Information and Communication Technology (ICT)

Information and communication technologies (ICT) is defined as a diverse set of technological tools and resources used to create, transmit, store, share or exchange information.

Computer literacy

Computer literacy is the ability to use computers and information technology efficiently

ICT related employment opportunities in Uganda to day

- Teaching
- Computer repair and maintenance
- Computer and parts sales
- Computer Programmers.
- Web Designers.
- Database Analysts.
- Project Managers.
- Social Media Managers.
- Social Community Managers.
- Security/Networking Analysts.
- Technology Support.

Ways in which ICT can improve the quality of education

- Enables students and teachers to access learning resources.
- Enable teachers to improve and use creative teaching method
- Provides interactive and engaging content.
- Facilitates personalized learning.
- Fosters collaboration and communication among students and teachers**.**
- Improves reading and listening skills
- Stores information for future reference

Uses of ICT to Businesses/economic sector

- Online Businesses (E-commerce)

- E-marketing
- Cashless Transactions
- Education
- Social Networking
- Facilitates business communication such as emails , video conferencing for meeting, interaction with customers

Disadvantages of ICT to Economic sector

- **Unemployment:** Automation and advanced technologies can lead to job losses, especially in roles that are easily automated.
- **Cyber security Risks:** Increased reliance on ICT makes businesses vulnerable to cyber-attacks, data breaches, and other security threats
- **High Costs:** Implementing and maintaining ICT systems can be expensive.
- **Workplace Distraction:** The constant connectivity provided by ICT can lead to distractions especially from social media and popup messages. These lead to decreased productivity
- **Technological Dependence:** Over-reliance on technology can make businesses vulnerable if systems fail.
- **Work-Life Balance:** ICT blurs the boundaries between work and personal life.

Advantages of ICT to social sector

- Access to all sorts of entertainments
- Improve access to information, games and sports
- Access to informal education
- Reduced information and transaction costs
- Connects people across the globe

Disadvantages of ICT to Social sector

- **Digital Divide**: Not everyone has equal access to ICT, which can exacerbate social inequalities.
- **Privacy Concerns**: The use of ICT in social services often involves handling sensitive personal data that may be pirated.
- **Social Isolation**: Over-reliance on digital communication can lead to social isolation.
- **Mental Health Issues**: Excessive use of ICT, particularly social media, has been linked to mental health issues such as anxiety, depression, and stress.
- **Dependence on Technology**: Over-reliance on ICT can lead to a lack of basic skills and knowledge.
- **Resource Intensive**: Implementing and maintaining ICT systems can be costly and resource-intensive.

Measures that can be taken to prevent environmental degradation through the use of ICT

- Reduces deforestation by saving on use of paper
- Reduces use of fossil fuel in transporting information
- reuse and recycle computer component
- Disseminate environmental education information

Computer laboratory

A computer laboratory is room/building/space equipped with computers where computer services are provided to a defined community.

Factors to consider when preparing a computer laboratory

- Security of computers, programs and other resources
- Reliability of the power source
- The number of computers to be installed and the available floor space.
- The maximum number of users that the computer laboratory can accommodate.

Qualities of good computer laboratories

- Standard and Enough furniture.
- Should have enough computers and facilities
- Good ventilation.
- Reliable & Enough source of power supply.
- Free from Dust and Moisture.

Non Computer components of a computer laboratory

- **Furniture**: Desks, chairs, and workstations designed for comfort and ergonomics.
- **Main Power supply**: to provide power computer and accessories.
- **Uninterruptible Power Supplies (UPS):**
    - Keep computer running for at least a short time when incoming power is interrupted to prevent loss of unsaved data and to allow proper shutdown of computer.
    - Prevent damage to computer in event of power failure
    - Stabilize power
    - Prolonged usage of computer in during abrupt power shutdown and thus increased efficiency.
- **LCD projector/Whiteboards for and screens:** for presentation of lectures, demonstrations, notices and instructional purposes

- **Networking equipment:** such as routers, switches and cables to ensure that all computers are connected
- **Air conditioning and ventilation** to maintain comfortable temperature, humidity and air flow.
- **Cabinets and shelves** for storing equipment and supplies
- **Stationery and supplies** such as pens, paper, and other office supplied for everyday use.
- **Printers and scanners** for printing and scanning respectively
- **Anti-glare filter screens:** protect the eyes reflection and strong computer light.

Computer laboratory cleaning equipment

- **Soft Cloths**: used to clean different computer components without scratching or leaving debris.
- **Compressed Air blower**: blow dust from key board and hidden parts of the computer.
- **Antistatic Wipes**: Useful for cleaning screens and other sensitive surfaces without causing static buildup.
- **Vacuum Cleaner with HEPA Filter**: Helps remove dust from the floor and other surfaces without redistributing it into the air.
- **Cable Ties**: Used to bundle and organize cables neatly inside and outside of computers.
- **Antistatic Mats and Wrist Straps**: Prevent static electricity from damaging sensitive components during cleaning.
- **Isopropyl Alcohol**: Effective for disinfecting surfaces and cleaning electronic contacts.
- **Microfiber cloths:** excellent for cleaning screens and other delicate surface without leaving streaks
- **Screen Cleaners (Also known as Screen Cleaning Solutions)** are used together with microfiber cleaning clothes to remove dirt, fingerprints, and dust from a computer.

How to ensure safety in computer laboratory

- Follow laboratory rules and restrictions for lab users
- Maintain a clean and organized work space: to minimize accidents and damage to persons and equipment
- Keep cables from walkways
- Use surge protectors for computer equipment
- Use right tool for right jobs
- Do not play, eat or drink from the computer laboratory. Eating and drinking in the laboratory attract rodents that may damage computers and their accessories.
- Surveillance: Install security cameras to monitor activities within the lab.

How to maintain computer laboratory security

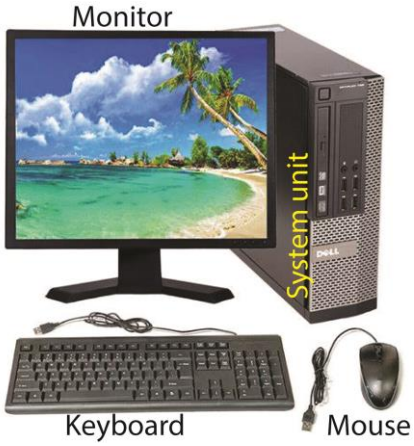
- Keep an authorized persons out of the laboratory
- Set up alarms to alert you in case of break-ins.
- Use system locks (locked key systems) to make it difficult to access internal components like hard disks and memory sticks.

- Use cables to lock the equipment to desk, cabinet or floor.
- Employ a responsible person for computer laboratory security
- The computer laboratory should be built with strong walls and doors
- Mount security camera to safeguard against intruders

Computer laboratory school rules and precaution

- Students should keep out the computer laboratories unless authorized to enter.
- Students should not play with computers or their accessories in the lab.
- Never open a power supply or a CRT monitor.
- Turn off the power and unplug equipment before performing service like cleaning.
- Students should not attempt to repair or maintain computers without supervision
- Do not touch areas in printers that are hot or that use high voltage.
- Any repairs to the computer should be done by someone who has knowledge regarding computer repairs.
- Avoid using programs and commands you are not familiar with and always seek for help.
- Follow correct procedures of starting and shutting down computers
- Floppy diskettes and CD should be removed from their drives before starting or shutting down the computer.
- No person should eat, drink or smoke from the computer laboratory since food and smoke particles damage computer part but also attract rodents that may damage computer accessories. Drinks spilled into computer components cause short circuit.

Computer



A computer is an electronic device that stores, retrieves, processes data and present it in the form the user desires. A computer operates under the control of a set of instructions that is stored in its memory unit.

Major laptop/ computer specification

- Processor speed
- Screen size and resolution.
- Storage Space
- Size of ram
- Presence of graphic card
- Expansion slots

Starting a computer

Booting is the process of starting a computer initiated via hardware using I/O button or by software command.

Types of booting

Cold booting is the process of starting up a computer that is switched off.

Warm booting is the process of restarting a computer that is already on without completely turning it off.

Circumstances under which a computer can be warm booted.

- when computer stops to respond
- when computer is slow,
- when computer is unstable.
- After software updates

Possible consequences a computer may encounter whenever improper shut down is done.

- Loss of unsaved documents
- Corruption Unsaved Work:
- Can cause damage to hard drive
- Damages software and operating System
- Decreased Lifespan of Components

The booting process of a computer

It is a process of load an operating system

Steps of booting process:

- **Running BIOS**: When the computer is turned on, the CPU looks for the BIOS (Basic Input/output System) program and runs it.
- **Running POST (Power-On Self-Test)**: The system checks hardware components for errors during this step.
- **Loading MBR (Master Boot Record) to RAM**: The MBR contains information about the partitions and the boot-loader.
- **Running the Boot-loader**: The boot-loader loads the operating system.
- **Running the OS (operating system)**: the OS kernel gains access to the hardware components

Qualities of modern computers/Advantages of using computer

- **Diligence:** that is Computers perform repetitive task without getting tired and work long hours without making mistakes
- **Versatility:** computers perform many tasks with the same accuracy and efficiency
- **Accuracy:** computers perform tasks with high degrees of exactness
- **Flexibility:** computers are flexible that they can perform a variety of programmed tasks
- **Time saving :** high computer speed enables computers to handle tasks quickly even those with complicated procedures
- **Effectiveness: computers process huge volumes of data effectively**
- **Space saving:** computers store a large amount of data saving shelf space
- **Low supervision cost:** computers perform automatic task that require minimal supervision
- **Simplifies work;** Computers simplify problem solving using programs designed for the purpose
- **Good for information flow;** Computers improve information flow in an organization
- **Entertainment;** Use of computers has ushered in the era of games and music playing
- **Multitasking:** computers can do many tasks at ago

Disadvantages of using computers

- Computer era has caused unemployment
- Time wastages on popup massages, games and entertainment reducing effective labor
- High cost of installation, computer repair and maintenance
- Continuous upgrading of computer systems cause loss of money in outdated hardware and software
- High costs of training
- **Computer viruses and malware** lead to loss of data and malfunctioning of computer leading time wastage

Symptoms of a computer infected by a virus

- Slowing down
- Unexpected pop-up windows
- Unwanted programs starting automatically

- Missing files and programs
- System crashing
- Being locked out of your computer
- Mass emails sent from your email account.
- Your security software has been disabled.
- Your battery drains quickly.

