Table of Contents

CHAPTER # 01
BASIC CONCEPTS OF INFORMATION TECHNOLOGY

COMPUTER:

The word computer is derived from an English word „COMPUTE‟ which means “To Calculate”. The basic objective to build-up a computer is the formation of an electronic machine which can solve human problem in very efficient way. It can be define as:

“Computer is an electronic device that accepts data and instructions (In form of programs) as input, process the data according to the given instructions and produce information as output.”

COMPUTER SCIENCE:

Computer science or computing science is the study of the theoretical foundations of information and computation, data processing, system control and of practical techniques for their implementation and application in computer systems.

INFORMATION TECHNOLOGY:

Information technology is a general term that describes any technology that helps to produce, manipulate, store, and communicate information. It describes the combination of the computer technology with the telecommunication.

CHARACTERISTICS OF A COMPUTER:

A Computer can achieve many objectives better then a human, means it is too quick, accurate and reliable as compare to a human. Some of the important characteristics and capabilities of a computer are shown below.

SPEED:

It is the prime factor of a computer due to which it is used it is used now days. Any task which a normal person can complete in days, weeks and months a computer can complete it in seconds or less without any error.

ACCURACY:

Computer generated results are too much accurate. If any calculation is made by human then chances of error was there but computer never make any mistake by the time user provide wrong information.

MEMORY:

In terms of memory computer is also superior over humans. It can store information quite safely and securely and can retrieve and can retrieve it upon user‟s request.

ARTIFICIAL INTELLIGENCE:

This is the latest area in computer science. Its purpose is to develop a machine which can think and behave like humans or to produce such qualities in a computer.

SELF-CHECKING:

A computer has a built-checking it means itself continuously or analyze progress by its own self.

SELF-OPERATING:

During the execution of any program computer never need human help anymore it means once the

program start computer executes it automatically.

DISADVANTAGES / LIMITATIONS OF A COMPUTER:

HUMAN DEPENDENT:

A computer cannot do anything by its own self. It always needed some information from user then on the basis of it produces output. It has no feeling senses.

EFFICIENCY:

It can only execute correct instructions but have no tendency to correct wrong instruction.

DECISION MAKING:

During the execution of a program if computer got stuck then it has no ability to resolve the problem by its own. IT has no IQ.

THE COMPUTER SYSTEM:

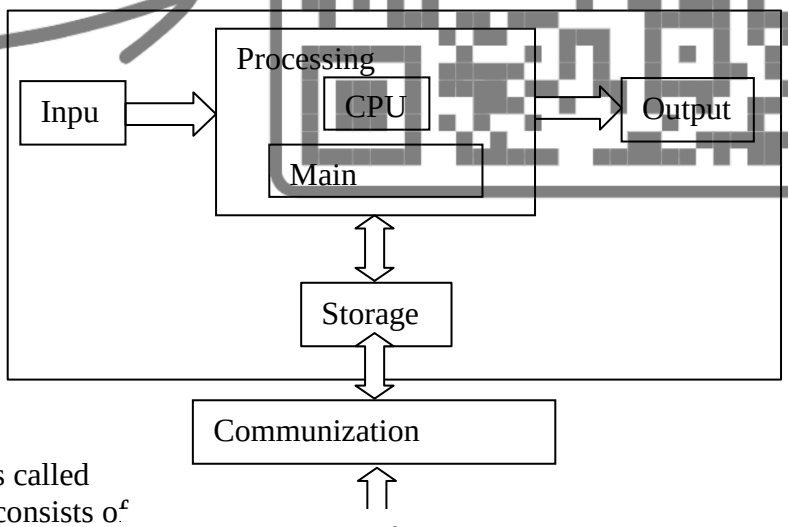
A system is a group of integrated parts that have the common purpose of achieving the same objective there are following characteristics of a computer system.

- ★ A system has more than one element
- ★ All the elements parts are logically related
- ★ All the elements are used in such a way that the goal is achieved.

ELEMENTS OF A COMPUTER SYSTEM:

A system is a group of integrated parts that have the common purpose of achieving the same objective there are following characteristics of a computer system.

- ★ Hardware
- ★ Software
- ★ Data/Information
- ★ Produres
- ★ People Communication



HARDWARE:

The physical equipment is called the hardware. Hardware consists of the following categories:

a. Input hardware
b. Processing hardware
c. Output hardware
d. Storage hardware
e. Communication hardware

a. INPUT HARDWARE:

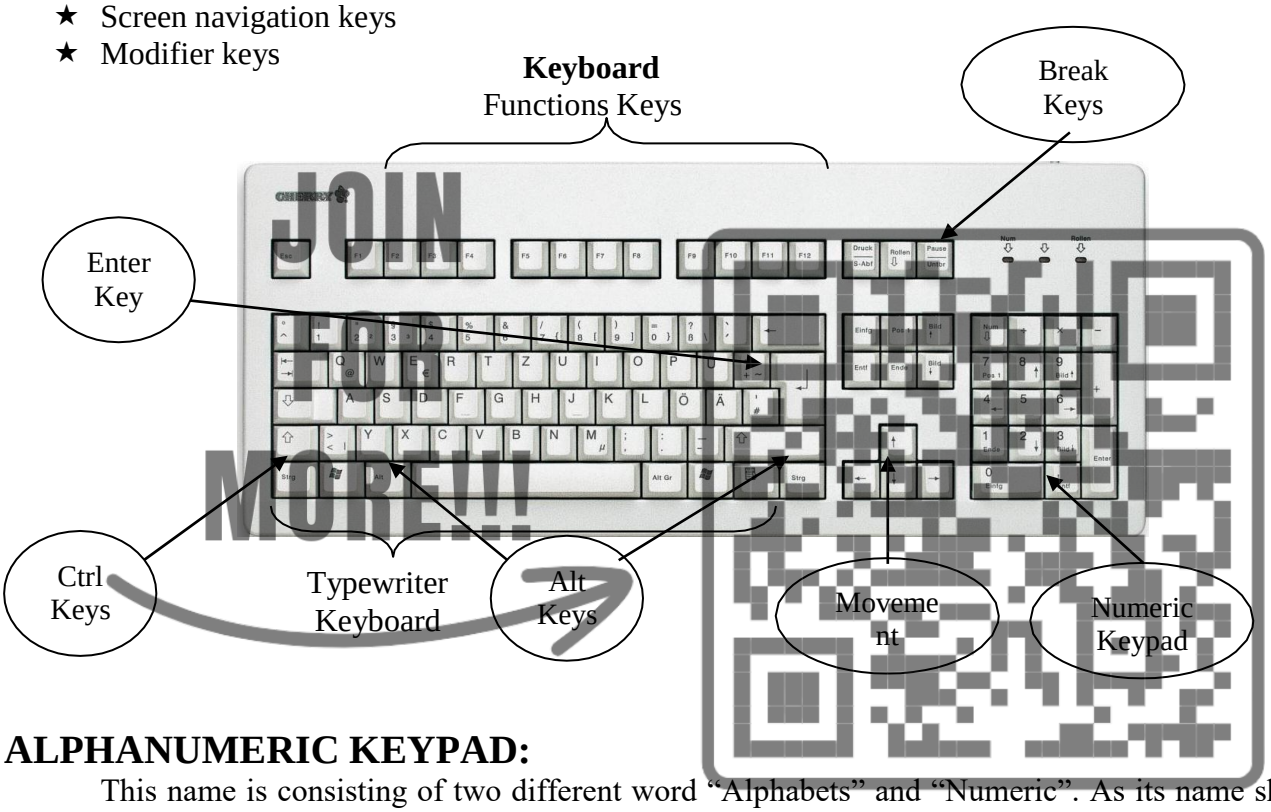
The function of input hardware is to collect data and convert it into a form suitable for computer processing. Examples are keyboard, mouse, trackball, microphone etc.

1. KEYBOARD:

The most common input device used all over the world is Keyboard. It is text based input device because by using it we can only input text data. It is just like a type writer and its working is also like a typewriter. It is sometime pronounced as QWERTY keyboard.

It is because of the reason that starting first character of the alphabetic portion consist on these six letters. A keyboard is divided into many parts of which are as follows:

- ★ Alphanumeric keypad
- ★ Numeric keypad
- ★ Function keys
- ★ Screen navigation keys
- ★ Modifier keys



ALPHANUMERIC KEYPAD:

This name is consisting of two different word "Alphabets" and "Numeric". As its name shows it consist on alphabets from A – Z and numeric digits. It also contain some special characters like !, @, #, $, ^, &, *, (,), :, ", <, >, ? Etc. It also contain some very important keys like Enter, Spacebar. These keys are also known as execution keys.

NUMERIC KEYPAD:

The numeric keypad, at the right side of keyboard and also at the top of keyboard is responsible for all numeric operation on computer so called numeric keys. It also contain basic numeric operations like +, -, *, /.

FUNCTION KEYS:

Keys from F1 to F12 at the top of keyboard called function keys because they perform some extra functions like open, save and to run a program directly from keyboard. These are called function keys because each key contain a special function.

SCREEN NAVIGATION OR CURSOR MOVEMENT KEYS:

All those keys use to change screen properties like cursor and display properties are called Screen Navigation or Cursor Movement Keys. It contains;

- ★ Arrow keys
- ★ Home and End keys

★ Page up and Page Down keys

★ **ARROW KEYS:**
There are four arrow keys to change arrow position. These keys are right, left, up and down keys to more cursor from one place to another according to user.

★ **HOME & END:**
HOME key move cursor at the beginning of a line and ENO key at the last character of the line.

★ **PAGE UP AND PAGE DOWN KEYS:**
Page-up key move the cursor from 8 to 12 lines up from its current position. Just opposite page-Down key moves the cursor from 8 to 12 lines down from its current positions.

MODIFIER KEYS:

Shift, Alt, Ctrl these keys are normally use in combination with other keys to enhance their working so normally called Modifier keys. Some other keys are,

★ **Delete Key:** Use to delete a character.
★ **Insert Key:** Use to insert a character between two letters without deleting any one of them.
★ **Esc Key:** The function of this key varies from program to program.
★ **Print Screen:** Print the current screen position either m soft or hard format.

2. MOUSE:

The most common pointing input device is Mouse. It is called pointing device because it is used to point a place on display screen and the select one or more action. The concept of mouse was first given by APPLE COMPUTERS with its brand new PC APPLE MACHINTOSH. But now it is a basic need of each and every GUI (Graphical user interface) based operating system.

STRUCTURE:

Its body is made up of hard plastic with a ball at its base, and has a cable from the front. This structure is very similar to the real nice therefore this device is known as Mouse. It also contains two buttons relatively called LEFT and RIGHT buttons. Normally we use left button for most of the task. In between both buttons a scroll wheel is placed which is used to scroll up and scroll down the page without disturbing the actual position of the mouse.

3. TRACKBALL:

Trackball is another pointing device work on exactly on the principle of mouse. Its structure is just the opposite structure of a mouse. Its ball is at the top while buttons are at the base. In order to use trackball user use its fingers to rotate Advantage of trackball over mouse is simply that it require less space to use as compare to a mouse and it can use any where on any surface. Majority of the Trackball users have to face wrist pain. This is due to the reason during using mouse our whole hand moves while in trackball only our wrist is working which is its only disadvantage.

4. SCANNER:

Scanner is the third most common input device after keyboard and mouse. It can input only image base data and convert it into digital signals. Normally scanners are available in black and white" and "Colored" modes. The most common type of scanner are;

- ★ Hand-Held scanner
- ★ Flatbed scanner
- ★ Sheet-Fed scanner

HAND-HELD SCANNER:

These scanners can be used by means of human hands. They are normally common and relatively cheap but their output quality is not so good because they require steady hand movement. These scanners are easy to use by passing it over the surface in steady position.

FLAT-BED SCANNER:

This is the most common type of scanner also known as horizontal scanners. It produces relatively good result as compare to handheld scanners. It is due to the reason as compare to handheld scanners. It is due to the reason that object is static at its place and machine scan it automatically so both are steady at there places so end result is good. Their working is just like Photostat machine. The difference is it copy image into computer.

SHEET-FED SCANNER:

It contain a long continues sheet and print it continuously. It is normally used to scan large images like portraits but this is the type of scanner which is normally not used for official purpose. It is different from the above two scanners because it scan both side of images simultaneously. So their speed is also greater then any other scanners.

5. JOYSTICK:

Joystick is also a pointing device. It consists of a vertical handle like a gearshift lever mounted on a base with one or two buttons. These buttons are generally known as triggers. They are primarily used for playing games. Joysticks are popular for flight simulator and driving games. Today joystick is consider as the basic device in order to design computer animations because its working is much smooth as compare to mouse.

6. LIGHT PEN:

It is a light sensitive, or pen-like device, connected by a wire to the terminal. It contains a photo detector which allow user to interact with the computer with a special design monitor. It is approximately 3.5 inches in length and0.5 inches in width. It also contains cord at one of its end through which it connect to the computer. The user brings the pen closer to a desired point on the display screen and presses the pen button, which identifies that screen location to the computer.

7. MICROPHONE:

Microphone or MIC is another widely used input device but it is categorized in the multimedia family. Microphone is only use to input sound signals. Sound signals are transformed into digital signals by microphone so that computer can understand it. Now days it is widely used for communication purpose over internet and video conferencing.

8. DIGITAL CAMERA:

The only input device which can input both still and motional pictures is Digital Camera. The basic difference between normal and digital camera is we have to use a thin sheet of film in normal camera white there is no concept of film in digital camera. Data store in it electronically and then can be store in computer. The image quality of digital camera is quite better as compare to normal camera.

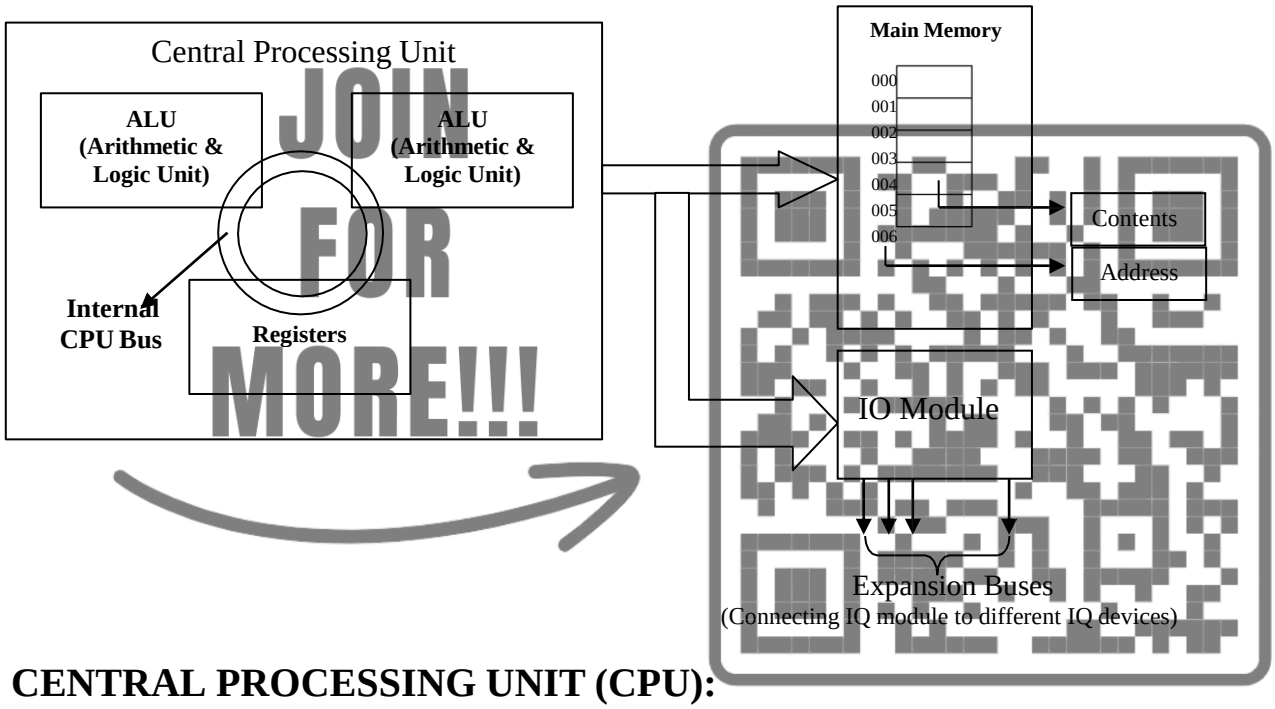
9. DIGITIZING TABLET:

A digitizing tablet, or digitizer, consists of a flat drawing surface and a pointing tool, which creates images that are converted to computer-usable form. The tablet, which is covered by a gird of tiny wires, is connected by cable to the computer screen, Later the drawing can be printed out Digitizing tablets are used in aircraft design and computer-chip design.

b. PROCESSING HARDWARE:

The function of processing hardware is to retrieve and execute (interpret) instructions provided to the computer. Processing may consist of performing calculations and other logical activities. Its components are central processing unit and main memory.

INTERNAL ARCHITECTURE OF THE PROCESSING UNIT:



CENTRAL PROCESSING UNIT (CPU):

CPU performs the main function of processing. It is contained on an IC (Integrated Circuit) chip. It is composed of the following main parts:

a) CONTROL UNIT, CU:

Control unit tells the rest of the computer how to carry out a program‟s instruction. It directs the movement of the electronic signals between main memory and the arithmetic / logic unit. It also directs the electronic signals between main memory and the IO devices.

b) ARITHMETIC AND LOGIC UNIT, ALU:

It performs arithmetic operations (like addition, subtraction, multiplication, division) and logical operations (like comparison and gate operations).

c) REGISTERS:

These are special, temporary storage areas that enhance the performance of the system. They store data during processing and provide working area for computation. Memory is the area that stores data to be processed a bit later whereas registers hold material that is to be processed immediately. Control unit loads data and instructions from main memory into these registers, which helps the computer process faster.

BUSES:

Buses are electrical path ways through which bits are transmitted within the CPU and between CPU and other device in the system unit. Typically a bus consists of multiple communication pathways, or lines.

According to location, buses are classified as follows:

Internal CPU: These lines are internal to the CPU and used to connect ALLI, control unit and various registers.

