing for timely replacement and a more dependable computing experience as show in figure 4.13. It involves several stages:

1) **Testing Process:**

a. **Memory Tests:**

- Purpose: Detect memory errors, ensure data integrity.
- Tools: MemTest86+, Windows Memory Diagnostic, HWINFO
- Parameters: Error rates, latency, data corruption, stability under stress.

b. **Performance Tests:**

- Purpose: Evaluate memory bandwidth and latency.
- Tools: AIDA64, User Benchmark, 3DMark Memory Test
- Parameters: Read/write speeds, latency, bandwidth.

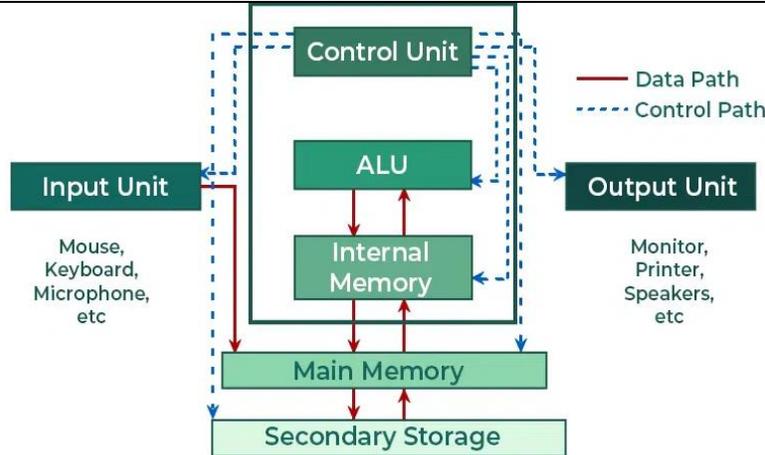


Fig. 4.13: Motherboard, with arrows indicating data flow and control signals.

3. Storage Drives (HDD/SSD): Storage drive (HDD/SSD) testing ensures the reliability and performance of your data storage. The process typically involves checking the drive's health status for errors or potential failures using built-in tools like S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology). Additionally, performance benchmarks measure read and write speeds, while stress tests assess stability under heavy load. These tests help identify issues that could lead to data loss or system slowdowns, allowing for timely intervention or replacement as show in figure 4.14. It involves several stages:

1) **Testing Process:**

a. **Performance Tests:**

- Purpose: Measure read/write speeds, assess data transfer rates.
- Tools: CrystalDiskMark, ATTO Disk Benchmark, AS SSD Benchmark
- Parameters: Sequential read/write speeds, random read/write speeds, 4K read/write performance, IOPS (Input/Output Operations Per Second).

b. **Endurance Tests:**

- Purpose: Evaluate drive longevity and reliability.
- Tools: Continuous write tests, random write tests over extended periods.
- Parameters: Data corruption, drive health indicators (SMART data).



Fig. 4.14: Hard drive or SSD with arrows indicating data flow and read/write heads.

4. Motherboard: Motherboard testing is a complex process aimed at verifying the overall health and functionality of the central hub of your computer as show in figure 4.15. It involves several stages:

1) **Testing Process**

a. **Compatibility Tests:**

- Purpose: Verify compatibility with different CPUs, RAM, graphics cards, and other components.

b. **Stress Tests:**

- Purpose: Evaluate stability under heavy workloads and extreme conditions.
- Tools: OCCT, Prime95 (for CPU stress), FurMark (for GPU stress)
- Parameters: System stability, component temperatures.

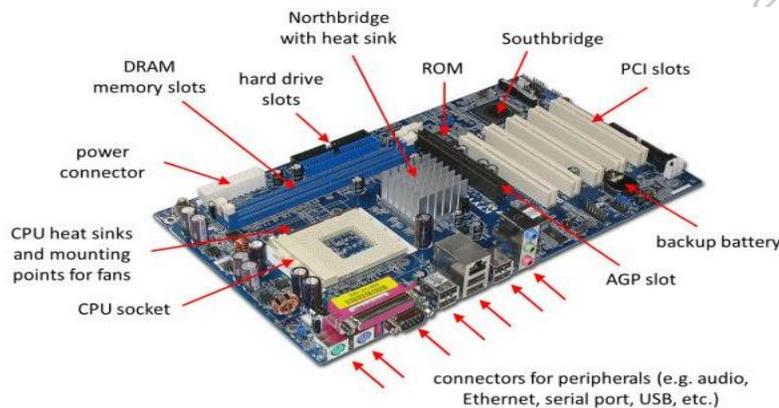


Fig. 4.15: Testing Motherboard Components

5. Graphics Card (GPU): GPU (Graphics Processing Unit) testing assesses its performance, stability, and thermal capabilities as show in figure 4.16. The process typically involves:

1) **Testing Process**

a. **Performance Tests:**

- Purpose: Evaluate gaming performance, 3D rendering capabilities.
- Tools: 3DMark, Unigine Superposition, Time Spy, Port Royal
- Parameters: Frames per second (FPS), graphics settings, rendering quality.

b. **Stress Tests:**

- Purpose: Evaluate stability and cooling performance under heavy load.
- Tools: FurMark, Unigine Superposition (extreme settings)
- Parameters: GPU temperature, clock speed under load, artifacting.



Fig. 4.16: Graphics card with a fan, highlighting the GPU core, memory chips, and power connectors

6. Peripherals: Peripheral testing ensures that your external devices are functioning correctly and communicating effectively with your computer as show in figure 4.17. The process varies depending on the peripheral but generally involves:

1) **Keyboard/Mouse:**

- Functionality Tests: Keystroke accuracy, button responsiveness, scroll wheel functionality.
- Durability Tests: Keystroke lifespan, button durability.

2) **Monitor:**

- Image Quality Tests: Color accuracy, contrast ratio, response time, viewing angles.
- Pixel Tests: Check for dead pixels, stuck pixels.

3) **Printer:**

- Print Quality Tests: Text clarity, image sharpness, color accuracy.
- Speed Tests: Print speeds for various document types.
- Reliability Tests: Print quality consistency over time.

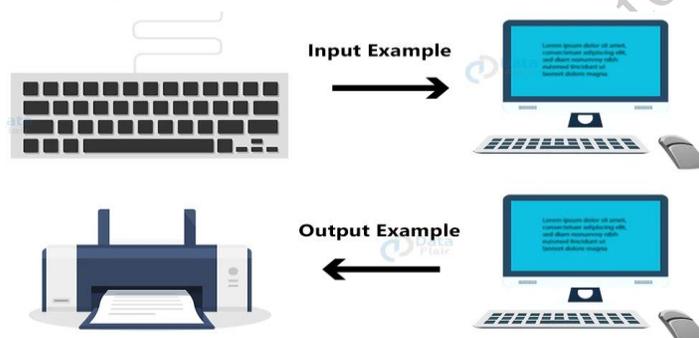


Fig. 4.17: Keyboard, mouse, monitor, and printer with arrows indicating data flow and signal connections.

7. Network Card: Network card testing verifies its ability to connect to and communicate effectively over a network as show in figure 4.18. The process generally involves:

1) **Network Performance Tests:**

- Purpose: Measure network throughput, latency, and packet loss.
- Tools: iPerf, Speedtest.net
- Parameters: Download/upload speeds, ping latency, packet loss.

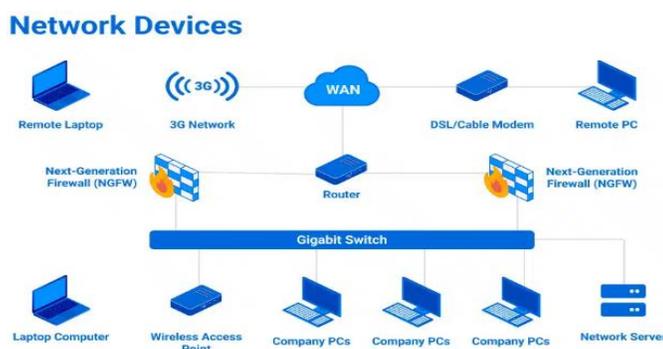
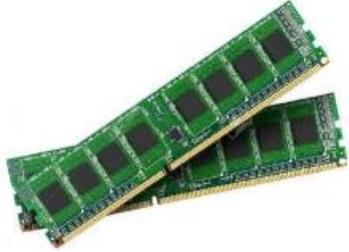


Fig. 4.18: Network card installed in a motherboard, with arrows indicating network cable connection and data flow

Practical Exercise List the testing process and parameters of various parts and components of desktop computer and peripherals.

Parts /Component	Parameters Tested	Testing process	Expected Result
			
			
			
			
			
			

Role of Documentation in Professional Settings

Documentation is essential in professional environments for transparency, accountability, and communication. Key documents include:

Work Reports: Track completed tasks, resource use, and progress, aiding in performance evaluation and informed decision-making.

Customer Feedback: Provides insights into client satisfaction, helping improve services and strengthen relationships.

Invoices: Detail services/products and payment terms, ensuring financial clarity and preventing disputes.

These elements work reports, customer feedback, and invoices form the backbone of effective business operations, contributing to operational efficiency, client satisfaction, and financial stability as shown in figure 4.19.

Customer Service Report

Company Name Address Line 1 Address Line 2 <<Phone>> <<Fax>> Email Address Company Website	Company Logo Here
---	----------------------

CUSTOMER SERVICE REPORT		
CSR NO.:	DATE:	
Customer Name:		
Address:		
City:	State:	ZIP Code:
Status of Call: Warranty or AMC <i>(Please circle)</i>	Instruction From Mr. _____ On _____	
NATURE OF PROBLEM		
Problem Reported:		
System Down: Yes / No <i>(Please circle)</i>		Equipment Type:
Make:	Model	Serial No.
Call Reported by:	Date:	Time:
Location of Installation:		
SERVICE DETAILS		
Service Rendered:		

Fig. 4.19: Customer service report

Process of Preparing the Invoice

Invoice processing is the systematic approach businesses use to handle invoices from the moment they are received until payment is made. Typically managed by the accounts payable (AP) department, it represents the crucial final stage of the procure-to-pay cycle, concluding the procurement of goods or services. This process encompasses several key actions: receiving, meticulously reviewing for accuracy and completeness (often involving matching against purchase and delivery orders), obtaining necessary approvals for payment authorization (either physical signatures or electronic authorizations), processing the approved invoice through the accounting system to facilitate electronic payment to the supplier, and finally, accurately recording the transaction in the general ledger and securely storing the invoice for future audits. The cycle begins upon receipt of an invoice from a vendor as shown in figure 4.20.



Fig. 4.20: Invoice Processing Workflow

Step 1. Receiving the Invoice: The process begins upon receiving the supplier's invoice, typically via email, even if the related goods or services were delivered separately. An initial check ensures essential information like date, amount owed, account number, and billing period are present. Missing information necessitates sending the invoice back for correction. Verified invoices are then entered into the accounting system.

Step 2. Entering Data into System: Manual data entry is error-prone and time-consuming. Automated solutions utilize scanning and Optical Character Recognition (OCR) to accurately capture data from various invoice formats (PDF, JPG). Advanced AI-powered solutions further enhance accuracy by learning to interpret scans. Once entered, the invoice data is cross-referenced with the corresponding purchase order.

Step 3. Three-Way Matching: This critical quality control compares the Purchase Order (PO), Delivery Receipt, and Invoice to ensure consistency in quantities and prices. Manual comparison is laborious, while automated systems quickly identify discrepancies, halting the process until any mismatches are resolved by the supplier.

Step 4. Payment Approval: Following successful data entry and matching, the invoice requires formal payment approval from authorized personnel within the AP department. This approval authorizes the release of funds through methods like checks or electronic transfers. Automated AP solutions streamline this process with efficient, click-based approvals.

Step 5. Payment Processing: Once approved, the invoice is paid according to the agreed-upon terms (e.g., wire transfer, credit card). In manual systems, payment details are forwarded to the responsible individual. Automated systems execute the payment upon receiving all necessary approvals based on predefined workflows.

Step 4. Storing the Invoice: The final step involves recording the transaction in the general ledger and securely storing the invoice for organized record-keeping and auditability. While manual storage options exist (like supplier-specific folders), automated solutions often handle this process, ensuring easy retrieval.

Procedure and formats of filing work-report and invoice

Filing a work report and invoice is a systematic process that ensures transparency, accountability, and timely payment. Here's how you do it step by step:

Step 1: Understand Client Requirements

- Clarify **reporting frequency** (daily, weekly, monthly).
- Confirm **billing model**: hourly, project-based, milestone-based.
- Determine **preferred formats** or templates (some clients have their own).

Step 2: Track Your Work

- Maintain a **log of tasks, dates, and hours.**
- Use tools such as:
 - **Manual:** Excel, Google Sheets
 - **Automated:** Clockify, Toggl, Harvest

Include:

- Date
- Task/Description
- Time Spent
- Notes/Status

Step 3: Prepare the Work Report

A work report outlines the work completed and serves as a record of progress and accountability. It helps the client verify the billing.

► Contents:

- Report Title (e.g., Weekly Work Report)
- Client and project name
- Reporting period
- Task summary with dates
- Hours spent
- Progress/remarks
- Signature/date

Step 4: Prepare the Invoice

An invoice is a formal document requesting payment.

► Contents:

- Your business/personal details
- Invoice number and date
- Client details
- Description of service provided
- Quantity (e.g., hours/days)
- Unit rate
- Total amount
- Tax (e.g., GST, VAT)
- Grand total
- Payment due date
- Payment method/bank details
- Notes/terms & conditions

Step 5: Combine and Submit

- Attach the **work report** and **invoice** in PDF format.
- Send via email or any client portal (Upwork, Fiverr, etc.).
- Subject line: “Work Report and Invoice – [Your Name] – [Project/Period]”

Step 6: Follow Up

- If the client has a **payment cycle** (e.g., net 15, net 30), follow up accordingly.
- Be polite and professional when reminding.

FORMATS OF WORK REPORT AND INVOICE

INVOICE

From:

[Your Name/Company Name]

[Address]

[Phone Number]

[Email]

GSTIN: [if applicable]

To:

[Client Name]

[Client Address]

Invoice No: INV-2025-04-001

Date: April 15, 2025

Due Date: April 30, 2025

Description of Services:

Task/Service	Hours	Rate	Amount
Website Development	45	₹800	₹36,000

Subtotal: ₹36,000

GST (18%): ₹6,480

****Total Due: ₹42,480****

Bank Details:

Account Name: [Your Name/Company]

Account No: [XXXXXXX]

Bank: [Bank Name]

IFSC Code: [XXXXXX]

Notes:

- Please make payment by the due date.
- Thank you for your business.

Signature

[Your Name]

Fig. 4.3: FORMATS OF WORK REPORT AND INVOICE

Importance of customer feedback:

Customer feedback is crucial for businesses as it helps them understand how their products, services, and overall customer experience are perceived. It provides direct insights into what customers value, what they are dissatisfied with, and what improvements they desire. Here's a breakdown of its importance along with an example and a diagram.

1. **Improves Products and Services:** Feedback helps identify flaws or gaps in products/services, leading to continuous improvement.
2. **Enhances Customer Satisfaction:** Acting on feedback shows customers that their opinions matter, building trust and loyalty.
3. **Informs Business Decisions:** Data-driven decisions can be made based on real customer experiences and suggestions.
4. **Measures Customer Satisfaction (CSAT):** Tools like surveys help gauge satisfaction levels to identify happy or unhappy customers.
5. **Builds Customer Loyalty:** Engaged customers who see their feedback used are more likely to stay loyal and promote the brand.
6. **Boosts Customer Retention:** Proactively addressing concerns can prevent churn and increase long-term profitability.

Procedure for Filing Customer Feedback

This is a step-by-step process that businesses follow to collect and handle customer feedback effectively:

1. Collection:

- Feedback is collected through various channels:
 - Feedback forms (online or physical)
 - Customer service calls
 - Email or chat support
 - Surveys

2. Documentation

- The feedback is recorded in a standard format for easy tracking.
- Tools like Excel, CRM software, or online survey platforms are used.

3. Categorization: Feedback is sorted into types:

- Complaint
- Suggestion
- Compliment
- Inquiry

4. Analysis

- Identify common issues or suggestions.
- Generate reports and insights.

5. Action: Based on the feedback, corrective actions are taken by relevant departments.**4. Follow-up**

- The customer is contacted (if needed) to inform them about the actions taken.
- Close the loop to ensure customer satisfaction.

Formats of Filing Customer Feedback

- Rating: ★★★★★
- Select Type: Complaint / Suggestion / Compliment
- Describe Your Experience: (Text Box)
- Upload Screenshot (optional)
- Your Email (optional)

Fig. 4.21: Formats of Filing Customer Feedback**Check Your Progress****A. Multiple-choice questions (MCQs)**

1. After a computer repair, the first step in verifying correct functioning is: (a) Checking internet connectivity (b) Running a malware scan (c) Installing system updates (d) Performing a Power-On Self-Test (POST)
2. Which of the following is NOT a crucial peripheral to test after computer repair? (a) Keyboard (b) Mouse (c) Monitor (d) Web Browser
3. The primary purpose of checking for system updates after repair is to: (a) Increase computer speed (b) Improve aesthetics (c) Enhance security and stability (d) Reduce storage space
4. What is the main goal of running a malware scan after computer repair? (a) Improve gaming performance (b) Remove any harmful software (c) Increase internet browsing speed (d) Optimize storage space
5. Data integrity checks after repair aim to: (a) Ensure all files and folders are accessible (b) Increase hard drive space (c) Improve internet connection speed (d) Update outdated software
6. Which of the following is NOT a benefit of preventive maintenance? (a) Improved data pro-

tection (b) Increased risk of equipment failure (c) Extended component lifespan (d) Reduced downtime and repair costs

7. What is the first step in the preventive maintenance process for a desktop computer? (a) Cleaning the keyboard and mouse (b) Running a disk cleanup utility (c) Updating software and drivers (d) Unplugging the computer from the power source
8. Which of the following factors should be considered when developing a preventive maintenance plan? (a) The user's skill level (b) The computer's brand and model (c) The computer's location and environment (d) The cost of replacement parts
9. Which of the following is NOT a common task in hardware maintenance? (a) Removing dust from internal components (b) Checking for loose cables (c) Installing new software (d) Cleaning the mouse and keyboard
10. How often should preventive maintenance tasks be performed? (a) Daily (b) Weekly (c) Monthly (d) Annually

B. Fill in the Blank

1. After a computer repair or maintenance, it is crucial to _____ all components to ensure proper _____.
2. The first step is to perform a _____ to check if the computer _____ correctly and _____ into the operating system.
3. Next, _____ all _____ such as the _____, _____, _____, _____, and _____ to ensure they are _____ correctly.
4. _____ and use common _____ to verify their _____ and _____.
5. _____ for and install any available _____ and _____ updates to enhance _____ and _____.
6. Before starting any maintenance, always _____ the device from the power source.
7. Use a _____ to clean the screen of your monitor.
8. Regularly _____ the keyboard to remove dust and crumbs.

D. Short Questions

1. What is the first step in verifying computer functionality after repair?
2. Do you test peripherals after repair?
3. What is the purpose of checking for system updates?
4. Why is a malware scan important after repair?
5. What does data integrity checking ensure?

Module 2**Installation and Configuration of Laptop and Peripherals****Module Overview**

In this module provides comprehensive knowledge and practical skills required for working with laptop hardware. It begins by introducing the uses of a laptop and explaining the step-by-step process of its initial setup. In the next stage, learners will gain practical knowledge of how to install the motherboard into a laptop, followed by the correct procedure for installing the CPU or processor onto the motherboard. The module then focuses on installing RAM modules into the appropriate memory slots with proper alignment and safety. Finally, learners will be guided through the complete process of assembling all hardware components into the laptop chassis and disassembling them when needed. This includes handling components with care, using the right tools, and following safety precautions. By the end of the module, learners will have the confidence and skills required to perform basic hardware tasks involved in laptop setup, maintenance, repair, and troubleshooting.

Learning Outcomes

After completing this module, you will be able to:

- Explain the uses and basic setup process of a laptop.
- Identify and install the motherboard in a laptop correctly.
- Install the CPU or processor onto the motherboard following proper safety procedures.
- Install RAM modules accurately and securely on the motherboard.
- Assemble all laptop components in the correct order using appropriate tools.
- Disassemble a laptop safely without damaging any internal parts.
- Follow standard safety measures and handling procedures during laptop assembly and disassembly.
- Demonstrate confidence in performing basic laptop hardware tasks for maintenance or repair.

Module Structure

Session 1. Uses of Laptop Process of Setting

Session 2. Motherboard Installing in laptop

Session 3. CPU or Processor Installing on Motherboard

Session 4. Install the RAM Modules on the Motherboard

Session 5. Assemble and disassemble the laptop

Session 1. The Functions of Operating System

Bringing home, a new laptop is an exciting event as shown in Figure 1.1. Whether you are a student, a professional, or simply someone who enjoys staying connected, a laptop can significantly enhance your productivity and entertainment. Therefore, before you can start browsing the web or diving into your favourite games, there are a few essential steps involved in setting up your new device.



Fig. 1.1: Laptop

1. Unboxing and Initial Inspection of laptop

The first step is to carefully unbox your laptop as shown in Figure 1.2. Take note of all the included accessories, such as the power adapter, any manuals or warranty cards, and any additional items like a carrying case or a cleaning cloth. Once you've removed everything from the box, inspect the laptop for any signs of damage during transit. If you notice any scratches, dents, or other issues, contact the retailer or manufacturer immediately.



Fig. 1.2: Unboxing laptop

2. Charging the Battery of Laptop

Before powering on your laptop for the first time, it's crucial to charge the battery. Connect the power adapter to the laptop and a power outlet. The charging indicator light will typically illuminate to show that the battery is charging as shown in Figure 1.3. Allow the battery to charge for at least a few hours, or until the indicator light shows that the battery is fully charged. This initial charge will help ensure optimal battery performance in the long run.



Fig. 1.3: Charging battery

3. Powering on and Initial Setup of Laptop

Once the battery has charged, you can power on your laptop. Locate the power button, usually on the top or side of the device, and press it to turn it on. The laptop will typically go through a series of start-up checks and may display the manufacturer's logo. After a short while, you should see the operating system's welcome screen. The initial setup process will vary depending on the operating system you're using (Windows, macOS, Chrome OS, etc.). However, common steps include:

Choosing your language and region: Select your preferred language and region to ensure correct time, date, and currency settings as shown in Figure 1.4.

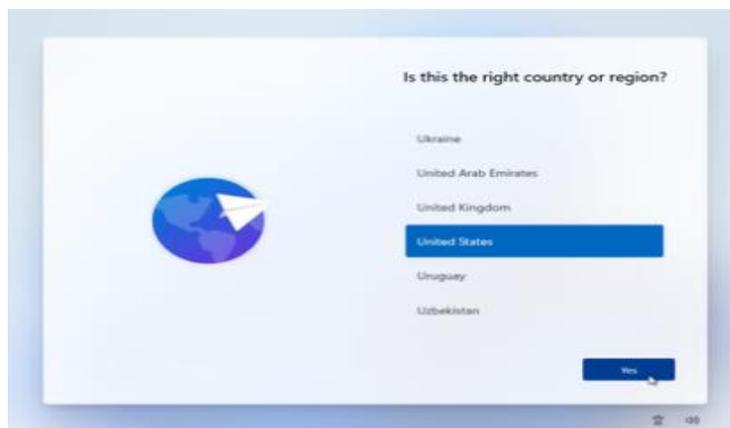


Fig. 1.4: Choosing your language and region

Connecting to Wi-Fi: Connect to your home or office Wi-Fi network to enable internet access as shown in Figure 1.5.



Fig. 1.5: Status of Connecting to Wi-Fi

Creating a user account: Create a user account with a username and password. This will be used to access your laptop and personalize settings as shown in Figure 1.6.

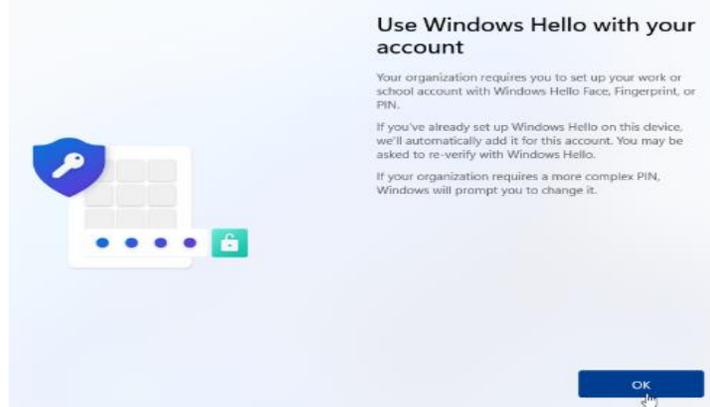


Fig. 1.6: Creating a user account

Software updates: Check for and install any available software updates as shown in Figure 1.7. This ensures that your laptop has the latest security patches and performance enhancements.



Fig. 1.7: updating software

4. Personalizing Your Settings

After completing the initial setup, you can personalize your laptop's settings to suit your preferences as shown in Figure 1.8.

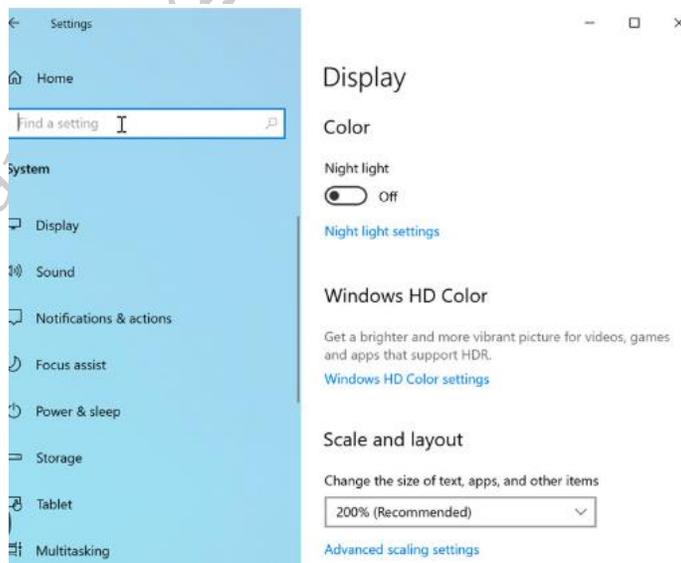


Fig. 1.8: personalize laptop settings

a. **Customizing the desktop background:** Choose a background image or color that you find

visually appealing.

- b. **Adjusting display settings:** Adjust the screen brightness, contrast, and resolution for optimal viewing comfort.
- c. **Setting up input devices:** Configure your keyboard and mouse settings, including shortcuts and sensitivity.
- d. **Installing necessary software:** Install any essential software, such as antivirus programs, productivity suites, and media players.

5. Connecting Peripherals of Laptop Device

If you plan to use external devices with your laptop, such as a monitor, printer, or external hard drive, you'll need to connect them. Most modern laptops have a variety of ports, including USB, HDMI, and Thunderbolt as shown in Figure 1.9.



Fig. 1.9: Connecting Peripherals in Laptop

6. Backing Up Your Data of Laptop Device

One of the most important steps in setting up your new laptop is to establish a regular data backup routine as shown in Figure 1.10. This will help protect your valuable files and documents in case of hardware failure, accidental deletion, or other unforeseen events. Consider using cloud storage services, external hard drives, or other backup solutions to ensure the safety of your data.



Fig. 1.10: Data backup

7. Troubleshooting Common Issues of Laptop Device

Even with careful setup, we may encounter some minor issues. Therefore a few common problems and their potential solutions:

- a. **Wi-Fi connectivity problems:** Ensure that your Wi-Fi router is properly configured and that

your laptop is within range. Try restarting your router or laptop to resolve connectivity issues.

- b. **Driver issues:** If you're having trouble with certain hardware devices, such as printers or webcams, it may be due to outdated or missing drivers. Visit the manufacturer's website to download and install the latest drivers.
- c. **Software conflicts:** If you're experiencing unexpected behaviour or crashes, try uninstalling recently installed software to see if it resolves the issue.
- d. **Overheating:** If your laptop feels excessively hot, ensure that it's not placed on a soft surface that can block airflow. Consider using a laptop cooling pad to improve ventilation.

8. Staying Updated

To ensure optimal performance and security, it's essential to keep your laptop's software up to date.

- a. **Operating system updates:** Regularly check for and install operating system updates, which often include security patches and performance improvements.
- b. **Software updates:** Keep your installed software updated to the latest versions to benefit from new features, bug fixes, and security enhancements.
- c. **Antivirus updates:** Regularly update your antivirus software to protect your laptop from the latest malware threats.

Example

Kunal and Rajesh were super excited as they unboxed the shiny new laptop. Kunal carefully cut open the box with a pair of scissors, and they both looked at the laptop in awe. "Wow, it looks amazing!"

Rajesh said, eagerly holding the laptop while Kunal plugged in the charger. The power light flickered on, and with a big grin, Kunal pressed the power button. The screen lit up, and both friends cheered as the "Welcome" message appeared.

Next, they selected their language and region, with Rajesh pointing at the time zone and Kunal clicking on "English" without hesitation.

The next challenge was connecting to Wi-Fi, which Kunal did quickly while Rajesh kept an eye on the network list. After entering the password, the laptop connected, and they both gave a celebratory high-five.

"Alright, now we just need to sign in," Kunal said as he typed in his email address. The laptop asked for a few updates, and while they waited for the progress bar to fill, Rajesh pretended to nap to pass the time, joking, "These updates take forever!" Once the updates were done, the desktop appeared, and they both jumped up in excitement. With all the apps and icons in place, Kunal smiled and said, "It's ready!"

"Let's explore!" Rajesh leaned back, grinning, as they sat down to enjoy the brand-new laptop together, ready for whatever came next as shown in Figure 1.11.



Fig. 1.11: Discussing new laptop

1.2. Features and specifications of laptop

Laptops have become indispensable tools for work, education, and entertainment. Understanding the key features and specifications is crucial when choosing the right laptop for your needs. These factors determine a laptop's performance, capabilities, and overall user experience.

Features & Specifications

Laptops come in a wide variety of shapes and sizes, each with its own unique set of features and specifications.

1. Processor (CPU)

- **Type:** Intel Core i3, i5, i7, i9, or AMD Ryzen (e.g., Ryzen 5, Ryzen 7, Ryzen 9). Higher numbers generally indicate better performance.
- **Clock Speed:** Measured in GHz, this determines how fast the processor can execute instructions. (Figure 1.12)



Fig. 1.12: Processor

2. RAM (Random Access Memory)

- **Capacity:** Measured in GB (Gigabytes). More RAM allows for smoother multitasking and running more demanding applications.
- **Type:** DDR4 or DDR5 are common types, with DDR5 offering faster speeds. (Figure 1.13)



Fig. 1.13: RAM

3. Storage:

- **HDD (Hard Disk Drive):** Offers large storage capacities but slower speeds.
- **SSD (Solid State Drive):** Much faster than HDDs, leading to quicker boot times and application loading.
- **eMMC:** A smaller, slower type of flash storage often found in budget laptops.
- **Capacity:** Measured in GB or TB (Terabytes). (Figure 1.14)



Fig. 1.14: Storage

4. Graphics Card (GPU)

- **Integrated:** Built into the CPU, suitable for basic tasks and light gaming.
- **Dedicated:** A separate graphics card (like NVIDIA GeForce or AMD Radeon) provides significantly better performance for gaming and demanding graphics applications. (Figure 1.15)



Fig. 1.15: Graphic card

5. Display

- **Size:** Measured in inches (e.g., 13.3", 15.6", 17.3").
- **Resolution:** Higher resolutions (like 1080p, 1440p, 4K) offer sharper images and more screen real estate.
- **Touchscreen:** Allows for direct interaction with the screen.
- **Refresh Rate:** Measured in Hz, this determines how many times the image on the screen refreshes per second, important for gaming. (Figure 1.16)



Fig. 1.16: Display

6. Operating System

- **Windows:** The most popular operating system for laptops.
- **macOS:** Used on Apple laptops (MacBooks).
- **Chrome OS:** A lightweight operating system focused on web-based applications.
- **Linux:** A versatile open-source operating system. (Figure 1.17)



Fig. 1.17: Operating System

7. Connectivity

- **Wi-Fi:** Essential for wireless internet access. Look for the latest Wi-Fi standards (Wi-Fi 6E for the fastest speeds).
- **Bluetooth:** Enables wireless connections to peripherals like headphones, keyboards, and mice.
- **Ports:**
 - USB-A: Standard USB ports.
 - USB-C: More versatile, often supporting faster data transfer speeds and video output.
 - HDMI: For connecting to external displays.
 - SD Card Reader: For reading memory cards from cameras and other devices.
 - Ethernet: For a wired internet connection. (Figure 1.18)



Fig. 1.18: Connectivity of ports

8. Battery Life

Measured in hours: Varies greatly depending on usage and settings as shown in Figure 1.19.



Fig. 1.19: Battery of Laptop

9. Weight and Portability

Important for those who frequently move around with their laptops as shown in Figure 1.20.



Fig. 1.20: Portable Laptop

10. Build Quality and Design

Consider factors like durability, materials used, and overall aesthetics.

11. Price

Set a budget and choose a laptop that fits within your price range as shown in Figure 1.21.

					
Thomson NEO Core Series Intel Core i5 12th Gen 1235U - (8 GB/512 ... 4.2★ (42) ₹27,990 ₹54,990 49% off	WarnerCann Hi5 pro Intel Core i5 12th Gen - (8 GB/256 GB SSD/Wind... ₹29,800 ₹56,000 46% off	ZEBRONICS Pro Series Z Intel Core i5 12th Gen 1235U - (8 GB/512 G... 3.9★ (952) ₹29,990 ₹60,999 50% off	ZEBRONICS Pro Series Z Intel Core i5 12th Gen 1235U - (8 GB/512 G... 3.9★ (952) ₹29,990 ₹60,999 50% off	ZEBRONICS Pro Series Z Intel Core i5 12th Gen 1235U - (8 GB/512 G... 3.9★ (952) ₹29,990 ₹60,999 50% off	Thomson NEO Core Series Intel Core i5 12th Gen 1235U - (16 GB/512... 4.2★ (42) ₹29,990 ₹59,990 50% off

Fig. 1.21: Value of Laptop

1.2 External components of laptop:

A laptop is a portable computer, designed for mobility and convenience. Its external components are the parts you can see and interact with directly, enabling input, output, and connectivity as shown in Figure 1.22.



Fig. 1.22: External components of Laptops

They are exploring these key components:

1. **Display/Screen:** This is the primary output device, showcasing visual information. It comes in various sizes (e.g., 13.3", 15.6"), resolutions (e.g., 1080p, 4K), and may even be touch-sensitive for interactive use as shown in Figure 1.23.



Fig. 1.23: Screen of Laptop

2. **Keyboard:** The primary input device for typing text and commands. It may include a numeric keypad and function keys for specialized tasks as shown in Figure 1.24.



Fig. 1.24: Qwerty keyboard

3. **Touchpad:** A touch-sensitive surface that acts as a pointing device, allowing you to control the cursor and perform gestures with your fingers as shown in Figure 1.25.

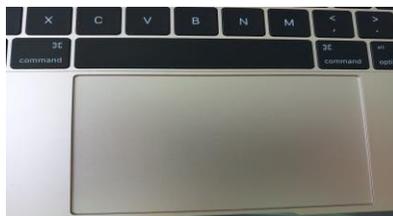


Fig. 1.25: Touchpad

4. **Speakers:** *These produce* sound for multimedia playback, such as music, videos, and games as shown in Figure 1.26.



Fig. 1.26: Speakers

5. **Webcam:** A built-in camera for video calls, capturing images, and video recording as shown in Figure 1.27.



Fig. 1.27: webcam

6. **Microphone:** Enables audio input for voice calls, voice commands, and recording as shown in Figure 1.28.



Fig. 1.28: Microphone

7. **Ports:** These connectors allow you to connect external devices. (Figure 1.29)

- **USB:** For connecting various peripherals like mice, keyboards, external drives, and more.
- **HDMI:** For connecting to external displays or TVs.
- **Thunderbolt/USB-C:** Versatile ports for high-speed data transfer, video output, and charging.
- **Ethernet:** For a wired internet connection.
- **Audio Jack:** For connecting headphones or external speakers.
- **SD Card Reader:** For reading memory cards from cameras and other devices.



Fig. 1.29: Ports

8. **Power Button:** This turns the laptop on and off as shown in Figure 1.29.



Fig. 1.29: Power Button

9. **Power Adapter:** Supplies power to the laptop when not running on battery power as shown in Figure 1.30.



Fig. 1.30: Power Adapter

10. **Battery:** Provides portable power, allowing you to use the laptop without being tethered to a power outlet as shown in Figure 1.31.



Fig. 1.31: Battery

1.3 Internal components of laptop:

Laptops are marvels of engineering, packing a lot of power and functionality into a small, portable package. While the external components are what you interact with directly, the internal components are the real workhorses. Here's a look at some of the key internal components of a laptop:

1.Motherboard: The main circuit board of the laptop. Houses the CPU, RAM slots, chipset, and various connectors for other components as shown in Figure 1.32.

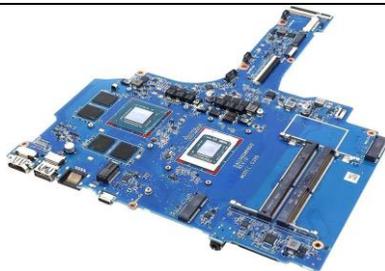


Fig. 1.32: Motherboard

2. Central Processing Unit (CPU): The "brain" of the laptop. It executes instructions and performs calculations. It comes in various types and speeds (e.g., Intel Core i5, AMD Ryzen 7). (Figure 1.33)



Fig. 1.33: CPU

3. Random Access Memory (RAM): Temporary storage for data that the CPU is actively using. It allows for quick access to information, crucial for multitasking. It is measured in GB (Gigabytes). (Figure 1.34)



Fig. 1.34: RAM

4. Storage Drive: Where data is permanently stored. It can be a Hard Disk Drive (HDD) or a Solid-State Drive (SSD). SSDs are faster and more durable than HDDs. (Figure 1.35)



Fig. 1.35: SSD

5. Graphics Processing Unit (GPU): It handles visual processing. It can be integrated into the CPU or a dedicated card. Dedicated GPUs offer better performance for gaming and graphics-intensive tasks as shown in Figure 1.36.



Fig. 1.36: GPU

6. Cooling System: Dissipates heat generated by the CPU and GPU. It Includes fans, heat sinks, and heat pipes as shown in Figure 1.37.



Fig. 1.37: Cooling System

7. Battery: it Provides power to the laptop when not connected to a power outlet. Lithium-ion batteries are commonly used in laptops as shown in Figure 1.38.



Fig. 1.38: Battery

8. Wireless Network Adapter:it Enables wireless connectivity (Wi-Fi). It Allows the laptop to connect to networks and the internet as shown in Figure 1.39.



Fig. 1.39: Wireless Network Adapter

9. BIOS Chip: it Contains the basic instructions for starting up the laptop as shown in Figure 1.40.



Fig. 1.40: BIOS Chip

1.4 Docking station

A docking station, also called a port replicator, is a device that allows you to connect multiple peripherals to your laptop or desktop computer. Docking stations can have ports for USB, HDMI, DisplayPort, Ethernet, and more.

Benefits of a docking station:

- **Increased connectivity:** Docking stations provide additional ports to connect more peripherals
- **Power connection:** Some docking stations provide a power connection for charging and using the device
- **Wired network connection:** Some docking stations provide a wired network connection

Process of docking a laptop:

Docking a laptop essentially means connecting it to a docking station. A docking station is a device that expands the connectivity and functionality of a laptop by providing additional ports and sometimes even charging capabilities as shown in Figure 1.41.



Fig. 1.41: working docking station

Practical Activity 1.1 Demonstrate of process of docking a laptop.

1. Connect the power cable: Plug the power cable into the docking station as shown in Figure 1.42.



Fig. 1.42: Connecting Power cable

2. Turn on the docking station: Power on the docking station as shown in Figure 1.43.

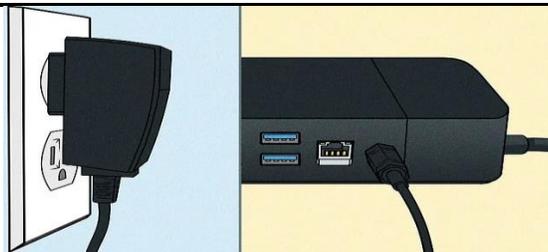


Fig. 1.43: Turn on docking station

3. Connect the docking station to the laptop: Ensure the docking station is connected to the correct port on the laptop as shown in Figure 1.44.



Fig. 1.44: Connecting docking station

4. Connect external devices: Connect any external devices, like a printer, webcam, or USB drive, to the docking station as shown in Figure 1.45.



Fig. 1.45: connecting external device

5. Configure displays: Adjust the display settings on your laptop, such as the screen resolution and layout as shown in Figure 1.46.

