Unit 2 Fundamental of Computer and Application

Computer components

Introduction to computer system

The word system refers to the integration of several individual independent unit which are integrated together to achieve a common objective or goal. System is a set of detailed method, procedure and routines created to carryout a specific activity, performs a duty or solve a problem. In a system different unit co-ordinate with each other so that they work as a whole. Without any of the unit whole system is affected. Similarly. computer system is also a Combination on hardware, software and peripherals which are organized together to run our computer system smoothly. Basically, our computer System works on IPO (Input Process Output) cycle. So, it is mandatory/compulsory to have different unit work together as a whole in order to convert raw facts and figure into meaningful information. Without any one of these unit computer starts malfunctioning. The design, arrangement, construction or organization a different parts of computer system is known as computer architecture. It is the conceptual design and fundamental operational structure of a computer system. It is a framework which focus in how CPU performs internal operation. So computer architecture may also be define as the science and art of selection, inter connecting hardware components to create computer to meet functional performance and cost.

Components/Elements of Computer System

A Computer System has several have several basic components or elements which are listed below:

1. Hardware (Input, Output, Processing and storage)
2. Software
3. Data/Information
4. Procedure
5. People
6. Communication

Hardware: Hardware is the physical devices on the computer which we can touch and see With out hardware, software cannot work it include input device, output device, processing device and storage device for example: device like keyboard, mouse, CPU, hard disk and RAM are commonly used hardware devices.

Software: The collection set of instruction is known as program.which performs some specific function. These programs are integrated together in order to work as a

software. Software describes how hardware should function and helps in popper utilization and mobilization of computer hardware.For eg. Operating system, MS-Office, Billing software etc.

Data/Information: The raw facts and figures that are isolated, uninterpreted, and doesn't give any sense is known as data. Data are fed into the computer for processing as a input though Input devices. Whereas, the meaningful result obtained after processing data according to the supplied instruction is known as information. Information generally are the processed version of data which are obtain as output through output device

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People/User: It is the m`ost important part of the computer system. People operate the computer hardware and create the computer software. People helps to generate command to operate the computer system. Without user no hardware and software can be mobilized.

Procedure: Procedure are the description of how things are done.It includes steps for converting raw fact and figure into meaningful information. It include the general guidelines of how computer should be used.

Communication: Once the computer system is setup, there is tremendous amount of data flow between user to computer and vice-versa. The data are shared among different components of our computer System in the form of electronic signal. The exchange of data and information between several components can also be termed as communication.

Basic hardware components of a computer system.

1. Input unit
2. Output unit
3. Processing unit
4. Storage unit

Input Unit: Data and instruction must enter the computer system before any computation can be perform on the supply data. Input device accepts data and instruction from the user, hence the device or the unit which is used to fed raw facts and figures to the computer system for processing along with set of instruction is called input unit. It also converts input data into suitable form that is accepted by the computer System. Generally, it acts as an interface/bridge or medium through which communication between

user and computer takes place. In short following are the functions performed by the input unit.

1. It accepts the list of instruction and data from the outside world.
2. It converts the supplied instruction and data into computer acceptable form that is binary code.
3. It supplies the converted instruction and data to the computer system for further processing.

Some of the commonly used input device are:
Keyboard , track pad, touchscreen, mouse, light pen, scanner, BCR, MICR, OCR, joystick ,trackball etc

Keyboard

Keyboard is the most basic input device. It is used for text input. It contains multiple keys. User can provide input by pressing the key. The different types of key found in keyboard are:

a) Alphanumeric keys (A-Z, 0-9)
b) Function keys (Ctrl, Alt, Caps lock, Enter, Tab, Shift)
c) Special function keys (F1, F2, F3,……..,F12)
d) Cursor movement keys (?, ?)
e) Punctuation keys („ “” , ’’, ?, !)
f) Numeric key

On the basis of keys, keyboard can be classified as

a) XT keyboard -83 keys
b) AT keyboard -101 keys
c) Enhanced keyboard -103 and more keys

A keyboard contains an electronic circuit known as keyboard encoder. This circuit detects the pressed key, generates its electronic signal and transmits towards CPU.
On the basis of connectivity, keyboard can be wire or wireless.

