CTH EDUCATION

Unit – 01 : PC Components and System Board.

- Hardware used for I/P, O/P & inside computer case,
- System board components used for communication among devices,
- Software - 3 types of Software, OS, application software,
- ROM BIOS,
- Functions of BIOS, The boot process,
- POST and important beep codes,
- Know about different connectors,
- The CPU & the chipset – CPU form factor, CPU slots and sockets,
- Different types of RAM,
- Buses – ISA, MCA, EISA, USB,
- Firewire, AGP, PCI, Setting the CPU & Bus speeds, CMOS setup and data protection.

Questions to be discussed :

1. What is hardware ? Explain in brief different hardware components.
2. What is software ? Explain different types of software.
3. Discuss BIOS in brief. Write the function of BIOS.
4. Discuss about motherboard. Also explain its type in brief.
5. What is Expansion Bus ? Explain different types of bus in computer system.
6. Explain different types of RAM in details.
7. Write short notes on :
   a. POST
   b. Beep Code
   c. USB
   d. CMOS

CTH EDUCATION

What is Hardware ?

- The physical device that make up the computer are called Hardware.
- The hardware units are responsible for input, storing and processing the given data and the displaying the output to the users.
- The basic hardware units of a computer are keyboard, mouse, CPU, memory, monitor & printer.
- Among these hardware units keyboard & mouse are used to input data into the computer.
- Memory is used to store data, CPU is used to process the input data and monito & printer are used to display the processed data to the user.

Hardware used for I/P and O/P :

- Hardware is the physical parts of a computer.
- A computer system usually contains, the following hardware components:

1. The System Unit
   - ✓ Motherboard (aka System Board)
   - ✓ CPU (Central Processing Unit)
   - ✓ Memory, such as RAM, ROM
   - ✓ Ports
   - ✓ Expansion Slots
2. Secondary Storage, such as hard disk drives, CD-ROMs, etc.
3. Input/output Devices
4. Communications Devices

Motherboard:

- The Motherboard is the main circuit board for the computer, containing both soldered, and non-removable components along with slots for components that can be removed.
- The motherboard holds the CPU, RAM and ROM chips, etc.

Central Processing Unit(CPU):

- The CPU is the "brain" of the computer.
- It executes instructions and tells other components what to do.
- There are 2 parts of the CPU: The ALU and Control Unit.
  - The ALU performs arithmetic operations (such as addition and subtraction) and logical operations (such as comparing two values).
  - The Control Unit deciphers and carries out instructions.

RAM

- RAM is used to hold instructions and data while they are being used.
- RAM is volatile, meaning its contents are lost when the power goes off.

ROM :

- ROM chips are non-volatile memory that generally contains instructions for "booting" the computer (i.e. loading the operating system when the computer starts up).

Ports :

- Ports are sockets that are on the outside of the system unit, meaning you can easily plug a cable into a port without opening the system unit.
  - **Serial** ports transmit one bit of data at a time.
  - **Parallel** ports transmit 8 bits of data at a time.
  - USB ports are much faster than serial or parallel ports and allow multiple devices to be connected to the same port.
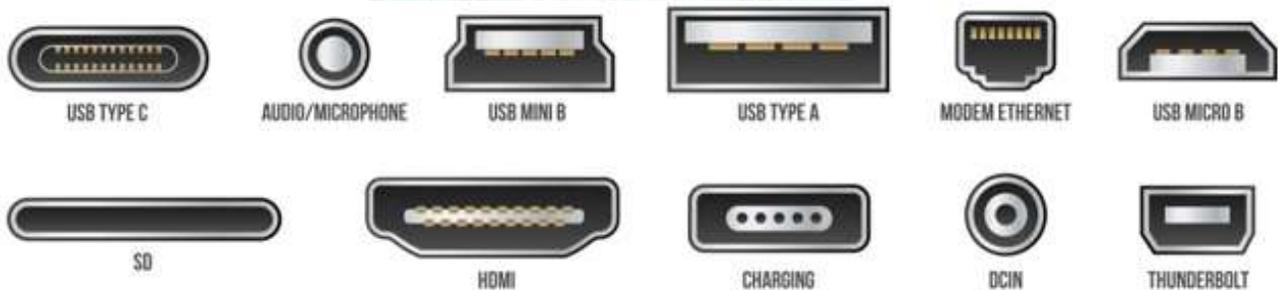
Expansion Slots

- Expansion Slots are sockets on the motherboard that you can plug expansion cards into.
- To plug a card into a slot, you must open the system unit.
- Common types of cards are graphics, sound, and network cards.
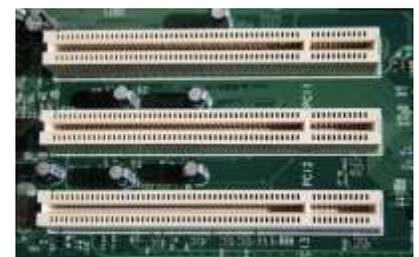
Secondary Storage

- Devices that "permanently" hold data and information (i.e. programs).
- It is non-volatile memory, when the power goes off, contents are still saved.
- Used to store instructions and data while they are **not** being used.

