2017

Computer Literacy

1.Computer Fundamentals

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Figure List

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What is a Computer?

The Computer is an advanced electronic device that takes raw data as input from the user and processes these data under the control of a set of instructions (called program) and gives the result (output) and saves output for the future use. It can process both numerical and non-numerical (arithmetic and logical) calculations.
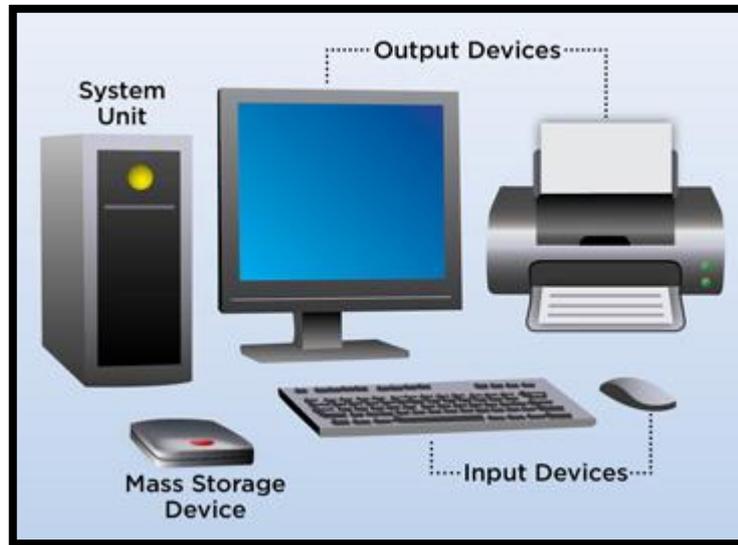

Fig-1. Computer and It's Peripherals

A Computer has following Function
1. Accepts Data- Input
2. Processes Data- Processing
3. Produces Data- Output
4. Stores Data- Storage

Input (Data)

Input is the raw information entered into a computer from the input devices. It is the collection of letters, numbers and images etc.

Process:

Process is the operation of data as per given instruction. It is totally internal process of the computer system

Output:

Output is the processed data given by computer after data processing. Output is also called as a Result. We can save these results in the storage devices for the future use.

Computer System
All of the components of a computer system can be summarized with the simple equations.

Computer System= Hardware+ Software+ User

Hardware= Internal Devices+ Peripheral Devices

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All Physical parts of the computer (Or Everything that we can touch) are known as Hardware.

Software= Programs
Software gives intelligence to the computer.

User= Person who operates the computer

Major Parts of the Computer

Input Devices

Fig-2. Mouse

Fig-3. Keyboard

Fig-4. Digital Camera

Fig-5. Web Camera

Fig-6. Joy Stick

Fig-7. Joy Stick

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Fig-8. Touch Pad

Fig-9. Light Pen

Fig-10. Bar Code Reader

Fig-11. MicroPhone

Input Devices

Fig-12. Graphics Tablet

Fig-13. Biometrics Input

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Processor

The main unit inside the computer is the CPU(Central Processing Unit). This unit is responsible for all events in the computer. It controls all internal and external devices,perform arithmetic and logic operations. The CPU (Central Processing Unit) is the device that interprets and executes instructions.
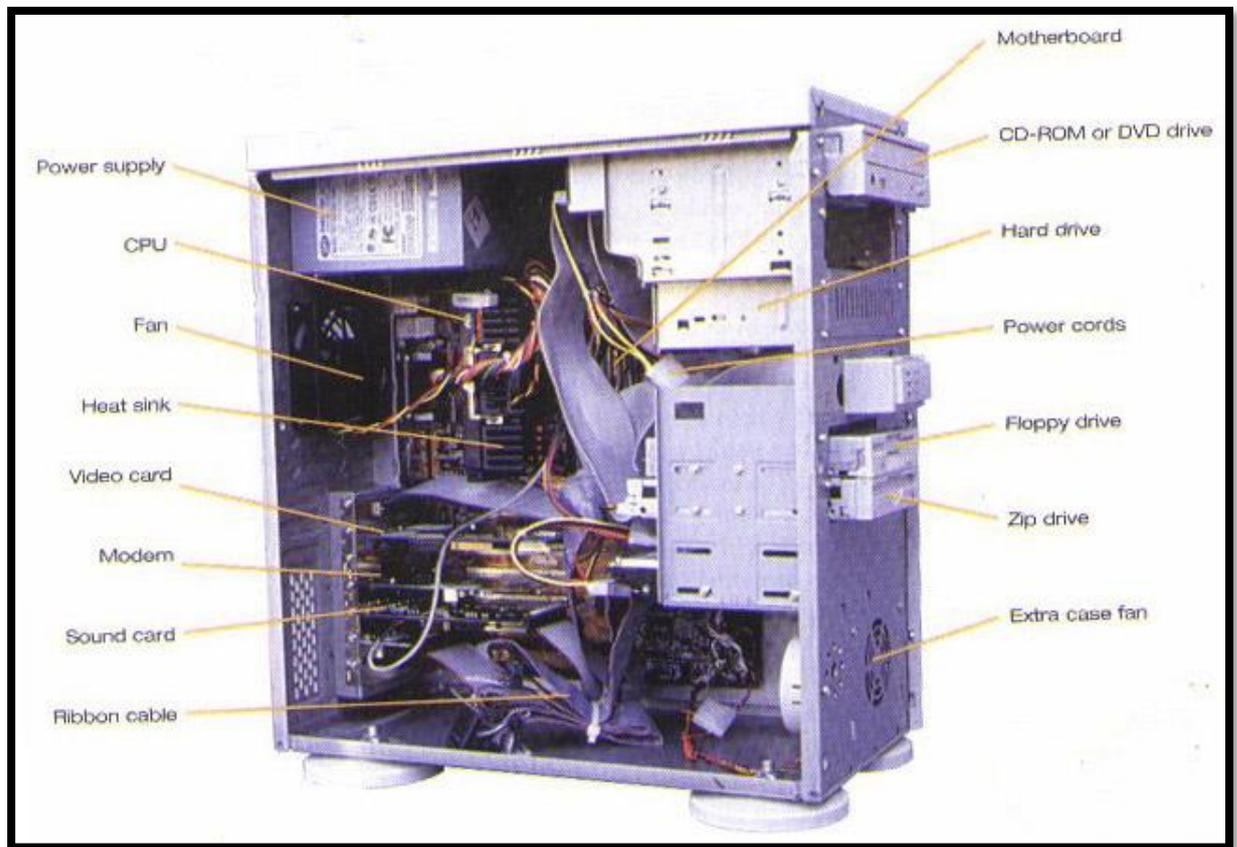
Fig-14. CPU with components