Mouse

Mouse is a most common pointing and selecting device. It is used in graphical user interface. Mouse contains buttons for providing inputs. User can provide inputs by moving the mouse and pressing the button.

Usually, the left button of the mouse is for normal selection and the right button is used for special function and central button is used for scrolling a document.

On the basis of working mechanism and its architecture, mouse can be classified as

a) Mechanical mouse
b) Opto-mechanical mouse
c) Optical mouse

Mechanical mouse contains a rubber ball and a pair of rotating wheels. When the mouse is moved on the table, the ball rotated which results in rotation of the wheels and generates electronic signal. Optical mouse operates using reflection of light. It is easier to use but usually less reliable than mechanical mouse.

The opto-mechanical mouse contains both mechanical and electric component.

Track ball

Trackball is the modification of mechanical mouse. It contains rubber ball on its top. User can move the cursor by rotating the ball with finger. It also contains two buttons on the either sides similar to mouse. It was used in older laptops.

Track pad/Touch pad

Track pad is the modification of optical mouse, and touch pad is further modification making it touch sensitive. It contains a window with two buttons on the either sides. User can also provide left click option by tapping the window with the finger. It is mainly used in portable devices like laptops, notebook, palmtop, etc.

Joystick

Joystick is a hand held pointing device which is mainly used for playing games. It is used for controlling objects, their movement, direction and speed of movement. Modern joysticks handle can move in any direction. When the handle is moved, the electronic circuit in the base detects the movement and sends corresponding binary signals to CPU.

Light pen

Light pen is used for creating drawings, designs by directly touching the screen. It is mainly used by designers, architects, engineers, etc. it is used in monitor not having touch screen facility. It is a pen shaped structure containing photo sensitive tip which can capture light emitted from the monitor and mark the position on the monitor.

Touch screen

Touch screen is none of the common input device at present mainly for portable computers. User can provide inputs by directly touching the screen with the metallic pen (stylus), finger or any pointed object.

Scanner

Scanner digitizes hard copy or printed images which can be used in digital computers. Scanner copies the image and draws a new digital image in its memory similar to hard copy image.

OCR (Optical Character Reader)

OCR digitizes handwritten or printed text. Printed text will have fewer errors than hand written. It directly converts hand written text into digital text which can be edited. OCR contains predefined

format of all the characters. During digitizing process, it creates an image of the character and compares it with stored format to determine the character.

MICR

It stands for Magnetic Ink Character Reader. MICR is an OCR that can digitize text written or printed by using magnetic ink like iron oxide or barium ferrite. It is used in security systems and for processing cheque in bank.

OMR

It stands for Optical Mark Reader. It is used for answer sheet correction in multiple choice questions. With the use of OMR answer sheet correction will be faster and error free.

BCR

It stands for Bar Code Reader. Bar codes are the magnetic lines used for storing the information about the product like manufacturing date, expiry date, company name, etc. BCR is used to read the information stored in bar codes. Bar codes are also used in security system.

Microphone

It is an input device for sound. It captures sound wave, converts it into digital format and provides it to the CPU. Common mobile computing devices like PDA, smart phone contains microphone.

Digital camera, Web camera

Digital camera captures real time images and video and stores it in a digital format. The image captured by digital camera can be directly used in a digital camera.

Web camera is a digital camera used in internet. It usually captures low quality images so that it could be transmitted at a faster speed.

Output Unit: The job of an output unit is just the reverse of an input unit. It supplies information and result of computation to the outside world. Thus, it links computer with the external environment. It consists of device that translate information processed by the computer into a form that human can understand. The computer processed information consist of Os and 1 which need to be translated into letters, numbers, special symbols, pictures etc that people can understand. In short following are the function performed by an output unit:

1. It accepts the result produce by the computer which is not understandable to us.
2. It converts the result into human understandable form.
3. It supplies the converted results to the outside world.

Commonly used output device are:

Monitor, printers, speakers, plotters etc.

There are two types of output device.

i. Hard Copy output
ii. Soft Copy output

Hard copy output: These type of output are in print form on the paper or some material that can be touched and carried for being shown to other. It is permanent in nature. So that we can look after these output even there is no computer. Unlike soft copy output, these type of output does not need continuous supply of power. for example, Output produce in paper or other material by printer or plotter is known as hard copy output and the device is known as hard copy output device. The commonly used hard copy output devices are printer and plotter.

