



RQF LEVEL 4



CSACR401

**COMPUTER SYSTEM
AND ARCHITECTURE**

Computer System Refurbishment

TRAINER'S MANUAL

October, 2024



COMPUTER SYSTEM REFURBISHMENT

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ACRONYMS

AIO: All-in-One (refers to devices like printers or PCs that combine multiple functions)

AMD: Advanced Micro Devices

ATX: Advanced Technology eXtended

BDD: Behavior-Driven Development

BIOS: Basic Input/Output System

CAD: Computer-Aided Design

CBT/A: Competency Based Training/Assessment

CD: Compact Disc

CD-ROM: Compact Disc Read-Only Memory

CI/CD: Continuous Integration/Continuous Deployment

CMOS: Complementary Metal-Oxide-Semiconductor

DDR4: Double Data Rate 4 (fourth generation)

DIMM: Dual In-line Memory Module

DVD: Digital Versatile Disc (or Digital Video Disc)

ESD: Electrostatic Discharge

GPU: Graphics Processing Unit

HDMI: High-Definition Multimedia Interface

HHD: Hybrid Hard Drive

HPC: High-Performance Computing

HPE: Hewlett Packard Enterprise

I/O: Input/Output

IC: Integrated Circuit

ICT: Information and Communication Technology

ICT: Information and Communication Technology

IDE: Integrated Drive Electronics

IoT: Internet of Things

IT: Information Technology

ITX: Information Technology eXtended

KOICA: Korea International Cooperation Agency

LED: Light Emitting Diode

MOSFET: Metal-Oxide-Semiconductor Field-Effect Transistor

NET: Network

NVMe: Non-Volatile Memory Express

OMR: Optical Mark Recognition

OS: Operating System

PCB: Printed Circuit Board

PCs: Personal Computers

PCU: Power Control Unit
POST: Power-On Self-Test
PPE: Personal Protective Equipment
PSU: Power Supply Unit
RAM: Random Access Memory
RGB: Red, Green, Blue (refers to the color model used in electronic)
ROM: Read-Only Memory
RTB: Rwanda TVET Board
SATA: Serial Advanced Technology Attachment
SDLC: Software Development Life Cycle
SDN: Software-Defined Networking
SFF: Small Form Factor
SSD: Solid State Drive
TDD: Test-Driven Development
TQUM Project: TVET Quality Management Project
UAT: User Acceptance Testing
UEFI: Unified Extensible Firmware Interface
USB: Universal Serial Bus
VMware: Virtual Machine Software (named after the company, VMware)
Wi-Fi: Wireless Fidelity

INTRODUCTION

This trainer's manual includes all the methodologies required to effectively deliver the module titled "**Computer System Refurbishment.**" Trainees enrolled in this module will engage in practical activities designed to develop and enhance their competencies.

The development of this training manual followed the Competency-Based Training and Assessment (CBT/A) approach, offering ample practical opportunities that mirror real-life situations.

The trainer's manual is organized into Learning Outcomes, which is broken down into indicative content that includes both theoretical and practical activities. It provides detailed information on the key competencies required for each learning outcome, along with the objectives to be achieved.

As a trainer, you will begin by asking questions related to the activities to encourage critical thinking and guide trainees toward real-world applications in the labor market. The manual also outlines essential information such as learning hours, didactic materials, and suggested methodologies.

This manual outlines the procedures and methodologies for guiding trainees through various activities as detailed in their respective trainee manuals. The activities included in this training manual are designed to offer students opportunities for both individual and group work. Upon completing all activities, you will assist trainees in conducting a formative assessment known as the end learning outcome assessment. Ensure that trainees review the key reading and the points to remember section.

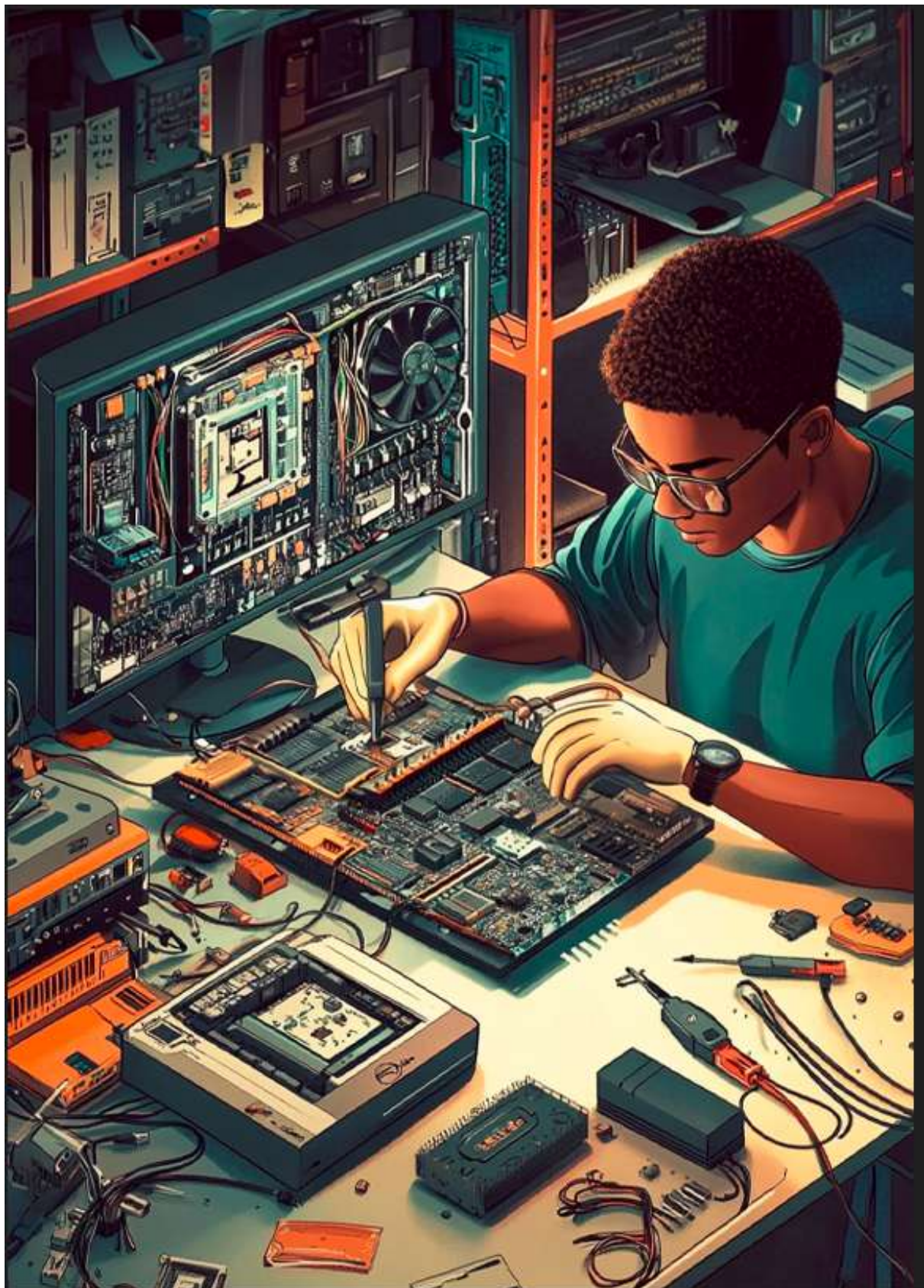
MODULE CODE AND TITLE: CSACR401 COMPUTER SYSTEM REFURBISHMENT

Learning Outcome 1: Perform Computer System Renovation.

Learning Outcome 2: Perform Computer System Restoration.

Learning Outcome 3: Perform Computer System Conversion.

Learning Outcome 1: Perform Computer System Renovation



Indicative Contents

1.1 Setting Working Place

1.2 Selection of Computer System Components

1.3 Selection of Tools, Materials and Equipment

1.4 Disassembling Computer System

1.5 Installation of New Hardware Component

1.6 Assembling Computer System

1.7 Installation of Computer System Drivers and Software

1.8 Perform Computer System Test

Key Competencies for Learning Outcome 1: Perform Computer System Renovation

Knowledge	Skills	Attitudes
• Description of working place • Description of computer system components • Description of computer system test	• Setting a working place • Selecting a computer system component • Assembling computer components • Disassembling computer component • Installing a new hardware component • Upgrading a computer hardware component • Testing computer system	• Being Innovative • Being organized • Having Flexibility • Having Time Management • Being Problem Solver • Having Teamwork spirit • Being Hard worker • Being Self-motivated



Duration: 20hrs

Learning outcome 1 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Describe properly working place according to occupation safety and health standards.
2. Describe properly computer system components based on system requirement.
3. Describe properly Description of computer system test according to computer unit testing requirement.
4. Select properly computer system component based on system requirement.
5. Disassemble correctly computer system based on its structure.
6. Assemble correctly computer system based on renovation requirement.
7. Install properly new hardware components based on computer system requirement.
8. Install properly system software based on computer system requirement.
9. Test effectively computer system according to the computer unit



Resources

Equipment	Tools	Materials
• Power supply tester • Oscilloscope • Multi-meter • Blower • Computer	• Screwdrivers • Tweezers • Flashlight or headlamp • Cable testers • Thermal paste applicator • Pliers • ESD Tools	• Thermal paste • Isopropyl alcohol and cotton swabs • Electrical tape and zip ties • Spare screws • Labelling materials



Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Avail organized workshop
- Have malfunctioning computer



Indicative content 1.1: Setting Working Place.



Duration: 2 hrs



Theoretical Activity 1.1.1: Description of working place



Notes to the trainer:

- May use small groups for describing working place.
- Have sample of image of PPEs to be didactic material.
- Have sample of image of safety sign.
- Have image illustrating hazard situation



Key steps:

While delivering this activity, pass through the following steps:

Step1: Introduce the activity and ask trainees to answer the following questions:

- Define the following:
 - Workplace in computer system
 - Hazard
 - Safety measure
 - PPE
 - Ergonomics
 - Hygiene and sanitation
- What are the safety measures applied in computer refurbishment?
- What are the types of hazards?