Input/Output Devices

- Input devices translate data into a form the computer can understand.
- The keyboard is the most common input device, but this type of data entry is very slow.
- Pointing devices such as the mouse, trackball, and touchpad allow you to manipulate a cursor on the screen.

Communications Devices :

- These allow your computer to send/receive data to/from other computers.
- A modem sends information over a phone line.
- Modems are slow and susceptible to problems such as phone line static.
- A network card sends information over a network cable.
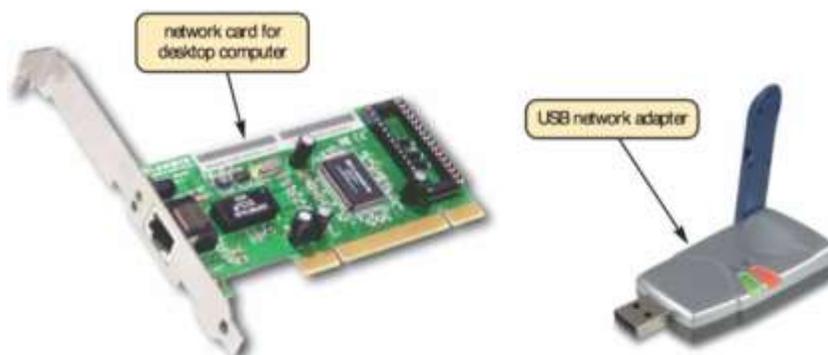
Motherboard :

- It is the piece of computer hardware that can be thought of as the "backbone" of the PC.
- The motherboard serves to connect all of the parts of a computer together.
- The CPU, memory, hard drives, and other ports and expansion cards all connect to the motherboard directly or via cables.
- A computer's motherboard is also known as the mainboard or system board.
- The IBM PC that was released in 1981, is considered to be the first computer motherboard.

Motherboard components used for communication among devices :

1. Mouse & keyboard
2. USB
3. Parallel port
4. CPU Chip
5. RAM slots
6. Floppy controller
7. IDE controller
8. PCI slot
9. ISA slot
10. CMOS Battery
11. AGP slot
12. CPU slot
13. Power supply plug in
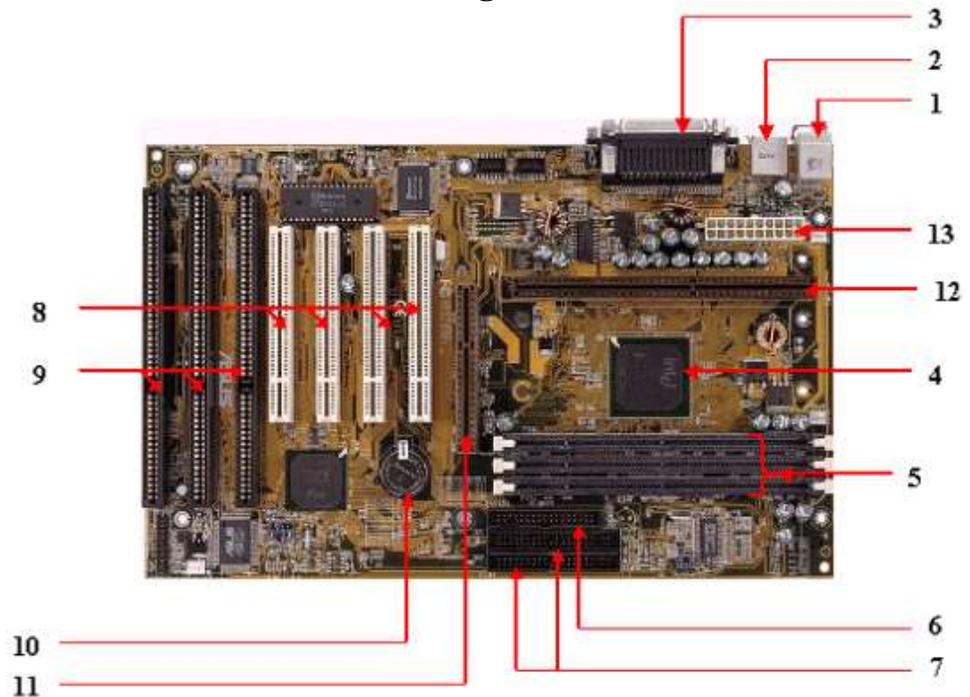
Keyboard and mouse :

- There are mainly 2 types of mouse and keyboard connectors.
- The first connector is known as PS/2 & the second connector is known as USB.