System Bus: It connects the CPU with the main memory and the main IO module the serves as the interface to the slower IO devices.

Expansion Buses: It connects the CPU with peripheral devices via IO module. Bus lines are also classified into three functional groups as follows:

- ★ Data lines provide a path for moving data between system modules. These lines collectively are called data bus.
- ★ Address lines carry addresses generated by the CPU to access a memory location or an IO device.
- ★ Control lines are used to control the access and the use of the data and address lines. In addition, there may be power distribution lines that supply power to the attached module.

MAIN MEMORY:

Main Memory is the primary storage medium;. It holds.

- ★ Data to be processed
- ★ Instructions to process data
- ★ Processed data

Main memory is contained on an IC chip. Memory is divided into locations. Each location is uniquely identified by an address. The contents of a memory location can change but the addresses always remain constant.

IO (INPUT / OUTPUT) MODULE:

The purpose of an IO system is to enable user to communicate with the computer. IO devices are attached to the computer by means of an IO module, whose function is to control data transfers between IO devices and the rest of the system. The reason for using the IO module is that IQ devices are extremely slow as compared to CPU therefore it is a sheer wastage of CPU‟s time to connect it directly with the IO devices. The CPU accesses both main memory and IO module in the same way, however, it usually takes much longer by the CPU to access data from IO module than to access data from memory because most IO operation are quite slow.

INSTRUCTION PROCESSING:

Machine Cycle:

Machine cycle is the shortest internal in which an elementary operation can take place within the process. It comprises a series of operations performed to execute a single program instruction.

Instruction Cycle:

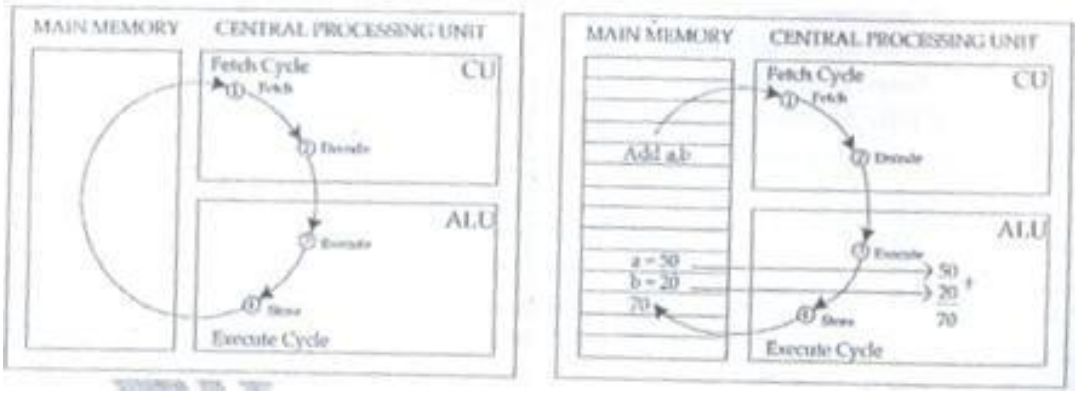
The processing required for a single instruction is called instruction cycle. The instruction cycle consists of two parts.

a) Fetch Cycle: During this stage the Control Unit

- ★ Fetches the instruction from main memory
- ★ Decodes the instruction (determines what the instruction means)

b) Execute Cycle: During this stage the Arithmetic/Logic Unit

- ★ Executes the instruction
- ★ Stores the result in a register or main memory



MEMORY CAPACITY:

The following terms are used to express memory capacity:

- ★ **Bit:** Each 0 or 1 is called a bit. IT is denoted by „b".
- ★ **Byte:** A group of 8 bits is called a byte. IT is denoted by „B".

KB (Mega byte):	1024 B	$= 2^{10}$ B = 1 KB.
MB (Mega byte):	1024 KB	$= 2^{20}$ B = 1 MB.
GB (Giga byte):	1024 MB	$= 2^{30}$ B = 1 GB.
TB (Tera byte):	1024 GB	$= 2^{40}$ B = 1 TB.
PB (Peta byte):	1024 TB	$= 2^{50}$ B = 1 TB.
EB (Exa byte):	1024 PB	$= 2^{60}$ B = 1 EB.

REPRESENTATION OF DATA AND PROGRAMS:

Computers use binary system to represent data. The binary system has only two digits. 0 and 1, representing the two states on and off. In the computers these two number are represented by electrical voltage. Thus, in the computer the binary 0 can be represented by a low voltage and 1 by a high voltage. All data and programs that go into the computer are represented by these two numbers.

BINARY CODING SCHEMES:

Letters, numbers and special characters are represented within a computer system by means of binary coding schemes. That is, the on/off and 1s are arranged in such a manner that they can be made to represent the characters, digits, or other values. Following are the coding schemes most commonly used:

a) ASCII (American Standard Code for Information Interchange):

It is an 8-bit code that means it uses different combinations of 8 bits to represent each character. These 8 bits can represent at most 256 (=28) characters. This is the most widely used coding system with microcomputers. Windows 95 users ASCII coding system.

b) EBCDIC (Extended Binary Coded Decimal Interchange Code):

This is another 8-bit code. Here also, the maximum number of characters that can be represented is 256 (=28) characters. This system is used in large computers like mainframes.

c) UNICODE (Universal Code, Universal Character Set):

This is a 16-bit code, that is, it can represent 65536 (=216) characters. Thus it allows almost all the written language of the world to be represented using a single character set. Windows NT used this coding system.

THE POWER OF PERSONAL COMPUTER:

The power of the personal computer is measured according to three main units of measurement:

- ★ RAM Capacity
- ★ Word Size Capability
- ★ Processor Speed

THE SYSTEM CABINET/UNIT:

The system unit consists of the motherboard (including the processor chip and memory chips), the power supply, and storage devices.

A. The Power Supply:

The electricity available from a standard wall outlet is alternating current (AC), but a microcomputer runs on direct current (DC), The power supply is a device that converts AC to DC to run the computer. The on/off switch in the computer turns on or shuts off the electricity to the power supply. Because the electricity can generate a lot of heat, a fan inside the computer keeps the power supply and other components from becoming too hot.

Electric power drawn from a standard AC outlet can be quite uneven. For example, a sudden surge, or spike, in AC voltage can burn out the low voltage DC circuitry in your computer. Instead of plugging the computer directly into the wall electrical outlet, the computer is plugged into a power protection device. The three principal types are:

a. Surge Protectors

A surge protectors, or surge suppressor, is a device that protects a computer from being damaged by surges (spikes) of high voltage. The computer is plugged into a surge protector, which in turn is plugged into a standard electrical outlet.

b. Voltage Regulators:

A voltage regulator, or line conditioner, is a device that protects a computer from being damaged by insufficient power brownout in voltage. Brownouts can occur when a large machine such as a power tool starts up and causes the light in the house to dim.

c. UPS (Uninterruptible Power Supply):

A UPS is a battery operated device that provides a computer with electricity if there is a power failure. The UPS will keep the computer going 5 – 10 hours or more. It goes into operation as soon as the power to the computer fails.

B. The Motherboard:

The motherboard or system board is the main circuit board in the system unit. It contains the microprocessor, RAM chips, ROM chips and some sockets called expansion slots where Mother Board showing above mentioned details.

The Microprocessor Chip:

Most microprocessors today use microprocessor of two kinds.

- ★ Made by Intel
- ★ Made by Motorola

Intel Chips: Input makes chips for personal computers such as Compaq, Dell, Gateway, Tandy, Toshiba, and Zenith. Variations of Intel chips are made by other companies, such as Advanced Micro Devices (AMD), Gyrix Inc Chips and Technologies.

Intel used to identify its chips by numbers 8086, 8088, 80286, 80386, 80486; the X86 series. Intel‟s successor to X86 chips is the Pentium family of chips. Listed from slowest to fastest, the current chip models available from Intel are the Pentium, Pentium with MMX technology, Pentium Pro, Pentium II, Pentium III, Pentium IV, Dual Core, and Core 2 Due.

Motorola Chips: Motorola produces the family of chips for Apple Macintosh computers. These RISC architecture.
RISC architecture
Most new chips are downward/backward compatible with older chips.
Downward/backward compatible means that you can run the software written for computers with older CPU chips on a computer with newer chips. For example, the word processing program and all the data files that you used for your 386 machines will continue to run on a 486 machines, thus 486 machines are downward compatible. However the reverse compatibility is not necessarily is not necessarily true. Upward compatible means that software written for a machine with a never chip will run on a machine with an older chip. Thus if you have a 486-powered PC and buy an old 286 portable, you may or may not be able to run your software on both.

RAM (Random Access Memory) chips:

Microcomputers come with different amounts of RAM, The more RAM you have, the faster the software can operate. If, for instance, you type such a long document in a word processing program that it will not all fit into your computer‟s RAM, the computer will put part of the document into your disk (either hard disk or diskette). This means you have to wait while the computer swaps data back and forth between RAM and disk. Microcomputers with 1GB RAM are common these days.
Additional RAM chips can be added by plugging memory modules, which are circuit boards that contain memory chips, into a memory socket on the motherboard. There are two types of RAM: SRAMs and DRAMs.

SRAMs – Static RAMs: In SRAM‟s binary values are stored using traditional flip-flops (a flip flop is a logical storage element made up of logic gates that can a single binary bit). A SRAM can hold its data as long as power is supplied to it. Since they do not require any refreshing, they are fast. They are more expensive than DRAMs. Examples of such memories are cache memories.
DRAMs – Dynamic RAMs: These memories are made with cells that store data as charge on capacitors. The presence or absence of charge on a capacitor is interpreted as a binary 0 or 1. As, the capacitors have natural tendency to discharge, DRAMs require periodic charge refreshing to maintain data storage. Hence they are slow. Examples of these memories are the traditional RAMs used in the PCs.

Types of DRAM Module
SIMM – Acronym for Single Inline Memory Module, a small circuit board that can hold a group of memory chips. Typically, SIMMs holds up 8 (on Macintoshes) or 9 (on PCs) RAM chips. On PCs, the ninth chip is often used for parity error checking. SIMMs, are easier to install than individual memory chips A SIMM is either 30 or 72 pins.
DIMM – Acronym for Dual Inline Memory Module, a small circuit board that holds memory chips. A single in-line memory module (SIMM) has a 32-bit path to the memory chips whereas a DIMM has 64-bit path., because the Pentium processor requires a 64-bit to memory. A DIMM contains 168 pins.
RIMM – The memory module used with RDRAM chips. It is similar to a DIMM package but uses different pin settings. Rambus trademarked the term RIMM as an entire word. It is the term used for a module using Rambus technology. It is sometimes incorrectly used as an acronym for Rambus Inline Memory Module. A RIMM contains 184 pins. Note must use all sockets in RIMM installation.

Types of DRAM

SDRAM – Short for Synchronous DRAM, A new type of DRAM that can at much higher clock speed than conventional memory. SDRAM actually synchronizes itself with the CPU‟s bus and is capable of running at 133 MHz. SDRAM delivers data in high speed burst.

DDR SDRAM – Short for Double Data Rate Synchronous DRAM, a type of SDRAM that supports data transfers on both edges of each clock cycle effectively, doubling the memory chip‟s data throughput. DDR – SDRAM is also called SDRAM II.

RDRAM – Short for Rambus DRAM, a type of memory (DRAM) developed by Rambus. Inc. In 1997, Intel announced that it would license the Rambus technology for use on its future motherboards, thus making it the likely de factors standard for memory architectures.

ROM (Read Only Memory) Chips:

ROM contains permanent pattern of data that cannot be changed. It is also known as firmware. They are non-volatile and non-erasable. While it is possible to read a ROM, it is not possible to change its data.

In microcomputer systems, one ROM chip holds the boot-up sequence of instructions called the ROM bootstrap, another ROM chip helps the processor transfer information between the keyboard, screen printer, and other peripheral devices to make sure all units are functioning properly. These instructions are called ROM BIOS, or basic input/output system. ROM BIOS is an interface, a connector and a translator between the computer hardware and the software programs.

Three variations of ROM chips are: PROM, EPROM and EEPROM.

a. PROM (Programmable Read-Only Memory)

A PROM is a memory chip on which data can be written only once, Once a program has been written onto a PROM, it remains there forever. Unlike RAM, PROM retain their contents when the computer is turned off. The difference between a PROM and a ROM (Read-Only Memory) is that a PROM is manufactured process. To write data onto a PROM chip, you need a special device called a PROM programmer or PROM burner. The process of programming a PROM is sometimes called burning the PROM.

b. EPROM (Erasable Programmable Read-Only Memory)

- ★ EPROMs are erased when exposed to ultraviolet light.
- ★ Erasure time is 20min or more.
- ★ Smaller in size / more dense as compared to EEPROM.
- ★ Their endurance is 100 programming cycles, i.e. EPROMs can be reprogrammed 100 times before the chip gets damaged.
- ★ Portions of EPROMs cannot be erased. The erasure process erases whole contents of the chip.

c. EEPROM (Electrically Erasable Programmable Read-Only Memory)

- ★ EEPROMs are erased when they are subjected to certain electrical voltage.
- ★ Erasure time is 10ms.
- ★ Larger in size as compared to EPROM.
- ★ Their endurance is 100,000 programming cycles.
- ★ Byte level erasure is possible in these chips.

C. Output Hardware:

The function of output hardware is to provide the user with the means to view information

produced by the computer system.

OR

All those devices which are used to translate computer generated signals into user understandable form are called Output Devices. Output could be of two types.

SOFTCOPY OUTPUT:

It is the temporary taken on monitor screen. Which can only be visualized.

HARDCOPY OUTPUT:

Hardcopy means the output is in a form can be physically touched. It is the permanent output taken on a paper by means of printer. It can be both visualized and storable physically.

MONITORS:

Monitor is the most common and most basic softcopy device. The basic structure of a PC is not complete without this component. The size of monitor screen is starting from 14 inches to onwards. If monitor screen is horizontal then called LAND SCAPE monitor and in case of vertical it is known as PORTAIR MONITOR.

TYPES OF MONITORS:

"By Structure"

According to structure monitors are divide into two types

- ★ CRT monitors
- ★ Flat-Panel display. OR LCD (Liquid crystal display) monitors.

CRT MONITORS:

CRT (cathode ray tube) monitors contain a tube its center by using which electrons are fired at phosphor dots on the screen. The dots are grouped into pixels, which glow when struck by electrons. In color CRTs; each pixel contains a red, green and blue dot. So by different combination of these colors many other colors appear. These are still the most common type of monitors used today.

FLAT – PANEL DISPLAY:

Most flat-panel monitors use liquid crystal display (LCD) technology or electro-luminescent (EI.). It is a new semiconductor technology in which monitor contains a special liquid at the top of the screen instead of CRT. Due to which its size reduces. This is the reason flat-panel monitors take up less desk space and are less in weight.

BY COLOR:

According to color the basic type of computer monitors are

- ★ Monochrome monitors
- ★ Gray-scale monitors.
- ★ Color monitors.

Monochrome Monitors:

Mono means one and chrome stands for color. These are called monochrome monitors because it can show data by using only one color (normally dirty white or bright white). It has black color on its background. This is the most basic type of monitors.

Gray-Scale Monitor:

As its name shows gray-scale is a special type of monitor which can shows almost 16 different shades of gray color it is not famous as compare to other two.

Color Monitors:
Today the mostly used type of computer monitors is Color monitor. It has the capability to show 16 to 1 million different colors. These are also called RGB monitors because their working based on three basic colors Red, Green, Blue. All

Properties of a Monitor Screen:
Resolution: Resolution means number of pixel on a screen. It tells about the sharpness of image of a monitor screen. As much as the pixels as good as the image.
Bandwidth: Bandwidth means the no of signal a monitor can handle at a time. As much as the bandwidth as higher will be refresh rata and as good will be the output.
Refresh Rate: Refresh rate is the number of times each second that the electron guns scan pixels. Refresh rate is measured in Hertz (Hz), or cycle per second. If refresh rate of a monitor is 72 Hz or higher then it is consider as a good monitor.
Dot Pitch: Dot pitch is the distance between the phosphor dots that make up a single pixel. In color monitors, three dots (red, green, and blue) make each pixel. Dots pitch no greater than. 31 millimeters consider reliable.
Convergence: the clarity and sharpness of each pixel known as Convergence. It means how greater the picture quality is.

PRINTERS:

The most famous hardcopy output device is printer. It accepts data in the form of both text and graphics from the CPU and then produces its hardcopy on paper. In early days it was not consider as important device with a computer system but now it is an essential device. With respect to structure, size, and cost printers are divided into two basic types,

- ★ Important Printer
- ★ Non-impact printers

IMPACT PRINTERS:

Impact means effect; it means these printers work by producing striking effects. Its basic structure contains a hammer behind an ink ribbon and in front of ink ribbon we place our paper so whenever hammer strikes the ribbon, it produce its impact on the paper. During the whole process they produce a great noise. There basic types are

- ★ Daisy-Wheel
- ★ Dot-matrix
- ★ Line printers

Daily Wheel:

As its name shows this type of printer contain a wheel over which all the alphabets and different symbols are written. A hammer sticks the wheel from back on a particular character and as a result it produces the impact of that particular character. Daisy wheel can only print data in text format.

Dot-Matrix:

Dot matrix printers are the most common. Type of impact printer. A dot matrix printers head contains a cluster of pins. The printer can push the pins out to form patterns in rapid sequence. The pins press an inked ribbon against the paper, creating an image on the paper. Some dot matrix printers print 500 cps (characters per second). These printers are still popular due to their low printing cost.

Line Printer:

Printers which can print a whole line on a single strike of hammer are called Line Printers. Their hammer size is relatively larger then the others printers. They are fast but printing quality is not too good. Drum and chain printers are the examples are the examples of line printers.

NON – IMPACT PRINTERS:

These printers are also known as hammerless printers. They print by means of laser and ink spread technology. Examples are

- ★ Ink jet printers
- ★ Laser printers
- ★ LCD and LED printers
- ★ Thermal printers

Inkjet Printers:

These printers print by means of ink cartridge. Its head spray ink on sheet of paper. These printers can print very high quality image and text output. Ink jet printers are available for color and black-and white printing. Due to their efficient working they are widely used for offices and home use.