Step 2: Ask trainees to write the answers on provided flipchart/paper.

Step 3: Ask trainees to present their findings to the whole class

Step 4: Provide expert view for more clarification.

Step 5: Address any questions or concerns.

Step 6: Ask trainees to read the **Key readings 1.1.1** in their manuals.



Points to Remember

- A "working place" or "workplace" In computer refurbishment, a workplace typically refers to a facility or area where used or damaged computers are repaired and upgraded.
- There is different safety measures applied in computer refurbishment such as: Electrical Safety, Component Handling, Physical Safety, Chemical Safety and Data Security.
- There are different types of hazards which are: Biological, Chemical, Ergonomic, Physical and Psychosocial.



Practical Activity 1.1.2: Setting the workplace



Notes to the trainer

- This activity should take place in workshop, where the trainee will implement safety measures.
- Have sample of real PPEs to be used as didactic material.



Key steps:

While delivering this activity, pass through the following steps:

Step 1. Introduce the activity and ask the trainees to do the task below:

As computer technician you are requested to go to the workshop to set workplace.

Step 2. Explain the task and provide clear work instruction.

Step 3. Demonstrate how to set workplace for computer refurbishment. While demonstrating, explain the steps to follow.

Step 4. Ask the trainees to set the workplace for computer refurbishment and monitor the activity.

Step 5. Verify whether safety measures are clearly implemented.

Step 6. Ask trainees to read the Key readings 1.1.2 in their manuals.

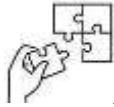


Points to Remember

A well-organized workplace can significantly improve efficiency and safety during computer refurbishment.

Here are some steps to consider when setting up your workspace:

1. Choose a Suitable Location
2. Organize Your Workspace
3. Equip Your Workspace
4. Safety Considerations
5. Ergonomics



Application of learning 1.1.

XYZ Company, which specializes in refurbishing computers, is setting up a new workspace for their technicians in computer system refurbishment, you have been tasked to set the workspace and implement safety measures.

Checklist

Criteria	Indicators	Observation	
		Yes	No
Workplace is properly set	1.1 A suitable location is effectively chosen		
	1.2 Workplace is well organized		
	1.3 Workspace is well equipped		
	1.4 Safety measures are effectively applied		
	1.5 Ergonomics is effectively applied		
	1.6 Safety measures are implemented		
Decision			



Indicative content 1.2: Selection of Computer System Components



Duration: 3 hrs



Theoretical Activity 1.2.1: Description of computer system hardware



Notes to the trainer:

- May use small groups for describing Computer system hardware.
- Have sample of real/image of computer system hardware to be didactic material.



Key steps:

While delivering this activity, pass through the following steps:

Step 1. Introduce the activity by asking trainees to answer the following questions:

- i. What are the components of computer system hardware?
- ii. What are the components of C.P.U?
- iii. What are the types of software?

Step 2. Ask trainees to write the answers on provided flipchart/paper.

Step 3. Ask trainees to present their findings to the whole class

Step 4. Provide expert view for more clarification

Step 5. Address any questions or concerns.

Step 6. Ask trainees to read the Key readings 1.2.1 in their manuals.



Points to Remember

- There is different component of computer system hardware which are: Central processing, Motherboard, storage and memories etc...
- There are two types of computer system software which are: system software and application software.



Practical Activity 1.2.2: Selecting computer system components



Notes to the trainer

- This activity should take place in workshop where the trainees will computer system components.
- Avail different computer components to used.



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the topic and ask trainees do the task described below:

As computer technician you are requested to go to the workshop to select the computer system components.

Step2. Explain the task and provide clear work instruction.

Step3. Demonstrate how to select computer system components, while demonstrating, explain the step to follow.

Step4. Ask the trainees to select computer components and monitor the activity.

Step5. Verify whether the selection of computer components are effectively selected.

Step6. Ask trainees to read key reading 1.2.2.



Points to Remember

- Before selecting the computer components, ensure you have a clear workspace and follow safety guidelines.
- While selecting the computer components pass through the following steps:
 1. Determine Your Purpose
 2. Choose a CPU (Processor)
 3. Select a Motherboard
 4. Pick RAM (Memory)
 5. Choose a GPU (Graphics Card)
 6. Storage Options
 7. Select a Power Supply Unit (PSU)
 8. Consider Cooling Solutions
 9. Choose a Case
 10. Peripherals and Accessories



Application of Learning 1.2

XYZ is a refurbish company wishes to set up new workstation for their employees in different departement each workstation must meet specific performance requirements. You asked to select computer system components that is reliable and match the Perfomence needs of each role of each office.

Criteria	Indicators	Observation	
		Yes	No
Computer system components are selected	1.1 C.P.U is chosen		
	1.2 Motherboard is selected		
	1.3 RAM is picked		
	1.4 GPU is chosen		
	1.5 Power Supply unit is selected		



Indicative content 1.3: Selection of Tools, Materials and Equipment



Duration: 2 hrs



Theoretical Activity 1.3.1: Description of tools, materials and equipment



Notes to the trainer:

- May use small groups for describing tools, materials and equipment.



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the activity and ask trainees to answer the following questions:

- Identify the types of tools used in computer system refurbishment
- Differentiate the thermal paste material from adhesive material
- Enumerates at least two examples of power protection device

Step2. Ask trainees to write the answers on provided flipchart/paper.

Step3. Ask trainees to present their findings to the whole class

Step4. Provide expert view for more clarification

Step5. Address any questions or concerns.

Step6. Ask trainees to read the Key readings 1.3.1 in their manuals.



Points to Remember

- There are four types of tools used in computer system refurbishment such as: SD tools, hand tools, diagnostic tools and cleaning tools.
- There the main difference between **thermal paste** and **adhesive material** where thermal paste: Enhances heat transfer between a CPU/GPU and a cooler by filling in microscopic gaps while adhesive material Used to bond or stick two surfaces together.
- In computer system refurbishment we have the examples of power protection device which are: Uninterruptible Power Supply (UPS), Surge Protectors, Power Conditioners, stabiliser, fuse and circuit breaker.



Practical Activity 1.3.2: Selecting tools, materials and equipment



Notes to the trainer

- This activity should take place in workshop where the trainees will select tools, materials and equipment
- Avail different computer components to used.



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the activity and ask trainees do the task described below:

As computer technician you are requested to go to the workshop to select the tools, materials and equipment.

Step2. Explain the task and provide clear work instruction.

Step3. Demonstrate how to select the tools, materials and equipment, while demonstrating, explain the step to follow.

Step4. Ask the trainees to select tools, materials and equipment and monitor the activity.

Step5. Verify whether the tools, materials and equipment are effectively selected.

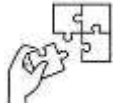
Step6. Ask trainees to read key reading 1.3.2.



Points to Remember

Practical steps to guide you through the selection process:

1. Assess the System Requirements
2. Select the Necessary Tools
3. Identify Required Materials
4. Choose the Right Equipment
5. Safety Considerations
6. Plan for Disposal



Application of learning

The IT department of a mid-sized company has decided to refurbish older computers to extend their lifespan and improve performance. You are requested to select the appropriate tools, materials, and equipment needed to carry out the refurbishment effectively.

Checklist:

Criteria	Indicators	Observation	
		Yes	No
Tools, material and equipment are appropriately selected	1.1 System requirements are properly assessed		
	1.2 Necessary tools are correctly selected		
	1.3 Materials are effectively identified		
	1.4 Right equipment is correctly chosen		
	1.5 Safety is well applied		
	1.6 Plan for disposal is applied		



Indicative content 1.4: Disassembling Computer System



Duration: 3hrs



Theoretical Activity 1.4.1: Description of computer system disassembling



Notes to the trainer:

- May use small groups for describing Computer system disassembling.



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the activity and ask trainees to answer the following questions:

- i. What are the types of computers?
- ii. What are the categories of computers?
- iii. What are the computer system components?
- iv. Differentiate assembling from disassembling computer?

Step2. Ask trainees to write the answers on provided flipchart/paper.

Step3. Ask trainees to present their findings to the whole class

Step4. Provide expert view for more clarification

Step5. Address any questions or concerns.

Step6. Ask trainees to read the Key readings 1.4.1 in their manuals.



Points to Remember

- There are some types of computers: Personal Computers (PCs), Workstations, Servers, Mainframes, Supercomputers
- Computers are classified into different categories based on various factors such as: Based on Size and Processing Power, Based on Purpose, Based on Function.
- Assembling and disassembling a computer are two opposite processes involved in handling computer hardware, where Assembling a computer involves putting together various components to create a functional computer system while Disassembling a Computer is the process of taking a computer apart, which might be done for various reasons, such as repairs, upgrades, or recycling.



Practical Activity 1.4.2: Disassembling a computer system



Notes to the trainer

- This activity should take place in workshop where the trainees will disassemble computer system.
- Avail electronic toolkit as required tools



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the activity and ask trainees do the task described below:

As computer technician you are requested to go to the workshop to disassemble computer system

Step2. Explain the task and provide clear work instruction.

Step3. Demonstrate how to disassemble computer system, while demonstrating, explain the step to follow.

Step4. Ask the trainees to disassemble computer system and monitor the activity.

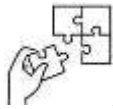
Step5. Verify whether the disassembling effectively performed.

Step6. Ask trainees to read key reading 1.4.2.



