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Assignment 1

a) Role of information technology and computers in today's world.

Information Technology is the use of computers, software, network and other electronic devices to store, process, transmit and manage information.

1.Communication

Enables instant communication through email, social media, video calls and messaging apps.

2.Education

Support e-learning, virtual classrooms, online research and digital libraries.

3.Business and commerce

Used for data management, online transactions, marketing, automation and customer service.

4.Healthcare

Assists in patient's records, medical research, diagnostics, telemedicine and hospital management systems.

5.Banking and finance

Enables mobile banking, ATM services, online payments and financial analysis.

6.Government services

Help in e-government services, data storage, national security and efficient public service delivery.

7.Entertainment

Used for streaming movies, music, gaming and digital content creation.

8.Transportation

Support navigation systems, traffic control, airline booking.

9.Agriculture

Used in weather forecasting, crop monitoring and farm management systems.

10.**Security**

Help in surveillance systems, cybersecurity and data protection.

2.Describe the fundamentals of computer operations.

There's the input showing how data enters the computer, processing showing how the CPU works on that data, there's output displaying the results, storage showing how data is saved and control how the computer manages all the operations.

1.INPUT.
The stage where raw data or instructions are entered into the computer.
Users use input devices such as keyboard, mouse, scanners, touch screens, microphone cameras.

2.PROCESSING
Once data is processed, the computer produces information.
After receiving input, the computer uses the CPU to process the data.
Processing involves

i. Calculations
ii. Comparisons
iii. Decision making

The CPU consists of the ALU and the Control unit which work together to handle data.

Arithmetic and logic unit(ALU)

Most computer operations are executed in ALU of the processor.

Note that all operands may not reside in main memory. Processor contains a number of high speed storage elements called registers, which may be used for temporary storage or frequently used operands.

Access time to registers are 5 to 10 faster than access time memory.

Control unit

The operations of all units are coordinated here. It acts as a nerve center that sends controls signal to other units.

Synchronization signals are also generated by control unit.

3.OUTPUT

Once a data is processed the computer produces information meaningful to the user.

Output devices include, monitors, printers, speakers and projectors.

4.STORAGE

It refers to saving data and instructions for current and future use.

There are two main types:

I)primary storage-for temporary storage of data when the computer is working. It is fast but loses data when power is off.

2)Secondary storage

Use for long term storage of files, software, and system data. It is non-volatile, meaning it keeps data even when computer is shut down.

5.CONTROL

Managed by the control unit inside the CPU.

It directs all the operations of the computer.

Ensures instructions are carried out in the correct order and coordinates input, processing, output and storage.

Basically acts as the brain manager of the computer.

Computers may give feedback to users or other systems. Feedback include notifications, error messages, prompt or status updates. It helps users know if the computer needs more input, if an action was successful or if something went wrong.

3.Describe the basis of computer hardware and software.

1.hardware.

Refers to all physical parts of a computer system that can be seen and touch, in short tangible ones.

Characteristics of hardware

It is tangible

It performs mechanical and electronic operations

Cannot work without software

It includes both internal and external components.

Examples:

Input devices: keyboard, mouse, scanner

Output devices: monitors, printers, speakers

Storage device: hard drives, SSD, flash drives

System unit components: CPU, RAM, motherboard, power supply.

Communication devices: routers

Categories of hardware

1) Input hardware- used to enter data
2) Processing hardware-CPU and memory that processes data
3) Output hardware-displays or produces results
4) Storage hardware-saves data
5) Communication hardware-enables networking

SOFTWARE

Set of instructions, programs and data that tell the computer what to do.

It is intangible-you cannot touch but can see it running.

Characteristics:

It is intangible

Controls and manages hardware

Created by programmers

Can be updated, modified or deleted.

Types of software.

a) System software

Controls the hardware and basic operations of the computer.

Includes:

Operating system: windows, Linux, maCos

Utility programs: antivirus, disk cleaners, backup

Device drives: allow hardware to work with the system

b) Application software

Are programs designed to help users perform specific tasks like, word processor, browsers, media players.

Relationship between hardware and software.

Hardware cannot function without software

Software needs hardware to run

Together, they complete the computer system

4. The construction of data files

It is the process of creating, organizing and storing data in a structured format so that it can be easily accessed, processed, and managed by a computer system.

a) Identifying the purpose of the file.

Determine why the file is need. This helps to decide what type of data will be stored.

b) Determining the data items(fields).

Decide specific pieces of information the file will contain. These pieces are called Fields. They include: name, ID number, age.

c) Grouping fields into records.

A record is collection by related files about one item or person. Student record may include registration number, age or course. Records make data easier to organize.

d) Choosing the file structure.

The type of file structure depends on how data will be stored and accessed.

Sequential file-data is stored in a fixed order, record by record.

Indexed file-uses an index to allow fast searching

Random file-records are stored at specific location for quick access.

e) Choosing the file format.