Output Devices

Fig-15. Monitor

Fig-16. Printer

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Fig-17. Projector

Fig-18. Plotter

Fig-19. Speaker

Storage Devices

1. Primary Memory (Main Memory)
   a. RAM (Random Acess Memory/Read-Write Memory)
   b. ROM (Read Only Memory)
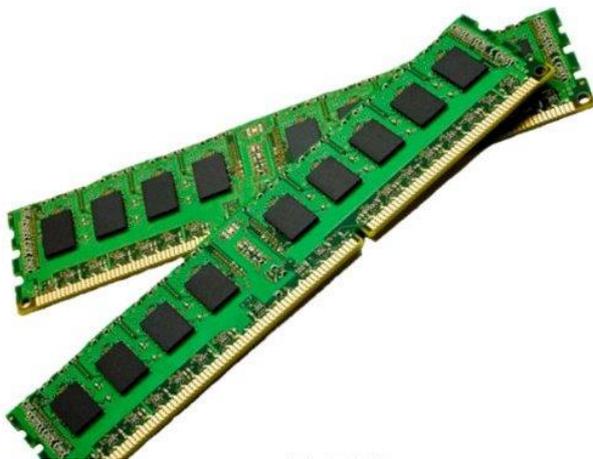
Fig-20. RAM

Fig-21. ROM

2. Secondary Memory (Storage Devices)
   a. Hard Disk (Local Disk)
   b. Optical Disks: CD-R, CD-RW, DVD-R, DVD-RW
   c. Pen Drive
   d. Floppy Disks

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      e.   Memory Card
      f.   External Hard Disk
3. Peripheral Devices
      a.   The Modem / Internet Adapter
      b.   Dongle
      c.   Switches/ Hub
      d.   Router
      e.   TV Tuner Card
4. Internal Components
      a.   The Mother Board
   b.   Expansion Slot
      c.   CMOS Battery
      d.   Cooling Fan
      e.   Network Card
      f.   Graphics Card
      g.   Power Supply Uni (SMPS)
      h.   Memory Slots

Software

The Software simply is the computer programs. The instructions given to the computer in the form of a program are called Software. Software is a set of programs, which are used for different purposes. All the programs used in the computer to perform a specific task is called Software

Types of Software

1. System Software
      a.   Operating System Software
          DOS, Windows 7,8,10, Unix/Linux, MAC etc.
      b.   Utility Software
          Windows Explorer (File/Folder Management), Windows Media Player, Anti Virus Software etc.
2. Application Software
      a.   Package Software
          MS Office 2003, 2007, 2010, Macromedia (Dreamweaver, Flash), Adobe (PageMaker, Photoshop)

Types of Computer

On the basis of working Principle

    a.   Analog Computer
        An Analog computer is a form of computer that uses continuous physical phenomena such as electrical, mechanical or hydraulic quantities to model the problem being solved.

    b.   Digital Computer
        A computer that performs calculations and logical operations with quantities represented as digits usually in the binary number system.

c. Hybrid Computer
A Combination of computers those are capable of inputting and outputting in both digital and analog signals. A hybrid computer system setup offers a cost effective method of performing complex simulations.

On the basis of Size

a. Super Computer
The fastest type of computer is known as Super Computer. These are very expensive and are employed for specialized applications that require immense amounts of mathematical calculations.

For example: - Weather Forecasting, Nuclear energy research, Fluid Dynamics, Petroleum Exploration etc.

b. Mainframe Computer
A very large and expensive computer capable of supporting hundreds or even thousands of users simultaneously. In the hierarchy that starts with a simple microprocessor at the bottom and moves to supercomputers at the top. Mainframe computers are just below Supercomputers because they support more simultaneous program. But Supercomputers can execute a single program faster than a mainframe.

c. Mini Computer
A mid sized computer is known as Mini Computer. A mini computer is a multiprocessing system capable of supporting from 4 to about 200 users simultaneously.

d. Micro Computer
General Purpose computers e.g. Desktop, Laptop, Plamtop etc.

Booting

The process of loading the system files of the operating system from the disk into the computer memory to complete the circuitary requirement of the computer system is called Booting.

Types of Booting:
There are two types of Booting:
1. Cold Booting: If the computer is in off state and we boot the computer by pressing the power switch 'ON' from the CPU box then it is called as cold booting.
2. Warm Booting: If the computer is already 'ON' and we restart, then it is know as Warm Booting.

Generations of Computers

Generation in Computer terminology is a change in technology a computer was being used. Initially the generation term was used to distinguish between varying hardware technologies. Now a days generation includes both hardware and software, which together make up an entire computer system.

1. First Generation: The Period of first generation 1946-1959. Vaccum Tube Based
2. Second Generation: The Period of Second Generation 1959-1965. Transistor Based

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3. Third Generation: The Period of Third Generation 1965-1971. Integrated Circuit Based
4. Fourth Generation: The Period of Fourth Generation 1971-1980. VLSI Microprocessor Based
5. Fifth Generation: The Period 1980 onwards. ULSI Microprocessor Based

First Generation Computers

The Period of first generation was from 1946-1959. The computers of first generation used vaccum tube as basic computers from mrmory and circuitary for CPU (Central Processing Unit). These tubes, like electric bulbs, produced a lot of heat and the installations used to fuse frequently. Therefore they were expensive and only large oraganizations were able to afford it.In this generation mainly batch processing operating system was used.

Some Computers of this generation were:
- ENIAC
- EDVAC
- UNIVAC
- IBM-701
- IBM-650

Second Generation Computers

The Second Generation was from 1959-1965. In this generation, transistors were used that were cheaper, consumed less power, more compact in size,. More reliable and faster than the first generation machines made of vaccum tubes.

In generation assembly language and high-level programming languages like FORTAN, COBOL were used. The computers used batch processing and multiprogramming operating system.

Some computers of this generation were:
- IBM 1620
- IBM 7094
- CDC 1604
- CDC 3600
- UNIVAC 1108

Third Generation Computers

The period of third generation was from 1965-1971. The Computers of third generation used Integrated Circuits in place of Transistors, Resistors and Capacitors along with the associated circuitary.

In this generation remote processing, time-sharing, multi-programming operating system were used. High Level languages (FORTAN-II to IV, COBOL, PASCAL PL/1, BASIC, ALGOL-68 etc. were used during this generation.

Some Computers in this generation were:
- IBM 360 series
- Honeywell 6000 series
- PDP (Personal Data Processor)

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- IBM 370/168
- TDC 316

Fourth Generation Computers

The Period of fourth generation was from 1971-1980. Computers of fourth generation used VLSI (Very Large Scale Integrated Circuits). VLSI circuits having about 5000 transistors and other circuit elements wih their associated circuits on a single chip made it possible to have micro computers of fourth generation.

Fourth Generation computers became more powerful, compact, realiable and affordable. As a result it gave rise to Personal Computer revolution.
In this generation time, sharing, real time networks, distributed oerating system were used. All the high-level languages like C, C++, DBASE etc. were used in this generation.

Some computers of this generation were:
- DEC 10
- STAR 1000
- PDP 11
- CRAV-1 (Super Computer)
- CRAV-X-MP (Super Computer)

Fifth Generation Computers

The Period of fifth generation is 1980-till date. In fifth generation, VLSI technology became ULSI (Ultra Large Scale Integration) technology, resulting in the production of microprocessor chips having ten million electronic components.

This generation is based on parallel processing hardware and AI (Artificial Intelligence) software.All the high-level languages like C and C++, Java, .Net etc are used in this generation.