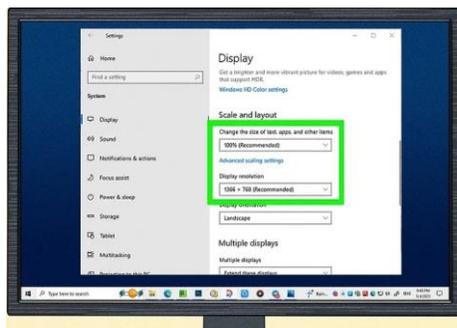


Fig. 1.46: Configure display setting

1.5 Various peripherals compatible with a laptop

Laptops, while powerful and portable, can often benefit from the addition of peripherals to enhance their functionality and user experience. Here's a breakdown of various peripherals compatible with laptops:

Input Devices:

Mouse

An external mouse offers more precision and comfort than the built-in touchpad, especially for tasks like graphic design or gaming. Options include wired, wireless, and ergonomic mice as shown in Figure 1.47.



Fig. 1.47: Mouse

Keyboard

A full-sized external keyboard can improve typing comfort and speed, particularly for extended typing sessions. Options include wired, wireless, and ergonomic keyboards as shown in Figure 1.48.



Fig. 1.48: Qwerty Keyboard

Graphics Tablet

For artists and designers, a graphics tablet provides a more natural and intuitive way to draw and create digital art as shown in Figure 1.49.



Fig. 1.49: Graphics Tablet

MIDI Keyboard

Musicians can connect a MIDI keyboard to their laptop to compose and produce music using software as shown in Figure 1.50.



Fig. 1.50: MIDI Keyboard

Webcam

While many laptops have built-in webcams, an external webcam can offer higher video quality and more flexibility in positioning as shown in Figure 1.51.



Fig. 1.51: Webcam

Output Devices:

Monitor

Connecting a laptop to an external monitor provides a larger display area for improved productivity and multitasking as shown in Figure 1.52.



Fig. 1.52: Monitor

Printer

A printer allows you to create physical copies of documents and images. Options include inkjet, laser, and all-in-one printers as shown in Figure 1.53.



Fig. 1.53: Printer

Speakers

External speakers can provide better audio quality than the built-in laptop speakers, enhancing your experience when watching movies or listening to music as shown in Figure 1.54.



Fig. 1.54: Speakers

Headphones

Headphones offer a private listening experience and can be useful for blocking out noise or focusing on work. Options include wired, wireless, and noise-canceling headphones as shown in Figure 1.55.



Fig. 1.55: Headphones

Projector

A projector can be connected to a laptop to display presentations or videos on a larger screen as shown in Figure 1.56.



Fig. 1.56: Projector

Storage Devices:

External Hard Drive: An external hard drive provides additional storage space for files, backups, and media. Options include portable hard drives and desktop hard drives as shown in Figure 1.57.



Fig. 1.57: External Hard Drive

USB Flash Drive: A USB flash drive is a small, portable storage device that can be used to transfer files between computers as shown in Figure 1.58.



Fig. 1.58: USB Flash Drive

SD Card Reader: An SD card reader allows you to access files stored on SD cards from cameras or other devices as shown in Figure 1.59.



Fig. 1.59: SD Card Reader

Other Peripherals:

Docking Station: A docking station expands the connectivity of a laptop by providing additional ports for peripherals, monitors, and Ethernet as shown in Figure 1.60.



Fig. 1.60: Docking Station

USB Hub: A USB hub allows you to connect multiple USB devices to a single USB port on your laptop as shown in Figure 1.61.



Fig. 1.61: USB Hub

Laptop Stand: A laptop stand can improve ergonomics by raising the laptop screen to eye level as shown in Figure 1.62.



Fig. 1.62: Laptop Stand

Cooling Pad: A cooling pad helps to prevent a laptop from overheating by providing additional ventilation as shown in Figure 1.63.



Fig. 1.63: Cooling Pad

Laptop Bag: A laptop bag is essential for protecting your laptop while traveling as shown in Figure 1.64.



Fig. 1.64: Laptop Bag

Practical Assignment: List the features and specifications of laptop.

Feature/Specification	Description	Importance	Considerations
Processor (CPU)			
Memory (RAM)			
Storage			
Graphics Card (GPU)			
Display			
Battery			

Check Your Progress

A. Multiple-choice questions (MCQs)

- Which of the following is NOT an external component of a laptop? a) Keyboard b) RAM c) Touchpad d) Screen
- What is the primary function of the HDMI port on a laptop? a) Connecting a USB drive b) Connecting to an external display c) Connecting headphones d) Connecting to a network
- Which component is responsible for capturing video and images on a laptop? a) Microphone b) Webcam c) Speaker d) Touchpad
- What is the purpose of the audio jack on a laptop? a) To connect a printer b) To connect headphones or speakers c) To connect a monitor d) To connect a network cable
- Which port is commonly used to connect various peripherals like mice, keyboards, and external drives? a) HDMI b) Ethernet c) USB d) Audio Jack

6. Which of the following is the "brain" of the laptop, responsible for processing information? a) RAM b) GPU c) CPU d) Storage Drive
7. What does RAM stand for, and what is its primary function? a) Read-Only Memory; stores permanent data b) Random Access Memory; temporary storage for active programs and data c) Redundant Array of Memory; backup storage d) Reduced Access Memory; slower memory
8. Which component is responsible for handling visual processing, especially for gaming and graphics-intensive tasks? a) CPU b) RAM c) GPU d) Storage Drive
9. What is the primary function of the storage drive in a laptop? a) To process information b) To store data permanently c) To display images d) To connect to networks
10. Which component helps to dissipate heat generated by the CPU and GPU? a) Battery b) Cooling System (fans, heatsinks) c) RAM d) Storage Drive

B. Fill in the Blank

1. The _____ is the primary input device for typing text and commands.
2. The _____ is a touch-sensitive surface used to control the cursor.
3. The _____ port is commonly used to connect external displays.
4. The _____ is a built-in camera used for video calls and capturing images.
5. The _____ allows you to connect headphones or speakers.
6. The _____ is the "brain" of the laptop, responsible for processing information.
7. _____ is temporary storage for active programs and data.
8. The _____ handles visual processing, especially for gaming and graphics-intensive tasks.
9. The _____ is where data is permanently stored.
10. The _____ helps to dissipate heat generated by the CPU and GPU.

C. Short Questions

1. Name three external components of a laptop.
2. What is the function of the touchpad?
3. What does the HDMI port do?
4. Where is the webcam usually located?
5. What is the purpose of the USB port?
6. What is the CPU responsible for?
7. What does RAM stand for, and what is its function?
8. What is the role of the GPU?
9. What are the two main types of storage drives used in laptops?
10. Why is a cooling system important in a laptop?

Session 2. Motherboard Installing in laptop

Replacing a laptop motherboard is a delicate and intricate process, demanding patience, precision, and a thorough understanding of the laptop's internal architecture. It's not a task for the faint of heart, but with the right tools, a steady hand, and careful attention to detail, it can be accomplished successfully. This guide will walk you through the process, providing a comprehensive overview of the steps involved in installing a new motherboard in a laptop as shown in Figure 2.1.



Fig. 2.1: Motherboard

Example

In the electronics lab, Kunal and Rajesh teamed up to replace a faulty motherboard in a client's laptop. Kunal followed the service manual closely, using his tablet for reference, while Rajesh relied on his hands-on experience to trace the internal components. They began by safely removing the battery and grounding themselves with static straps to avoid damage. Carefully, they disconnected delicate cables and components, labeling screws and taking photos to ensure accurate reassembly. (Figure 2.2)

Once the old motherboard was removed, they installed the new one with precision. Using their photos as a guide, they reconnected each component—Wi-Fi card, RAM, display, keyboard, and touchpad. After sliding the battery back in, they powered on the laptop, holding their breath until the screen flickered to life. A sigh of relief and a high-five followed their successful repair. It was another day of flawless teamwork and technical skill for the duo in the electronics lab.

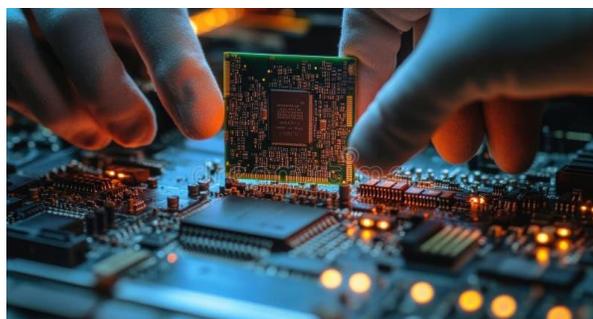


Fig. 2.2: Working in Motherboard

2.1 Various components of Laptop Motherboard

Motherboards can be broadly categorized based on their level of component integration and intended application.

Integrated Motherboards

These motherboards incorporate peripheral device slots, input/output ports, and legacy serial/parallel ports directly onto the board. This design saves space and cost compared to non-integrated motherboards. However, a significant drawback is that the failure of a single integrated component may necessitate replacing the entire motherboard.

Non-Integrated Motherboards

These motherboards typically integrate RAM slots. Other I/O ports (like serial and parallel), and controllers for devices like hard drives and floppy disk drives are connected to the system using expansion boards. This modular approach allows for more flexibility and potentially easier replacement of faulty components, but it can increase the overall system size and cost. Note: Non-integrated motherboards with separate expansion cards for basic I/O are largely a thing of the past in modern computing. Most modern motherboards, even in desktops, integrate most common I/O.

Desktop Motherboards

Designed for personal computers and desktop systems, these motherboards balance performance, features, and cost-effectiveness for everyday computing tasks.

Server Motherboards

Engineered for high-demand environments, server motherboards prioritize reliability, performance, and support for redundant technologies (e.g., ECC memory, RAID controllers). They are built to handle heavy workloads and ensure continuous operation.

Laptop Motherboards

Laptop motherboards are highly compact and specialized. They often integrate advanced features comparable to (and sometimes exceeding) those found in desktop motherboards, but within a much smaller form factor. They prioritize power efficiency and miniaturization.

Form Factors of Motherboard

a) Obsolete Form Factor refers to motherboard sizes and designs that are no longer in common use due to advancements in technology.

- Baby AT – Similar to original IBM XT motherboard structure. It supports a maximum of 8 slots
- Advanced Technology (AT) – Matches the original IBM AT motherboard in structure and layout. Size is very large. It supports a maximum of 7 slots.
- Low Profile Extended (LPX) – Advantages are low cost and small size. Developed by Western Digital. Difficult to upgrade or expand and exhibit cooling problems. Supports a maximum of 8 slots.

b) Modern Form Factor refers to the current standard motherboard designs used in most computers today, offering better performance, compatibility, and compactness.

- ATX – Popular and has best features of LPX and AT form factors
- Micro ATX – Limited expandability and capacity
- Flex ATX – Provides benefits of ATX and micro ATX form factors
- Mini ITX – Similar to ATX, micro ATX, Flex ATX, and BTX form factors
- NLX form factors – New addition to motherboard form factors, easier assembly, reduced

cost, space efficiency and flexibility

c) Proprietary Form Factor refers to a unique or custom motherboard design made by specific companies, not following standard sizes like ATX or Micro ATX.

- **Compaq:** Often used proprietary form factors in their desktops, making upgrades and replacements difficult with standard parts.
- **HP (Hewlett-Packard):** Also used proprietary designs in some models, including unique power connectors and layouts that are not compatible with standard motherboards. (Figure 2.3)

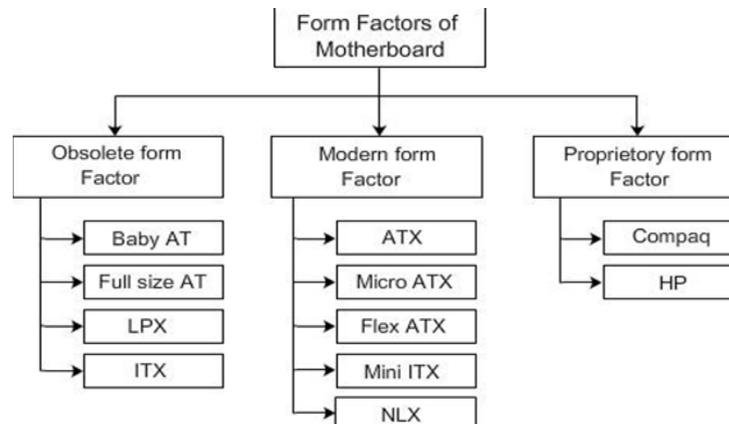


Fig. 2.3: Flow chart of Form Factors of Motherboard

Components of a Motherboard

Motherboard contains slots, sockets and connectors for connecting various devices. It contains a super I/O chip, slots for connecting various peripheral devices. Configure the motherboard using jumpers.

Connectors:

- System panel connector
- USB headers
- Digital audio connector
- MDC connector – connects to modem card module
- Internal audio connectors – connects to CD ROM or voice modem card
- GAME/MIDI connector
- System Management Bus (SMBus) connector
- ATX 12V connector
- ATX Power Connector
- CPU and chassis fan connectors
- Serial Advanced Technology Attachment (SATA) connectors
- IDE connectors
- Serial port connector
- Floppy disk drive connector

Slots and sockets

Slots and sockets on a motherboard are essential components that provide connection points for various hardware devices. They allow you to install and connect crucial parts like the CPU, RAM, graphics cards, and expansion cards, enabling your computer to function and perform a wide range of tasks as shown in Figure 2.4.

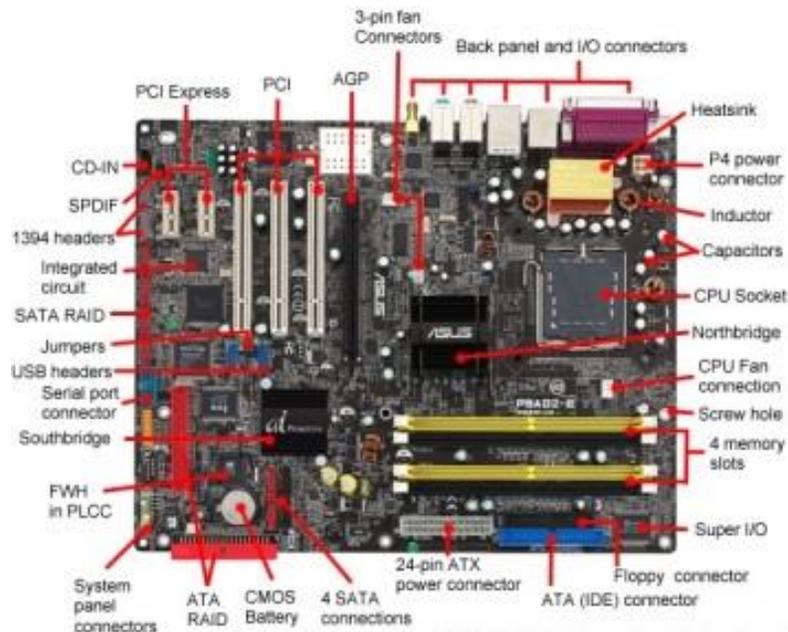


Fig. 2.4: Slots and sockets on motherboard

1. CPU Socket

- **The Heart of the System:** The CPU socket is arguably the most important socket on the motherboard. It's where the Central Processing Unit (CPU), the "brain" of your computer, resides.
- **Variety of Types:** CPU sockets come in different types, each designed to support specific CPU generations and manufacturers (Intel or AMD). It's crucial to choose a motherboard with a socket that's compatible with your chosen CPU.
- **LGA vs. PGA:** Modern CPUs typically use either Land Grid Array (LGA) or Pin Grid Array (PGA) sockets. LGA sockets have pins on the motherboard, while PGA sockets have pins on the CPU itself.

2. RAM Slots

- **Memory is Key:** Random Access Memory (RAM) is essential for your computer to run programs and multitask efficiently. RAM slots, also known as DIMM slots, hold the RAM modules.
- **DDR Generations:** RAM slots are designed for specific DDR (Double Data Rate) generations of RAM (e.g., DDR4, DDR5). The slots have different keying to prevent you from installing the wrong type of RAM.
- **Dual-Channel and More:** Most motherboards have multiple RAM slots, often arranged in pairs to support dual-channel memory architecture, which improves performance.

3. PCIe Expansion Slots

- **Expanding Capabilities:** PCI Express (PCIe) slots are used to connect expansion cards,

which add extra functionality to your computer.

- Graphics Cards: The most common use for a PCIe x16 slot is to install a dedicated graphics card, which provides enhanced graphics processing for gaming and other visually demanding tasks.
- Other Cards: PCIe slots can also be used for sound cards, network cards, SSDs (in the form of PCIe cards), and other expansion devices.
- Different Sizes: PCIe slots come in different sizes (x1, x4, x8, x16), with x16 being the most common for graphics cards.

4. M.2 Slots

- High-Speed Storage: M.2 slots are primarily used for high-speed Solid-State Drives (SSDs). M.2 SSDs offer significantly faster data transfer speeds compared to traditional SATA SSDs.
- Various Sizes and Keying: M.2 slots come in different sizes (length) and keying (which determines the type of M.2 SSD it supports). It's essential to check the specifications of your M.2 SSD and the motherboard to ensure compatibility.

5. SATA Ports

- Traditional Storage: SATA ports are used to connect traditional hard drives (HDDs) and 2.5-inch SATA SSDs. While M.2 SSDs are becoming more common, SATA ports are still relevant for connecting mass storage devices.

6. Other Slots and Sockets

- Fan Connectors: Motherboards have fan connectors for connecting case fans and CPU coolers.
- Front Panel Connectors: These connectors are used to connect the front panel buttons (power, reset) and LEDs of your computer case.
- Audio Connectors: Audio connectors are used to connect the front panel audio jacks.

2.2 Procedure for installation of Motherboard in laptop

Installing a laptop motherboard is a delicate and intricate process that requires patience, precision, and a good understanding of the laptop's internal layout. It's not a task for beginners, and consulting the service manual for your specific laptop model is highly recommended. This manual will provide detailed diagrams and step-by-step instructions tailored to your device. If you're not comfortable with the process, it's always best to seek professional help. However, if you're determined to proceed, here's a general overview of the installation procedure.

Practical Activity 2.1: Demonstrate for installation of Motherboard in laptop

Materials

- Small Phillips head screwdrivers (various sizes)
- Flat-head screwdriver or plastic pry tool (for gentle prying)
- Tweezers or small pliers (for tiny parts)
- Container or magnetic tray for screws
- Static wrist strap (very important)
- Camera or phone for taking pictures. (Figure 2.5)



Fig. 2.5: Various Tools

Procedure

Step 1. Find a clean, flat surface.

Avoid carpets (static).

Put on your static wrist strap.

Clip it to a metal part of your workspace (not the laptop yet). (Figure 2.6)



Fig. 2.6: Clean Workspace with Tools

Step 2. Turn off the laptop completely.

Don't just put it to sleep.

Unplug the AC adapter.

Remove the battery (if it's removable – some are internal).

There's usually a latch or screws holding it in. (Figure 2.7)



Fig. 2.7: Laptop with Battery Removed

Step 3. Unscrew all the screws on the bottom of the laptop.

Keep the screws organized! Gently pry off the bottom cover.

Use a plastic pry tool or flat-head screwdriver if needed.

Be careful not to break any clips. (Figure 2.8)



Fig. 2.8: Laptop with Bottom Cover Removed

Step 4. Disconnect all the ribbon cables (flat, flexible cables).

These connect the display, keyboard, touchpad, etc.

Be very gentle, they often have tiny latches you need to release first.

Disconnect any other connectors (Wi-Fi card, hard drive, etc.).

Remove the RAM modules (if they're not soldered).

They have clips on the sides. (Figure 2.9)

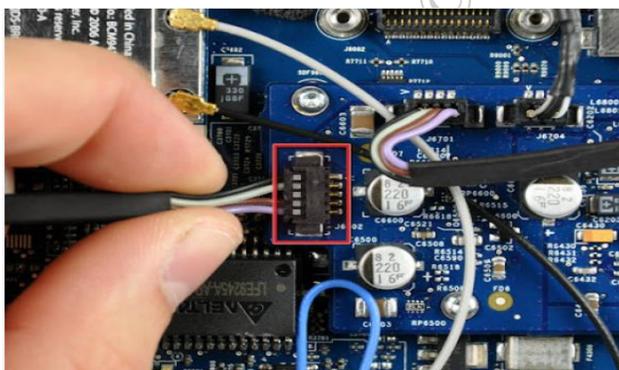


Fig. 2.9: Close-up of Motherboard with Connections Highlighted

Step 5. Unscrew the screws that hold the motherboard in place.

Carefully lift the motherboard out of the laptop. (Figure 2.10)



Fig. 2.10: Motherboard Being Removed

Step 6. Align the new motherboard with the mounting points.

Screw it in securely. (Figure 2.11)



Fig. 2.11: New Motherboard Installed

Step 7. Reinstall the RAM modules (if you removed them). (Figure 2.12)



Fig. 2.12: Reconnecting Components (Use your pictures)

Step 8: Put the bottom cover back on.

Screw it back together.

Make sure you use the correct screws in the correct places. (Figure 2.13)



Fig. 2.13: Reassembling the Laptop

Step 9. Put the battery back in.

Plug in the AC adapter.

Turn on the laptop. (Figure 2.14)



Fig. 2.14: Plug in the AC adapter.

1.3 Features and specifications of CMOS Battery

The CMOS battery, usually a CR2032 lithium coin cell, is a small but vital component on a computer's motherboard. It powers the CMOS chip, which stores crucial system settings such as the date, time, and hardware configurations, ensuring these are retained even when the computer is powered off. Key features of the CMOS battery include its compact size, low power consumption, stable voltage output, long lifespan, and its ability to preserve BIOS settings through power outages as shown in Figure 2.15.



Fig. 2.15: CMOS Battery

CMOS Battery Specifications

Type: Lithium coin cell (commonly CR2032)

Voltage: 3V

Lifespan: 2-10 years (depending on usage and environmental factors)

Function: Preserves BIOS settings while the computer is off

Location: On the motherboard

Practical Activity 2.2: Demonstration installation and un-installation of CMOS battery on Motherboard.

Materials

New CMOS battery, Small Phillips-head screwdriver, Plastic or flat-head screwdriver, Anti-static wrist strap, Flashlight, Small brush (Figure 2.16)



Fig. 2.16: Various Tools

Procedure

Step 1. To protect the Laptop from potential static electricity harm, unplug it from the power source and remove the battery (if it has one).

Step 2. Remove the Laptop case by unscrewing the screws that hold it together. You will then have access to the motherboard.

Step 3. On the motherboard, find the CMOS battery. Usually, it will look like a tiny, round battery with a "+" and "-" sign on it. Note its orientation to ensure that the battery is replaced in the same orientation. Most Laptop use a coin cell CMOS battery such as the CR2032.

Step 4. Clean the battery socket's contact points with a tiny brush to ensure the new battery makes excellent contact.

Step 5. Screws must be tightened after replacing the computer's case.

Step 6. To check that the clock and BIOS settings are correct, connect the computer to a power supply and turn it on.

Practical Activity 2.3: Resetting BIOS Settings on a Laptop After CMOS Battery Replacement**Procedure**

The BIOS (Basic Input/output System) controls a laptop's basic functions, including startup and system settings. Replacing the CMOS battery can reset these settings to their defaults.

Step 1. Access BIOS Setup: As the laptop starts, repeatedly press the key that opens the BIOS setup utility. This key varies between manufacturers (often Del, F2, F10, F12, or Esc). Your laptop's manual or a quick online search for "[your laptop model] BIOS key" will tell you the correct key. (Figure 2.17)

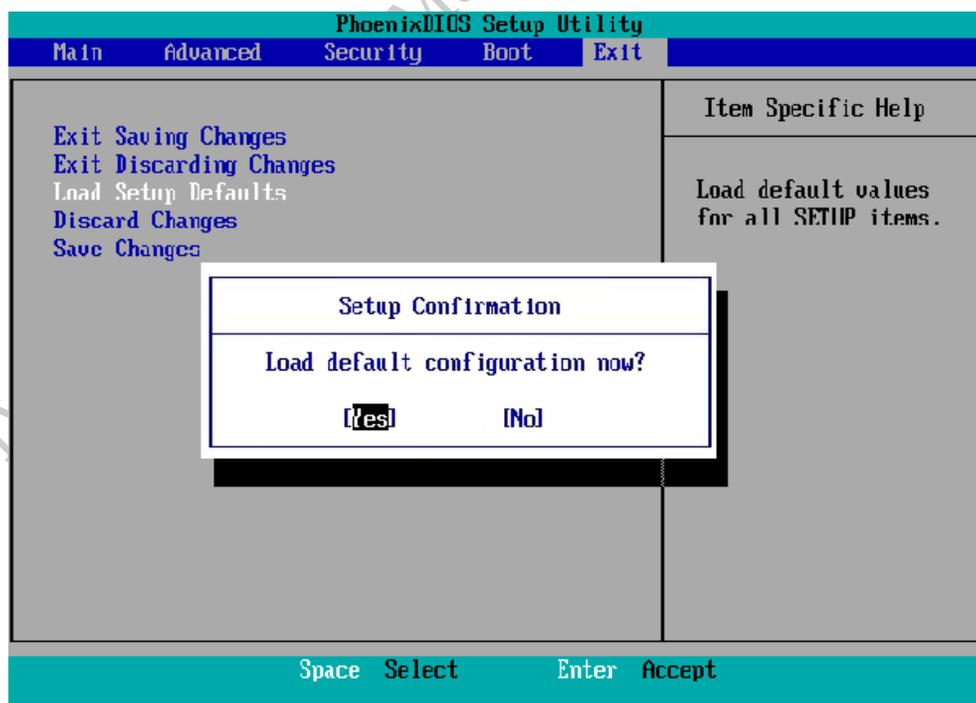


Fig. 2.17: BIOS Step

Step 2. Load Defaults: Within the BIOS setup utility, look for an option like "Load Default Settings," "Restore Defaults," "Load Optimized Defaults," or "Reset to Default." This is often found in the "Exit," "Main," or "Advanced" menus.

Step 3. Save and Exit: After loading the defaults, navigate to the "Exit" menu. Select "Save Changes and Exit" or a similar option. This will save the default settings and restart the laptop.

Assignment 1. Identify and name the different components of laptop motherboard.

Component Name	Function
CPU (Central Processing Unit)	
GPU (Graphics Processing Unit)	
SATA Connector(s)	
Wi-Fi Card Slot	
CMOS Battery	

Assignment 2. Identify and name the type of motherboards used in laptop.

Motherboard Type	Usage
Integrated Motherboard	
Modular Motherboard	
Desktop-Grade Motherboard	
Chip-on-Board (CoB) Motherboard	
Motherboard with Dedicated GPU	

Assignment 3. Demonstrate to connect and disconnect various components and install the motherboard in laptop

Component	Connecting Steps	Disconnecting Steps
Battery		
RAM (Memory)		
Hard Drive / SSD		
Keyboard		
Motherboard Installation		

Assignment 4. Demonstrate to install and uninstall the CMOS battery on motherboard of laptop.

Check Your Progress

A. Multiple-choice questions (MCQs)

1. What is the FIRST thing you should do before starting any work inside a laptop? a) Disconnect the AC adapter and remove the battery. b) Gather your tools. c) Put on your anti-static wrist strap. d) Take pictures of the internal components.
2. Which tool is MOST important to prevent electrostatic discharge (ESD) damage to laptop components? a) Phillips head screwdriver b) Anti-static wrist strap c) Plastic pry tool d) Tweezers
3. When disconnecting ribbon cables from the motherboard, what is the BEST approach? a) Pull firmly on the cable. b) Use a flat-head screwdriver to gently release any locking mechanisms and then pull on the connector, not the cable itself. c) Use pliers to grip the cable and pull. d) It doesn't matter how you disconnect them as long as they come off.
4. Why is it important to take pictures during the laptop disassembly process? a) To document the repair for warranty purposes. b) To help you remember how to reconnect everything during reassembly. c) To share your repair progress on social media. d) To estimate the cost of repairs.
5. What is the typical connection type for the laptop's display to the motherboard? a) SATA cable b) Ribbon cable c) M.2 connector d) ATX power connector
6. Where are the screws that secure the motherboard to the laptop chassis typically located? a) On the bottom of the laptop, under the access panel. b) Around the edges of the motherboard itself. c) Underneath the keyboard. d) Inside the optical drive bay.
7. What should you do AFTER installing the new motherboard and reconnecting all components? a) Immediately close up the laptop and test it. b) Double-check all connections and then power on the laptop to test. c) Install the operating system. d) Update the BIOS.
8. If the laptop doesn't power on after installing the new motherboard, what is the FIRST thing you should do? a) Assume the new motherboard is faulty. b) Double-check all connections and review your pictures from disassembly. c) Replace the CMOS battery. d) Contact the laptop manufacturer for support.

B. Fill in the Blank

1. Before starting any work inside a laptop, it's crucial to _____ the AC adapter and _____ the battery.
2. A(n) _____ wrist strap is essential to prevent electrostatic discharge (ESD) from damaging laptop components.
3. When disconnecting ribbon cables, you should gently release any _____ mechanisms before pulling on the _____, not the cable itself.
4. Taking _____ during disassembly is highly recommended to help with reassembly.
5. The laptop's _____ connects to the motherboard via a ribbon cable.
6. Motherboard screws are typically located _____ the motherboard itself.
7. After installing the new motherboard, you should double-check all _____ before powering on the laptop.
8. If the laptop doesn't power on after installing the new motherboard, the first thing you should do is double-check all _____ and review your _____ from disassembly.

C. Short Questions

1. Why is it important to disconnect the battery before working inside a laptop?
2. What tool is crucial for preventing ESD damage?
3. How should you disconnect ribbon cables?
4. Why should you take pictures during disassembly?
5. What type of cable typically connects the display to the motherboard?
6. Where are the screws that secure the motherboard usually located?
7. What is the first thing you should do after installing the new motherboard?
8. What should you do if the laptop doesn't power on after the installation?
9. Are laptop motherboards standardized like desktop motherboards?
10. Is it recommended for inexperienced users to replace a laptop motherboard?

Session 3. CPU/Processor Installing on Motherboard

Installing a CPU, the "brain" of your computer, onto the motherboard is a crucial step in building a PC. It's a delicate process, but with careful attention to detail, anyone can do it. This process involves several key steps, starting with preparing the motherboard socket as shown in Figure 3.1. This socket, a square-shaped component with numerous tiny holes, is where the CPU will reside. A lever on the side of the socket needs to be lifted to unlock it, allowing the CPU to be inserted. Often, a protective cover safeguards the delicate pins within the socket, which must be removed before installation.



Fig. 3.1: Motherboard socket

3.2 Speed, form factor and performance of CPU in laptop

The CPU, or Central Processing Unit, is the "brain" of your laptop, responsible for carrying out instructions and performing calculations. When considering a laptop's CPU, three key aspects come into play: speed, form factor, and performance.

Speed of CPU

CPU speed is a critical factor in determining how quickly your computer can process information and execute tasks. It's essentially the pace at which your computer's "brain" operates. CPU speed is a combination of various factors that work together to determine how quickly your computer can process information.

a) **Clock Speed:** Measured in gigahertz (GHz), clock speed indicates how many calculations the

CPU can perform per second as shown in Figure 3.2. A higher clock speed generally translates to faster processing. Therefore, clock speed isn't the only factor determining CPU speed.



Fig. 3.2: CPU with a clock speed of 3.5 GHz

- b) **Cores:** Modern CPUs have multiple cores, each capable of handling separate tasks simultaneously. More cores enable better multitasking and improved performance in applications that can utilize multiple cores. (Figure 3.3)

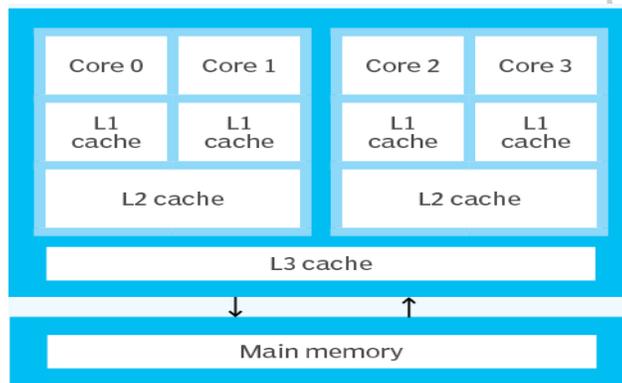


Fig. 3.3: Architecture Quad-Cores processors in CPU

- c) **Cache:** Cache memory is a small, fast memory within the CPU that stores frequently accessed data. A larger cache can improve performance by reducing the time it takes to access data. (Figure 3.4)

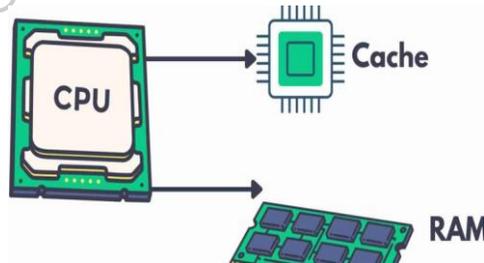


Fig. 3.4: CPU with cache memory

Form Factor of CPU

"form factor" essentially refers to the physical characteristics of the CPU package, including its size, shape, and how it connects to the motherboard. CPU form factor is a critical factor to consider when building or upgrading a computer. It ensures that the CPU is compatible with the motherboard and that you can properly cool it.

- a) **Integrated:** Most laptop CPUs are integrated directly onto the motherboard, making them non-replaceable. This design helps keep laptops compact and energy-efficient. (Figure 3.5)



Fig. 3.5: Laptop motherboard with an integrated CPU

- b) **Socketed:** Some high-performance laptops may have socketed CPUs, allowing for upgrades. However, this is less common in laptops compared to desktop computers. (Figure 3.6)



Fig. 3.6: Socket CPU in a laptop

Performance of CPU

CPU performance is a complex interplay of various factors. While clock speed is important, it's not the only thing to consider. The number of cores, cache size, architecture, IPC, and other factors all contribute to the overall performance of the CPU.

- a) **Architecture:** The CPU's architecture as shown in Figure 3.7. Which refers to its internal design and how it processes instructions, significantly impacts performance. Newer architectures generally offer better performance and efficiency.

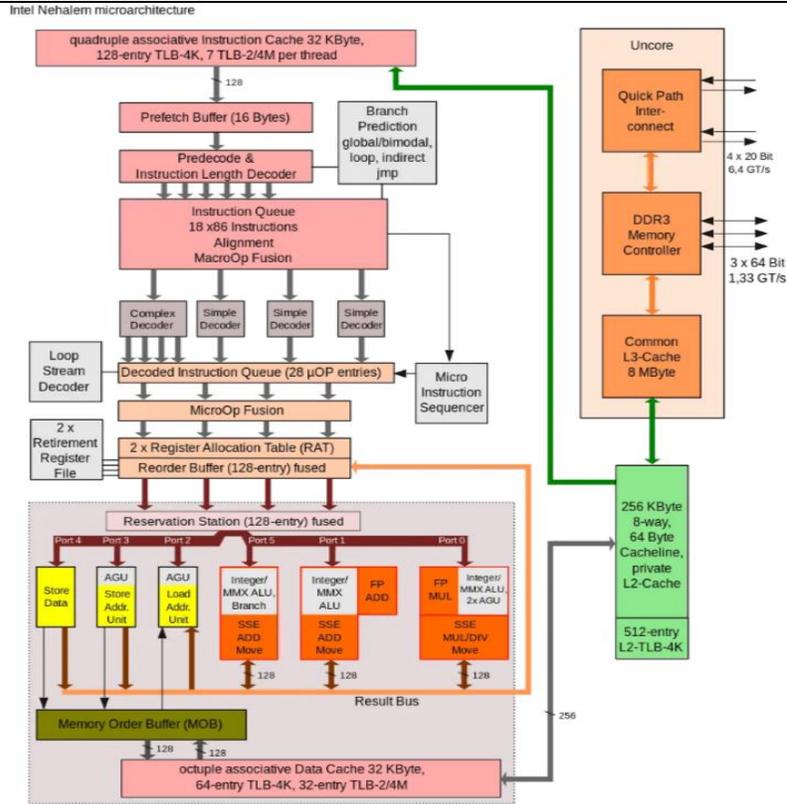


Fig. 3.7: CPU with a modern architecture

- b) **Thermal Design Power (TDP):** TDP indicates the amount of heat the CPU generates. Laptops require CPUs with lower TDPs to manage heat within the limited space and ensure efficient battery life. (Figure 3.8)



Fig. 3.8: CPU with a TDP of 15 watts

- c) **Integrated Graphics:** Many laptop CPUs include integrated graphics processing units (GPUs) that handle basic graphics tasks. For more demanding graphics needs, such as gaming or video editing, a dedicated GPU might be necessary. (Figure 3.9)

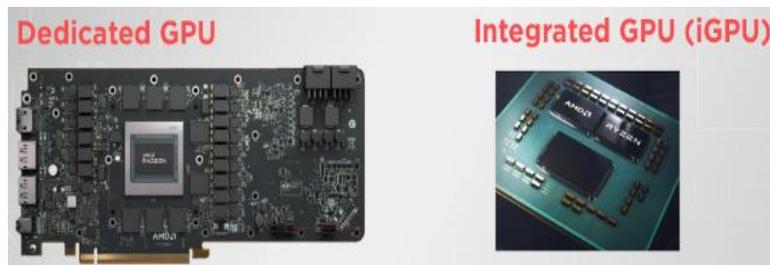


Fig. 3.9: CPU with integrated graphics

3.3 Procedure for installation of CPU and CPU fan in laptop

Installing a CPU and fan in a laptop is a delicate process best left to experienced technicians. It involves disassembling the laptop, carefully removing the old components, applying thermal paste to the new CPU, and securely mounting the new fan and heatsink. Each laptop model is different, requiring specific disassembly steps often detailed in a service manual. Due to the complexity and risk of damage, it's generally recommended to seek professional help for this procedure. Improper installation can lead to overheating and system failure.

Practical Activity 3.1 Demonstrate for installation of CPU and CPU fan in laptop.

Materials: Small Phillips head screwdrivers, Plastic pry tools or picks, Anti-static wrist strap, Thermal paste, Compressed air

Procedure

Step 1. Locate the alignment keys on the motherboard CPU socket and the notches on the CPU. (Figure 3.10)

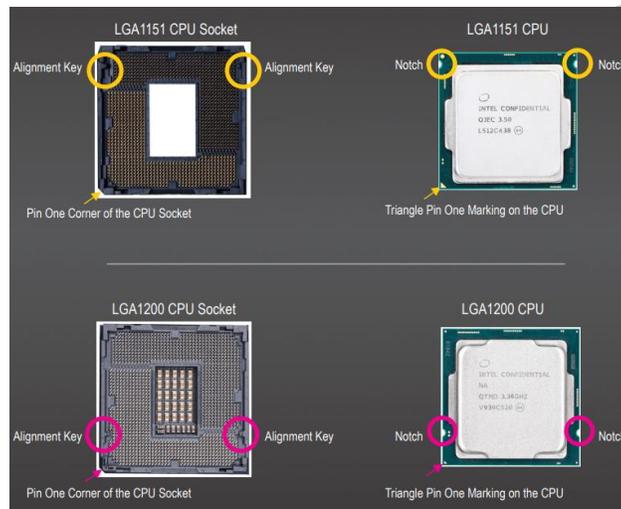


Fig. 3.10: Motherboard CPU socket

Step 2. Lift the CPU socket lever and the metal load plate will be lifted as well. If the protective socket cover is fastened on the CPU socket, remove it first as shown in Figure 3.11.

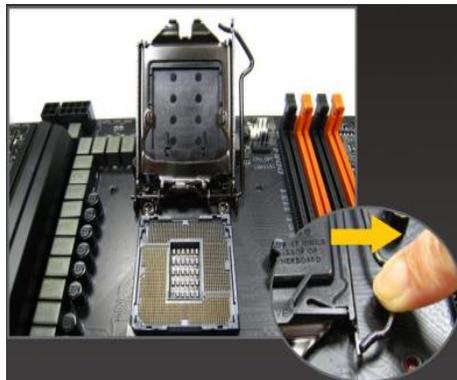


Fig. 3.11: Lift CPU socket

Step 3. If the protective socket cover is fastened on the metal load plate, do not remove it at this stage. The socket cover may pop off from the load plate automatically during the process

of re-engaging the lever after you insert the CPU as shown in Figure 3.12.



Fig. 3.12: Protective socket cover

Practical Activity 3.1 Demonstrate Installing the CPU Cooler

Materials: Small Phillips head screwdrivers, Plastic pry tools or picks, Anti-static wrist strap, Thermal paste, Compressed air

Procedure

Step 1. Before installing the CPU cooler, please first add a thin layer of heat sink paste on the surface of the CPU as shown in Figure 3.13. Then install the cooler (refer to the installation manual for your CPU cooler).



Fig. 3.13: Heat sink paste surface in CPU

Step 2. Connect the CPU cooler cable to the CPU_FAN connector located on the motherboard so that the cooler can properly function to prevent the CPU from overheating.



Fig. 3.14: CPU_FAN connector in CPU

Assignment 1. Prepare the specifications of CPU mentioning the speed and form factor of CPU in laptop.