Points to Remember

- Before disassembling your computer, ensure you have a clear workspace and follow safety guidelines.
- Steps for Disassembling a Computer System
 1. Power Off and Disconnect
 2. Open the Case
 3. Disconnect Components
 4. Remove Motherboard
 5. Remove Other Components
 6. Remove Additional Components



Application of learning 1.4.

You are a technician at XYZ Company, and you have been assigned the task of disassembling a computer system, you are tasked to disassemble the computer carefully, ensuring that all components are handled safely and stored properly for future reassembly or replacement.

Checklist

Criteria	Indicators	Observation	
		Yes	No
1. Computer system is properly disassembled.	1.1 The computer is correctly turned off and unplugged		
	1.2 Computer case is correctly opened		
	1.3 Components are effectively disconnected		
	1.4 Motherboard is well removed		
	1.5 Additional components are well separated		



Indicative content 1.5: Installation of New Hardware Component.



Duration: 3 hrs



Practical Activity 1.5.1: Installing a New Hardware Component



Notes to the trainer

- This activity should take place in workshop where the trainees will install new hardware.
- The trainer avails the new hardware to be installed.
- Avail hand tools



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the activity and ask trainees do the task described below:

As a technician, you are requested to install a new hardware in the computer.

Step2. Explain the task and provide clear work instruction.

Step3. Demonstrate how to install new hardware, while demonstrating explain the steps to follow.

Step4. Asks trainees to install a new hardware and monitor the activity

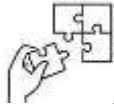
Step5. Verify whether activities are performed correctly.

Step6. Ask trainees to read key reading 1.5.1.



Points to Remember

- Here are the general steps for installing new hardware in a computer:
 1. Turn Off and Unplug the Computer
 2. Open the Computer Case
 3. Locate the Hardware Slot or Space
 4. Install the Hardware
 5. Connect Necessary Cables
 6. Close the Case
 7. Power On
 8. Install Drivers (if needed)
 9. Test the Hardware



Application of learning 1.5.

ABC Company hired you as a computer technician and you are tasked with refurbishing an aging desktop computer system. The goal is to install the new hardware to improve performance and extend its lifespan.

Checklist

Criteria	Indicators	Observation	
		Yes	No
New Hardware component is properly installed	1.1 The computer is well turned off		
	1.2. The computer Case properly opened		
	1.3. The hardware Slot or Space are correctly located		
	1.4. The hardware is properly Installed		
	1.5. Cables are effectively Connected		
	1.6. The computer case is well Closed		
	1.7. The computer is Powered On		



Indicative content 1.6: Assembling Computer system



Duration: 3 hrs



Practical Activity 1.6.1: Assembling computer system



Notes to the trainer

- This activity should take place in workshop where the trainees will assemble computer system.
- Avail prepared work place
- Avail tool box, ESD tool, cleaning tool which are prepared/organised.



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the activity and ask the trainees to do the task below:

As computer technician you are requested to go to the workshop to assemble computer system.

Step2. Explain the task and provide clear work instruction.

Step3. Demonstrate how to assemble computer, while demonstrating, explain the step to follow.

Step4. Ask the trainees to assemble computer and monitor the activity.

Step5. Verify whether customization appearance are clearly performed.

Step6. Ask trainees to read the Key readings 1.6.1 in their manuals.



Points to Remember

- While assembling a computer system pass through the following steps:
 1. Install the Power Supply Unit (PSU)
 2. Install the Motherboard
 3. Install the Central Processing Unit (CPU)
 4. Install CPU Cooler
 5. Install Memory (RAM)
 6. Install Storage (SSD/HDD)

7. Install the Graphics Card (GPU)
8. Connect Power and Data Cables
9. Test the System



Application of learning 1.6.

A small business owner has recently purchased a new computer component. The owner has attempted to assemble the computer system themselves but has encountered difficulties. You are requested to assemble and customize computer system.

Checklist

Criteria	Indicators	Observation	
		Yes	No
Computer system is properly assembled	1.1 The Power Supply Unit (PSU) is properly Installed		
	1.2 The Motherboard is properly Installed		
	1.3 The Central Processing Unit (CPU) is properly Installed		
	1.4 CPU Cooler is properly Installed		
	1.5 Memory (RAM) is properly Installed		
	1.6 Storage (SSD/HDD) is properly Installed		
	1.7 The Graphics Card (GPU) is properly Installed		
	1.8 Power and Data Cables are correctly Connected		
	1.9 Computer System is effectively customized		



Indicative content 1.7: Installation of Computer system drivers and software



Duration: 3hrs



Theoretical Activity 1.7.1: Description of computer system drivers and software



Notes to the trainer:

- Trainer may use small groups to describe computer system drivers and software
- Avail software setup and computer



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the activity and ask trainees to answer the following questions:

- I. What are the criteria to consider while checking software compatibility?
- II. Define device drivers?

Step2. Ask trainees to write answers provided on flipchart/paper.

Step3. Ask trainees to present their findings to the whole class

Step4. Provide expert view for more clarification

Step5. Address any questions or concerns.

Step6. Ask trainees to read the Key readings 1.7.1 in their manuals.



Points to Remember

- When selecting software for your computer system, compatibility consider some key criteria such as: Operating System Compatibility, Hardware Requirements, Software Dependencies, Feature Set, User Interface, Support and Updates
- A device driver is a type of software that allows a computer's operating system to communicate with a specific hardware device.



Practical Activity 1.7.2: Installing computer system software



Notes to the trainer

- This activity should take place in workshop where the trainees will install software
- Avail flash drive with software setup or internet.
- Avail working computers



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the activity and ask trainees do the task described below:

As a technician, you are asked to install software in the computer.

Step2. Explain the task and provide clear work instruction.

Step3. Demonstrate how to install new software in computer, while demonstrating, explain the step to follow.

Step4. Ask the trainees to install software and monitor the activity.

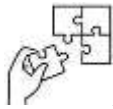
Step5. Verify whether software compatibilities has been checked.

Step6. Ask trainees to read the Key readings 1.7.2 in their manuals.



Points to Remember

- Here are the general steps involved in installing software on a computer:
 1. Select the type of software to be installed
 2. Download the Software/having installer setup.
 3. Run the Setup File
 4. Follow the Instructions
 5. Installation Progress
 6. Complete Installation



Application of learning 1.7

Mid-sized company, has just on boarded new employees. They need to install a new software and install device drivers in their computers to complete daily tasks. However, they are not familiar with the installation process. You are asked to install both system software and application software.

Checklist

Criteria	Indicators	Observation	
		Yes	No
Software is correctly installed	1.1 The software is properly downloaded		
	1.2 The Setup File has been executed successfully		
	1.3 The Instructions are effectively followed		
	1.4 Installation software is properly installed		
	1.5 Device driver are properly installed		



Duration: 1hr



Theoretical Activity 1.8.1: Description of computer system testing



Notes to the trainer:

- Trainer may use small groups to describe computer system testing.
- Trainer may have installed computer.



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the activity and ask trainees to answer the following questions:

- Provide clear description about:
 - System functionality
 - System performance
 - System stress test

Step2. Ask trainees to write answers provided on flipchart/paper.

Step3. Ask trainees to present their findings to the whole class

Step4. Provides expert view for more clarification

Step5. Address any questions or concerns.

Step6. Ask trainees to read the key reading 1.8.1 in the trainee manual.



Points to Remember

- System Functionality Testing involves verifying that all components and features of the system are working as intended. It ensures that the system can perform its basic functions accurately and without errors.
- System Performance Testing focuses on evaluating the system's performance under various conditions, including load, stress, and peak usage. It helps identify bottlenecks and areas for optimization.
- System Stress Testing is a more intensive form of performance testing that involves subjecting the system to extreme conditions to identify its limitations and vulnerabilities.



Practical Activity 1.8.2: Perform computer system testing



Notes to the trainer

- This activity should take place in workshop where the trainees will test computer system.
- The trainer avail installed computer



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the activity and ask trainees do the task described below:

As a technician, you are asked to test computer system.

Step2. Explain the task and provide clear work instruction.

Step3. Demonstrate how to test computer system. While demonstrating explain the steps to follow.

Step4. Asks trainees to test computer system and monitor the procedures.

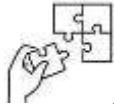
Step5. Verify whether activities are performed correctly.

Step6. Ask trainees to read key reading 1.8.2.



Points to Remember

- Best Practices for Computer System Testing:
 1. Planning the Testing Process
 2. Gathering Requirements
 3. Designing Test Cases
 4. Setting up the Test Environment
 5. Executing Test Cases
 6. Reporting Defects
 7. Performance Testing
 8. User Acceptance Testing (UAT)
 9. Final Review and Reporting



Application of learning 1.8.

A company is refurbishing a batch of used computers for resale. The computers have undergone hardware repairs, cleaning, and software reinstallations. Before offering the refurbished systems to customers, they need to conduct thorough testing to ensure their reliability and functionality, as technician you are requested to test the computer system.

Checklist

Criteria	Indicators	Observation	
		Yes	No
Software is properly tested.	1.1 Comprehensive test plan is properly created		
	1.2 Test cases are effectively prioritized		
	1.3 System functionality/System performance/ System stress test are correctly used		
	1.4 Test Results are properly documented		
	1.5 Continuously Improve Testing Processes		
	1.6 Comprehensive test plan is effectively Created		



Learning outcome 1 end assessment

Written assessment

I. Circle the letter that corresponds to the correct answer.

1. A workplace in computer refurbishment typically refers to:

- a) A facility where computers are manufactured.
- b) A place where people work on their personal computers.
- c) A place where used or damaged computers are repaired and resold.
- d) A facility where computer parts are sold.

Answer: C

2. PPE is primarily used to:

- a) Protect employees from workplace hazards.
- b) Enhance computer performance.
- c) Improve employee productivity.
- d) Make the workplace more aesthetically pleasing.