Computer Components (Internal)
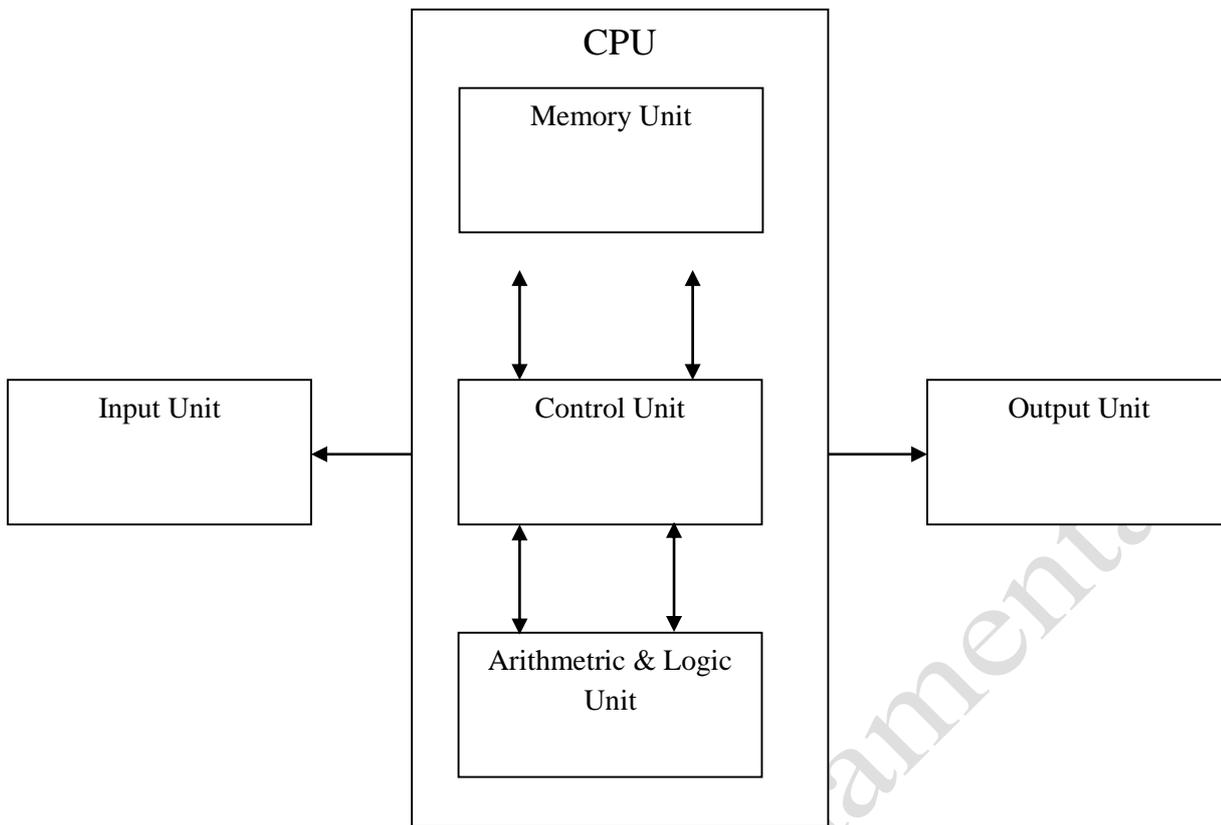
Input Unit

This unit contains devices with the help of which we enter data into the computer. This unit creates a link between the user and the computer. The input devices translate the information into a form understandable by the computer.

Central Processing Unit (CPU)

CPU is considered as the brain of the computer. CPU performs all types of data processing operatins. It stores data, intermediate results and instructions(program). It controls the operation of all parts of the computer.

CPU itself has the following three components

- ALU (Arithmetic Logic Unit)
- Memory Unit
- Control Unit

ALU (Arithmetic Logic Unit)

This unit consists of two subsections namely

- Arithmetic Section
- Logic Section

Arithmetic Section

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Function of Arithmetic section is to perform operations like addition, substraction, multiplication and division. All complex operations are done by making repetitive use of the above operations.

Logic Section

Function of logic section is to perform logic operations such as comparing, selecting, matching and merging of data.

Memory Unit

This Unit can store instructions, data and intermediate results. This unit supplies information to other units of the computer when needed.

Memory is primarily of three types

- Cache Memory
- Primary Memory/Main Memory
- Secondary Memory

Cache Memory

Cache Memory is a very high speed semiconductor memory which can speed up the CPU. It acts as a buffer between the CPU and the main memory. It is used to hold those parts of data and program which are most frequently used by the CPU. The parts of the data and programs are transfered from the disk to cache memory by the operating system from where CPU can acess them.

Advantages

The advantages of cache memory are as follows:

- Cache memory is faster than main memory.
- It consumes less acess time as compared to main memory.
- It stores the program that can be executed within a short period of time.
- It stores data for temporary use.

Disadvantages

The disadvantages of cache memory are as follows

- Cache memory has limited capacity.
- It is very expensive.

Primary Memory

Primary memory holds only those data and instructions on which the computer is currently working. It has a limited capacity and data is lost when power is switched off. It is generally

made up of semiconductor device. These memories are not as fast as registers. The data and instruction required to be processed resides in the main memory. It is divided into two subcategories RAM and ROM.

Characteristics of Main Memory

These are semiconductor memories. It is known as the main memory.

- Usually volatile memory.
- Data is lost in case power is switched off.
- It is the working memory of the computer.
- Faster than secondary memories.
- A computer cannot run without the primary memory.

Secondary Memory

This type of memory is also known as external memory or non-volatile. It is slower than the main memory. These are used for storing data/information permanently. CPU directly does not access these memories, instead they are accessed via input-output routines. The contents of secondary memories are first transferred to the main memory, and then the CPU can access it. For example, disk, CD-ROM, DVD, etc.

Characteristics of Secondary Memory

- These are magnetic and optical memories. It is known as the backup memory.
- It is a non-volatile memory.
- Data is permanently stored even if power is switched off.
- It is used for storage of data in a computer.
- Computer may run without the secondary memory.
- Slower than primary memories.

Random Access Memory (RAM)

RAM (Random Access Memory) is the internal memory of the CPU for storing data,program, and program result. It is a read/write memory which stores data until the machine is working. As soon as the machine is switched off, data is erased. Access time in RAM is independent of the address, that is, each storage location inside the memory is as easy to reach as other locations and takes the same amount of time. Data in the RAM can be
accessed randomly but it is very expensive. RAM is volatile, i.e. data stored in it is lost when we switch off the computer or if there is a power failure. Hence, a backup Uninterruptible Power System (UPS) is often used with computers. RAM is small, both in terms of its physical size and in the amount of data it can hold.

RAM is of two types -
- Static RAM (SRAM)
- Dynamic RAM (DRAM)

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Static RAM (SRAM)

The word static indicates that the memory retains its contents as long as power is being supplied. However, data is lost when the power gets down due to volatile nature. SRAM chips use a matrix of 6-transistors and no capacitors. Transistors do not require power to prevent leakage, so SRAM need not be refreshed on a regular basis. There is extra space in the matrix, hence SRAM uses more chips than DRAM for the same amount of storage space, making the manufacturing costs higher. SRAM is thus used as cache memory and has very fast access.