Feature	Specification Examples
---------	------------------------

Manufacturer	
CPU Model	
Architecture	
Cores/Threads	
Clock Speed	
Cache	

Assignment 2. Demonstrate to install the CPU and CPU fan on motherboard of laptop

Check Your Progress

A. Multiple-choice questions (MCQs)

1. What is the primary purpose of the CPU in a computer? a) To store data b) To process instructions and perform calculations c) To display images on the screen d) To connect to the internet
2. Before handling the CPU, what is the most important precaution to take? a) Wear gloves b) Ground yourself to prevent static discharge c) Wash your hands d) Apply thermal paste
3. Where is the CPU installed on the motherboard? a) In the RAM slots b) In the PCI Express slot c) In the CPU socket d) Under the heatsink
4. How do you typically unlock the CPU socket before inserting the CPU? a) By pushing a button b) By lifting a lever c) By turning a screw d) By removing a cover
5. What is the correct orientation for inserting the CPU into the socket? a) Upside down b) Any direction is fine c) Aligning the triangle or dot on the CPU with a mark on the socket d) Diagonally

B. Fill in the Blank

1. After seating the CPU, _____ the socket lever to secure it.
2. _____ paste is essential for efficient heat transfer between the CPU and the cooler.
3. Apply a small, _____-sized amount of thermal paste to the center of the CPU's IHS.
4. Follow the instructions provided with your CPU cooler to _____ it to the motherboard.
5. Ensure the CPU cooler is _____ attached to provide adequate cooling.

C. Short Questions

1. What is the primary function of the CPU in a computer system?
2. Why is it important to ground yourself before handling CPU or motherboard components?
3. What is the correct way to hold a CPU during installation?
4. How do you align the CPU correctly in the socket?
5. What is the purpose of the CPU socket lever?

Session 4. Installing RAM, Graphics Cards, and Sound Cards

RAM stands for Random Access Memory. It's a type of computer memory that can be accessed randomly, meaning any piece of data can be retrieved directly without needing to go through other data. Think of RAM as your computer's short-term memory. It holds the data and instructions that the CPU (Central Processing Unit) needs to use right now.



Fig. 4.1: Ram (Random Access Memory)

Importance's of RAM

RAM (Random-Access Memory) is a computer's short-term memory, storing active data and instructions for quick access by the CPU. It enables smooth multitasking and faster performance. More RAM allows running more programs without lag, while insufficient RAM can cause slowdowns. Think of it like a chef keeping ingredients on the counter instead of fetching them from the pantry each time.

RAM on the Motherboard

Find the RAM slots on the motherboard – they have little clips at the ends. Gently push these clips outwards. Look closely at the RAM stick: there's a notch that must match the slot. Line it up correctly. Now, push the RAM firmly down into the slot until the clips click back into place, locking the RAM in. You'll hear a click sound. If you have more RAM, do the same for the other slots. Make sure the RAM is properly seated by checking that the clips are closed. It's important to handle RAM carefully and avoid touching the gold connectors.

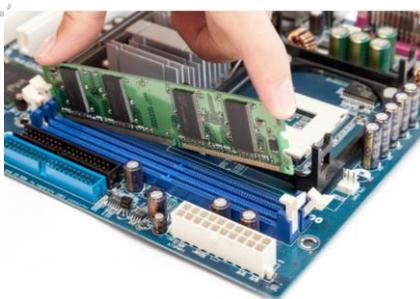


Fig. 4.2 RAM slots on the motherboard

4.2 Types of RAM and specifications

1. **SRAM (Static RAM):** It is fast, costly, and used in CPU cache. It doesn't need refreshing.

SRAM = Speed

2. **DRAM (Dynamic RAM):** It is slower, cheaper, and used as main memory. It needs constant refreshing.

DRAM = Capacity

Table 4.1 There are the main types of RAM for computers.

<p>SDR SDRAM: This is the oldest type in common use. It's pretty outdated now, you won't find it in modern systems.</p>	
<p>DDR SDRAM: The first generation of "Double Data Rate" RAM, offering a significant speed improvement over SDR. Still quite old.</p>	
<p>DDR2 SDRAM: Faster and more efficient than DDR. You might find this in some older machines.</p>	
<p>DDR3 SDRAM: A further improvement in speed and efficiency. This was very common for many years.</p>	
<p>DDR4 SDRAM: The current standard for most computers. It provides a great balance of speed, power efficiency, and cost-effectiveness.</p>	
<p>DDR5 SDRAM: The newest generation, offering the highest speeds and best performance yet. It's gradually becoming more common.</p>	

4.3 Procedure for installation of RAM modules in laptop

Upgrading laptop RAM is generally straightforward. First, power off the laptop and unplug it. Access the RAM compartment, usually located on the bottom or back, often behind a removable panel. Gently push the clips on the sides of the existing RAM modules outwards; the modules will pop up at an angle. Carefully remove them. Align the notch on the new SO-DIMM module with the slot and firmly push it in until the clips click into place, securing the RAM. If installing multiple modules, consult your laptop's manual for the correct configuration. Once installed, reassemble the laptop and power it on. The system should automatically recognize the new RAM. If not, check your BIOS settings. Always handle RAM by the edges and avoid touching the gold connectors to prevent damage.

Practical Activity 4.1. Installation of RAM modules in laptop.

Materials

Compatible RAM, Small Phillips head screwdriver, Anti-static wrist strap, Soft cloth or anti-static mat, User Manual

Procedure

Step 1. First, completely shut down your laptop and let it sit for a few minutes to cool down as shown in Figure 4.3. Laptops get hot easily because everything is packed tightly inside.

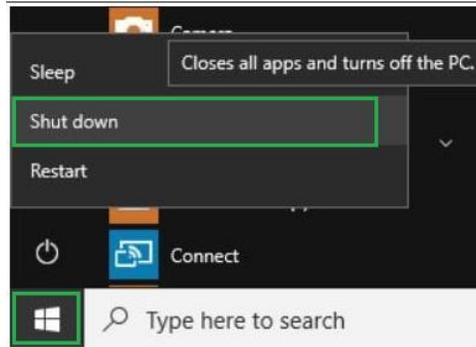


Fig. 4.3: Shut down Laptop

Step 2. Unplug the laptop and remove the battery. Then, press the power button for a short time to drain any leftover electricity as shown in Figure 4.3. This helps prevent shocks.

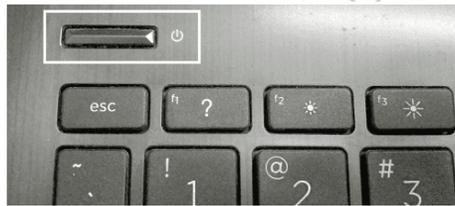


Fig. 4.3: Press the power button in Laptop

Step 3. Carefully open the back of your laptop to find the RAM slots. These slots don't have clips. Hold the new RAM stick gently and insert it into the slot at a slight angle. (Figure 4.4)

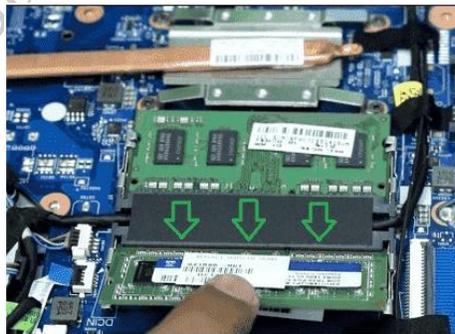


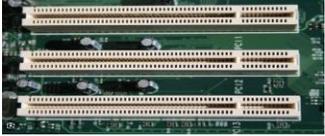
Fig. 4.4: Opening RAM slots

Step 4. Gently push the RAM down. Small tabs on the sides of the slot will automatically click into place, holding the RAM securely. (Figure 4.5)



Fig. 4.5: Pushing RAM

Assignment 1: Identify slots of RAM modules

Slots	Slots Name
	
	
	

Graphics card

A graphics card, also known as a video card, is responsible for rendering images and videos on a computer screen. It contains its own processor (GPU) and memory, allowing it to handle visual tasks independently from the main CPU. This results in better performance, especially for graphics-intensive tasks like gaming, video editing, and 3D design. While basic systems use integrated graphics built into the CPU, dedicated graphics cards are essential for smooth and high-quality visual output in demanding applications. (Figure 4.6)



Fig. 4.6: Graphics card

Types of Graphic cards

1. **Integrated Graphics:** Built into the CPU or motherboard, offering basic performance for

tasks like web browsing and light gaming. Examples include Intel HD Graphics and AMD Vega.

2. **Discrete (Dedicated) Graphics Cards:** Separate cards with their own memory (VRAM), ideal for gaming, 3D rendering, and professional applications. Examples include NVIDIA GeForce and AMD Radeon.
3. **External Graphics Cards (eGPUs):** External units that connect to laptops for enhanced graphical performance, useful for gaming and heavy tasks.
4. **Workstation Graphics Cards:** Specialized for professional use in tasks like CAD, 3D modeling, and video editing, such as NVIDIA Quadro and AMD Radeon Pro.

Procedure for installing a Graphics card on Laptop

Installing a *traditional* graphics card *inside* a laptop is generally not possible. Laptops are designed with integrated graphics or, in some rare cases, specialized mobile graphics solutions. They lack the space, expansion slots, and power capacity to accommodate standard desktop graphics cards.

Sound card

Sound cards are hardware components that improve a computer's audio capabilities, allowing for connections to speakers, microphones, and other audio devices. Initially, computers only produced basic beeps, but as multimedia evolved, sound cards were developed to provide higher-quality audio, with early models offering features like percussion mode and programmable audio. (Figure 4.7)

Today, most computers include integrated sound chips, making basic audio accessible, but dedicated sound cards still offer significant advantages. Available in internal and external formats, they feature their own processing chips, reducing the load on the computer's main processor and improving audio performance, particularly for gaming and professional applications. External sound cards are also useful for laptops, providing an easy way to upgrade audio quality.



Fig. 4.7: Sound card

Type of Sound Cards

- **Motherboard Sound Chips:** Integrated into the motherboard, these built-in sound chips provide affordable audio for most users, eliminating the need for separate sound cards.
- **Standard Sound Cards:** Expansion cards that plug into PCI or PCIe slots, offering dedicated sound processing for higher-quality audio, especially beneficial for gaming.
- **External Sound Adapters:** Portable devices that connect via USB or FireWire, offering similar functionality to internal sound cards. They are useful for laptops and often include additional features like volume controls and extra I/O options.

Use of Sound Cards:

There are some common uses of sound cards:

1. Playing music, watching movies, and gaming.

2. Audio and video conferencing, voice recognition, and recording dictations.
3. Creating and playing MIDI music.
4. Educational software often utilizes sound for instruction and feedback.
5. Business presentations often incorporate audio elements.

Procedure for Installing a Sound Card on a Laptop

Choose a USB sound card that suits your needs and budget.

- Plug it into an available USB port.
- If not auto-detected, install drivers from the CD or manufacturer's website.
- In sound settings, make it the default audio device.
- Plug in headphones, speakers, or a microphone.
- Start using the enhanced sound features.

LAN card

A LAN (Local Area Network) card, also known as a network interface card (NIC), is a crucial component that allows a computer to connect to a network, typically a local area network like your home or office network. It provides the physical connection (usually via an Ethernet cable or wirelessly) and the necessary circuitry to send and receive data over the network, enabling communication with other devices like computers, printers, and servers. Essentially, it's the gateway for your computer to the network and the internet. (Figure 4.8)



Fig. 4.8: Lan card

Procedure for installing a Lan card on Laptop.

While technically possible in some very niche cases, installing a traditional LAN card *inside* a laptop is generally **not feasible**. Laptops are designed to be compact, and they typically lack the necessary expansion slots and physical space to accommodate internal add-on cards like LAN cards.

Using an External USB to Ethernet Adapter

This is the standard and recommended approach for adding a LAN port to a laptop.

1. **Choose Your Adapter:** Select a USB to Ethernet adapter that's compatible with your laptop's USB ports (usually USB 3.0 or USB-C for faster speeds).
2. **Connect to a USB Port:** Plug the USB adapter into an available USB port on your laptop.
3. **Install Drivers (If Needed):** Most modern USB to Ethernet adapters are "plug-and-play" and will be automatically recognized by your operating system. If not, install the drivers from the included CD or the manufacturer's website.
4. **Connect Ethernet Cable:** Plug an Ethernet cable from your network (router, switch, or wall

jack) into the Ethernet port on the USB adapter.

5. **Configure Network Settings:** Your laptop should automatically detect the new network connection. You might need to configure network settings (like IP address) if you're on a specific network.
6. **Enjoy Wired Connectivity:** You should now be able to access the network and the internet through the wired connection.

Disk Drives

Disk drives store data in computers and are non-volatile, meaning they retain data without power. Hard Disk Drives (HDDs) use spinning disks and are affordable with large storage but slower due to moving parts. Solid State Drives (SSDs) use flash memory, have no moving parts, and offer much faster performance, though they cost more per GB. Both are essential, with HDDs suited for bulk storage and SSDs for speed and efficiency.

Type of Disk Drives

1. Hard Disk Drives (HDDs)

Primary memory is fast but limited and volatile, losing data when power is off. Secondary memory, like hard disk drives (HDDs), offers large, permanent storage for data and programs. HDDs use spinning disks with tracks and sectors to organize data. Although outer tracks are larger, all tracks store the same data using different storage densities. A read-write head accesses data by moving precisely over the spinning disk. HDDs are non-volatile, retaining data even when the computer is turned off. (Figure 4.9)

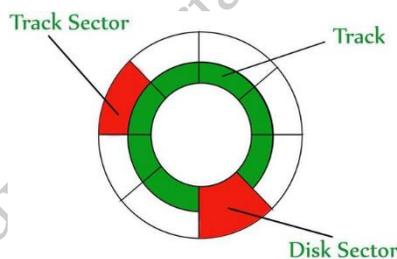


Fig. 4.9: Hard Disk Drive

2. Solid State Drives (SSDs)

Solid State Drives (SSDs) are non-volatile storage devices that use integrated circuits instead of spinning disks, making them faster, quieter, and more durable than traditional Hard Disk Drives (HDDs). They retain data without power and come in modern formats like M.2 and use high-speed protocols like NVMe for improved performance. Unlike HDDs, SSDs have no moving parts, offering lower latency and better shock resistance. Some high-end SSDs even use RAM for ultra-fast access, though they may lose data without power. (Figure 4.10)



Fig. 4.10: Solid State Drives

3. Hybrid Drives (SSHDs)

Hybrid drives (SSHDs) combine the large storage capacity of HDDs with the speed of SSDs by using a small SSD cache for frequently used data. This improves boot times and application performance while keeping costs lower than full SSDs. SSHDs are a cost-effective option for users needing both speed and large storage. (Figure 4.11)



Fig. 4.11: Hybrid drives

Features, speed and specifications of HDD and SSD used in laptop

Feature/Specification	HDD (Hard Disk Drive)	SSD (Solid State Drive)
Storage Technology	Magnetic	Flash Memory
Capacity	High	Moderate to High
Speed	Slower	Much faster
Access Time	High	Very low
Latency	High	Very low
Durability	Lower	Higher
Noise	Can produce noise	Silent operation
Power Consumption	Moderate	Lower
Heat Generation	Moderate	Lower
Lifespan	Can be limited by mechanical wear	Generally, longer, but dependent on write cycles
Cost per GB	Lower	Higher
Common Interfaces	SATA, M.2 SATA	M.2 SATA, M.2 NVMe

Form Factors	2.5-inch, M.2	M.2
Typical Laptop Use Cases	Mass storage, operating system, applications	Operating system, applications, frequently used files

Practical Activity: Installing a 2.5-inch SSD in a Laptop

Materials: SSD (2.5" SATA or M.2), Screwdriver, External enclosure or USB-to-SATA adapter, Cloning software, Laptop user manual, Antistatic wrist strap, Backup device

Know more....

Before you install your SSD

1. Stop static: Static electricity can harm computer parts. Before touching anything inside your computer, either:
 - a. Touch a bare metal part of your computer's case.
 - b. Wear an anti-static wrist strap.
2. Handle with care: Don't touch the gold pins on the SSD. Hold it by the edges.
3. Don't open it: Opening the SSD will break your warranty.

Installing an SSD in a laptop can significantly boost its performance. Here's a general guide, but always consult your laptop's manual for specific instructions as designs vary.

Procedure

Step 1. Prepare a Static-Safe Workspace

Clear your work area of any plastic bags, paper, or other materials that could generate static electricity. A clean, uncluttered surface is ideal.

Step 2. Gather Your Supplies (Figure 4.12)

- 2.5-inch SSD
- Screwdriver
- Your laptop's owner's manual



Fig. 4.12 Tools

Step 3. Power Down Your Laptop Completely

Shut down your laptop. Do *not* just put it to sleep or hibernate. Unplug the power adapter. Remove the battery (consult your laptop's manual for how to do this safely).

Step 4. Discharge Residual Electricity

Press and hold the power button for 5 seconds. This will help dissipate any remaining electrical charge as shown in Figure 4.13.



Fig. 4.13 Laptop Discharge mode

Step 5. Open Your Laptop's Case

Refer to your laptop's owner's manual for detailed instructions on how to access the internal components. Each laptop model is different. This step may involve removing screws on the bottom or accessing the drive bay through the keyboard area. (Figure 4.14)

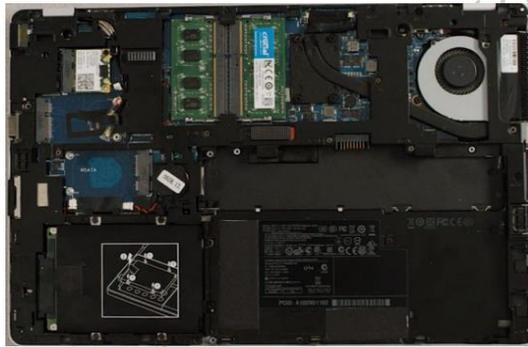


Fig. 4.14 Opening laptop frame

Step 6. Ground Yourself

Before touching any internal components, ground yourself to prevent static discharge. Touch an unpainted metal part of your laptop's frame (that is plugged into a grounded outlet, but switched off) or, ideally, wear an anti-static wrist strap. (Figure 4.15)



Fig. 4.15 Touching internal components

Step 7. Locate and Remove the Old Drive (Figure 4.16)

- Consult your owner's manual to find the storage bay. Note the size of the bay (2.5-inch in this case).

- Remove the screws securing the old drive and carefully slide it out.

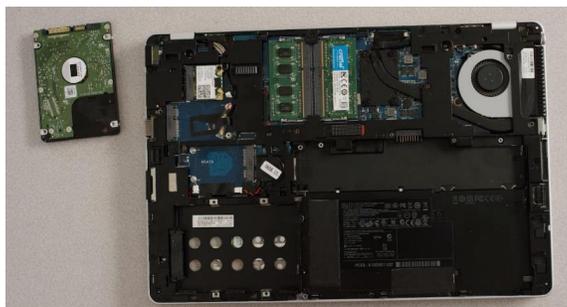


Fig. 4.16 Locate and Remove Old Drive

Step 8. Install the SSD

Carefully insert the SSD into the drive bay. It should slide in easily and fit snugly. Do not force it.

Step 9. Reassemble Your Laptop

Carefully replace any access panels and secure them with the screws you removed earlier.

Step 10. Power on Your Computer

Reconnect the power adapter and turn on your laptop. You may need to enter your BIOS/UEFI settings to ensure the new SSD is recognized as the boot drive. If you have a fresh SSD, you'll need to install your operating system. If you cloned your old drive, you should be able to boot directly from the new SSD. (Figure 4.17)



Fig. 4.17 Reconnect the Power Adapter

Practical Activity: Installing a 2.5-inch HDD in a Laptop.

Materials: HDD (2.5), Screwdriver, External enclosure or USB-to-SATA adapter, Cloning software, Laptop user manual, Antistatic wrist strap, Backup device

Know more....

Before you install your HDD

1. Stop static: Static electricity can harm computer parts. Before touching anything inside your computer, either:
 - a. Touch a bare metal part of your computer's case.
 - b. Wear an anti-static wrist strap.
2. Handle with care: Don't touch the gold pins on the SSD. Hold it by the edges.

3. Don't open it: Opening the HDD will break your warranty.
4. Installing an HDD in a laptop can significantly boost its performance. Here's a general guide, but always consult your laptop's manual for specific instructions as designs vary.

Procedure

Step 1. Prepare a Static-Safe Workspace

Clear your work area of any plastic bags, paper, or other materials that could generate static electricity. A clean, uncluttered surface is ideal.

Step 2. Gather Your Supplies

- 2.5-inch HDD
- Screwdriver
- Your laptop's owner's manual
- Small container or magnetic mat for screws
- Optional: Anti-static wrist strap
- Optional: External enclosure for your old drive

Step 3. Power Down Your Laptop Completely

Shut down your laptop. Do *not* just put it to sleep or hibernate. Unplug the power adapter. Remove the battery (consult your laptop's manual for how to do this safely).

Step 4. Discharge Residual Electricity

Press and hold the power button for 5 seconds. This will help dissipate any remaining electrical charge. (Figure 4.18)



Fig. 4.18 Laptop Discharge mode

Step 5. Open Your Laptop's Case

Refer to your laptop's owner's manual for detailed instructions on how to access the internal components. Each laptop model is different. This step may involve removing screws on the bottom or accessing the drive bay through the keyboard area. (Figure 4.19)

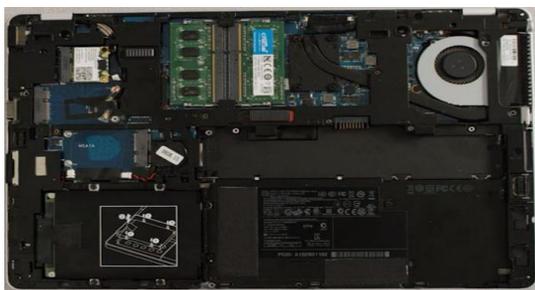


Fig. 4.19 Opening laptop frame

Step 6. Ground Yourself

Before touching any internal components, ground yourself to prevent static discharge. Touch an unpainted metal part of your laptop's frame (that is plugged into a grounded outlet, but switched off) or, ideally, wear an anti-static wrist strap. (Figure 4.20)



Fig. 4.20 Touching internal components

Step 7. Locate and Remove the Old Drive (Figure 4.21)

- Consult your owner's manual to find the storage bay. Note the size of the bay (2.5-inch in this case).
- Remove the screws securing the old drive and carefully slide it out.



Fig. 4.21 Locate and Remove Old Drive

Step 8. Install the HDD

Carefully insert the HDD into the drive bay. It should slide in easily and fit snugly. Do not force it.

Step 9. Reassemble Your Laptop

Carefully replace any access panels and secure them with the screws you removed earlier.

Step 10. Power on Your Computer

Reconnect the power adapter and turn on your laptop. You may need to enter your BIOS/UEFI settings to ensure the new HDD is recognized as the boot drive. If you have a fresh HDD, you'll need to install your operating system. If you cloned your old drive, you should be able to boot directly from the new HDD. (Figure 4.22)



Fig. 4.22 Reconnect the Power Adapter

Assignment 1. List the features and specifications of Disk Drives.

Feature/Specification	HDD (Hard Disk Drive)	SSD (Solid State Drive)
Storage Capacity		
Cost per GB		
Speed		
Interface		
Power Consumption		
Noise		
Lifespan		

Check Your Progress

A. Multiple-choice questions (MCQs)

- Which of the following is a type of RAM commonly used in laptops? (a) DDR4 (b) SSD (c) HDMI (d) GPU
- What is the first step in installing a RAM module in a laptop? (a) Power on the laptop (b) Remove the keyboard (c) Shut down and disconnect all power sources (d) Insert a DVD
- What is the primary purpose of a graphics card? (a) Increase network speed (b) Improve audio quality (c) Render images and videos (d) Store data
- Which type of sound card is integrated into most motherboards? (a) External USB sound card (b) PCIe sound card (c) ISA sound card (d) Onboard sound card
- A LAN card is used for (a) Audio recording (b) Network connectivity (c) Video editing (d) Increasing RAM
- Why would you use a USB to Ethernet adapter? (a) To increase speaker volume (b) To connect a VGA monitor (c) To access a wired network without an internal Ethernet port (d) To charge the laptop
- Which of the following is a type of disk drive used in modern laptops? (a) Blu-ray (b) HDD (c) Floppy (d) Cassette

B. True or False

1. DDR4 RAM is faster and more efficient than DDR3 RAM.
2. It is safe to install RAM in a laptop while it is running.
3. A graphics card is responsible for processing and displaying images and videos on the screen.
4. External USB sound cards cannot be used with laptops.
5. A LAN card allows a computer to connect to a local area network using an Ethernet cable.
6. USB to Ethernet adapters are only compatible with desktop computers.
7. Solid State Drives (SSD) are faster than traditional Hard Disk Drives (HDD).

C. Short Questions

1. Explain the differences between DDR3 and DDR4 RAM in terms of speed, voltage, and performance.
2. Describe the step-by-step procedure to safely install a RAM module in a laptop.
3. What is the function of a GPU in a computer? Compare integrated and dedicated graphics cards. Mention their advantages and limitations.
4. What type of sound card is commonly built into motherboards? Discuss the types of sound cards and their use cases in different systems.
5. What is the main function of a LAN card? Explain how a LAN card works and how it connects a computer to a network.
6. Describe how to set up and troubleshoot an external USB to Ethernet adapter.
7. Explain the differences between HDD and SSD in terms of speed, durability, and performance.

Session 5. Assemble and Disassemble of Laptops

Assembling and disassembling a laptop is like taking apart and putting back together a puzzle, but with tiny screws and delicate components.

Disassembling

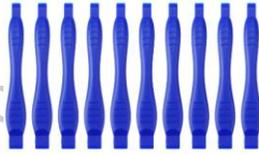
It is like carefully taking the puzzle apart piece by piece. You start by removing the outer covers, then disconnect components like the battery, storage drives, and memory. It's important to be organized and gentle, as everything is connected with tiny screws, clips, and cables.

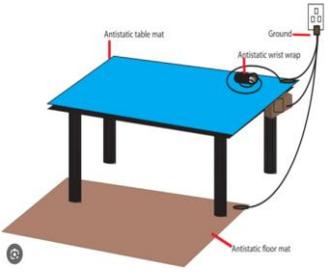
Assembling

It is the reverse process. You carefully put all the pieces back together, reconnecting cables, securing components, and finally putting the covers back on. It's like solving the puzzle again, making sure everything fits snugly and works properly.

Tools for laptop assembly

Assembling or disassembling a laptop requires a specific set of tools to avoid damage and ensure proper reassembly. Therefore, a list of essential tools:

Small Phillips-head screwdrivers	Laptops use very small screws, so a set with various sizes is crucial. A magnetic tip is highly recommended to prevent losing screws inside the laptop.	
Precision screwdriver set	This is a good investment as it often includes a wider range of small sizes and sometimes Torx screwdrivers, which are also used in some laptops.	
Plastic pry tools or spudgers	These are essential for safely separating plastic panels without scratching or breaking them. Avoid using metal tools for this purpose. A thin, flexible plastic card (like an old credit card) can sometimes work in a pinch.	
Anti-static wrist strap	Absolutely vital. Static electricity can damage sensitive electronic components. Wearing this strap grounds you and prevents static discharge.	
Small container or magnetic tray	Keeps screws organized and prevents them from getting lost. A magnetic tray is especially helpful.	
Tweezers	Useful for handling small components, connectors, and cables.	
Compressed air	Helps to clean dust and debris from inside the laptop during disassembly.	

<p>Isopropyl alcohol and cotton swabs/lint-free cloths</p>	<p>For cleaning thermal paste off heat sinks or other components if necessary.</p>	
<p>Thermal paste</p>	<p>If you're replacing the CPU or heatsink, you'll need fresh thermal paste for proper heat transfer.</p>	
<p>Small flashlight or headlamp</p>	<p>Helpful for seeing in tight spaces inside the laptop.</p>	
<p>Camera or smartphone</p>	<p>Take pictures during disassembly. This is incredibly helpful when you're putting everything back together, especially with complex cable routing.</p>	
<p>Work surface</p>	<p>A clean, flat, and well-lit workspace is essential. A static mat is a good idea, but not strictly necessary if you're using an ESD strap.</p>	
<p>Multimeter</p>	<p>Can be useful for testing components like the battery or power supply.</p>	

Small zip ties or cable organizers

Helpful for keeping cables neat and organized during reassembly.



Precautions for laptop Assembly

Laptop assembly, while rewarding, requires careful attention to detail. There are some key precautions.

Static Electricity

To prevent static electricity damage during laptop assembly, always wear an anti-static wrist strap grounded to the laptop chassis, work on an anti-static mat, handle components by their edges, avoid touching sensitive areas with bare fingers, periodically touch a grounded surface, and ensure proper grounding of your workspace; always disconnect power before working on internal components.

Power Down Completely

Before you even think about opening your laptop, make absolutely sure it's completely powered off. Unplug the power adapter and remove the battery if possible. Hold the power button down for about 30 seconds to discharge any residual electricity.

Organized Workspace

A cluttered workspace is a recipe for disaster. Have a well-lit, clean area. Use small containers or a magnetic tray to keep screws organized. Label things if you're unsure. Take pictures as you disassemble so you have a visual reference for reassembly.

Gentle Handling

Laptop components are fragile. Don't force anything. If something doesn't want to come apart easily, double-check for screws or clips you might have missed. Use plastic pry tools or spudgers instead of metal screwdrivers to avoid scratching or damaging parts.

Screw Management

Laptops use a variety of tiny screws. Keep track of where each screw goes. Mixing up screws can lead to problems. As mentioned above, a magnetic tray is your friend here.

Cable Connections

Be extremely careful when disconnecting and reconnecting cables. They often have delicate connectors. Make sure they are fully seated and locked in place when you reassemble. Don't pull on the wires themselves; grip the connectors.

Grounding

Ensure proper grounding, especially when working with the motherboard.

Manuals and Guides

If you have a service manual for your laptop model, use it! Online tutorials and videos can also be immensely helpful. iFixit is a great resource.

Patience

Don't rush. Take your time and double-check your work. If you get frustrated, take a break.

Know Your Limits

If you're not comfortable with any part of the process, it's best to seek professional help. Trying to fix something you're not qualified to handle can make the problem worse.

Component Compatibility

If you are upgrading or replacing parts, make sure they are compatible with your laptop model. Check the manufacturer's specifications or consult online resources.

Laptop parts and peripherals and their compatibility

It's impossible to create a *completely* comprehensive table of laptop part and peripheral compatibility because there are *so many* variations in laptop models and components. However, I can give you a table outlining the *key factors* that determine compatibility.

Part/Peripheral	Factors	Check Compatibility
CPU (Processor)	Motherboard socket type BIOS support	Laptop manual Manufacturer's website CPU compatibility lists
RAM (Memory)	Type (DDR3, DDR4, DDR5, etc.) Speed Capacity SO-DIMM form factor	Laptop manual Manufacturer's website Crucial.com or similar memory finder tools
Storage (HDD/SSD)	Interface (SATA, NVMe/M.2) Form factor (2.5-inch, M.2 size) Capacity BIOS support (for some NVMe drives)	Laptop manual Manufacturer's website Check available slots in your laptop
Display (Screen)	Connection type (e.g., eDP) Resolution Size Backlight type (usually LED)	Generally, NOT user-replaceable unless you have the exact same model. Check with manufacturer or repair shop.
Motherboard	This dictates CPU, RAM, and storage compatibility.	Usually not replaced unless doing a major repair. Check laptop model specifications.
Wi-Fi Card	Interface (Mini PCIe, M.2) Wireless standards (802.11ac, Wi-Fi 6, etc.)	Laptop manual. Check existing Wi-Fi card for specifications
Battery	Specific model compatibility	Look for replacement batteries matching your laptop model number.

AC Adapter (Charger)	Voltage Wattage Connector type	Check original adapter's specifications.
USB Devices	USB type (A, B, C) Power requirements	Generally good compatibility, but some devices might need more power than a USB port can provide.
External Displays	Video output ports on laptop (HDMI, DisplayPort, VGA) Resolution and refresh rate support of laptop's graphics card	Check laptop specifications and monitor requirements.
Audio Devices	3.5mm headphone jack or USB connection	Generally good compatibility.

Practical Activity 5.1: Procedure for laptop Dis-assembly.

Material Required: Laptop, Mini screwdriver, Anti-static wrist strap, Magnifying glass

Procedure

Step 1. Removal of battery

Start the disassembly process by removing the battery (see Figure 5.1). Remove one screw securing the optical CD/DVD drive. Pull out the optical drive and remove it. Remove all the screws securing the bottom case. There are two screws hidden under the two laptop bottom feet. Remove the bottom screws. Peel off the bottom from the case to access the hidden screws. Remove the hidden screws from both sides of the notebook.



Fig. 5.1: Remove battery

Step 2. Separation of palm rest. Using a plastic case opener, separate the palm rest from the bottom case as shown in Figure 5.2.



Fig. 5.2: Separate palm rest from bottom case

Step 3. Removal of bottom case. Turn the notebook upside down and remove the bottom case as shown in Figure 5.3.



Fig. 5.3: Remove screws from the hard drive and disconnect it

Step 4. Disconnecting the hard drive cable from the motherboard as shown in Figure 5.4.



Fig. 5.4: Open the connector and release hard drive cable

Step 5. Remove the hard drive. Remove the hard drive assembly from the notebook. If you are going to replace it with another hard drive or SSD, you will have to transfer the mounting bracket and the SATA cable. (Figure 5.5 & 5.6)



Fig. 5.5: Remove hard drive assembly



Fig. 5.6: Disconnect SATA cable

Step 6. Removal of RAM. A notebook PC motherboard has two memory slots. Remove both RAM modules if necessary.

Step 7. Disconnection of cable. Remove the one screw fixing the USB LED status board. Disconnect the cable from the motherboard.

Step 8. Removal of USB LED status board. Remove the USB LED status board as shown in Figure 5.7.

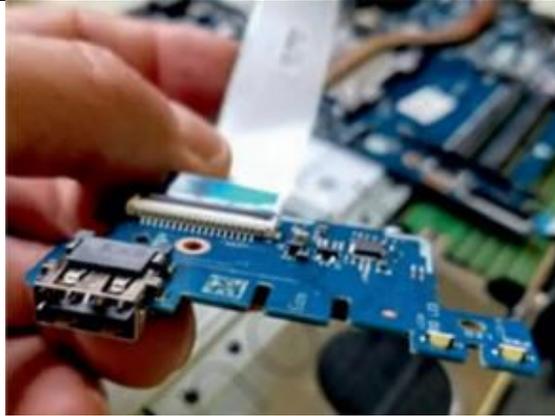


Fig. 5.7: Remove USB LED status board

Step 9. Removal of screw fixing the optical CD/DVD drive connector board. Remove the one screw fixing the optical CD/DVD drive connector board as shown in Figure 5.8. Disconnect the cable from the motherboard.



Fig. 5.8: Remove optical CD DVD drive connector board

Step 10. Removal of the cooling fan. Remove the two screws fastening the cooling fan to the case. Unplug the fan cable from the motherboard and remove the cooling fan (see Figure 5.9, 5.10 & 5.11)

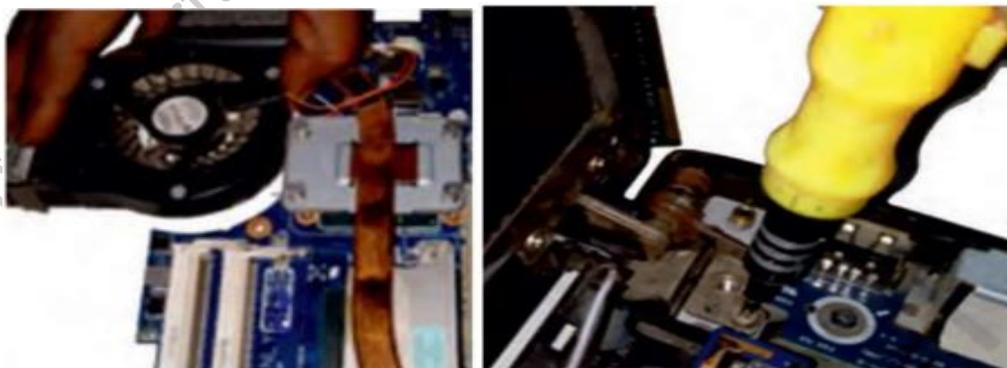


Fig. 5.9: Remove cooling Fan

Fig. 5.10: Remove screws fastening display hinge

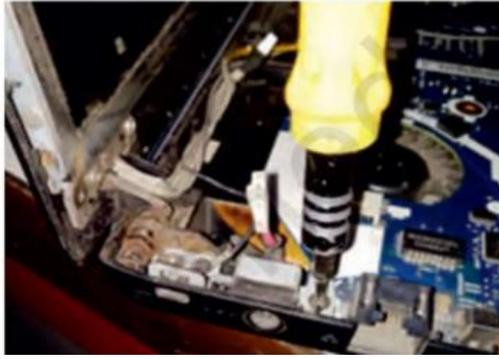


Fig. 5.11: Open the hinge and remove DC power jack

Step 11. Removal of DC power jack. In a notebook PC, the DC power jack is mounted under the hinge. Remove it. Disconnect the Wi-Fi antenna cable from the wireless card. Disconnect the DC power jack harness from the motherboard. Move all cables aside and remove the two screws from the display hinge. Open up the hinge and remove the DC power jack.



Fig. 5.12: DC power jack mounted under display hinge



Fig. 5.13: Disconnect Wi-Fi Module

Step 12. Removal of motherboard

Separate the motherboard from the top case and remove it. The other side of the motherboard is shown in Figure 5.14 and 5.15. In a notebook PCs, the keyboard is permanently attached to the top case with rivets. When the keyboard fails, it is necessary to replace the top case. The touchpad is glued to the top case but the touchpad button board can be removed as shown in Figure 5.16.



Fig. 5.14: Disconnect cables from motherboard and remove screws



Fig. 5.15: Remove the motherboard from notebook case



Fig. 5.16: Keyboard permanently attached to tap case

Step 13. Removal of screw securing the board. The power button board is also mounted under the same hinge. Remove the one screw securing the board and unplug the cable from the motherboard.

Practical Activity 5.2: Procedure for laptop Assembly.

Material Required: Laptop, Mini screwdriver, Anti-static wrist strap, Magnifying glass.

Step 1. Keep track of screws. There are several types of small screws that are used throughout the laptop. Place these in small envelopes and write the component name on the envelope. Be organized and keep track of all the screws. We have to figure out how to remove the back panel. (Figure 5.17)



Fig. 5.17: Back panel of a laptop

Step 2. Installation of processor. First component to be installed is the processor. Take extreme care not to touch the pins in the socket during the process (see Figure 5.18 and 5.19)

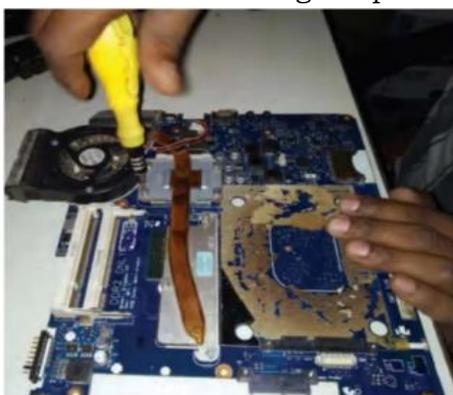


Fig. 5.18: Unscrew the socket



Fig. 5.19: Fit processor in the socket

Step 3. Pop in the video card. First, find the baggie with three larger silver screws and two small black screws to install the graphics card. Hold the card at about a 30-degree angle as you insert its edge connector into the video-card slot near the center of the motherboard. Press the card in and downward, and then use the two small black screws to secure it in place.

Step 4. Set up the drive. The motherboard SATA connectors are along the front, right edge, and under the lip of the laptop's shell. Drop the drive into place and then carefully use your thumb to push the drive into the SATA connectors. Now use the remaining two screws to secure the drive-in place.

Step 5. To install memory, locate the memory slots on the motherboard. Align the notches on the memory module with the ridge in the slot. Firmly push the module until the clips on the side of the slot snap into place.

Step 6. Now that all the hardware components are installed, find the four screws you removed from the ACE door, slide the door back into place, and replace the screws. To prepare for power up, pop in the notebook's battery pack, connect the power brick and plug it into a wall outlet. Finally, open the laptop's cover with one hand, use your other hand to press the power button.

Practical Activity 5.3: Testing the functionality of each part of laptop.

Procedure

Step 1. Check for any obvious physical damage like cracks, loose parts, or bent connectors. Ensure all cables and connectors are firmly seated.

Step 2. Verify the power button works and the laptop powers on. Observe the boot process. Does it proceed normally, or are there any error messages? if you want to Access the BIOS/UEFI settings (usually by pressing Del, F2, F10, F12, or Esc during startup – the key varies by manufacturer). Check if all the installed hardware is recognized.