Laser Printers:

Laser printers are the most famous type of non-impact printers. They use heat and pressure to bond particles to paper. Laser printers are available for color and black and white printing. Laser printers provide resolutions from 300 – 1200 dpi (dots per inch) and higher. Black and white laser printers usually produce 4 – 16 ppm (pages per minute). Laser printers produce higher quality print than ink jet printers, but are more expensive.

LCD & LED Printers:

LCD (liquid crystal display) and L.E.D. (light emitting diode) work on the same mechanism of laser but in these we different diodes for printing instead of laser beam.
Normally they are not use for commercial purposes. Most of the LED and LCD printers are used in research laboratories.

Thermal Printers:

Thermal means heat energy. It means this printer print by means of heat. These types of printer contain their head at hot state. So on making contact with a surface they produce their impact on it. They are widely used on industrial level.

Characteristics of a Printer:

Basic characteristics of a printer are

- ★ Quality of print
- ★ Speed
- ★ Graphics
- ★ Fonts
- ★ Color

Quality of print:

The quality of print is divided into two types, either “LETTER” or “DRAFT”. Daisy wheel, inkjet and laser printers produce letter quality (relatively good) while
most of the printers produce draft quality.

Speed: Speed is another very important issue in printing. Printers speed is measured in CPS (characters per second) and PPM (pages per minute). Daisy wheel is the slowest printer print with 30 cps. Still Laser printers are the fastest printers which can print about 4 to 20 or more pages per minute. Line printer can print 3,000 lines in a minute. Generally speed of the printer is directly proportional to its cost.

Graphic: Now-a-days graphic printing is another very important issue. Printer like laser, inkjet done this task with high quality while other like matrix are not capable of such kind of printing.

Fonts: Font means size, shape and design of a letter. New printers are capable of working with different fonts. Old printers like dot-matrix can deal with a limited number of fonts.

Color: In modern printing, color printing is very important. In different documents like maps, presentations and banners these color are of great importance. Some printers can print in only using thousands of colors.
Resolution: It is measured in DPI (dots per inch).It means how sharp and good is the printing. Printing resolution from 600dpi to onwards consider as a better one.

PLOTTERS:

Plotters are specialized output devices to produce high-quality graphics in a variety of colors. They are mostly used for print-outs that are too large to be printers. Plotters use mechanical, ink jet, or thermal technology to create large-format images for architectural or engineering uses. Now-a-days there are two basic types of plotters,

- ★ Pen plotters
- ★ Electrostatic plotters

PEN PLOTTERS:

Pen plotters structure based on a pen to do all the task regarding printer either images or text. Pen plotters are further divided into two types,

- ★ Drum plotters
- ★ Flatbed plotters

Drum Plotters:

It consists on a pen which writes over a paper which is roll over a drum. This kind of plotters are using for the printing of those banners of a fixed width with large length.
Flatbed Plotters: It is a plotter in which paper is fixed over a surface and pen is move over its surface. It is normally used in engineering purposes because of its high quality image.

ELECTROSTATIC PLOTTERS:

They work like a photocopy machine. They are faster and more expensive. They work by using electric charges (electricity). They consume a large amount of electricity but image quality is not so great as compare to drum or flatbed plotters.

SOUND OUTPUT DEVICES:

Sound-output device produce music, special-effect, noise, or other sounds. Sound capabilities can be added to some microcomputers by inserting a sound circuit board or by other means. Appropriate software and speakers are also required.

VOICE OUTPUT DEVICES:

Voice-output devices, or voice synthesizers, convert data in the computer into vocalized sounds understandable to human.

Computer Output Micro Film/Microfiche (COM) System:

Computer output microfilm/microfiche (COM) is computer output produced as very small images on rolls or sheets of films.
The principal advantages of this technology are:
1. Speed: COM systems can easily handle output at a rate in excess of 30,000 lines per minute. This is about 50 percent faster than most large laser printers.
2. Size: The output is condensed in size (compared to hardcopy output) by a factor ranging from 20 to 100.
3. Cost: The cost per page of printed material is less than that of regular hardcopy output methods.
The principal disadvantage of this technology is:

The major disadvantage of COM system is that, because of the reduced visual size of the output, special equipment – that is a microfilm/microfiche reader – is needed to rend the output.

D. Storage Hardware:

It is also called secondary stage. The function of this storage hardware is to provide a means of storing instructions and data in a form that is relatively permanent i.e. nonvolatile and easy to retrieve when needed for processing (nonvolatile memories are those which retain their contents even after the power is turned off).
Examples are Hard disks, floppy disks, Compact Disks (CDs), etc.

SECONDARY MEMORY:

Secondary storage is known as Auxiliary storage/external memory that is used to store large quantity of data. It is nonvolatile type of memory means data will not lost when power is turned off. Secondary memory is relatively slow and cheap as compare to primary memory. It cannot be processed directly by the CPU. Secondary storage devices used magnetic tape, magnetic disks and some optical disks like CDs etc.

FLOPPY DISK:

It is the most commonly used secondary storage device used in the 1990"s. It is made up of polyester films coated with metal oxide compound. The rotation speed of the film is from is from 45 to 70 rps (rotation per minute). It is available in two sizes 5.25 inches and another one is 3.5 inches. With respect to storage ability floppies are available in two types single sided and double sided. Those floppies which can store data on a single side called single sided floppy disk. While floppies can store data on both sides are known as double sided floppies. Today two new terms HD (high density) and DD (double density) are also associated with the storage capability of a floppy disk.

HARD DISK:

Hard disk is the most commonly used secondary storage device used now a days. Today without hard disk concept of computer is not getting complete. As compare to floppy hard disk is less portable (transferable). But due to its large capacity it is used widely. It is made up of rigid aluminum or glass disk of about 3.5 inches in diameter. They are also coated with oxide or any ferromagnetic substance. A hard disk is consisting of many magnetic plates. On the surface of these plates there are circular spaced area called TRACKS. That track over which writing and reading process is going on is simply known as sectors. The reading and writing process is done by means of a head and the process is termed as "SEEK". The rotation speed of hard disk is normally from 4500 to 7200 rpm (rotations per minute). While is seeking time is measured in milliseconds.

MAGNETIC TAPE:

All those devices in which data stored follow a single pattern or data store in a straight path are known as SERIAL SATORAGE DEVICE. A magnetic tape is also serial storage device. Serial storage devices are always slower then dynamic storage devices. In serial to access data at the last of the magnetic tape we have to cover the complete length in order to catch the desired position. The width of the tape is normally 1.27cm (0.5 inches) and the length is about 731.5 meters. On the back there is a ring used to write data on the disk. The magnetic tape is divided into logical blocks. A file consists of a single block at least. There are two other gaps known as

Interlock gap: It separates logical block and at very small distance to each other.

Inter record gap: They are relatively wider and separate different records. Magnetic tape is used today because they are still the cheapest technology. They can store large amount of data for long periods. All the telecom companies in Pakistan use magnetic tape to store there called records. The only

disadvantages of magnetic tape is that it is a sequential or serial media which means that you have to start from the beginning of the tape to access a record in the middle.

DIFFERENCE BETWEEN PRIMARY MEMORY & SECONDARY MEMORY

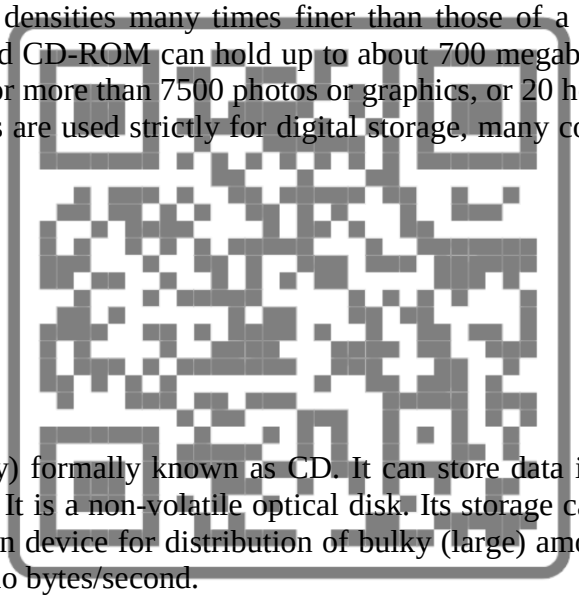
PRIMARY MEMORY	SECONDARY MEMORY
It is a faster memory area.	It is relatively slow.
It consists on both volatile (RAM) and non-volatile memory areas.	It consists on only non-volatile memory areas.
Usually primary memory is not portable.	Secondary memory is mostly portable except HDD.
It is relatively costly.	It is cheaper as compare to primary memory.

OPTICAL STORAGE:

Optical storage techniques make use of the laser beams to write and read data – which can consist of text, graphics, audio clips, or video images – at densities many times finer than those of a typical magnetic disk. A single optical disk of the type called CD-ROM can hold up to about 700 megabytes of data. This works out to about 269,000 pages of text, or more than 7500 photos or graphics, or 20 hours of speech, or 77 minutes of video. Although some disks are used strictly for digital storage, many combine text, visuals, and sounds.

Some of important optical devices are as follows:

- ★ CD – ROM
- ★ CR – R
- ★ CD – RW
- ★ DVD – ROM



CD – ROM:

CD – ROM (compact disk read only memory) formally known as CD. It can store data in both formats text graphics and audio or visual based data. It is a non-volatile optical disk. Its storage capacity is from 650MB to 1GB. Today it is the most common device for distribution of bulky (large) amount of data. Its speed is measured in "X" where 1X = 150 kilo bytes/second.

Structure of CD-Rom consist of a spiral originate from the center and ending at outermost edge of the disc. These circular paths are called PITS. The distance between two consecutive pits is from 1.5 to 1.7 microns. In the initial period of CD – ROM there were some heating and vibration problems but now they are completely resolved.

CD – R:

A CD – R (Compact Disc-Recordable) is a variation of the Compact Disc invented by Philips and Sony. CD – R is a Write Once Read Many (WORM) optical medium, though the whole disk does not have to be entirely written in the same session.

CD – R retains a high level of compatibility with standard CD readers.

The whole CD – R is written in one session with no gaps and the disc is "closed" meaning no more data can be added and the CD – R effectively becomes a standard read-only CD. With no gaps between the tracks the Disc At Once format is useful for "live" audio recordings. Data are written to the CD – R one track at a time but the CD is left "open" for further recording at a later stage. It also allows data and audio to reside on the same CD – R.

COMPACT DISC RE – WRITABLE (CD – RW)

Compact Disc Re0-Writable (CD – RW) is a rewritable optical disc format. Known as CD-Erasable (CD-E) during its development, CD-RW was introduced in 1997, CD-RW discs are usually

produced in the most common CD-R disc capacities such as 650 and 700 MB, while smaller and larger capacities are rarer. CD – RW recorders typically handle the most common capacities best. In theory a CD-RW disc can be written and erased roughly 1000 times, although in practice this number is much lower. CD-RW recorders can also read CD-R discs.

DVD ROM:

DVD – R is a DVD recordable format. A DVD-R typically has a storage capacity of 4.71 GB (or 4.38GiB), although the capacity of the original standard developed by Pioneer was 3.95 GB (3.68 GB). Both values are significantly larger than the storage capacity of its optical predecessor, the 700 MBCD-R – a DVD – R has 6.4 times the capacity of a CD-R.

Data on a DVD-R cannot be changed. Whereas a DVD – RW (DVD-rewritable) can be rewritten multiple (1000+) times. DVD-R(W) is one of three competing industry standard recordable formulas; the others are DVD+R(W).

SUMMARY OF STORAGE DEVICES:

Magnetic disk	
Floppy disk,	used for off-line storage
Hard disk drive,	used for secondary storage
Magnetic tape data storage,	used for tertiary and off-line storage

SUMMARY OF OPTICAL STORAGE:

CD, CD-ROM, DVD, BD-ROM: Read only storage used for mass distribution of digital information (music, video, computer programs)

CD-R, DVD-R, DVD+R, BD-R: Write once storage, used for tertiary and off-line storage.

CD-RW, DVD-RW, DVD+RW, DVD-RAM, DB-RE: Slow write, fast read storage, used for tertiary and off-line storage.

SOFTWARE:

Computer hardware is useless without electronic instructions called software, which tells hardware what to do. Software is composed of programs and programs are in turn composed of instructions. Software generally comes on disks, purchased off-the-shelf (ready made from the market) or custom written. There are two types of software.

a) Application Software b) System Software

a) Application Software:

Application software performs general-purpose tasks for users. Examples are word processing, spread sheet programs, payroll processing, etc.

b) System Software:

System software runs basic computer operations, manages computer resources and enables application software to run on the computer. It does not solve problems related to business or a profession. Examples are operating systems, device drivers and utility programs.

The components of System Software:

There are three basic components of system software:

- ★ Operating System
- ★ Device drivers
- ★ Utility programs

THE OPERATING SYSTEM:

The operating system (OS), also called the software platform, consists of the master system of programs that manage the basic operations of the computer.

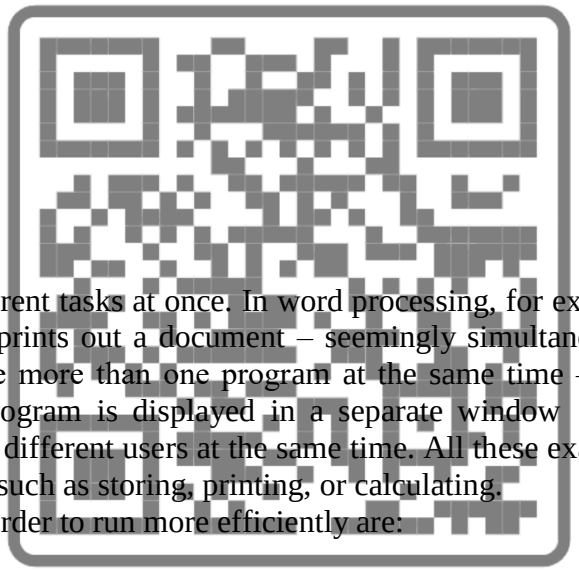
Operating system provides resources management services of many kinds. It handles the control and use of hardware resources, such as:

- ★ Disk space
- ★ Memory
- ★ CPU time allocation &
- ★ Peripheral devices

In general, an operating system written for one kind of hardware will not be able to run on another kind of machine. In other words, different operating system are mutually incompatible.

TASKS PERFORMED B OPERATING SYSTEM:

- ★ Booting
- ★ User Interface
- ★ CPU Management
- ★ Memory Management
- ★ File Management
- ★ Task Management
- ★ Formatting
- ★ Security Management



TASK MANAGEMENT:

A computer is required to perform many different tasks at once. In word processing, for example, it accepts input data, stores the data on a disk, and prints out a document – seemingly simultaneously. Some computers‟ operating systems can also handle more than one program at the same time – word processing, spreadsheet, database searcher. Each program is displayed in a separate window on the screen. Others can accommodate the needs of several different users at the same time. All these examples illustrate tasks management. A “task” is an operation such as storing, printing, or calculating.

Among the ways operating systems manage tasks in order to run more efficiently are:

- ★ Multitasking
- ★ Multiprogramming
- ★ Time-sharing
- ★ Multiprocessing

Multitasking:

Multitasking is the execution of two or more programs by one user concurrently on the same computer with one central processor.

Earlier microcomputers could do only single-tasking, whereby an OS could run only one application program at a time. Thus, users would have to shut down the application program they were working in before they opened another application, which was inconvenient. Today, multitasking operating systems are used.

You may be writing a report on your computer with one program while another program plays a music CD. How does the computer handle both programs at once?

The answer is that the operating system directs the processor to spend a predetermined amount of time executing the instructions for each program, one at a time. Thus, a small part of the first program is processed, and then the processor moves to the remaining programs, one at a time, processing small parts of each. The cycle is repeated until processing, is complete. Because the processor is usually very fast, it may appear that all the programs are being executed at the same time. However, the processor is still executing only one instruction at a time.

Multiprogramming:

Multiprogramming is the execution of two or more programs concurrently on a multi-user operating system.

As with multitasking, the processor spend a certain amount of time executing each user‟s program. Once again, because the processor works so quickly, it seems as though all the programs are being run at the same time.

Time-Sharing:

In time-sharing, a single computer processes the tasks of several users at different stations in round-robin fashion.

Time-sharing is used when several users are linked by a communications network to a single computer.

The computer will first work on one user‟s task for a fraction of a second, then go on to the next user‟s tasks, and so on.

This is accomplished through time slicing. Because computers operate so quickly, they can alternately apportion slices of time (frictions of a second) do various tasks. Thus, the computer may rapidly switch back and forth among different tasks, just as a hairdresser or dentist works with several clients or patients concurrently. Users are generally unaware of the switching process. Multitasking and time-sharing differ slightly. With multitasking, the processor directs the programs to take turns accomplishing small tasks or events, such as making a calculation, searching for a record, or printing out part of a document. Each event may take a different amount of time to complete. With time-sharing, the computer spends a fixed amount of time with each program before going on the next one.

Multiprocessing:

Multiprocessing is processing done by two or more computers or processors linked together to perform work simultaneously – that is, at precisely the same time.

As in multitasking, which involves only a single processor, the processing should be so fast that, by spending a little bit of time working on each program in turn, several programs can be run at the same time. With both multitasking and multiprocessing, the operating system keeps track of the status of each program so that it known where it left off and where to continue processing. But an operating system capable of multiprocessing is much more sophisticated than that required for multitasking.

Two possible approaches to multiprocessing are:

- ★ Co-Processing
- ★ Parallel Processing

In co-processing, the controlling CPU works with specialized microprocessors called co-processing, each of which handles a particular task.

In parallel processing several full-fledged processors work together on the same tasks, sharing memory.