Answer: A

3. The main goal of ergonomic design in ICT is to:

- a) Create a visually appealing workplace.
- b) Increase computer speed.
- c) Reduce the risk of discomfort and injury for users.
- d) Make computers more expensive.

Answer: C

4. Safety in a computer workplace refers to:

- a) Preventing accidents and injuries.
- b) Ensuring computers are always working.
- c) Making the workplace more comfortable.
- d) Increasing computer sales.

Answer: A

5. Proper waste disposal in a computer workplace helps to:

- a) Prevent accidents.
- b) Improve computer performance.
- c) Reduce the risk of attracting pests.
- d) Make the workplace more colourful.

Answer: C

6. Which of the following is considered as the brain of the computer?

- a) Motherboard
- b) RAM
- c) CPU
- d) BIOS chip

Answer: C

7. A device that allows entering data and instruction into a computer system is called

- a) Interaction
- b) Terminal
- c) Communication
- d) Input

Answer: D

8. Which of the following are not input devices?

- a) Keyboard, trackball, light pen
- b) Barcode reader, OMR, OCR, MICR
- c) Biometric sensor, scanner, Mic
- d) Plotter, projector, headphones

Answer: D

9. Microsoft Word, Microsoft Excel, and Google Docs are the examples of

- a) an operating software
- b) System software
- c) Utility software
- d) Application software

Answer: D

II.TRUE OR FALSE QUESTIONS:

1. Computer hardware refers to the intangible components of a computer system.

ANSWER: **False**

2. Software is considered a type of hardware

ANSWER: **False**

3. System software helps run applications.

ANSWER: **True**

4. Word processing and games are examples of system software.

ANSWER: **False**

5. The CPU is often referred to as the "brain" of the computer.

ANSWER: **True**

6. Expansion cards can be used to add features like sound or networking capabilities.

ANSWER: **True**

9. A keyboard is an output device.

ANSWER: **False**

10. A webcam is used to capture video input.

ANSWER: **True**

11. A printer is an input device.

ANSWER: **False**

12. Speakers are used to output audio signals.

ANSWER: **True**

13. It is not safe to disassemble a computer while it is still plugged into the power source.

ANSWER: **False**

14. Static electricity can damage internal components of a computer, such as the RAM or motherboard.

ANSWER: **True**

15. It is not okay to skip installing thermal paste between the CPU and the heatsink, as it is essential for proper cooling.

ANSWER: **False**

16. It is important to update drivers after installing new hardware in a computer.

ANSWER: **True**

17. Cleaning dust from computer components can improve the overall performance of the system.

ANSWER: **True**

Practical assessment

XYZ is a refurbishing company wants to perform computer system renovation to their computers to improve performance, enhance security and ensure compatibility with modern software and hardware to their computer system. The renovation will involve Setting Working Place, Selection of Computer system components, Selection of Tools, materials and equipment, Disassembling Computer system, Installation of New hardware component, Assembling Computer system, Installation of Computer system drivers and software, Perform computer system test.

Checklist:

Criteria	Indicators	Observation	
		Yes	No
Computer system renovation is properly performed.	1.1 Workplace is set		
	1.2 Computer system components are selected		
	1.3 Tools, materials and equipment are selected		
	1.4 Computer system is disassembled		
	1.5 New hardware component is installed		



Further information to the trainer

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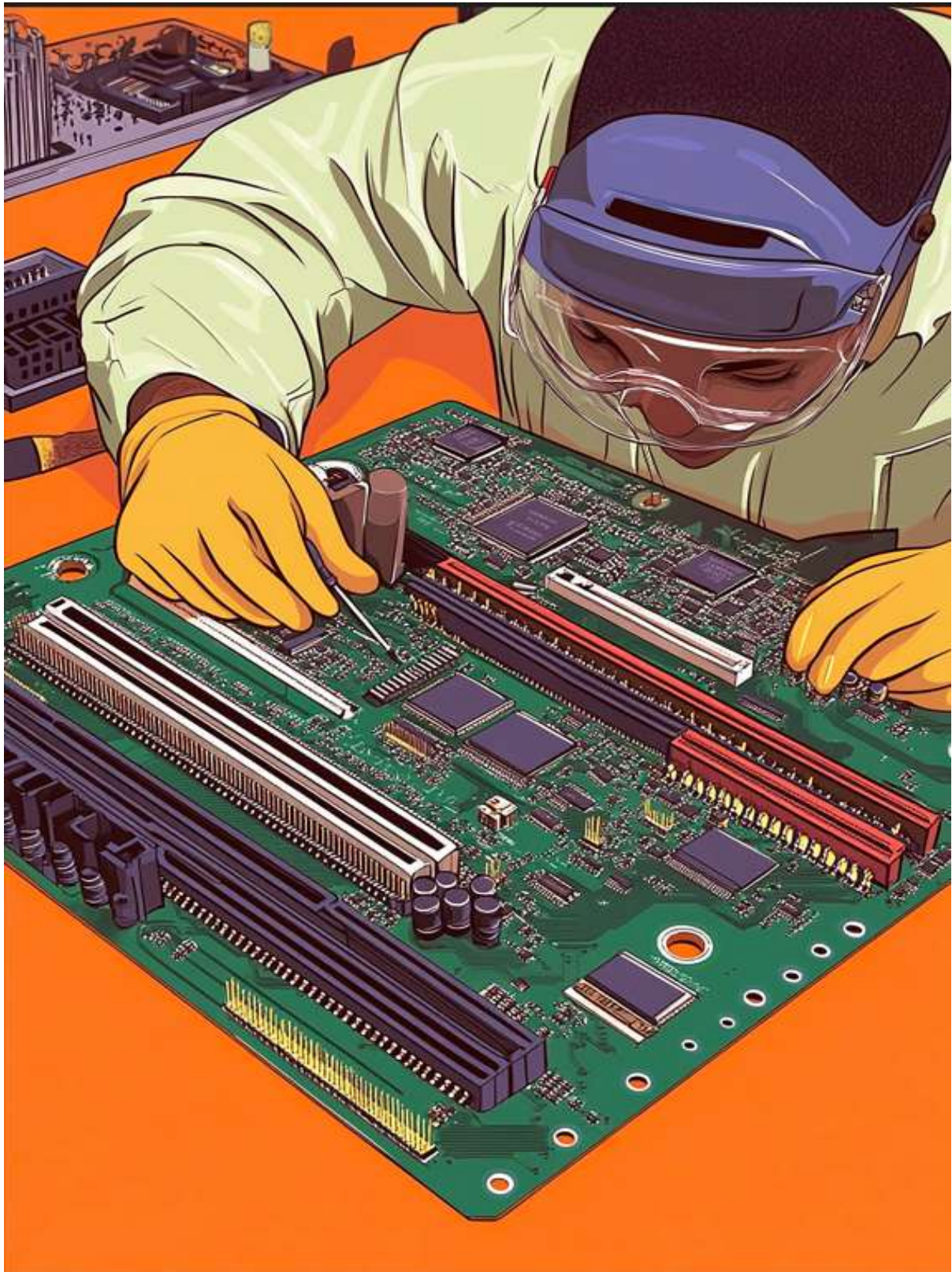
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Learning Outcome 2: Perform Computer System Restoration



Indicative Contents

2.1 Perform Computer System Motherboard Troubleshooting

2.2 Perform Computer System Software Troubleshooting

2.3 Perform Computer System Testing

Key Competencies for Learning Outcome 2 : Perform Computer System Restoration

Knowledge	Skills	Attitudes
• Description of computer system motherboard • Identification of common faults of motherboard	• Assembling computer system motherboard • Performing repair computer system motherboard • Performing computer system software troubleshooting • Performing computer system testing	• Being Innovative • Having organization • Having safety First • Having flexibility • Having time Management • Being Problem Solving • Being Self-motivated • Being Detail-oriented



Duration: 30hrs

Learning outcome 2 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Describe correctly computer system motherboard based on computer system functionality
2. Describe correctly common faults of motherboard based on computer system functionality

3. Identify appropriately faults of motherboard based on computer system functionality
4. Perform correctly repair computer system motherboard according to the faults of motherboard
5. Test appropriately computer system motherboard component based on computer system functionality
6. Assemble correctly computer system motherboard based on computer system functionality
7. Perform correctly Computer system software troubleshooting based on computer system functionality
8. Perform correctly computer system testing based on computer system functionality



Resources

Equipment	Tools	Materials
- Power supply tester - Multi-meter - Anti-static mat - SMD rework station - Blower	- Tweezers - Screwdrivers - Soldering iron - Desoldering pump - Flashlight or headlamp - Needle-nose pliers - Wire cutter/striper	- Anti-static wrist strap/mat - Thermal paste - Isopropyl alcohol and cotton swabs - Soldering wire (tin) - Labelling materials - Spare screws - Soldering paste - Electrical tape and zip ties - Desoldering wick



Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Have working place
- Avail tools and equipment must be organized

Needle-nose pliers



Indicative content 2.1: Perform Computer System Motherboard Troubleshooting



Duration: 15 hrs



Theoretical Activity 2.1.1: Description of computer system motherboard



Notes to the trainer:

- May use small groups for describing computer system motherboard.
- Avail real/sample image of motherboard to be used as didactic material.



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the activity and ask trainees to answer the following questions:

- I. Define computer system motherboard
- II. Explain the Main components of computer system motherboard and their function
- III. State Interconnections and Communication of computer system on the motherboard components
- IV. What are computer system motherboard technologies

Step2. Ask trainees to write the answers on provided flipchart/paper.

Step3. Ask trainees to present their findings to the whole class

Step4. Provide expert view for more clarification

Step5. Address any questions or concerns.

Step6. Ask trainees to read the Key readings 2.1.1 in their manuals.