Ways of protecting data and software

- Install antivirus software
- Create strong passwords to very document
- Use firewalls to block unauthorized access to the network
- Implement strict access control to sensitive information
- Regular Backups to store data in multiple location
- Encrypt Dada to protect it from unauthorized access
- Use VPN
- Train users about cyber security and to recognize phishing attempts and other social engineering attacks.
- Monitor Network activity using intrusion detection systems (IDS)
- Update and patch system to fix vulnerabilities that could be exploited by attackers
- Develop a comprehensive security policy that covers aspects of network security and data handling.

- Computers require power to work
- Computer data is easily hacked.
- Computer dependence stops production in case of power failure or computer production

Computer automation

It refers to the process of using technology to perform tasks with minimum human intervention

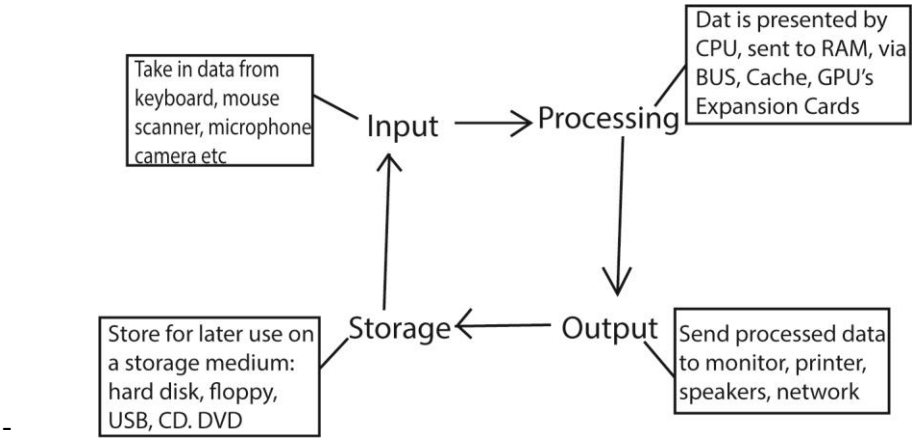
Advantages of using automation in industry

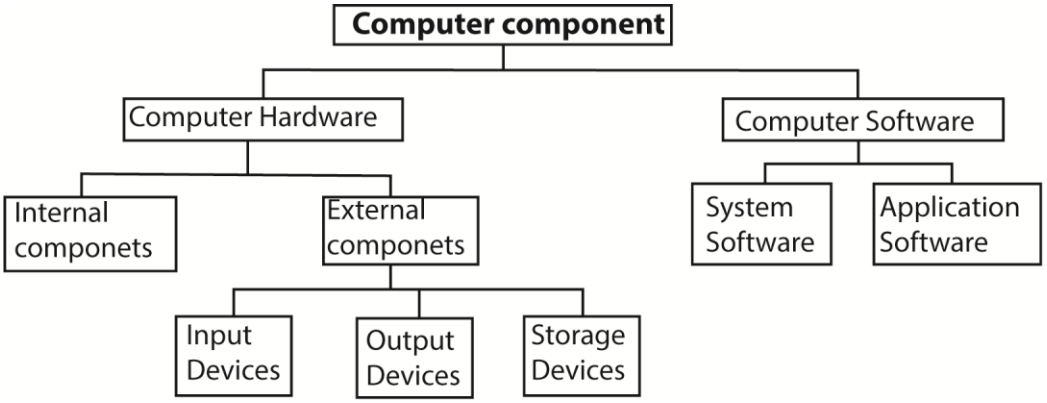
- Higher production rates and increased productivity automated machines work 24/7
- Improved worker safety since dangerous work is assigned to robots
- Better and consistently high quality production
- Reduced space required for production
- Reduced human errors
- Reduced lead times: automation streamlines production processes thereby reducing the time it takes to bring product to market.
- Flexibility and adaptability: modern automation technologies can quickly adapt to new production schedules or products making it easy for businesses to respond to market changes
- Reduced wastage of materials since automated systems are efficient

Violation of computer ethic usage by computer user

- Illegally downloading movies, music, software, etc., from the internet.
- Internet fraud/theft
- Duplicating copyrighted content without the author's approval
- Accessing personal information of others
- Hacking is an unethical practice that involves unauthorized access to computer systems, networks, or data, often with malicious intent.
- Cutting and pasting a paper together using online materials without appropriate citations.

The information processing cycle





Computer hardware is a physical part of a computer.

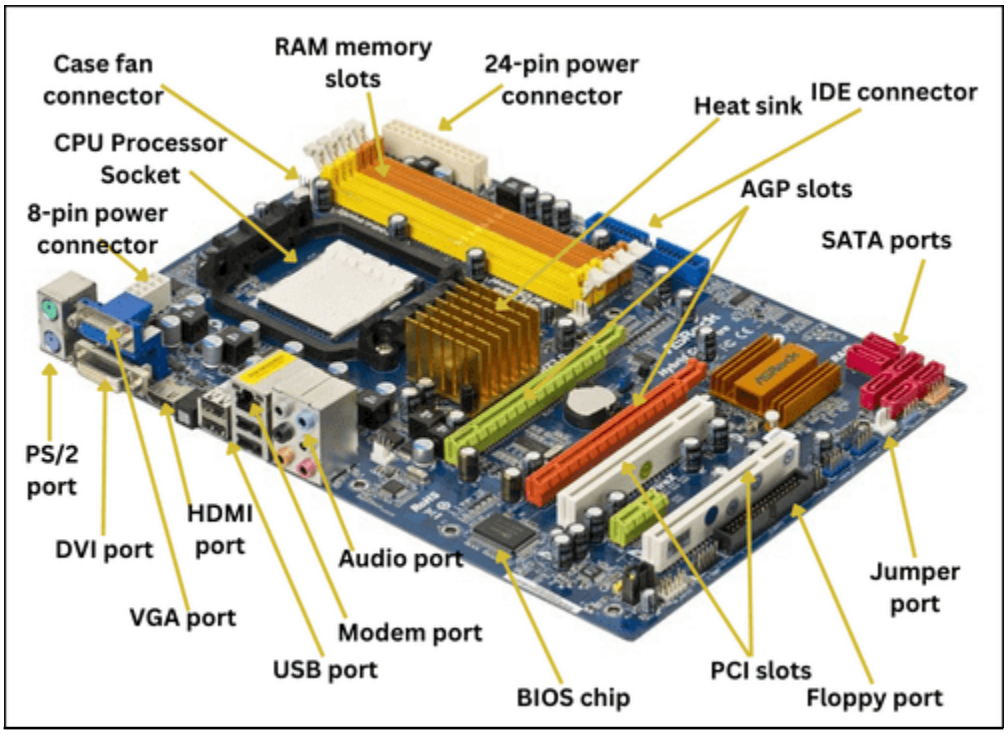
Software is a collection of instructions, procedures, and documentation that performs different tasks on a computer system.

Types of computer hardware

Internal hardware

They are components inside a computer or laptop case, they include

(i) **Motherboard** is a printed circuit board (PCB) that connects all components of a general-purpose computer.



The motherboard contains

(i) RAM (Random Access memory) slots

(ii) CPU socket

(iii) BIOS (Basic Input/Output System)

BIOS (basic input/output system) are the program a computer's microprocessor uses to start the computer system after it is powered on. It also manages data flow between the computer's operating system (OS) and attached devices, such as the hard disk, video adapter, keyboard, mouse and printer.

(iv) **Cooling fans** for cooling the internal parts

(v) I/O port to put on and off the computer

(vi) Power supply connector to connect to the main power supply

(vii) USB (**Universal** Serial Bus):

USB drives are commonly used for storage, data backup, and transferring files between devices.

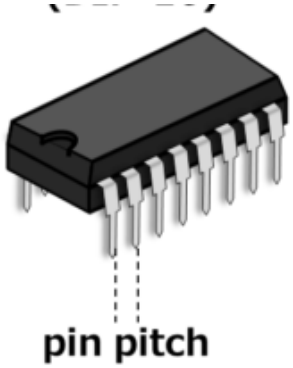
(viii) CPU slot

(ix) Mouse and keyboard ports

(x) FDC (Floppy-Disk Controller)

(xi) CMOS (Complementary Metal-oxide-semiconductor): CMOS battery provides power to the CMOS which **stores critical system information such as the date, time, and hardware configuration.**

(xii) **DIP (Dual In-line Package) switch:**



DIP Switches are used in place of jumper blocks and are commonly found on motherboards to hold configuration settings

(xiii) **Jumper slot:** jumpers are short length conductors that connect two or more points in electrical circuit to ease connection and power distribution.

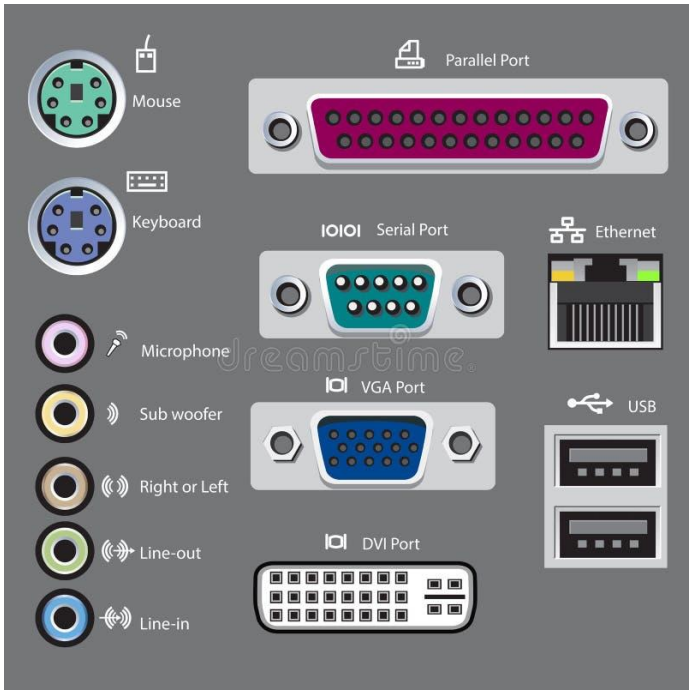
(xiv) **Clock generator:** is an electronic oscillator that produces a clock signal for use in synchronizing a circuit's operation

(xv) Computer ports

Computer port

A computer port is a connection point or interface between a computer and an external or internal device

Examples of computer port

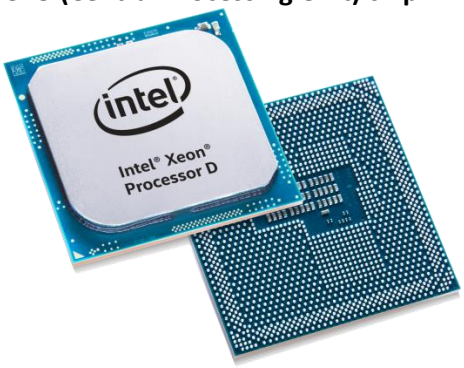


- **USB Ports**:
  - **USB-A**: The most common type, used for connecting peripherals like keyboards, mice, and flash drives.
  - **USB-C**: A newer, versatile port used for data transfer, charging, and video output. It's reversible, meaning you can plug it in either way.
  - **USB-B**: Often used for printers and other larger peripherals.
- **HDMI (High-Definition Multimedia Interface)**:
  - Used to connect monitors, TVs, and projectors. It carries both video and audio signals.
- **Ethernet Port**:
  - Used for wired internet connections. It looks like a larger phone jack.
- **VGA (Video Graphics Array)**:
  - An older type of port used to connect monitors. It carries only video signals.
- **DVI (Digital Visual Interface)**:
  - Another video port, often used for monitors. It can carry both digital and analog signals.
- **Thunderbolt**:
  - A high-speed port used for data transfer, video output, and charging. It's commonly found on newer laptops and desktops.
- **Audio Jacks**:
  - Used to connect headphones, microphones, and speakers.
- **Serial and Parallel Ports**:
  - Older types of ports used for connecting peripherals like printers and external modems. They are less common on modern computers.
  - **Serial ports** are used to transmit data one bit at a time and are used to connect the mouse, keyboard and communication devices like modems.