Hard Copy Output Devices

Printer: Printer is peripheral device used to print text, picture, illustration, figure and image. It is used to produce hardcopy output i.e. in the permanent readable form. There are two types of printers: *Impact printer* and *Non-impact printer*.

An impact printer has mechanism resembling that of a typewriter. That is, an impact printer forms character or image by striking a mechanism such as a print hammer or wheel against an inked ribbon, leaving an image on paper. It is noisier, slower for printing, single colored. It produces low quality output. It is usually cheaper and it can produce multiple copies at the same time by using carbon paper. It uses ink ribbon for printing.

Dot matrix printer, Daisy wheel printer, and Line printers are the examples of impact printer.

Characteristics of impact printer:

- It prints by physically touching the printing material.
- It uses mechanical method for printing.
- It is noisy.
- It is slower for printing.
- The printing quality is not good as from non impact printer.
- It is usually single colored.
- It can produce multiple copies at a same time by using carbon paper.
- It uses ink ribbon for printing.
- It is rarely used at present.

Non-impact printer is faster and quieter than impact printer because they have fewer moving parts. It forms characters and images without making direct physical contact between printing mechanism and paper. It is faster than an impact printer. It can also print in different

fonts- that is, styles and sizes. The disadvantage of non-impact printer is that, they produce single copy of the text whereas impact printer can produces multiple copies of text by using carbon paper. Two examples of non-impact printer often used with microcomputer are laser printer and ink-jet printer. The more expensive model can print in different colors. A third one, the thermal printer is seen less frequently.

Characteristics of nonimpact printer:

- It prints by spraying liquid or powder ink.
- It uses electromagnetic or electrostatic mechanism for printing.
- It produces low noise.
- It is faster for printing.
- The printing quality is better than impact printer.
- It can be either single or multi colored.
- It cannot produce multiple copies at a same time.
- It uses liquid or powder ink for printing.
- It is popularly used at present.

S.N	**Impact printer**	**Non-Impact Printer**
1	Impact printer uses electromechanical mechanism that causes hammers or pins to strike against a ribbon and paper to print the text.	Non-impact printer do not use electromechanical printing rather they use thermal, chemical, electrostatic, laser beam or ink jet technology for printing text and images.
2	The efficiency of impact printer is less as compared to non-impact printer because it uses electrical energy (external force) which is further converted into heat and sound.	It has higher efficiency because electrical energy is not wasted.
c	It is slow while printing.	It is fast while printing.
4	It uses force for printing and produces more sound while printing.	It does not use force and hence produces less sound while printing.
5	This printer cannot print graphics perfectly.	It can print graphics perfectly.
6	It can produce multiple copies at the same time using carbon paper.	It cannot produce multiple copies at the same time. Each paper has to be printed out separately.
7	It is usually single colored.	It can be single or multi colored.
8	It uses ink ribbon for printing.	It uses liquid or powder ink for printing.
9	It is rarely used at present.	It is popularly used at present.
10	Example: Dot Matrix printer, electronic typewriter, daisy wheel printer, line printer.	Example: Ink jet printer, Laser printer, Thermal printer.

3D printer: A 3D printer is a type of material design printer that designs and builds 3D models and products of devices and components using an additive manufacturing process.

3D printers design three-dimensional prototypes and create the end product by directly building them using computer aided design (CAD) or software-created 3D design diagrams, figures and patterns.

Like a traditional printer, a 3D printer receives digital data from a computer as input. However, instead of printing the output on paper, a 3D printer builds a three-dimensional model out of a custom material.

3D printers use a process called additive manufacturing to form (or "print") physical objects layer by layer until the model is complete. This is different than subtractive manufacturing, in which a machine reshapes or removes material from an existing mold. Since 3D printers create models from scratch, they are more efficient and produce less waste than subtractive manufacturing devices.

Plotter: A plotter is a computer hardware device much like a printer that is used for printing vector graphics. Instead of toner, plotters use a pen, pencil, marker, or another writing tool to draw multiple, continuous lines on paper rather than multiple dots, like a traditional printer. Plotters produce a hard copy of schematics and other similar applications.