Characteristic of Static RAM
- Long life
- No need to refresh
- Faster
- Used as cache memory
- Large size
- Expensive
- High power consumption

Dynamic RAM (DRAM)

DRAM, unlike SRAM, must be continually refreshed in order to maintain the data. This is done by placing the memory on a refresh circuit that rewrites the data several hundred times per second. DRAM is used for most system memory as it is cheap and small. All DRAMs are made up of memory cells, which are composed of one capacitor and one transistor.

Characteristics of Dynamic RAM
- Short data lifetime
- Needs to be refreshed continuously
- Slower as compared to SRAM
- Used as RAM
- Smaller in size
- Less expensive
- Less power consumption

Read Only Memory

ROM stands for Read Only Memory. The memory from which we can only read but cannot write on it. This type of memory is non-volatile. The information is stored permanently in such memories during manufacture. A ROM stores such instructions that are required to start a computer. This operation is referred to as bootstrap. ROM chips are not only used in the computer but also in other electronic items like washing machine and microwave oven.

MROM (Masked ROM)

The very first ROMs were hard-wired devices that contained a pre-programmed set of data or instructions. These kind of ROMs are known as masked ROMs, which are inexpensive.

PROM (Programmable Read Only Memory)

PROM is read-only memory that can be modified only once by a user. The user buys a blank PROM and enters the desired contents using a PROM program. Inside the PROM chip, there are small fuses which are burnt open during programming. It can be programmed only once and is not erasable.

EPROM (Erasable and Programmable Read Only Memory)

EPROM can be erased by exposing it to ultra-violet light for a duration of up to 40 minutes. Usually, an EPROM eraser achieves this function. During programming, an electrical charge is trapped in an insulated gate region. The charge is retained for more than 10 years because the charge has no leakage path. For erasing this charge, ultra-violet light is passed through a quartz crystal window (lid). This exposure to ultra-violet light dissipates the charge. During normal use, the quartz lid is sealed with a sticker.

EEPROM (Electrically Erasable and Programmable Read Only Memory)

EEPROM is programmed and erased electrically. It can be erased and reprogrammed about ten thousand times. Both erasing and programming take about 4 to 10 ms (millisecond). In EEPROM, any location can be selectively erased and programmed. EEPROMs can be erased one byte at a time, rather than erasing the entire chip. Hence, the process of reprogramming is flexible but slow.

Advantages of ROM

The advantages of ROM are as follows:

- Non-volatile in nature
- Cannot be accidentally changed
- Cheaper than RAMs
- Easy to test
- More reliable than RAMs
- Static and do not require refreshing
- Contents are always known and can be verified

Control Unit

This unit controls the operatins of all parts of the computer but does not carry out any actual data processing operations.

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Functions of this unit are:

- It is responsible for controlling the transfer of data and instructions among other units of a computer.
- It manages and coordinates all the units of the computer.
- It obtains the instructions from the memory, interprets them and directs the operation of the computer.
- It communicates with Input/Output devices for transfer of data or results from storage.
- It does not processs or store data.

Motherboard

The motherboard serves as a single platform to connect all of the parts of a computer together. It connects the CPU, memory, hard drives, optical drives, video card, sound card, and other ports and expansion cards directly or via cables. It can be considered as the backbone of a computer.
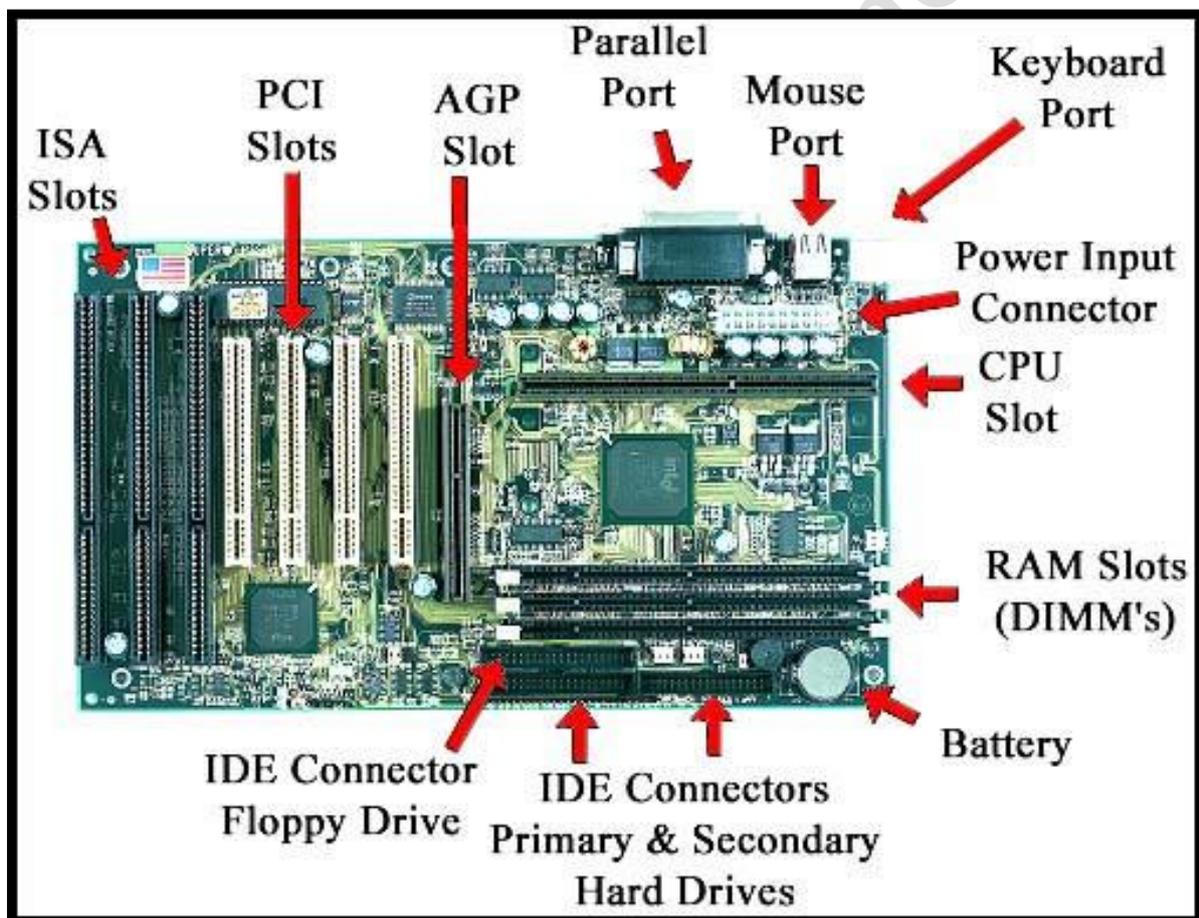

Fig-22. Mother Board

Features of Motherboard

A motherboard comes with following features:

- Motherboard varies greatly in supporting various types of components.