Points to Remember

- Motherboard is Printed Circuit Board. It serves as the backbone of the system, connecting all the components together and facilitating communication between them.
- The main components of a motherboard include: Processor socket, Memory slots, Expansion slots, Chipset, Southbridge, BIOS (Basic Input/Output System), Power supply connector, I/O ports

- The interconnection and communication on the motherboard are: CPU-to-RAM communication, Expansion card communication, I/O device communication, Storage device communication, Chipset to RAM, CPU to Chipset
- Computer system motherboard technologies are: Form Factors, Chipset Advancements, Storage Connectivity, Connectivity and Ports



Theoretical Activity 2.1.2: Identification of common faults of motherboard



Notes to the Trainer:

While delivering this activity, pass through the following steps:

- May use small group to identify the common faults of computer system motherboard
- Avail crashed motherboard.



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the activity and ask trainees to answer the following questions:

- I. What are the common faults categories on motherboard
- II. Describe computer system unit testing.

Step2. Ask trainees to write the answers on provided flipchart/paper.

Step3. Ask trainees to present their findings to the whole class

Step4. Provide expert view for more clarification

Step5. Address any questions or concerns.

Step6. Ask trainees to read the Key readings 2.1.2 in their manuals.



Points to Remember

- There are categories of Faults in computer system Motherboards such as: Hardware Faults and Software faults.
- In computer system Hardware-Related Faults are: Component Failures, Loose Connections, Physical Damage, Power Supply Issues
- In computer system Software-Related Faults: BIOS Errors, Driver Conflicts, Malware or Viruses



Theoretical Activity 2.1.3: Description of repair computer system motherboard



Notes to the trainer:

- May use small group to describe repair computer system motherboard
- Avail sample image/real motherboard.

While delivering this activity, pass through the following steps:



Key steps:

While delivering this activity, pass through the following steps:

Step1.Introduce the activity and ask trainees to answer the following questions:

- I. What do you mean of computer system tracer repair?
- II. Differentiate Soldering and desoldering computer system motherboard
- III. What are the components board level repair of PCB
- IV. What are the components for testing on the motherboard of the computer
- V. What are the components needed for assembling computer system motherboard

Step2.Ask trainees to write the answers on provided flipchart/paper.

Step3.Ask trainees to present their findings to the whole class

Step4.Provide expert view for more clarification

Step5.Address any questions or concerns.

Step6.Ask trainees to read the Key readings 2.1.3 in their manuals.



Points to Remember

- Computer trace repair is the process of repairing damaged or broken conductive traces on a printed circuit board (PCB).
- There is different between soldering and desoldering computer system motherboard where Soldering involves applying molten solder to the joints between electrical components and heating transistors to create a permanent bond. While Desoldering is the process of removing solder from a joint.
- There are the Components board level repair on PCB such as: Diodes, Capacitor, inductor, IC, Voltage Regulators, Transistors, etc.
- Components testing through to motherboard are: Power Supply, CPU, RAM, Storage Devices, Expansion Cards, cooling system, I/O Ports etc.

- Components needed to assemble motherboard are: CPU, RAM, Storage Devices, Expansion Cards etc.



Practical Activity 2.1.4 Perform computer system motherboard troubleshooting



Notes to the trainer

- This activity should take place in workshop where the trainees will troubleshoot computer system motherboard
- Avail all components of motherboard.



Key steps:

While delivering this activity, pass through the following steps:

Step 1. Introduce the topic and ask trainees do the task described below:

As a computer hardware technician, you are asked to go to the workshop to troubleshoot computer system motherboard.

Step 2: Explain the task and provide clear work instruction.

Step 3: Demonstrate how to troubleshoot computer computer system motherboard. While demonstrating, explain the steps to follow.

Step 4: Ask learners to troubleshoot computer system motherboard and monitor the procedures.

Step 5: Verify whether the computer system testing, repair computer system motherboard assembling computer system motherboard are correctly performed.

Step 6: Ask trainees to read key reading 2.1.4.



Points to Remember

Troubleshooting a computer motherboard can be a systematic process, as issues can arise from various components. Here's a step-by-step guide to help you through the troubleshooting process:

1. Preparation
2. Power Supply Check:
3. Basic Boot Test

4. Check the CPU:
5. Check for Short Circuits
6. Test I/O Port



Practical Activity 2.1.5: Assembling computer system motherboard



Notes to the trainer

- This activity should take place in workshop where trainees should perform assembling of computer system motherboard.
- Avail all components of motherboard
- Avail PC toolkit



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the topic and ask trainees do the task described below:

As computer system technician you are requested to go to the workshop to assemble the computer system motherboard.

Step2. Explain the task and provide clear work instruction.

Step3. Demonstrate all steps how to assemble computer system motherboard. While demonstrating, explain the steps to follow.

Step4. Ask learners to assemble computer system motherboard and monitor the procedures.

Step5. Verify whether the assembling of computer system motherboard is correctly performed.

Step6. Ask trainees to read key reading 2.1.5.

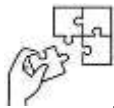


Points to Remember

To assemble motherboard, follow these steps:

1. Prepare Your Workspace
2. Install the Processor
3. Install the RAM Modules
4. Attach the CPU Cooler

5. Connect Power Cables
6. Install Expansion Cards (Optional)
7. Mount the Motherboard in the Case
8. Connect Storage Devices
9. Connect Other Peripherals



Application of learning 2.1.

The IT department receives a service request from an employee whose workstation will not boot. Initial checks reveal potential motherboard issues. You are requested to troubleshoot the motherboard to Perform repair computer system motherboard, assembling computer system motherboard and, if necessary, repair or replace it to get the workstation back up and running.

Checklist

Criteria	Indicator	Observation	
		Yes	No
1.Computer system motherboard troubleshooting is properly Performed	1.1 Preparation is done		
	1.2 Power Supply Check is done		
	1.3 Basic Boot Test is done		
	1.4 Checking the CPU is done		
	1.5 Checking for Short Circuits is done		
	1.6 Repair computer system motherboard is performed		
	1.7 Motherboard is assembled		



Indicative content 2.2: Perform Computer System Software Troubleshooting



Duration: 10 hrs



Theoretical Activity 2.2.1: Description of computer system software



Notes to the trainer:

- May use small group to describe software troubleshooting of computer system
- Avail computers.



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the activity and invite the trainees to respond to the following questions.

Define the following term:

- Data Recovery
- Common faults
- Factory reset
- Restoration of operating system
- Upgrading hardware Firmware
- Computer system unit testing

Step2. Ask trainees to write the answers on provided flipchart/paper.

Step3. Ask trainees to present their findings to the whole class

Step4. Provide expert view for more clarification

Step5. Address any questions or concerns.

Step6. Ask trainees to read the Key readings 2.2.1 in their manuals.



Points to Remember

- Identify the Common Faults involves diagnosing frequent issues in software systems, such as bugs, compatibility problems, and performance bottlenecks.
- Data recovery refers to the process of retrieving lost or corrupted data from storage devices.
- A factory reset restores a device to its original settings by erasing all data and installed applications.

- Restoration of Operating System is the process involves reinstalling or reverting the operating system to a previous state to fix errors or enhance performance.
- Upgrading firmware involves updating the software that controls hardware components.
- Unit testing evaluates individual components of a computer system to ensure they function correctly.



Practical Activity 2.2.2: Performing data recovery on computer system



Notes to the trainer

- This activity should take place in a computer lab where trainees should recover data.
- Avail software used in recovery.
- Avail Computer



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the topic and ask trainees do the task described below:

As a computer hardware technician, you are asked to go to the computer lab perform data recovery.

Step2. Explain the task and provide clear work instruction.

Step3. Demonstrate how to recover data, while demonstrating, explain the steps to follow.

Step4. Ask learners to recover data on PC and monitor the procedures.

Step5. Verify whether data recovery is correctly performed.

Step6. Ask trainees to read key reading 2.2.2



Points to Remember

- Here are the general steps to follow for effective data recovery:
 1. Assess the Situation
 2. Choose a Data Recovery Method
 3. Download and Install Recovery Software
 4. Run the Data Recovery Software
 5. Review the Scan Results

6. Recover the Files
7. Verify Recovered Data
8. Backup Important Data
9. Consider Professional Help (if needed)



Practical Activity 2.2.3: Performing factory reset



Notes to the trainer

- This activity should take place in a computer lab where trainees should perform factory reset on pc
- Avail software used to reset
- Avail Computer



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the topic and ask trainees do the task described below:

As a computer hardware technician, you are asked to go to the computer lab perform factory reset.

Step2. Explain the task and provide clear work instruction.

Step3. Demonstrate how to perform factory reset. While demonstrating, explain the steps to follow.

Step4. Ask learners to perform factory reset and monitor the procedures.

Step5. Verify whether the factory reset is correctly performed.

Step6. Ask trainees to read key reading 2.2.3.



Points to Remember

Steps to perform factory reset:

1. Open Settings
2. Go to Recovery Options
3. Choose "Reset this PC
4. Choose Reset Option
5. Cloud Download or Local Reinstall
6. Confirm and Begin Reset:

7. Wait for the Process to Complete



Practical Activity 2.2.4: Restoring operating system.

Notes to the trainer

- This activity should take place in a computer lab where trainees should restore operating system.
- Avail software system (Windows, LINUX)
- Avail computer.



Key steps:

While delivering this activity, pass through the following steps:

Step1.Introduce the topic and ask trainees do the task described below:

- i. As a computer hardware technician, you are asked to go to the computer lab to restore operating system.

Step2.Explain the task and provide clear work instruction.

Step3. Demonstrate how to restore operating system. While demonstrating, explain the steps to follow.

Step4. Ask learners to restore operating system and monitor the procedures.

Step5. Verify whether the restoring operating system is correctly performed.

Step6.Ask trainees to read key reading 2.2.4.