- **Parallel ports** are used to connect devices that send or receive large amounts of data for example printers, disk drives, tape drives.

- **FireWire (IEEE 1394)**:
  - Used for high-speed data transfer, especially in video editing and external hard drives.
- **eSATA (External Serial Advanced Technology Attachment)**:
  - Used for connecting external storage devices like hard drives.

(ii) CPU (Central Processing Unit) chip



Role of CPU in computers

- fetches and executes command
- It temporarily stores data being processed and intermediate results.
- Controls all communication between RAM and all other input-output devices by interpreting data from and to the devices.
- It carries out all arithmetic calculations and performs logic operations.

Components of CPU

- **Registers** are small amounts of high-speed memory contained within the CPU. They are used by the processor to store small amounts of data that are needed during processing, such as: the address of the next instruction to be executed.
- **Control unit** is a unit that controls all activities that go on within the computer
- **Arithmetic Logic Unit ALU** is where all calculation and logic operations happen
- **RAM (computer memory)** is used to temporally store data that is required for processing within the CPU.

RAM chip

- **Computer BUSes** are pathways that data travels when the CPU is communicating with RAM and other input-output devices.
- **Cache memory** is a memory type that is used to store data that is frequently used by the CPU.
  CPU clock is an electronic pulse that determines the number of cycles that a CPU executes instructions per second. The cycles are measured in Hertz.

Fetching, decoding and execution in management of program instructions

Fetching is the process of obtaining a program instruction or data item from the memory.
Decoding is the process of translating the instructions into commands a computer can execute.
Executing is the process of carrying out commands Storing Is the process of writing the results to the memory.

Factors affecting CPU/computer speed

- **The number of cores:** more cores means the process can be processed by many cores hence faster execution.
  Definition
  A **processor core** is a single command execution unit that can execute commands independently. A single CPU can have multiple cores which enables it to execute many instructions simultaneously.
- **Cache size:** big cache means more data will be stored nearer to the processor hence high access speed. When access speed increases it means time wasted waiting for data from slower RAM is reduced.
- **Clock speed:** high clock speed lead to a faster processor. A 3GHZ processor will be faster than 2.3GHZ.
- **Hyperthreading:** it creates logical cores which means multithreading can be used to execute many threads at the same time.
- **Instruction Set Architecture:** this determines the number of location addresses that the processor can support. X86-64 processors will execute faster since they have a bigger memory location to store data when it is being executed

(iii) **Internal hard drive (HDDs and SSDs) is the** primary storage device located inside a computer system

(iv) Graphics Card or Graphics Processing Unit (GPU) is a piece of hardware that runs the graphics display on the screen.

(v) **Computer fan** cools the components on the motherboard

(vi) **CD/DVD drive** is an optical drive that writes and reads data on the CD or DVD

(vii) The **power supply** is the device that supplies power to all the components in the computer.

Types of computer memory

RAM and ROM are the two different types of memory found in the computer.

ROM (Read ONy Memory) is used to store software and configurations used in booting a computer.

RAM (Random Access Memory) is used to store programs apparently used by the user when the computer is working.

Differences between RAM and ROM

RAM	ROM
Volatile	No volatile
Read and write	Read only
Temporal	Permanent
Can be increased	normaly not Increasable

Measurement of data

Units of data used to measure the capacities of data storage and communication systems are

- **Bit** is the smallest unit of the computer. It is usually represented with digits 0 and 1.
- **Byte** = 8 bits.
- **Kibibyte (KiB)** = 2^{10} byte or 1,024 bytes.
- **Mebibyte** (**MiB**) = 2^{20} bytes, or 1,048,576 bytes
- **Kilobyte (KB)** = 10^3 or 1,000 bytes
- **Megabyte (MB)** = 10^6 or1,000,000 bytes
- **Gigabyte (GB)** = 10^9 or 1,000,000,000 bytes
- **Terabytes(TiB)** = 10^{12} or 1,000,000,000,000 bytes

Parity bits

These are bits added to data by a computer to ensure its accuracy.

File

It is a collection of information initially created in memory then stored on a secondary storage device with a name.

File extension

A **file extension** is the character or group of characters after the period that makes up an entire file name

Purpose of a file extension

- It identifies the type of file created by the same program
- Helps the operating system to open/edit the file with the correct software thus preventing errors

- Helps the user to identity a potentially dangerous files such as executable files(.exe) which may contain malware

Examples of file extensions

Word document type – docx

Audio file – PCM (Pulse-Code Modulation), WAV (Waveform Audio File Format), MP3 (MPEG-1 Audio Layer 3)**, AAC (**Advanced Audio Coding**), WMA (**Windows Media Audio)**,** FLAC (Free Lossless Audio Codec)

Presentation document – PPTX

Spreadsheet document – xlsx

Database document – .DB, .ACCDB, .NSF, .FP7

Programs files that perform fundamental operations in computer **.sys**

A Microsoft word file **.doc**

A file containing series of commands during boot up. **.bat**

A plain file created using note pad **.txt**

A graphic file created using application such as Adobe Photoshop **.tif**

File folder

A folder, also called a directory, is a **space that stores files, other folders, and shortcuts on a computer**.

External hardware/peripheral device

A **peripheral device** is a device that either enters information into a computer system or receives information from the computer system

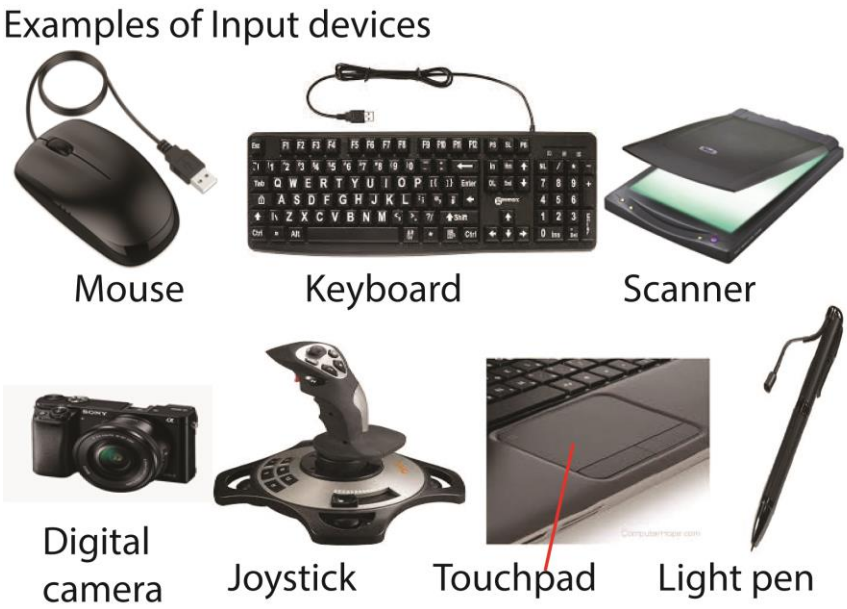
Type of peripheral devices

(a) Input devices

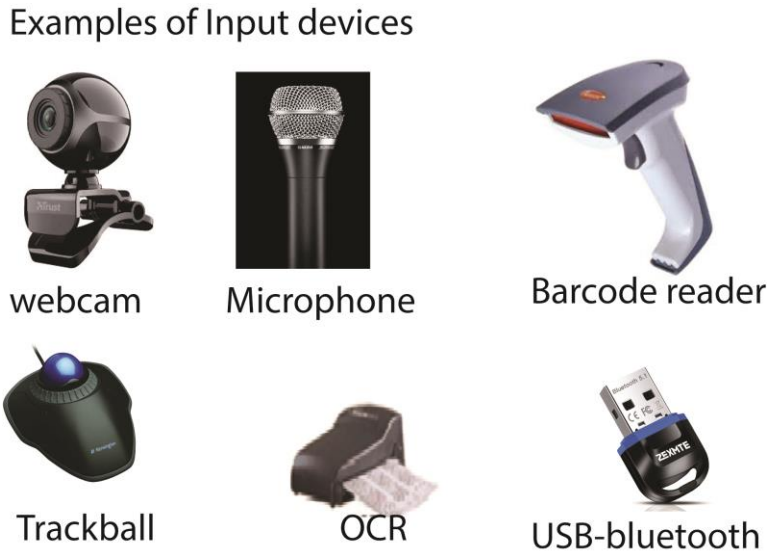
An input device is a hardware component of a computer system that enters information into the computer

(i) Mouse: the mouse performs the following activities

- Move the cursor pointer on screen
- select/ highlights image, text, file or icon
- right click displays menu
- double clicking opens or executes a program
- can be used for scrolling
- move images, text on screen
- Positioning cursor
- displays hover information



(ii) **Keyboard:** keyboard allows a person to enter character and functions into the computer
(iii) **Scanner** feeds hardcopy information into computer softcopy
(iv) **Digital camera** captures picture and feed them into the computer



(v) **Microphon**e enable audio recording into the computer
(vi) **Barcode reader** obtains information from a barcode
(vii) **Webcams** captures video and audio through a camera and microphone and transmitting it over the internet in real time.
(viii) **OCR (Optical Character Recognition)**technology is used to convert virtually any kind of images containing written text into machine-readable text data
(ix) **Trackballs** are used in various fields such as gaming, graphic design, security and assistive technology.

(b) **Output devices:**

An output device is a hardware component of a computer system that displays information to users

Examples of Output devices

(i) Monitor: displays text, video and graphic information generated by the computer.