Universal Serial Bus (USB) :

- The USB port is used for connecting the computer system.
- The main use of a USB port is to connect the peripheral devices and computer motherboards.
- The peripheral device connected to the computer system can be inserted or remove without system restarts that can be the main advantage of a USB port.

Parallel port

- The old printers that are used the parallel port to connect with the computer system.
- In the parallel port, multiple wires are used to send or receive multiple bits of the data in a single instance.
- On the other hand, serial ports use only one wire at a time.
- In the parallel port, 25 pins female DB type connector is used.

CPU chip

- The CPU is the processor that controls all the functions of the computer system.
- The overall flow of task and functions are controlled by the central processing unit.
- For the computer system, the CPU is called the brain of the computer system.

RAM slots

- The RAM slots are used for connecting the RAM (memory) in the computer system.
- In the general computer system, there are mainly two RAM slots but sometimes there can be four-plus slots in the motherboard to increase the memory of the computer system.

Floppy Controller

- The older motherboard chip contains a 34-pin type ribbon cable for connecting the computer system with a floppy drive.
- In this ribbon cable, one end is directly connected with the computer system and one end is connected with the motherboard.

IDE controller

- The integrated drive electronics are also known as ATA or Parallel ATA.
- The IDE is the type of component that issued for hard drive control.
- In today's computer system, the IDE controller supports is not supported.

PCI slot

- The full form of PCI is a peripheral component interface.
- The PCI slot is mainly used to insert the expansion cards on the computer.
- The other PCI devices can also be connected like a sound card, network card, video, card, modems, and other devices.
- In today's computer system support for PCI expansion slots are not there.

ISA slot

- Industry-standard architecture (ISA) is defined as standard architecture for expansion bus.
- The ISA slot issued for connecting input devices and modems.

CMOS Battery

- The CMOS battery is used for storing the BIOS settings on the motherboard.
- The CMOS battery is also capable of storing the time and data in it.

AGP slot

- AGP stands for Accelerated Graphics slot.
- AGP is a type of computer slot that is used for attaching the video card to the system.
- This slot is a high-speed slot so that data transfer can be done at high speed.

CPU slot

- The CPU slot is a type of port that is used to connect the central processing unit to the motherboard of the computer system.

Power supply slot

- The power supply slot is used for providing the electric supply to the computer system so that it can start and perform its functions.

Factors of Motherboard :

- The main form factor for the motherboard is size and shape.
- The other factors are physical layout, mounting holes, and board organization.
- In the below section, some of the form factors are mentioned below:

1. ATX

- In this type, the standard locations were defined for mouse, keyboard, input/output devices, video connectors, and other devices.
- In the year 1990, the ATX form factor was developed.

2. Micro-ATX

- The benefit obtained from the Micro-ATX is the same as from the ATX form factor.
- The main difference is an improvement in system design so that the overall cost of the component can be reduced as the size of the motherboard is reduced in this form factor.

What is software?

- A Software is a collection program that enables a computer to perform a specific task according to given instruction.
- A program is a set of instructions and data.
- An instruction is a set of rules.
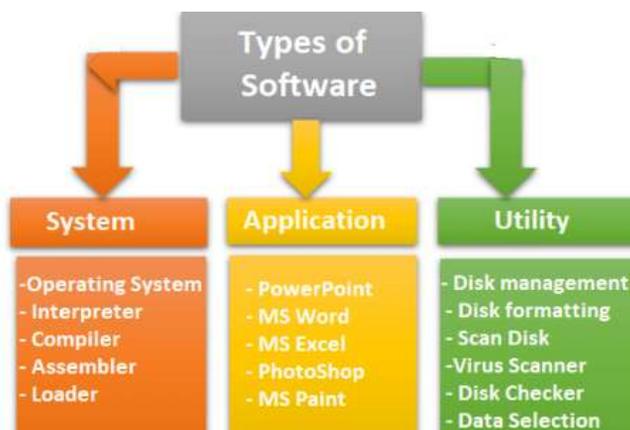
System Software :

- The system software is a software that manages and controls the hardware.
- It is an essential part of the computer system.
- They create an interface between the user and the hardware and provide a platform to execute the application software.
- It is a type of software that requires to operate the system.
- Without system software we can't operate any hardware or even computer system also.