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- Motherboard supports a single type of CPU and few types of memories.
- Video cards, hard disks, sound cards have to be compatible with the motherboard to function properly.
- Motherboards, cases, and power supplies must be compatible to work properly together.

Popular Manufacturers

Following are the popular manufacturers of the motherboard.
- Intel
- ASUS
- Gigabyte

Description of Motherboard

The motherboard is mounted inside the case and is securely attached via small screws through pre-drilled holes. Motherboard contains ports to connect all of the internal components. It provides a single socket for CPU, whereas for memory, normally one ormore slots are available. Motherboards provide ports to attach the floppy drive, hard drive, and optical drives via ribbon cables. Motherboard carries fans and a special port designed for power supply.

There is a peripheral card slot in front of the motherboard using which video cards, sound cards, and other expansion cards can be connected to the motherboard. On the left side, motherboards carry a number of ports to connect the monitor, printer, mouse, keyboard, speaker, and network cables. Motherboards also provide USB ports, which allow compatible devices to be connected in plug-in/plug-out fashion. For example, pen drive, digital cameras, etc.

Output Unit

The Output unit consists of devices with the help of which we get the information from the computer. This unit is a link between the computer and the users. Output devices translate the computer's output into a form understable by the users.

Ports

A port is a physical docking point using which an external device can be connected to the computer. It can also be programmatic docking point through which information flows from a program to the computer or over the Internet.

Characteristics of Ports

A port has the following characteristics:

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- External devices are connected to a computer using cables and ports.
- Ports are slots on the motherboard into which a cable of external device is plugged in.
- Examples of external devices attached via ports are the mouse, keyboard, monitor, microphone, speakers, etc.

Serial Port

- Used for external modems and older computer mouse
- Two versions: 9 pin, 25 pin model
- Data travels at 115 kilobits per second

Parallel Port
- Used for scanners and printers
- Also called printer port
- 25 pin model
- IEEE 1284-compliant Centronics port

PS/2 Port
- Used for old computer keyboard and mouse
- Also called mouse port
- Most of the old computers provide two PS/2 port, each for the mouse and keyboard
- IEEE 1284-compliant Centronics port

Universal Serial Bus (or USB) Port
- It can connect all kinds of external USB devices such as external hard disk, printer, scanner, mouse, keyboard, etc.
- It was introduced in 1997.
- Most of the computers provide two USB ports as minimum.
- Data travels at 12 megabits per seconds.
- USB compliant devices can get power from a USB port.

VGA Port
- Connects monitor to a computer's video card.
- It has 15 holes.
- Similar to the serial port connector. However, serial port connector has pins, VGA
- port has holes.

Power Connector
- Three-pronged plug.
- Connects to the computer's power cable that plugs into a power bar or wall socket.

Firewire Port
- Transfers large amount of data at very fast speed.
- Connects camcorders and video equipment to the computer.
- Data travels at 400 to 800 megabits per seconds.
- Invented by Apple.
- It has three variants: 4-Pin FireWire 400 connector, 6-Pin FireWire 400 connector and 9-Pin FireWire 800 connector.

Modem Port

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- Connects a PC's modem to the telephone network.

Ethernet Port
- Connects to a network and high speed Internet.
- Connects the network cable to a computer.
- This port resides on an Ethernet Card.
- Data travels at 10 megabits to 1000 megabits per seconds depending upon the network bandwidth.

Game Port
- Connect a joystick to a PC
- Now replaced by USB

Digital Video Interface, DVI port
- Connects Flat panel LCD monitor to the computer's high-end video graphic cards.
- Very popular among video card manufacturers.

Sockets
- Sockets connect the microphone and speakers to the sound card of the computer.

Software

Software can be broadly are categorized as:
- System Software
- Application Software
- Utility Softwar

System Software

System Software is the software that is directly related to coordinating computer operations and performs tasks associated with controlling and utilizing computer hardware. These programs assist in running application programs and are designed to control the operation of a computer system. System software directs the computer what to do, when to do and how to do. System software can be further categorized into
- Operating System
- Language Translators

Operating System

An Operating system is the most important system software. It is a set of programs that control and supervise the hardware of a computer and also provide services to application software, programmers and users. It manages all hardware and software, input, output and processing activities within the computer system, the flow of information to and from the processor, sets priorities for handling different tasks, and so on. Without operating system a computer cannot do anything useful. When a computer is switched on, the operating system is the first program that is loaded onto its memory. A user cannot communicate directly with the computer

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hardware, so the operating system acts as an interface between the user and the computer hardware.

Some of the popular operating systems used in personal computers are DOS, Windows, Unix, Linux, Solaris, etc. An operating system can be a Single User or a Multiuser operating system. A single user operating system allows only one user to work at any time but a multiuser operating system allows two or more users to use a powerful computer at the same time. For example Windows 7 is a single user operating system while Linux is a multiuser operating system.

Need for an Operating System

Operating system provides a platform, on top of which, other programs, called application programs can run. As discussed before, it acts as an interface between the computer and the user. It is designed in such a manner that it operates, controls and executes various applications on the computer. It also allows the computer to manage its own resources such as memory, monitor, keyboard, printer etc. Our choice of operating system, therefore, depends to a great extent on the CPU and the other attached devices and the applications we want to run. The operating system controls the various system hardware and software resources and allocates them to the users or programs as per their requirement.

Functions of an Operating System
An operating system has variety of functions to perform. Some of the prominent functions of an operating system can be broadly outlined as:

Processor Management: This deals with management of the Central Processing Unit (CPU). The operating system takes care of the allotment of CPU time to different processes. This is called scheduling. Two types of scheduling techniques are employed by an operating system :

Priority Scheduling: Each task is given CPU time according to the priority assigned to that task. The program with higher priority will be given CPU time before a program with lower priority. The CPU executes the task till it is completed or there is some interrupt request i.e. till the time operating system has to stop (interrupt) the current task due to an unavoidable job request. The major drawback of Priority scheduling is that even a small job has to wait for a long time when a long duration job with higher priority is being executed.

Round Robin Scheduling: This type of scheduling technique is also known as Time Sharing Scheduling. In this, each program or task is given a fixed amount of time to execute. The CPU continues with the execution till either the allotted time is over or there is some interrupt request or the task is completed before the allotted time. If the task is not completed at the end of the allotted time, it is put at the end of the queue. So each task gets its allotted share of CPU time. This scheduling technique improves the response time and provides an interactive environment. Hence time sharing operating system is very useful in network environment as each user is allowed to share the network resources.

Device Management: The Operating System communicates with hardware and the attached devices and maintains a balance between them and the CPU. This is all the more important because the CPU processing speed is much higher than that of I/O devices. In order to optimize the CPU time, the operating system employs two techniques - Buffering and Spooling.

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Buffering: In this technique the temporary storage of input and output data is done in Input Buffer and Output Buffer. Once the signal for input or output is sent to or from the CPU respectively, the operating system through the device controller moves the data from the input device to the input buffer and for the output device to the output buffer. When the signal is sent to/from the operating system to the respective device controllers, the program doesn't wait rather it returns to its processing. In case of input, if the buffer is full, the operating system sends a signal to the program which processes the data stored in the buffer. When the buffer becomes empty, the program informs the operating system which reloads the buffer and the input operation continues. Similarly for output when the program being executed has to display some output, it fills the buffer and then informs the operating system. Thereafter the operating system empties the buffer by sending data to the output device and in the meantime the program fills another buffer. This technique is called overlapped processing. This is because while the operating system reloads one buffer, the executing program doesn't stop as it is able to retrieve/fill data from/in another buffer.