(ii) **Speakers and Headphones** are audio output devices

(iii) **Projectors** display images, videos, or other content on a large screen or surface

(iv) Printers accept text or image files from a computer and transfers them to a medium such as paper of film.

Categories of printers

(a) Impact printer (in which the print medium is physically struck) is a class of printers that functions by making physical contact with an ink ribbon before striking the page.

Example of impact printers

- L**etter-quality printer**
- Daisy wheel
- Dot matrix
- Line printer

(b) Non-impact printers do not use a striking mechanism to transfer ink or toner onto paper

Examples of non-impact printers

- laser printers use a laser beam to attract toner to an area of the paper
- ink-jet printers spray a jet of liquid ink e.g. Wide-format printers
- thermal printers transfer wax-based ink or use heated pins to directly imprint an image on specially treated paper e.g. snapshot printers

Qualities of a good printer

- good resolution
- high speed
- portability
- affordability

- single/duplex printing
- cache memory
- security
- availability of spare parts and maintenance skills
- black and white or full color printing

(c) **Storage media**

A storage medium is **a physical device that receives and retains electronic data** for applications and users and makes the data available for retrieval.

(i) Magnetic Storage: is the manipulation of magnetic fields on a medium in order to record audio, video or other data.

Examples of magnetic storage devices

Hard disk | External hard disk | Foppy diskette | Magnetic tape

- **Hard Disk Drive (HDD)**: Uses magnetic platters to store data. Common in many computers for large storage needs.
- **External hard disks**.
- **Floppy Disk**: An older form of magnetic storage, now largely obsolete.
- **Magnetic Tape**: Used for large-scale data backup and archival.

(ii) Optical Storage: is a storage medium that uses laser beam to write and read data on a disc.

Examples of optical storage devices

CD | DVD | BLU-RAY DISK

- **Compact Disc (CD):** Used for music, software, and data storage.
- **Digital Versatile Disc (DVD):** Similar to CDs but with higher storage capacity, often used for movies.

- **Blu-ray Disc:** High-definition video and data storage with even greater capacity than DVDs.

  Example

  Ali has a DVD full of data and would like to transfer the data to CDs. The capacity of the DVD is 4.7GB and each CD is 700MB. Calculate the number of CD's he needs to transfer all his dat. (05marks)

  Solution

  Number of CD = $\frac{4.7\ x\ 1000}{700}$ $6.7 \approx 7$

(iii) Flash Memory: is a **solid-state storage technology** that uses flash memory chips for writing and storing data, known as input/output operations per second (IOPS)

- **Solid-State Drive (SSD)**: Faster and more reliable than HDDs, commonly used in modern computers.
- **USB Flash Drive**: Portable and easy to use for transferring files.
- **Memory Card**: Used in cameras, smartphones, and other portable devices.

Examples of flash memory storage devices

Solid State Drive (SSD) | USB Flash Drive | Memory Card:

Uses memory card

- They are used in storing data like pictures, documents, and videos.
- They are also used in creating data backups.
- The data and information in the memory card can be password protected.
- The memory card can easily be transported from one place to another.
- They are non-volatile and possess an incredible data transfer rate hence used globally.

Disadvantage of memory cards

- Easily damaged
- Easily lost
- Have limited numbers of write operations before degradation

Uses ofFlash disks

- Flash disks are solid-state drives that are durable
- Store large huge amount of data

- High transfer rate

Disadvantages of flash disk

- Can transmit viruses
- Easily damaged
- Have limited numbers of write operations before degradation.

(iv) Network Storage

- **Network-Attached Storage (NAS)**: Provides centralized data storage for multiple devices over a network.
- **Cloud Storage**: Online storage services like Google Drive, Dropbox, and OneDrive.

(v) Paper Storage

- **Barcode**: Encodes data in a visual pattern readable by machines.
- **Punched Card**: An early form of data storage using cards with punched holes.

Reading and writing in relation to storage medium

Reading from storage media means that user is copying or moving data form storage media to the computer.

Writing to storage media means that user is copying or moving data to storage media from the computer.

(d) **Communication devices**

(i) **Network adapter:** is a piece of computer hardware designed to allow a computer to communicate over a computer network.

(ii) **Modems:** a modem is the device that allows computers, smartphones, tablets, and other devices to connect to the internet

(e) **Specialty devices:** Game controllers and musical instrument

Primary storage and **secondary storage**

Primary storage is the temporary, volatile storage of information when the computer is running that it is directly accessible by the CPU (central processing unit) e.g. RAM, ROM, cache memory

Secondary storage is the type of storage that provides long term storage for software programs and data even when the computer is turned off e.g. hard disk drives, solid state drives, USB drives, CDs, and DVDs, floppy disc, external hard disk, ZIP,

Programs and software

Program and software are instructions given to the computer to perform a specific task

A program is a small block of code or a set of instruction the system to do its task

Software is a set of programs which instructs computer just like program does. But the functionalities and features of software are more complex compared to that of a program.

Types of software

(a) System software

System Software is **the type of software that is the interface between application software and the** system

Features of system software

- System Software is closer to the system
- Generally written in a low-level language
- The system software is difficult to design and understand
- Fast in speed
- Less interactive
- Smaller in size
- Hard to manipulate

Examples of System Software

(i) Operating system **manages hardware, software resources, and provides common services for computer** programs.

Functions of operating system

- manages files,
- manages memory,
- manages processes,
- handles input and output,
- controls peripheral devices like disk drives and printers
- provide the interface between computer hardware and peripheral devices
- Configuring devices.
- Accomplish booting processes
- Monitoring system performance.
- Administering security.

Examples of operating systems

(a) Microsoft Windows

Advantages of windows operating system

- User-friendly graphical user interface (GUI).
- Wide range of compatible software and applications.
- Extensive hardware support for various devices.
- Regular updates and security patches for improved performance.
- Familiarity, as it's a widely used operating system.
- Standard operating system for high-end gaming
- Available at different configurations and price points

Disadvantages of windows operating system

- Security Vulnerabilities. One of the most significant drawbacks of the Windows Operating System is its vulnerability to security threats such as viruses, malware,
- High Resource Requirements such as higher RAM, advanced processors, and substantial storage space
- Are expensive.
- Frequent Updates be disruptive, requiring significant installation time and system restarts.
- Compatibility Issues: new window versions are incompatible with older applications and hardware
- Privacy Concerns.
- System Stability: some window features are unstable leading to data loss
- Bloatware/unnecessary pre-installed software that consumes space and sometimes slowing the computer
- Limited customization can be a drawback for users who wish to tailor their operating system to their specific needs and preferences.
- Licensing Restrictions limits distribution and use

(b) Linux Operating System

Advantages of Linux Operating system

- **O**pen-source nature: Linux is freely available and customizable.
- Security: Linux is more secure than other operating systems.
- Easy and frequent software updates.
- Variety of distributions: Choose from various Linux distributions based on your requirements.
- Cost-effectiveness: Linux is freely available on the internet.
- Stable

Disadvantages of Linux operating system

- Steeper learning curve compared to other operating systems.
- Limited software availability.
- Hardware compatibility issues.
- Lack of standardization.

- Difficult setup, installation, and use for inexperienced users.

(c) Apple mac OS
(d) Google's Android OS
(e) Apple iOS

(iii) **Drivers** allow operating system to communicate with hardware devices like printer, graphic cards, network adapters etc.
(iv) **Utility software** performs tasks to enhance productivity, efficiency, functionality, or maintenance of a computer system to ensure the system runs smoothly.

Example of Utility software

- Antivirus software for virus protection.
- Disk cleanup
- File management tools for managing files.
- Compression tools for reducing file size.
- Disk management tools for managing storage.
- Debuggers for examination and modifying data
-

(v) **Firmware** is **low**-level software embedded in hardware devices, providing control and communication between the devices and other system components.
(vi) **Boot loaders** are responsible for loading operating system into computer's memory when the system is powered on
(vii) **Language processors/translators** translate high-level programming languages into machine codes that the computer can execute.
Types of programming language translators

- **Interpreters** convert high-level language to machine language line by line.
- **Compilers** convert entire high-level language programs to machine language at once.
- **Assemblers** translate assembly language programs to machine language.

Compiler, interpreter, and assembler are different in that the compiler In contrast, an interpreter The assembler

(ii) **Resource allocation** is **system** software that allocate resources like CPU time, memory space and input/output devices to various programs and users
(iii) **Security and Access control ensures that** unauthorized user do not access the system and that data is protected from corruption and loss.
(iv) **Communication Software: Communication** software allows us to transfer data and programs from one computer system to another.

(b) Application software

Application Software is a program that is created to perform a specific task for a user.

Feature of Application Software:

- Perform more specialized tasks like word processing, spreadsheets, email, photo editing, etc.
- It needs more storage space as it is bigger in size
- Easy to design and more interactive for the user
- Generally written in a high-level language

Qualities of good application software

- **Functionality:** It refers to the degree of performance of the software.
- **Reliability:** A set of attribute that Bear on the capability of software to.
- **Efficiency:** It refers to the ability of the software to use System.
- **Usability:** It refers to the extent to which the software can be used with.
- **Maintainability:** Refers to the ease with which the modifications can be made in a software system to extend its functionality, improvement, performance or correct errors. Maintainability covers Testability, Stability, Changeability, Analyzability.
- **Robustness:** It refers to the degree to which the software can keep on functioning in spite of being provided with invalid data.
- **Integrity:** It refers to the degree to which Unauthorized Access to the software data can be prevented.

Examples of application software

- **Word processing software**
- **Graphic software**
- **Spreadsheet software**
- **Presentation software**
- **Database software**
- **Web browsers**
- **Multimedia software**

(a) A **word processor** is software program that **lets users create, edit, print, and save text documents.** This allows a user to create and manipulate documents that contain text and graphics.

Examples of word processing software:

Microsoft word, Word pad, AmiPro, PC Write, Mac Write, Lotus word, Pro Notepad, Word star, Corel word perfect, Microsoft, pocket word

Uses of word processor

- document creation: letters, report, resume, stories and essays
- edits and formats documents
- provides templates for documents like business letters, invoices etc.

- mail merge: automating the process of sending personalized letter or email to multiple recipients
- Creates academic papers and articles
- Creates tables charts and lists of organized information effectively
- Automatically checks and corrects spelling and grammatical errors

Advantages of processor document

- Easily edited
- Easily stored and retrieved
- Shared easily

(b) **Spreadsheet** software organizes data in rows and column and also performs calculations.

Examples of spread sheet software include: Microsoft excel, Corel Quattro pro, Lotus 123, Microsoft pocket.