	Definition Processing of two or more programs	Number of Users	Number of Processors	Order of Processing
Multitasking	By one user concurrently on one processor	One	One	Concurrently
Multiprogramming	By multiple users concurrently on one processor	Multiple	One	Concurrently
Time sharing	By multiple users in round-robin fashion on one processor	Multiple	One	Round Robin
Multiprocessing	By one or more users simultaneously on two or more processors	One or more	Two or more	Simultaneously

- ★ Common Operating Systems
- ★ Windows 3.x
- ★ Windows 9x
- ★ Windows NT/Windows 2000/ Windows Millennium
- ★ Windows Vista
- ★ OS/2 warp
- ★ UNIX
- ★ Linux (Developed by Linus Torvalds in 1990 while he was a computer science students at Helsinki
- ★ University in Finland
- ★ Mac OS
- ★ Netware

Device Drivers: Running Peripheral Hardware:

Device drivers are specialized software programs that allow input and output devices to communicate with the rest of the computer system.

Many basic device drivers come with system software when you buy a computer, and the system Software will guide you through choosing and installing the necessary drivers.

If you buy a new peripheral device, such as a mouse, scanner, or printer, the package will include a device driver (probably on a CD-ROM). You „ll need to install the diver on your computer‟s hard-disk drive (by following the manufacturer‟s instructions) before the device will operate.

Data/Information:

The purpose of computer system is to convert data into information. Data consists of raw facts and figures. Information is processed data. For example, the raw data of employees‟ hours worked and wage rate is processed by a computer into information of paychecks and payrolls.

Information produced by one program can be used as data for another program. For example, the information of paychecks and payrolls may become data that goes someone‟s yearly financial projections and tax returns.

Procedure:

Procedures are description of how things are done, steps for accomplishing a result. Procedures for computer systems appear in documentation manuals, also called reference manuals/or CD-ROMs which contains instruction, rules and guidelines to follow when using hardware and software.

People / Personnel:

They are the most important component of a system. They operate the hardware and create the software. They can be generally categorized as:

- ★ Computer operator
- ★ Programmer
- ★ System analyst

Computer Operator is a person who runs computer. They are capable of handling computers when hey malfunction.

Programmer is a person who writes software.

System Analyst is information specialist who performs system analysis, design and implementation. He studies the information and communication needs of an organization to determine how to deliver information that is more accurately, timely and useful. He is responsible for the development of an information system. (Information system is an organization‟s framework of standards and procedures for processing data into usable information. It can be manual or computer based).

Utilities: Service Programs

Utility programs, also known as service programs, perform tasks related to the control and allocation of computer resources. They enhance existing functions or provide services not supplied by other system software programs.

PROGRAMMING LANGUAGE:

A Computer language by means of which we can write a computer program to instruct computer to do some particular job is known as PROGRAMMING LANGUAGE.

A program is a set of instruction that directs the computer. It is a set of rule which directs a computer towards a certain goal.

There are too many types of computer language as follows.

MACHINE LANGUAGE (LOW LEVEL LANGUAGE)

A computer language which can easily understandable by a computer system is known as machine language. IT is in binary format means 0‟s and 1‟s. Machine language is consisting on a series of 0‟s and 1‟s which is computer readable format.

For a computer programmer it is very difficult to understand this format.

ASSEMBLY LANGUAGE:

Assembly language is the modified form of a low level language using few instructions and symbols. Statements are written in symbolic codes (mnemonics). The main reason to write program in assembly language because it is very close to low level language so computer can easily understand it. All the hardware related computer programs (soundcard driver, VGA card driver) are written in assembly language. E.g. MASM, TASM etc.

HIGH LEVEL LANGUAGE:

Language which is closer to human language (user understandable) but difficult for a computer to understand. All the programs written in high level language first translate into machine language by using any language translator. In High-level languages, common English words are used as instructions to the

computer. High-level language statements resemble English phrases combined with the mathematical terms needed to express the problems or task being programmed.
Example: COBO, PASCAL, BASIC, ADA, FORTRAN etc.

VERY HIGH LEVEL LANGUAGES OR 4GL'S

These languages provide all the facilities of high-level languages along with enhanced facilities of file handling and report preparation. And application generation Thus, they are regarded as the evaluation of 3rd generation high level languages, and are called Very-High-Level Languages, 4GL"s (4th Generation Language).
Example: SQL, FoxPro, ORACLE, PROLOG etc.

NATURAL LANGUAGES OR A.I. LANGUAGES OR 5GL'S:

Natural Languages are highly sophisticated programming languages, which can interact with humans and situations in natural way. The main goal of these languages is to simplify the human"s task and to communicate with the computer easily.
Example: PROLOG, AJAX.

LANGUAGE TRANSLATION:

The software which translates codes of human understandable programming languages into computer"s machine language is called Language Translators.

TYPES OF LANGUAGE TRANSLATORS:

- ★ Interpreter
- ★ Compiler
- ★ Assembler

★ INTERPRETER:

"A program that translates instructions of high-level language into machine language, one instruction at a time, is called a Interpreter."
The interpreters are slow in speed as compared to compilers. It takes a single line of the source code, translates that line into object code and carries it out immediately. The process is repeated line by line until the whole program has been translated and run. If the program loops back to earlier statements, they will be translated afresh (once again) each time round. This means that both the source program and the interpreter must remain in the main memory together, which may limit the space available for data. Perhaps the biggest drawback of an interpreter is the time it takes to translate and run a program including all the repetition, which can be involved.

★ COMPILER:

"A program that translates the entire code of a high-level language into machine code is known as Complier. The original program is called "Source Program" and its machine translation is known as "Object Program".
A compiler can translate only that program which has been written in the language for which the computer is meant e.g., FORTRAN compiler is only capable of translating source program, which have been written in FORTRAN. Each machine requires a separate compiler for each high level language. Compiler can diagnose the following kinds of errors in a source program during translation.

- ★ Illegal characters.
- ★ Illegal combination of characters
- ★ Improper sequence of instruction in a program.

A source program containing an error diagnosed by compiler will not compiled into an object program. The computer will print (display) a suitable message.

★ ASSEMBLER

"A program that translates instructions of Assembly Language (low level symbolic language) into machine language is known as ASSEMBLERS."

In Assembly language, there is exactly one code corresponding to a machine code, called "MNEMONIC". The assembly program is known as "SOURCE PROGRAM" while its translation into machine code is termed as "OBJECT PROGRAM". Thus, the assembler's task is relatively easier than that of interpreters or compilers. Since each computer has its distinct machine code, thus has its own mnemonic. As a result, each computer has its own assembler. Liking process is always required in the end to execute the object program.

GENERATIONS OF COMPUTERS

Generations of computer science is divided into many distinct generations which are as follows.

TYPES OF GENERATIONS:

- ★ First Generation (1940 – 1956)
- ★ Second Generation (1956 – 1963)
- ★ Third Generation (1965 – 1971)
- ★ Fourth Generation (1971– 1981)
- ★ Fifth Generation (1981 – Onward)

★ FIRST GENERATION (1940 – 1956)

First generation computers were consists on thousands of Vacuum Tubes. Computers size was large because of the great number of tubes that was used in it. The vacuum tubes required great amount of energy and they generated a lot of heat. Most of the data were entered into the computer through punch cards. UNIVAC was the first computer of this generation developed in the U.S in 1951.

Remaining are ENIAC, EDVAC, IBM-709 etc.

Advantages:

Vacuum tubes were used as electronic components. They were declaring as the first Electronic digital computers. This generation computers were the fastest calculating devices of that time.

Disadvantages:

Computers are too much heavy in size. They require air conditioning. First generation computers produced large amount of heat due to vacuum tubes.

★ SECOND GENERATION (1956 – 1963)

In the second-generation computers the "Transistor" technology was implemented. Transistors are electronic devices that are built in 1947, and used in different digital electronic components.

Usually it consists of small layers of silicon or germanium. Transistor was faster, less expensive, smaller and emitted less heat than vacuum tubes.

Examples of 2nd generation computers are IBM-1401, UNIVAC-III, NCR 300 etc.

Advantages:

Computers of 2nd generation are smaller. In size as compare to first generation computers. They are much more reliable. They generate less and Computations were performed in microsecond's. Due to above reason they are widely used commercially.

Disadvantages:

Computers of this age required Air conditioning. They require heavy maintenance work. Commercial production was difficult and costly as compare to the third generation computers.

★ THIRD GENERATION (1965 – 1971)

Third generation is the Integrated Circuits (IC‟s) generation. Computers of this generation were smaller, more efficient and more reliable than previous generations. Unlike transistors and vacuum tubes, integrated circuits (IC‟s) were used. Programming becomes easy in this generation of computers. Computers prices also decrease and computer becomes a very popular counting machine. Examples of 3rd generation computers are INTEL 4004 etc.

Advantages:

They are smaller in size as compare to previous generations. Reliability increase as compared to previous generations. Heat generations was decreasing. Hardware failure was also reduces. Very easy to shift from one place to another. Their production start on a very vast scale.

Disadvantages:

Air conditioning is still a great problem in it. IC chips production is a costly process so computer in this generation was a bit costly.

★ FOURTH GENERATION (1971– 1981)

Integrated circuits were also used in this generation of computers. Initially they were used on a very small scale termed as Small Scale Integration (SSI). After some time the technology became more sophisticated and known as Large-Scale Integration (LSI). In LSI each chip consists of thousand of small electronic components on a single small board. These boards are known as microprocessor. In 1971, a powerful microprocessor chip INTEL 8008 was introduced. It was the first microprocessor, which is used in PC, Examples of Computers of 4th generation are IBM-3033, IBM system 34 etc.

Advantages:

In fourth generation size reduces a lot. Computer becomes Very reliable. Heat generation was reduced. Much faster computation was possible. Easily portability because of their small size. Commercial production of computer was easier and cheaper.

Disadvantages:

Technology of IC manufacturing becomes too complex.

★ FIFTH GENERATION (1981 – ONWARD)

In fifth generation two new technologies are used for the production of IC chips, these technologies are,

- ★ Very Large Scale Integration (VLSI)
- ★ Ultra Large Scale Integration (ULSI)

In fifth generation computers become much faster as well as smaller as compare to the previous generations. The goal of the fifth generation is to have the computer which can understand human language and also can recognize voices. Artificial Intelligence (AI) is the basic field of interest in fifth generation. In this generation computer size and weight reduces and it becomes more and more popular among the computer users like Laptop or potable computers. The new versions of laptop were introduced named as “Note Book” while the smallest laptops are termed as “Palmtop”.

Advantages:

This is the best generation according to computer‟s size and speed. Long bit processors were built. Small size Laptop computers introduced. Artificial intelligences developed directing us toward robotic world.

Disadvantage:

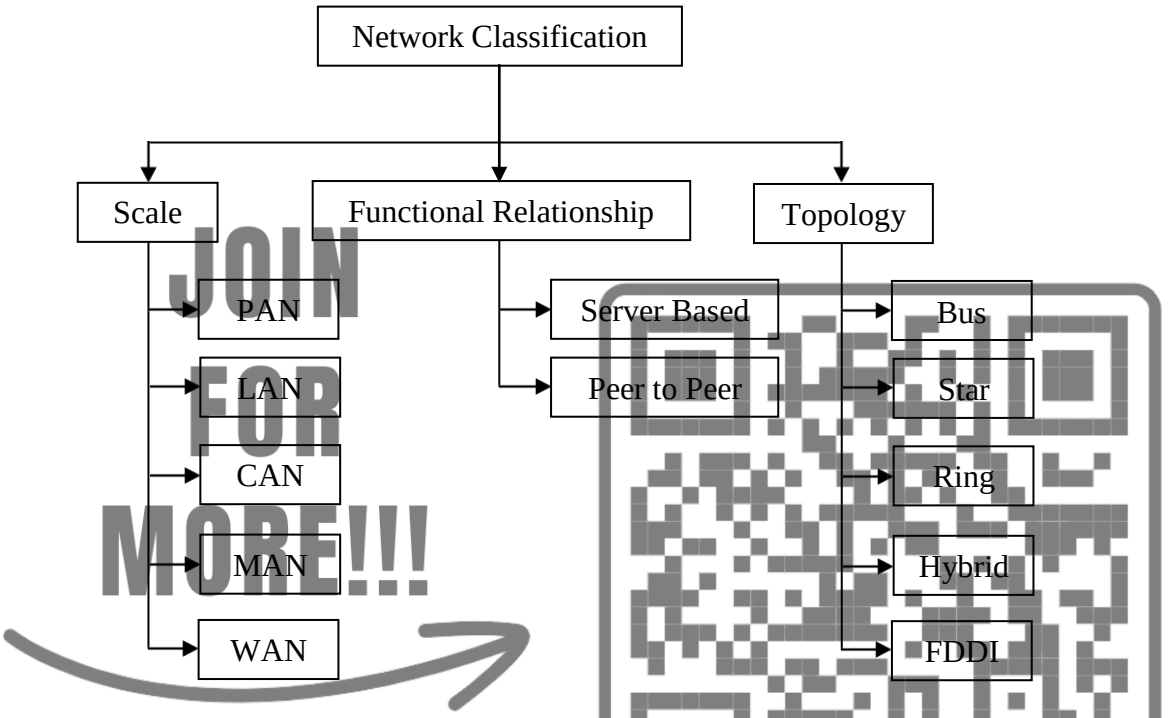
The only disadvantage of this generation computers are they make humans too much busy.

CHAPTER # 02

INFORMATION NETWORKS

COMPUTER NETWORKS:

A computer network is a group of interconnected computers. Telephones, or other communication devices that can communicate with one another and share applications and data. Networks may be classified according to a wide variety of characteristics.



TYPES OF NETWORKS (ON THE BASIS OF SCALE)

Personal Area Network:

A personal area network (PAN) is a computer network used for communication among computer devices close to one person. Some examples of devices that are used in a PAN are printers, fax machines, telephones, PDAs or scanners. The reach of a PAN is typically within about 20 – 30 feet. Personal area networks may be wired with computer buses such as USB. A wireless personal area networks (WPAN) can also be made possible with network technologies such as IrDA and Bluetooth.

LOCAL AREA NETWORK:

Local area network (LAN) is a network covering a small geographic area, like a home, office, or building. Current LANs are most likely to be based on Ethernet technology. For example, a library may have a wired or wireless LAN for users to interconnect local derives (e.g., printers and servers) and to connect to the internet.

CAMPUS AREA NETWORK:

A network that connects two or more LANs but that is limited to a specific and contiguous geographical area such as a college campus, industrial complex, or a military base. A CAN may be considered a type of MAN (metropolitan area network), but is generally limited to an area that is smaller than a typical MAN. This term is most often used to discuss the implementation of networks for a contiguous area.

METROPOLITAN AREA NETWORK:

A metropolitan Area Network is a network is a network that connects two or more Local Area Networks or Campus Area Networks together but does not extend beyond the boundaries of the immediate town/city. Routers, switches and hubs are connected to create a Metropolitan Area Network.

WIDE AREA NETWORK:

A WAN is a data communications network that covers a relatively broad geographic area (i.e. one city to another and one country to another country) and that often uses transmission facilities provided by common carriers, such as telephone companies.

TYPES OF NETWORKS:

(ON THE BASIS OF FUNCTIONAL RELATIONSHIP)

Server Based Systems:

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TYPES OF NETWORKS:

(ON THE BASIS OF FUNCTIONAL RELATIONSHIP)

SERVER BASED SYSTEMS

Server-based networks are defined by the presence of server on a network that provide security and administration of the network. In order to operate, server-based networks have clients that rely on the services the server provides, such as file storage and printing client computers are generally less powerful than pear or server computers.

Advantages:

- ★ Strong central security
- ★ Ability to share expensive equipment, such as laser printers.
- ★ Freeing of users from the task of managing the sharing of recourses.
- ★ Easy manageability of a large member of users.
- ★ Central organization, which keeps data from gently last among computers.

Disadvantages:

- ★ Expensive dedicated hardware.
- ★ Expensive network operating system software and client licenses.
- ★ A dedicated network administrator (usually required).

PEER-TO-PEER:

Peer networks are defined by lack of central control over the network. There are no servers in peer network, users simply share disk space and resources, such as printers and faxes, as they see fit.
Peer networks are organized into workgroups. Workgroup have very little security control. These is no central login process.
Access to individual resources can be controlled if the users who shared the resource require a password to access it. Because there is no central security trust, we will have to know the individual password for each secured shared resource you wish to access. This can be quite inconvenient.
Peer is also not optimized to share resources. Peer also generally has licensing limitations that prevent more than a small number of users from simultaneously accessing resources.

Advantages:

Peer computers have many advantages, especially for small business that cannot afford to invest in expensive server hardware and software.

- ★ Easy setup
- ★ No extra investment in server hardware or software is required.
- ★ No reliance on other computer for their operation
- ★ Lower cost for small networks.

Disadvantages:

- ★ Additional load on computers because of resource sharing.
- ★ Inability of peers to handle as many networks connections as servers.
- ★ Lack of central organization, which can make data hard to find.
- ★ No central point of storage for files archiving.
- ★ Requirement that users administer their own computers.
- ★ Weak and intrusive security.

TYPES OF NETWORKS (ON THE BASIS OF TOPOLOGY)

The physical layout or shape of the network is called topology Networks can be laid into the five basic topologies:

- ★ Star
- ★ Ring
- ★ Bus
- ★ Hybrid
- ★ FDDI

Star Networks:

In star network, all microcomputers and other communication devices are connected to the central hub, usually via UTP (unshielded twisted pair). Electronic messages are sent through the central hub to their destinations at rates of 1 – 100 Mbps. The central hub monitors the flow of traffic.

Example:
A PBX system is the example of star network.

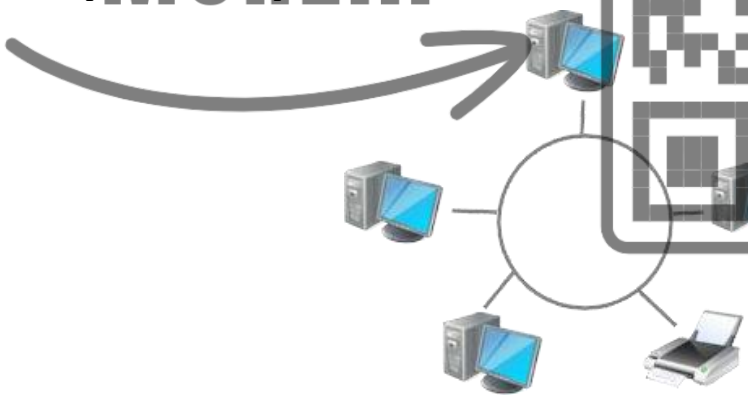
Advantage:

- ★ If the connection is broken between any communications device and the hub, the rest of the devices will continue operating.
- ★ New terminals can be added to a network easily.
- ★ There is no chance of data collision because central server prevents collisions between messages.
- ★ If a connection is broken between any communications device and the central server, the rest of the devices on the network will continue operating.
- ★ Transmission delays between two terminals of between server and terminal do not increase by adding new nodes to the network because any two devices may be connected via two links only.