Spooling (Simultaneous Peripheral Operation on Line): This is a device management technique used for processing of different tasks on the same input/output device. Say for example there are various users on a network sharing the same printer. At one point of time more than one user might give print command. The speed of the printer is very slow as compared to the CPU processing. So the operating system temporarily stores the data of every user on the hard disk of the computer to which the printer is attached. The individual users need not wait for the printing process to be complete. Instead the operating system sends the data from to hard disk to the printer one by one.

Memory management: In a computer, both the CPU and the I/O devices interact with the memory. When a program needs to be executed it is loaded onto the main memory till the execution is complete. Thereafter that memory space is freed and is available for other programs. The common memory management techniques used by the operating system are Partitioning and Virtual Memory.

Partitioning: The total memory is divided into various partitions of same size or different sizes. This helps to accommodate number of programs in the memory. The partition can be fixed i.e. remains same for all the programs in the memory or variable i.e. memory is allocated when a program is loaded on to the memory. The later approach causes less wastage of memory but in due course of time, it may become fragmented.

Virtual Memory: This is a technique used by the operating system by virtue of which the user can load the programs which are larger than the main memory of the computer. In this technique the program is executed even if the complete program is not loaded on to the main memory. The operating system divides the main memory into equal sizes called pages. A part of the program resides in the main memory and is called the active set. The rest is in the secondary storage device in the form of tracks/sectors or blocks. With the help of Page Map Tables (PMT), the operating system keeps track which page of main memory is storing which block of secondary memory. A virtual address (which is not the real physical address) is mapped either to the main memory or the secondary memory. Hence virtual memory allows more programs and even larger programs to be executed in the main memory leading to efficient memory utilization.

File Management: The operating System manages the files, folders and directory systems on a computer. Any data on a computer is stored in the form of files and the operating system keeps information about all of them using File Allocation Table (FAT). The FAT stores general information about files like filename, type (text or binary), size, starting address and access

mode (sequential/indexed sequential/direct/relative). The file manager of the operating system helps to create, edit, copy, allocate memory to the files and also updates the FAT. The operating system also takes care that files are opened with proper access rights to read or edit them.

Types of Operating System

OS are classified into the following types depending on their capability of processing

- Single User and Single Task OS is used on a standalone single computer for performing a single task. Operating systems for Personal Computers (PC) are single-user OS. Single user OS are simple operating system designed to manage one task at a time. MS-DOS is an example of single user OS.

- Multiuser OS is used in mini computers or mainframes that allow same data and applications to be accessed by multiple users at the same time. The users can also communicate with each other. Linux and UNIX are examples of multiuser OS.

- Multiprocessing OS have two or more processors for a single running process. Processing takes place in parallel and is also called parallel processing. Each processor works on different parts of the same task, or, on two or more different tasks. Since execution takes place in parallel, they are used for high speed execution, and to increase the power of computer. Linux, UNIX and Windows 7 are examples of multiprocessing OS.

- Time sharing Operating System: It allows execution of more than one tasks or processes concurrently. For this, the processor time is divided amongst different tasks. This division of time is also called time sharing. The processor switches rapidly between various processes. After the stipulated time is over, the CPU shifts to next task in waiting, So this type of operating system employs round robin scheduling technique. The system switches rapidly from one user to another but still each user feels that it is getting a dedicated CPU time. Virtual Memory techniques are used in this type of operating system. For example, the user can listen to music on the computer while writing an article using a word processing software. The user can switch between the applications and also transfer data between them. Time sharing operating system can be both single user and multiuser. Windows 95 and all later versions of Windows are examples of multitasking OS.

- Real Time Operating System: It is a multitasking operating system designed for real time applications like robotics. In this type of operating system, the tasks have to be done within a fixed deadline. System performance is good if task is finished within this deadline. If it is not done, the situation is called Deadline Overrun. Lesser the deadline over run, better is the system efficiency. Hence Real Time operating systems depend not only on the logical result of the computation but also on the time in which the results are produced.

- Distributed Operating System: On a network data is stored and processed on multiple locations. The Distributed Operating System is used on networks as it allows shared data/files to be accessed from any machine on the network in a transparent manner. We

can insert and remove the data and can even access all the input and output devices. The users feel as if all data is available on their workstation itself.

- Interactive Operating System: This is the operating system that provides a Graphic User Interface (GUI) through which the user can easily navigate and interact. The computer responds almost immediately after an instruction has been entered, and the user can enter new instructions after seeing the results of the previous instructions.

Commonly Used Operating Systems

Some of the commonly used operating systems are discussed below:

1. Windows: Microsoft launched Windows 1.0 operating system in 1985 and since then Windows has ruled the world's software market. It is a GUI (Graphic User Interface) and various versions of Windows have been launched like Windows 95, Windows 98, Win NT, Windows XP, Windows 7,8 and the latest being Windows 10 .

2. Linux: Linux is a free and open software which means it is freely available for use and since its source code is also available so anybody can use it, modify it and redistribute it. It can be downloaded from www.linux.org. It is a very popular operating system used and supported by many companies. The defining component of this operating system is the Linux kernel.

3. BOSS (Bharat Operating System Solutions): This is an Indian distribution of GNU/Linux. It consists of Linux operating system kernel, office application suite, Bharateeya OO, Internet browser (Firefox), multimedia applications and file sharing.

4. UNIX: It is a multitasking, multiuser operating system originally developed in 1969 at Bell Labs. It was one of the first operating systems developed in a high level language, namely C. Due to its portability, flexibility and power, UNIX is widely being used in a networked environment. Today, "UNIX" and "Single UNIX Specification" interface are owned and trademarked by The Open Group. There are many different varieties of UNIX, although they share common similarities, the most popular being GNU/Linux and Mac OS X.

5. Solaris: It is a free Unix based operating system introduced by Sun Microsystems in 1992. It is now also known as Oracle Solaris. Solaris is registered as compliant with Single UNIX Specification. It is quite scalable and is used on virtual machines.

Language Processors

We know that computer understands instructions in machine code, i.e. in the form of 0s and 1s. It is difficult for us to write computer program directly in machine code. The programs are written mostly in high-level languages, i.e. BASIC, C++, Python etc. A program written in any high-level programming language (or written in assembly language) is called the Source Program or Source Code.

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The source code cannot be executed directly by the computer. The source code must be converted into machine language to be executed. The program translated into machine code is known as Object Program or Object code.

The special translator system software that is used to translate the program written in high-level language (or Assembly language) into machine code is called language processor or translator program. The language processors can be any of the following three types-Assembler, Compiler and Interpreter.

Assembler

The Assembler is used to translate the program written in Assembly language into machine code. The input of Assembler is a source program that contains assembly language instructions. The output generated by assembler is the object code or machine code understandable by the computer.