Uses spreadsheet software

- For budgeting and financial management
- For inventory management
- To facilitate data analysis by creating charts and graphs to
- To analyze research data
- Used to create financial statements
- Used to prepare statistical reports

Advantages of spreadsheet software in preparing budgets

- Offer limitless customization
- Handles vast amount of data
- Makes adjustment of figures easy
- Organizes and makes tracking of income and expenditure easy
- Makes calculation easy
- Provide flexibility in how to manage and analyze the budget
- Enhances visualization through use graphs
- Provides storage and easy accessibility options
- Cheap because most spread software like Google Sheets is free

(c) **Desktop publishing software** is used to create the following: Text books Corporate news letters Marketing literature Product catalogues Annual reports Business cards Calendars Flyers

Features of desktop publishing software include

- **Text tools** that allow creation of documents with various fonts, text wrapping, drop caps and paragraph styles
- **Graphic tools** for easy insertions and edit of images
- **Page layout** tools such as grinds and guides to align elements precisely on page and use of layers to organize different elements on separate layer to easier editing and complex designing.
- **Provision for master templates** with consistent headers, footers and other repeating elements
- **Interactive elements** such as hyperlinks and multimedia integration tools for audio and videos into a document.
- **Provision of stylish templates** for brand development and maintenance.

(d) **Data management software**/**database**, defines, creates, edits and manages vast amounts of data databases.

Examples of database software

Microsoft access, Claris file marker pro, D-base, Fox pro, Paradox, Oracle

Features of database

- **Data Storage and Management:** it enables storage, retrieval and management of large volume data.
- **Data Security:** Database software protects data form unauthorized access and cyber threats. It includes features for data encryption, access control and regular backups to ensure data integrity and security.
- **Data Analysis and Reporting:** it enables users to perform complex queries and generate reports
- **Multi-user Access**: it supports concurrent access by multiple users, allowing team to collaborate and access the same data simultaneously
- **Web Application:** many web applications rely on database to store user data, preferences and activity logs
- **Backup and Recovery:** Database software contains tools for backing up data and recovering it in case of hardware failure.
- **Data Integration:** it can integrate data from various sources, providing a unified view of information.
- **Scalability:** modern database software can handle increasing amounts of data and users, making it suitable for growing businesses and applications.

(e) **Presentation software** is used to combine text, graphics, animations, audio and video in presentation

Examples of presentation software

- Microsoft PowerPoint
- Google slide
- Keynote

Uses Presentation software

- Teaching

- Lectures
- Demonstration
- Project report
- Workshops
- Marketing reports
- training

(f) **Web browsers**: a web browser is a program used to access and view websites or website information.

Example of web browsers: Google chrome, opera, Internet Explorer, Mozilla Firefox

(g) A **multimedia program,** multimedia application, or any multimedia software is software that plays or records and creates audio and video files.

Tailor-made software

It is software that is developed specifically for some specific organization or other user.

Off-shelf programs/software

Off-the-shelf/ out-of-the-box software is ready-made software, usually commercial, designed to serve a broad audience with common needs.

Examples of off-self software

- **Editor programs-** examples include Photoshop, Lightroom, Facetune
- **Mail services-** examples include Gmail, Outlook, Zohomail
- **Media players-** examples are VLC, Windows Media player
- **Operating systems-** examples are Windows, Mac
- **Electronic Mail:** Enables messages to be sent over an internet connection. Examples of these kinds of software include Gmail (Google), Yahoo Mail, and Hotmail (Microsoft).
- **Anti-Virus Software:** These types of software applications have been developed to protect computer systems from malicious software programs. Examples include Norton and Kaspersky.
- **Customer Relationship Management:** As the name suggests, CRM software like Salesforce and Hubspot are used by businesses to manage relationships with their customers.
- **Graphic Design:** These software applications help users create graphics, manipulate images, and touch-up photos, among other functions. Adobe Photoshop, Illustrator, Canva, and Figma are well-known examples of the software.
- **Communication:** Software like WhatsApp, Slack, and Microsoft Teams enable communication in real-time between people in different parts of the globe.
- **Task Management:** ClickUp and Trello are two examples of task management software used by (usually remote) teams to track tasks.

Elements of the “off-the-shelf” software

(i) They are standardized programs that massively produced and ready for use

(ii) They are not explicitly tailored but rather universal and made for widespread business use

(iii) Are easily integrated with existing systems without complex configurations.

Advantages of off-self software

- Lower initial cost and cost-effectiveness
- Quicker and easier to implement and use
- Proven reliability and quality
- Regular updates and support
- Available training resources and community support
- Owned by someone else, so they foot the development/upgrade costs

Disadvantages of off-self software

- **Lack of customization:** off-self software are designed for wide audience and may not meet specific needs.
- **Limited Scalability:** off-self software my fail to scale effectively to growing business demand.
- Off-self software may fail to integrate with existing system leading to **compatibility problems**.
- **Limited Control**: the user has limited control over the software's features and updates. If the vendor decides to change or discontinue the product, the user has no choice.
- **Security Concerns**: Since off-the-shelf software is widely used, it can be a more attractive target for cyber-attacks.
- **Off**-self software may have **unnecessary functionalities** while **lacking some that are crucial** for a specific business

Packaged software

Packaged software is a collection of programs that perform similar functions or have similar features. For example, Microsoft Office includes multiple applications such as Excel, word, PowerPoint etc. Video and audio editing software may also be available as packaged software, used for editing music and video files used in a movie.

Advantages of packaged software

- Initial cost is cheaper than custom counterpart
- Allow trial period before buying
- Easily distributed
- Availability of updates
- Offer community support
- Mitigates security issues;
- Decreases risks for business disruption;

Disadvantages of packaged software

- Packaged software is a standard program solution and may not be appropriate for all organizations.
- It is costly to maintain when future upgrades are required, or new versions are needed.
- It is time-consuming to install and maintain.
- Limited customization
- Extra features when required have to be purchase independently
- Unneeded software in the package take up computer space.

Software version and a release

A **software version** is software distributed but differs from other/earlier forms of similar software in some features and identified by a unique set of numbers and letters.

A **software release** is the distribution of the final version or the newest version of software

Shareware

It refers to copyrighted software distributes free for a trial period and payment is required for continued use after the trial period. For example antivirus software such as McAfee, Kaspersky. Motorbikes, computer car racing simulation

Freeware software

It refers to copyrighted software provided at no cost to the user by an individual or company. For example games like Dave, solitaire and antivirus software.

Examples of freeware

- Web browsers: Mozilla Firefox, Google Chrome
- Media players: VLC
- Antivirus programs: Avast, AVG
- Office suites: OpenOffice, LibreOffice
- Games: MineCraft, Doom

Public domain software

It free software donated for public use with no copyright restrictions. For example parliament news, news papers

Software Piracy

Software piracy is the **unauthorized use, copying or distribution of copyrighted software**

Precautions taken to prevent software piracy

- Comply with Piracy Regulations.
- Utilize End-user License Agreement.
- Utilize General Public License.
- Use a License Key Management System.
- Introduce a Subscription Model.
- Release an Improved Version of the Pirated Software.

Human Computer Interaction/ Computer Human Interface (HCI)

(Human Computer Interaction) or MMI (Man Machine Interaction) provides a user-friendly environment for communication between the human user and a computer system.
Here interface refers to a medium or interaction between the computer and the end user.

The principles of CHI are equitable use, simple and intuitive to use, perceptible information, tolerance for error, low physical effort and size and space approach and use.

Types of CHI

- **Command Line** interface: users uses text commands to interact with computers programs
- **Graphic user interface**: u**sers** communicate with a computer through the use of icons, symbols, visual metaphors, and pointing devices.
- **Natural Language:** users interact with computer by the help of languages that we are using in our day to day life. **Alexa**, **Siri**, **Google voices are** the best example of voice assistant that uses natural language.
- **Q/A (Question and Answer):** the user is presented with a question on the display by the computer. The user interacts by entering an answer (either with a keyboard or a mouse click), and the computer responds to that information in a preprogrammed way, usually by going on to the next question. E.g. chatbots.
  A **chatbot** is a software or computer program that simulates human conversation or chatter through text or voice interactions.

Ways in which computers have been made user-friendly for persons without hands

- Speech recognition
- Mouth, Chin, Lip-Direct Access
- Head Movement-Direct Access

Ways in which computers have been made user-friendly for persons Impaired vision

- Font magnification
- Speech recognition

Health issues that may be caused by prolonged use of computers.

- Muscle and joint pain
- Overuse injuries of the shoulder, arm, wrist, or hand
- Eye strain
- Backache
- Upper limb disorders (repetitive strain injury or RSI)

Programming languages

A **programming language** is a set of instructions and syntax used to create software programs.

Some of the key features of programming languages include:

- **Syntax**: The specific rules and structure used to write code in a programming language.
- **Debugging** is the process of identifying and resolving errors or bugs in a software system.
- **Data Types**: The type of values that can be stored in a program, such as numbers, strings, and booleans.
- **Variables**: Named memory locations that can store values.
- **Operators**: Symbols used to perform operations on values, such as addition, subtraction, and comparison.
- **Control Structures**: Statements used to control the flow of a program, such as if-else statements, loops, and function calls.
- **Libraries** and Frameworks: Collections of pre-written code that can be used to perform common tasks and speed up development.
- **Paradigms**: The programming style or philosophy used in the language, such as procedural, object-oriented, or functional.

Types of programing languages

(a) **Low-level/assembly programming language** is type of programming language that:

- Contains basic instructions recognized by a computer.
- Provides little or no abstraction from a computer's instruction set architecture.
- Deals with a computer's hardware components and constraints.
- Requires manual memory management.
- Is often cryptic and not human-readable.

(b) **High-level languages** are programming languages that:

- Are designed to simplify computer programming.
- Use easy-to-read syntax that is closer to human languages.
- Are several steps removed from the actual code run on a computer's processor.
- Are independent of specific computing system architecture.

Examples of high-level programming language are: Java, python, and C^{++}.

Language processors/translators

These software that translate high-level programming languages into machine codes that the computer can execute.

Types of programming language translators

- **Interpreters** convert high-level language to machine language line by line.
- **Compilers** convert entire high-level language programs to machine language at once.
- **Assemblers** translate assembly language programs to machine language.

  Compiler, interpreter, and assembler are different in that the compiler In contrast, an interpreter The assembler

Characteristics of a good programming language

- **Simplicity:** A good programming language should be easy to understand and use, with clear syntax and semantics.
- **Readability:** The language should promote code readability, making it easy for programmers to understand and maintain the code.
- **Expressiveness:** A good programming language provides expressive power, enabling developers to write concise and meaningful code.
- **Scalability:** Scalability is the ability of code to handle an increasing amount of data and traffic.
- **Testability:** Testability is the ability to write automated tests to verify the correctness of the code.

Source code and open source software

Source code refers to the human-readable instructions or statements that a programmer writes in a high-level programing language to communicate with computers.