Disadvantage:

- ★ Hub is the central point of failure.
- ★ The network crucially depends on the central server. If the central server fails, the entire network will stop.
- ★ Star topology is expensive because a separate cable is required for connecting each computer with the central server.

Ring Network:
In ring network, all microcomputers and other communication devices are connected in a continuous loop. Electronic message are passed around the ring in one direction, with each node serving as a repeater, until they reach the right destination. Rings generally are UTP, STP, or fiber optic cable with transmission speed of 16 Mbps.



Example:

The example of ring network is IBM‟s Token Ring Network, in which a bit pattern (Called the „toke‟) determines which user on the network can send information.

Advantage:

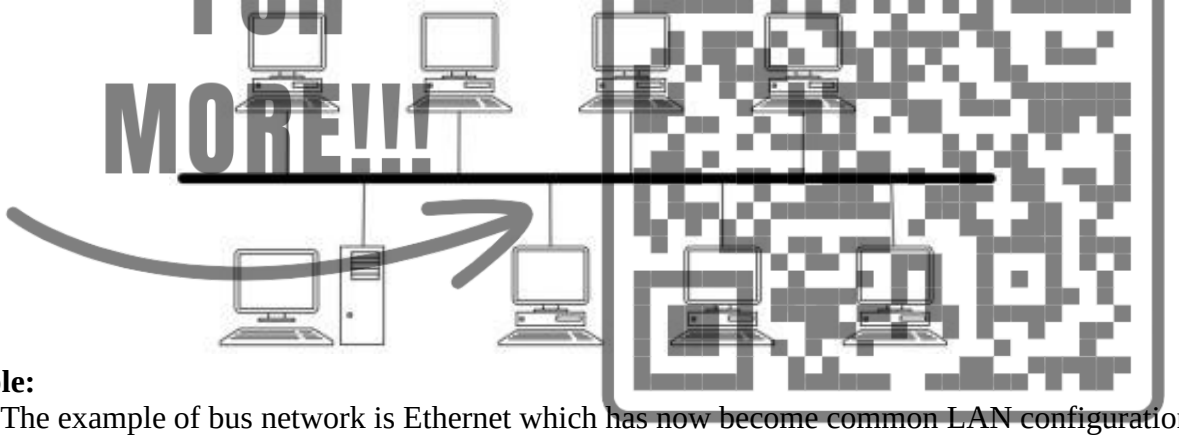
- ★ Message flow in only direction so there is no danger of collision.
- ★ In a ring network messages flow in only one direction. Thus, there is no danger of collision.
- ★ It is more reliable than a star network because communication is not dependent on a single host computer.

Disadvantage:

- ★ The current speed limit and the relatively high cost is its limitation.
- ★ If the ring is broken, the entire network stops working.
- ★ It is difficult to troubleshoot the ring network.
- ★ New computer or terminal cannot be added to network easily.
- ★ Communication delay is directly proportional to the number of computers in the network.

Bus Network:

In bus network, all microcomputers and other communication devices are connected to a common cable called the bus, using co-ax. STP, or UTP. Data transmission is bidirectional at a rate of about 1 – 10 Mbps. Each communication device transmits electronic messages to other devices. If some of those message collide, the device waits and tries to retransmit.



Example:

The example of bus network is Ethernet which has now become common LAN configuration.

Advantage:

- ★ It is relatively in expensive to install.
- ★ This type of network is simple and easy to understand.
- ★ A bus network may be organized as client/server or peer-to-peer network.
- ★ New terminals can be added to a network easily.
- ★ If one of the terminals becomes defective it does not affect on other computers of the network.

Disadvantages:

- ★ If the bus fails, the entire network fails.
- ★ Extra circuitry and software are needed to avoid collisions between data.
- ★ If an error arises in a network, it is not easy to detect.
- ★ If a connection in the bus is broken, the entire network may stop working.

HYBRID NETWORK:

Hybrid networks are combinations of star, bus, and ring networks.

Example:

A small university campus might use a bus network to connect buildings but might use star and ring networks within certain buildings.

FDDI NETWORK:

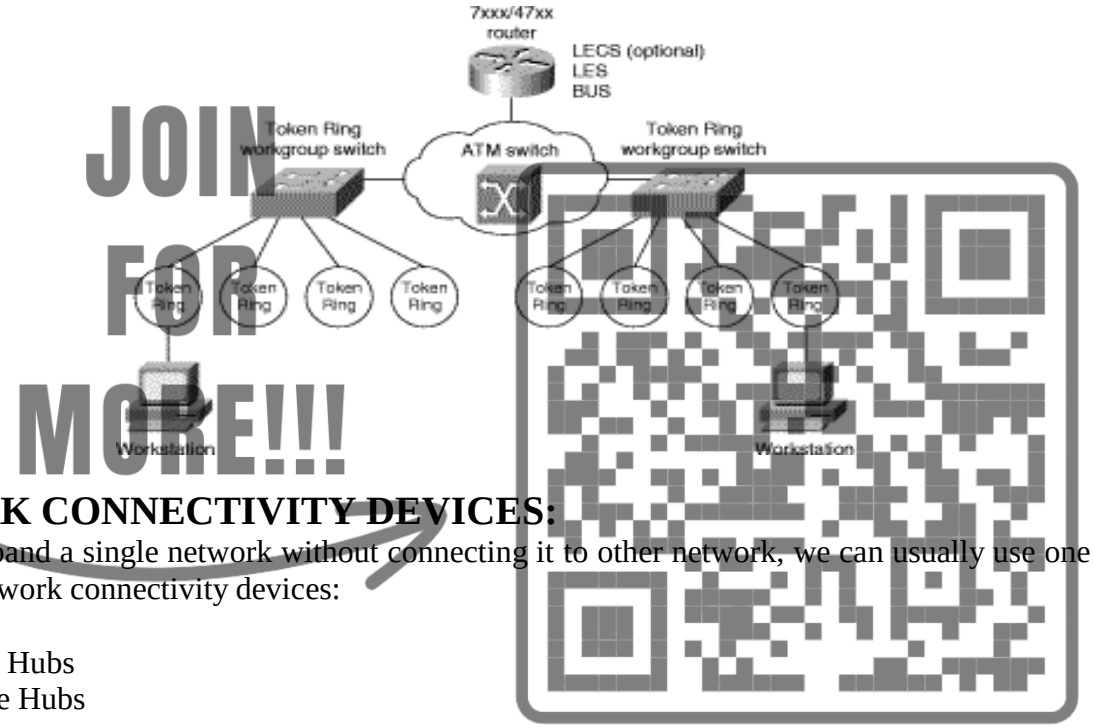
A newer and higher speed and more costly network is FDDI (Fiber Distributed Data Interface). If is capable of transmitting data at 100 – 200 Mbps. FDDI network uses fiber optic cable with a duple token ring topology. FDDI is used for high tech purposes such as, electronic imaging, high-resolution graphics and digital video.

Advantage:

★ If the primary ring fails, the network can continue operating via the secondary cable ring.

Disadvantage:

★ The disadvantage is its high cost and the fragility of the fiber-optic cable.



NETWORK CONNECTIVITY DEVICES:

To expand a single network without connecting it to other network, we can usually use one of the following Network connectivity devices:

★ Hubs
★ Active Hubs
★ Passive Hubs
★ Repeaters
★ Bridges

★ HUBS:

All networks (except those using coaxial cable) require a central location to bring media segments together. These central locations are called hubs.

★ PASSIVE HUBS:

A passive hub simply combines the signals of network segments. There is no signal processing or regeneration. Because it does not boost the signal and, in fact, absorbs some of the signal a passive hub reduces by half the maximum cabling distances permitted.

★ ACTIVE HUBS

Active hubs are like passive hubs except that they have electronic components that regenerate or amplify signals.

★ REPEATERS:

All transmission media attenuate (weaken) the electromagnetic waves that travel through them. Attenuation therefore limits the distances any medium can carry data. Adding a device that amplifies

the signal can allow it to travel farther increasing the size of the network.

If we are connecting computers that are more than 100 meters (328 feet) a part using a 10 base Ethernet cable, we will need a device that amplifies signals to ensure data transmission. Devices that amplify signals in this way are called repeaters.

★ BRIDGES:

Bridges connect networks segments. The use of a bridge increases the maximum possible size of the network. Unlike a repeater that simply passes on all the signals it receives, a bridge selectively determines the appropriate segment to which it should pass a signal.

★ INTERNETWORK CONNECTIVITY:

An Internetwork consists of two or more, independent networks that are connected and yet maintain independent identities. An Internetwork may include different types of networks (an Ethernet and a Token Ring network, for example). To connect independent networks, we require internetwork connectivity device. The Internetwork connectivity devices discussed here are:

- ★ Routers
- ★ Gateways I CSUs/DSUs:

Routers:

Routers are devices that connect two or more networks. They consist of a combination of hardware and software. The hardware can be a network Server, a separate computer or a special black box device. The two main pieces of software in a router are the operating system and the routing protocol. Routers operate at the bottom three levels of OSI protocol model. Router is able to view the network as a whole.

Gateways:

Routers can successfully connect networks with protocols that function in similar ways. When the networks that must be connected are using completely different protocols from each other, a more powerful and intelligent device is required. A gateway performs protocol conversion at all seven layers of the OSI model. A gateway entrances to dissimilar networks by tearing down a packet of information from one network and restructuring it for a different network‟s protocol.

CSUs/DSUs:

Sometimes, when expanding the network, it is less costly and easier to use existing public networks, such as the public telephone network in our area. Connecting to some of these networks requires the use of CSUs/DSUs (Channel Service Units/Digital Services Usnits). CSUs/DSUs are also useful for shielding our network from both noise and dangerous voltage and currents that can come through the public network.

ADVANTAGES OF NETWORKS:

The following advantages are particularly true for LANs, although they apply to MANs and WANs as well.

SHARING OF PERIPHERAL DEVICES:

Laser printers, disk drives, and scanners are example of peripheral devices-that is, hardware that is connected to a computer. Any newly introduced piece of hardware is often quite expensive, as was the case with color laser printers. To justify their purchase, companies want them to be shared by many users. Usually the best way to do this is to connect the peripheral device to a network serving several computer users.

SHARING OF PROGRAMS AND DATA:

In most organizations, the people use same software and needs access to the same information. It could be expensive for a company to buy one copy of a work processing program for each employee. Rather, the company will usually buy a network version of that will serve many employees.

BETTER COMMUNICATIONS:

One of the greatest features of networks is electronic mail. With e-mail everyone on a network can easily keep other pasted about important information. Thus, the company eliminates the delays encountered with standard interoffice mail delivery or telephone tag.

SECURITY OF INFORMATION:

Before networks became commonplace, an individual employee might be the only one with a particular piece of information, stored in his or her desktop computer. If the employee was dismissed or if a fire or flood demolished the office, no one else in the company might have any knowledge of that information. Today such data would be backed up or duplicated on a networked storage device shared by others.

ACCESS TO DATABASE:

Networks also enable users to tap into numerous databases, whether the private databases of a company or the public databases of online services.

MAJOR FEATURES OF INTERNET:

Since the Internet evolves so rapidly, the features offered over it also change constantly. This section describes five more popular features. These include; electronic mail (e-mail), Usenet, Telnet, File Transfer Protocol (FTP) and Chat.

ADVANTAGES OF INTERNET:

Electronic Mail:

Internet mail service now links people about 200 countries. Futurists predict a universal electronic mail network similar to the phone system.

Chats & Forms:

You can take part in worldwide chats and forums on matters of personal interest – simply browse the network to find topics you wish to discuss.

E – Shopping & E – Business:

It is now possible to search through scores of electronic malls for products. “Intelligent agent” programs will help you find what you want.

Education:

You can find learning materials on virtually every topic on the Internet. Eventually, you will be able to access millions of books online instead of going to library.

Information Retrieval:

Virtually any type of information can be found on the internet – tutorials on various subjects, legal and medical advice – you name it.

On-Demand Movies & Television:

Someday it will be possible to order virtually any movie and television show by computer, choosing your own viewing times.

Customer Support:

Many companies assist customers over the internet. The internet is also widely used to distribute advertising literature about products and to update software.

Access to Remote Computing:

If your own computer is not powerful enough to perform certain types of tasks, you can access larger computers located elsewhere – and their software too.

Bulk File Transfer:

Products such as electronic news papers and magazines – as well as software and music – are distributed over the internet, saving cost of print, media, disks and mailing.

Social Video Gaming:

Games in which several people participate are now available over the internet. Participation in video games via internet links will increase in future.

News & Weather:

Information about news, events and weather happening all over the globe are updated regularly on the internet. You can even access satellite data.

Conferencing:

Futurists predict that a picture – a phoning device that enables people to see each other as they speak – will someday be a standard feature on the internet.

Electronic Mail:

The internet is now the world's largest electronic mail system. Anyone with an e-mail account can send message to other users of the internet and to may networks connected to the program files to messages.

All internet electronic mail address has two parts, the user name and the domain name.

Advantages of E-mail:

Compared to the postal service electronic mail has many advantages:

- ★ It is very fast. It delivers you messages and data in few seconds.
- ★ It is very easy to receive, respond and send messages and data.
- ★ It is available at every time.
- ★ It is a great gun to find friends all over the world.
- ★ Electronic mail access is available from different services which are free.
- ★ It is really flexible. You can send a message to all the persons you like.

Disadvantages of E-mail:

Following are some disadvantages of e-mail:

- ★ It is not commonly available.
- ★ It has created an information overload. People are swamped by junk/spam mails and finding what is relevant and need to read from the hundreds of mails.
- ★ It is possible that any of the e-mail contains virus, which may affect your computer system.
- ★ Any e-mail send to wrong address cannot be recalled back.
- ★ It is not completely private or confidential due to hacking problem.
- ★ As e-mail is free, so someone may send e-mail for trouble so that you may feel uneasy to deal with.

Usenet:

Usenet is a collection of more than 30,000 newsgroups, or discussion groups, on every

conceivable subject. For example, some newsgroups are self-help groups for victims of cancer or other abuse, and other give the latest in gossip about show business personalities.

Telnet:

Telnet is the service of the internet that allows you to access remote computers outside your area. Many computers on the internet are set up to allow Telnet access. Some require login names and passwords, but many do not have any restriction.

File Transfer Protocol (FTP)

Another common use of the internet is to download computer programs and files by means of File Transfer Protocol (FTP), one of the internet‟s many standards.

Chat:

Chat refers to a facility that enables people to engage in interacting conversations over the internet. The oldest but still most common type of chat is internet relay chat.

Other Types of Chat:

Various other, more sophisticated types of chat exist, Several of these are discussed below.

3-D Virtual Chat:

This type of chat is a graphical extension of IRC. It enables you to take the persona of a 3-D character who appears on the screen. In the chat, you mingle with other people having their own onscreen personas.

To use this feature, you need 3-D chat software, a speedy computer, and a fast internet connection e.g. Skype.

Instant Messaging:

Instant messaging is a cross between the IRC chat room and e-mail. A buddy list contains the names of your friends and associates; a small windows pops up on your screen from your ISP telling you when they are online. At that time, you can invoke instant messaging by sending any of then a message that immediately appears on their screen. The receiver can respond in kind sending an instant message back to you e.g. MSN Messenger.

World Wide Web (WWW)

The World Wide Web (WWW) is a worldwide hypermedia system. When you read a Web document (Web site), you see underlined words. Each underlined word refers to a computer resources program, graphic or document. When you select, or click the world, the Web software connects you to that computer. You don‟t have to know exactly where the resources are located – you just click.

The internet and the World Wide Web are redefining the globe community. Because have found a new internet and the World Wide are redefining the globe community. Business have found a new venue for two-way communication with customers in the Web site. Not only can business advertise, but they also can provide much more information.

Addresses for World Wide Pages:

Web pages and links to information at Gopher, FTP and other sites are most commonly located on the internet through Uniform Resource Locators, or URLs. Every Web page has its own URL (sometimes pronounced “earl”). If you know a page‟s URL, type it in the specified area of your Web browser‟s screen and the page will be displayed.

Web-site URL‟s often contain the three letters www preceded by the protocol identifier http:// for hypertext transfer protocol). For instance, the Web search site, respectively, have the following URLs.

http://www.google.com
http://www.yahoo.com

WEB TERMINOLOGY:

The most important parts of the World Wide Web are the elements, such as servers, pages, hot links and more, all of which comprise the bulk of the World Wide Web. The following are some related terms:

Anchor:

A link that takes you to a different part of the same Web page.

Browser:

A software program that requests, interprets, and presents World Wide documents. Frequently used browsers include. Microsoft Internet Explore, Mozilla Firefox, Google Chrome, Netscape etc.

Client:

In addition to being a computer, a client also can be a software program that requests and acquires information from computers that store World Wide Web documents and files. World Wide Web brewers are also known as clients.

Domain Name:

The name given any computer registered on the World Wide Web as an official provider of information and files. Domain names are usually two or more terms separated by periods. Some examples are aol.com or msn.com.

Extranet:

An extension of an internal network (intranet) to connected not only internal personnel but also selected customer, suppliers and other strategic offices.

Firewall:

A firewall is a system of hardware and software that connects the intranet to external networks, such as the Internet. It blocks unauthorized traffic from entering the intranet and can also prevent unauthorized employees from accessing the intranet.

Frame:

A feature available on the World Wide Web that presents text, links, graphics and other media in separate portions of the browser display. Some sections remain unchanging, whereas others serve as an exhibit of linked documents.

Home Page:

Frequently, the "cover" of a particular Web Site. The home page is the main or first, page displayed for an organization"s or person"s World Wide Web site.