Decide whether the file will be:

- Text file(TXT)
- Database file (DBF, SQL)
- Spreadsheet file(XLSX)
- Binary

The format depends on type of operations needed.

f) Specifying file layout

Define the order of fields, field sizes, data types and constraints. It helps maintain consistency when entering or processing data.

g) Creating the file

Use appropriate software: database systems, spreadsheet program, programming languages.

The file is created to start storing records.

h) Entering and validating data.

Add records into the file

Check your errors, duplicates, missing values. This ensures accuracy and validity of data.

i) Storing and maintaining the file

Save the file

Regular updates, backups, and security measures must be applied. This helps protect data from loss and corruption.

5. Determine the different means of disk storage.

Disk storage-different devices and technologies used to store digital data permanently. The devices hold data even when power is turned off.

a) *Hard disk drive*.

A HDD is one of the oldest and most common form of secondary storage.

It stores data magnetically on rotating disk called platter.

A mechanical read/write head moves across the spinning disk to store or retrieve data.

Key features:

It is made up of platters coated with magnetic material

Has moving mechanical parts

Storage capacity is large

Access speed is lower compared to SSDs

Advantages:

Low cost per gigabyte

Good for storing large files

Long lifespan if handled well

Disadvantages:

Slower read/write speed

Produces noise because of moving parts

Easily damaged by dropping or physical shock

b) Solid-state drive(SSD).

It uses flash memory chips to store data. Unlike HDDs, they have no moving parts making them faster and more durable.

Key features:

Stores data electronically

Much faster than HDDs

Silent in operations

More reliable due to lack of moving parts

Advantages:

Very fast boot and load times

More durable and resistant to shock

Consumes less power

Disadvantages:

More expensive

Has limited number of write cycles

c) Hybrid Drive (SSHD).

A solid state hybrid drive combines the features of both SSD and HDD. It includes a small SSD portion for frequently accessed data and an HDD portion for larger storage.

Key features:

Uses SSD memory for speed

Uses HDD for large capacity

Automatically moves commonly used files to the SSD section

Advantages:

Faster than a normal HDD

Cheaper than a full SSD

Good balance of price and performance

Disadvantages:

Not as fast as pure SSD

Slightly more expensive than HDDs

d) Optical disks (CD, CVD, Blu-ray).

They store data using laser technology. The laser burns microscopic marks on the disk surface to represent data.

Advantages:

Cheap and portable

Good for media distribution

Useful for backups

Disadvantages:

Limited storage capacity

Can scratch easily

Becoming outdated

e) USB flash drives.

These are small portable storage devices that use flash memory.

They connect through a USB port and widely used for transferring files.

Advantages:

Very portable and easy to carry

Reusable and easy to plug into any computer

Available in many capacities

Disadvantages:

Can be lost easily due to small size

Can be corrupted if mishandled

f) Memory cards.

They can store data using flash memory, just like USB, but used mainly in portable devices such as smartphones, tablets. Common types are, secure digital, micro SD, compact flash.

Advantages:

Small and lightweight

Good for portable devices

Expandable storage for phones and cameras

Disadvantages:

Easy to damage or corrupt

Slower than SSDs

g) Network attached Storage(NAS).

A dedicated storage device connected to a network.

It stores data for multiple users and devices

Key features:

Works like a personal cloud within a home or office

Accessible over Wi-Fi or Ethernet

Used in offices for file sharing and backups

Advantages:

Centralized data storage

Supports multiple users

Reliable for backups

Disadvantages:

Expensive

Requires technical setup

h) Cloud Storage

It is not a physical disk that you hold but data stored on remote services through the internet. Examples include: good drive, one drive, I cloud, drop box

Advantages:

Access files anywhere with internet

Safe backup against physical damage

Allows sharing and collaboration

Disadvantages:

Requires internet connection

Limited free storage

Depends on the provider's security

6. Use different number systems and bases and apply the concepts in the four basic operations.

1. Decimal number system (Base 10)

Uses digits 0 to 9

Each position has place value for powers of 10.

Example:

452= (4*100) +(5*100) +(2*1)

2. Binary number system(base2)

Mostly used by computers

Uses digits 1 and 0 only

Example:

1011_2= (1*8) + (0*4) + (1*2) + (1*1) =11

3. **Octal number system (base 8)**

Uses digits 0 to 7

Often used as a shortcut to binary

Example:

65_8= (6*8) + (5*1) = 53

4. **Hexadecimal number system (base 16)**

Uses digits 0 to 9 and A to F

Used mostly in programming

Example:

$1A_{16}$ = (1*16) +(A=10*1) =26

The four basic operations in different bases:

Addition

101+011 = 1000

Subtraction

Borrowed when needed just like decimal but using the base

Example:

1000 – 011 = 101

Multiplication

Multiply like decimals but use base rules

Division

Same method as decimal: divide, subtract, bring down.

Example:

1010/10 = 101