There are a number of different types of plotters: a *drum plotter* draws on paper wrapped around a drum which turns to produce one direction of the plot, while the pens move to provide the other direction; a *flatbed plotter* draws on paper placed on a flat surface; and an *electrostatic plotter* draws on negatively charged paper with positively charged toner.

Soft copy output: Soft copy output refers to the data shown on display screen or produced by speaker. These type output is untouchable. It is temporary in nature that means, output cannot be carried for being shown to others. These types of output resides only when there is computer or continuous electric supply. It is non-portable compared to hard copy output. for example, Output produced on display screen or sound produced from speaker are soft copy output and whereas the device is known as soft copy output device. The commonly used soft copy output devices are speaker and monitor.

Softcopy Output Devices

Monitor

Monitor is the display screen that is used to display the text and graphics, allowing users to view the result of the processing. It is the most common and popularly used output device for producing soft copy output. It displays the generated output on a television like screen.

There are several types of flat panel monitor such as LCD, LED, and Plasma Display.

Liquid Crystal Display (LCD) Monitor

LCD is one of the common flat-panel monitor. It creates images with a special kind of liquid crystal that is normally transparent but becomes opaque when charged with electricity.

LCD contains liquid crystals in between two plates of the screen. The plates are made by either glass or plastic. The front plate is transparent and the back plate is reflective. Liquid crystals are charged electronically to display the content. This monitor is popular for portable devices because of its small size, light weight, low power requirement however it has low brightness and it requires viewing angle of almost 90.

Merits of LCD:

- Ø It is small in size.
- Ø It is light in weight.
- Ø It has low power requirements so, can be used in portable devices.
- Ø It is cheaper than LED and plasma display.
- Ø It is better for human eye due to its low brightness and low radiation.

De-merits of LCD:

- Ø It has limited viewing angle compared to other monitors.
- Ø It is expensive compared to CRT.
- Ø It has low brightness. So, it is difficult to view in a brighter environment.

LED (Light Emitting Diode) Monitor

LED monitor contains an array of light emitting diodes as video display. Those diodes are turned on or off to display the output. Initially it was used only for simple digital display like in calculator, digital watch. At present it is the popular monitor television set, desktop PC, laptop, mobile phones, tablet PC.

Merits of LED are:

- Ø It is light in weight so, it can be used in portable devices.
- Ø It requires less power.
- Ø It is small in size.
- Ø Its viewing angle is larger compared to LCD.
- Ø It is better for human eye similar to LCD monitor.
- Ø It provides better brightness as compared to LCD and plasma monitor.

De-merits of LED are:

- Ø It has low brightness compared to CRT monitor but is better than LCD and plasma.
- Ø It is an expensive monitor.
- Ø It is difficult to maintain.

Gas-Plasma Display

Gas-Plasma display is like a neon bulb, in which the display uses a gas that emits light in the presence of an electric current. That is, the technology uses predominantly neon gas and electrodes above and below the gas. When electric current passes between the electrodes, the gas glows. At present, gas plasma technology is more expensive and thus not used as often as LCD and LED technology. Arrangement of transistors in the screen can be- active matrix or passive matrix.

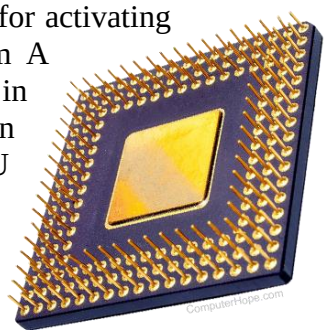
Merits of plasma display:

- Ø It is smaller in size and light in weight.
- Ø It has low power requirement so can be used in portable devices.
- Ø It has larger viewing angle of almost 180 degree.
- Ø It is better for human eye similar to LCD and LED monitor.

De-merits of plasma display:

- Ø It has low brightness.
- Ø It is expensive than LCD.

Central Processing Unit: The CPU is brain of any computer system. Like in human body, all major decision are taken by the brain Similarly, in computer all major calculation and comparison are made inside the CPU and CPU is also responsible for activating and controlling the operation of other unit of a computer system A micro processor is a single chip that performs the function of CPU in micro-computers. The speed of the microprocessor is measured in terms of Megahertz and Gigahertz. The functions of CPU (processor) are:



i. To carry out processing.
ii. To give command and co-ordinate with all other parts of computer system.
iii. To control the sequence of operation that takes place in our computer system.
iv. To helps in memory allocation and controls storage of data and instruction.