   Example :
   - Operating System(OS)
   - Language Processor
     like Compiler, Interpreter, Assembler.
   - Device Driver
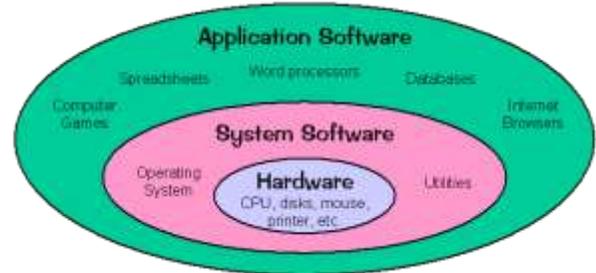
Application Software(apps)

- Application Software is a group of software programs.
- That helps a user to perform single or multiple tasks.
- They can be constructed in any language depending on the work.
- It is also called end-user software.
- It is a type of software that is used for special purpose.
   - Word processors, spreadsheets, Powerpoint.
   - Web Browser(Google Chrome, IE, Opera Mini etc), Media Player, Photoshop etc.

Utility Software :

- Utility software is also known as a Service program.
- It is a computer system software that is designed to help organize computer hardware, operating system, or application software.
- It also helps to configure, and monitor, or maintain a computer.
- It controls the health issue of system software.
   Example :
   - Disk management
   - Virus Scanner, Disk Checker, Anti-Virus, Firewall etc.

What is BIOS ?

- BIOS stands for Basic Input Output System.
- BIOS is a small program which is pre-installed on windows based OS.
- It is used to start up the computers.
- It is the first program which is installed in computer even before the OS.

Boot process :

- BIOS check the CMOS settings after starting the computer.
- They read the settings of the CMOS, to check whether everything is functioning correctly.
- After checking BIOS setting BIOS load computer driver which works as interface between the operating system and connected device.
- After loading the computer driver, it starts all CPU registers are ready to work correctly.
- After all this process, BIOS finds a bootable medium after reading the bootable medium, and they load the correct file to the RAM just after the computer is on.

Function of BIOS :

- The main function of BIOS is to boot the operating system of the computer.
- When the computer is on, then BIOS does this tasks given below.
  - For the custom setting, you can check the CMOS setup.
  - To load the Interrupt handlers and device driver.
  - To conduct Power-on-self-test (POST).
  - For display system settings.
  - To decide from which device system is the boot.

Difference between BIOS and CMOS :

BIOS	CMOS
BIOS Stands for Basic Input Output System	CMOS Stands for Complementary Metal Oxide Semiconductor.
BIOS configure the i/p & o/p of the computer, store all settings, and start the computer.	CMOS work is in the form of battery and to secure all settings of BIOS.
BOIS is known as Computer Boot Process Start-up.	CMOS is known, Real Time Clock (RTC), Non-volatile RAM (NVRAM).
BIOS Software are installed in motherboard's EEPROM is stored on the ROM chip.	The CMOS battery is small coin shaped cell on the motherboard,
Their work is incomplete without each other if CMOS is damaged, then BIOS still works,	If BIOS is damaged, then CMOS stops responding.
BIOS gets power from CMOS.	CR2032 cell battery gives power to CMOS which is also called CMOS battery

What is beep code ?

- A beep code is the audio signal given out by a computer to announce the result of testing sequence the computer performs when first powering up (called POST).

1 short beep	Normal post –system is ok
2 short beeps	Post error –error code shown on screen
3 no beep	Power supply or system board problem
Continous beep	Power supply, system board or keyboard problem
Repeating short beeps	Power supply or system board problem
1 long, 1 short beep	System board problem
1 long. 2 short beeps	Display adapter problem (MDA, CGA)

POST :

- POST stands for Power On Self-Test.
- The POST is a collection of test programs.
- The function of these programs is testing the various functional units in the PC and verifying whether they are working or not.
- The POST programs are automatically executed whenever the PC is turned on or reset.
- If the computer passes the POST the computer will have a single beep as the computer starts and the computer will continue to start normally.
- However, if the computer fails the POST, the computer will either not beep at all or will generate a beep code, which tells the user the source of the problem.

CPU Form Factors :

- The form factor of the CPU describes its general shape, what sorts of Sockets and slots used and how heat sink is arranged, and its physical organization.