HTML:

Hypertext Markup Language. HTML is the coding language for the World Wide Web that informs browsers how to display a document"s text, links, graphics and other media. This language forms the foundation for all web pages.

Image Map:

A feature available on the World Wide Web that enable you to click various locations in an graphic image to link to different documents.

Intranet:
Intranets are internal corporate networks that use the infrastructure and standards of the Internet and the World Wide Web.

Link:
Short for "hypertext link". A link provides a path that connects you from one part of a World Wide Web document to another part of the same document, a different document, a different documents, or another resource. A link usually appears as a uniquely coloured word that you can click to be transported to another Web page.

Proxy Server:
A proxy server is a server, or remote computer that may exist outside of the organization‟s network, and all communications to the organization are routed through it. The proxy server decides which messages or files are safe to pass through to the organization‟s network.

Table:
A feature available on the World Wide Web that presents document text, links, graphics and other media in row and column format. Table borders may be visible in some documents but invisible in others.

Web Site:
A collection of World Wide Web documents, usually consisting of a home page and several related pages. You might think of a Web site as an interactive electronic book.

Webmaster:
The individual responsible for maintaining and updating the content of a World Wide Web document. Webmasters are the creative forces behind the World Wide Web.

ABUSES OF INTERNET:

Below are common internet services, common abuses and protections:

E-mail:
Commonly e-mail abuses are:
- ★ Sending threatening or harassing e-mail.
- ★ Sending junk e-mail.

Common e-mail mistakes are:
- ★ Poor composition and spelling mistakes.
- ★ Writing something in e-mail that you shouldn‟t.
- ★ Sending anonymous jokes and pranks.

News Groups:
News groups are world wide computer bulleting boards.
Common news groups abuse are:
- ★ Flaming
- ★ Off topic messages

Common news groups mistakes are:
- ★ Getting drawn in to a flame war.
- ★ Posting off-topic messages.

Web Browsing:
Web browsing is generally safe, however you should use your web brower‟s security features. Children should use browsers that can filter the undesirable web sites. Even if use sites. Even if you filtering software children should always be supervised while using the internet.
Common web abuses are:
- ★ Contains incorrect information or material about Muslims and Islam.

★ Posting erroneous information.

Common web mistake are:

★ Believing everything you see.

Chat Programs:

Common chat abuses are:

★ Rogues that harass and/or try to take over your channel.

★ Adults trying to „Pick up‟ children.

Common chat mistake are:

★ Giving a rouge “operator” privileges.

★ Giving personal information to someone you don‟t know.

CONCLUSION:

The internet is new for most people. Just as with the use of other new technologies telephone, automobile etc.) some people will abuse or use the new technology to harm others. You should be aware of the risks, use the Internet with care, and care, and stay abreast of the precautions you need to take.

CHAPTER # 03

DATA COMMUNICATIONS

The ability to link computers brings so many benefits that it has become one of the major growth areas in the personal-computers market. When PCs first started appearing in the business environment, the software application were simple and were designed for a single user, the advantages of connecting PCs weren‟t so compelling. But as these machines spread throughout business and as complex, multi-user software appeared, connecting microcomputers became a paramount goal. Suddenly Data Communications, the electronic transfer of information between computers, became a major focus of the computer industry.

- ★ Through Modems
- ★ Through Networks

Modems allow computers to use the telephone lines to read data and networks connect computers directly, either through special wires or by some form of wireless transmission.

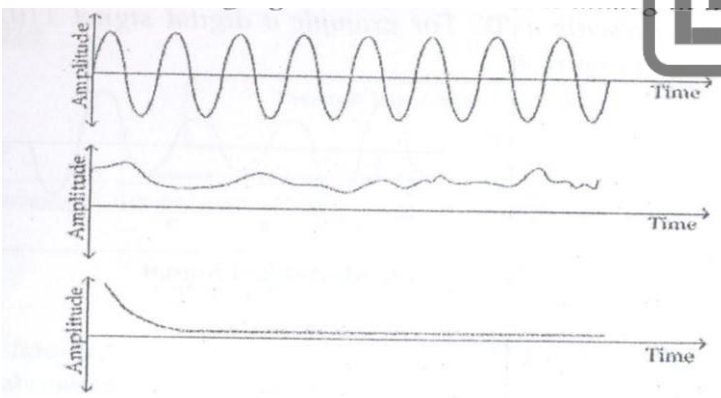
THE MODEM:

Computers use digital signals. However, many of our communication lines, such as telephone and microwave are still analog. To get around this problem, we need a MODEM – short for Modulator/DEModular to convert digital signals into analog form (the process is known as modulation) for transmission over phone lines. The receiving modem at the other end of phone line then convert analog signal back to digital signal (a process known as demodulation).

Moduation/demodulation does not actually change the wave form of an analog signal into on/off form of digital signal. Rather, it changes the form of the wave.

ANALOG SIGNAL:

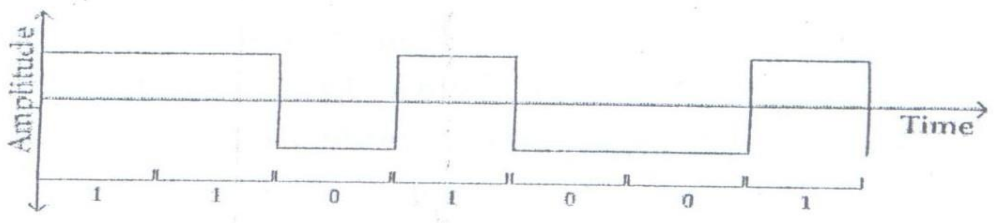
A signal, having the property of continuously varying in strength or quantity such as voltage, pressure, and audio is called signal. The real world is analog in nature.



Analog waveforms

DIGITAL SIGNAL:

A signal transmitted within or between computers, in which information is represented by discrete states – for example, high and low voltage i.e, binary “0” or “1” – rather than by fluctuating levels in a continuous stream, as in an analog signal.

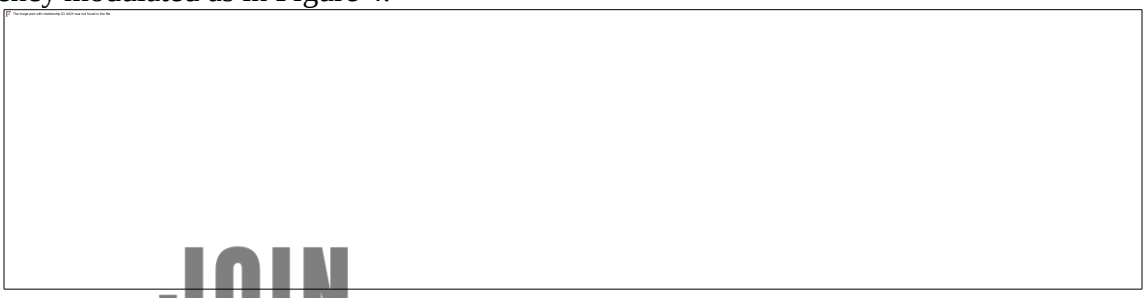


MODIFYING AN ANALOG SIGNAL:

A modern may modify an analog signal to carry the on/off digital signals of a computer in two ways:

FREQUENCY MODULATION:

The frequency of wave cycle is altered so that the normal wave represents a „0" and a more frequent wave within a given period represents a „1". For example a digital signal 1101001 (Figure 2) will be frequency modulated as in Figure 4.

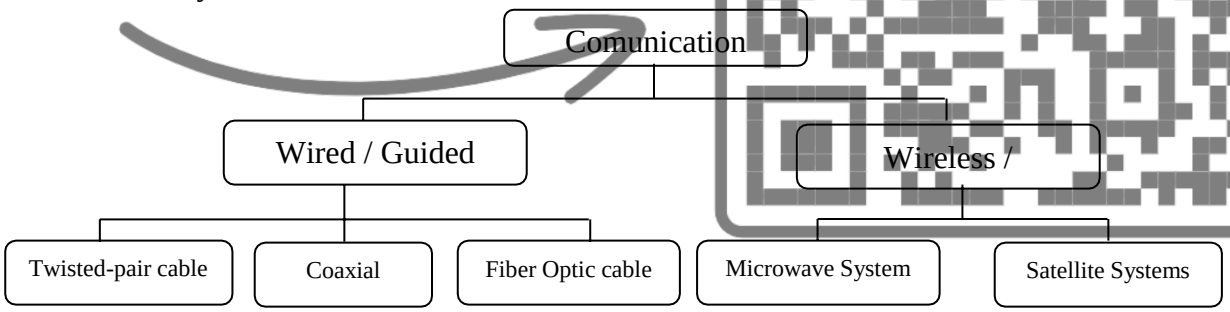


AMPLITUDE MODULATION:

The amplitude (height) of the wave is altered so that a wave of normal height represents a „0". For example a digital signal 1101001 (Figure 2) will be amplitude modulated as in Figure 4.

COMMUNICATION MEDIA:

When we talked about data storage, the term media referred to the storage media used in, for example, magnetic disks and tape. But in network communications, media refers to the wires, cables, and other means by which data travels from its source to its source to its destination.



Classification of Communication Media

GUIDED MEDIA:

Guided media confine the data to specific physical pathways. Common examples of guided media are copper wires and optical fiber cables. Cable TV also uses guided media.

UNGUIDED MEDIA:

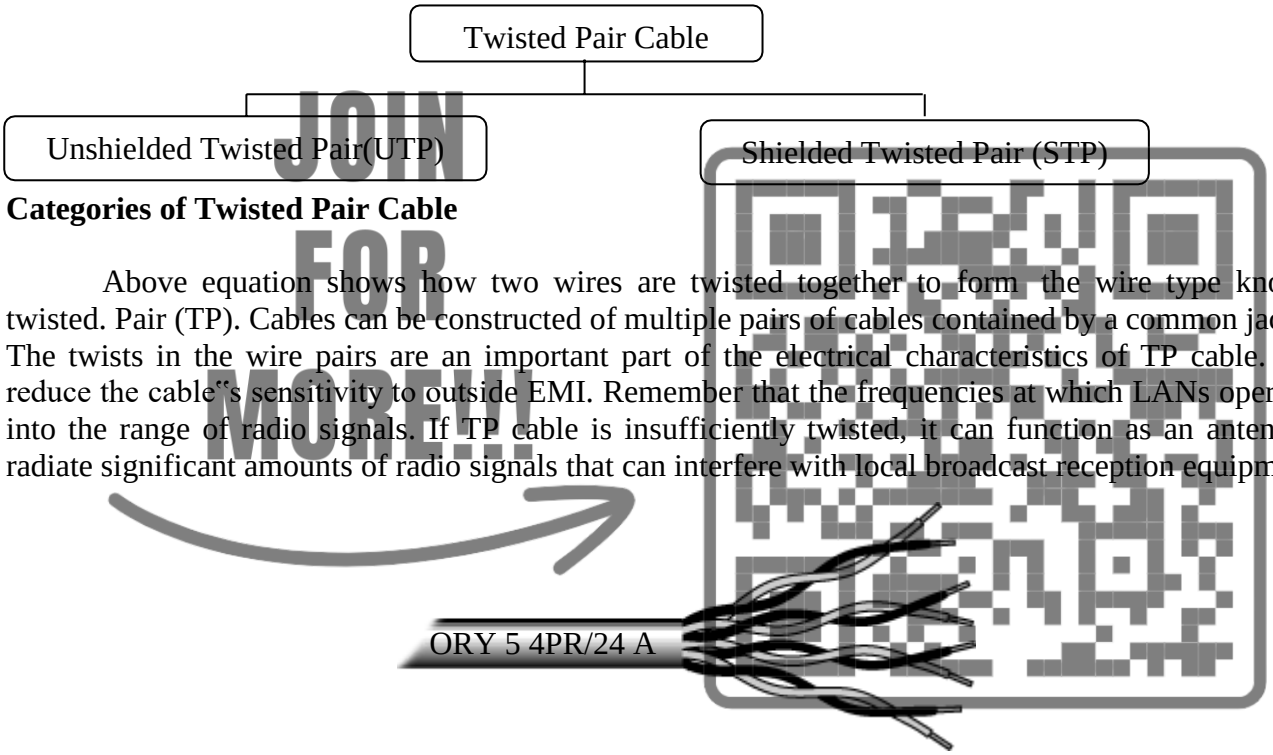
Unguided media transmit the data-carrying signal through space, independent of a cable. Broadcast radio and television are examples of unguided media.

CHARACTERISTICS UNDER CONSIDERATION WHILE EXAMINING CABLES:

- ★ Resistance to electrical magnetic interference (EMI).
- ★ Bandwidth, the range of frequencies that the cable can accommodate. LANs generally carry data rates of 1 to 100 megabits per second and require moderately high bandwidth.
- ★ Attenuation characteristics. Attenuation describes how reduce the strength of a signal with distance. Resistance is one factor that contributes to signal attenuation.
- ★ Cost.

GUIDED MEDIA:

Twisted Pair Cable:



Categories of Twisted Pair Cable

Above equation shows how two wires are twisted together to form the wire type known as twisted. Pair (TP). Cables can be constructed of multiple pairs of cables contained by a common jacket. The twists in the wire pairs are an important part of the electrical characteristics of TP cable. Twists reduce the cable"s sensitivity to outside EMI. Remember that the frequencies at which LANs operate fall into the range of radio signals. If TP cable is insufficiently twisted, it can function as an antenna and radiate significant amounts of radio signals that can interfere with local broadcast reception equipment.

Unshielded Twisted Pair Cable

The EIA/TIA (Electronic Industry Association/Telecommunication Industry Association) has established standards of UTP and rated five categories of wire.

TYPE	USE
Category 1	Voice Only (Telephone Wire)
Category 2	Data to 4 Mbps (Local Talk)
Category 3	Data to 10 Mbps (Ethernet)
Category 4	Data to 20 Mbps (16 Mbps Token)
Category 5	Data to 100 Mbps (Fast Ethernet)

Categories of UTP

A disadvantage of UTP is that it may be susceptible to radio and electrical frequency interference. Shielded Twisted Pair (STP) is suitable for environment with electrical interference; however the extra shielding can make the cables quite bulky. Shielded twisted pair is often used on networks using Token Ring topology.

UNSHIELDED TWISTED PAIR CONNECTORS:

In most cases, UTP cable is implemented using modular telephone-type connectors such as the RJ-1 (2 pair) and RJ-45 connectors. RJ-45 is a plastic connector that looks like a large telephone-style connector (Figure 8). A slot allows the RJ-45 to be inserted only one way. RJ stands for Registered Jack, implying that the connector follows a standard borrowed from the telephone industry. This standard designates which wire goes with each pin inside the connector.

RJ-45 Connector (having 8 conductor)

ADVANTAGES OF TWISTED-PAIR WIRING:

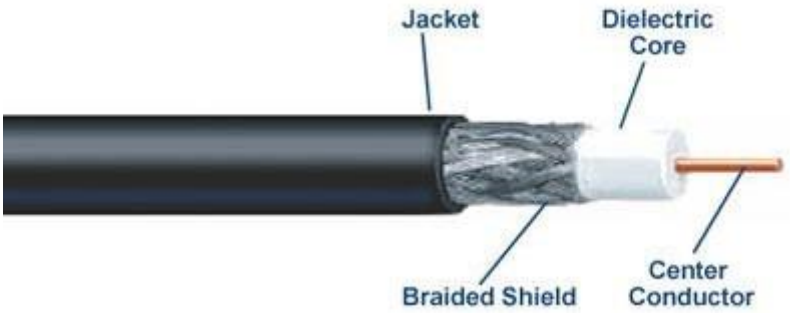
- ★ Telephone cable standards are mature and well established. Materials are plentiful, and a wide variety of cable installers are familiar with the installation requirements.
- ★ It may be possible to use in-place telephone wiring if it is of sufficiently high quality.
- ★ UTP represents the lowest cost cabling. The cost for STP is higher and is comparable to the cost of coaxial cable.

DISADVANTAGES OF TWISTED-PAIR WIRING:

- ★ STP can be expensive and difficult to work with.
- ★ Compared to fiber optic cable, all TP cable is more sensitive to EMI. UTP especially may be unsuitable for use in high-EMI environments.
- ★ TP cables are regarded as being less suitable for high-speed transmissions than coax or fiber optic. Technology advances, however, are pushing upward the data rates possible with TP, Cable segment lengths are also more limit with TP.

COAXIAL CABLE:

Coaxial cabling has a single copper conductor at its center. A plastic layer provides insulation between the center conductor and a braided metal shield (Figure 9). The metal shield helps to block any outside interference from fluorescent lights, motors, and other computers.



Coaxial Cable

Coax has many desirable characteristics. It is highly resistant to EMI and can support high bandwidths. Some types of coax have heavy shields and center conductors to enhance these characteristics and to extend distances that signals can be transmitted reliably.

A wide variety of coax cable is available. You must use cable that exactly matches the requirements of a particular type of network.
Here are some common examples of coaxial cables used in LANs, along with their impedances, and the LAN standards with which they are associated:

- ★ RG-8 and RG-11 are 50 ohm cables required for thick-wire Ethernet. (10Base5 – ThickNet)
- ★ RG-58 is a smaller 50 ohm cable required for thin-wire Ethernet. (10Base2 – ThinNet)
- ★ RG-59 is a 75 ohm cable familiar when used to wire cable TV. RG-59 is also used to cable broadband 802.3 Ethernet.

COAXIAL CABLE CONNECTORS:

Both thick-net and thin-net use connection components, known as BNC (Bayonet Nut Connector), to make the connection between the cables and the computers. There are several important components in the BNC family, including the following:

BNC Cable Connector

- ★ The BNC cable connector – this connector is either soldered or crimped to the end of a cable.
- ★ The BNCT connecter – this connector is either soldered or crimped to the end of a cable.
- ★ The BNC barrel connector – it is used to join two lengths of thin-net cable to make a longer length. I the BNC terminator – it closes each end of the bus cable to absorb stray signals. Without it, a bus network will not function.

ADVANTAGES OF COAXIAL WIRING:

- ★ Highly insensitive to EMI.
- ★ Supports high bandwidths.
- ★ Represents a mature technology that is well understood and consistently applied among vendors.