Microprocessors Characteristics

Microprocessors are multipurpose devices that can be designed for generic or specialized functions. The microprocessors of laptops and smartphones are general purpose whereas ones designed for graphical processing or machine vision are specialized ones. There are some characteristics that are common to all microprocessors.

These are the most important defining characteristics of a microprocessor −

- Clock speed
- Instruction set
- Word size

Clock Speed

Every microprocessor has an internal clock that regulates the speed at which it executes instructions and also synchronizes it with other components. The speed at which the microprocessor executes instructions is called clock speed. Clock speeds are measured in MHz or GHz where 1 MHz means 1 million cycles per second whereas 1 GHz equals to 1 billion cycles per second. Here cycle refers to single electric signal cycle.

Currently microprocessors have clock speed in the range of 3 GHz, which is maximum that current technology can attain. Speeds more than this generate enough heat to damage the chip itself. To overcome this, manufacturers are using multiple processors working in parallel on a chip.

Word Size

Number of bits that can be processed by a processor in a single instruction is called its word size. Word size determines the amount of RAM that can be accessed at one go and total number of pins on the microprocessor. Total number of input and output pins in turn determines the architecture of the microprocessor.

First commercial microprocessor Intel 4004 was a 4-bit processor. It had 4 input pins and 4 output pins. Number of output pins is always equal to the number of input pins. Currently most microprocessors use 32-bit or 64-bit architecture.

Instruction Set

A command given to a digital machine to perform an operation on a piece of data is called an instruction. Basic set of machine level instructions that a microprocessor is designed to execute is called its instruction set. These instructions do carry out these types of operations:

- Data transfer
- Arithmetic operations
- Logical operations
- Control flow
- Input/output and machine control

The central processing unit consists of the following unit:

1. Arithmetic logic Unit (ALU)
2. Control Unit (CU)
3. Memory Unit (MU)

ALU: ALU stands for Arithmetic Logic Unit. It is one of the most important unit of processing. Where actual execution of the instruction takes place during processing. It performs arithmetic and logical operations and controls speed of those operations as directed by control unit(CU). To be clear all the calculation and decision are made in ALU. The data and instruction are stored in the primary memory before processing, and are transferred when needed to the ALU. ALU is designed to perform fundamental mathematical operations such addition, subtraction, multiplication, division and logical Operation which perform Comparison between the two or more than two operands to make a solid decision also known as logical operation which consists of logical OR, logical AND and logical NOT.

CU: Although, control unit doesn't perform any actual processing on the data , it acts as a central nervous system for other component of the computer. It manages and co-ordinate the entire computer system. It obtain instruction from the program stored in the main memory, interprets the instruction accordingly and issue signal that cause other unit of the system to execute them. Basically, it controls overall operation of the computer. It also controls all other device input/output device connected to the CPU. It directs the movement of electrical signal between main memory to ALU and input-output device. Hence, control unit acts as the nerve system of the computer system.

MU: Memory unit is responsible for storing data and instruction either for short or longer period of time. Basically memory unit stores data and instruction before and after processing . As we know, memory are needed for program being currently used or to store data and instruction permanently. Depending upon the nature of data stored memory unit are

distinguished into primary memory and secondary memory. Memory unit of CPU is a primary memory where data and instruction are stored temporarily. Where as the processed data and information can be stored in secondary memory permanently so that user can retrieve information whenever required. There are two types of memory used in our computer system.

1. Primary memory/Main memory
2. Secondary memory/Auxiliary Memory

1) Primary Memory/Main Memory:

Primary Memory is also known as main memory of computer. This is the place where our data and instruction are stored before processing and the result are stored before displaying output. Memory which stores data and information currently being used by the computer is known as primary memory.

Features of primary memory:

1. It is not used to store data permanently.

2. It is usually volatile except ROM.

3. It is usually expensive and faster than Secondary storage.

4. It is normally used for smaller storage.

5. It is not used to transfer data from one computer to another computer.

6. It is made up of semiconducting material.

There are two type of Primary memory.