Characteristics of source code

- Human readable
- It is written in high level languages
- It is platform independent but requires developers to write codes that can run it on different operating systems without modification provided compatible compiler or translators are available.
- It is processed by a compiler or translator to a bite code that can be executed by computer.
- Debugging and maintenance: developers use source code to identify and fix errors/bugs. It also acts as a basis for maintenance and updates.

Open-source software (OSS) is **computer software** that is released under a license in which the copyright holder grants users the rights to use, study, change, and distribute the software and its source code to anyone and for any purpose. It may be improved by dedicated programmers and share the changes within the community.

Public-domain software refers to any program that is not copyrighted which is free and can be used without restrictions.

Examples of public domain software

- **GNU:** A collection of software programs developed by the Free Software Foundation.
- **Linux:** An open source operating system that was originally developed by Linus Torvalds in 1991.
- **Apache:** An open source web server that is widely used to host websites and web applications.
- **Blender:** A free and open source 3D modeling and animation software program.
- **BLAST (1990)**

Advantages of open source software within the user community

- Security
- Affordability
- Transparence
- Flexibility
- Localization is possible

Troubleshooting of computers

Troubleshooting is a systematic process used to locate the cause of a fault in a computer system and correct the relevant hardware and software issues.

Ways of troubleshoot a computer that has failed to start.

- Try a different power source.
- Check your monitor connection.
- Listen for beeps.
- Let the battery charge
- Start your PC in safe mode.
- Restore your computer to previous settings.
- Unplug USB devices.

Computer repair and servicing

Computer servicing is the regular maintenance activities and upkeep required to keep your computer running smoothly and efficiently.

Computer repair is the process of fixing a computer that has broken down or malfunctioned.

Importance of servicing and maintenance of computers

- To ensure the computer is clean
- Enhanced performance: Regular maintenance ensures your computer runs optimally.
- Increased reliability: Prevents issues and reduces downtime.
- Improved security: Helps protect against viruses and malware.
- Data protection: Regular backups and updates safeguard your data.
- Longer lifespan: Proper maintenance extends the life of your computer.

Activities involved in servicing and maintenance of computers.

- Regular cleaning
- Updating software
- Uninstall programs and applications you no longer use.
- Shutdown your computer over the weekends or when they are unattended for extended periods.
- Perform a regular backup of any files you do not want to loose
- Regular antivirus scanning

Net working

A network is a connection of at least two computers either by cable or wireless connection in order to share resources. The biggest computer network is the internet connecting billions of communicating devices.

Types of computer networks

- **Personal area network** (single person network)
- **Local area network** (multiple computer network in a local area)
- **Campus network** (several building network)
- **Metropolitan area network** (city-wide network)
- **Wide ara network** (Global network)
- **Wireleess LAN**
- **Storage area network** (High-speed storage network)
- **Home network** (home-base network)
- **System area network** (High-performance network)

Factors to consider before choosing a network

- geographic and physical location
- bandwidth /the amount of information can handle at a given time
- network security
- scalability: a network that accommodate more users, business applications, new location, etc. is preferred
- IT maintenance costs
- Initial costs.

Requirements for setting up a computer network

- **Computers** to be networked
- **Software** to enable connected computers to operate
  Examples of networking software
    - Novel Netware
    - Apple talk
    - Digi card
    - NanjaOne
    - Intermapper. Useful Free Network Tools.
    - Econet for acorn computers
    - UNIX Windows for work groups
- **Router:** Connects your network to the internet and manages traffic between devices.
- **Modem:** Connects to your ISP (Internet Service Provider) and provides internet access.
- **Switch:** Expands the number of devices you can connect in a wired network and enables connected devices to share information and talk to each other.
- **Access Point:** Extends the range of your wireless network.
- **Cables:** Ethernet cables (Cat5, Cat5e, or Cat6) for wired connections.
- **Network Interface Cards (NICs):** Required for each device to connect to the network.
- A **bridge** is a network device that connects multiple sub-networks to create a single network

Server

A server is a computer that provides information to other computers called “clients” " on a computer network

Uses/advantages of a server in a computer networking

- Store and manage and computes data on a network
- Enable sharing of printers by computers on the network
- Enables sharing of software by computers on the network
- Processes requests from clients
- Enable sharing of internet by the computers on the network

- Enable interactive activities like games be played by users on the network

Disadvantages of networking computer

- Has high initial cost to setup
- Encourages spread Virus and Malware to network computers
- Disruptions can occur frequently.
- Computer Networking can direct us to various types of distractions.
- It requires a specific type of setup.
- May lead to loss of information easily

Threats to data networked environment

- **Malwares** such viruses, worms and Trojans that infect systems, steal data or cause disruption
- **Phishing:** e-mail phishing are deceptive e-mails that trick user into revealing sensitive information and spear phishing ot targeted attacks on specific individuals within an organization.
- **Network Hacking** or unauthorized access to network resources to steal data or disrupt services
- **Weak security control**
- **Insider threats** where employ or contractor misuse their access to harm the organization.

How to control data threats over network

- Install antivirus software
- Create strong password
- Use firewalls to block unauthorized access to the network
- Encrypt Dada to protect it from unauthorized access
- Regular Backups to store data in multiple location
- Train users about cyber security and to recognize phishing attempts and other social engineering attacks.
- Monitor Network activity using intrusion detection systems (IDS)

Computer communication

Data communication, **the process of transferring data over a transmission medium between two or more devices, systems, or places.**

Elements of data communication

- **Sender.** The device that starts the transmission of data. Sending devices code information to be sent

- **Receiver.** The device that receives the data sent by the sender. Receiving device decodes information.
- **Message or data.** This is the information transmitted from one device to another, including text, images, audio, video, or any other form of content.
- **Protocol.** A set of rules governing the format, timing, and sequencing of data transmission
- **Medium.** The physical path or channel through which data is transmitted, such as an optical cable or wireless transmission.

Examples of wireless transmission media

- **Radio waves** e.g. Bluetooth, mobile phones
- **Microwaves** e.g. satellites, radars
- **Infrared e.g.** short-range communications like remote controls, optical fibres, security systems and thermal imaging cameras which detect people in the dark.

Limitations of wireless transmission media

- Transmission **speed is comparably less.**
- **it has a limited amount of bandwidth for communication**
- As communication is done through open space, it is less secure.
- More open to interference.
- Has high chance of jamming.
- Unreliability
- **Wireless networks can be easily hacked.**

Types of communication

(a) Manual communication methods

These include:

- sign language
- gestures
- touch
- Manual English Signed Systems

(b) Chemical communications

- Use perfumes
- Pheromones

(c) Electronic communication

- **Email** refers to the exchange of computer-stored messages from **one** user to one or more recipients via the internet.
- **Instant messaging:** refers to the real-time or instantaneous transmission of messages via the internet or an internal network or server.

- **Video conferencing is a** technology that allows users in different locations to hold real-time face-to-face meetings**,** often at little to no cost
- **Social media** refers to websites and applications that enable users to create and share content or to participate in social networking.
- Text messaging
- Phone and voicemail
- Videos: short explainer videos are being used in marketing

Internet

The Internet is **a global network of interconnected computers and networks that enables communication and data services.**

Requirements for internet connection

- A **computer or device** to send and receive information
- An **Internet Service Provider (ISP**) is any company that provides Internet access to consumers and businesses.
- C**able lines or wireless media** to transmit messages between computers
- A **modem or a network card**: **Modem** stands for Modulator/Demodulator, it is networking device that is used to connect devices connected in the network to the internet.
- **Communication Software (Web browser)** that enable users to send and access information over the internet.
  Uses communication software

  - Instant massaging
  - Video conferencing
  - File sharing
  - Entertainment

  Examples of web browsers
  Google chrome, opera, Internet Explorer, Mozilla Firefox

Uses of internet in an organization

- Online Businesses (E-commerce)
- E-marketing
- Cashless Transactions
- Education
- Social Networking
- Entertainment

Advantages of internet connectivity

- Faster communication
- Access to information
- Transfer of research papers
- Advertising
- Marketing
- Easy banking
- Access to a global audience
- A search engine is a software program that helps people find the information they are looking for online using keywords or phrases.

Disadvantages of electronic/internet communication

- Lacks non-verbal cues such as body language and facial expression that enhance understanding
- Information overload caused by constant influx of massages, emails and notifications.
- Risks to security and privacy concerns to cyber-attack vulnerability.
- Impersonal nature
- Technical issues such as lack of internet connection disrupts communication
- Prolonged use of electronic devices can lead to physical health problems such headaches and poor postures.
- Distractions and interruptions: popup sounds associated to electronic communication can lead to frequent distractions and interruptions, affecting productivity and focus.

Advantages of sending documents using ordinary post over email

- It tangible creating stronger impression
- Carry physical parcels that e-mail can't
- Proof of existence of receiver and residence
- Post office are not prone to hacking
- Personal touch: Handwritten letter or cards carry a sentimental value that email can't replicate

Ways in which a student can use the Internet.

- **Access to knowledge:** the internet provides students with a wealth of knowledge from all over the world.
- Students access online tutorials and classes
- Research Work Becomes Easier
- Internet facilitates communication of students with teachers and peers through emails and chartrooms.
- Internet provide platform for students to express their creativity.
- It is convenient to access libraries and database resources.

Why students should be discouraged to own phone

- Addition leading poor time management when excess time is spent on the internet
- High cost of data
- Inaccurate information
- Exposure to pornography leading to early sex and unplanned pregnancy
- May contract gambling habits
- Information overload

Electronic payment (E-payment)

It is a process of conducting financial transactions electronically without the use of physical cash or paper checks.

Application of e-payment

- Online bank transfer
- payment of utilities
- payment for airtime
- payment of school fees and tuitions
- online shopping

Advantages of using E-payment over traditional methods

- reliable
- fast
- secure: reduces risk of theft
- low cost
- convenient because it can be done anywhere at any time

Forms of e-payment system

- **Credit/debit cards:** Electronic payments made using a consumer's credit or debit card.
- **E-wallets:** Digital wallets that allow consumers to store credit/debit card information and other personal data securely online.
- **Online banking:** Transferring money between bank accounts electronically.
- **QR code payments:** Scanning QR codes to make payments.
- **Contactless payments:** Using NFC technology for quick transactions.

