(SOFTWARE CONCEPTS)

Relationship Between Software and Hardware

Computer System = Hardware + Software

Software and hardware are interdependent components of a computer system. They work together to perform tasks and execute operations efficiently.

Thus, software and hardware complement each other to make computing possible.

1. Hardware

- Physical components of a computer (e.g., CPU, RAM, Hard Drive, Motherboard, etc.).
- Provides the infrastructure for executing software programs.
- Without software, hardware is just an idle machine.

2. Software

- Set of instructions that tell the hardware what to do.
- Includes Operating Systems (Windows, Linux, macOS) and Applications (MS Office, Games, Browsers, etc.).
- Without hardware, software cannot function.

3. Relationship Between Software and Hardware

- **Software controls hardware**: Operating systems manage hardware resources, and applications perform user-specific tasks.
- **Hardware executes software instructions**: The CPU processes program instructions stored in memory.
- **Drivers & Firmware act as intermediaries**: Drivers help software communicate with hardware (e.g., printer drivers), while firmware is embedded software that runs hardware components.
- **Both evolve together**: Advanced software needs powerful hardware, and new hardware requires updated software to function efficiently.

4. Examples of Software-Hardware Interaction

- A video game (software) running on a gaming PC (hardware).
- A web browser (software) using RAM and CPU to display webpages.
- A printer (hardware) requiring driver software to function.

Algorithm

Definition: An algorithm is a step-by-step procedure or set of rules to solve a specific problem systematically.
Example: Algorithm to add two numbers:

1. Start
2. Take two numbers as input
3. Add the numbers
4. Display the result
5. Stop

Flowchart

Definition: A flowchart is a graphical representation of an algorithm using symbols to show the logical flow of a program.
Common Symbols:

- **Oval** → Start/Stop
- **Parallelogram** → Input/Output
- **Rectangle** → Processing
- **Diamond** → Decision

Program

Definition: A program is a collection of instructions written in a programming language to perform a specific task when executed by a computer.
Example (C program to add two numbers):

```
#include <stdio.h>

int main() {

   int a, b, sum;

printf("Enter two numbers: ");

scanf("%d %d", &a, &b);
```

```
   sum = a + b;
printf("Sum: %d", sum);
   return 0;
}
```

Pseudocode (P-Code)

Definition: Pseudocode is an informal way of writing an algorithm using simple English-like statements without following strict syntax rules of a programming language.
Example:

```
BEGIN
  Read A, B
  Sum = A + B
  Print Sum
END
```

Features of a Good Programming Language

A good programming language should have the following characteristics:

1. **Simplicity** – Easy to learn and use.
2. **Readability** – Code should be understandable.
3. **Efficiency** – Should execute quickly and use minimal resources.
4. **Portability** – Should run on different platforms.
5. **Modularity** – Supports code reusability (functions, modules).
6. **Scalability** – Can handle small and large applications.
7. **Robustness** – Should handle errors and exceptions properly.
8. **Security** – Should have built-in security features.
9. **Support for Libraries** – Should have a rich set of built-in functions.
10. **Community Support** – Should have good documentation and community support.

MS-DOS (Microsoft Disk Operating System)

- **Definition**: MS-DOS is a command-line-based operating system developed by Microsoft for IBM-compatible personal computers.
- **Developed by**: Microsoft
- **Released in**: 1981
- **Founder**: Bill Gates & Paul Allen
- **History**:
    - Originally developed as **QDOS (Quick and Dirty Operating System)** by Tim Paterson in 1980.
    - Microsoft acquired QDOS, modified it, and released **MS-DOS 1.0** in 1981.
    - It was a **text-based OS** that required users to type commands to operate the computer.
    - Dominated the PC market until Windows took over in the 1990s.
    - The last standalone version was **MS-DOS 6.22 (1994)**.

2. Linux

- **Definition**: Linux is an open-source, Unix-like operating system based on the Linux kernel, known for its stability, security, and flexibility.
- **Developed by**: Linus Torvalds
- **Released in**: 1991
- **Founder**: Linus Torvalds
- **History**:
    - Inspired by **UNIX**, Torvalds developed the first version, **Linux Kernel 0.01**, in 1991.
    - Gained popularity due to its **open-source nature** and community-driven development.
    - Used in **servers, supercomputers, mobile devices (Android), and embedded systems**.
    - Major distributions include **Ubuntu, Debian, Fedora, Red Hat, and Arch Linux**.

3. Windows Operating System

- **Definition**: Windows is a GUI-based operating system developed by Microsoft that allows users to interact with the computer through graphical elements like windows, icons, and menus.
- **Developed by**: Microsoft
- **First Release**: **Windows 1.0 (1985)**
- **Founder**: Bill Gates
- **History**:
    - Built as a **Graphical User Interface (GUI)** for MS-DOS to make computers more user-friendly.
    - Key versions:
        - **Windows 3.1 (1992)** – First widely used GUI version.
        - **Windows 95 (1995)** – Introduced Start Menu and Plug & Play.
        - **Windows XP (2001)** – One of the most successful versions.
        - **Windows 7 (2009)** – Known for stability and user-friendliness.
        - **Windows 10 (2015)** – Integrated across PCs, tablets, and phones.
        - **Windows 11 (2021)** – Latest version with a modern design and enhanced performance.
    - Windows remains the **most popular desktop OS** worldwide.