Step 3. Check for dead pixels, discoloration, or flickering. Adjust brightness and contrast to ensure they function correctly. If possible, connect the laptop to an external monitor to test the video output ports (HDMI, DisplayPort, VGA).

Step 4. Test all keys, including special function keys (Fn key combinations). Check touchpad responsiveness and button functionality. If using a separate mouse, ensure it connects and works correctly.

Step 5. Play audio to test the built-in speakers. Test the headphone jack with headphones or earbuds. Test the built-in microphone or an external microphone if available.

Step 6. Verify the operating system loads from the storage drive. Check for unusual noises or slow performance. You can use disk checking utilities to check for errors. Test the optical drive by inserting a CD or DVD.

Step 7. Check the system information (in Windows, macOS, or Linux) to confirm the installed RAM is recognized and the correct amount is reported. Run a memory diagnostic tool (like Memtest86) to check for memory errors.

Step 8. Connect to a Wi-Fi network and browse the internet to test Wi-Fi functionality. If available, test Bluetooth by connecting a Bluetooth device (like a mouse or speaker).

Step 9. Test each USB port with a USB device. Test other ports like Ethernet, SD card reader, etc., if applicable.

Step 10. Verify the laptop charges when plugged in. Observe how long the battery lasts on a full charge (this will vary depending on usage).

Step 11. Test the built-in webcam using a camera application.

Step 12. Check if the operating system loads and runs smoothly. Ensure all necessary drivers are installed and up to date. Test commonly used applications to ensure they function correctly.

Check Your Progress

A. Multiple Choice questions

1. Which of the following is the MOST important precaution to take when working with laptop components? (a) Working quickly to save time (b) Wearing an anti-static wrist strap (c) Using excessive force to ensure parts fit snugly (d) Eating snacks while working to stay focused
2. What is the primary purpose of a plastic pry tool or spudger when disassembling a laptop? (a) To tighten screws (b) To safely separate plastic panels without damage (c) To clean dust from internal components (d) To apply thermal paste to the CPU
3. When disassembling a laptop, what should you do with the screws you remove? (a) Discard them as they are easily replaceable (b) Keep them organized in labeled containers or a magnetic tray (c) Mix them all together as they are all the same size (d) Leave them loose inside the laptop casing
4. Which component is MOST susceptible to damage from static electricity? (a) The plastic casing (b) The hard drive (c) The RAM (memory modules) (d) The keyboard
5. What is the correct way to disconnect a ribbon cable connector? (a) Pull on the wires (b) Gently wiggle the connector while pulling on the wires (c) Carefully release any locking mechanisms and then pull on the connector itself (d) Use a screwdriver to pry the connector loose
6. Which of the following is NOT a typical step in disassembling a laptop? (a) Removing the battery (b) Removing the keyboard (c) Cutting wires to access internal components (d) Disconnecting the display cable
7. When installing RAM modules, how do you know they are correctly seated? (a) They click into place and the retaining clips close. (b) They are flush with the edge of the slot. (c) They require significant force to push in. (d) They light up.
8. What is the purpose of thermal paste when installing a CPU? (a) To insulate the CPU from heat (b) To improve heat transfer between the CPU and heatsink (c) To lubricate the CPU socket (d) To secure the CPU in place
9. What is the FIRST step you should take before disassembling a laptop? (a) Install the latest drivers (b) Back up your data (c) Power off the laptop and unplug it (d) Clean your work area
10. Why is it important to consult the service manual or online resources specific to your laptop model before disassembling it? (a) Because all laptops are identical internally (b) Because disassembly procedures vary significantly between models (c) Because it's not really necessary and you can figure it out as you go (d) Because it will tell you where to buy replacement parts.

B. Fill in the blanks

1. Before disassembling a laptop, the most important first step is to _____ it off and _____ it.
2. _____ electricity can damage sensitive laptop components.

3. Keep screws organized using a _____ tray or labeled _____.
4. Use _____ pry tools to separate plastic panels.
5. When installing RAM, align the _____ on the module with the _____ in the slot.

D. Short Answer Type Questions

1. What is the most important precaution to take against electrostatic discharge (ESD) when working on laptops?
2. Why is it crucial to keep screws organized during disassembly?
3. What tools are commonly used to safely separate plastic panels on a laptop?
4. Why should you avoid touching the gold-plated contacts on RAM modules?
5. What is the purpose of thermal paste when installing a CPU or heatsink?
6. What is the first component you should typically remove when disassembling a laptop?
7. Where are screws often hidden on the underside of a laptop?
8. How do you typically disconnect ribbon cables or delicate connectors?
9. Why is it important to note the position of cables and connectors during disassembly?
10. What should you do if a component doesn't come loose easily during disassembly?

Module 3**Repair and Maintenance of Laptop and Peripherals****Module Overview**

This module provides learners with the essential skills and knowledge required for diagnosing, maintaining, and servicing laptops and their peripherals. It focuses on identifying common technical issues, performing routine maintenance tasks, and ensuring devices function effectively after repair. Learners will also develop the ability to verify and test the performance of repaired equipment. In addition, the module emphasizes the importance of documenting work accurately, gathering customer feedback, and generating professional invoices. By the end of the module, learners will be equipped to provide efficient technical support while maintaining quality service and customer satisfaction.

Learning Outcomes

After completing this module, you will be able to:

- Identify and troubleshoot common hardware and software issues in laptops.
- Perform regular maintenance tasks to ensure the proper functioning of laptops and their peripherals.
- Conduct post-repair testing to verify the performance and reliability of serviced devices.
- Prepare accurate work reports and maintain proper service documentation & Communicate effectively with customers and collect meaningful feedback.
- Demonstrate a systematic and quality-oriented approach to laptop repair and maintenance services.

Module Structure

Session 1. Hardware and software issues in Laptop

Session 2. Maintenance Process of laptop and peripherals

Session 3. Testing of Repaired Laptops & Peripherals

Session 4. Work report, Customer Feedback and Invoice

Session 1. Hardware and Software issues in Laptop

Laptops and their peripherals are essential tools in today's world, but they can experience a variety of hardware and software issues. Laptops can have two main types of problems:

1. Hardware
2. Software.

Hardware problems are with the physical parts of the laptop, like the keyboard or screen as shown in Figure 1.1.

Software problems are with the programs that run on the laptop, like the operating system or apps.

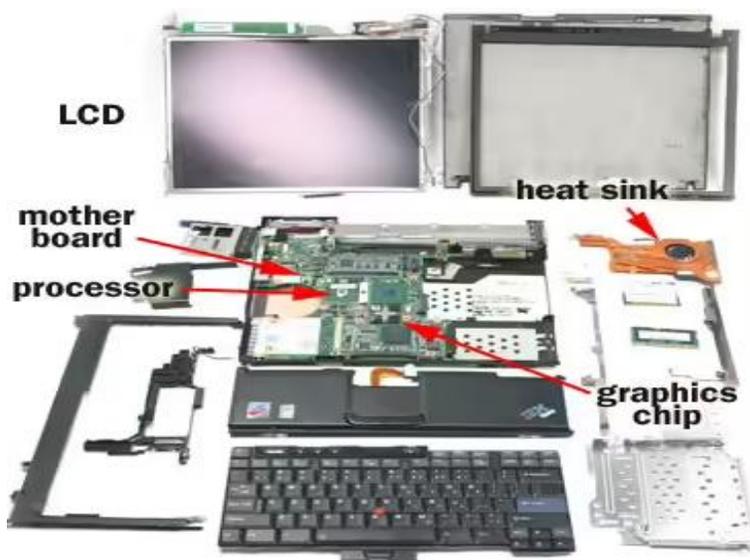


Fig. 1.1 Hardware Parts of laptop

Types of faults in the laptop and its peripherals

Laptops and the things you connect to them can have both hardware and software problems. Hardware problems with the laptop itself include things like bad memory (RAM), a hard drive that's going bad, battery trouble, a keyboard or touchpad that doesn't work right, graphics card problems, broken USB ports, or overheating. Sometimes cables or ports get damaged too. With connected devices, you might have trouble getting printers or scanners to work. Software problems are different. These can be things like the operating system crashing, viruses, problems with drivers, programs crashing, files getting messed up, the laptop running slowly, or software not working after an update. Common hardware and software issues encountered in laptops and their peripherals:

Hardware Issues in Laptop:

Laptops, like any machine, can have hardware problems. These are issues with the physical parts of the laptop, like the screen, keyboard, battery, or hard drive. Sometimes the laptop won't turn on, the screen might crack, or it might run really slowly. Understanding these common hardware problems is the first step to getting your laptop working again. Common hardware issues in laptop are:

Overheating of laptop

Laptop overheating occurs when the internal components generate more heat than the cooling system can handle. This excess heat can cause performance slowdowns, system instability, and even permanent damage. Factors like dust buildup blocking vents, demanding tasks, and improper ventilation (e.g., using the laptop on a soft surface) contribute to overheating. Signs include a hot surface, loud fan noise, sluggish performance, and unexpected shutdowns as shown in Figure 1.2. Preventing overheating involves regular cleaning, ensuring proper airflow, and avoiding resource-intensive tasks for extended periods.



Fig. 1.2: Overheating of laptop

Cracked Screen of laptop

A cracked laptop screen is a common form of physical damage, often caused by accidental drops, impacts, or pressure as shown in Figure 1.3. The damage can range from minor hairline cracks to severe shattering, affecting the display's clarity and functionality. A cracked screen may show lines, discoloration, dead pixels, or become completely unusable. While some minor cracks might not immediately impede use, they can worsen over time. Repairing a cracked screen usually involves replacing the entire LCD panel, a process often best left to professionals. Attempting a DIY repair can be risky and may cause further damage. Protecting your laptop with a padded case and handling it with care can help prevent cracked screens.



Fig. 1.3: Cracked Screen of laptop

Keyboard Issues of laptop

Laptop keyboard issues can range from minor annoyances to complete keyboard failure. Common problems include sticky keys due to dirt or spills, unresponsive keys that don't register input, and keys that type the wrong characters as shown in Figure 1.4. Some keys might be completely broken or missing. These problems can be caused by dust, food particles, liquid spills, or general wear and tear. Troubleshooting steps include cleaning the keyboard with compressed air, updating drivers, or restarting the laptop. In more serious cases, the keyboard might need to be replaced. External keyboards can be used as a temporary or permanent solution. Addressing keyboard issues promptly is important for maintaining productivity and a comfortable user experience.



Fig. 1.4: Keyboard Issues of laptop

Battery Problems of laptop

Laptop battery problems are a frequent source of frustration for users. Common issues include a battery that won't charge, drains too quickly, reports incorrect charge levels, or doesn't last as long as it used to. These problems can stem from a worn-out battery due to age and usage, faulty charging circuitry within the laptop, or software glitches. Over time, laptop batteries naturally degrade, holding less charge. Other contributing factors include extreme temperatures and improper charging habits. Troubleshooting steps include checking the power adapter, updating drivers, and calibrating the battery. If the problem persists, replacing the battery is often the most effective solution as shown in Figure 1.5. A healthy battery is essential for laptop portability and uninterrupted use.



Fig. 1.5: Keyboard Issues of laptop

Hard Drive Failure of laptop

A hard drive failure in a laptop is a serious issue that can lead to data loss and the inability to use the computer. The hard drive, responsible for storing all your files and the operating system, can fail due to various reasons, including physical damage from drops or impacts, logical errors from corrupted files, or general wear and tear over time. Signs of a failing hard drive can include slow performance, unusual noises (clicking or grinding), frequent crashes, file corruption, and the dreaded "Blue Screen of Death." Recovering data from a failed hard drive can be challenging and sometimes requires professional data recovery services. Regular backups are crucial to protect your data in case of hard drive failure. Replacing a failed hard drive is often necessary to get the laptop working again as shown in Figure 1.6.



Fig. 1.6: Hard Drive Failure of laptop

Peripheral Issues of laptop

Peripheral issues in laptops involve problems with devices connected to the laptop, rather than the laptop itself. These can include problems with printers (connectivity issues, paper jams, printing errors), mice (unresponsive cursor, tracking problems), keyboards (keys not working, sticking), external drives (not recognized, data transfer errors), webcams (not working, poor image quality), and other connected devices. Troubleshooting peripheral issues often involves checking cables and connections, updating drivers, restarting the laptop or peripheral, or consulting the device's documentation. Sometimes, the issue may lie with the laptop's ports (USB, HDMI, etc.) rather than the peripheral itself as shown in Figure 1.7.



Fig. 1.7: Peripheral Issues (USB Cable of laptop)

Software Issues in Laptop

Laptops also have problems with their software, which is like the programs that make the laptop work. Sometimes the computer might freeze, programs might crash, or you might get error messages. These software problems can be just as frustrating as hardware issues, but often they're easier to fix. Knowing about common software problems can help you get your laptop running smoothly again. Common Software issues in laptop are:

Blue Screen of Death (BSOD) of laptop

The Blue Screen of Death (BSOD) is an error screen displayed on a Windows computer after a fatal system error as shown in Figure 1.8. It indicates that the computer has encountered a critical problem, most often due to corrupt code or driver incompatibility, and must be shut down for repairs. The blue hue on the BSOD gives it its name; prior to Windows 10, the color was navy blue.



Fig. 1.8: Blue Screen of Death (BSOD) of laptop

Slow Performance of laptop

A slow laptop performs sluggishly, taking excessive time to start up programs, open files, or respond to user input. This can manifest as lagging, freezing, or even crashing. Common causes include insufficient RAM, a slow hard drive (especially a traditional HDD), too many programs running at startup, background processes consuming resources, malware infections, fragmented files, or an outdated operating system as shown in Figure 1.9. Regular maintenance, such as disk cleanup, software updates, and malware scans, can often improve performance. Upgrading hardware like RAM or switching to an SSD can also make a significant difference.

Name	Status	CPU	Memory	Disk	Network	GPU	GPU engine
Microsoft Edge (15)		0.5%	986.2 MB	0 MB/s	0.1 Mbps	0%	
Antimalware Service Executable		10.8%	254.3 MB	2.2 MB/s	0 Mbps	2.0%	GPU 0 - 3D
Microsoft OneDrive		3.3%	229.0 MB	0.1 MB/s	0.6 Mbps	0%	
Razer Central Service (32 bit)		0%	205.4 MB	0 MB/s	0 Mbps	0%	
Windows Widgets (7)		19.6%	196.7 MB	2.0 MB/s	0.2 Mbps	0%	GPU 0 - 3D
Desktop Window Manager		2.5%	159.8 MB	0.1 MB/s	0 Mbps	5.1%	GPU 0 - 3D
Spotify (32 bit) (6)		0.1%	152.2 MB	0.1 MB/s	0 Mbps	0%	
Windows Explorer		0.7%	86.7 MB	0.1 MB/s	0 Mbps	0.1%	GPU 0 - 3D
Slack		0.1%	84.9 MB	0 MB/s	0 Mbps	0%	
Microsoft Teams (Preview) (4)		0%	82.1 MB	0 MB/s	0 Mbps	0%	
Settings		0%	77.8 MB	0 MB/s	0 Mbps	0%	
Razer Synapse 3 (32 bit)		0%	67.1 MB	0 MB/s	0 Mbps	0%	
Razer Synapse Service (32 bit)		0%	64.0 MB	0.1 MB/s	0 Mbps	0%	
GameManagerService (32 bit)		0%	61.1 MB	0 MB/s	0 Mbps	0%	
Slack		0.2%	52.6 MB	0 MB/s	0 Mbps	0%	
Intel(R) System Usage Report		0%	50.3 MB	0 MB/s	0 Mbps	0%	
CefSharp.BrowserSubprocess (3...		0%	49.3 MB	0 MB/s	0 Mbps	0%	
wsappx		0%	43.7 MB	0 MB/s	0 Mbps	0%	
Razer Central (32 bit)		0%	42.9 MB	0 MB/s	0 Mbps	0%	
Microsoft Windows Search Inde		6.1%	40.2 MB	6.6 MB/s	0 Mbps	0%	

Fig. 1.9: Task Manager

Application Crashes of laptop

Application crashes occur when a software program unexpectedly closes or stops responding, often displaying an error message or simply disappearing as shown in Figure 1.10. This can happen due to various reasons, including bugs in the application's code, conflicts with other software, insufficient system resources (like RAM), corrupted program files, or driver issues. A single crash might be a minor glitch, but frequent crashes can indicate a more serious underlying problem. Troubleshooting steps include restarting the application, checking for updates, reinstalling the program, or examining system logs for error details.



Fig. 1.10: Windows operating system corrupted

Driver Problems of laptop

Driver problems on a laptop arise when the software that allows hardware components (like the graphics card, Wi-Fi adapter, or printer) to communicate with the operating system malfunctions or is outdated. This can lead to various issues, including system instability, device malfunction (e.g., Wi-Fi not working), performance issues, or even the dreaded Blue Screen of Death. Driver problems can be caused by incorrect driver installation, corruption, incompatibility with the operating system, or outdated drivers as shown in Figure 1.11. Updating, reinstalling, or rolling back drivers are common solutions.

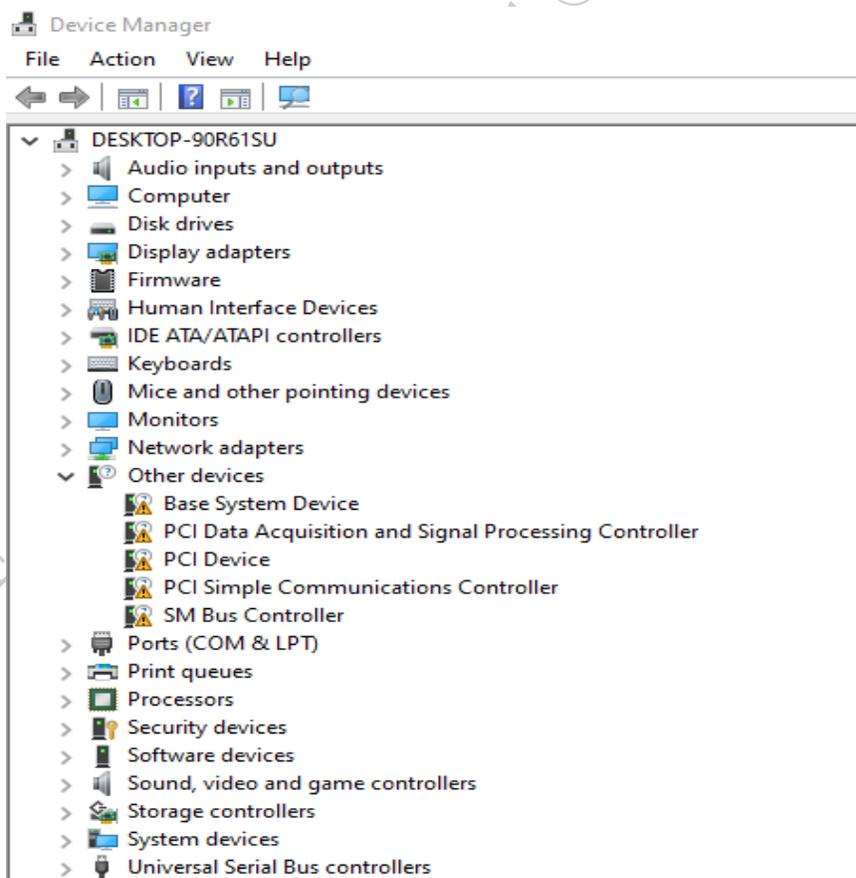


Fig. 1.11: Device Manager

Virus Infections of laptop

A virus infection on a laptop occurs when malicious software (malware) infiltrates the system. This can happen through various means, like downloading infected files, clicking malicious links, or using compromised USB drives. Viruses can cause a range of problems, from slowing down performance and displaying unwanted ads to corrupting files, stealing data, or even completely disabling the system as shown in Figure 1.12. Symptoms include unusual pop-ups, slow performance, missing files, or unexpected program behavior. Antivirus software is crucial for detecting, quarantining, and removing viruses, and regular scans are essential for maintaining system security.



Fig. 1.12: Virus attack on operating system

1.3 Diagnosis of faults in the laptop and its peripherals

Diagnosing faults in a laptop and its peripherals is a systematic process of identifying and isolating the root cause of a problem. It begins with careful observation and proceeds through a series of troubleshooting steps. The initial stage involves clearly defining the symptoms. What exactly is malfunctioning? Is it a display issue, a problem with the keyboard or mouse, connectivity problems with Wi-Fi or Bluetooth, or perhaps performance issues like sluggishness or frequent crashes? When did the problem first appear? Was it after a software update, a hardware change, or did it occur spontaneously? Noting any error messages displayed is crucial, as these often provide specific clues. Also, observe the laptop's physical state: is it excessively hot, making unusual noises, or are any lights flashing abnormally? Once the symptoms are documented, basic troubleshooting begins. Often, a simple restart can resolve temporary software glitches. Checking all physical connections, ensuring cables are securely plugged in, is another essential step, especially for external peripherals. Outdated or corrupted drivers are a frequent culprit, so updating them is a key part of the process. Windows offers built-in diagnostic tools like "chkdsk" for hard drive errors and "Windows Memory Diagnostic" for RAM issues. These can help identify underlying hardware problems. Recently installed software can sometimes conflict with existing programs, so checking for software conflicts is also important. Isolating the problem is the next phase. If a specific peripheral is malfunctioning, test it on another computer to determine if the issue lies with the device itself or the laptop. Booting the laptop in Safe Mode, which loads Windows with minimal drivers and programs, can help pinpoint software conflicts. If the problem started recently, using System Restore to revert the system to a previous state might be effective. More advanced diagnostics may be necessary for complex issues. The Event Viewer in Windows logs system events and errors, offering valuable insights into crashes or malfunctions. Specialized hardware testing tools can be used to diagnose individual components like RAM, hard drive, or graphics card. Monitoring the laptop's temperature is also important, as overheating can lead to performance degradation and hardware damage.

Finally, if all troubleshooting avenues are exhausted, seeking professional help is the best course of action. Technicians have the expertise and specialized tools to diagnose and resolve complex hardware and software problems. Throughout the diagnostic process, backing up important data is

crucial to prevent data loss in case of a system failure. When handling internal components, caution is advised to avoid static electricity damage. It's also important to check the warranty status before attempting any repairs, as doing so might void the warranty. By following a systematic approach, combining careful observation with appropriate troubleshooting techniques, and knowing when to seek expert assistance, you can effectively diagnose and resolve a wide range of laptop and peripheral faults.

Different types of hardware issues encountered in a laptop and its peripherals

Laptops and their peripherals can experience a range of hardware problems. These include battery issues, failing hard drives, overheating, display malfunctions, and keyboard/trackpad problems. Connectivity issues like Wi-Fi or Bluetooth failures, faulty charging ports, motherboard problems, and RAM errors are also common. Users may also encounter speaker or audio issues, mouse malfunctions, and problems with external devices such as printers or scanners. These hardware failures can lead to various symptoms, from slow performance and system crashes to data loss and the inability to boot the laptop.

1. Power Issues of Laptop: Laptop power issues can include situations where your laptop won't turn on, suddenly shuts down, doesn't charge properly, or experiences rapid battery drain, often caused by problems with the power adapter, battery, power port, or even internal hardware malfunctions within the laptop itself. Common problem is show in there:

- a) **Battery Problems:** This is a classic laptop issue. Batteries degrade over time, holding less charge. They can also fail completely, refusing to charge or power the laptop.
- b) **Charging Port Issues:** A faulty charging port can prevent the laptop from charging or cause intermittent charging. This can be due to physical damage or loose connections.
- c) **Power Adapter Problems:** The adapter itself can fail, no longer providing power to the laptop. This is often caused by damage to the cable or the adapter's internal circuitry.

2. Storage Problems of Laptop: Laptop storage problems are a common headache, affecting how smoothly your computer runs and how much data you can keep. Think of your laptop's storage like a filing cabinet - when it gets too full or disorganized, it becomes slow and difficult to find what you need. This can happen due to various reasons, from a failing hard drive to simply running out of space. Common problem is show in there:

- a) **Hard Drive Failures:** Hard drives, especially traditional spinning ones (HDDs), can fail due to age, physical shock, or internal errors. This can lead to data loss and system instability.
- b) **SSD Failures:** Solid-state drives (SSDs) are more durable than HDDs, but they can still fail. Issues can include controller failures or bad sectors.

3. Display Problems of Laptops: Laptop display problems range from minor annoyances like dead pixels to major issues like a cracked screen or complete display failure. These problems can stem from physical damage (drops, impacts), hardware malfunctions (backlight issues, graphics card failure), or software glitches (driver problems). Symptoms vary widely, including flickering screens, distorted images, no display at all, or strange colors. Troubleshooting involves checking connections, updating drivers, and sometimes requires professional repair, like screen replacement. Proper handling and avoiding extreme temperatures can help prevent many display issues. Common problem is show in there:

- a) **Screen Damage:** Cracked screens, dead pixels, or backlight issues are common display problems. These can be caused by physical impact or wear and tear.

- b) **Graphics Card Issues:** The graphics card, responsible for processing images, can malfunction, leading to distorted images, artifacts, or complete display failure.
- c) **Cable Issues:** The internal cables connecting the screen to the motherboard can become loose or damaged, causing display problems.

4. Input Device Problems of Laptops: Input device problems on laptops involve malfunctions with the tools you use to interact with your computer. This includes the keyboard, trackpad, mouse, and even the microphone. Issues can range from keys not responding or sticking to a trackpad that's erratic or completely frozen. Mouse problems might involve connectivity issues or tracking problems. Microphone problems can result in no sound being picked up or distorted audio as shown in Figure 1.13. These problems can be caused by software issues (like outdated drivers), hardware failures, or physical damage. Common problem is show in there:

- a) **Keyboard Malfunctions:** Keys can stop working, become sticky, or repeat. This can be due to dirt, debris, or physical damage.
- b) **Trackpad Issues:** The trackpad can become unresponsive, erratic, or have issues with clicking. This can be caused by wear and tear, software issues, or physical damage.
- c) **Mouse Problems:** External mice can have issues with tracking, clicking, or connectivity. This can be due to driver problems, physical damage, or wireless interference.

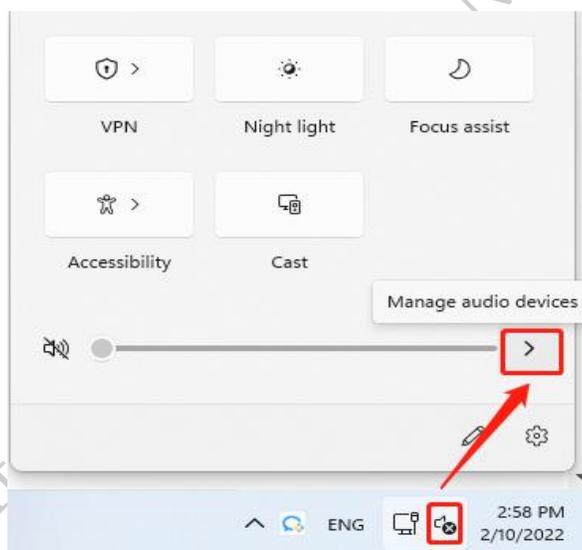


Fig. 1.13: Input Device Problems of Laptops

5. Connectivity Problems of Laptop: Laptop connectivity problems refer to issues with how your laptop connects to other devices or networks. This most commonly involves Wi-Fi (for internet access), Bluetooth (for connecting wireless devices), Ethernet (for wired network connections), and problems with USB ports (for connecting peripherals). Issues can include difficulty connecting, intermittent connections, slow speeds, or complete inability to connect. These problems can stem from software issues (like driver problems), hardware failures (like a malfunctioning Wi-Fi adapter), or network issues outside of the laptop itself as shown in Figure 1.14. Common problem is show in there:

- a) **Wi-Fi Issues:** Problems with the Wi-Fi adapter can prevent the laptop from connecting to wireless networks. This can be caused by driver issues, hardware failure, or network problems.

- b) Bluetooth Issues: Similar to Wi-Fi, Bluetooth connectivity can be affected by driver problems, hardware failure, or interference.
- c) Port Issues: USB ports, Ethernet ports, or other ports can become damaged or stop working, preventing the connection of external devices.

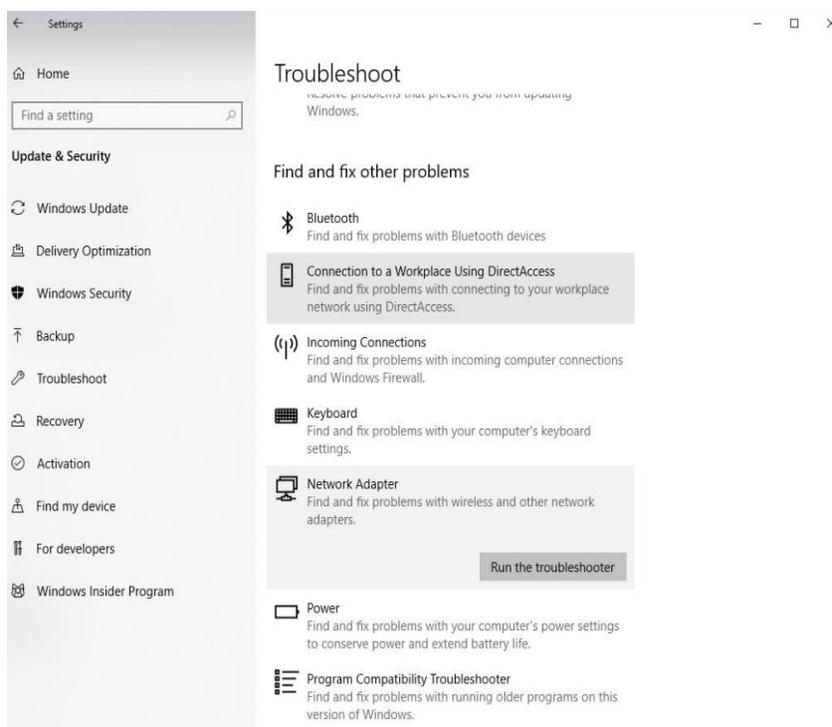


Fig. 1.14: Troubleshoot Connectivity Problems

6. Audio Problems of Laptop: Laptop audio problems encompass any issues affecting the sound produced by your laptop. This includes problems with the built-in speakers (no sound, distorted sound, low volume), the headphone jack (no sound, static, only one ear working), or the sound card itself. Microphone issues, like no sound being recorded or poor recording quality, also fall under this category. These problems can be caused by software issues (like driver problems), hardware failures (like damaged speakers), or incorrect audio settings as shown in Figure 1.15. Common problem is show in there:

- a) Speaker/Headphone Issues: Speakers can fail, producing no sound or distorted sound. Headphone jacks can also malfunction.
- b) Sound Card Issues: The sound card, responsible for processing audio, can have problems, leading to audio issues.

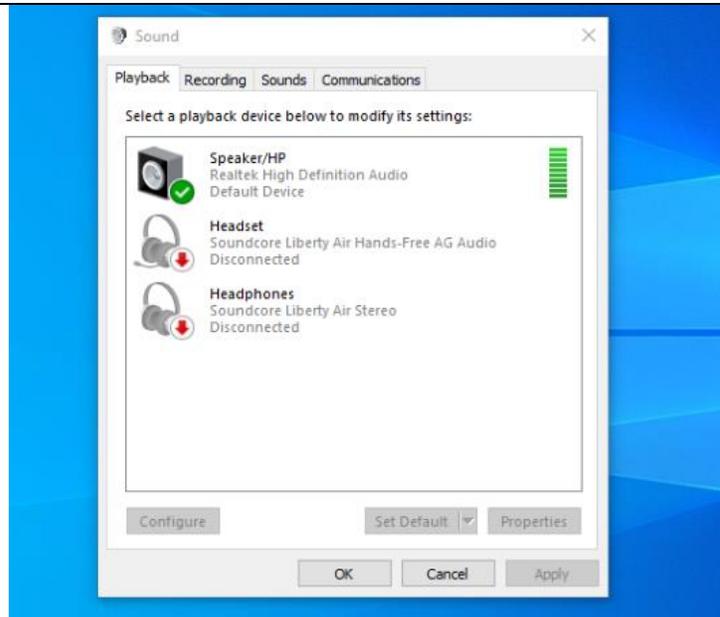


Fig. 1.15: Audio Problems of Laptop

7. Motherboard Problems of Laptop: Motherboard problems in a laptop refer to malfunctions or failures within the main circuit board of the device. The motherboard connects and enables communication between all other components like the CPU, RAM, storage, and peripherals. When the motherboard malfunctions, a wide range of issues can occur, from the laptop not turning on at all to random crashes, system instability, or specific components (like USB ports or Wi-Fi) ceasing to function. These problems are often complex and usually require professional diagnosis and repair. Common problem is show in there:

- Motherboard Failures:** The motherboard is the main circuit board of the laptop. If it fails, the laptop may not power on or experience various issues as shown in Figure 1.16.
- Component Failures:** Individual components on the motherboard, such as capacitors or resistors, can fail, causing a range of problems.



Fig. 1.16: Motherboard Failures

8. Memory (RAM) Problems of Laptop: Laptop memory (RAM) problems involve issues with the computer's short-term memory, where it stores data for currently running programs. RAM issues can manifest as system crashes (often with a Blue Screen of Death), data corruption, slow performance,

or the laptop failing to boot up at all. These problems can be caused by faulty RAM modules, incorrect RAM installation, or software conflicts. Common problem is show in there:

- a) RAM Errors: RAM modules can develop errors, leading to system crashes, data corruption, or the inability to boot as shown in Figure 1.17.



Fig. 1.17: RAM Errors

9. Overheating of Laptop: Laptop overheating occurs when the internal components of the laptop generate more heat than the cooling system can dissipate. This excessive heat can lead to performance slowdowns, system crashes, data corruption, and even permanent hardware damage. Overheating is often caused by blocked vents, dust accumulation, a failing cooling fan, or demanding tasks that push the CPU and GPU to their limits as shown in Figure 1.18. Common problem is show in there:

- a) Cooling System Issues: The cooling system, including fans and heatsinks, can become clogged with dust or fail, leading to overheating.
- b) Thermal Paste Issues: The thermal paste, which helps transfer heat from the CPU and GPU to the cooling system, can dry out, leading to overheating.



Fig. 1.18: Overheating of Laptop

10. Peripheral Problems of Laptop: Peripheral problems in laptops refer to malfunctions or issues with devices connected to the laptop, but not integral to its core function. These include external mice, keyboards, printers, scanners, webcams, External hard drives, and USB flash drives as shown in Figure 1.21. Problems can range from connectivity issues (not being recognized by the laptop) to device-specific malfunctions (like a printer jamming or a mouse not tracking properly). These problems can be caused by faulty peripherals, driver issues, or problems with the laptop's ports. Common problem is show in there:

- a) Printer Issues: Printers can have problems with connectivity, paper jams, or driver issues.
- b) Scanner Issues: Scanners can have problems with connectivity, scanning quality, or driver issues.

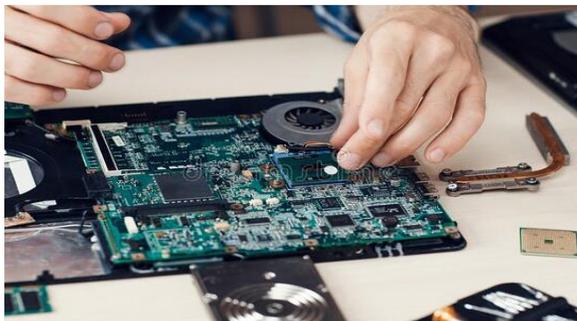


Fig. 1.21: Motherboard Peripherals Port issue

Different types of Software issues encountered in a laptop and its peripherals

Common software issues encountered in a laptop and its peripherals include: operating system errors, application crashes, driver conflicts, outdated software, malware infections, connectivity problems, corrupted files, slow performance, compatibility issues, data loss, and issues with updates or installations, often stemming from faulty or outdated drivers managing peripheral devices.

Software issues can cause a wide range of problems in laptops and their peripherals. Here's a breakdown of common types:

1. Operating System (OS) Problems of Laptop: Operating System (OS) problems on a laptop can disrupt its fundamental functions. The OS is the core software that manages all hardware and software resources. Issues can range from slow performance and system freezes to the dreaded "blue screen of death" crashes. Causes include corrupted system files, software conflicts, or insufficient resources. Troubleshooting might involve restarting the laptop, running system diagnostics, or in more severe cases, repairing or reinstalling the OS. Keeping your OS updated is crucial for preventing many of these problems.

- a) **System Crashes (BSOD/Kernel Panics):** These abrupt system failures can be caused by corrupted system files, driver conflicts, or hardware issues, but often point to underlying software instability.
- b) **Slow Performance:** A sluggish system can result from too many programs running, insufficient RAM, fragmented files, or malware infections.
- c) **Boot Errors:** Issues with the OS boot files can prevent the laptop from starting up correctly.
- d) **Software Conflicts:** Newly installed programs may conflict with existing ones, causing instability or malfunctions.
- e) **Driver Issues:** Incompatible or outdated drivers can cause a wide range of problems, from hardware malfunctions to system crashes.
- f) **Updates Gone Wrong:** Failed or problematic OS updates can introduce new bugs or create conflicts.

2. Driver Problems of Laptop: Driver problems on a laptop occur when the software that allows your computer's hardware to communicate with the operating system malfunctions. These "drivers" are essential for everything from your graphics card to your Wi-Fi adapter. When drivers are outdated, corrupted, or incompatible, you might experience issues like display problems, sound glitches, or

devices not working at all. Troubleshooting often involves updating, reinstalling, or sometimes even rolling back drivers to a previous version. Identifying the correct driver for your specific hardware is crucial for resolving these problems.

- a) **Incompatible Drivers:** Using the wrong drivers for your hardware can lead to malfunctions or instability.
- b) **Outdated Drivers:** Older drivers may not work correctly with newer software or hardware.
- c) **Corrupted Drivers:** Drivers can become corrupted due to malware, system errors, or improper installation.
- d) **Missing Drivers:** Without the correct drivers, hardware may not function at all.

3. Application Problems of Laptop: Application problems on a laptop occur when software programs malfunction or fail to perform as expected. This can range from minor glitches like temporary freezes to major crashes that close the application entirely. Common causes include bugs in the software, insufficient system resources (like RAM), or conflicts with other programs. Troubleshooting often involves restarting the application or the laptop, checking for updates, or reinstalling the problematic software. Sometimes, checking system requirements or compatibility settings can also resolve the issue.

- a) **Application Crashes:** Programs may unexpectedly close or freeze due to bugs, conflicts, or insufficient resources as shown in Figure 1.20.
- b) **Application Errors:** Error messages may appear when trying to run or use specific applications.
- c) **Installation Issues:** Problems during software installation can prevent programs from working correctly.
- d) **Software Conflicts:** Applications may conflict with each other, causing instability or malfunctions.



Fig. 1.20: Application Crashes Error

4. Malware Infections of Laptop: Malware infections on a laptop are a serious threat. They involve malicious software infiltrating your system, potentially causing data loss, performance issues, or even identity theft. This malware can take many forms, like viruses, spyware, or ransomware. Symptoms can include slow performance, unusual pop-ups, or files disappearing. Protecting your laptop requires using antivirus software, being cautious about downloads, and regularly updating your system. If infected, you may need to run scans, remove the malware, or in severe cases, reinstall your operating system.

- Viruses:** Malicious programs that can damage files, steal data, or disrupt system operations.
- Spyware:** Software that secretly monitors user activity and collects data.
- Adware:** Programs that display unwanted advertisements.
- Ransomware:** Malware that encrypts files and demands payment for their release as shown in Figure 1.21.



Fig. 1.21: Ransomware attack

5. Peripheral Software Issues of Laptop: Peripheral software issues on a laptop arise when the programs that allow your computer to communicate with external devices malfunction. This can manifest in various ways, such as a printer not printing, a mouse not responding, or a webcam failing to display images. These problems often stem from outdated or corrupted drivers, which are the software bridges between your laptop and the peripheral. Troubleshooting usually involves updating or reinstalling these drivers, checking connections, and sometimes adjusting compatibility settings.

- Printer Driver Problems:** Incorrect or outdated printer drivers can cause printing errors.
- Scanner Driver Problems:** Similar to printers, scanner drivers can cause scanning issues.
- Mouse/Keyboard Driver Problems:** Problems with these drivers can affect input device functionality as shown in Figure 1.22.