Points to Remember

- **Steps to restore operating system.**
 1. Backup Your Data:
 2. Open Settings:
 3. Go to Update & Security
 4. Select Backup
 5. Restore Files



Practical Activity 2.2.5: Upgrading firmware



Notes to the trainer

- This activity should take place in a computer lab where trainees should upgrade firmware
- Avail firmware software.
- Avail computer hardware component.



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the topic and ask trainees do the task described below:

- i. As a computer hardware technician, you are asked to go to the computer lab to upgrade firmware on PC.

Step2. Explain the task and provide clear work instruction.

Step3. Demonstrate how to upgrade firmware. While demonstrating, explain the steps to follow.

Step4. Ask learners to upgrade firmware and monitor the procedures.

Step5. Verify whether the upgrading firmware is correctly performed.

Step6. Ask trainees to read key reading 2.2.5.



Points to Remember

- **Steps for upgrading firmware**
 1. Check for updates
 2. Download the update
 3. Prepare your PC
 4. Start the update
 5. Monitor the process
 6. Verify the update



Application of learning 2.2

IT support team receives a help desk ticket from an employee who reports that their computer is running slowly, frequently freezing, and that some applications aren't responding. You are requested to identify common faults, perform data recovery, perform factory reset, restore operating system, and perform firmware upgrade for resolving it to improve the computer's performance and functionality.

Checklist

Criteria	Indicator	Observation	
		Yes	No
Computer system motherboard software is properly Performed	1.1 Common faults are identified		
	1.2 Data recovery is performed		
	1.3 Factory reset is performed		
	1.4 Operating system is restored		
	1.5 Firmware is upgraded		



Indicative content 2.3: Perform Computer System Testing



Duration: 5hrs



Theoretical Activity 2.3.1: Description of computer system software and hardware testing



Notes to the trainer:

- Involves the trainees in group and ask them to perform computer system testing based on hardware and software.



Key steps:

While delivering this activity, pass through the following steps:

Step1.Introduce the activity and invite the trainees to respond the following questions.

- I. Describe hardware testing.
- II. Describe software testing

Step2 Ask trainees to write answers provided on flipchart/paper.

Step3 Ask trainees to present their findings to the whole class

Step4.Provide expert view for more clarification

Step5.Address any questions or concerns.

Step6.Ask trainees to read the Key readings 2.3.1 in their manuals.



Points to Remember

- Hardware testing involves checking the physical components of a computer system for functionality, performance, and compatibility.
- Software testing focuses on the applications, operating system, and other software components, ensuring they work correctly and interact seamlessly.



Practical Activity 2.3.2: Testing Computer system hardware



Notes to the trainer

- This activity should take place in a computer workshop where trainees should be test computer system hardware.
- Avail computer hardware component.



Key steps:

While delivering this activity, pass through the following steps:

Step1.Introduce the topic and ask trainees do the task described below

As a computer technician, you are requested to test computer system hardware.

Step2.Explain the task and provide clear work instruction.

Step3.Demonstrate how to test computer system hardware. While demonstrating, explain the steps to follow.

Step4.Ask learners test hardware computer system and monitor the procedures.

Step5.Verify whether the testing hardware computer system is correctly performed.

Step 6. Ask trainees to read key reading 2.3.2.



Points to Remember

- Steps to Perform Computer system Hardware Testing
 1. Preparation
 2. Check Power Supply
 3. Run POST (Power-On Self-Test)
 4. Test RAM
 5. Check Hard Drive
 6. Run System Diagnostics



Practical Activity 2.3.3: Testing computer system software



Notes to the trainer

- This activity should take place in a computer workshop where trainees should be test computer system software
- Avail computer.



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the topic and ask trainees do the task described below

As a computer technician, you are requested to test computer system software

Step2. Explain the task and provide clear work instruction.

Step3. Demonstrate how to test computer system software. While demonstrating, explain the steps to follow.

Step4. Ask learners test software and monitor the procedures.

Step5. Verify whether test computer system software is correctly performed.

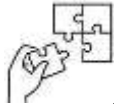
Step6. Ask trainees to read key reading 2.3.3.



Points to Remember

While performing computer system software testing pass through the following steps:

1. Planning the Testing Process
2. Requirements Analysis
3. Design Test Cases
4. Set Up the Testing Environment
5. Execute Test Cases
6. Verify and Validate
7. Performance Testing
8. User Acceptance Testing (UAT)



Application of learning 2.3

ABC Innovations Inc. aims to deliver a reliable and high-performing TechBook Pro laptop to its customers. The results from both testing phases will guide final adjustments and improvements before the product launch, ensuring a positive user experience and reducing post-launch issues. As technicians you required for solving a testing both the hardware and software components, the technician can effectively diagnose and resolve the computer's performance issues, ensuring customer satisfaction.

Checklist

Criteria	Indicators	Observation	
		Yes	No
Software is properly tested.	1.1 Test cases are designed		
	1.2 Test cases are executed		
	1.3 Testing is performed		



Learning outcome 2 end assessment

Written assessment

I. Choose or cycle the right answer

1. What is the primary function of a motherboard in a computer system?

- A. It stores data and programs.
- B. It processes information.
- C. It connects all the components of the computer.
- D. It displays output on the screen.

Answer: C

2. Which of the following components is typically not directly connected to the motherboard?

- A. CPU
- B. RAM
- C. Power Supply Unit (PSU)
- D. Monitor

Answer: D

3. What is the term for the expansion slots on a motherboard that allow for additional components like graphics cards or sound cards?

- A. Ports
- B. Sockets
- C. Buses
- D. Slots

Answer: D

4. Which of the following factors is most important when choosing a motherboard for a computer build?

- A. Color
- B. Brand
- C. Compatibility with other components
- D. Weight

Answer: C

5. What is the chipset on a motherboard responsible for?

- A. Controlling the flow of data between components
- B. Providing power to the motherboard
- C. Storing BIOS settings

- D. Displaying information on the screen

Answer: A

6. Which type of motherboard is typically used in laptops?

- A. ATX
- B. Micro-ATX
- C. Mini-ITX
- D. BTX

Answer: C

7. Which component is responsible for connecting the motherboard to other devices like keyboards and mice?

- A. CPU
- B. RAM
- C. I/O ports
- D. BIOS

Answer: C

8. What is the difference between a socket and a slot on a motherboard?

- A. Sockets are for larger components, while slots are for smaller ones.
- B. Sockets are used for connecting cables, while slots are for inserting cards.
- C. Sockets are for connecting the CPU, while slots are for connecting RAM.
- D. There is no difference between sockets and slots.

Answer: C

9. Which of the following is not a type of bus used in computer systems?

- A. PCI Express (PCIe)
- B. Serial ATA (SATA)
- C. Universal Serial Bus (USB)
- D. Parallel ATA (PATA)

Answer: A

10. What is the term for the physical connections between components on a motherboard?

- A. Buses
- B. Sockets
- C. Slots
- D. Ports

Answer: A

11. Which component is typically the last to be connected to the motherboard after it is installed in the case?

- A. CPU

- B. Storage drives
- C. Graphics card

D. Power Supply Unit (PSU)

12. What should be done after completing the assembly of the motherboard to ensure proper functionality?
- A. Install the operating system
 - B. Test the system by booting it up
 - C. Clean the case and components

D. All of the above

13. If a component is not functioning correctly after assembly, what is the first step to troubleshoot the issue?
- A. Replace the component.
 - B. Check the connections**
 - C. Update the BIOS
 - D. Install a new operating system
14. What is the best way to prevent electrostatic discharge (ESD) damage when handling motherboard components?
- A. Wear an ESD wrist strap
 - B. Ground yourself before touching components
 - C. Avoid touching components with bare hands
 - D. All of the above**

II. fill the empty space.

I) _____ is a type of bus used for connecting expansion cards like graphics cards and sound cards.

Answer: PCI Express (PCIe)

II) The _____ form factor is the most common standard for motherboards used in desktop computers. **Answer: ATX**

III) _____ motherboards combine multiple components, such as the CPU, GPU, and memory, onto a single chip.

Answer: System on a Chip (SoC)

IV) _____ technology helps to improve the efficiency and reduce the power consumption of the motherboard. **Answer: Power Deliver**

III Match the fault in Column A with its corresponding description in Column B.

Column A	Column B	answer
A. BIOS corruption	I) Damaged or lose power supply connections	A =II
B. Overheating	II) Incorrect BIOS settings or firmware updates	B =III
C. Short circuit.	III) Excessive heat causing component failure	C=IV
D. Power supply issues	Faulty components or damaged traces on the motherboard	D=I

IV Match the testing method in Column A with its corresponding description in Column B.