Compiler

The language processor that translates the complete source program as a whole in one go into machine code is called compiler. Some of the examples are C and C++ compilers. The program translated into machine code is called the object program. The source code is translated to object code successfully if it is free of errors. If there are any errors in the source code, the compiler specifies the errors at the end of compilation with line numbers. The errors must be removed before the compiler can successfully recompile the source code again.

Interpreter

The language processor that translates a single statement of source program into machine code and executes it immediately before moving on to the next line is called an Interpreter. If there is an error in the statement the interpreter terminates its translating process at that statement and displays an error message. Only after removal of the error, the interpreter moves on to the next line for execution.

Utilities

A utility software is one which provides certain tasks that help in proper maintenance of the computer. The job of utility programs is to keep the computer system running smoothly. Nowadays many utility softwares are part of the operating system itself. Even if there is no utility software on your computer, the computer works but with the right kind of utility software loaded, the computer becomes more reliable and even its processing speed increases. Some of the commonly use utility softwares are antivirus, Disk defragmenter, backup, compression etc.

Antivirus

An antivirus is utility software which detects and removes computer viruses. If the software is not able to remove the virus, it is neutralized. The antivirus keeps a watch on the functioning of the computer system. If a virus is found it may alert the user, flag the infected program or kill the virus. Some of the common types of viruses are:

- Boot Sector Virus: A boot sector virus displaces the boot record and copies itself to the boot sector i.e. where the program to boot the machine is stored. So first the virus is

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loaded on to the main memory and then the operating system. Whenever a new disk is inserted the virus copies itself to the new disk. The antivirus overwrites the correct boot record on the infected boot sector and also cleans the bad sectors.

- File Virus: A file virus generally attacks executable files. They can attach to various locations of the original file, replace code, fill in open spaces in the code, or create companion files to work with an executable file. Most of the file viruses are memory resident and wait in the memory until the user runs another program. While another program is running, the virus replicates.

- Macro Virus: This virus infects an important file called normal.dot of MS Word. As soon as the application is opened the virus gets activated. It damages the formatting of documents and even may not allow editing or saving of documents.

- Trojan Horse: It is a code generally hidden in games or spreadsheets. Since they are hidden, the program seems to function as the user wants but actually it is destroying the program. A Trojan horse does not require a host program to embed itself. It is a complete program. Its main objective is to cause harm to the data. They can create bad sectors on the disk, destroy file allocation tables and cause the system to hang.

- Worm: Worm is a program capable of replicating itself on a computer network. A worm also does not require a host as it is a self contained program. They generally travel from one computer to another across communication links on a network. They generally disrupt routine services.

Disk Defragmenter.

The memory is used in small chunks randomly. Sometimes when a memory chunk of appropriate size is not available, the operating system breaks or fragments the files resulting in slower access to files. A disk defragmenter scans the hard disk for fragmented files and brings all the fragments together.

Backup Utility

This utility is used to create the copy of the complete or partial data stored in a disk or CD on any other disk. In case the hard disk crashes or some other system failure occurs, the files can be restored using backup software.

Compression Utility

This utility is used to compress large files. Compression is useful because it helps reduce resources usage and the file transmission on the network becomes easier.

Disk Cleaner

This utility scans for file that have not been accessed/used since long. Such files might be occupying huge amount of memory space. In that case the Disk Cleaner utility prompts the user to delete such files so as to create more space on the disk. If the files are important, the user might take a backup before deleting them.

File Management Tools

This utility helps the user in storing, indexing, searching and sorting files and folders on the system. The most commonly used tool is the Windows Explorer and Google Desktop.

Application Software

An application software is bought by the user to perform specific applications or tasks, say for example making a document or making a presentation or handling inventory or managing the employee database. An application software can be of two types –

General Purpose Application Software and Customized Application software.

General Purpose Application Software

Some of the application software is made for the common users for day to day applications and uses. These are also referred as Office Tools. The users may use them in the manner they want. Some of the popular types of general purpose application software are discussed below:

Word Processor: Word processor is a general purpose application software used to create documents. It allows us to create , edit and format documents. We can use different types of fonts of various sizes; underline or make bold a certain part of the text. We can add clipart and other graphics into the document. Popular examples of Word processing software are Writer (Open Office) and Microsoft Word. We use word processing software for various uses like writing a simple document to designing special art effects. Since we can attach images and different shapes, can use different colors, even a poster can be designed using word processing software. Features like Mail Merge, Macro has further enhanced the word processing software and made it very useful.

Presentation Tools: Presentation tools is a general purpose application software that lets us create presentations on any topic. We can not only create a presentation and add slides into that but also can use different types of background, fonts, animations, audio, video, etc. We can add clipart and other graphics into our document. Even audio video files can be added on to the presentations. Popular examples of Presentation tools software are Impress (open office) and Microsoft Power Point.

Spreadsheet Packages: Spreadsheet is a general purpose application software that lets us create and store data in tabular form. Both text and numerical values can be entered in that tables known as a spreadsheet. We can not only create a document and add data into that but also can create different types of charts and graphs based upon the numerical data stored in that page. All common mathematical and statistical formulae can be used on the numeric data. Popular examples of Spreadsheet software are Calc (Open Office) and Microsoft Excel.

Database Management System: Database Management System is general purpose application software that lets us create computer programs that control the creation, maintenance, and the use of database for an organization and its end users. We can not only store data but can also manage data in a database. We can also import and export the data to many formats including

Excel, Outlook, ASCII, dBase, FoxPro, Oracle, SQL Server, ODBC, etc. Popular examples of Database Management System are Base (Open Office) and Microsoft Access.

Customized Software

Customized Software is one which is tailor made as per the user's requirement. Such type of software is customer specific. It is made keeping in mind the individual needs of the user and so are also referred as Domain Specific Tools. Such software cannot be installed and used by any other user/customer since the requirements may differ. Some examples of customized software are discussed below:

Inventory Management System & Purchasing System: Inventory Management System is generally used in departmental stores or other organizations to keep the record of the stock of all the physical resources. For Example, in a Computer store, it keeps record of the number of computers, printers, printing sheet, printer cartridge available. It also helps to place purchase orders, bills, invoices etc. Various reports as to position of stock, sales made in a particular period, profit earned etc. can be generated.

School Management System: School Management System (sometimes called a School Information System or SIS) is a system that manages all of a school's data in a single, integrated application. Having all of the information in a single system allows schools to more easily connect data together. For example, when viewing a student's record, the user can follow a link to the student's class, and from there a link to the student's teacher, and from there a link to the teacher's other classes, and so on

Payroll System: Payroll Management System software is used by all modern organizations to keep track of employees of the organization who receives wages or salary. All different payment amounts are calculated by the payroll software and the record is maintained. The software keeps track of personal records of employees viz. name, address, date of birth, qualification, date of joining etc. It also keeps track of professional record viz. allowances, perks, income tax, insurance etc. Different reports, pay slips etc can be generated through this software.

Financial Accounting: Financial accounting System is used to prepare accounting information, maintain different accounts ledger, and account books. It also helps an organization to make budget.