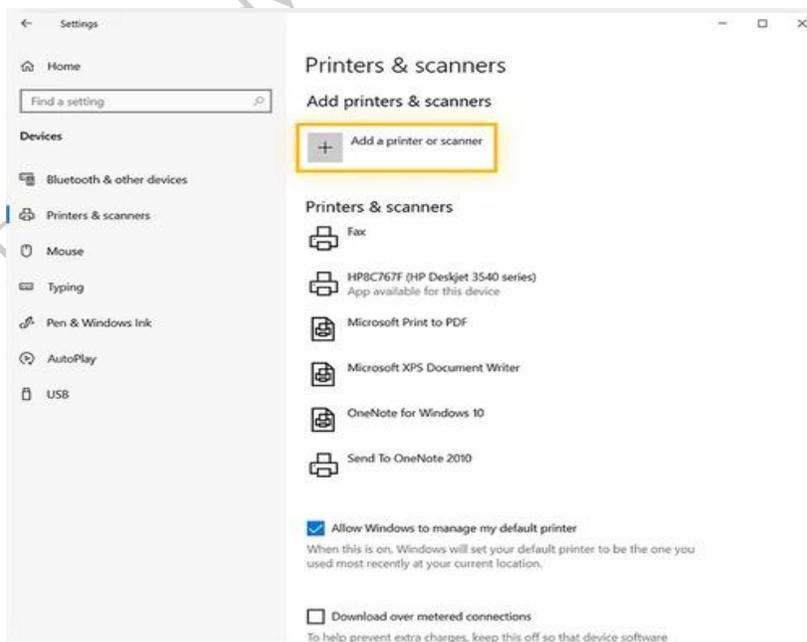


Fig. 1.22: Printers & Scanner Setting

6. Network Issues of Laptop: Network issues on a laptop can be a real headache. They can range from minor annoyances like slow loading times to major problems like complete disconnections. Some common culprits include weak Wi-Fi signals, outdated drivers, or even problems with your router.

- Connectivity Problems:** Issues with network drivers or settings can prevent the laptop from connecting to Wi-Fi or Ethernet.
- Slow Network Speeds:** Network congestion, driver problems, or incorrect settings can affect internet speed as shown in Figure 1.23.

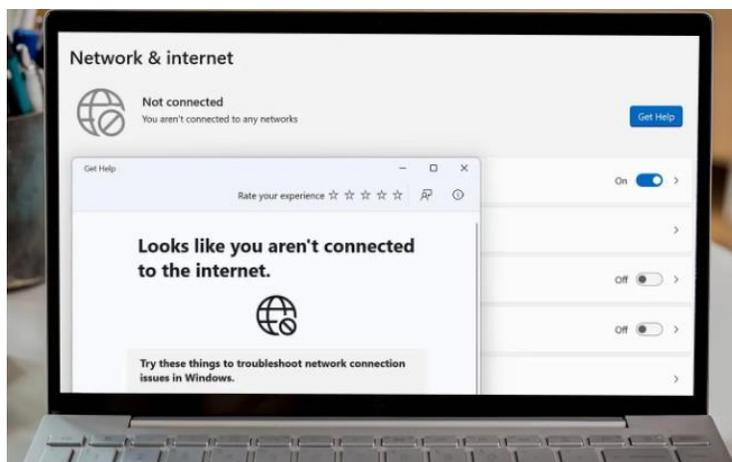


Fig. 1.23: Network & Internet Setting

7. File System Problems of Laptop: File system problems on a laptop involve issues with how the computer organizes and manages files on its storage drives. This includes how files are named, stored, and accessed. Problems can range from corrupted files that won't open to errors that prevent the operating system from properly reading or writing data, potentially leading to data loss or system instability.

- File Corruption:** Files can become corrupted due to software errors, hardware failures, or malware.
- File System Errors:** Problems with the way files are organized on the hard drive can lead to data loss or system instability as shown in Figure 124.

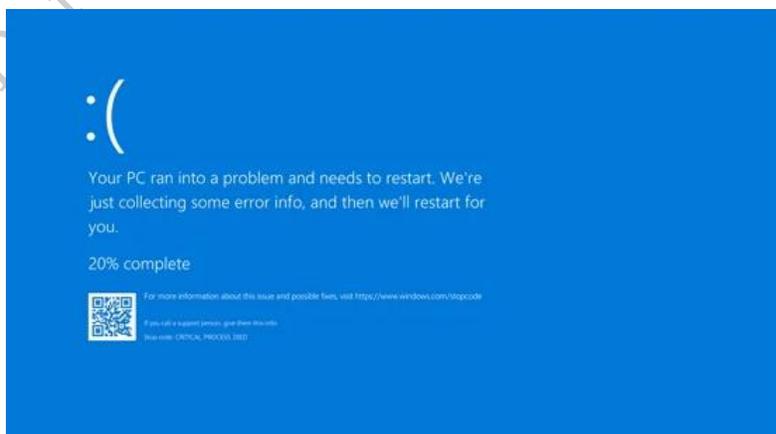


Fig. 1.24: Operating system errors

8. BIOS/UEFI Issues of Laptop: BIOS/UEFI issues on a laptop relate to problems with the low-level software that starts up your computer and connects your hardware to the operating system. Think of it as the foundational layer that gets everything going. Problems here can include difficulties booting up, incorrect settings causing malfunctions, or failed updates leading to instability or even a completely unusable laptop.

- BIOS/UEFI Updates Gone Wrong:** Problems during BIOS updates can lead to serious system malfunctions.
- Incorrect BIOS/UEFI Settings:** Incorrect settings in the BIOS can cause various hardware or software issues as shown in Figure 1.25.

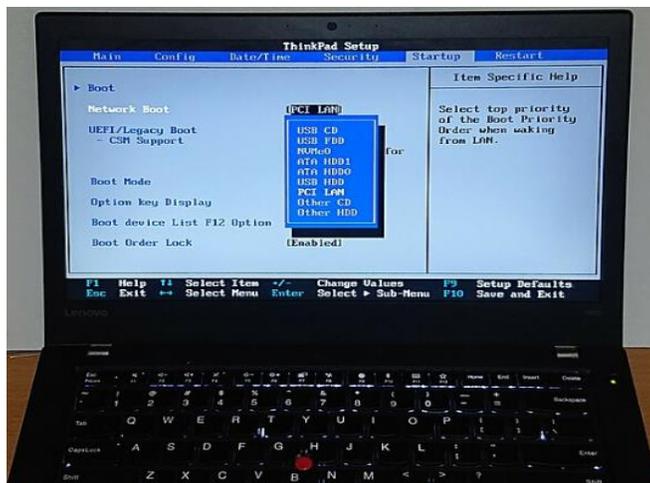


Fig. 1.25: BIOS/UEFI Setup

Check Your Progress

A. Multiple Choice questions

- Which of the following is a common symptom of a failing hard drive (hardware issue)? a) Slow application loading times b) Blue Screen of Death (BSOD) errors c) Unusual clicking or grinding noises from the laptop d) All of the above
- A printer connected to your laptop is printing gibberish. This is MOST likely a: a) Hardware issue with the printer itself b) Software issue with the printer driver c) Network connectivity problem d) Problem with the power outlet
- Your laptop's Wi-Fi connection drops frequently. Which troubleshooting step would be LEAST helpful? a) Updating the Wi-Fi adapter drivers b) Checking the router's settings c) Reinstalling the operating system d) Moving closer to the router
- Which of these is NOT typically a software issue? a) Corrupted system files b) A cracked laptop screen c) Malware infection d) Application crashes
- Your external monitor is not displaying an image. Which of the following could be the problem? a) A faulty cable b) Incorrect display settings on the laptop c) Outdated graphics drivers d) All of the above

6. A peripheral device, like a USB mouse, is not being recognized by the laptop. What's a likely first step in troubleshooting? a) Check if the USB port is working with another device b) Immediately reinstall the operating system c) Assume the mouse is permanently broken d) Contact the manufacturer for a replacement
7. Which of the following is a potential consequence of overheating (hardware issue)? a) System instability and crashes b) Reduced performance c) Component damage d) All of the above
8. A program is freezing repeatedly. This is most likely a: a) Hardware issue with the RAM b) Software issue with the program itself or a conflict c) Problem with the laptop's battery d) Issue with the room temperature
9. Which of the following is an example of a peripheral device? a) RAM (Random Access Memory) b) CPU (Central Processing Unit) c) Keyboard d) Hard Drive
10. Which of these is NOT a common symptom of a malware infection (software issue)? a) Slow performance b) Unexpected pop-ups c) Physical damage to the laptop casing d) Files disappearing

B. Fill in the blanks

1. A common hardware issue with laptop batteries is their inability to hold a _____.
2. _____ issues often arise when the software that connects a peripheral device to the operating system is outdated or corrupted.
3. A slow or unresponsive _____ is a frequent symptom of a failing hard drive.
4. If your laptop is overheating, it may be a sign of a problem with the _____ system.
5. Malware, such as _____ or ransomware, can cause significant software problems on a laptop.
6. When a program freezes or crashes repeatedly, it could be due to a _____ conflict.
7. A blank screen on your laptop could indicate a hardware issue with the graphics card or the _____.
8. Problems with a printer not printing correctly are often related to outdated or incorrect printer _____.
9. If your external speakers aren't producing sound, check the _____ connection and the volume settings.
10. Regularly backing up your data can protect you from data loss due to hardware or _____ failures.

C. Short Answer Type Questions

1. What are two common symptoms of a failing hard drive?
2. What might cause a laptop battery to not hold a charge?
3. What is a potential consequence of overheating in a laptop?
4. What are some signs of RAM problems in a laptop?
5. What could cause a laptop screen to display distorted images or no image at all?
6. What is a common hardware issue with laptop keyboards?

7. What might cause a peripheral device, like a mouse, to stop working?
8. What are some possible problems if a laptop's fan is excessively loud?
9. What is a common hardware issue with laptop optical drives (if present)?
10. What can you check if your laptop's USB ports are not working?

Session 2. Maintenance Process of laptop and peripherals

Our laptops have become indispensable tools in modern life, serving as our connection to the world, our workspaces, and our entertainment centers. We rely on them for everything from composing important documents to streaming our favorite shows. But like any complex machine, laptops and their associated peripherals are susceptible to wear and tear, software glitches, and occasional hardware failures. Understanding the basics of laptop repair and maintenance is crucial for ensuring the longevity and optimal performance of these vital devices. This guide will explore the processes involved in maintaining your laptop and its peripherals, as well as addressing common repair scenarios. Maintaining a laptop is akin to maintaining a car – regular upkeep can prevent larger, more costly problems down the road.

This preventative approach involves a combination of physical cleaning, software maintenance, and proactive measures to protect your system from potential threats. Regular cleaning, both inside and out, is essential. Dust accumulation can impede airflow and lead to overheating, which can significantly impact performance and shorten the lifespan of components. Software maintenance, including keeping your operating system and applications updated, is equally important. Updates often contain crucial security patches that protect your system from vulnerabilities, as well as performance enhancements that ensure smooth operation. Regularly backing up your data is another critical aspect of maintenance. In the event of a hardware failure or software corruption, having a recent backup can save you from losing valuable files and countless hours of work. Beyond regular maintenance, understanding the basics of troubleshooting and repair can empower you to address minor issues yourself, saving time and money. While complex repairs should always be handled by qualified technicians, many common problems can be resolved with a little knowledge and patience.

This guide will delve into the process of diagnosing common hardware and software issues, providing insights into troubleshooting steps and potential solutions. We will explore the intricacies of laptop disassembly and reassembly, emphasizing the importance of careful handling and organization to avoid further damage. We will also discuss the tools and techniques used for repairing and replacing components, from hard drives and RAM to keyboards and screens. Furthermore, this guide will extend beyond the laptop itself to encompass the maintenance and repair of its peripherals. Peripherals, such as mice, keyboards, printers, and external monitors, are integral to the overall computing experience. Just like the laptop, these devices require care and attention to ensure optimal functionality. We will discuss the specific maintenance procedures for various peripherals, including cleaning, cable management, and software driver updates. We will also touch upon common issues encountered with peripherals and provide guidance on troubleshooting and basic repairs.

process of Repair and Maintenance of laptop & peripherals

Repair and maintenance of laptops and their peripherals encompass a range of activities aimed at

keeping these devices in optimal working condition. Some of the Standard process of laptop and its peripherals are:

Laptop Repair

Laptop repair addresses a range of hardware and software issues, from cracked screens and malfunctioning keyboards to operating system errors and data recovery needs. Troubleshooting involves diagnosing the problem, often using diagnostic tools or observing symptoms. Repairs can involve component replacement, like replacing a hard drive or RAM, or software fixes, such as reinstalling the operating system. Some repairs are DIY-friendly, while others, especially those involving intricate hardware, require professional expertise. Data backup before any repair is crucial to prevent data loss. Effective laptop repair restores functionality and extends the device's lifespan. Common laptop repair categories include:

Troubleshooting: Diagnosing hardware and software issues like blue screens, slow performance, connectivity problems, or hardware failures (e.g., hard drive, RAM, keyboard) as shown in Figure 2.1.



Fig. 2.1: Troubleshooting Diagnosing

Component Replacement: Replacing faulty or damaged components such as hard drives, RAM modules, keyboards, screens, batteries, or power adapters as shown in Figure 2.2.



Fig. 2.2: Component Replacement

Software Repair: Reinstalling or repairing operating systems, drivers, or applications. Addressing software conflicts, malware infections, or corrupted files as shown in Figure 2.3.

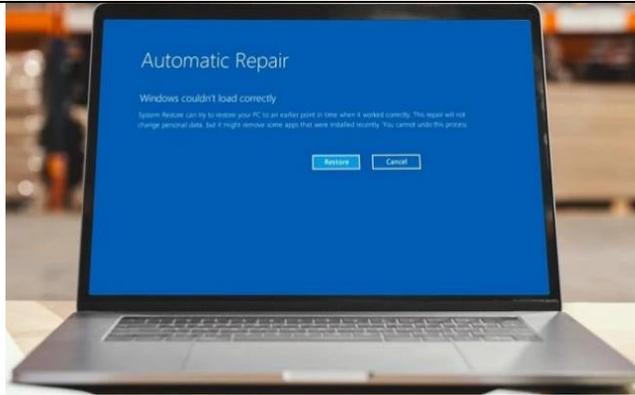


Fig. 2.3: Repair operating systems issues

Data Recovery: Attempting to recover lost or inaccessible data from damaged hard drives or other storage devices as shown in Figure 2.4.



Fig. 2.4: Damaged hard drives

Connectivity Repair: Fixing issues with Wi-Fi, Bluetooth, or Ethernet connections as shown in Figure 2.5.

Common network issues

Business networks routinely experience a range of problems, both big and small. Here are some of the most common network issues that IT departments troubleshoot.

Slow network speeds

End users might complain the network is too slow. Several factors can stall network performance with video traffic a common culprit.

Weak Wi-Fi signal

Reconfiguring an office could create areas with weak Wi-Fi connections. A wireless network testing tool can help remedy this problem.

Broken physical connections

Damaged or disconnected network cables are a common cause of physical connectivity issues. Proper cable management is key.



High CPU usage

The Task Manager is a simple tool that can detect which applications are gobbling up system resources. Stopping and restarting apps can help.

DNS problems

Slow DNS lookups can certainly hinder network traffic. Network admins can reconfigure local routers to shift network requests to faster servers.

IP address issues

Duplicate, exhausted and static IP addresses can prevent systems from accessing the network reliably and result in network disruptions.

Can't connect to printer

Many end users have encountered this problem. Luckily, many of the fixes for this issue are simple, like make sure the printer is plugged in.

VLAN and VPN problems

Check for virtual LAN misconfigurations. VPN connectivity issues can also be a common network problem with simple to complex solutions.

Fig. 2.5: Common Network issue

Laptop Maintenance

Laptop maintenance is crucial for optimal performance and longevity. Regular cleaning, both inside and out, prevents dust buildup that can lead to overheating. Keeping software updated, including the operating system and drivers, patches security vulnerabilities and improves efficiency. Regular virus scans and malware removal protect against malicious software. Backing up important data prevents loss due to hardware failure or software corruption. Optimizing system settings and removing unnecessary programs enhances performance. These simple steps can significantly extend your laptop's lifespan and prevent costly repairs. Common laptop Maintenance categories include:

Cleaning of laptop: Regularly cleaning the laptop's exterior, keyboard, screen, and vents to remove dust and debris that can impede airflow and cause overheating as shown in Figure 2.6.



Fig. 2.6: Cleaning of laptop

Software Updates of laptop: Keeping the operating system, drivers, and applications up to date with the latest security patches and performance improvements as shown in Figure 2.7.

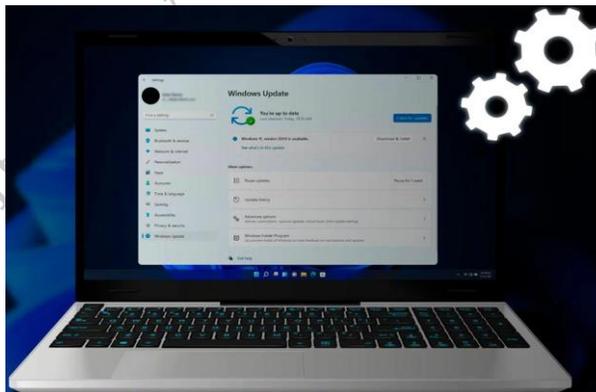


Fig. 2.7: windows updates

Virus and Malware Protection of laptop: Installing and regularly running antivirus and anti-malware software to protect against malicious software as shown in Figure 2.8.

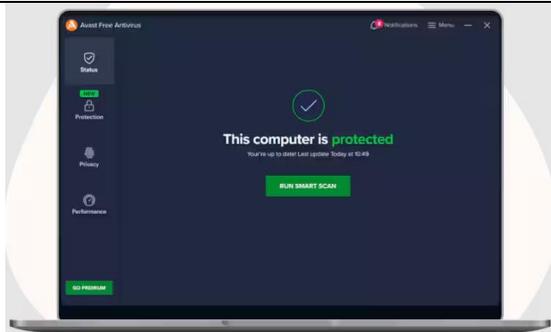


Fig. 2.8: Antivirus Software Scanning

Data Backup of laptop: Regularly backing up important data to prevent data loss in case of hardware failure or software corruption as shown in Figure 2.9.



Fig. 2.9: Data Backup of laptop

Performance Optimization of laptop: Optimizing system settings, removing unnecessary programs, and defragmenting hard drives to improve performance as shown in Figure 2.10.

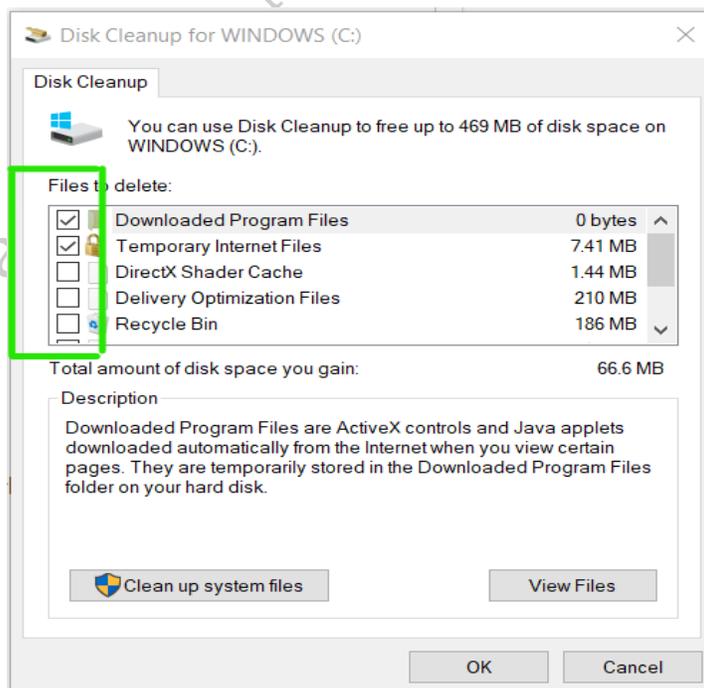


Fig. 2.10: Disk cleanup

Hardware Checks of laptop: Periodically checking the health of hardware components, such as the hard drive and battery, using diagnostic tools as shown in Figure 2.11.

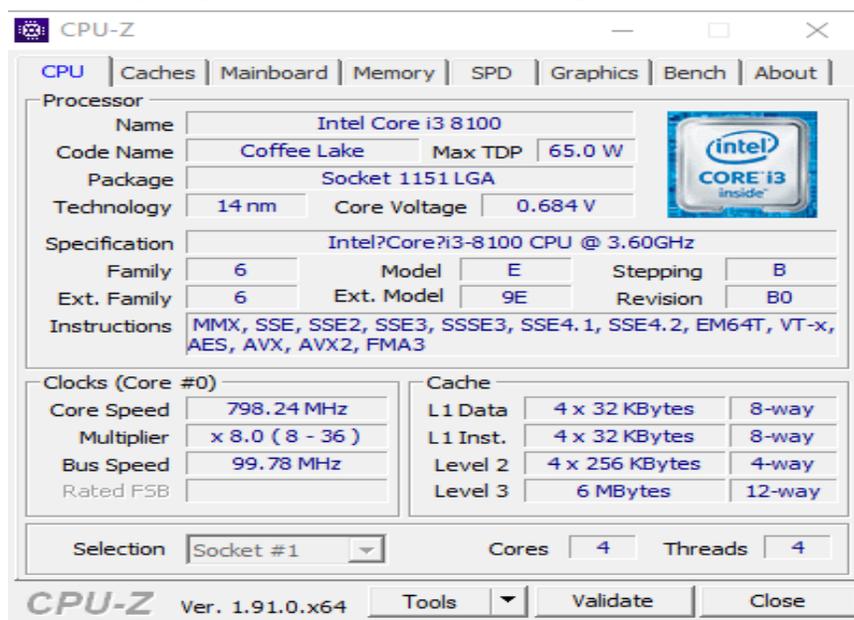


Fig. 2.11: CPU-Z Software

Peripheral Repair and Maintenance of Laptop

Peripheral repair and maintenance ensure the smooth operation of devices connected to your laptop, like printers, mice, keyboards, and monitors. Maintenance involves regular cleaning, driver updates, and cable checks to prevent common issues. Repair addresses specific malfunctions, such as broken keys, printer jams, or monitor display problems. Simple repairs can often be DIY, like replacing a mouse battery or troubleshooting connection issues. However, complex problems, especially with printers or monitors, may require professional service. Proper care of peripherals extends their lifespan and enhances the overall computing experience. Common Peripheral Repair and Maintenance laptop categories include:

Peripheral Repair: Addressing hardware issues with peripherals like mice, keyboards, printers, monitors, and external drives. This might involve repairing cables, replacing buttons, or troubleshooting connectivity problems as shown in Figure 2.12.



Fig. 2.12: Peripheral Devices

Peripheral Maintenance: Cleaning peripherals, updating drivers, and ensuring proper connections to the laptop. For printers, this might include replacing ink or toner cartridges and cleaning print heads.

2.2 Preventive Maintenance process of laptop & Peripherals

Preventive maintenance for a laptop is a proactive approach to keeping it running smoothly and preventing problems before they happen. Think of it like regular check-ups for your digital companion. Instead of waiting for something to break down, you take following steps to ensure its health and longevity. A laptop and peripheral preventive maintenance plan should include:

Physical Cleaning: Regularly cleaning the laptop's exterior, keyboard, screen, and vents to remove dust, dirt, and debris that can cause overheating and affect performance.

Software Updates: Keeping the operating system, drivers, and applications up to date with the latest security patches and performance improvements. This also helps ensure compatibility between different software components.

Virus and Malware Protection: Installing and regularly running antivirus and anti-malware software to protect against malicious software that can compromise your system and data.

Data Backup: Regularly backing up important data to an external drive or cloud storage to prevent data loss in case of hardware failure, software corruption, or accidental deletion.

Performance Optimization: This includes tasks like:

- a) Removing unnecessary files and programs.
- b) Defragmenting the hard drive.
- c) Optimizing system settings for performance.
- d) Checking for and updating drivers.

Hardware Checks: Periodically checking the health of hardware components, such as the hard drive and battery, using diagnostic tools. This can help identify potential problems early on.

Regular Inspections: Checking for loose connections, frayed cables, or other signs of wear and tear.

The goal of preventive maintenance is to:

- a) **Extend the laptop's lifespan:** By preventing problems and keeping it running efficiently.
- b) **Improve performance:** A well-maintained laptop runs faster and more smoothly.
- c) **Enhance security:** Protecting against malware and ensuring data safety.
- d) **Reduce downtime:** Minimizing unexpected crashes and malfunctions.
- e) **Save money:** Preventing major problems that can be expensive to fix.

Practical Activity 2.1 Preventive maintenance process of laptop and its peripherals. Practical preventive maintenance activity for a laptop and its peripherals. We'll focus on a monthly schedule, but you can adjust the frequency based on your needs and usage.

Material Required

Microfiber Cloths, Compressed Air, Cleaning Solutions, Cotton Swabs/Q-tips, Isopropyl Alcohol, Anti-Static Wrist Strap, Anti-Static Mat, Screwdrivers, Flashlight

Procedures

Step 1. The first step in a monthly laptop maintenance routine is physical cleaning, which should take approximately 15 minutes. Begin by cleaning the exterior. Dampen a microfiber cloth

with an electronics cleaning solution and carefully wipe down the laptop's lid, base, and keyboard as shown in Figure 2.13. It's crucial to avoid getting any moisture inside the laptop's openings. Next, use a separate, clean microfiber cloth, either dry or slightly dampened with screen cleaner if necessary, to gently clean the screen. Apply minimal pressure to avoid damaging the delicate display. Finally, use short bursts of compressed air to blow out any accumulated dust from the laptop's vents, paying particular attention to the areas around the fans. This helps ensure proper airflow and prevents overheating.



Fig. 2.13: microfiber cloth

Step 2. The second step, software updates, requires about 30 minutes. Begin by checking for and installing any available updates for your operating system as shown in Figure 2.14, whether it's Windows or macOS. Next, use the Device Manager (Windows) or System Preferences (macOS) to check for driver updates. Pay particular attention to drivers for key components like the graphics card, Wi-Fi adapter, and chipset. It's generally best practice to download newer drivers from the manufacturer's website for optimal compatibility and performance. Finally, update any frequently used applications to ensure you have the latest features, security patches, and bug fixes.

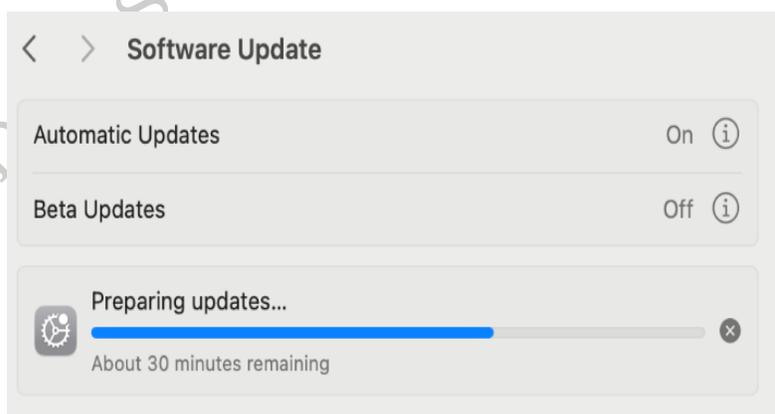


Fig. 2.14: Software update

Step 3. The third step, a security scan, should take approximately 30 minutes. Begin by running a full system scan using your installed antivirus software. This scan will check all files and programs for known malware and viruses, quarantining or removing any threats detected as

shown in Figure 2.15. For an added layer of security, consider running a scan with Malwarebytes (the free version is sufficient). Malwarebytes often detects malware that traditional antivirus software might miss, providing a more comprehensive security check. This dual approach significantly strengthens your laptop's defenses against malicious software.



Fig. 2.15: Virus & threat Protection

Step 4. Data backup, the fourth step, is a crucial 15-minute process. Begin by verifying the success of your most recent backup. Ensure that all expected files were backed up correctly and that the backup media is accessible. Next, back up any new files or files that have been modified since your last backup. This ensures that your most current work is protected as shown in Figure 2.16.



Fig. 2.16: Data backup

Step 5. The fifth step, a performance check, should take about 15 minutes. If you're using Windows, utilize the Disk Cleanup utility to remove temporary files, browser cache, and other unnecessary data cluttering your system. macOS has similar built-in tools for managing storage. This process frees up disk space and can improve overall system responsiveness. Following the disk cleanup, review the list of programs that automatically start when your computer boots up

as shown in Figure 2.17.

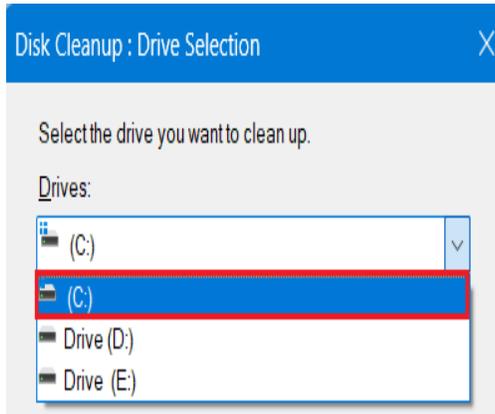


Fig. 2.17: Disk Cleanup utility

Step 6. The sixth step, cleaning the mouse and keyboard, should only take about five minutes. For the keyboard, use short bursts of compressed air to dislodge dust, crumbs, and other debris that accumulates between the keys. This is a quick and effective way to keep your keyboard clean and functioning properly. After using compressed air on the keyboard, and for both the keyboard and the mouse, wipe them down with a slightly damp cloth as shown in Figure 2.18.



Fig. 2.18: Cleaning

Step 7. The seventh step, monitor cleaning, requires only five minutes. Using a dry microfiber cloth, gently wipe the monitor screen to remove dust, fingerprints, and smudges. Avoid applying too much pressure, as this can damage the delicate display. If necessary, you can use a screen cleaner, but do so sparingly. Lightly dampen the microfiber cloth with the screen cleaner, never spray the cleaner directly onto the screen as shown in Figure 2.19.



Fig. 2.19: laptop monitor cleaning

Step 8. The eighth step, the printer check, should take approximately ten minutes as shown in Figure 2.20. Begin by checking the ink or toner levels. If any cartridges are low or empty, replace them as needed to ensure uninterrupted.



Fig. 2.20: Printer Check

Check Your Progress

A. Multiple-choice questions (MCQs)

- Which of the following is NOT a typical step in a laptop repair process? a) Diagnosis b) Planning c) Randomly replacing parts d) Testing
- What is the primary purpose of preventive maintenance for a laptop? a) To increase the laptop's resale value b) To prevent future problems and extend its lifespan c) To make the laptop look newer d) To impress friends and family
- Which of these is a crucial step *before* starting any laptop repair? a) Immediately ordering replacement parts b) Backing up important data c) Cleaning the work area d) Reading the laptop's manual (if available)
- What is the BEST tool for cleaning dust out of laptop vents? a) A vacuum cleaner b) Compressed air c) A damp cloth d) A brush
- Which of the following is a common software maintenance task for laptops? a) Replacing the CPU b) Updating the operating system c) Physically cleaning the RAM modules d) Re-soldering circuit board connections
- What is the purpose of an anti-static wrist strap when working on laptop hardware? a) To prevent electric shock to the technician b) To prevent electrostatic discharge from damaging laptop components c) To make the technician look professional d) To hold screws and small parts
- Which of these is a common peripheral maintenance task? a) Replacing the printer's motherboard b) Cleaning the mouse and keyboard c) Re-soldering a broken USB port d) Updating the monitor's firmware (if applicable)
- What is the BEST way to clean a laptop screen? a) Use a household cleaner b) Use a paper towel c) Use a microfiber cloth and screen cleaner (if needed) d) Use a window cleaner
- What is the purpose of running a disk cleanup utility on a laptop? a) To defragment the hard drive b) To remove temporary files and free up disk space c) To scan for viruses d) To update device drivers

10. Which of the following is NOT a good practice for laptop battery maintenance? a) Keeping the battery cool b) Completely draining the battery regularly c) Avoiding extreme temperatures d) Using the original charger

B. Fill in the Blank

1. If your laptop is running slowly, you might need to run a _____ cleanup utility.
2. When cleaning a laptop screen, avoid applying too much _____.
3. A common peripheral maintenance task is cleaning the _____ and _____.
4. Overheating can significantly reduce the _____ of a laptop's components.
5. When disassembling a laptop, it's important to keep track of all the small _____ and screws.
6. For more complex laptop repairs, it's often best to seek _____ help.
7. A _____ scan can help identify and remove malicious software from your laptop.
8. Regularly checking the _____ levels in your printer can prevent printing issues.
9. A _____ cloth is recommended for cleaning a monitor screen.

C. Short Questions

1. Why is it important to back up data before performing laptop repairs?
2. What is the purpose of preventive maintenance for a laptop?
3. What are some common signs of a failing hard drive?
4. Why is it important to keep laptop vents free of dust?
5. What are some common software issues that can be resolved through maintenance?
6. What is the best way to clean a laptop screen?
7. What tools are typically needed for basic laptop disassembly?
8. What is the purpose of an anti-static wrist strap?
9. Why is it important to use appropriate cleaning solutions for electronics?
10. What are some common peripheral maintenance tasks?

Session 3. Testing of Repaired Laptops & Peripherals

Laptops are essential tools in today's world, and when they malfunction, repairs and maintenance are crucial to restoring their functionality. However, simply fixing a problem isn't enough. A critical step in the repair process is thorough testing. This involves not only checking the laptop itself but also all connected peripherals, such as mice, keyboards, monitors, and printers. This comprehensive testing ensures that the initial issue has been resolved and that no new problems have arisen during the repair or maintenance process. Only by rigorously testing the laptop and its peripherals can we guarantee that the system is operating correctly and ready for reliable use. This process validates the effectiveness of the repairs, confirms the stability of the system, and ultimately ensures user satisfaction.

Importance of testing a laptop & peripherals

Testing is a fundamental and indispensable process across numerous domains, serving as a cornerstone for quality assurance and risk mitigation. Whether applied to software development, product manufacturing, or even complex systems like laptops and their peripherals, testing plays a vital role in ensuring that the final product or service meets its intended purpose and performs reliably. The primary importance of testing lies in its ability to verify functionality, confirming that all components work as expected and that the system as a whole operates correctly as shown in Figure 3.1. Furthermore, testing is crucial for identifying defects, errors, or vulnerabilities early in the development or maintenance process, allowing for timely corrections and preventing these issues from escalating into more significant problems later on. By rigorously evaluating products and systems under various conditions, testing helps to minimize the risk of failures, accidents, or unexpected malfunctions, ultimately contributing to increased safety and reliability. In addition to technical aspects, testing also plays a key role in enhancing user experience by identifying usability issues and ensuring that products are intuitive and user-friendly. Ultimately, testing is an investment in quality, safety, and user satisfaction, leading to better products, improved processes, and greater confidence in the reliability and performance of the systems we depend on.



Fig. 3.1: testing a laptop

Testing a laptop and its peripherals after repair and maintenance is absolutely crucial for several reasons:

CPU & RAM testing on laptop

CPU and RAM testing is essential for maintaining optimal laptop performance and stability. The CPU, the "brain" of the laptop, executes instructions, while RAM, the short-term memory, holds data for quick access. Testing the CPU ensures it can handle demanding tasks efficiently and reliably, preventing slowdowns and crashes. RAM testing verifies its ability to store and retrieve data accurately, crucial for smooth multitasking. These tests help identify potential issues like overheating, memory errors, or performance bottlenecks. By proactively testing these core components, users can ensure their laptop operates at its best, preventing future problems and maximizing its lifespan. This process is vital for both everyday use and demanding applications like gaming or video editing. Some Testing technique to apply of laptop parts as shown in Figure 3.2:

- Benchmark software: Tools like Geek bench or Cinebench assess performance under stress.
- Stress testing: Run demanding applications or games to check stability.

- c) Monitoring tools: Keep an eye on temperatures and resource usage during heavy loads.



Fig. 3.2: CPU and Ram testing of laptop

Storage (HDD/SSD) testing on laptop

Laptop storage, whether a traditional HDD (Hard Disk Drive) or a modern SSD (Solid State Drive), is crucial for safeguarding valuable data as shown in Figure 3.3. Testing this storage is essential for ensuring its reliability and preventing data loss. Regular testing verifies the drive's health, checks for errors, and assesses its performance. For HDDs, this includes checking for bad sectors and mechanical issues. For SSDs, tests focus on performance metrics and wear leveling. By proactively testing storage, users can identify potential problems early on, back up critical data, and take necessary steps to maintain the integrity and longevity of their laptop's storage system. This process is vital for both personal files and professional data, ensuring peace of mind and preventing catastrophic data loss. Some Testing technique to apply of laptop parts:

- Diagnostic tools: Use manufacturer-provided or third-party software (like CrystalDiskInfo) to check for errors and health status.
- File transfer tests: Transfer large files to and from the drive to assess speed and reliability.



Fig. 3.3: SSD testing laptop

Graphics Card testing on laptop

The graphics card, whether integrated or dedicated, plays a critical role in a laptop's visual output, impacting everything from basic display to high-end gaming and video editing. Testing the graphics

card is essential to ensure smooth visuals, accurate rendering, and overall system stability. Testing verifies the card's ability to handle graphical workloads, checks for artifacts or glitches, and assesses its performance under stress. This process is particularly important for gamers, designers, and anyone relying on visually intensive applications. By testing the graphics card, users can identify potential issues like overheating, driver problems, or hardware failures, allowing for timely intervention and preventing a degraded visual experience or even system crashes as shown in Figure 3.4. Some Testing technique to apply of laptop parts:

- a) Benchmark software: Tools like 3DMark or FurMark evaluate graphics performance.
- b) Gaming: Play graphically intensive games to check for smooth frame rates and stability.

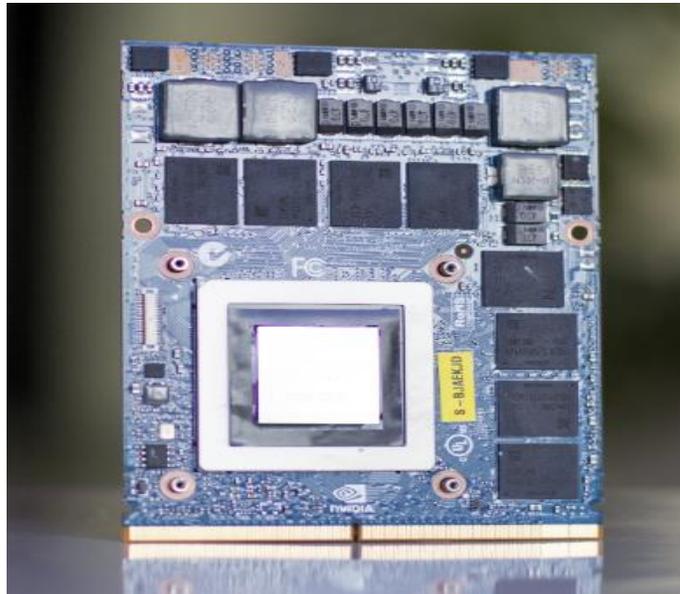


Fig. 3.4: Graphics Card

Ports testing on laptop

Laptop ports are the gateways to connecting essential peripherals and external devices, enabling seamless interaction and expanding functionality. Testing these ports—USB, HDMI, audio jacks, Ethernet, and others—is crucial to ensure reliable connectivity and prevent communication breakdowns as shown in Figure 3.5. Testing verifies that each port can properly transmit data, power devices, and maintain stable connections. This process involves physically connecting various devices and testing data transfer, video output, audio input/output, and network connectivity. By thoroughly testing laptop ports, users can identify faulty connections, driver issues, or hardware problems, preventing frustrating connectivity issues and ensuring seamless integration with external devices. This proactive approach is vital for both everyday use and specialized tasks requiring specific peripherals. Some Testing technique to apply of laptop parts:

- a) Physical testing: Connect devices to each port (USB, HDMI, etc.) to ensure they function.
- b) Data transfer tests: Transfer files through each port to verify proper communication.



Fig. 3.5: Ports testing on laptop

Keyboard testing on laptop

The keyboard is a primary input device, crucial for interacting with a laptop. Testing it ensures all keys function correctly, from alphanumeric characters to special function keys. A malfunctioning keyboard can hinder productivity and cause frustration. Testing involves checking individual key responsiveness, identifying sticky keys or keys that don't register, and verifying the functionality of modifier keys like Shift, Ctrl, and Alt as shown in Figure 3.6. This process is vital for both everyday typing tasks and specialized input for gaming or programming. Thorough keyboard testing ensures seamless interaction with the laptop, preventing input errors and maximizing user efficiency.

- Online keyboard testers: Websites that allow you to check each key's functionality.
- Typing tests: Practice typing to assess responsiveness and accuracy.



Fig. 3.6: Keyboard typing test

Mouse/Trackpad testing on laptop

The mouse and trackpad are essential input devices that enable precise cursor control and navigation on a laptop. Testing these devices is crucial for ensuring smooth and accurate interaction. Mouse testing verifies button functionality, scroll wheel operation, and cursor tracking accuracy as

shown in Figure 3.7. Trackpad testing assesses responsiveness, multi-touch gesture recognition, and overall precision. A malfunctioning mouse or trackpad can significantly impact productivity and user experience. Thorough testing identifies issues like erratic cursor movement, unresponsive buttons, or inaccurate tracking. This process ensures seamless navigation, precise control, and a comfortable user experience, whether for everyday tasks or specialized design work. Regular testing can also help detect early signs of wear or potential hardware problems.

- a) Functionality tests: Check all buttons, scrolling, and cursor movement.
- b) Precision tests: Use drawing or design software to evaluate accuracy.