Column A	Column B	answer
1.Black-box testing	A. Testing based on the internal structure and design of the system	
2.White-box testing	B. Testing based on the specified input and expected output of the system	
3. Integration testing	C. Testing individual components of the system in isolation	
4.System testing	D. Testing the entire system as a whole	
5.Regression testing	E. Testing to ensure that changes to the system have not introduced new bugs.	
	F. Testing to ensure that changes to the system have not introduced new bugs	

V. Answer the following statements by “True” if it is correct or “False” if it is incorrect

- a) Soldering is the process of joining two or more pieces of metal using a heated metal alloy called metal cutter. **False**
- b) Desoldering is the process of removing solder from a joint. **True**
- c) Using a thermal paste to improve heat dissipation can help prevent motherboard failure. **True**
- d) It is always necessary to remove the motherboard from the computer case before soldering or desoldering components. **True**
- e) Solder flux helps to clean the metal surfaces before soldering and prevents oxidation. **True**

Practical assessment

You have been asked to set up Computer system refer to hardware and software maintenance in **XYZ computer lab**. The users will not be using the computers because they have some issues relates to motherboard issues and software upgrading on system operating system or software not update. **XYZ** have been hired by a company, **ABC Solutions Inc.**, to solve those problem in order to perform in good condition as Desoldering motherboard, soldering motherboard, assembling motherboard, reinstall, upgrade firmware, and update any application on computer system

Checklist:

Criteria	Indicators	Observation	
		Yes	No
Computer system restoration is Performed	1.1 Computer system motherboard troubleshooting is performed		
	1.2 Computer system software troubleshooting is performed		
	1.3 Computer system testing is Performed		

END



Further information to the trainer

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Learning Outcome 3: Perform Computer System Conversion



Indicative Contents

3.1 Identification of Computer System Transformation Requirement

3.2 Applying Computer System Transformation Techniques

3.3 Assembling New Computer System

3.4 Perform Computer System Test

3.5 Elaboration of System Report

Key Competencies for Learning Outcome 3: Perform Computer System Conversion

Knowledge	Skills	Attitudes
• Description of computer system transformation • Description of computer system components • Description of Computer system transformation techniques • Description of computer system test	• Using Computer system transformation techniques • Assembling new computer system • Performing computer system testing • Elaborating System report	• Being Innovative • Having organization • Having safety First • Having time Management • Being Problem Solving • Being Self-motivated • Being Detail-oriented



Duration: 20hrs

Learning outcome 3 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Describe correctly computer system transformation based on computer system functionality.
2. Identify appropriately computer system components based on repurposing goals.

3. Identify appropriately computer system transformation techniques based on computer system functionality.
4. Describe correctly computer system test based on system expected functionality.
5. Apply properly Computer system transformation techniques based on intended use.
6. Assemble properly new computer system based on repurposing goals.
7. Perform successfully System testing based on system expected functionality.
8. Elaborate effectively Refurbishment report based on work done



Resources

Equipment	Tools	Materials
• Power supply tester • Oscilloscope • Multi-meter • Function generator • Anti-static mat • SMD rework station • Blower	• Tweezers • Screwdrivers • Soldering iron • Desoldering pump • Flashlight or headlamp • Needle-nose pliers • Wire cutter/striper	• Anti-static wrist strap/mat • Thermal paste • Isopropyl alcohol and cotton swabs • Soldering wire (tin) • Labelling materials • Spare screws • Soldering paste • Electrical tape and zip ties • Desoldering wick



Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Have working place
- Having computer component not functioning



Indicative content 3.1: Identify Computer System Transformation Requirements



Duration: 4hrs



Theoretical Activity 3.1.1: Description of computer system transformation



Notes to the trainer:

- May use small groups for describing computer system transformation.



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the activity and ask trainees to answer the following questions:

- I. Define computer system transformation
- II. Describe the purpose computer system transformation
- III. What are the computer system technologies?
- IV. Identify computer system components

Step2. Ask trainees to write the answers on provided flipchart/paper.

Step3. Ask trainees to present their findings to the whole class

Step4. Provide expert view for more clarification

Step5. Address any questions or concerns.

Step6. Ask trainees to read the Key readings 3.1.1 in their manuals.



Points to Remember

- A computer system transformation refers to a significant change or upgrade to the infrastructure, architecture, or functionality of a computer system.
- Purpose of Computer System Transformation are: improving Performance , Enhancing Security, Increasing Scalability, Cost Efficiency, Facilitating Innovation
- The computer system technologies can be broadly categorized into: Computer System Hardware Technologies, Computer System Software Technologies and Computer System Network Technologies
- Computer system components are classified based on: Hardware Components and software components.



Indicative content 3.2: Applying Computer System Transformation Techniques



Duration: 4hrs



Theoretical Activity 3.2.1: Identification of computer system transformation techniques



Notes to the trainer:

- May use small groups for identifying computer system transformation.



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the activity and ask trainees to answer the following questions:

- What are the categories of Computer system transformation techniques
- Where are computer system transformation techniques applied?

Step2. Ask trainees to write the answers on provided flipchart/paper.

Step3. Ask trainees to present their findings to the whole class

Step4. Provide expert view for more clarification

Step5. Address any questions or concerns.

Step6. Ask trainees to read the Key readings 3.2.1 in their manuals.



Points to Remember

- There are categories of computer system transformation techniques which are: software based, hardware based, networking and connectivity, Hybrid.
- Computer system transformation can be applied in enterprise IT infrastructure, software development, healthcare, finance and banking, retail and E-commerce, manufacturing, telecommunication, education etc.



Practical Activity 3.2.2: Applying computer system transformation techniques



Notes to the trainer

- This activity should take place in workshop where the trainees will apply computer system transformation techniques.
- Avail computer connected to the internet



Key steps:

While delivering this activity, pass through the following steps:

Step1.Introduce the activity and ask trainees to do the task described below:

As a technician, you are asked to apply computer system transformation techniques.

Step2.Explain the task and provide clear work instruction.

Step3.Demonstrate how to apply computer system transformation techniques, while demonstrating, explain the steps to follow.

Step4. Asks trainees to apply computer system transformation techniques and monitor the procedures.

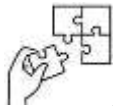
Step5.Verify whether categories of computer system transformation techniques are correctly used.

Step6.Ask trainees to read key reading 3.2.2.



Points to Remember

- While using computer system transformation techniques involves a structured approach to transitioning from one system or architecture to another.
- Here are the key steps to effectively implement this process:
 1. Assessment and Planning,
 2. Select Transformation Techniques,
 3. Create a Detailed Plan,
 4. Design the New System,
 5. Implementation,
 6. Training and Change Management,
 7. Deployment,
 8. Post-Implementation Review



Application of learning 3.2.

ABC Solutions Inc. is a mid-sized technology consulting firm that provides IT services and software solutions to clients across various industries. The company has been experiencing rapid growth, leading to challenges in managing its internal systems, workflows, and customer relationships. To address these challenges, ABC Solutions is requesting you as technician to implement various computer system transformation techniques.

Checklist:

Criteria	Indicators	Observation	
		Yes	No
The computer system transformation techniques are effectively used	1.1 Assessment and Planning is properly established		
	1.2 Transformation Techniques are effectively Selected		
	1.3 Detailed Plan is correctly Created		
	1.4 New System is correctly Designed		
	1.5 Implementation is correctly done		
	1.6 Deployment is done		
	1.7 post-implementation is properly Reviewed		



Indicative content 3.3: Assembling New Computer System



Duration: 4 hrs



Practical Activity 3.3.1: Assembling new computer system



Notes to the trainer

- This activity should take place in workshop where the trainees will assemble new computer system.
- Avail tool box
- Avail new components to be used as didactic material



Key steps:

While delivering this activity, pass through the following steps:

Step1.Introduce the activity and ask trainees to do the task described below:

As a technician, you are asked to assemble new computer system.

Step2.Explain the task and provide clear work instruction.

Step3.Demonstrate how to new assemble computer system, while demonstrating, explain the steps to follow.

Step4.Asks trainees to new assemble computer system and monitor the procedures.

Step5.Verify whether assembling precautions are performed correctly.

Step6.Ask trainees to read key reading 3.3.1



Points to Remember

- **Steps to assemble a new computer system**
 1. Gather Your Components
 2. Prepare Your Workspace
 3. Install the CPU
 4. Install the CPU Cooler
 5. Install the RAM
 6. Install the Motherboard into the Case
 7. Install the Storage Devices

8. Install the Graphics Card (if applicable)
9. Install the Power Supply Unit
10. Connect Peripherals
11. Power On and Test



Application of learning 3.3.

As a technician in a technical institution, you are requested to assemble a new computer system. And you must follow the institution's safety protocols and assembling precautions to avoid damaging components and ensure a successful build.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	1.Assembling Precaution respected is	1.1 Gather Your Components		
		1.2 The Workspace is well Prepared		
		1.3 CPU is correctly installed		
		1.4 CPU Cooler is correctly Installed		
		1.5 RAM is correctly Installed		
2	2.Assembling procedure followed is	2.1 Motherboard into the Case is correctly Installed		
		2.2 Storage Devices are properly Installed		
		2.3 Power Supply Unit is properly installed		
		2.3 Assembling precautions are effectively respected		



Indicative content 3.4: Perform Computer System Test



Duration: 4hrs



Theoretical Activity 3.4.1: Description of computer system test



Notes to the trainer:

- Trainer may avail installed computer



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the activity and ask trainees to answer the following questions:

Provide clear explanation about:

- i. System Compatibilities
- ii. System performance
- iii. System functionality

Step2. Ask trainee to write answers provided on flipchart/paper.

Step3. Ask trainees to present their findings to the whole class

Step4. Provide expert view for more clarification

Step5. Address any questions or concerns.

Step6. Ask trainees to read the key reading 3.4.1 in the trainee manual.



Points to Remember

- **Computer system testing** is a systematic process of evaluating a computer system to ensure that it meets specified requirements and performs as intended.
- **System compatibility** refers to the ability of different components within a computer system to work together seamlessly.
- **System performance** refers to how well a computer system performs tasks.



Practical Activity 3.4.2: Performing computer system testing



Notes to the trainer

- This activity should take place in workshop where the trainees will test computer system.
- Avail working computers



Key steps:

While delivering this activity, pass through the following steps:

Step1.Introduce the activity and ask trainees to do the task described below:

As computer technician you are requested to go to the workshop to Perform computer system testing.

Step2.Explain the task and provide clear work instruction.

Step3.Demonstrate how to test computer system, while demonstrating, explain the steps to follow.

Step4.Asks trainees to test computer system and monitor the procedures.

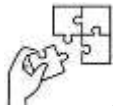
Step5.Verify whether compatibility, performance and functionality are performed correctly.

Step6.Ask trainees to read key reading 3.4.2.