Way in which the internet can be a danger to:

(a) Molarity (01 mark)

- Use of vulgar language on social media
- Cyber bullying
- Cyber Predators such as sexual and other predators often stalk children on the internet, taking advantage of their innocence, lack of adult supervision and abusing their trust.
- Watching pornography, bestiality

(b) Labour (01 mark)

- Fraud through fake Job advertisement
- Internet addictions reducing effective labor
- Increased unemployment
- threats to decent work and fair competition from digital labour platforms
- reduced job satisfaction due to unfair comparisons among jobs and countries

(c) System security (01 mark)

- Hacking, where unauthorized users gain access to computer systems, email accounts, or websites.
- Viruses or malicious software (known as malware) which can damage data or make systems vulnerable to other threats.
- Identity theft, where criminals can steal personal and financial information.

(d) Human security (01mark)

- Abuses on social media causing psychological harm
- Addition to malicious information and behavior.
- Cyber rimes

(e) Information

- Hacking, where unauthorized users gain access to computer systems, email accounts, or websites.
- Spread of false information
- Identity theft.
- Data breaches.
- Malware and viruses.
- Phishing and scam emails.
- Fake websites.

Netiquette guidelines while using the internet

Netiquette, short for “Internet etiquette” refers to guidelines and rules for courteous communication and behavior online. They include

- empathy
- use friendly tone
- use respectful language
- Send messages if appropriate
- Check for grammar mistakes
- Respect people’s privacy
- Respond to e-mails on time
- Create clear and accurate posts

Violations of computer ethic usage by computer user

- Illegally downloading movies, music, software, etc., from the internet.
- Internet fraud/theft
- Duplicating copyrighted content without the author's approval

- Accessing personal information of others
- Hacking is an unethical practice that involves unauthorized access to computer systems, networks, or data, often with malicious intent.
- Cutting and pasting a paper together using online materials without appropriate citations.
-

Measures that should be put in place to guard against information piracy in an organization

- protect data with password
- restrict access to company computers
- Use of watermarking to make pirate content traceable.
- Report pirated content to marketplaces
- Educating work that information piracy is illegal
- Use of Legal & Enforcement to punish those involved in information piracy

Digital forensic specialist

Digital forensic specialist is an expert in cybercrimes

Tasks that are performed by digital forensic specialists

- Gather sensitive data from electric media such as computers, laptops and mobile phones to serve as evidence in cybercrimes
- Analyzes evidence from cybercrimes.
- Preserves electronic evidence for legal proceeding
- Identify the location and personnel involved a cybercrime.
- Reports cybercrimes
- Develops standard procedure to protect data
- Retrieves crime evidence from virtual networks and physical devices.
- Reconstructing events that led to a cyber-attack.
- Recovering data compromised in a hack.
- Reconstructing and restoring data damaged or erased from devices.

Factor that determine internet transmission speed

- **Network congestion** Occurs when a user sends data faster than the network resources can handle.
- **Network latency.** The time it takes for data to travel from one point to another can also affect transfer rates. High latency connections can result in slower transfer rates because data has to travel farther and may encounter more delays along the way.
- **Bandwidth** is the amount data that sent each second. Data can be transferred more swiftly over a link with more bandwidth than over one with less capacity. An example of bandwidth affecting

data transfer rates would be downloading a large file over a slow internet connection versus a fast internet connection.

- **Type of connection.** For rinstance wired connections tend to be faster than wireless connections, and fiber optic cables can transmit data at much higher speeds than traditional copper cables.
- **Limited hardware and software resources.** A client or server with insufficient hardware resources (processing power, hard drive, input/output, and RAM) can affect the data transfer rate for the entire network.
- **Load balancing.** Load distribution is a technique used in certain devices to optimize performance and prevent overload. Nonetheless, when a high volume of data packets is involved, these devices may become overloaded or misconfigured, leading to issues such as disconnections, retransmissions, or packet loss.

Terminologies of the internet connection

1. **World Wide Web (WWW)** refers to all the public websites or pages that users can access on their local computers and other devices through the internet.
2. A **domain name** is web address that helps users find your website.
3. A **home page** is a webpage that serves as the starting point of website.
4. **Hyperlink** is a group of words, shape, or image, when clicked allows movement between documents, presentation slides or redirects computer user to a specified URL.
5. An **Internet Protocol (IP) address** is the unique identifying number assigned to every device connected to the internet.
6. A **protocol** is a set of rules and guidelines for communicating data. These rules define how computer or devices should interact during communication, ensuring successful data transmissions.

   Example of internet protocols

   (i) **Simple Mail Transfer Protocol (SMTP)** is a set of rules and guidelines for transmitting electronic mail (email) over a network.

   (ii) **Post Office Protocol (POP) is** a network server by which client-based e-mail programs are connected to access a user's e-mail on a central server.

   (iii) **Hypertext Transfer Protocol (HTTP)** is a set of rules and guidelines for transmitting hypermedia documents, such as HTML

7. A **modem** is a hardware component that allows a computer or another device to connect to the computer.
8. **Bandwidth** is the amount of information that something, like a connection to the internet, can handle at a given time.
9. **Processor speed** is the number of cycles per second in which a CPU can process instructions.

10. **Fetching** is the **retrieval** of information from a source, such as a database, network, or storage medium. After being retrieved, the data is moved to an alternate location or displayed on a screen.
11. **Decoding** is a process of interpretation and translation of coded information into an understandable form.
12. **Hyperlink** is a group of words, shape, or image, when clicked allows movement between documents, presentation slides or redirects computer user to a specified URL.
13. A **search** engine is a software program that helps people find the information they are looking for online using keywords or phrases.
    Examples of search engine include Google, Yahoo!, and MSN Search.
14. **Wi-Fi** is a technology that allows an electronic devices to exchange data wirelessly (using radio waves) over a computer network, including high-speed internet connections.
15. **Bluetooth is** a wireless technology that lets devices connect and share data over short distances.
16. **Website** is a collection of publicly accessible, interlinked web pages that share a single domain name.

Components of a website

(i) **Web Pages**: These are digital files written using HTML (HyperText Markup Language). Each web page has a unique URL within the domain.

(ii) **Web Server**: This is the backend technology that stores and serves the web pages that make up a website.

(iii) **Navigation**: This includes elements like the main menu, breadcrumb trails, and optional search bars that help users navigate the site.

(iv) **Design**: This encompasses the layout, color scheme, and typography of the website.

(v) **Content**: This includes both static and dynamic content displayed on the web pages.

(vi) **Functionality**: This includes forms, buttons, sliders, and interactive media.

Advantages of owing institutional website

- Enhances your brand image. When it comes to corporate digital presence, the company's image grows stronger as it dominates new channels.
- Serves as information bank about the institution
- Increases visibility and accessibility because information is available to globe 24/7 online
- Markets institution’s good and services.
- Facilitates communication between the institution and its clients
- A well-designed website enhances the institution’s credibility and professionalism, helping to build trust among stakeholders.
- It may act as resource centre by hosting a variety of resource such as research publication, online courses and digital libraries.
- Facilitates interaction between the institution and its clients through features like forum, contact us, comments.

17. **Website address/URl (Uniform Resource Locator)** is a digital address for a website's server and web content. It is used to find a specific resource on internet, and it specifies the location of that resource on a computer network
18. **E-mail address** is a unique identifier used to send and receive electronic messages over the internet. It written as **local part/users name@ domain name.high-level domain name**, for example

Examples of domain name: gmail, yahoo, hotmail

Some worked example

1. During a practical examination, student was required to open a blank file and save is as. D:\STUDENT WORK\EOT PRACTICAL\safety.doc
   (a) State the name of the immediate subfolder in which students must save the file (01 marks)
   EOT PRACTICAL
   (b) Write the root directory onto which the file must be saved. (02 marks)
   D:
   (c) Suggest one example of a computer application the student can use to create the file. (01 mark)
   Word processing .
   (d) State the name of the file represented by the above file path. (01 mark)

   Safety.doc

2. Use the terms to complete the statements that follow: (05marks)

   Virtual Reality, WIFI, Simulation, Bluetooth, Artificial intelligence

   (a) The science of representing behavior of real life situation using a computerized mode is **simulation.**
   (b) The technology that allows an electronic device to exchange data using radio waves of a computer network is **WIFI**
   (c) The technology that allows users to transfer data for short distances between mobile devices is **Bluetooth**

(d) The technique that rates images by a computer that appears to surround the person looking at them is **Virtual reality**

(e) The science of computers that enable qualities of human being to be imitated is **Artificial intelligence**

3. (a) Explain the following terms giving examples in each case. (02 marks)

(i) Simplex (02 marks)

- Simplex mode is a transmission mode in which information is sent in one direction only, also known as unidirectional.
- Example: keyboard, Television, Mouse, Radio Broadcasts, and Monitor

(ii) Half duplex (02 marks)

- In half-duplex mode, each station can both transmit and receive, but not at the same time.
- Example: walkie-talkie - a two-way radio that has a push-to-talk button

(iii) Full duplex channel is where both the sender and receiver can send and receive information simultaneously.

4. State one function of each of the following utility programs (03marks)

(i) Diagnostic utility

A diagnostic utility is software used **to troubleshoot a problem on the computer system**. It provides clues about the causes of problematic computer symptoms.

(ii) File compression Utility

File compression Utility a program that compresses and decompresses various file types

(iii) Antivirus Utility

An antivirus is a program that helps to keep the computer virus-free.

NB. Utility software is a program or tool that performs specific tasks to enhance productivity, efficiency, functionality, or maintenance of a computer system.

(b) Outline two ways of reducing the spread of computer viruses.

- Install antivirus and anti-malware software.
- Avoid sharing flash disks
- Avoid installing programs and files unsecure sources

- Regularly update antivirus software.
- Do not open unsecure email attachments.
- Back up your data.

5. (a) Give two reasons why file management is important in computer system (02marks)

(i) Eases finding and accessing a file

(ii) Maintains **data integrity by preventing accidental deletion or alteration of files**

(iii) Ensures data security.

(iv) Ensure saving of related files in the same folder

(v) Standardized processes of files

(b) List three operations which can be performed on a file (03 marks)

- Saving
- opening
- editing
- copying
- moving
- renaming
- deleting files.

6. (a) Explain the term troubleshooting as used in computers. (02marks)

Troubleshooting is a systematic process used to locate the cause of a fault in a computer system and correct the relevant hardware and software issues.

(b) State three ways in which one can troubleshoot a computer that has failed to start.

- Try a different power source.
- Check your monitor connection.
- Listen for beeps.
- Let the battery charge
- Start your PC in safe mode.
- Restore your computer to previous settings.
- Unplug USB devices.

7. (a) Distinguish between utilities and application software (02marks)

Utility software is a program or tool that performs specific tasks to enhance productivity, efficiency, functionality, or maintenance of a computer system.

Application software is software designed to handle specific tasks for users.

(b) Give three examples of utility programs. (03marks)

(i) Antivirus software for virus protection.

(ii) File management tools for managing files.