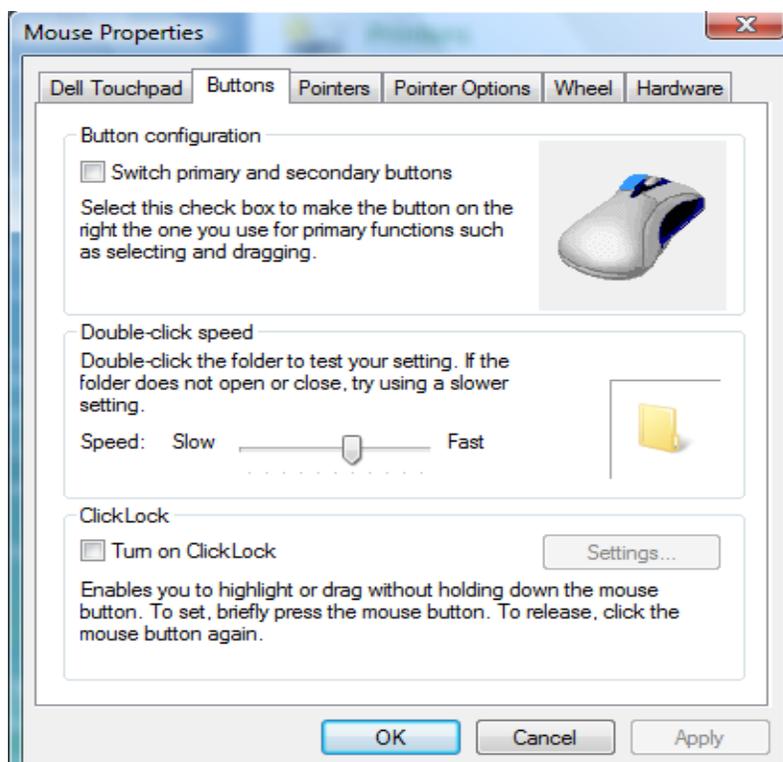


Fig. 3.7: Mouse Properties

Monitor testing on laptop

The laptop monitor is the primary visual interface, displaying information crucial for user interaction. Testing it ensures accurate image display, vibrant colors, and optimal viewing experience. Testing involves checking for dead pixels, screen uniformity, brightness, contrast, and color accuracy as shown in Figure 3.8. It also verifies proper resolution and refresh rate support. A malfunctioning monitor can lead to eye strain, distorted images, or an inability to properly view content. Thorough testing ensures the display meets quality standards, providing clear and comfortable visuals for everyday tasks, graphic design, or multimedia consumption. This process helps identify potential issues like backlight problems, color imbalances, or physical damage, ensuring a satisfying viewing experience.

- a) Visual inspection: Check for dead pixels, color accuracy, and brightness.
- b) Online monitor tests: Websites with tools to assess display quality.

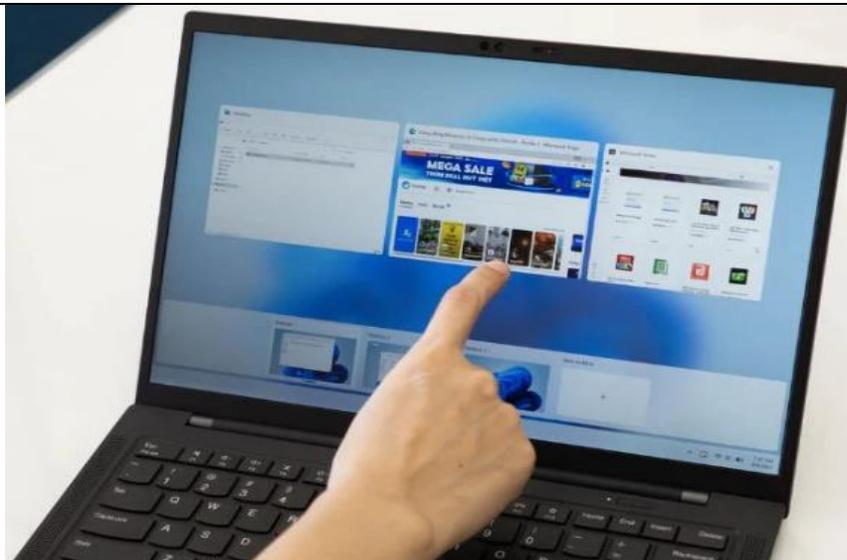


Fig. 3.8: Monitor Testing

Printer testing on laptop

Printer testing on a laptop verifies the seamless interaction between the two devices, ensuring reliable printing functionality. This testing confirms the laptop can properly communicate with the printer, send print jobs, and receive status updates as shown in Figure 3.9. Testing involves printing documents with various formats and content, checking for print quality, and ensuring proper paper handling. It also verifies the printer's connection to the laptop, whether through USB, Wi-Fi, or network connection. A successful printer test ensures users can reliably produce hard copies of their work, documents, or photos, preventing frustrating printing errors and ensuring a smooth workflow. This process is crucial for both home users and professionals who rely on printed materials.

- a) Test prints: Print documents with different content and formats.
- b) Connection tests: Ensure the printer connects and communicates reliably.

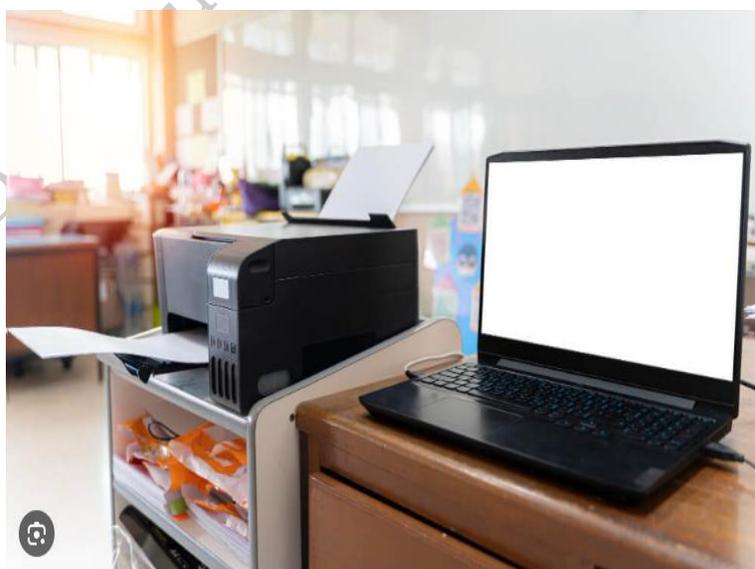


Fig. 3.9: Printer Testing

Other Peripherals testing on laptop

Beyond the core components, laptops often rely on a range of other peripherals for expanded functionality. Testing these peripherals is crucial for a complete and seamless user experience. This includes devices like speakers, microphones, webcams, external drives, and specialized input devices as shown in Figure 3.10. Testing ensures proper connection, functionality, and compatibility with the laptop. For audio peripherals, this involves checking sound quality and microphone sensitivity. Webcam testing verifies image quality and video capture. External drive testing assesses data transfer speeds and reliability. Thorough testing of all connected peripherals ensures a complete and optimized computing environment, preventing frustrating compatibility issues and maximizing the laptop's capabilities.

a) Functional testing: Check speakers, microphones, webcams, etc., using relevant applications.



Fig. 3.10: Other Peripherals

3.2 Functioning of various parts and components of laptop & peripherals

The state where components are powered on but not actively performing intensive tasks. It's important to understand this state as it significantly impacts power consumption, heat generation, and overall system responsiveness.

Laptop Components:

- **CPU (Central Processing Unit):** In idle, the CPU operates at its lowest clock speed and voltage, minimizing power usage. It's essentially waiting for instructions, performing background tasks, or managing system resources. Temperatures should be low.
- **RAM (Random Access Memory):** RAM retains the operating system and currently running programs in a low-power state, ready for immediate access. It consumes minimal power in idle.
- **Storage (HDD/SSD):** HDDs may spin down or enter a low-power mode when idle, while SSDs consume very little power in this state. Data is stored passively.
- **Graphics Card (GPU):** Integrated GPUs often enter a low-power mode, relying on the CPU for basic display tasks. Dedicated GPUs may also have low-power states or even turn off completely if not in use.
- **Motherboard:** The motherboard manages power distribution and communication between

components. In idle, it ensures all components receive necessary power at their lowest operating levels.

- **Cooling System:** Fans operate at low speeds or may turn off entirely when the system is idle, maintaining a cool and quiet environment.

Peripherals Component of Laptop:

- **Keyboard & Mouse/Trackpad:** These typically draw minimal power when idle, waiting for user input. Some wireless devices may have power-saving modes.
- **Monitor:** Monitors have a low-power state or sleep mode when not receiving a signal or after a period of inactivity. They consume very little power in this state.
- **Printer:** Printers generally have a sleep mode, consuming minimal power until a print job is sent.
- **Other Peripherals:** Speakers, microphones, webcams, and external drives may have power-saving modes or consume minimal power when idle.

3.3 Testing process and parameters of various parts of laptop & peripherals

The testing process and parameters for laptop components and peripherals aim to establish a comprehensive understanding of their functionality, performance, and stability. The theoretical approach involves a structured evaluation, often based on established benchmarks, industry standards, and manufacturer specifications.

Laptop Components:

1. CPU (Central Processing Unit)

CPU testing involves subjecting it to various workloads, from basic arithmetic operations to complex simulations, to assess its ability to execute instructions accurately and efficiently. Parameters like clock speed, cache size, and instruction set architecture are considered, and performance is evaluated against theoretical maximums and comparisons to similar CPUs. Thermal design power (TDP) and thermal limits are also theoretically considered to ensure the CPU operates within safe temperature ranges. Some Testing Process of CPU Component are:

Stress Testing

Run demanding applications (e.g., video editing software, games) or use dedicated stress-testing tools (Prime95, IntelBurnTest) to push the CPU to its limits as shown in Figure 3.11.

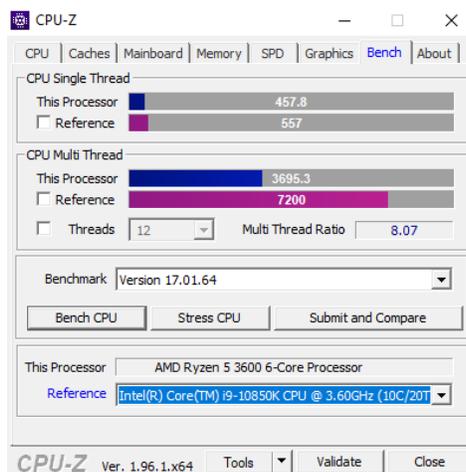


Fig. 3.11: CPU-Z

Benchmarking

Use benchmarking software (Geekbench, Cinebench) to measure CPU performance under specific conditions as shown in Figure 3.12.

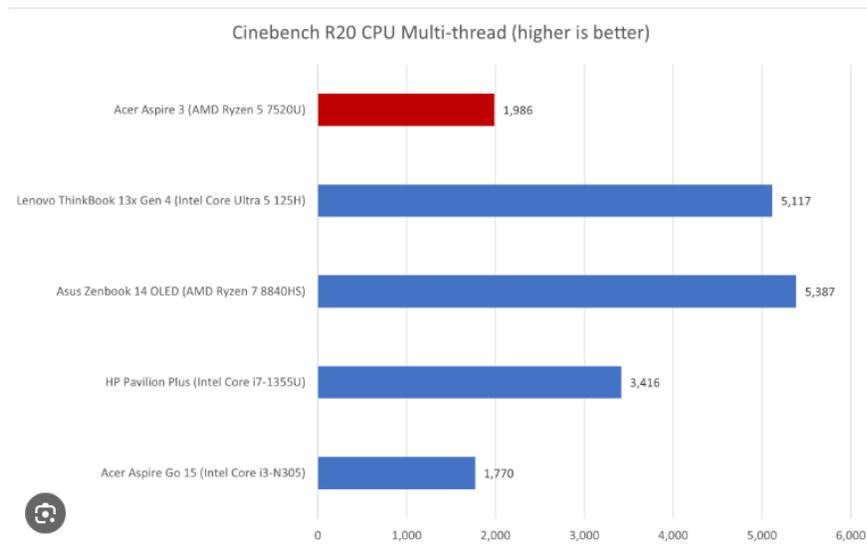


Fig. 3.13: Benchmarking

Monitoring

Track CPU usage and temperature during normal operation and heavy loads using monitoring tools (Task Manager, Activity Monitor) as shown in Figure 3.13.

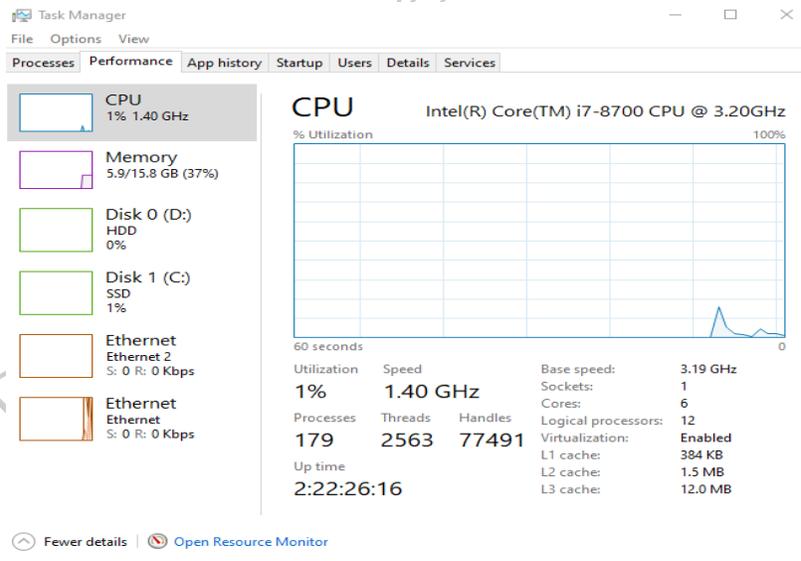


Fig. 3.13: Task manager

Some Parameters Process of CPU Component are:

Temperature

Monitor CPU temperature to ensure it stays within safe limits (typically below 90°C) as shown in Figure 3.14.

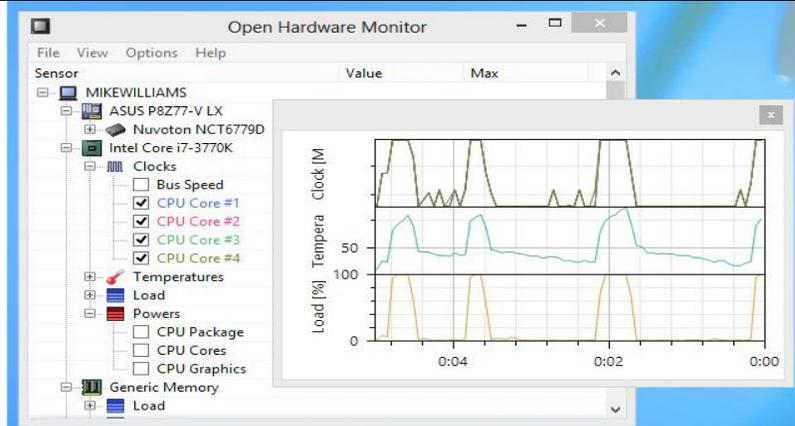


Fig. 3.14: Open Hardware Monitor

Clock Speed

Verify the CPU reaches its rated clock speed under load as shown in Figure 3.15.

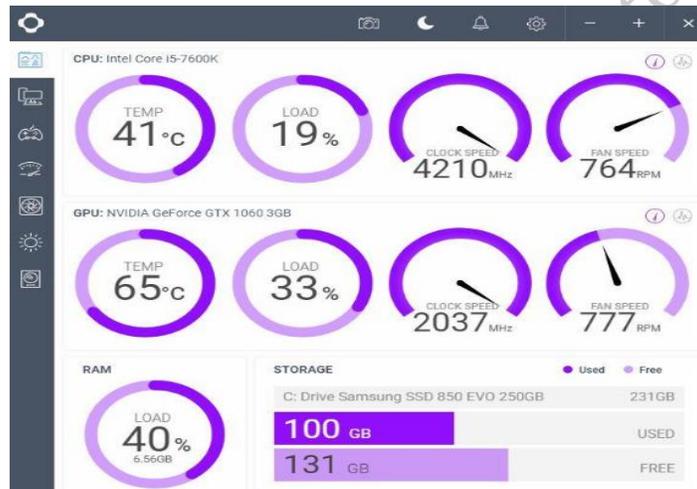


Fig. 3.15: CPU Check clock Speed

Stability

Check for system crashes, freezes, or errors during stress tests as shown in Figure 3.16.

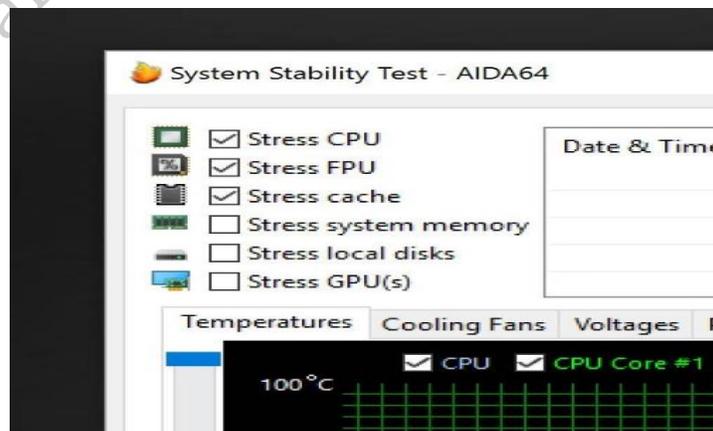


Fig. 3.16: System stability Test

Performance

Compare benchmark scores to expected performance levels for the specific CPU model as shown in Figure 3.17.

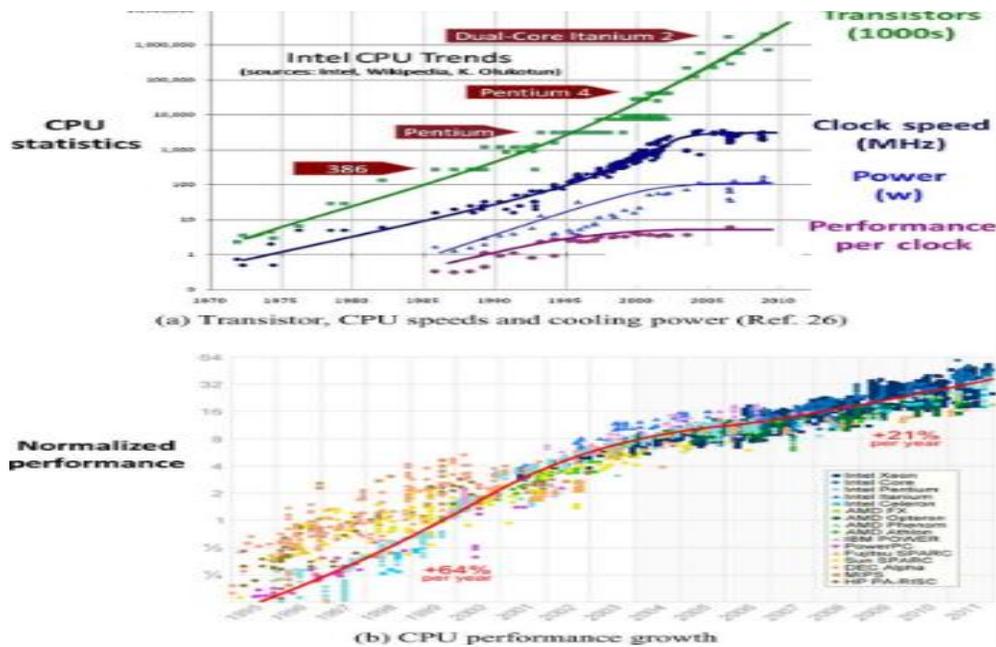


Fig. 3.17: CPU Performance check

2. RAM (Random Access Memory)

RAM testing focuses on verifying its capacity, speed, and error-free operation. Theoretical tests involve writing and reading data to all memory locations, checking for any inconsistencies or errors. Latency and bandwidth are also theoretically calculated and compared to expected values. Some Testing Process of RAM Component are:

Memory Diagnostic Tools

Use built-in tools (Windows Memory Diagnostic, Apple Diagnostics) or third-party software (MemTest86) to check for memory errors as shown in Figure 3.18.

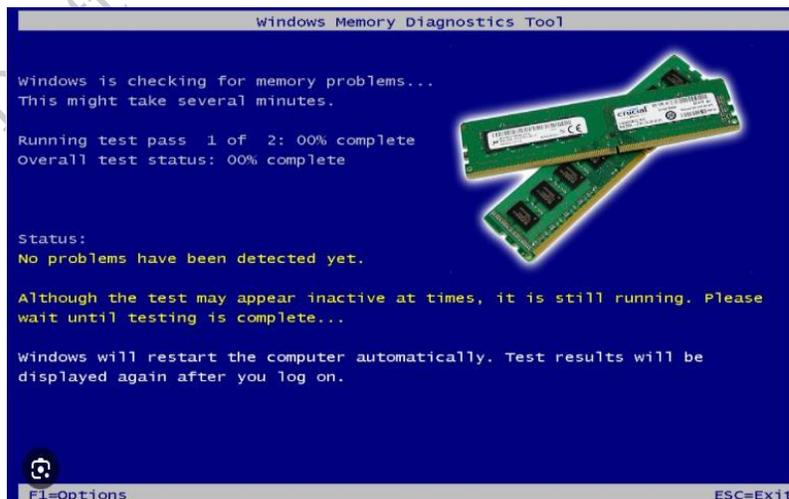


Fig. 3.18: Windows Memory Diagnostic

Stress Testing: Run memory-intensive applications or use memory testing tools to identify stability issues.

Some Parameters Process of RAM Components are:

Errors

Check for any errors reported by memory diagnostic tools as shown in Figure 3.19.

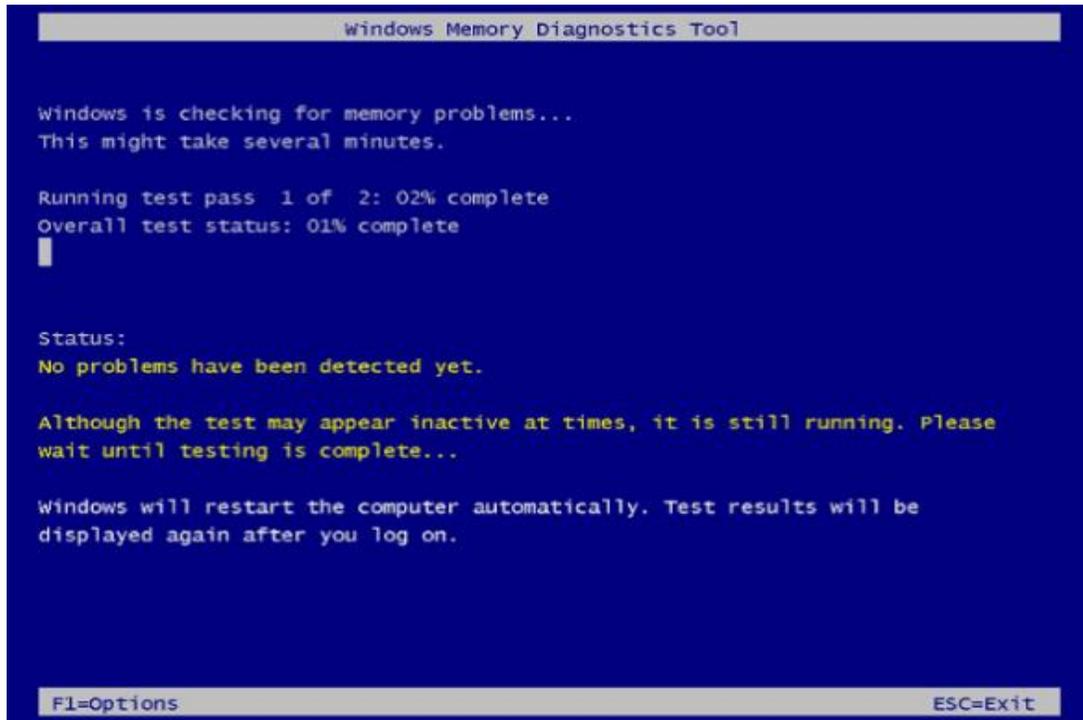


Fig. 3.19: Check error Windows Memory Diagnostic

Stability

Monitor for system crashes or blue screens during memory-intensive tasks as shown in Figure 3.20.

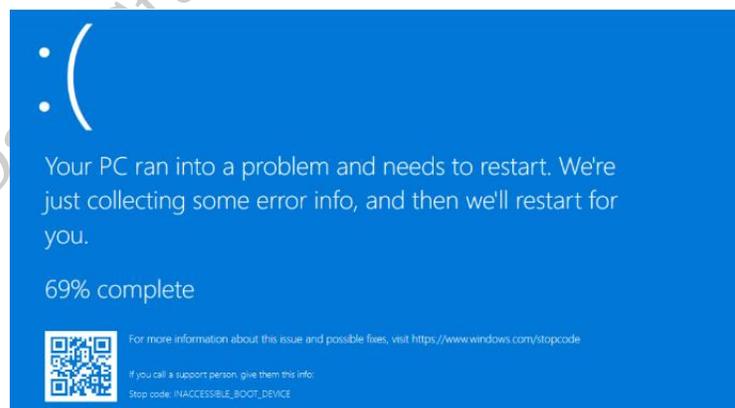


Fig. 3.20: System crashes or blue screens

Performance

Evaluate how well the system handles multitasking and memory-demanding applications as shown in Figure 3.21

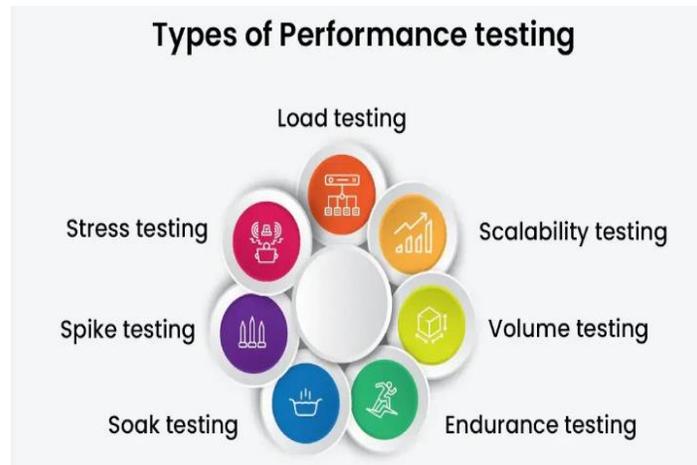


Fig. 3.21: Type of Performance Testing

3. Storage (HDD/SSD)

Storage testing evaluates read and write speeds, access times, and overall reliability. For HDDs, theoretical considerations include rotational speed, platter density, and seek time. For SSDs, the focus is on NAND flash technology, controller performance, and wear leveling algorithms. Mean time between failures (MTBF) is a theoretical measure of drive reliability. Some Testing Process of Storage (HDD/SSD) Component are:

Diagnostic Tools

Use manufacturer-provided or third-party software (CrystalDiskInfo) to check for drive health, errors, and bad sectors (for HDDs) as shown in Figure 3.22.

CrystalDiskInfo 6.6.1

File Edit Function Theme Disk Help Language

Good
34 °C
C: D:

WDC WD800AAJS-75M0A0 80.0 GB

Health Status	Firmware	02.03E02	Total Host Reads	12087 GB
Good	Serial Number	WD-WMAV3A735535	Total Host Writes	9204 GB
Temperature	Interface	Serial ATA	Power On Count	2869 count
34 °C	Transfer Mode	---- SATA/300	Power On Hours	8926 hours
	Drive Letter	C: D:		
	Standard	ATA8-ACS ----		
	Features	S.M.A.R.T., AAM, NCQ		

ID	Attribute Name	Current	Worst	Threshold	Raw Values
01	Read Error Rate	200	200	51	00000000073
03	Spin-Up Time	135	135	21	000000001070
04	Start/Stop Count	98	98	0	000000000836
05	Reallocated Sectors Count	200	200	140	000000000000
07	Seek Error Rate	100	253	0	000000000000
09	Power-On Hours	88	88	0	0000000022DE

Fig. 3.22: Diagnostic Tools

Performance Tests

Transfer large files to and from the drive to assess read/write speeds as shown in Figure 3.23.

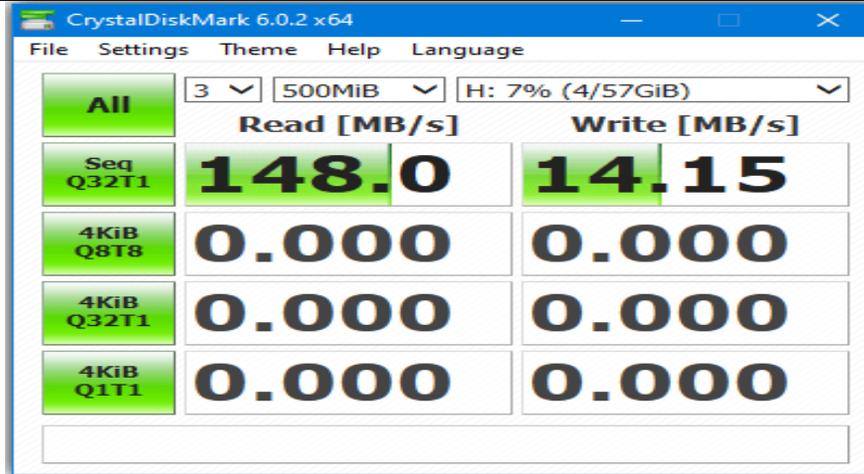


Fig. 3.23: Crystal disk mark

Some Parameters Process of Storage (HDD/SSD) components are:

Health Status

Check for any reported errors or warnings about the drive's condition as shown in Figure 3.24.

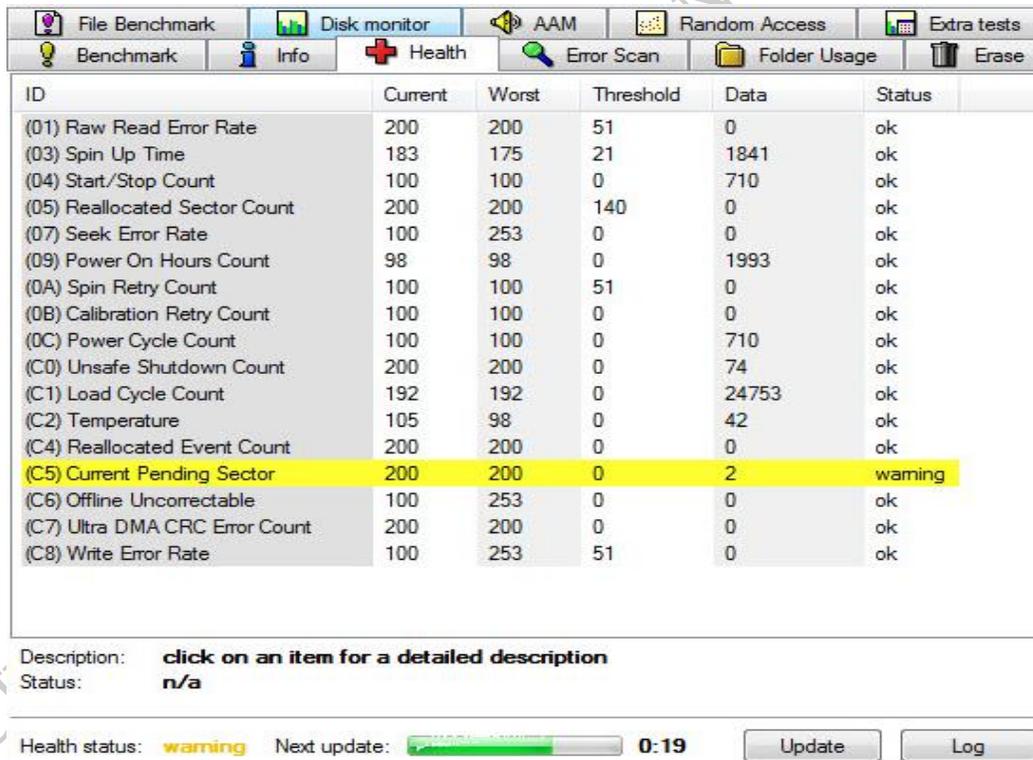


Fig. 3.24: system Health status check

Read/Write Speeds

Compare measured speeds to the drive's specifications as shown in Figure 3.25.

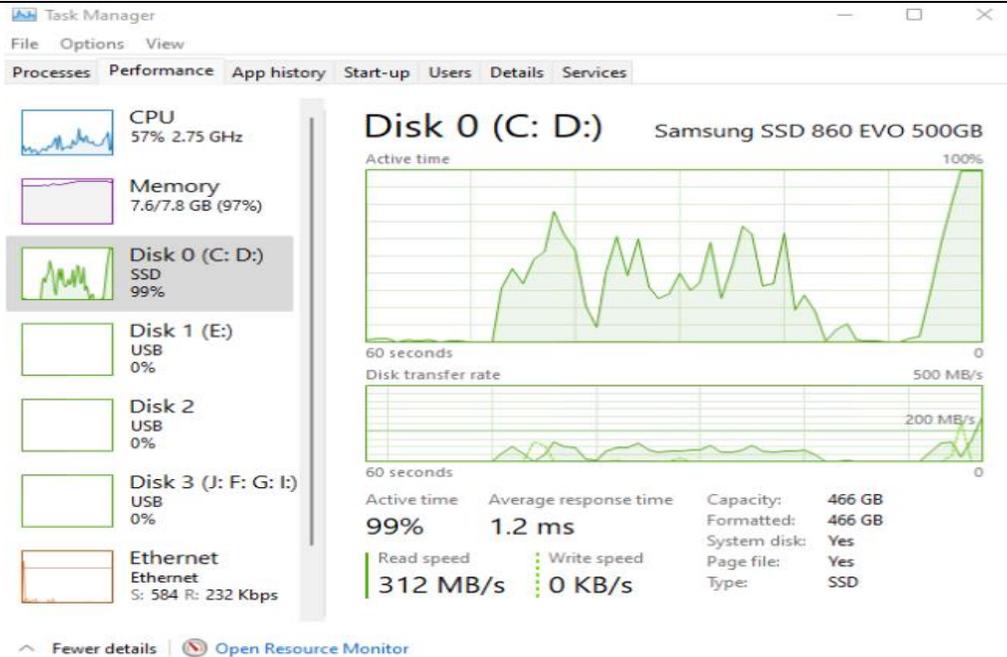


Fig. 3.25: Task Manager (Disk Utilization Check)

Bad Sectors (HDD)

Identify and isolate any bad sectors on the hard drive as shown in Figure 3.26.

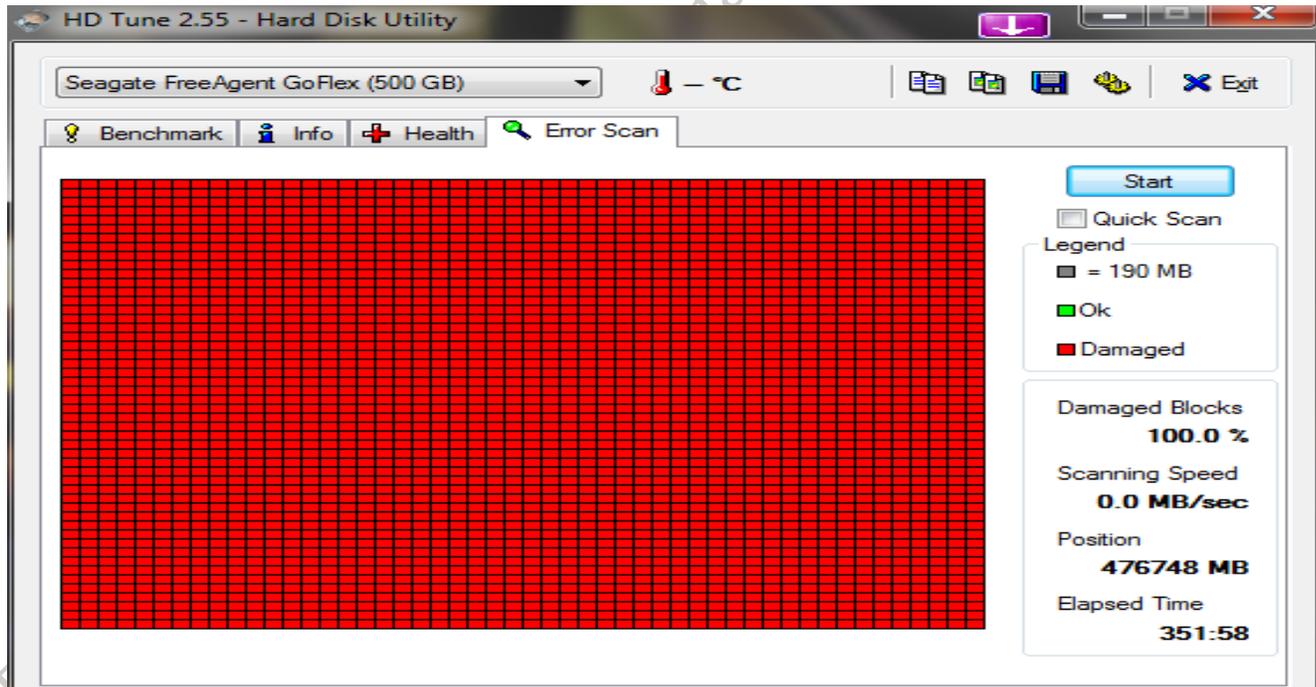


Fig. 3.26: Check Bad Sector of HDD

4. Graphics Card (GPU)

GPU testing assesses its ability to process graphical data, including rendering 2D and 3D images, videos, and complex visual effects. Parameters like clock speed, memory bandwidth, and the number

of CUDA cores (for NVIDIA) or stream processors (for AMD) are considered. Theoretical performance is often measured using standardized benchmarks and compared to similar GPUs. Some Testing Process of Graphics Card (GPU) components are:

- **Benchmark Software:** Use tools like 3DMark or FurMark to evaluate graphics performance.
- **Gaming:** Play graphically demanding games to check for smooth frame rates and stability.
- **Frame Rate:** Measure the frames per second (FPS) in games or benchmarks.
- **Temperature:** Monitor GPU temperature under load.
- **Visual Artifacts:** Check for any visual glitches, distortions, or artifacts during testing.

5. Ports

Port testing verifies their adherence to industry standards (e.g., USB, HDMI) and their ability to transmit data and power reliably. Theoretical considerations include data transfer rates, signal integrity, and compatibility with various devices. Some Testing Process of Ports components are:

- **Physical Testing:** Connect devices to each port (USB, HDMI, audio jacks, etc.) to ensure they function.
- **Data Transfer Tests:** Transfer files through each port to verify proper communication and speed.
- **Connectivity:** Ensure devices are recognized and function correctly when connected to each port.
- **Data Transfer Speed:** Measure the speed of data transfer through each port.

6. Peripherals

Laptop peripherals are devices that connect to a laptop to expand its functionality and improve the user experience.

Keyboard of laptop

The laptop keyboard is a primary input device, essential for interacting with the system. It allows users to input text, commands, and navigate through applications. Keyboards can be full-sized, compact, or ergonomic, and connect via wired (USB) or wireless (Bluetooth, proprietary receiver) connections. A typical keyboard includes alphanumeric keys, function keys (F1-F12), modifier keys (Shift, Ctrl, Alt), and special keys (Enter, Backspace, Tab). Keyboards can also have specialized features like backlighting, media controls, or programmable macros. Regular cleaning and maintenance are important to ensure proper function and prevent sticky or unresponsive keys. A well-functioning keyboard is crucial for efficient and comfortable laptop use. Some Testing Process of Keyboard components are:

- **Online Keyboard Testers:** Use websites that allow you to check each key's functionality.
- **Typing Tests:** Practice typing to assess responsiveness and accuracy.
- **Key Functionality:** Verify that all keys register input correctly.
- **Responsiveness:** Check for any delays or sticking keys.

Mouse/Trackpad of laptop

Testing a laptop's mouse and trackpad is crucial for ensuring smooth and accurate navigation. Mouse testing involves verifying the functionality of all buttons (left, right, middle click), the scroll wheel, and cursor tracking precision. For trackpads, test responsiveness, multi-touch gestures

(scrolling, zooming, rotating), and overall cursor accuracy. Move the cursor across the entire trackpad surface, checking for dead spots or erratic movements. Click and drag icons to ensure smooth selection and manipulation. Pay attention to any delays or unresponsiveness. Thorough mouse and trackpad testing ensure seamless interaction with the laptop, preventing frustrating navigation issues and maximizing user efficiency. Regular checks can also identify potential hardware problems early on. Some Testing Process of Ports components are:

- **Functionality Tests:** Check all buttons, scrolling, and cursor movement.
- **Precision Tests:** Use drawing or design software to evaluate accuracy.
- **Accuracy:** Ensure the cursor moves precisely as intended.
- **Responsiveness:** Check for any delays or erratic movement.