Points to Remember

- While performing computer system testing pass through the following steps:
 1. Planning the Testing Process
 2. Requirements Analysis
 3. Design Test Cases
 4. Set up the Testing Environment
 5. Execute Test Cases
 6. Verify and Validate
 7. Performance Testing
 8. User Acceptance Testing (UAT)
 9. Final Review and Sign-Off



Application of learning 3.4.

ABC Company, after assembling their new computer system, you are requested by ABC Company to perform a series of tests to ensure that all components are functioning properly.

Checklist:

Criteria	Indicators	Observation	
		Yes	No
Computer system is effectively tested	1.1 Testing Objectives are effectively defined		
	1.2 Test Plan is effectively Developed		
	1.3 Test Cases is properly Identified		
	1.4 Testing Environment is properly Set up		
	1.5 Testing is correctly Performed		
	1.6 Results is properly Documented		
	1.7 Retesting and Regression are effectively Tested		
	1.8 Performance is properly Tested		
	1.9 Security is correctly Tested		
	1.10. Deployment and post-deployment is effectively Tested		



Indicative content 3.5: Elaboration of System Report



Duration: 4 hrs



Theoretical Activity 3.5.1: Description of computer system report



Notes to the trainer:

- Trainer may avail computers.



Key steps:

While delivering this activity, pass through the following steps:

Step1. Introduce the activity and ask trainees to answer the following questions:

What do you understand about the following:

- a. System report
- b. Status before maintenance
- c. Activity procedures
- d. Status after maintenance
- e. Conclusion and recommendation

Step2. Ask trainee to write answers provided on flipchart/paper.

Step3. Ask trainees to present their findings to the whole class

Step4. Provides expert view and clarifies ideas.

Step5. Address any questions or concerns.

Step6. Ask trainees to read the key reading 3.5.1 in the trainee manual.



Points to Remember

- A system report is a comprehensive document that provides detailed information about a system, including its configuration, components, and performance. It is often used to document the status of a system before and after maintenance or troubleshooting procedures.
- Status Before Maintenance this refers to the condition of the system prior to any maintenance or repair work. It includes a description of the problem or issue being addressed, any error messages or abnormal behavior, and the system's performance at the time.

- **Activity Procedures** these are the steps taken to address the problem or issue. They may involve hardware replacements, software updates, configuration changes, or other troubleshooting techniques.
- **Status After Maintenance** this describes the condition of the system after the maintenance or repair work has been completed. It includes information on whether the problem has been resolved, any improvements in system performance, and any remaining issues.
- **Conclusion and Recommendation** this section summarizes the overall outcome of the maintenance or repair work. It may include a statement of whether the problem was successfully resolved, any lessons learned from the experience, and recommendations for preventing similar issues in the future.



Practical Activity 3.5.2: Elaborating system report



Notes to the trainer

- This activity should take place in workshop where the trainees will elaborate the system report



Key steps:

While delivering this activity, pass through the following steps:

Step1.Introduce the topic and ask trainees do the task described below:

Elaborate the system report after fixing an issue arise in the computer system.

Step2.Explain the task and provide clear work instruction.

Step3.Demonstrate how to elaborate report. While demonstrating, explain the steps to follow.

Step4.Asks trainees to do the tasks and monitor the procedures.

Step5.Verify whether system report is elaborated correctly.

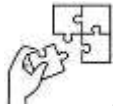
Step6.Ask trainees to read key reading 3.5.2



Points to Remember

- Here are the steps to create an effective computer system report:
 1. Define the Purpose and Scope
 2. Gather Information

3. Analyze the Resolutions
4. Organize the Report Structure
5. Draft the Report
6. Review and Revise
7. Finalize the Report



Application of learning 3.5

You are a computer technician working in AZ company, you are going to pass year in the mission outside the country and you finish to resolve the problem arises in the computer system, then you are requested to elaborate system report after resolving the issue successfully that might help other in your absence if the same issue arise.

Checklist:

Criteria	Indicators	Observation	
		Yes	No
System report elaboration	1.1 The Purpose and Scope is correctly defined.		
	1.2 Information are correctly gathered		
	1.3 Resolutions is correctly analysed		
	1.4 Report Structure is correctly organized		
	1.5 Draft the Report is effectively prepared		
	1.6 Review and Revise are properly performed		



Learning outcome 3 end assessment

Written assessment

I. Select the right answer

Q1. What is computer system transformation?

- A. The process of changing the physical appearance of a computer
- B. The act of upgrading a computer's hardware components
- C. The process of modifying a computer's software to improve its functionality
- D. The evolution of computer systems over time, encompassing hardware, software, and applications

Answer: D

Q2. Why do computer systems undergo transformation?

- A. To make them look more aesthetically pleasing
- B. To increase their processing power and efficiency
- C. To reduce their cost
- D. To make them obsolete

Answer: B

Q3. What technological advancement has had the most profound impact on computer system transformation?

- A. The invention of the transistor
- B. The development of the internet
- C. The creation of the first personal computer
- D. The discovery of electricity

Answer: A

Q4. Which of the following is not a safety precaution when assembling a computer?

- A. Wearing anti-static wristbands
- B. Using a grounded outlet
- C. Discharging static electricity by touching a metal object
- D. Working on a carpeted floor

Answer: D

Q5. Before installing components, you should:

- A. Clean them with a damp cloth
- B. Inspect them for damage
- C. Apply thermal paste to the processor

D. All of the above

Answer: B

Q6. If your system is not booting up, you should:

- A. Check the power supply connections
- B. Reseat the RAM modules
- C. Inspect the motherboard for damage
- D. All of the above

Answer: D

Q7. What is the primary purpose of documenting the system's status before maintenance?

- A. To identify potential issues or risks
- B. To evaluate the effectiveness of maintenance activities
- C. To provide a baseline for comparison after maintenance
- D. To document the system's configuration changes

Answer: C

Q8. Which of the following elements should be included in the "Status Before Maintenance" section of a system report?

- A. System performance metrics
- B. Maintenance history
- C. Future maintenance plans
- D. All of the above

Answer: A

Q9. What is the importance of documenting the activity procedures followed during maintenance?

- A. To ensure consistency and reproducibility
- B. To track the time spent on maintenance tasks
- C. To evaluate the effectiveness of maintenance personnel
- D. To document the system's configuration changes

Answer: A

Q10. Which of the following should be included in the "Activity Procedures" section of a system report?

- A. A detailed step-by-step guide
- B. A list of tools and equipment used
- C. The names of maintenance personnel involved
- D. All of the above

Answer: D

Q11. What is the purpose of documenting the system's status after maintenance?

- A. To identify potential issues or risks
- B. To evaluate the effectiveness of maintenance activities
- C. To provide a baseline for comparison before maintenance
- D. To document the system's configuration changes

Answer: B

Q12. Which of the following elements should be included in the "Status After Maintenance" section of a system report?

- A. System performance metrics
- B. Maintenance history
- C. Future maintenance plans
- D. All of the above

Answer: A

Q13. What is the primary goal of the "Conclusion and Recommendation" section of a system report?

- A. To summarize the key findings and provide actionable recommendations
- B. To document the system's configuration changes
- C. To evaluate the effectiveness of maintenance personnel
- D. To track the time spent on maintenance tasks

Answer: A

Q14. Which of the following elements should be included in the "Conclusion and Recommendation" section of a system report?

- A. An assessment of the maintenance activities' success
- B. Suggestions for future improvements
- C. A summary of any issues encountered
- D. All of the above

Answer: D

II. Read the following statement and respond by YES if it is correct or No if not

- I) Virtualization is a hardware-based technique for transforming computer systems. **NO**
- II) II)Firmware updates are a hybrid technique that involves both hardware and software components. **YES**
- III) III)Hardware upgrades, such as replacing a CPU or RAM, are a software-based technique for transforming computer systems. **NO**
- IV) Networking and connectivity techniques, like upgrading network infrastructure or implementing new protocols, can significantly impact computer system performance. **YES**

V) Hybrid techniques combine elements of software-based and hardware-based transformations to achieve optimal results. **YES**

III. Complete sentences using computer system transformation techniques: by using **Virtualization, Networking and connectivity techniques, improving productivity and communication, optimizing resource utilization.**

A) enables multiple operating systems to run simultaneously on a single physical server,

B)facilitate efficient data transfer and collaboration.....

Answer: A) **Virtualization** enables multiple operating systems to run simultaneously on a single physical server, **optimizing resource utilization.**

B) **Networking and connectivity techniques** facilitate efficient data transfer and collaboration, improving productivity and communication.

IV. Matching Computer System Testing with the definition

i.

Term	Definition	answer
1.Software-based Transformation	A) Combining software and hardware modifications to achieve desired changes.	1..... D
2.Hardware-based Transformation	B) Enhancing the system's communication and interoperability with other systems.	2..... C
3.Networking and Connectivity	C) Altering the system's capabilities by adding or replacing hardware components..	3..... B
4. Hybrid Transformation	D) Modifying the system's behavior through software changes.	4..... A

ii.

Term	Definition	answer
1. System Compatibility	A)The ability of hardware and software components to work together seamlessly.	1.....A
2. System Performance	B)The speed and responsiveness of the system.	2.....B
3.System Functionality	C)The ability of the system to perform its intended functions reliably and efficiently.	3.....C
4.System Testing	D)The process of verifying that the system meets specified requirements.	4.....D

Practical assessment

ABC Company has been experiencing performance issues with their existing computer system. The system is outdated and struggling to handle the increasing workload. To address these challenges, ABC Company is requesting you to transform their computer system.

Checklist:

Criteria	Indicators	Observation	
		Yes	No
Computer System Conversion is effectively applied	1.1 Transformation Techniques are effectively applied		
	1.2 New System is correctly Designed		
	1.3 Assembling precaution is effectively applied		
	1.4 Assembling procedure is effectively applied		
	1.5 Computer System is correctly tested		
	1.6 System report is correctly elaborated		

END



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