(iii) Compression tools for reducing file size.
(iv) Disk management tools for managing storage.
(v) Debuggers for examination and modifying data

8. Explain the following as applied to internet

(i) Hotspot (02 marks)

Wireless hotspots are wireless access points, typically in public location, that provides internet access to mobile devices such as your laptop or smartphone when you are away from the office or your home.

(ii) Internet Service provider (01mark)

An ISP is a company that provides web access to consumers and businesses through various channels, such as cable, DSL, fiber, or wireless.

(iii) Search Engine (02marks)

A search engine is software that searches a database of information according to the user's query.

9. (a) Give two reasons to justify ownership of institutional website (02 marks)

- Enhances your brand image. When it comes to corporate digital presence, the company's image grows stronger as it dominates new channels.
- Serves as information bank about the institution
- Increases visibility and accessibility because information is available to globe 24/7 online
- Markets institution's good and services.
- Facilitates communication between the institution and its clients
- A well-designed website enhances the institution's credibility and professionalism, helping to build trust among stakeholders.
- It may act as resource centre by hosting a variety of resource such as research publication, online courses and digital libraries.
- Facilitates interaction between the institution and its clients through features like forum, contact us, comments.

(b) (i) What is a web browser? (01 mark)

A web browser is a program used to access and view websites or website information.

(ii) Under what circumstances can someone use a Uniform Resource Locator (URL) in a web browser? (02marks)

A URL (Uniform Resource Locator) is an address of a website used to locate a resource on the internet.

10. (a) Give three disadvantages of electronic communication. (03marks)
    - Lacks non-verbal cues such as body language and facial expression that enhance understanding
    - Information overload caused by constant influx of massages, emails and notifications.
    - Risks to security and privacy concerns to cyber-attack vulnerability.
    - Impersonal nature
    - Technical issues such as lack of internet connection disrupts communication
    - Prolonged use of electronic devices can lead to physical health problems such headaches and poor postures.
    - Distractions and interruptions: popup sounds associated to electronic communication can lead to frequent distractions and interruptions, affecting productivity and focus.

(b) Name any two manual communication methods
(i) sign language
(ii) touch
(iii)Manual English Signed Systems

11. (a) Differentiate between intranet and extranet. (02 marks)

An intranet is a **private network contained within** an enterprise that is used to securely share company information and computing resources among employees.

An Extranet is a **private network contained within** an enterprise shared by internal and selected, external parties, such as business partners, suppliers, key customers, etc.

(b) Define a Local Area Network (LAN) (02 marks)

A local area network (LAN) is a **collection of devices connected together in one physical location**, such as a building, office, or home.

(c) Suggest an area network which is restricted to connecting users in a city. (01mark)

Metropolitan area network (MAN) (city-wide network)

(b)Explain the function of a device driver in a computer system (02 marks)
- Operate and control a device attached to a computer.
- Provide an interface between the operating system (and application) and the device.
- To tell the operating system how to communicate with the hardware component.

- Translate requests between the device and the computer.

12. Write the following in full as used in Information and Communication Technology
    (a) CCTV stands for Closed-Circuit Television
    (b) ROM stands for **Read-Only** Memory
    (C) CAD stands for Computer Aided Design
    (d) CPU stands for **Central Processing Unit**
    (e) VDU stands for Visible Display Unit
13. (a) Identify one storage device that is resistant to virus attacks (01marks)

    CD, DVD, DVDR

    (b) Describe the following terms as used in computer;
    (i) File (02marks)
    A computer file is a collection of digital data(text, images, media etc.) stored as a single object on a disk.
    (ii) Folder (02marks)
    A folder is an **area on the computer containing other folders and files** and helps keep the computer organized
14. (a) State four categories of computer systems. (04marks)
    - On the basis of size and capacity: Supercomputer, Mainframe, Mini, and Micro Computer.
    - On the basis of purposes: General and Special Purpose.
    - On the basis of hardware design and type: Analog, Digital, and Hybrid Computer.
    - Personal Computers (PCs)
    - Workstations

    (b) Give the function of any one category you have stated in 5(a). (01mark)

    Personal computer is used to do and store personal data
15. (a) Name two examples of documents created using desktop publishing applications. (02marks)
    (i) Brochures
    (ii) News papers
    (iii) Magazines
    (iv) Greeting card
    (v) flayers

    (b) State any three desktop publishing features that can be enhance enhance the document you named in 10(a) (03 marks)

    - **Text tools** that allow creation of documents with various fonts, text wrapping, drop caps and paragraph styles
    - **Graphic tools** for easy insertions and edit of images

- **Page layout** tools such as grinds and guides to align elements precisely on page and use of layers to organize different elements on separate layer to easier editing and complex designing.
- **Provision for master templates** with consistent headers, footers and other repeating elements
- **Interactive elements** such as hyperlinks and multimedia integration tools for audio and videos into a document.
- **Provision of stylish templates** for brand development and maintenance.

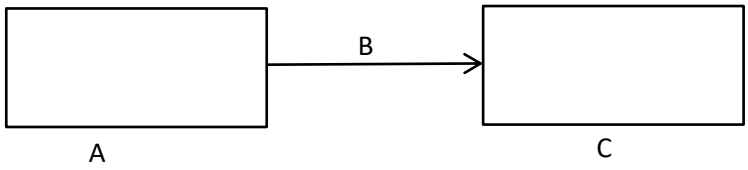
16. (a) Outline any three threats that a system Administrator may face as a result of networking (02marks)
    - **Malwares** such viruses, worms and Trojans that infect systems, steal data or cause disruption
    - **Phishing:** e-mail phishing are deceptive e-mails that trick user into revealing sensitive information and spear phishing ot targeted attacks on specific individuals within an organization.
    - **Network Hacking** or unauthorized access to network resources to steal data or disrupt services
    - **Insider threats** where employ or contractor misuse their access to harm the organization.
    - **Distributed Denial of Services (DDoS)** that cause service disruption.
    - **Social Engineering** or manipulating individuals into divulging confidential information
    - **Advanced Persistent Threats (APTs)** or long-term targeted attacks aimed at stealing data or spying on the organization.
    - **SQL Injection (SQLi) attacks** or exploiting vulnerabilities in web application to access or manipulate database
    - **Man-in-the- middle (MitM) attack** or intercepting and altering communication between two parties without their knowledge.
    - **Weak Security Control** or poorly configured systems and outdated software that can be easily exploited by attacks.

(b) Suggest two measures that the system administrator can employ to reduce the network threats. (03marks)

- Install antivirus software
- Create strong password
- Use firewalls to block unauthorized access to the network
- Encrypt Dada to protect it from unauthorized access
- Regular Backups to store data in multiple location
- Train users about cyber security and to recognize phishing attempts and other social engineering attacks.
- Monitor Network activity using intrusion detection systems (IDS)
- Update and patch system to fix vulnerabilities that could be exploited by attackers

- Implement strict access control to sensitive information
- Develop a comprehensive security policy that covers aspects of network security and data handling.

17. Study the data communication below and answer the questionsthatfollow



(a) Name the elements of data communication (02marks)

A - sender /transmitter
B – transmission medium
C – receiver

(b) Suggest the device used to connect A to B (01 mark)
Cable/wire/ transmission media
wireless

(c) State the protocol used to uniquely Identify A and C (01mark)
A – Encodes/encrypts data
C – Decodes data

18. The table below consist of some of the peripheral devices of a computer. Indicate Input or output (05 marks)

	PERIPHERAL DEVICES	INPUT/OUTPUT
(a)	Biometric reader	Input
(b)	Projector	output
(c)	Plotter	output
(d)	Scanner	input
(e)	Headphones	output

19. (a) Give two reasons why an electronic spreadsheet is suitable for preparing budgets. (02 marks)
- Offer limitless customization
- Handles vast amount of data
- Makes adjustment of figures easy
- Organizes and makes tracking of income and expenditure easy
- Makes calculation easy
- Provide flexibility in how to manage and analyze the budget
- Enhances visualization through use graphs
- Provides storage and easy accessibility options

- Cheap because most spread software like Google Sheets is free

(b) State one use of the following applications

(i) Presentation software (01 mark)

- Teaching
- Lectures
- Demonstration
- Project report
- Workshops
- Marketing reports
- training

(ii) Word processor (01marks)

- document creation: letters, report, resume, stories and essays
- edits and formats documents
- provides templates for documents like business letters, invoices etc.
- mail merge: automating the process of sending personalized letter or email to multiple recipients
- Creates academic papers and articles
- Creates tables charts and lists of organized information effectively
- Automatically checks and corrects spelling and grammatical errors

(iii) Communication software (01 marks)

- Instant massaging
- Video conferencing
- File sharing
- Entertainment
- Relaxation

20. (a) Name one example of presentation software (01marks)

- **Microsoft** PowerPoint
- Google Slides
- Prezi
- Pitch
- **Visme**
- **Keynote**
- Haiku Deck

- Canva

(b) Give the importance of each of the following features as used in electronic presentation

(i) Master slide

- Enhances presentation efficiency i.e. changes made on the master slide apply to all slides in the presentation saving time for individual slide manual editing
- Consistency i.e. all slides will carry the same log, color, fonts etc.
- Enhances visual effects.

(ii) Transition (02marks)

- Enhance appearance
- Control speed

21. (a) State three advantages of using e-mail service over sending mail by post. (03 marks)

- Reduce postage costs
- Fast
- It is environmentally friendly
- Convenient : letters are created and sent from anywhere.
- Improve document security.
- Mails can be sent and receive simultaneously to multitude of recipients at ago.

(b) State two advantages of post-mail over e-mail communication. (02marks)

- It tangible creating stronger impression
- Carry physical parcels that e-mail can't
- Proof of existence of receiver and residence
- Post office are not prone to hacking
- Personal touch: Handwritten letter or cards carry a sentimental value that email can't replicate

22. Give five examples of networking software (05marks)

- Novel Netware
- Apple talk
- Digi card
- NanjaOne
- Intermapper. Useful Free Network Tools.
- Econet for acorn computers
- UNIX Windows for work groups

23. Outline five ways in which a student can use the Internet. (05marks)

- Access To Knowledge: the internet provides students with a wealth of knowledge from all over the world.
- Students access online tutorials and classes
- Research Work Becomes Easier
- Internet facilitate communication of students with teachers and peers through emails and chartrooms.
- Internet provide platform for students to express their creativity.
- It is convenient to access libraries and database resources.

24. (a) (i) What is data transmission media (01marks)

Transmission media is the physical path between the transmitter and the receiver through which data is sent from one place to another.

(ii) Give two examples of data transmission media. (02marks)

- Cable/wired
- wireless

(b) Name two services offered by data communication tools. (02marks)

- mails
- video conferencing
- SMS
- Phone calls
- Tutorials
- entertainment