7. Monitor

Testing a laptop monitor is crucial for ensuring a clear and comfortable viewing experience. Begin with a visual inspection, checking for dead pixels, scratches, or other physical damage. Evaluate brightness, contrast, and color accuracy by displaying various images and patterns. Online monitor test websites offer tools to assess color gamut, grayscale gradients, and response time. Check for screen uniformity, ensuring consistent brightness across the entire display. Test different resolutions to confirm the monitor displays images sharply at its native setting. Pay attention to any flickering, ghosting, or other visual artifacts. Thorough monitor testing ensures accurate image reproduction, prevents eye strain, and optimizes the overall visual output of the laptop. Some Testing Process of Monitor components are:

- **Visual Inspection:** Check for dead pixels, color accuracy, and brightness.
- **Online Monitor Tests:** Use websites with tools to assess display quality.
- **Dead Pixels:** Identify any non-functioning pixels on the screen.
- **Color Accuracy:** Evaluate how accurately the monitor displays colors.
- **Brightness and Contrast:** Adjust and test brightness and contrast levels.

8. Printer

Testing a printer connected to a laptop ensures seamless printing functionality. First, establish the connection—either via USB cable, Wi-Fi, or a network connection. Install the correct printer drivers on the laptop. Print a test page with varied content (text, images, different fonts) to evaluate print quality, color accuracy, and paper handling as shown in Figure 3.27. Test printing from different applications (word processor, browser, image editor). Verify the printer responds to print commands promptly and without errors. Check for any paper jams or connectivity issues. Testing different paper types and sizes is also advisable. A successful printer test confirms reliable communication between the laptop and printer, guaranteeing efficient document production and preventing frustrating printing problems. Some Testing Process of Printer components are:

- **Test Prints:** Print documents with different content and formats.
- **Connection Tests:** Ensure the printer connects and communicates reliably.
- **Print Quality:** Check for clear text, accurate colors, and proper image reproduction.
- **Connection Stability:** Ensure the printer maintains a stable connection with the laptop.



Fig. 3.27: Printer

9. Other Peripherals

Testing other laptop peripherals ensures a complete and functional user experience. This includes devices like speakers, microphones, webcams, external drives, and any specialized peripherals as shown in Figure 3.28. For audio, test speakers for clear sound output across different volume levels and microphones for clear audio input. Webcam testing involves checking image and video quality. External drives should be tested for data transfer speeds and reliability. Test any specialized peripherals according to their specific functions. Verify that all devices connect properly and are recognized by the laptop's operating system. Thoroughly testing these additional components ensures seamless integration and optimal performance, preventing compatibility issues and maximizing the laptop's overall capabilities. Some Testing Process of Other Peripherals components are:

- **Functional Testing:** Check speakers, microphones, webcams, etc., using relevant applications.
- **Audio Quality:** Evaluate speaker sound quality and microphone sensitivity.
- **Video Quality:** Test webcam image quality and video capture.
- **Functionality:** Ensure all other peripherals function as expected.



Fig. 3.28: Other Peripherals

Check Your Progress

A. Multiple-choice questions (MCQs)

1. What is the primary goal of testing a laptop after repair and maintenance? (a) To identify the cause of the initial problem. (b) To ensure all components are brand new (c) To confirm that the initial issue is resolved and no new problems have arisen. (d) To upgrade the laptop's performance.
2. Which of the following is NOT a crucial aspect of testing a laptop's CPU after repair? (a) Monitoring CPU temperature under load. (b) Checking the CPU's clock speed. (c) Verifying the CPU's serial number. (d) Running stress tests.
3. What does RAM testing primarily focus on? (a) Checking the RAM's manufacturer. (b) Verifying the RAM's capacity and error-free operation. (c) Measuring the RAM's color. (d) Determining the RAM's physical dimensions.
4. When testing a laptop's storage (HDD/SSD), which parameter is NOT typically evaluated? (a) Read/write speeds. (b) Drive health status. (c) File size limit. (d) Bad sectors (for HDDs).
5. Why is it important to test the graphics card after a laptop repair? (a) To ensure proper display of images and videos. (b) To check the graphics card's price. (c) To verify the graphics card's fan speed. (d) To determine the graphics card's weight.
6. Which of the following is a key aspect of testing laptop ports? (a) Checking the port's color. (b) Verifying that devices connect and communicate properly. (c) Measuring the port's size. (d) Inspecting the port's packaging.
7. What is the main purpose of testing a laptop's keyboard? (a) To check the keyboard's design. (b) To ensure all keys function correctly. (c) To measure the keyboard's thickness. (d) To determine the keyboard's material.
8. When testing a mouse or trackpad, what is a crucial parameter to evaluate? (a) Cursor accuracy and smooth movement. (b) The mouse/trackpad's color. (c) The mouse/trackpad's weight. (d) The mouse/trackpad's brand.
9. What does monitor testing primarily focus on? (a) Checking the monitor's stand. (b) Evaluating display quality, including color accuracy and dead pixels. (c) Measuring the monitor's power consumption. (d) Determining the monitor's dimensions.
10. Why is printer testing important after a laptop repair? (a) To ensure the printer's ink cartridges are full. (b) To verify that the laptop can communicate with the printer and print documents correctly. (c) To check the printer's warranty. (d) To measure the printer's noise level.

B. Short Questions

1. What is the primary purpose of demonstrating the functioning of repaired parts?
2. Why is it important to test both the laptop *and* its peripherals?
3. What should you do if a repaired component still isn't working correctly?
4. How can you build confidence in the user after a repair?
5. What documentation should be provided after a repair and testing?

Research Report For Students

Title of the Research Report

Subtitle (if applicable)

Author(s):

Name of the Student(s)

Department, University

Email Address(es)

Supervisor:

Name of the Supervisor

Department, University

Email Address

Date of Submission:

[Day Month Year]

Abstract

A concise summary of the research, including the purpose, methodology, main findings, and conclusions.

Table of Contents

I. Introduction

II. Literature Review

III. Methodology

IV. Results

V. Discussion

VI. Conclusion and Recommendations

Fig. 4.6: Research Reports

Components of a work report:

A well-structured work report is essential for effective communication. Each component plays a distinct role in conveying information clearly and accurately. Understanding these key elements allows for the creation of informative and easily digestible reports.

Title

The title should precisely and descriptively reflect the report's purpose. Avoid vague titles; instead, opt for specificity. For example, "2025 Annual Financial Performance Analysis" is more effective than simply "Annual Report."

Executive Summary

This section provides a concise overview of the report's purpose, key findings, and recommendations. It's often most effective to write this after completing the main body of the report, ensuring it accurately captures the essential insights.

Introduction

The introduction sets the stage by clearly stating the report's purpose, providing necessary background information, and explaining its relevance to the intended audience.

Body

The body of the report contains the core data and analysis. It should be organized logically, using headings and subheadings to enhance readability and ensure a clear flow of information.

Conclusion

The conclusion summarizes the main findings, reiterates the report's purpose, and presents actionable recommendations or proposed next steps. It serves to reinforce the key takeaways and provide a clear direction for the reader.

Practical Activity: *how to write a work report.*

Tools and templates for report writing

- Microsoft Word for report formatting and layout
- Google Docs for collaborative report writing
- Grammarly for checking the grammar and spelling of your report
- Canva for creating engaging charts, graphs, and other visuals for your report.

Procedure

Step 1. Identify the purpose and topic of your report as shown in Figure 4.7.



Fig. 4.7: think the research topic

Step 2. Choose a tone and language that fits your audience as shown in Figure 4.8.



Fig. 4.8: Choose research topic

Step 3. Gather your research and supporting materials, if applicable as shown in Figure 4.9.



Fig. 4.9: Gather research topics

Step 4. Review your progress if you're writing a progress report as shown in Figure 4.10.



Fig. 4.10: Review your progress

Step 5. Outline the information you need to include in your report as shown in Figure 4.11.



Fig. 4.11: Outline research topic

Step 6. Use a cover or title page as shown in Figure 4.12.

project name

date

prepared by:

organization name

Fig. 4.12: Cover page of research topic

Step 7. Provide an executive summary detailing the key information as shown in Figure 4.13.

Executive Summary

Mission Statement:

Objective:

Company Information:

Growth Highlights:

Products:

Fig. 4.13: Executive summary

Step 8. Include a table of contents listing what's in your report as shown in Figure 4.14.

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TABLES iii

FIGURES iv

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INTRODUCTION TO THE IDEA

 Introduction 1

 Problem Statement 2

 Proposed Solution 3

 Steps Involved 4

 Benefits 5

 Potential Obstacles 6

Fig. 4.14: Table of contents

Step 9. Write an introduction to provide an overview of the report as shown in Figure 4.15.

Introduction:

Our current printers print on one side only. All prints generated for employee use or customer mailouts require a separate piece of paper for each page of the document.

Fig. 4.15: Overview of report

Step 10. Explain the results or conclusions you're presenting as shown in Figure 4.16.

Overview of the results:

The addition of a duplex printer and a duplex printing policy would allow the company to save considerable money by printing on both sides where possible. Cost savings would result from using less paper, fewer paper clips and staples, and less postage on larger mailouts.

Fig. 4.16: Overview of the results

Step 11. Give your recommendations for moving forward as shown in Figure 4.17.

Recommendations:

1. Purchase a printer with duplex printing capabilities.
2. Show employees how to set printer options to print on both sides.
3. Communicate the new policy requiring employees to use duplex printing wherever applicable.

Fig. 4.17: Recommendations report

Step 12. Discuss your process and reasoning for reaching your conclusions as shown in Figure 4.18.

Process and reasoning: 

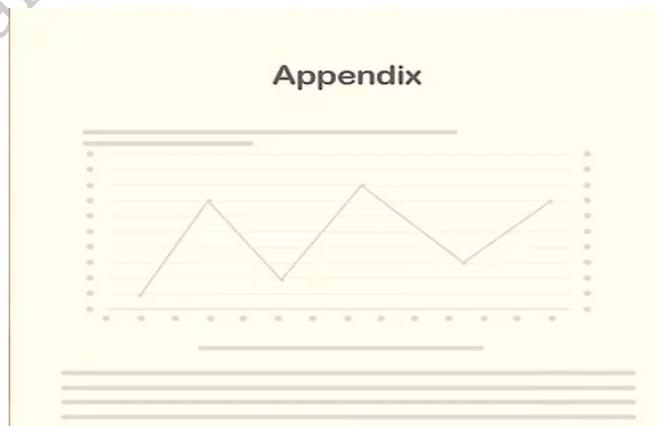
The cost of the new printer (\$1200). The new equipment would pay for itself within five months of use...The resistance of employees to change and follow the new procedures. While there will always be those resistant to change initially, this is not a difficult adjustment to make. However, management may need to visit the issue with employees who are regularly found not adhering to the new policy.

Fig. 4.18: Process and reasoning

Step 13. List any references you used in preparing your report as shown in Figure 4.19.

**Fig. 4.19: References of reports**

Step 14. Provide appendices for materials like surveys, questionnaires, or emails as shown in Figure 4.20.

**Fig. 4.20: Appendix**

Step 15. Include a short conclusion summarizing your findings or progress as shown in Figure 4.21.



Fig. 4.21: Conclusions

Step 16. Use clear headings to help your audience navigate the report as shown in Figure 4.22.

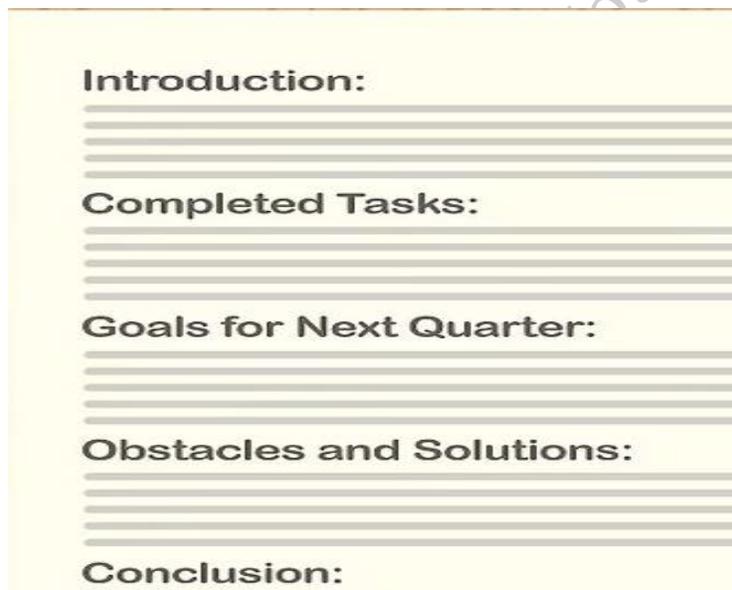


Fig. 4.22: Heading of reports

Step 17. Use simple, direct language to convey your ideas.

Step 18. Use concise writing to keep your report as brief as possible.

Step 19. Express your ideas using objective and non-emotional language.

Step 20. Avoid using slang, as well as the word "I" in most reports as shown in Figure 4.23.

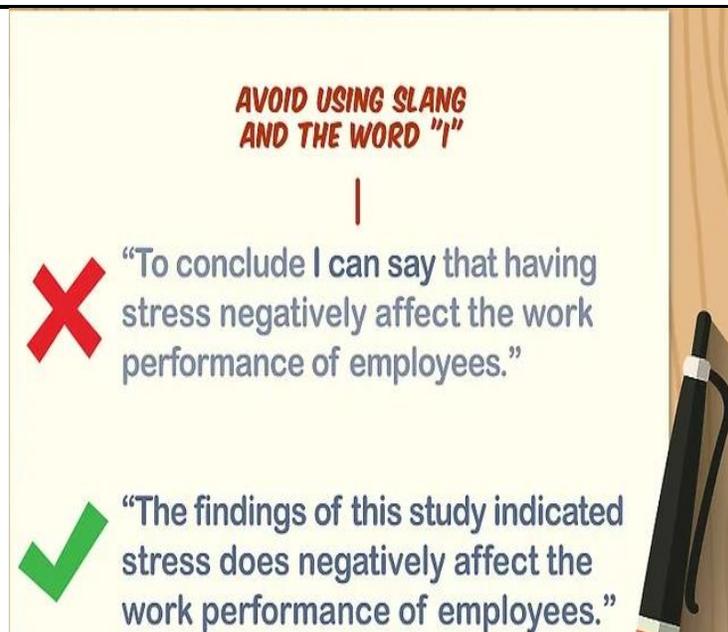


Fig. 4.23: Avoid using slang

Step 21. Proofread your report to ensure it doesn't contain errors as shown in Figure 4.24.

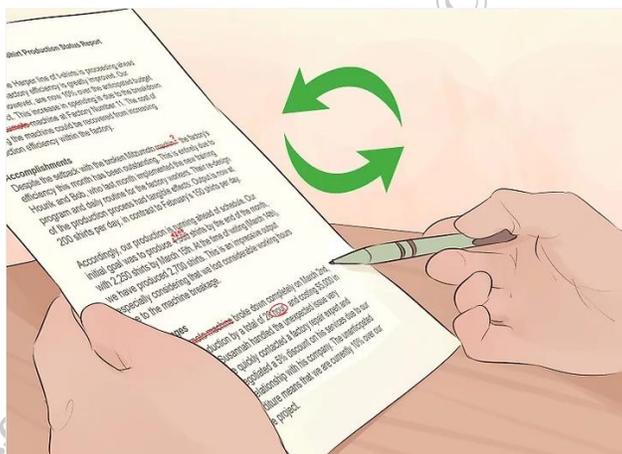


Fig. 4.24: Proofread your report

4.2 Process of preparing the invoice and processing the payment

Invoice processing is the systematic workflow that a company employs to manage invoices from receipt to payment. This process is crucial for maintaining accurate accounting records and ensuring healthy cash flow. Key steps in invoice processing include:

- **Invoice Capture and Validation:** This involves accurately recording invoice details and verifying their legitimacy.
- **Purchase Order (PO) Verification:** If applicable, this step compares the invoice to the corresponding purchase order to confirm accuracy and authorization.
- **Invoice Approval Process:** This stage involves obtaining necessary approvals from authorized personnel before payment.
- **Invoice Payment Process:** This step executes the payment to the vendor according to agreed-

upon terms.

- **Documentation for Audits:** Maintaining thorough records of all invoice processing activities is essential for audit compliance.

Every company uses some form of each of these steps, even if the workflow isn't completely formalized. The more a company grows, the more important it is for the invoice processing system to be fully defined. Using automated accounting software can help to streamline invoice processing.

Invoice processing work Steps

Invoice capture automates the process of entering and managing invoice data, significantly improving financial record-keeping efficiency. Therefore, a typical workflow as shown in Figure 4.25:

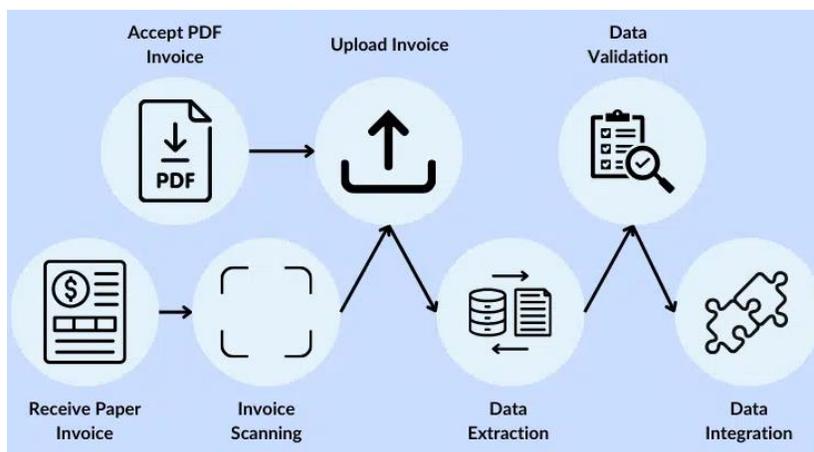


Fig. 4.25: Invoice processing

Centralize Invoice Receiving: Businesses receive invoices either as PDFs via email or as paper documents. Each format requires a different initial handling method.

Uploading and Scanning: PDF invoices are directly uploaded to the invoice capture software. Paper invoices, however, must first be scanned to create a digital copy.

Data Extraction: The invoice capture software then extracts information from the invoice. This includes the vendor's name, address, invoice number, the total amount due, line items, dates, and possibly terms of payment.

Data Validation: After extraction, the software performs invoice reconciliation. This step ensures that the extracted information matches what's on the invoice, reducing the likelihood of errors. Common ways are 2-way matching, 3-way matching, or 4-way matching.

Data Integration: Finally, the validated invoice data is transferred to an accounting system or a spreadsheet. This integration allows for streamlined financial management, where payment tracking and general bookkeeping are simplified.

Procedure and Flowchart of filing work-report and invoice as shown in Figure 4.26

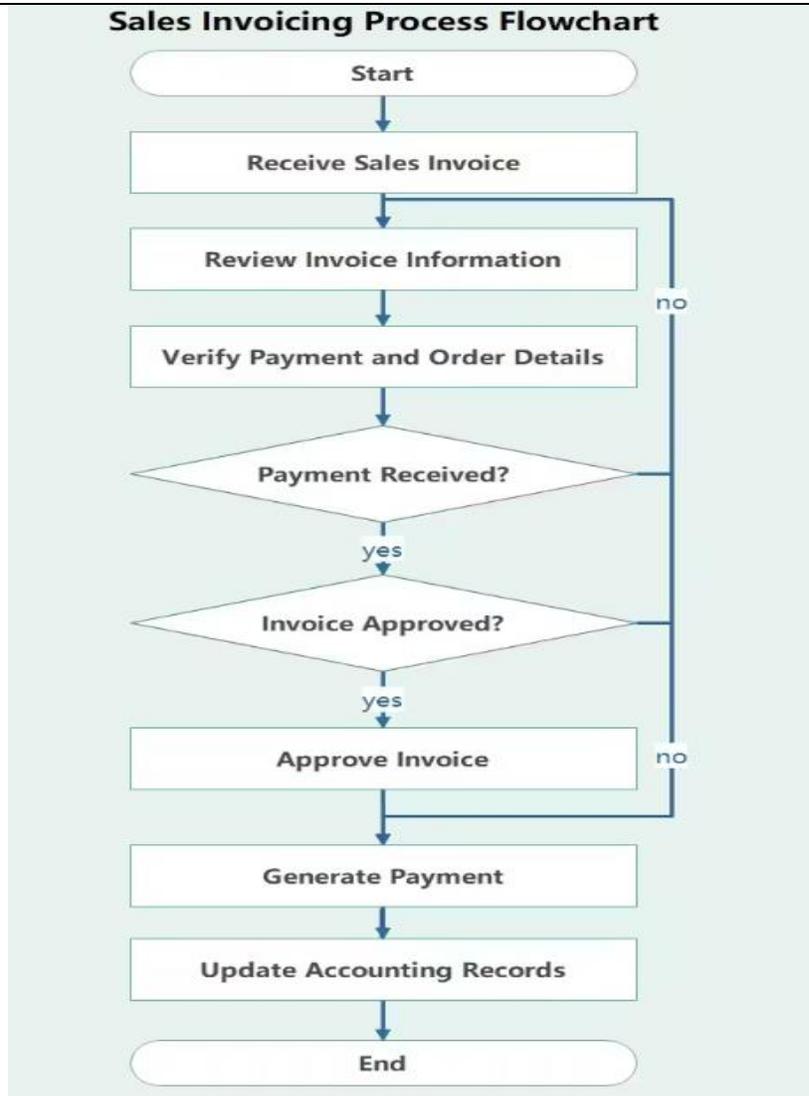


Fig. 4.26: Flowchart of invoicing Process

Importance of customer feedback:

Customer feedback is vital for any business, providing invaluable insights into customer satisfaction and areas for improvement. It acts as a direct line of communication, revealing how customers perceive products, services, and overall experiences. This feedback allows businesses to identify strengths and weaknesses, enabling them to refine offerings and enhance customer loyalty. Positive feedback reinforces successful strategies, while negative feedback highlights potential issues that need addressing. Moreover, customer feedback fosters a customer-centric culture, demonstrating that their opinions are valued. By actively listening and responding to feedback, businesses build stronger relationships and cultivate trust. Ultimately, customer feedback drives innovation, guides strategic decisions, and ensures that the business remains aligned with customer needs and expectations, contributing to long-term growth and success as shown in Figure 4.27.



Fig. 4.27: Importance of customer feedback

Types of Customer Feedback

Customer feedback comes in various forms, each offering unique insights into customer experiences.

- 1) **Direct Feedback:** This is information provided explicitly by customers.
Examples: Surveys, focus groups, and interactions with customer support.
- 2) **Indirect Feedback:** This is gathered by observing customer behavior.
Examples: Website analytics, product usage patterns, and social media mentions.
- 3) **Public Feedback:** This consists of customer opinions shared on public platforms.
Examples: Online reviews and ratings on platforms like Google, Yelp, or Trustpilot.
- 4) **Private Feedback:** This involves customer communication directly with the business.
Examples: Personal messages and customer service interactions.

Collect Customer Feedback

There are following key channels for Collecting Customer Feedback are:

Surveys: Versatile tool for structured feedback via online forms, email, in-app prompts, or paper questionnaires. Allows for specific questions and rating scales.

Online Reviews and Ratings: Public feedback on platforms like Google, Yelp, and social media. Provides written comments and star ratings, influencing potential customers.

Social Media: Direct interaction via platforms like Twitter, Facebook, and Instagram. Customers can message, comment, and participate in discussions.

Customer Support Interactions: Feedback gathered during phone calls, live chats, and email exchanges. Provides insights into customer satisfaction and areas for improvement.

In-Person Interactions: Feedback collected through comment cards, suggestion boxes, and direct conversations. Useful for businesses with physical locations.

Focus Groups: Facilitated discussions with small customer groups. Allows for in-depth exploration of specific topics and products.

Website Feedback Widgets: On-site surveys and pop-ups to capture visitor feedback. Gathers data

on website experience and potential issues.

Email and Newsletter Surveys: Direct feedback collection via email, integrated into newsletters or standalone requests. Allows for tailored questions based on customer interactions.

Mobile Apps and In-App Feedback: Integrated feedback features within mobile applications. Convenient for customers to provide feedback at strategic touchpoints.

Procedure and Flowchart of filing customer feedback as shown in Figure 4.28

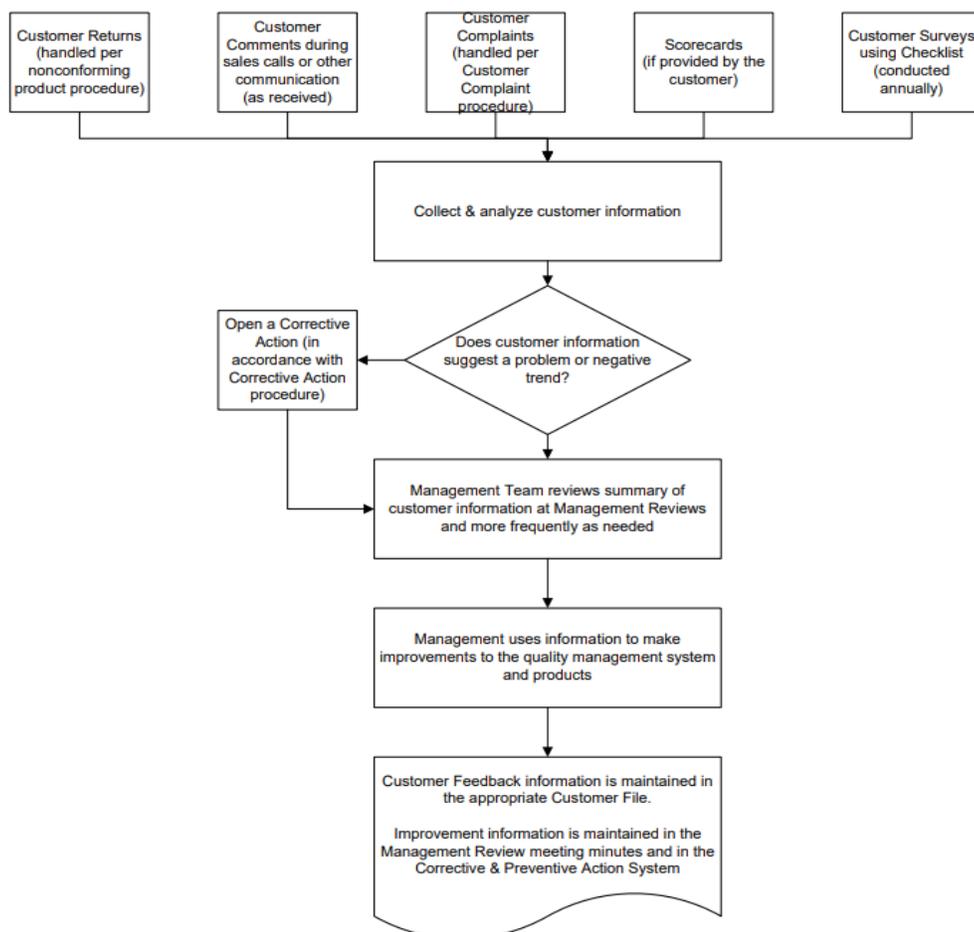


Fig. 4.28: Flowchart customer feedback procedure

Check Your Progress

A. Multiple-choice questions (MCQs)

1. What is the primary purpose of a work report? (a) To advertise the company's services. (b) To document and communicate work performed (c) To solicit customer feedback (d) To generate invoices.
2. Which of the following is typically included in a work report? (a) Personal opinions about the client (b) Detailed financial projections (c) A summary of tasks completed and results achieved (d) Competitor analysis.
3. What is the purpose of an executive summary in a work report? (a) To provide a detailed description of every task (b) To summarize the report's key findings and recommendations (c) To list all the

employees involved in the project (d) To provide a history of the company.

4. Why is customer feedback important? (a) It helps businesses improve products and services (b) It allows businesses to ignore customer complaints (c) It increases the cost of customer service (d) It is only useful for large corporations.

5. Which of the following is an example of indirect customer feedback? (a) A customer filling out a survey (b) A customer posting a review on Yelp (c) Website analytics showing customer browsing patterns (d) A customer calling customer support.

6. What is the benefit of collecting customer feedback through surveys? (a) It guarantees positive reviews (b) It allows for structured feedback with specific questions (c) It eliminates the need for customer support (d) It is only useful for collecting negative feedback

7. What is the purpose of an invoice? (a) To provide a project proposal (b) To request payment for goods or services (c) To advertise new products (d) To provide a receipt before payment

8. Which of the following is typically included on an invoice? (a) The client's social security number (b) A detailed description of the goods or services provided (c) The client's personal opinions (d) Employee's personal contact information.

B. Fill in the Blank

1. A work report's _____ summary provides a brief overview of the report's main points.
2. _____ feedback is collected by observing customer actions, such as website analytics.
3. An invoice should include the _____ amount due and the payment terms.
4. _____ capture automates the process of extracting data from invoices.
5. Collecting customer feedback helps businesses identify areas for _____ and improve customer satisfaction.

C. Short Questions

1. What is the main purpose of a work report?
2. Name one method for collecting direct customer feedback.
3. What key information should always be on an invoice?
4. Why is invoice validation important?
5. What benefits does customer feedback provide to a business?

Module 4**Occupational Health & Safety Standards****Module Overview**

In today's dynamic work environment, prioritizing the well-being of employees and safeguarding the environment is of utmost importance. The Module "Organization Work and Resources as per Health and Safety Standards" encompasses a comprehensive approach to workplace safety and environmental sustainability. It covers a range of critical topics, from precautionary measures and first aid techniques to fire safety, evacuation procedures, and safe working practices. This knowledge equips individuals with the skills needed to identify and address potential hazards, respond effectively to emergencies, and establish a secure work environment.

Furthermore, the Module delves into the organization's commitment to eco-friendly practices. It addresses waste management, including handling E-Waste and proper segregation of recyclable and non-recyclable materials. Understanding waste disposal methods and the sources of pollution is crucial for maintaining a clean and sustainable work environment. Additionally, the module emphasizes the integration of green practices into various job roles, contributing to a more environmentally conscious workplace. By adopting these principles, organizations can foster a culture of safety, health, and environmental responsibility, creating a better working environment for all stakeholders.

Learning Outcomes

After completing this module, you will be able to:

- Identify and follow essential workplace health and safety practices effectively.
- Understand and implement the organisation's green practices to support sustainability.

Module Structure

Session 1. Workplace Health and Safety Practices

Session 2. Organisation's Green Practices

Session 1. Workplace Health and Safety Practices

Employees have a right to a secure workplace. Because of this, the businesses set and follow the law and ensure a safe working environment. The highest requirements for worker safety and conditions are outlined in a workplace health and safety policy. Ensuring that the workplace complies with the highest safety regulations is the obligation of all organizations. When beginning a

business, some things to consider are:

- Use furniture and equipment with ergonomic designs to avoid bending and twisting.
- Provide mechanical support to avoid having to lift or move heavy objects.
- Stock up on safety equipment for risky jobs.
- Make sure the emergency exits are present and in a handy location.
- Create health codes and ensure adherence to them.
- Adhere to the regular safety protocol.

1.1 Precautions to be taken while at work

Every employee has a responsibility to adhere to the organization's safety procedures. Every employee needs to develop the following habits:

1. Notify the supervisor of any unsafe conditions right away.
2. Identify and report any safety risks that could cause trips, falls, or slips.
3. Notify the supervisor of any accidents or injuries.
4. Put on the appropriate safety gear when necessary.
5. Acquire the knowledge necessary to operate the safety-related equipment properly.
6. Recognize and refrain from doing anything that can put other people in danger.
7. Constantly be aware
8. Inform the staff of the location of the fire extinguishers and the first/emergency exits on the floor.

1.2 First Aid Techniques

Injuries, Pain, illness, are all a part of life. This may occur in any case. Every person is vulnerable to disease and accidents at any time and in any location. In the event that any of these occur, prompt medical attention or treatment is required to lessen pain, discomfort, and condition progression. "First Aid" refers to the initial medical care provided before seeking professional medical assistance. First aid is the temporary care provided to an accident or sudden illness victim in the interim until "Medical Aid" arrives. First aid refers to giving victims of accidents or illnesses the necessary medical attention and life support in the beginning. First Aid, however, has its limitations and is not a substitute for professional medical treatment. A patient's life can be saved when a first aider provides appropriate, prompt assistance. Accidents and illnesses can occur anywhere: at home, at work, or in public. Regardless of the safety precautions we take, illness is a possibility for everyone occasionally. Some common injuries and their rescue techniques are described in the next section.

- Direct pressure must be applied to the cut or wound with a clean cloth, tissue, or piece of gauze, until bleeding stops.
- If blood soaks through the material, it is highly recommended not to remove it.
- More cloth or gauze must be put on top of it, and pressure must be continued.
- If the wound is on the arm or leg, the limb must be raised above the heart to help slow the bleeding.
- Hands must be washed again after giving first aid and before cleaning and dressing the wound.

- A tourniquet must not be applied unless the bleeding is severe and not stopped with direct pressure.

1.1.1 Clean cut or wound

1. The wound must be cleaned with soap and lukewarm water.
2. To prevent irritation and burning sensation, the soap solution must be rinsed out of the wound.
3. Hydrogen peroxide or iodine must not be used to clean or treat the wound since they are corrosive and can damage live tissues. It is shown in Figure 1.1(a).



Fig. 1.1(a): Clean cut or wound

1.1.2 Protect the wound

4. Antiseptic cream or solution must be applied to the wound to reduce the risk of infection.
5. Then the wound must be gently covered with a sterile bandage.
6. Till the wound heals, the bandage must be changed (dressed) daily to keep the wound clean and dry. It is depicted in Figure 1.1(b) and 1.1(c).



Fig. 1.1(b): apply antiseptic



Fig.1.1(c): Protect the wound

Call the Emergency Helpline if:

7. The bleeding is severe and deep
8. You suspect Internal Bleeding
9. Abdominal or Chest wound exists
10. Bleeding continues even after 10 minutes of firm and steady pressure

1.1.3 For Burns:

11. Immediately put the burnt area under cold water for a minimum of 10 minutes as shown in Figure 1.1(d).



Fig. 1.1(d): Put Burnt Area under Water

12. If the burned area is covered, take clean scissors, cut, and remove the fabric covering the area
13. In case clothing is stuck to the burned area, leave it as it is Before sterile dressing application, remove jewellery (if any).
14. It is better to leave the burned area open. Do not apply any medication or ointment. Breaking a blister – it is an absolute no-no!

1.1.4 For Broken Bones and Fractures

1. Protruding bone must be left alone

- a. If a bone has broken through the skin, it must not be pushed back into place.
- b. The area must be covered with a clean bandage and immediate medical attention must be sought.

1. Bleeding must be stopped

- a. Steady and direct pressure must be applied with a clean piece of cloth for 15 minutes and the wound must be elevated.
- b. If a blood soaks through, one must apply another cloth over the first and seek immediate medical attention.

3. Swelling must be controlled

- a. The RICE (Rest, Ice, Compression and Elevation) therapy must be applied to control and reduce swelling.
- b. Rest the injured part by having the person stay off of it.
- c. Ice must be applied on the area with the help of an ice pack or by wrapping the ice in a clean cloth. Ice must not be directly placed against the skin.

1.1.5 For Heart Attack/Stroke

- a. Think FAST. Face: is there weakness on one side of the face?
- b. Arms: can they raise both arms?
- c. Speech: is their speech easily understood?
- d. Time: to call Emergency helpline
- e. Immediately call the medical/ambulance helpline or get someone else to do it. It is shown in Figure 1.1 (e).

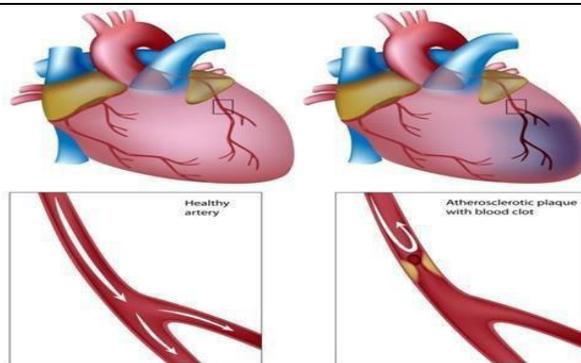


Fig 1.1(e): Anatomy of Heart Attack

1.1.6 For Head Injury

- Ask the victim to rest and apply a cold compress to the injury (e.g. ice bag)
- If the victim becomes drowsy or vomits, call the Medical helpline or get someone else to do it.

1.1.7 Chemical hazards

Caused by toxic materials, which are poisonous. And being poisonous in nature, they can either be fatal or cause serious damages in case the preventive actions are not taken on time. Now, the exposure to chemicals can be in 3 forms.

They can be:

- Inhaled (entering the body through nose)
- Directly in contact with skin
- Ingested (consumed)

The symptoms, in this case, will be:

- Seizures
- Partial or complete loss of responsiveness
- Burning sensation
- Stomach Cramping with bouts of excruciating pain
- Nausea
- Vomiting (and in times with blood-stains). It is shown in Figure 1.1 (f).



Fig 1.1 (f): chemical hazards

Now, where there is a problem, their solutions come side by side. In such situations, the person giving first aid requires to be calm and take certain preventative actions.

Some of the essential actions are:

- Using insulated equipment
- Wearing protective clothing, goggles, masks, shoes and gloves
- Ensuring the place has enough ample ventilation

Remedial action

The foremost thing that one should do is to provide immediate first aid. However, it is to be remembered that the victim should not be given any kind of fluid (water, milk) until doctors from the Poison control unit give a green signal.

- Aside from this, there are a few things a person can perform to the victim of toxic material exposure.
- Remove the victim from the toxic zone or vicinity
- Call for an ambulance
- Remove contaminated clothing
- Splash water in the eyes
- If ingested, do not try to make the victim puke (vomit)
- Wash their mouth with water
- In case the victim's breathing has stopped, give CPR (Cardiopulmonary resuscitation) as shown in Figure 1.1(g).



Fig 1.1(g): CPR

- In case of burning due to toxic material, apply burn gel or water gel on that area.
- Avoid any cream based or oil-based lotion or ointment

Even though giving first aid is the right thing to do in the first place, it is also important to report the incident to their supervisor.

1.1.8 Steps of using breathing apparatus

Table 1.1: Steps of using breathing apparatus

SN	Procedure	Image
1.	Check the parts of the breathing apparatus thoroughly	

2.	Check the bypass knob (red). Close it if you see it open. After this, press the reset button (area above bypass knob – black)	
3.	Inspect the facemask to see that it is undamaged	
4.	Lift the cylinder ensuring that on the top the cylinder valve should be present. The back plate of the cylinder should face the wearer. Wear the breathing apparatus on the shoulder like a bag pack and by the neck strap, hang the facemask.	
5.	After wearing the breathing apparatus tighten shoulder straps and fasten the waist belt.	
6.	The cylinder valve should be opened slowly to inspect the pressure gauge.	

7.	Make sure that 80% of the cylinder is full.	
8.	Wear the mask slowly by resting your chin in the resting cusp and pull the head strap slowly over your head. Pull the head straps for a snug but comfortable fit.	
9.	Breathe in and normally to see if you can breathe normally or not.	
10.	Now insert a finger sideways of the facemask for easy outward airflow.	
11.	Slowly close the cylinder valve without leaving the knob. Be steady for 10 minutes and hold your breath or extremely slow to listen to any wheezing sound. Also, check the pressure gauge for any dip in the pressure.	

12.	Normally Breathe to vent system. Listen for a whistle alarm while observing the pressure gauge at 55 bars (+/-5 bar)	
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1.1.9 Briefing and Guidance for Fire Fighters

There are basically three methods with the help of which people can be rescued from a building engulfed in a blazing fire. To ensure on-site reception, here are two of the important steps that we will discuss now. These come under the best safe lifting and carrying practices.

Conventional Technique – This is a good method if there is an open area close by. The first rescuers will make the victim sit reach under their armpits and finally, grab their wrist. The other rescuer will cross the ankle (victim), pull up that person's legs on his shoulder. Finally, on the count of 3, both will lift the person up and move out as shown in Figure 1.1(h).



Fig. 1.1 (h): Fast Strap

Fast Strap – In case the victim is completely incapable of moving out of the fire zone. The rescuers should follow this method. One of the rescuers will place their knee between victim's shoulder and head. Pin the loop of webbing to the ground with the help of the knee. This acts as an anchor. With the non- dominant hand hold the other end of the webbing and make a loop. With steady hands, pull the victim's hand in from the loop, tie it securely and finally clip the webbing loops as shown in Figure 1.1(i).