Hotel Management: Hotel management software refers to management techniques used in the hotel sector. These can include hotel administration, accounts, billing, marketing, housekeeping, front office or front desk, food and beverage management, catering and maintenance. Even advance bookings can be made through this software. Customers can have a look at the hotel and the rooms before making bookings. At any point of time the room availability, tariff for each type of room and even booking status can be checked.

Reservation System: Reservation System is software used to book (reserve) air flights, railway seats, movie tickets, tables in a restaurant, etc. In the case of a booking system, the inputs are booking requests. The processing involves checking if bookings are possible, and if so making the bookings. The outputs are booking confirmations/rejections.

 Weather Forecasting system: This software makes it possible to forecast the weather for days and even months in advance. The detailed weather reports can also be generated.

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Open Source Concepts

Software are mainly categorised into the following categories based on their licenses:
1. Proprietary
2. Shareware
3. Freeware
4. Open source
5. Free Software

Proprietary

We pay a supplier for a copy of the software which these days may be supplied on physical media (disks) or downloaded from the Internet. We get the permission to use the software on one or sometimes more than one machines. Examples of this type of software include Microsoft Office and Microsoft Windows.

Shareware

Shareware is basically a software for trial purpose that the user is allowed to try for free, for a specified period of time. It is usually downloaded from the Internet. When the trial period ends, the software must be purchased or uninstalled.

Freeware

Freeware software is free of cost and is usually bundled up with some operating system or any other software. Examples of freeware include Microsoft Internet Explorer which comes bundled up with any Microsoft operating system. The author of the freeware software is the owner of the software, though people may use it for free. The source code is not available, so no modifications can be done. Freeware should not be mistaken with Open Source Software or Free Software.

Open source

Open Source Software (OSS) is the software which gives the users freedom to run/use the software for any purpose and in any manner. They can be used, modified and even redistributed. In simple terms it can be freely used but it may not be free of charge. The source code is freely available to the customer. Python, Tux Paint etc are examples of Open Source Software.

Free Software

This type of software is freely accessible and can be freely used, modified, copied or distributed by anyone. And no licence fee or any other form of payment need to be made for a free software. The source code is also accessible in case of free softwares.

Flow Chart

Flow-charting is used to diagram a process [steps to solve a problem] on paper to make it easier to visualize. Flowcharts can be useful in a variety of applications ranging from computer programming to solving mathematic problems. Simple computer logic problems can be written this way and then turned into the programming code. Each step in the process flow is represented by a different symbol and contains a short text description of the process step. So a flow chart is an organized combination of shapes, lines and text that graphically illustrates a process.

Symbol	Symbol Name/ (Alternate Shape Name)	Symbol Description
	Terminator (Terminal Point, Oval)	An oval flow chart shape indicating the start or end of the process.
	Process	A rectangular flow chart shape indicating a normal process flow or action step.
	Decision	Indicates a question or branch in the process flow. Typically, a Decision flowchart shape is used when there are 2 options (Yes/No, No/No-Go, etc.)
	Data Shape (I/O Shape)	A parallelogram that indicates data input or output (I/O) for a process.
	Connector (Inspection)	A small, labeled, circular flow chart shape used to indicate a jump in the process flow.
→→	Arrow	Direction of flow of data/information

Let's Draw Flow Chart for watching VCR
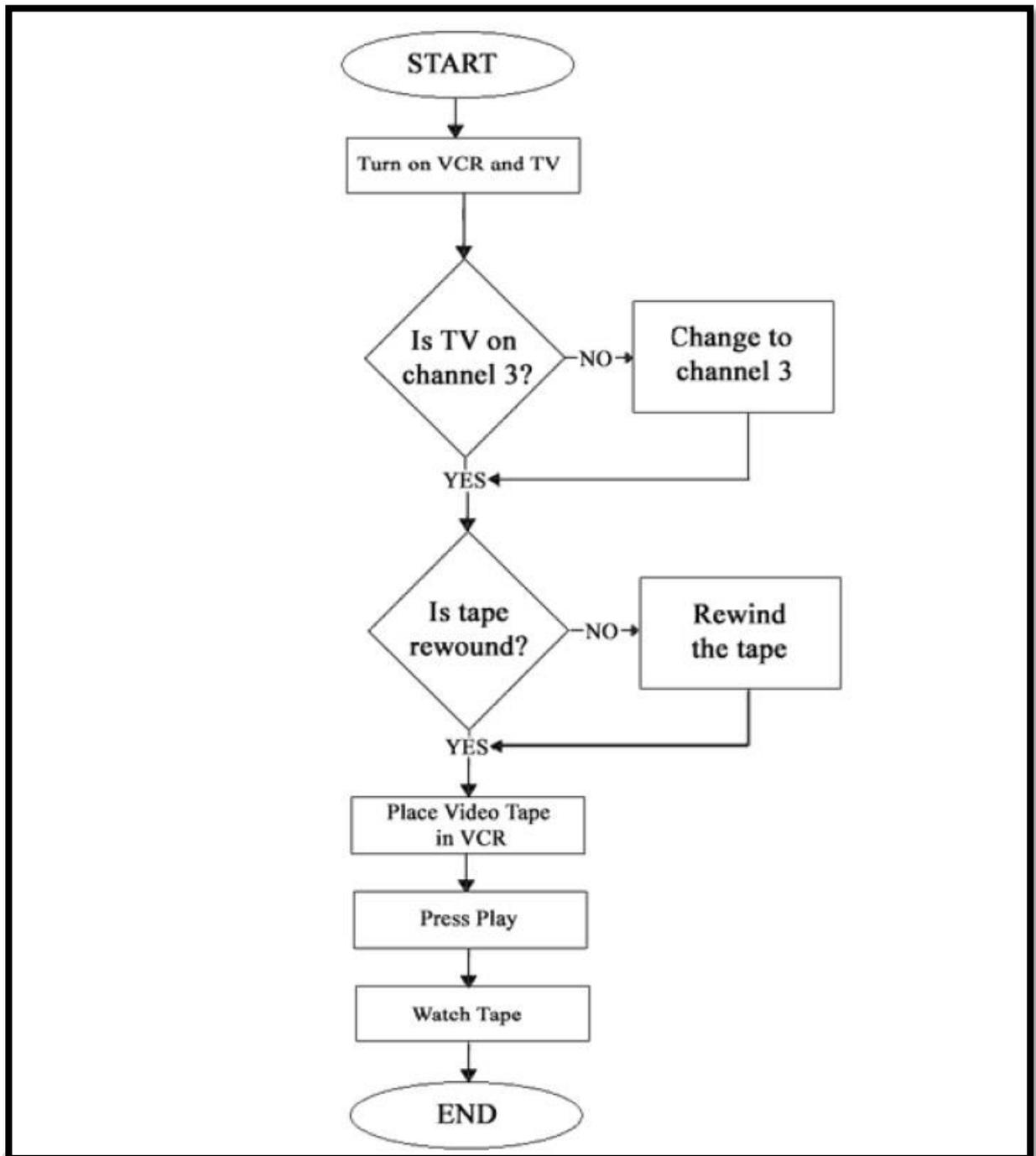
Fig-23. Flow Chart

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