CPU Slots and Sockets

- Slot or socket is the physical connection used to connect a device (CPU) to the system board.
- The type of slot or socket supplied by the system board for the processor must match that required by the processor

History of RAM :

Type of RAM	Year Invented
FPM-(Fast page mode RAM)-	1990
EDO RAM (Extended data out random access memory)	1994
SDRAM (Single dynamic RAM)	1996
RDRAM (Rambus RAM)	1998
DDR (Double Data Rate)	2000
DDR2	2003
DDR3	2007
DDR4	2012
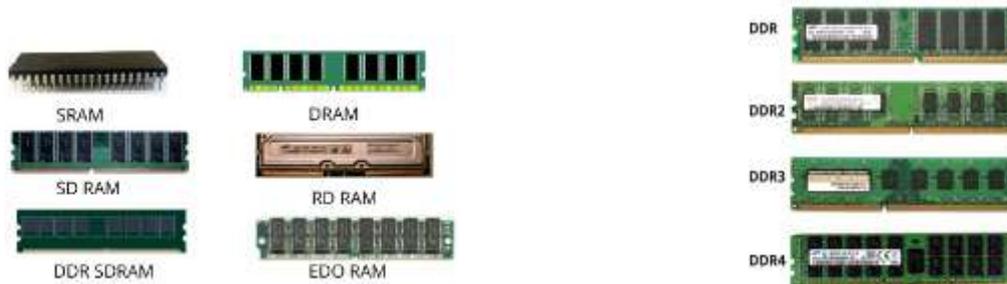
What is RAM ?

- RAM stands for Random Access Memory.
- It is a read-write memory, where data is stored that the processor is currently using.
- Your computer can access RAM memory much faster than data on a hard disk, SSD.
- RAM capacity is critical for system performance.
- It is volatile in nature and also known as working memory of computer.
- There are two types of RAM : Static RAM and Dynamic RAM

Difference between SRAM and DRAM :

SRAM	DRAM
SRAM has lower access time, so it is faster compared to DRAM.	DRAM has higher access time, so it is slower than SRAM.
SRAM is costlier than DRAM.	DRAM costs less compared to SRAM.
SRAM consumes more power.	DRAM consumes less power.
It is a complex internal circuitry, and it offers less storage capacity.	It is the small internal circuitry and it offers large storage capacity is available.

What is Computer Bus ?

- The computer system consist of number of internal and external components.
- These components are physically interconnected & communicate with each other through a network of wires, these wires are called computer bus.
- It is used to send data, addresses, control signals and power to the various components.
- In simple computer buses are electrical wires that connect hardware components of computer system.
- There are three types of computer bus :
  1. System Bus
  2. Expansion Bus
  3. Input/Output Bus

What is Expansion Bus ?

- The expansion bus connects most important internal system component CPU and PCI.
- The PCI slots are used to add card such as graphics card and sound card.
- These cards are installed to enhance the system performance.
- Buses are classified by their shape, number of connector pins, and the type of signals.

What is an ISA Bus?

- ISA stands for Industry Standard Architecture.
- An ISA bus is a computer bus that allows additional expansion cards to be connected to a computer's motherboard.
- An ISA bus that appeared in 1981 is a 8-bit bus with a clock speed of 4.77 MHz.
- In 1984, the bit was expanded into a 16-bit bus and the clock speed went from 6 to 8 MHz.

    8-bit ISA Connector:

    16-bit ISA Connector:

What is MCA Bus?

- MCA stands for Micro Channel Architecture.
- It is an improved bus designed by IBM in 1987.
- The MCA bus was designed to upgrade ISA features, including:
  Slow speed Complex configuration, Limited hardware options etc.

What is an EISA Bus?

- EISA stands for Extended Industry Standard Architecture.
- It was developed in 1988 by a consortium of companies to compete with the MCA bus that was launched by IBM the previous year.
- The EISA bus used connectors that were the same size as the ISA connector but with 4 rows of contacts instead of 2, for 32-bit addressing.

Universal Serial Bus (USB) :

- USB stands for Universal Serial Bus.
- USB is the bus standard for connecting cables between computers, and devices.
- USB is used for data transfer and power supply.
- It connects peripheral devices such as digital cameras, mice, keyboards, printers, scanners, media devices, external hard drives and flash drives.

What is Firmware ?

- Firmware is a software that provides basic machine instructions that allow the hardware to function and communicate with other software running on a device.
- Firmware provides low-level control for a device's hardware.
- It is a piece of programming code embedded in a particular hardware.
  Examples :
  Firmware resides in keyboards, video cards, routers, webcams, motherboards, mice, microwave ovens, refrigerators, washing machines, etc.