DISADVANTAGES OF COAXIAL WIRING:

- ★ Although fairly insensitive to EMI, coax remains vulnerable to EMI in harsh conditions such as factories.
- ★ Coax can be bulky.
- ★ Coax is among the most expensive types of wire cables.

FIBER OPTIC CABLE:

Fiber optic cables are similar to coax, except without the braid. Figure 11 (a) shows a single fiber viewed from the side. At the center is the glass core through which the light propagates.
The principle on which this transmission of light depends is that of total internal reflection. Light traveling inside the fiber center, or core, strikes the outside surface at an angle of incidence greater than the critical angle, so that all the light is reflected toward the inside of the fiber without loss. Thus light can be transmitted over long distance by being reflected inward thousands of times. In order to avoid losses through the scattering of light by impurities on the surface of the fiber, the optical fiber core is

clothed with a glass layer called cladding of much lower refractive index. The reflections occur at the interface of the glass fiber and the shield (cladding).
Next comes a thin plastic jacket to protect the cladding. Fivers are typically grouped in bundles, protected by an outer sheath. Figure 11(b) shows a sheath with three fibers.

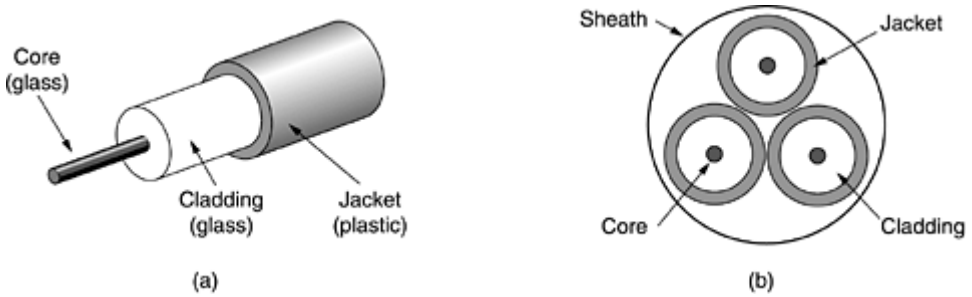


Figure 11 (a) Side view of a single fiber (b)End view of a sheath with three fibers

An optical transmission system has three key components:

- ★ The light source
- ★ The transmission medium
- ★ The detector

Conventionally, a pulse of light indicates a 1 bit and the absence of light indicates a 0 bit. The transmission medium is an ultra-thin of glass. The detector generates an electrical pulse when light falls on it. By attaching a light source to one end of an optical fiber and a detector to the other, we have a unidirectional data transmission system that accepts an electrical signal, converts and transmits it by light pulses, and then reconverts the output to an electrical signal at the receiving end.

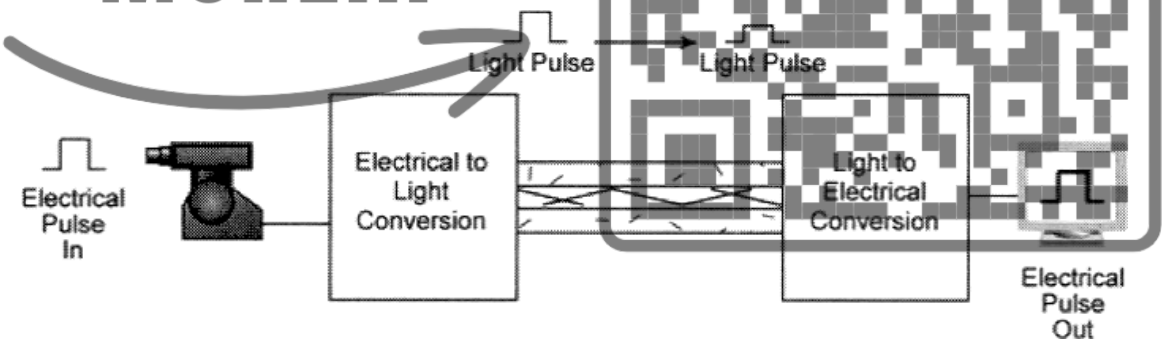


Figure 12: Transmission of electrical pulse through Fiber Optic Cable

FIBER OPTIC CONNECTORS:

The most common connector used with fiber optic is an ST connector (figure 13-a). It is barrel shaped, similar to a BNC connector. A newer connector, the SC (Figure 13-b), is becoming more popular. It has a square face and is easier to connect in a confined space.

Figure 13 (a): ST Connector

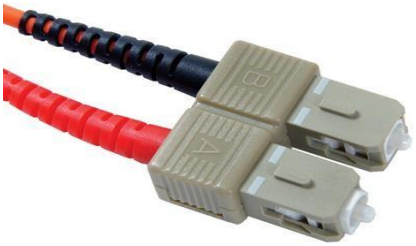


Figure 13(b): SC Connector

PHYSICAL APPEARANCE OF FIBER OPTIC CABLE:

The following are the few different types of Fiber optic cables available.

ADVANTAGES OF FIBER OPTIC CABLES:

- ★ Very high bandwidth.
- ★ Immunity to EMI; fiber optic cable can be used in environments that make wire cables unusable.
- ★ No radio frequency emissions; signals on fiber optic cables cannot interfere with nearby electronic devices.

DISADVANTAGES OF FIBER OPTIC CABLES:

- ★ Fragile.
- ★ High cost
- ★ Difficult installation and maintenance.

COMPARISON OF DIFFERENT CABLE TYPES:

Factors/Cable Type	UTP	STP	Coaxial	Fiber Optic
Cost	Lowest	Moderate	Moderate	Difficult
Installation	Easy	Fairly easy	Fairly easy	Difficult
Bandwidth	1 to 155 Mbps (Typically 10 Mbps)	1 to 155 Mbps (Typically 16 Mbps)	30 (10Base2) 100 (10Base5)	Lowest
Node Capacity per section	High	High	High	Lowest
EMI	Most vulnerable to EMI	Less vulnerable than UTP but still vulnerable to EMI	Less vulnerable than UTP but still vulnerable to EMI	Not affected by EMI

UNGUIDED MEDIA:

Unguided media or wireless communication transports electromagnetic waves without using physical conductor. Instead signals are broadcast through air (or water), and thus are available to anyone who has a device capable of receiving them.

RADIO FREQUENCY ALLOCATION:

The section of electromagnetic spectrum defined as radio communication is divided into nine ranges, called bands, each regulated by government authorities. These bands are rated from very low frequency (VLF) to tremendously high frequency (THF). See Figure below.

BLUETOOTH:

Bluetooth is a wireless protocol utilizing short-range communication technology facilitating data transmission over short distances from fixed and/or mobile devices, creating wireless personal area networks (PANs). The intent behind the development of Bluetooth was the creation of a single digital wireless protocol, capable of connecting multiple devices and overcoming issues arising from synchronization of these devices. Bluetooth provides a way to connect and exchange information between devices such as mobile phones, telephones, laptops, personal computers, printers, GPS receivers, digital cameras, and video game consoles over a secure, globally unlicensed Industrial, Scientific, and Medical (ISM) 2.4 GHz. Short-range radio frequency bandwidth. The Bluetooth specifications are developed and licensed by the Bluetooth Special Interest Group (SIG). The Bluetooth SIG consists of companies in the areas of telecommunication, computing, networking, and consumer electronics.

FACTORS AFFECTING COMMUNICATIONS AMONG DEVICES:

- ★ Transmission rate – frequency and bandwidth
- ★ Line configurations – point-to-point versus multipoint 1 Serial versus parallel transmission
- ★ Direction of transmission – simplex, half-duplex, and full-duplex 1 Transmission mode asynchronous versus synchronous 1 Multiplexing.
- ★ Protocols

TRANSMISSION RATE:

FREQUENCY:

The amount of data that can be transmitted on a channel depends on the wave frequency. Frequency is expressed in hertz; 1 cycle per second equals 1 hertz. The more the cycles per second, the more data the can be sent through that channel.

For Example:

- ★ A twisted-pair telephone wire operating at a frequency of 4000 hertz might send only 1 kilobyte of data in a second.
- ★ A coaxial cable of 100 megahertz might send 10 megabytes.
- ★ A fiber-optic cable of 200 trillion hertz might send 1 gigabyte.

BANDWIDTH:

Bandwidth is the difference between the highest and lowest frequencies, that is, the range of frequencies. Data may be sent not just on one frequency but on several frequencies within a particular bandwidth, all at the same time.

Thus, the greater the bandwidth of a channel, the more frequencies it has available and hence the more data that can be sent through that channel. The rate of speed of data through the channel is expressed in bits per second (bps), kilobits per second (Kbps), or megabits per second (Mbps).

LINE CONFIGURATIONS:

Line configuration is a way of connecting communications lines. There are two principal line configurations:

- ★ Point-to-point
- ★ Multipoint

POINT-TO-POINT:

A point-to-point line directly connects the sending and receiving devices, such as a terminal with a central computer. This arrangement is appropriate for a private line whose sole purpose is to keep data secure by transmitting it from one device to another. A point-to-point line may be public or private (leased).

MULTIPOINT:

A multipoint line is a single line that connects several communication devices to one computer. On a multipoint line only one communication device can tranmit at any given time.

SERIAL & PARALLEL TRANSMISSION:

There are two ways of transmitting data:

- ★ Serial data transmission
- ★ Parallel data transmission

SERIAL DATA TRANSMISSION:

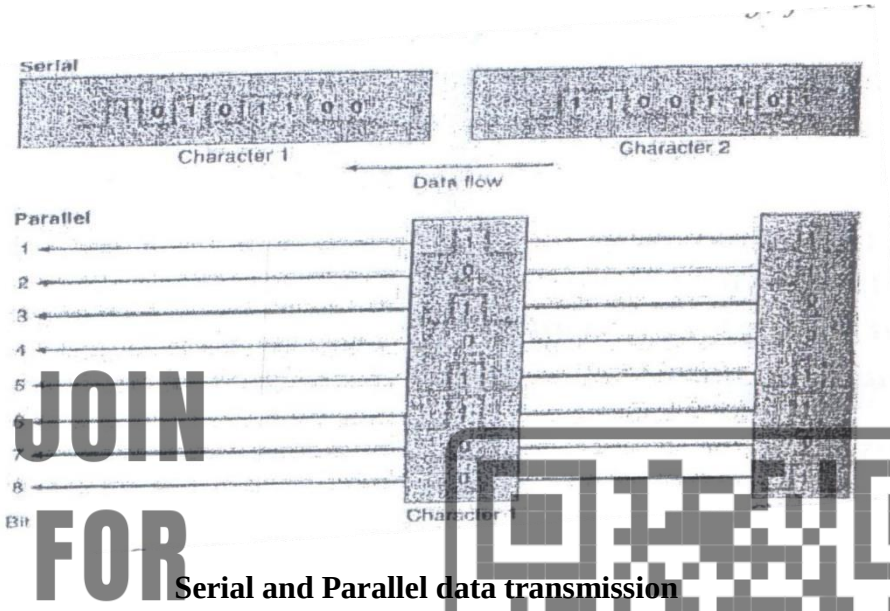
In serial data transmission, bits are transmitted sequentially, one after the other. This arrangement resembles cars proceeding down a one-lane road.

Serial transmission is the way most data flows over a twisted-pair telephone line. It is found in communications lines, modems, and most mice. The plug-in board for a microcomputer modem usually has a serial port.

PARALLEL DATA TRANSMISSION:

In parallel data transmission, bits are transmitted through separate lines simultaneously. The

arrangement resembles cars moving in separate lanes at the same speed on a multilane freeway.
Parallel lines move information faster than serial lines do, but they are efficient for up to only 15 feet. Thus, parallel lines are used to transmit data from a PC‟s processor to a printer.
Parallel transmission may also be used within a company‟s facility, for terminal-to-main-computer data transmission.



Serial and Parallel data transmission

DIRECTION OF TRANSMISSION:

When two computers are in communication, data can flow in three ways:

- ★ Simplex
- ★ Half-duplex
- ★ Full-duplex

SIMPLEX TRANSMISSION:

In simplex transmission. Data can travel in only direction. (See Figure 21)

Example:

- ★ A traditional television broadcast is an example, in which the signal is sent from the transmitter to your TV antenna. There is no return signal.
- ★ Some computerized data collection devices also work this way such as seismograph sensors that measure earthquakes.

HALF – DUPLEX TRANSMISSION:

In half-duplex transmission, data travels in both directions but only in one direction at a time. This arrangement resembles traffic on a one-lane bridge: the separate streams of cars must take turns.

Example:

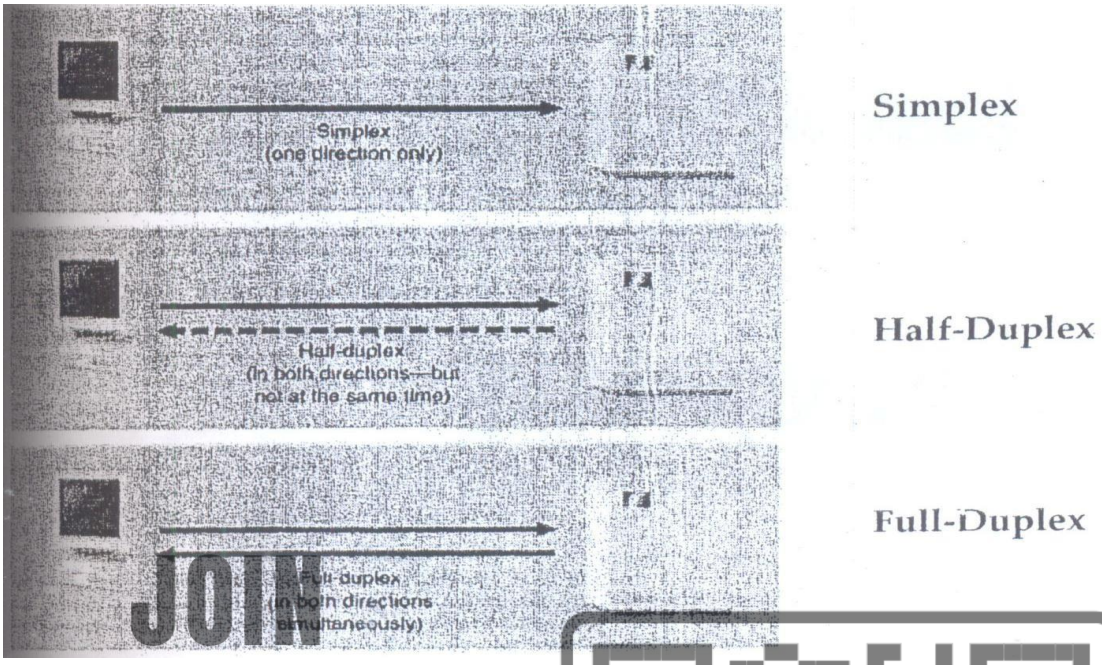
- ★ Half-duplex transmission is seen with marine radius, in which both parties must take turns talking.

FULL-DUPLEX TRANSMISSION:

In full-duplex transmission, data is transmitted back and forth at the same time. This arrangement resembles automobile traffic on a two-way street.

Examples:

- ★ An example is two people on the telephone talking and listening simultaneously.
- ★ It is also available for some new microcomputer modems and software to support truly interactive collaboration using products like Microsoft NetMeeting.



Transmission Directions

TRANSMISSION MODE: ASYNCHRONOUS VERSUS SYNCHRONOUS:

Suppose your computer sends the word CONGRATULATIONS! To someone as bits and byte over a communications line. How does the receiving equipment know where one byte (or character) ends and another begins? This matter is resolved through either asynchronous transmission or synchronous transmission.

ASYNCHRONOUS TRANSMISSION

This method is used with most microcomputers and is also called start-stop transmission. In asynchronous transmission data is sent one byte (or character) at a time.
Each string of bits making up the byte is bracketed, or marked off, with special control bits. That is, a „start" bit represents the beginning of a character, and a „stop" bit represents its end.

ADVANTAGE:

★ Its advantage is that the data can be transmitted wherever it is convenient for the sender.

DISADVANTAGE:

★ This is a relatively slow method. As a result, asynchronous transmission is not used when great amounts of data must be sent rapidly.

SYNCHRONOUS TRANSMISSION:

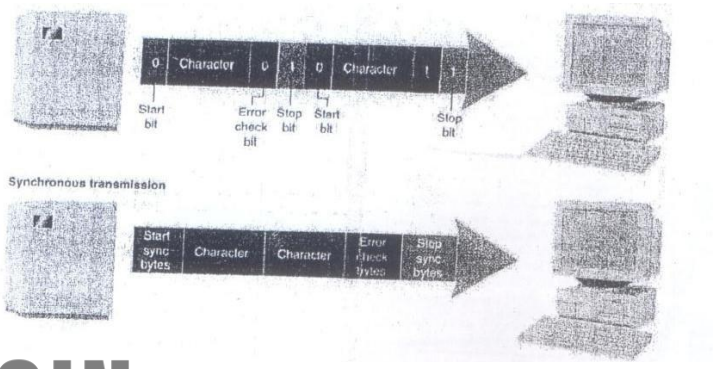
Instead of using start and stop bits, synchronous transmission sends data in blocks (synchronous means „timed"). Start and stop bit patterns, called sync bytes are transmitted at the beginning and end of the blocks. These start and end bit patterns synchronize internal clocks in the sending and receiving devices so that they are in time with each other.

ADVANTAGE:

★ It can transmit (great quantities of data quickly so it is appropriate for large computer systems.

DISADVANTAGES:

- ★ This method is rarely used with microcomputers because it is more complicated and more expensive than asynchronous transmission.
- ★ It also requires careful timing between sending and receiving equipment.