Fig. 1.1 (i): Fast Strap

Essentials for Smooth Evacuation – The following are essential to have a smooth evacuation during an outbreak:

1. Clear passageways to all escape routes
2. Signage indicating escape routes should be clearly marked
3. Enough exits and routes should be present to allow a large number of people to be evacuated quickly
4. Emergency doors that open easily
5. Emergency lighting where needed
6. Training for all employees to know and use the escape routes
7. A safe meeting point or assembly area for staff
8. Instructions on not using the Elevator during a fire

Special Evacuation Requirements for Especially Abled Persons

The Visually Impaired

1. Announce the type of emergency
2. Offer your arm for help

With Impaired Hearing

1. Turn lights on/off to gain the person's attention, or indicate directions with gestures, or write a note with evacuation directions

People with Prosthetic Limbs, Crutches, Canes, Walkers

1. Evacuate these individuals as injured persons.
2. Assist and accompany the evacuation site if possible.
3. Use a sturdy chair, or a wheeled one, to move the person to an enclosed stairwell. Notify emergency crew of their location

1.3 Importance of Fire Safety Drills

Any public or commercial building should have fire drills to practice what to do in the event of a fire. In addition, all employees of a company are required to work as per the Fire Safety Order of 2005, which is a legal requirement. Here's how to maximize your fire training experience. Fire drills are essential for a number of reasons. Firstly, they provide an opportunity to rehearse evacuation procedures to ensure that all personnel are familiar with them. Because everyone will know what to do in a real-life emergency, there won't be as much panic because the staff will leave the building swiftly. Fire drills are also useful for evaluating the effectiveness of escape routes.

It is also possible to verify that emergency exits are operational and alarm systems are functioning correctly during fire drills. In general, fire drills improve safety by preparing you for the best possible outcome in the event of a real fire. Two fire drills should ideally occur each year, though this can vary depending on the workplace and after reviewing the risk assessment of the company. If any employees work shifts, appropriate arrangements should be made to guarantee that every employee participates in a fire drill annually and receives training on how to handle emergency situations.

There are justifications for and against informing the public in advance of fire drills. Some claim that keeping employees in the dark adds a sense of surprise and makes them approach drills with greater sincerity. In a real fire, on the other hand, this could also have the opposite effect, as people might assume it's merely a drill after hearing the alarm. The advantage of informing all employees ahead of time about fire drills is that, at first, they won't become alarmed, preventing

any injuries that might result from a hasty departure from the building. In addition, in the event that the alarm goes off without any prior notice, everyone will know it's a drill and react appropriately. In public places such as shopping centres, it is prudent to make members of the public alert when a drill is about to happen. The symbol for this alert is shown in Figure 1.1.



Fig. 1.2: Drill alert

1.4 Importance of safe working practices

There are millions of bacteria and viruses in the environment in which we live. Additionally, these microorganisms may use our bodies as a breeding ground. They proliferate, spread, and give rise to numerous illnesses that can occasionally be lethal to people. Each year, these microorganisms that cause disease claim the lives of over 17 million people. We can all experience amazing changes with a few easy tricks and small adjustments to our basic personal hygiene routines. If we practice good hygiene every day, we can avoid getting these diseases.

1.5 Importance of Social Distancing

Preventing communicable diseases

All these above practices will help us to prevent communicable diseases. These diseases are highly infectious and contagious and spread through air, urine, faeces, saliva, skin (through touch) and using the same towels and utensils.

Social Distancing and isolation, Self-Quarantine

Ever since the spread of the pandemic covid-19, several health organisations have been insisting on following social distancing and isolation. Communicable diseases mainly spread through coming close to the infected individual and through physical touch. If a person is infected with diseases like normal flu or cold and spreads it to others, the symptoms may remain with the infected person for a day or two. The virus may be destroyed by taking an antibiotic. But in severe cases like corona virus the infection is severe and can prove fatal to the affected people. To prevent the spread of the virus, the entire world adopted lockdown, **social distancing** and compulsory face mask. And the infected person has to be in **self-isolation** and **quarantine** till the time the symptoms are over. This was an advisory from the World Health Organisation, and the entire world followed it to prevent the rapid spread of the virus. The same can be applicable to all types of communicable diseases that are spread mainly through air and touch.

Anybody who is infected with a contagious disease needs to practice isolation in order to prevent the spread of the germs to their near and dear ones. This became very popular and was strictly adhered to during the covid-19 pandemic. People who were confirmed to have COVID-19, **isolation** was mandatory. Isolation is a health care term that means keeping people who are infected with a contagious illness away from those who are not infected. Isolation can take place at home or at a hospital or care facility. Special personal protective equipment will be used to care for these

patients in health care settings. They are attended by well trained nurses and specialised doctors. And these people have to be in the PPE kits all through their presence in the hospital. It is shown in Figure 1.3.



Fig. 1.3: Complete PPE Kit

Health professionals and physicians who treat patients with highly contagious diseases and who are segregated to stop the spread wear the personal protective equipment (PPE) kits. When their shift is over, they have to take it off. They have to wear it whenever they come in contact with the patient. The face mask and goggles can be reused as long as they are properly sanitized, but the majority of PPE components are meant to be used only once. PPE kits must be disposed of carefully because they may contain contaminants that are stuck to them and, if improperly disposed of, could infect a healthy person. The risk of contracting the illness may be higher for healthcare professionals.

1.6 Safe Workplace Practices

Every company has the provision of a first aid box. As you have already read about the types of injuries that technicians can receive in their field of work, it is imperative for the companies to have appropriate first aid accessories. The basic first aid supplies and accessories that a first aid box should have the components shown in Figure 1.4.

Supplies and Accessories in the First Aid Box





Fig. 1.4: first aid box contents

1.7 Methods of Reporting Safety Hazards

Every organization, from every industry, has a standard reporting protocol, comprising the details of people in the reporting hierarchy as well as the guidelines to be followed to report emergencies. However, the structure of this reporting hierarchy varies between organizations, but the basic purpose behind the reporting procedure remains the same.

The general highlights of the Organizational Reporting Protocol, commonly known as the 6Cs, are:

Communicate First

- The first source of information during an emergency is the preferred source.
- Crises situations are time-bound and hence it is important to communicate promptly.

Communicate Rightly

- Distortion of information due to panic must be avoided.
- Proper, accurate information must be provided to concerned authorities and this can save lives.

Communicate Credibly

- Integrity and truthfulness must never be forgotten during emergencies.

Communicate empathetically

- One must wear the shoes of the victims while communicating emergencies.

Communicate to instigate appropriate action

- Communicating to the right authorities help in taking the necessary action.

Communicate to promote respect

- Communicating with the victims with respect help in earning their trust and thus eases the disaster management process.

Hazards and potential risks / threats can be identified and then reported to supervisors or other authorized persons in the following ways:

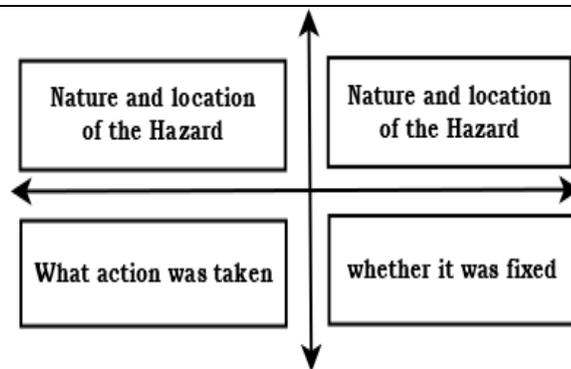


Fig. 1.5: Describing hazard matrix

Part A: To be completed by the Worker Details Required:

1. Name of Worker
2. Designation
3. Date of filling up the form
4. Time of incident / accident
5. Supervisor / Manager Name
6. Work Location / Address
7. Description of the hazard/what happened (Includes area, task, equipment, tools and people involved)
8. Possible solutions to prevent recurrence (Suggestions)

Part B: To be completed by the Supervisor / Manager Details Required:

9. Results of Investigation (Comment on if the hazard is severe enough to cause an injury and mention the causes of the incident / accident)

Part C: To be completed by the Supervisor / Manager Details Required:

10. Actions taken / Measures adopted (Identify and devise actions to prevent further injury, illness and casualty).

The reporting format is shown in following table 1.1.

Table 1.2: List of actions taken

Action	Responsibility	Completion Date

Any job role and any occupation in this world have some hazards, in varying severity, associated with it. These are called Occupational Hazards. Occupational Hazard can be defined as “a risk accepted as a consequence of a particular occupation”. According to the Collins English Dictionary, it is defined as “something unpleasant that one may suffer or experience as a result of doing his or her job”. Occupational Hazards report form is shown in the following table 1.3.

Table 1.3: Hazards Report Form

Hazard Report Form	
Name:	Date:
Location:	
Tool/Equipment:	
Description of the hazards:	
Suggested corrective action:	
Signature:	
Supercisor's remarks:	
Corrective action taken:	
Signature of Supervisor:	Date:

Practical Activity 1.1. Workplace Safety Inspection to familiarize with potential hazards and safety measures in a workplace.

Step 1. Choose a workplace setting (e.g., office, workshop, construction site).

Step 1. Walk through the chosen setting and identify potential hazards (e.g., tripping hazards, unsafe equipment).

Step 3. Document the identified hazards along with suggested preventive measures.

Step 4. Discuss findings with colleagues or supervisors.

Practical Activity 1.1. Practice first aid techniques for common injuries.

Step 1. Select a specific injury scenario (e.g., cut, burn, broken bone).

Step 1. Simulate the scenario using props or role-play with a partner.

Step 3. Apply appropriate first aid techniques based on the provided guidelines.

Step 4. Evaluate the effectiveness of the applied first aid.

Practical Activity 1.3. Practice reporting safety hazards using a standardized reporting form.

Step 1. Review the provided Hazard Report Form given in the chapter.

Step 1. Choose a hypothetical workplace scenario with a safety hazard.

Step 3. Complete the Hazard Report Form (Parts A, B, and C) based on the chosen scenario.

Step 4. Discuss the identified hazard and proposed preventive measures with a peer or supervisor.

Practical Activity 1.4. Analyze different types of hazards and assess their associated risks.

Step 1. Review the list of hazards given in the chapter.

Step 1. Select a specific hazard (e.g., chemical exposure, ergonomic strain).

Step 3. Conduct a risk assessment for the chosen hazard, considering severity and likelihood.

Step 4. Propose appropriate preventive measures for the identified hazard.

Summary

- This chapter emphasizes the critical importance of workplace safety and compliance with legal regulations.
- It covers key elements of a comprehensive health and safety policy, including practical measures like ergonomic equipment and emergency preparedness.
- The chapter also provides guidance on employee precautions and first aid techniques for various situations.
- Additionally, it highlights the significance of fire drills and personal hygiene practices in preventing the spread of communicable diseases.

Check Your Progress

A. Multiple Choice questions

1. What is the primary emphasis of the chapter on "Workplace Health and Safety Practices"?
(a) Employee benefits (b) Legal obligations and safety compliance (c) Business profitability
(d) Workplace aesthetics
2. Which of the following is NOT mentioned as a practical consideration for businesses in ensuring workplace safety?
(a) Use of ergonomic furniture and equipment (b) Providing mechanical support for heavy objects
(c) Stocking up on safety equipment for risky jobs (d) Maximizing office aesthetics
3. According to the chapter, what should employees do in case of unsafe conditions at the workplace?
(a) Ignore them and continue working (b) Notify the supervisor right away (c) Wait until the end of the day to report them
(d) Document them for personal reference
4. What is the purpose of a workplace health and safety policy?
(a) To set the highest standards for worker safety and conditions (b) To maximize business profits
(c) To control employee behavior (d) To ensure compliance with taxation regulations
5. What is the significance of fire drills, according to the chapter?
(a) To evaluate the effectiveness of escape routes (b) To test the fire alarm system
(c) To improve workplace aesthetics (d) To assess employee performance
6. In the context of preventing the spread of communicable diseases, what is the role of

personal hygiene practices, as mentioned in the chapter? (a) They have no impact on disease prevention (b) They play a crucial role in preventing diseases (c) They are only relevant during flu seasons (d) They are primarily for cosmetic purposes

7. According to the chapter, what is the primary purpose of reporting safety hazards? (a) To assign blame for incidents (b) To document incidents for legal purposes (c) To prevent future occurrences and ensure safety (d) To increase insurance premiums
8. What is the primary purpose of providing mechanical support to employees for lifting heavy objects? (a) To encourage regular exercise (b) To minimize the risk of injuries from lifting (c) To improve workplace aesthetics (d) To reduce the need for physical exertion
9. What is the recommended action if blood soaks through the material used to apply direct pressure on a wound? (a) Remove the material immediately (b) Add more material and continue applying pressure (c) Leave the material in place and add more on top (d) Wash the wound with soap and water
10. What does the RICE therapy stand for in the context of injuries? (a) Rest, Ice, Compression, Elevation (b) Run, Inhale, Cover, Exhale (c) Roll, Inflate, Check, elevate (d) Reduce, Instruct, Cover, Evaluate

B. Fill in the blanks

1. Use furniture and equipment with ergonomic designs to avoid _____ and twisting.
2. Make sure the _____ exits are present and in a handy location.
3. In case of a clean cut or wound, direct pressure must be applied until _____ stops.
4. Antiseptic cream or solution must be applied to the wound to reduce the risk of _____.
5. In case the victim's breathing has stopped, give _____.
6. Clear passageways to all escape routes, signage indicating escape routes, and enough exits are essential for a smooth _____.
7. According to the chapter, personal hygiene practices play a crucial role in preventing _____ diseases.
8. The purpose of a hazard report form is to identify and report safety hazards for _____ action.
9. Using _____ equipment is recommended to prevent accidents and injuries at work.
10. The acronym FAST stands for Face, Arms, Speech, _____ in the context of stroke assessment.

C. State true or False for the following

1. Hydrogen peroxide or iodine should be used to clean and treat wounds, as they help in preventing infection.
2. In case of a broken bone protruding through the skin, it is recommended to push the bone back into place.
3. Using insulated equipment, wearing protective clothing, and ensuring ample ventilation are

important preventive actions for chemical hazards.

4. Personal protective equipment (PPE) kits should be disposed of carefully to prevent potential contamination.
5. Social distancing and isolation are important practices for preventing the spread of communicable diseases, especially during a pandemic.
6. Reporting safety hazards is essential for preventing future incidents and ensuring workplace safety.
7. Occupational hazards refer to risks accepted as a consequence of a particular occupation.
8. Providing clear passageways, signage, and sufficient exits are not essential for a smooth evacuation during an emergency.
9. The purpose of a hazard report form is to assign blame for incidents and accidents in the workplace.
10. In the context of first aid, a tourniquet should be applied immediately to stop any bleeding, regardless of its severity.

D. Short Answer Type Questions

1. What are some of the considerations mentioned for businesses when it comes to ensuring workplace safety?
2. What is the recommended action for a clean cut or wound, and how should it be protected?
3. In case of chemical hazards, what are the three forms of exposure mentioned in the chapter?
4. What are some essential actions mentioned for providing first aid in case of exposure to toxic materials?
5. Why are fire drills considered important in a workplace or public setting?
6. What are the benefits of informing employees in advance about fire drills, according to the chapter?
7. Why is it important to practice social distancing and isolation during a pandemic or outbreak of a contagious disease?
8. What is the purpose of a hazard report form, and how does it contribute to workplace safety?
9. What are occupational hazards, and why is it important for individuals to be aware of them?
10. Why is it essential to have clear passageways, signage, and sufficient exits for a smooth evacuation during an emergency?

Session 2. Green Practices in Organisation

2.1 Waste Management

2.1.1 E-Waste

Electrical and electronic products are all around us. We can't imagine a world without these gadgets. Our life is indispensable without electricity and electronic devices. Growth in the IT and communication sectors has increased the usage of electronic equipment immensely. Frequent change in the technological features of electronic products is forcing consumers to discard their old electronic products very quickly, which, in turn, adds e-waste to the solid waste pool. What this translates to is mountainous masses of electrical and electronic waste which has a high potential to pollute the environment. This growing menace of e-waste calls for a greater focus on recycling e-waste and better e-waste management.

E-waste means electrical and electronic equipment, whole or in part discarded as waste by the consumer or bulk consumer as well as rejects from manufacturing, refurbishment, and repair processes. E-waste usually is made up of usable and non-usable material. Some of the waste if left unattended will be destructive to the environment. E-waste is made up of hazardous substances like lead, mercury, toxic material, and gases.

There are many companies these days who are engaged in the collection, handling, and disposal of this e-waste in a safer and more secure place to protect the environment.

The amount of e-wastes comprising computers and computer parts, electronic devices, mobile phones, entertainment electronics, refrigerators, microwaves, TV, fridges, and industrial electronics that are obsolete or that have become unserviceable is growing. All these electronic devices contain plastics, ceramics, glass, and metals such as copper, lead, beryllium, cadmium, and mercury and all these metals are harmful to humans, animals, and the earth. Improper disposal only leads to poisoning the Earth and water and therefore all life forms. Our effort is meant to preserve the environment and prevent pollution by proper handling of e-waste. While it will take a lot of effort to educate people to dispose of such wastes in the right way, we are doing our part by providing a channel to collect e-wastes and dispose of them in a sustainably safe manner. We convert waste to usable resources. The electronic industry is not only the world's largest industry but also a fast-growing manufacturing industry. It has been instrumental in the socio-economic and technological growth of the developing society of India.

At the same time, it poses a major threat in the form of e-waste or electronics waste which is causing harmful effects on the whole nation. E-waste is creating a new challenge to the already suffering Solid waste management, which is already a critical task in India.

Electronic goods/gadgets are classified under three major heads:

- White goods: Household appliances,
- Brown goods: TVs, camcorders, cameras etc.,
- Grey goods: Computers, printers, fax machines, scanners etc. The complete process is carried out as per the government guidelines.

2.1.2 E-waste Management Process

- Collection of e-waste from all the electronic stores, manufacturing companies, etc.

- Transport of e-waste to the disposal units
- Segregation of e-waste at the disposal unit
- Manual dismantling of e-waste to segregate components into various types such as metal, plastics and ceramics
- Convert into raw material (recycle and reuse)
- Supply recovered raw material to processors and electrical/electronic industries
- Dispatch hazardous e-waste for safe disposal
- Waste management is carried out to ensure that all types of waste and garbage are collected, transported, and disposed of properly. It also includes recycling waste so that it can be used again.
- The basic waste management hierarchy is shown in Figure 2.1.

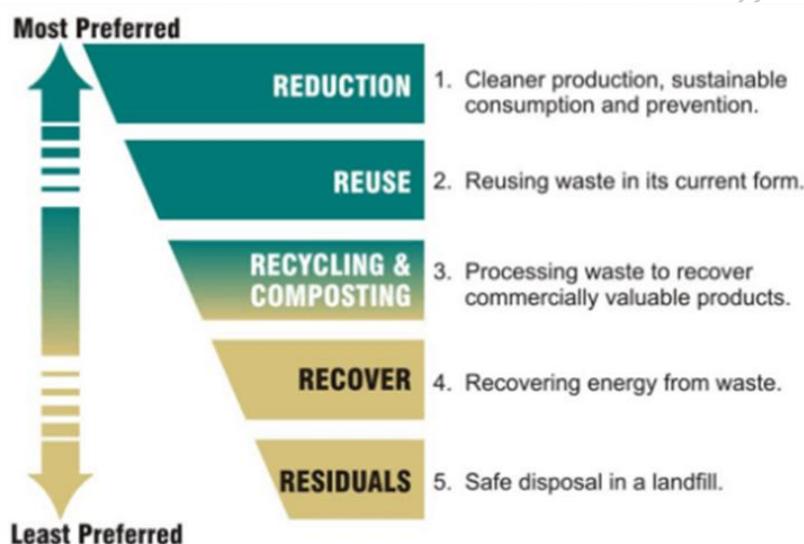


Fig. 2.1: E-waste Management Process

2.2 Recyclable and Non-Recyclable waste

Recyclable waste is renewable or can be reused. This means that the waste product is converted into new products or raw materials, like paper, corrugated cardboard (OCC), glass, plastic containers and bags, hard plastic, metal, wood products, e-waste, textile, etc. Recycling not only conserves important areas in our landfills but also assists decrease greenhouse gas emissions. Contrary to this,

Non-recyclable waste cannot be recycled and cause a major threat to the environment. The following items cannot be recycled: Shredded paper, aerosol cans, paper coffee cups, milk and juice cans, used baby diapers, and bottle caps.

Recycling is one of the best ways to have a favourable influence on the world where we live. Recycling will greatly help us to save both the environment and humans from pollution. If we take immediate action, we can control this, as the quantity of waste we are accumulating is increasing all the time.

2.3 Colour codes of waste collecting bins

India's urban population of 429 million citizens produce a whopping 62 million tonnes of garbage

every year. Out of this, 5.6 million tonnes are plastic waste, 0.17 million tonnes are biomedical waste, 7.90 million tonnes are hazardous waste and 15 lakh tonnes is e-waste.

According to an estimate, 40% of municipal waste in the city is 'wet' waste, which can easily be composted and used as manure. Nearly 30% of the municipal waste comprises plastic and metal, which can be sent to an authorized dealer for recycling, and about 20% of it is e-waste, from which precious metals can be taken apart and recycled. However, out of the total municipal waste collected, 94% is dumped on land and only 5% is composted. To gather the garbage two colour bin systems were suggested. Green bin for wet waste and blue for dry waste. However, there is a drawback in that system. People go through the sanitary napkins and children's diapers along with wet waste causing the contamination of things. Hence the government has come up with three colored garbage collection bins.

1. Green Bin – The green colored bin is used to dump biodegradable waste. This bin could be used to dispose of wet/organic material including cooked food/leftover food, vegetable/fruit peels, egg shell, rotten eggs, chicken/fish bones, tea bags/coffee grinds, coconut shells and garden waste including fallen leaves/twigs or the puja flowers/garlands will all go into the green bin.

2. Blue bin – The blue colored bin is used for segregating dry or recyclable left over. This category includes waste like plastic covers, bottles, boxes, cups, toffee wrappers, soap or chocolate wrapper and paper waste including magazines, newspapers, tetra packs, cardboard cartons, pizza boxes or paper cups/plates will have to be thrown into the white bin. Metallic items like tins/cans foil paper and containers and even the dry waste including cosmetics, hair, rubber/thermo col (polystyrene), old mops/dusters/sponges.

3. Black bin – Black bin, make up for the third category, which is used for domestic hazardous waste like sanitary napkins, diapers, blades, bandages, CFL, tube light, printer cartridges, broken thermometer, batteries, button cells, expired medicine etc. These three colored bins are shown in Figure 2.1.



Fig.2.2: Tri colored Bins

2.4 Waste disposal methods

- **Incineration** – Combusting waste in a controlled manner to minimize incombustible matter like waste gas and ash.
- **Waste Compaction** – Waste materials are compacted in blocks and are further sent away for recycling.
- **Landfill** – Waste that can't be recycled or reused can be thinly spread out in the low-lying

areas of the city.

- **Composting** – Decay of organic material over time by microorganisms.
- **Biogas Generation** – With the help of fungi, bacteria, and microbes, biodegradable waste is converted to biogas in bio-degradation plants.
- **Vermicomposting** – Transforming the organic waste into nutrient-rich manure by degradation through worms.

2.5 Sources of Waste

- **Construction waste** – waste coming from construction or demolition of buildings.
- **Commercial waste** – waste from commercial enterprises.
- **Household waste** – garbage from households is either organic or inorganic.
- **Medical or clinical waste** – wastes from the medical facilities- like used needles and syringes, surgical wastes, blood, wound dressing.
- **Agricultural waste** – Waste generated by agricultural activities that include empty pesticide containers, old silage packages, obsolete medicines, used tires, extra milk, cocoa pods, wheat husks, chemical fertilizers, etc.
- **Industrial waste** – The waste from manufacturing and processing industries like cement plants, chemical plants, textile, and power plants
- **Electronic waste** – The defective, non-working electronic appliances are referred to as electronic waste. These are also called e-waste. Some e-waste (such as televisions) contains lead, mercury, and cadmium, which are harmful to humans and the environment.
- **Mining waste** – chemical gases emitted in mine blasting pollutes the environment. And the mining activity greatly alters the environment and nature.
- **Chemical waste** – waste from the chemical substance is called chemical waste.
- **Radioactive waste** – radioactive waste includes nuclear reactors, extraction of radioactive materials, and atomic explosions.

2.6 Sources of Pollution

All the waste above mentioned also adds to environmental pollution. The contaminants that cause detrimental change to the environment are called pollution. It is one of the most serious problems faced by humanity and other life forms on our planet. The earth's physical and biological components have been affected to such an extent that normal environmental processes could not be carried out properly.

2.7 Types of Pollution

Types of Pollution	Detail/Pollutants involved
Air pollution	<ul style="list-style-type: none"> • Solid particles and gases mixed in the air cause air pollution. • Pollutants: emissions from the car, factories emitting chemical, dust, and pollen.

Water pollution	<ul style="list-style-type: none"> • Water gets polluted when toxic substances enter water bodies such as lakes, rivers, oceans, and so on. They get dissolved in it and cause it to be unfit for consumption. • Pollutants that contaminate the water are discharges of untreated sewage, and chemical contaminants, release of waste and contaminants into the surface.
Soil pollution	<ul style="list-style-type: none"> • It is the presence of toxic chemicals (pollutants or contaminants) in soil, in high enough concentrations to pose a risk to human health and/or the ecosystem • Sources of soil pollution include metals, inorganic ions, and salts (e.g. phosphates, carbonates, sulfates, nitrates)
Noise pollution	<ul style="list-style-type: none"> • Noise pollution happens when the sound coming from planes, industry or other sources reaches harmful levels • Underwater noise pollution coming from ships has been shown to upset whales' navigation systems and kill other species that depend on the natural underwater world
Light pollution	<ul style="list-style-type: none"> • Light pollution is the excess amount of light in the night sky. Light pollution, also called photo pollution, is almost always found in urban areas. • Light pollution can disrupt ecosystems by confusing the distinction between night and day.

2.8 Organization's focus on the Greening of Jobs

2.8.1 ESG

- The ESG is the short form of environmental, social, and governance. ESG guidelines are used to evaluate businesses on how well they control emissions, governance, human rights, and other factors of their business.
- Several companies audit these companies for ESG compliance. They will let the companies know how well the ESG policies are implemented in their company and let companies know how well their ESG policy is working.
- Every business enterprise is deeply intertwined with Environmental, Social, and Governance (ESG) issues. ESG has been looked at seriously by the corporate, government establishments and stakeholders.
- ESG is important as it creates high value, drives long-term returns, and global stakeholders are paying attention to the topic.
- ESG is said to have created high value, and focuses on long-term returns, and stakeholders are focusing more on this concept.

2.8.2 Factors of ESG

Several factors are used to determine how well a business is doing in maintaining its ESG policies. For creating the ESG Policy, thorough knowledge of these factors is critical.

The factors are divided into three categories; environmental, social, and governance. Knowing

about these factors comes a long way in designing the effective ESG policy.

Environmental

Environmental factors relate to a business's impact on the environment. Examples include:

- Usage of renewable energy
- Effective waste management
- Policies for protecting and preserving the environment

Social

Social factors relate to the people of the organization. How they are treated in the organization is what it focuses on. The major entities are the stakeholders, employees, and customers. Examples include:

- diversity and inclusion
- proper work conditions and labour standards
- relationships with the community

Governance

Governance factors relate to the company policies for effectively running it. They include:

- tax strategies
- structure of the company
- relationship with stakeholders
- payments to the employees and CEO

Every factor is important and matters a lot to the overall rating of the company in ESG compliance. Ignoring one aspect in favour of another can affect the rating and in turn the reputation of the company.

The companies make a clear communication about these policies to all the employees, and to the public, they should mention what their various activities are that will protect the environment, people, and the governing factors.

Practical Activity 2.1. Raise awareness about proper e-waste disposal.

Step 1. Workshops: Educate employees on e-waste dangers and recycling benefits.

Step 1. Posters: Display informative posters on e-waste in the workplace.

Step 3. Collection Drive: Set up collection points for old electronic devices.

Step 4. Partner with Recyclers: Collaborate with certified e-waste recycling companies.

Step 5. Progress Tracking: Keep records and share e-waste collection progress.

Practical Activity 2.1. Educate employees on waste segregation.

Step 1. Educational Materials: Provide pamphlets on recyclable waste.

Step 1. Game: Have employees categorize waste into recyclable and non-recyclable.

Step 3. Discussion: Discuss the importance of waste segregation.

Step 4. Proper Bins: Label bins for recyclable and non-recyclable waste.

Practical Activity 2.3. Familiarize employees with tricolored bin system.

Step 1. Information Session: Explain green, blue, and black bins.

Step 1. Interactive Quiz: Test knowledge of bin usage.

Step 3. Bin Labeling: Ensure bins are labeled correctly.

Step 4. Role Play: Demonstrate proper waste disposal.

Summary

- The chapter focuses on green practices in organizations.
- It highlights e-waste management, introduces a tricolored bin system for waste collection, and explains various disposal methods.
- It identifies sources of waste and discusses types of pollution.
- The chapter emphasizes the adoption of ESG guidelines for environmental, social, and governance considerations.
- Overall, it underscores the importance of sustainable practices for both organizations and the environment.

Check Your Progress**A. Multiple Choice questions**

1. What is e-waste? (a) Waste from construction activities (b) Electrical and electronic equipment discarded as waste (c) Biodegradable waste (d) Hazardous waste from medical facilities
2. What are the three major categories of electronic goods? (a) Red goods, blue goods, green goods (b) White goods, brown goods, grey goods (c) Recyclable goods, non-recyclable goods, hazardous goods (d) Electronic, electrical, and industrial goods
3. What is the purpose of the tricolored bin system in waste collection? (a) To create a visual appeal for waste bins (b) To confuse people about waste segregation (c) To improve the segregation of different types of waste (d) To reduce the number of waste bins needed
4. What is one of the methods mentioned for waste disposal? (a) Exporting waste to other countries (b) Throwing waste in rivers and lakes (c) Incineration to minimize waste gas and ash (d) Leaving waste in open areas for natural decomposition
5. What does ESG stand for in the context of organizations? (a) Environmental, Social, and Governance (b) Energy, Sustainability, and Growth (c) Efficiency, Safety, and Governance (d) Ecology, Standards, and Growth
6. Which factor is NOT part of the ESG framework for evaluating businesses? (a) Environmental (b) Social (c) Governmental (d) Governance
7. What is the significance of ESG compliance for businesses? (a) It has no impact on the business's reputation (b) It creates high value and drives long-term returns (c) It only matters to government agencies (d) It is only relevant for large corporations
8. What are some examples of environmental factors in ESG evaluation? (a) Diversity and inclusion (b) Effective waste management (c) Proper work conditions (d) Relationships with the community

9. Why is proper waste management important for the environment? (a) It creates more job opportunities (b) It conserves important areas in landfills and reduces greenhouse gas emissions (c) It increases pollution levels (d) It has no significant impact on the environment
10. What percentage of municipal waste in India is categorized as 'wet' waste? (a) 40% (b) 30% (c) 20% (d) 10%

B. Fill in the blanks

1. The tricolored bin system in waste collection includes green bin for biodegradable waste, blue bin for dry or recyclable waste, and black bin for domestic _____ waste.
2. Ignoring one aspect of ESG compliance in favour of another can affect the company's _____ and reputation.
3. Effective waste management is an example of an _____ factor in ESG evaluation.
4. Recyclable waste can be converted into new products or raw material, while non-recyclable waste cannot be _____.
5. India's urban population of 429 million citizens produces a _____ of garbage every year.
6. E-waste contains hazardous substances like lead, mercury, and _____.
7. Light pollution is the _____ in the night sky.
8. The blue coloured bin is used for _____.
9. Waste management is carried out to ensure that all types of waste and garbage are collected, transported, and _____.
10. The contaminants that cause detrimental change to the environment are called _____.

C. State true or False for the following

1. Recycling helps conserve space in landfills and reduces greenhouse gas emissions.
2. The black bin is used for disposing of biodegradable waste.
3. Composting is a method of waste disposal that involves the decay of organic material over time by microorganisms.
4. ESG factors include environmental, social, and geological considerations.
5. ESG compliance is important for creating high value and driving long-term returns.
6. Social factors in ESG focus on how people within the organization are treated.
7. Governance factors in ESG pertain to how a company is effectively run, including tax strategies and stakeholder relationships.
8. Soil pollution is caused by the presence of toxic chemicals in soil at low concentrations.
9. Non-recyclable waste can be converted into new products or raw materials.
10. Landfills are used for waste that cannot be recycled or reused.

D. Short Answer Type Questions

1. What is e-waste, and why is it a growing concern for the environment?
2. Explain the process of e-waste management.
3. What is the purpose of using tri colored bins for waste collection?
4. Name three types of recyclable waste and explain why recycling is important.
5. Describe the factors used to evaluate a business's ESG compliance.

6. What is the impact of soil pollution on human health and ecosystems?
7. How does composting contribute to waste management?
8. What are the sources of electronic waste mentioned in the chapter?
9. What are the different methods of waste disposal mentioned in the chapter?
10. Why is it important to properly segregate waste into recyclable and non-recyclable categories?

Glossary

Assembly – The process of putting together the components of a computer system.

Disassembly – The process of carefully taking apart a computer to repair or upgrade it.

Peripheral – External devices connected to a computer such as a keyboard, mouse, printer, or scanner.

Motherboard – The main circuit board in a computer that connects all hardware components together.

CPU (Central Processing Unit) – The brain of the computer where most calculations take place.

RAM (Random Access Memory) – Temporary memory in a computer used to store data that is actively being used.

Maintenance – Routine tasks and procedures to keep computer systems running efficiently.

Troubleshooting – The process of diagnosing and fixing problems in a computer system.

Preventive Maintenance – Regularly performed maintenance to reduce the risk of future system failures.

Software Issues – Problems caused by applications or operating systems that affect computer performance.

Hardware Issues – Malfunctions or failures in the physical parts of a computer system.

Post-Repair Testing – Verifying that a repaired system is functioning properly after maintenance or repair work.

Work Report – A document summarizing the tasks completed during repair or maintenance.

Customer Feedback – Input provided by the client to assess service satisfaction and performance.

Invoice – A detailed bill provided to a customer listing the services and parts used during repair.

Configuration – The arrangement of components and settings to make a computer system ready for use.

Green Practices – Environmentally friendly actions in the workplace to reduce waste and energy use.

Occupational Safety – Measures taken to protect workers from injuries and health risks at the workplace.

ESD (Electrostatic Discharge) – The sudden flow of electricity between two objects that can damage electronic components.

Diagnostics – Tools or software used to test and identify hardware or software problems in a computer system.

Answer Key

Module 1. Repair and Maintenance of Desktop Computer and Peripherals

Session 1. Repair and Maintenance in Computer peripherals

A. Multiple-choice questions (MCQs)

1. (c) 2. (c) 3. (c) 4. (d) 5. (d) 6. (c) 7. (a) 8. (a) 9. (b) 10. (c)

B. True or False

1. (T) 2. (T) 3. (T) 4. (F) 5. (T) 6. (F) 7. (T) 8. (F) 9. (T) 10. (T)

Session 2. Hardware and Software Issue in Computers

A. Multiple-choice questions (MCQs)

1. (c) 2. (d) 3. (b) 4. (b) 5. (b) 6. (b) 7. (b) 8. (c) 9. (b) 10. (b)

B. Fill in the Blank

1. Blue Screen of Death (BSOD) 2. Video Cable (or display cable, HDMI cable, etc.) 3. Hard drive (or HDD) 4. CPU (Central Processing Unit) 5. Power cord (or cables, connections) 6. Conflicts 7. Startup 8. Malware (or virus) 9. Drivers 10. Compatibility

Session 3. Disassembly and Reassembly and Preventive maintenance

A. Multiple-choice questions (MCQs)

1. (c) 2. (b) 3. (a) 4. (b) 5. (c) 6. (b) 7. (a) 8. (c) 9. (c) 10. (b) 11. (b) 12. (d) 13. (c) 14. (c) 15. (c)

B. Fill in the Blank

1. Unplug it from the power source 2. Power supply unit (PSU) 3. Anti-static wrist strap 4. Data, Power 5. PCIe 6. Preventive maintenance 7. Unplug 8. microfiber cloth 9. clean 10. cool, well-ventilated

Session 4. Post-Repair Desktop Functionality & work report, customer feedback

A. Multiple-choice questions (MCQs)

1. (d) 2. (d) 3. (c) 4. (b) 5. (a) 6. (b) 7. (d) 8. (c) 9. (c) 10. (c)

B. Fill in the Blank

1. Thoroughly test; Functioning 2. Power-On Self-Test (POST); Powers on; boots 3. Test; Peripherals; Keyboard; Mouse; Monitor; Speakers; Printer; Functioning 4. Open; Applications; Performance; Stability 5. Check; Operating system; Driver; Security; Performance 6. Unplug 7. Microfiber cloth 8. Clean

Module 2. Installation and Configuration of Laptop and Peripherals

Session 1. Uses of Laptop Process of Setting

A. Multiple-choice questions (MCQs)

1. (b) 2. (b) 3. (b) 4. (b) 5. (c) 6. (c) 7. (b) 8. (c) 9. (b) 10. (b)

B. Fill in the Blank

1. Keyboard 2. Touchpad 3. HDMI 4. Webcam 5. Audio Jack 6. CPU 7. RAM 8. GPU 9. Storage Drive 10. Cooling System

Session 2. Motherboard Installing in laptop**A. Multiple-choice questions (MCQs)**

1. (a) 2. (b) 3. (b) 4. (b) 5. (b) 6. (b) 7. (b) 8. (b)

B. Fill in the Blank

1. Disconnect, Remove 2. Anti-static 3. Locking, connector 4. Pictures 5. Display 6. Around/on 7. Connections 8. Connections, pictures

Session 3. CPU/Processor Installing on Motherboard**A. Multiple-choice questions (MCQs)**

1. (b) 2. (b) 3. (c) 4. (b) 5. (c)

B. Fill in the Blank

1. Lower 2. Thermal 3. Pea 4. Attach 5. Firmly

Session 4. Installing RAM, Graphics Cards, and Sound Cards**A. Multiple-choice questions (MCQs)**

1. (a) 2. (C) 3. (c) 4. (d) 5. (b) 6. (c) 7. (b)

B. True or False

1. (T) 2. (F) 3. (T) 4. (F) 5. (T) 6. (F) 7. (T)

Session 5. Assemble and Disassemble of Laptops**A. Multiple-choice questions (MCQs)**

1. (b) 2. (b) 3. (b) 4. (c) 5. (c) 6. (c) 7. (a) 8. (b) 9. (c) 10. (b)

B. Fill in the Blank

1. Power, Unplug 2. Static 3. Magnetic, Containers 4. Plastic 5. Notch, Ridge

Module 3. Repair and Maintenance of Laptop and Peripherals**Session 1. Hardware and Software issues in Laptop****A. Multiple-choice questions (MCQs)**

1. (d) 2. (b) 3. (c) 4. (b) 5. (d) 6. (a) 7. (d) 8. (b) 9. (c) 10. (c)

B. Fill in the Blank

1. Charge 2. Driver 3. Hard drive 4. Cooling 5. Viruses 6. Software 7. Display 8. Drivers 9. Cable 10. Software

Session 2. Maintenance Process of laptop and peripherals**A. Multiple-choice questions (MCQs)**

1. (c) 2. (b) 3. (b) 4. (b) 5. (b) 6. (b) 7. (b) 8. (c) 9. (b) 10. (b)

B. Fill in the Blank

1. Disk 2. Pressure 3. Mouse, Keyboard 4. Lifespan 5. Parts 6. Professional 7. Virus 8. Ink 9. Microfiber

Session 3. Testing of Repaired Laptops & Peripherals**A. Multiple-choice questions (MCQs)**

1. (c) 2. (c) 3. (b) 4. (c) 5. (a) 6. (b) 7. (b) 8. (a) 9. (b) 10. (b)

Session 4. Work report, Customer feedback and invoice**A. Multiple-choice questions (MCQs)**

1. (b) 2. (c) 3. (b) 4. (a) 5. (c) 6. (b) 7. (b) 8. (b)

B. Fill in the Blank

1. Executive 2. Indirect 3. Total 4. Invoice or Data 5. Improvement

Module 4. Occupational Health and Safety Standards**Session 1. Workplace Health and Safety Practices****A. Multiple Choice Questions**

1. (b) 2. (d) 3. (b) 4. (a) 5. (a) 6. (b) 7. (c) 8. (b) 9. (c) 10. (a)

B. Fill in the Blanks

1. Bending 2. Emergency 3. Bleeding 4. Infection 5. Rescue breaths (or CPR) 6. Evacuation 7. Communicable 8. Preventive 9. Insulated/protective 10. Time

C. State true or False

1. (T) 2. (F) 3. (T) 4. (T) 5. (T) 6. (T) 7. (T) 8. (F) 9. (F) 10. (F)

Session 2. Green Practices in Organization**A. Multiple Choice Questions**

1. (b) 2. (b) 3. (c) 4. (c) 5. (a) 6. (c) 7. (b) 8. (b) 9. (b) 10. (a)

B. Fill in the Blanks

1. Hazardous 2. Growth 3. Environmental 4. Recycled 5. Mountain 6. Cadmium 7. Excess light 8. Dry/recyclable waste 9. Disposed 10. Pollutants

C. State true or False

1. (T) 2. (F) 3. (T) 4. (F) 5. (T) 6. (T) 7. (T) 8. (F) 9. (F) 10. (T)