1.1) **RAM:** RAM stands for Random Access Memory, which stores data and instruction temporarily. It is also known as volatile memory that means data and instruction written in RAM gets erased away when electric power is c.ut off. A user can read as read from it and write in it. Hence, it is also known read-write memory. There are two types of RAM.

SRAM: It stands for Static Random Access Memory. It is made up of transistors. It is called static because it can remember its memory content without being refreshed or as long as there is power. SRAM doesn't need periodic refreshment like DRAM. It is faster than DRAM but more consume more electricity.

DRAM: It stand for Dynamic Random Access Memory. It is made up of capacitors. It is called dynamic because it needs periodic refreshment and can remember its memory content only after being refreshed as long as there is electric charge in a capacitor. It consume less electricity and is less expensive but is slower than SRAM.

1.2**) ROM:** ROM stands Read Only Memory where data and information are stored permanently. It is also known as non-volatile memory as data and instruction remain even after there is no power supply. Data are stored in ROM during manufacturing time. The program present in ROM is called firmware and is responsible to boot the computer. The types of ROM are:

PROM: It stands Programmable Read Only Memory. Initially, it is a blank chip which can be written or program only once by using a special machine called ROM burner. Once the PROM is written it cannot be modified and becomes ROM.

EPROM: It stands Erasable Programmable Read Only Memory. It is a special chip which can be reprogrammed to recond different information. The data and information are erased by exposing it to the intensive ultra violet light.

EEPROM: It stands for Electrically Erasable Programmable Read Only Memory. This type of chip can be erased and reprogrammed repeatedly with special electric pulses. It doesn't require special device to write onto it. EEPROM can be re-programmed without removing it from the computer.

2) **Secondary Memory/Auxiliary Memory:**

Memory which stores data and information permanently for future reference is known as secondary memory. It is a permanent memory where data and instruction remains forever. It is also known as non-volatile memory in which data and instruction remains even if there is no electric supply. This type of memory is also known as auxiliary memory. It has a huge storage capacity up to Gigabytes, Terabytes or even more. Different secondary storage media used are: Magnetic storage, Optical storage and Flash storage.

2.1) **Magnetic Storage**: It is a storage media in which data are stored in the form of magnetic spot. A coating of magnetic metal oxide like ferric oxide is done over the disk which attracts the data to be deposited over them. Data are stored in the form of magnetic pattern. Some of the magnetic storage media are: Magnetic tape, Floppy disk and so on.

Hard disk: It is secondary storage device of Computer. It is an air-tight sealed consisting of number of magnetic disk (Platters) mounted on a spindle. It was introduced by IBM in 1956 AD. It was first called Winchester disk. Unlike, floppy disk it cannot be bend so it is known as hard disk. It is mainly used to store huge volume of data and programs permanently so it is known as non-volatile memory. The disk is divided into the number of concentric circle called tracks and this tracks is divided into invisible segments called sector.

Floppy disk: It is a round and flat disk made up of Mylar (Plastic material) coated with magnetic material. It is read-write memory as we can read from it as well as write onto it. We can access information from a floppy disk randomly randomly. It has very small storage compare to hard disk.

2.2) **Optical Storage:** is also non-volatile secondary storage media. It is a flat round disk made up of plastic poly carbonate material coated with aluminium alloy. A very fine laser beam is projected to read and write data from and onto the disk. Some commonly used

optical storage is CD-ROM, DVD and Blu-Ray (BD). The different types of optical storage are:

CD-ROM: It stands for Compact Disk- Read Only Memory. It is a optical storage media as it use laser beam to access data from the disk. It can store up to 700mb of data and are useful to store large amount data like computer software, audio, video movies etc. Other types of CD-ROM are CD-R and CD-RW.

DVD: DVD stands for digital Digital Versatile Disk or Digital Video Disk. It is also a type of optical memory which can store very large amount of data and information almost six times more than CD. It is also considered as improved form of CD-ROM and use same technology as that of CD-ROM for reading and writing data.

2.3) **Flash Memory**: It is a non-volatile. erasable and programmable solid state memory which is made up of Semi- Conductor chip. It was first introduced in mid 1980's by Fujio Masuaka in Toshiba Corporation of Japan It can be re-programmed at high speed and hence the name flash. It is derived from EEPROM. In Flash entire memory can be eased in a few second by using electric technolgy. Examples memory card, pen-drive etc.