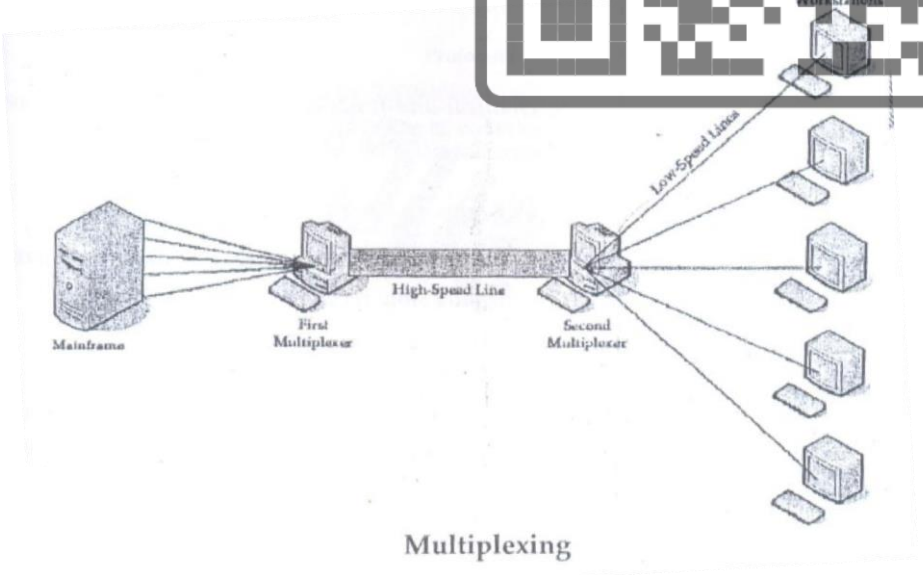
Transmission Modes

MULTIPLEXING:

In telecommunications and computer networks, multiplexing (known as muxing) is a term used to refer to a process where multiple analog message signals or digital data streams are combined into one signal over a shared medium. The aim is to share an expensive resource. For example, in telecommunications, several phone calls may be transferred using one wire.

The multiplexed signal is transmitted over a communication channel, which may be a physical transmission medium. The multiplexing divides the capacity of the low-level communication channel into several higher-level logical channels, one for each message signal or data stream to be transferred. A reverse process, known as demultiplexing, can extract the original channels on the receiver side.

A device that performs the multiplexing is called a multiplexer (MUX), and a device that performs the reverse process is called a demultiplexer (DEMUX).



Multiplexing

PROTOCOLS:

A protocol, or communications protocol, is a set of conventions governing the exchange of data between hardware and/or software components in a communications network.

Protocols are built into the hardware or software you are using. The protocol in your communications software will specify how receiver devices will acknowledge sending devices by means of handshaking.

Handshaking establishes the facts that the circuit is available and operational. It also establishes the level of device compatibility and the speed of transmission.

PROTOCOLS SPECIFY:

- ★ The type of electrical connections used
- ★ The timing of message exchanges
- ★ Error-detection techniques, and so on.

In the past all hardware and software developers were not subscribed to the same protocols. As a result, many kinds of equipment and programs have not been able to work with one another. In recent years, more developers have agreed to subscribe to a standard of protocols called OSI. Backed by the International Standards Organization, OSI (Open System Interconnection) is an international standard that defines seven layers of protocols, or software responsibilities, for worldwide computer communications.

THE OSI MODEL:

One communications standard created by the ISO is called the Open Systems Interconnection (OSI) model that simulates the communications process using seven layers, each with its own set of protocols. The purpose of the OSI model is to enable any vendor‟s computer system to share data with any other vendor‟s system in an open networking environment. Following figure shows the structure of the OSI model. A description of each of the seen layers are as follows:

Layer 1: Physical Layer:

The physical layer controls the electrical, mechanical and functional transmission of bits over the data circuits.

Layer 2: Data Link Layer:

The data link detects and compensates for transmission errors and ensures that information sent by high-speed transmitters is properly receive by slow receivers.

Layer 3: Network Layer:

The network layer determines how information is routed between computers and within and between individual networks. It also handles software interfaces between networks, including networks with different protocols.

Layer4: Transport Layer:

The transport layer specifies the rules for information exchange and manages end-to-end delivery of information within and between networks, including error recovery. It also controls information flow for examples multiple data streams on a single channel.

Layer 5: Session Layer:

The session layer controls the dialog between two computers, managing file transfers and putting checkpoints into a data stream to allow portions of files to be retransmitted as needed.

Layer 6: Presentation Layer:

The presentation layer supplies transparent communications by masking the differences in unlike data formats such as the ASCII and EBCDIC character codes, and performs data compression and encryption.

Layer 7: Application Layer:

The applications layer supplies functions for particular applications such as file transfer, remote access and virtual terminals.

Passes bits into connecting medium

The OSI model: defines framework for implementing protocols

CHAPTER # 04

APPLICATION & USES OF COMPUTERS

COMPUTER LITERACY:

That encompasses three aspects of the computer‟s universal appeal.

THE KNOWLEDGE OF COMPUTER & ITS STUDY:

Awareness:

Studying about computers will make you more aware of their importance and their versatility.

Knowledge:

Learning what computers are and how they work requires coming to terms with some technical terminology.

Interaction:

There is no better way to understand computers than through interacting with one. So being computer literate also means being able to use a computer for some simple applications.

IMPORTANCE OF COMPUTER IN DAILY LIFE:

Computers have been getting a lot of attention now-a-days. We hear about them almost every day and we seen them all around every day and we see them all around us. In fact, every time we cash a cheque, go through a supermarket checkout or listen to a compact disk player, computers are involved. Simply we can say that computer is very importance in our daily life, some of them are given below.

LEARNING:

Computer affect our lives, whether we realize it or not. They are used in banks, offices, stores, factories, schools, government agencies, military installations, and just about and other organization you think of Tiny specialized computers are built into many modern appliances, machines and vehicles. All kinds of advanced equipment from cameras to jet aircraft depend utterly on computer technology. Unless we learn a few fundamental computer concepts, it will be difficult to understand many of today‟s and tomorrow‟s technological issues.

EMPLOYMENT:

Since most businesses and other organizations routinely use computers, employers need workers who are at least familiar with them. Knowing how to use a computer certainly won‟t guarantee you a job, but it can help you to be more competitive in today‟s labour market.

PRODUCTIVITY:

A compelling reason for learning to use a computer is that it can help it can help us to do certain jobs more efficiently. For example, word processing, a common computer application allows you to produce documents such as letters and reports, with a computer.

CAPABILITY:

Computers not only let you perform everyday tasks more efficiently, but they also allow you to tackle jobs you otherwise would not be able to do at all. One example is a computer-simulated chemistry lab. Actually, students do not mix real chemicals; they just tell the computer what they would mix. The computer then displays on a screen prerecorded video sequences of the results that would occur.

FUN:

Once they learn to use a computer, most people find that they enjoy it. There are many computer games available from simulations of traditional board games such as chess and monopoly to much exciting games such as Need for Speed, Pac Man, Dark Castle and Brian Lara‟s Cricket. The computer opens whole new worlds of information, communication, productivity and entertainment.

RESOURCES OF COMPUTER SYSTEM:

Computers are tools; they help people perform many different kinds of tasks. The places where computer can be used are as follows:

Information Management:

Computers are excellent tools for managing large quantities of information. We combine hardware, software, people, procedures and data o create an information system. A computer-based information system provides an organization with data processing capabilities and the knowledge workers in the organization with the information they need to make better, more informed decision.

Personal Productivity:

A variety of domestic and business applications forms applications form the foundation of personal computing. Domestic applications include everything from personal finance to education to entertainment.

These are some of the most popular productivity tools:

- ★ Word processing
- ★ Desktop processing
- ★ Spreadsheet
- ★ Database
- ★ Graphics
- ★ Communications

APPLICATIONS OF COMPUTER IN FIELD:

Communication:

The telephone and the computer are two of our most useful tools. Combine them and you end up with a powerful communication system. Many people use their computers together with their telephones to communicate electrically with another and with other computers.

SCIENCE, RESEARCH & ENGINEERING:

Engineers and scientists routinely use the computer as a tool in experimentation, design and development. There are at least as many science and research applications for the computer as there are scientists and engineers. One of these applications is computer-aided design (CAD).

Computers can simulate environments, emulate physical characteristics. Many monkeys, mice, cats and dogs have been spared since computers have been added to the research.

Computers are also used to generate models of DNA, the molecule that houses the genetic instructions that determine the specific characteristics of organisms.

EDUCATION & REFERENCE:

Computers can interact with students to enhance the learning process. The most common use of personal computers in the education environment takes place in computer labs. Computers are now being applied to the tasks of accelerating and enhancing the learning process.

The combination of interactive computer technology and videodisk images be used to present materials. Computer-based education will not replace, but educators agree that computer-based training (CBT) is having a profound impact on traditional modes of education.

ENTERTAINMENT & EDUTAINMENT

Personal computers have reinvented the concept of entertainment. You can buy a computer chess opponent in the form of a board, chess pieces, and a miniature robotic arm that moves the pieces.

ART:

Artists are using personal computers to generate and manipulate experimental images. Film industry makes extensive use of personal computers to control camera movements for special effect sequences in movies such as those in the Star Wars series. With a Musical Instrument Digital Interface (MIDI), personal computers can be used to control synthesizers to produce music.

ENERGY:

Energy companies use computers to locate oil, coal, natural gas and uranium. Electric companies use computers to monitor vast power networks.

BUSINESS & E-COMMERCE:

Many companies are redefining the customer-salesperson relationship by arming their sales reps can also perform analyses on pricing, to help customers determine the most cost-effective products to buy. Orders can be printed and given to the customer immediately, which helps reduce later disputes about what was ordered.

On stock exchange, brokers are replacing older terminals with personal computers that help them monitor trending, look for trends and order trades.

MONEY:

Computers have revolutionized the way we handle money. Computers speed up record keeping and allow banks to offer some-day services, banking over the phone and remote transactions via automated taller machines (ATMs). Computers have evolved cashless economy, enabling the widespread use of credit cards and instantaneous credit cheques by banks, departmental stores and other retailers. Some banks now provide ATM card reader.

AGRICULTURE:

Computers have penetrated to farms. Farmers now use small computers purchased for less than the price of a tractor to help with billing, crop information, cost per acre, feed combinations ad market price checks.

Cattle ranchers can also use computers for information about livestock breeding and performance.

GOVERNMENT:

The largest single user of computer is the federal government. The NADRA, for example, produces millions of tax documents, voter lists, national identify cards etc. a month with the help of computers. Computers are also used for forecasting weather, for servicing parts, for processing immigrants, for imparting justice and of course for collecting taxes.

TRAINING:

Computers are being used as training devices in industry and government. It is much cheaper.

HEALTH & MEDICINE:

Personal computer applications in science and medicine are also beginning to appear. The highly Magnetic Resonance Imagining (MRI) uses magnetic fields and radio waves to create electronic pulses that can be amplified and analyzed by computer to produce images of the spinal cord and brain. Computers help monitor a serious patient in intensive care units.

Personal computers help neurosurgeons locate within a millimeter, the area of the brain needing surgery.

ROBOTICS:

Computers have paved the way for robots to take many of the jobs that place human life at risk. These robots are performing tasks too unpleasant, too dangerous , or too critical for humans. Clearly, these robots have eliminated many jobs for factory workers.
Finally the amount of computing capacity in the world is doubling every two years.

THE IMPACT OF COMPUTERS ON PEOPLE:

The technological advances in the field of computer have made it one of the most powerful forces in society today. No one can doubt that use of computers has had a strong impact on many people. Here some of the positive and negative effects that computer usage may have on individuals.

Positive Impact:

People may benefit from computers in many ways. Among the benefits are the following:

New Job Opportunities:

Hundreds of thousands of new jobs have been created in such areas as programming, computer operations and information systems management.

Greater Job Satisfaction:

Scientists and engineers can tackle can interesting problems that they could not have considered without computer‟s help.

Use By Business:

The use of computers by business to avoid waste and improve efficiency may result in lower product prices and/or better service to individuals.

USE BY PUBLIC ORGANIZATIONS:

Avoiding waste and improving efficiency in government agencies. Colleges and hospital units can also result in better service.

Use In The Home:

Millions of microcomputers have been acquired for home use. Personal systems are used for entertainment and hobby purposes, for education uses, for family financial applications.

Negative Impact:

In spite of the countless benefits unit people receive form computer usage, such usage can also lead to potential dangers and problems. Some of these problem areas are:

The Threat Of Unemployment:

The greater efficiency made possible by computer usage can result in job obsolescence and displacement for some workers.

The Use Of Questionable Data Processing Practices:

In other cases, inaccurate and incomplete data about people have been placed in computer system files. Finally, human errors in preparing input data and in designing and preparing programs.

The System Security Issue:

The lack of control over data security in a computer system has resulted in the destruction of an individual‟s records in some cases.

The Privacy Issue:

Lack of control over data storage, retrieval and communication has led to abuses of a person‟s legitimate. The records of patients hospitalized for psychiatric treatment may be made available to insurance companies, police departments, the motor vehicle department and all other licensing agencies.

THE IMPACT OF COMPUTER ON ORGANIZATIONS:

The uses of computers are having both positive and negative effects on the organizations that use them. A few of these effects are outlined below.

Positive Impact:

We have seen that organizations any benefit from computers. Those benefits include the following:

Better Planning & Decision Making:

Planning is deciding in advance on a future course of action. Computer-based information systems that are quicker-responding and broader in scope than those previously available can have a positive impact on the planning and decision making that occurs in a business or non-profit organization.

Better Control of Resource:

Control is a follow-up to planning. It is the check on performance to see it planned goals are being achieved. Computer systems can be used to measure actual performance levels, compare these levels against planned standards and then carry out pre-programmed decisions.

Greater Efficiency of Operations:

You have seen how greater efficiency may benefit individuals. But greater efficiency resulting from computer usage also benefits organizations. PIA and other small airlines have also gained a larger share of the market by permitting travel agents to tap into their systems.

Negative Impact:

The following brief listing identifies some of the challenges that computer-using organizations may face:

The Problems in Information System Design:

The design of new computer-based information systems can be a very complex and challenging tasks.

The System Security Issue:

The failure to secure the information systems being used has threatened organizations as well as individuals. Assets have been stolen from organizations through system manipulation. Secrets have been copied and sold to competitors.

THE CHALLENGE TO ORGANIZATIONAL STRUCTURE:

When new computer systems are introduced, work group in an organization may be created, disbanded.

THE ACCESS TO INFORMATION ISSUE:

Organizations with limited computing resources may have difficulty computing against organizations with much greater sophistication in the use of computers.

CHAPTER # 05

COMPUTER ARCHITECTURE

COMPUTER ORGANIZATION:

Computer organization is concerned with the way the hardware components operate and the way. They are connected together to form the computer system. The various components are assumed to be in place and the task is to investigate the organizational structure to verify that the computer parts operate as intended.

COMPUTER DESIGN:

Computer design is concerned with the hardware design of the computer. Once the computer specifications are formulated, it is the task of the designer to develop hardware for the system.
Computer design is concerned with the determination of what hardware should be used and how the parts should be connected. This aspect of computer hardware is sometimes referred to as computer implementation.

COMPUTER ARCHITECTURE:

Computer architecture is concerned with the structure and behavior of the computer as seen by the user. It includes the information formats the instruction set, and techniques for addressing memory. The architectural design of a computer sustem is concerned with the specifications of the various functional modules, such as processor and memories, and structuring them together into a computer system.

COMPONENTS OF A DIGITAL COMPUTER:

A digital computer can be broadly classified as a collection of four basic units.

1. Input Unit
2. Output Unit
3. Central Processing Unit (CPU)
4. Memory Unit

Input Unit:

The input unit provides an interface between the users and the machine for inputting data and instructions etc. One of the most common examples is the keyboard.

Output Unit:

Like the input unit, the output unit also provides an interface between the user and the machine. A common example is the monitor of a personal computer.

Central Processing Unit (CPU):

The Central Processing Unit is the brain of the computer system. It has two principal sections; an arithmetic/logic unit and a control unit. It also contains several register and a network of buses connecting various components.

Memory Unit:

Memory also called main memory, RAM Primary or Internal Storage. It holds programs and data passed to the computer system for processing, intermediate processing results and output ready for transmission to a secondary storage or output device.

MEMORY LOCATIONS:

The memory unit may be considered as made of small compartments, usually called cells or memory locations.

ADDRESS:

A memory location can hold a data or an instruction. Each of these locations is assigned a particular number called its address.

COMPUTER REGISTERS:

A register is a temporary storage device which holds data (or an instruction) as long as it is being manipulated. Each register within the CPU performs a specific role.
Registers also differ from memory in that they are not addressed as a memory location.
Registers are used in many different ways in a computer may hold data being processed, an instruction being executed, a memory or I/O address to be accessed, or even special binary codes used for some other purpose, such as codes that keep track of the status of the computer.

GENERAL PURPOSE REGISTERS:

The General-Purpose Registers may be used for temporarily storing data. General-Purpose Registers are also known as programmable registers as they may be programmed by the user with the help of instructions.

ACCUMULATOR (AC)

The Status Register also called Flag Register, holds 1-bit flag to indicate certain conditions that arise during arithmetic and logical operations. The important conditions shown by flag or status registers are:

Carry	Indicates whether there is overflow or not.
Zero	Indicates whether the result is zero or non-zero.
Sign	Indicates whether the result is plus or minus.
Parity	Indicates whether the result contains odd number of 1st or even number of 1s

MEMORY BUFFER REGISTER (MBR):

This register is also known as the Memory Data Register (MDR). It is used to hold a word that is being stored to or retired from the memory location currently addressed by the Memory Address Register.

MEMORY ADDRESS REGISTER (MAR):

This register holds the address of a memory location of the word to be written from or read into the MBR.

INSTRUCTION REGISTER (IR):

This is very important register. It holds the actual instruction being excuted currently by the computer.

PROGRAM COUNTER (PC):

This is a register which deals with the order for execution of instructions. This acts like a pointer which indicates the subsequent memory location where instruction is stored. After one instruction is executed, the Program Counter gets incremented by one to indicate the location of the next instruction in the serial order.

STACK POINTER (SP):

Stack may be defined as a set of memory locations and the Stock Pointer may be defined as the indicator to these memory locations. Stack memory location are used by a microprocessor for storing data temporarily for execution of a program.

MINIMUM NUMBER OF REGISTERS REQUIRED BY A COMPUTER:

For the basic computer we shall consider the following registers:

1. One register for holding data called Memory Buffer Register (MBR).
2. One register for storing instruction called Instruction Register. (IR).
3. A register for holding the address of memory word called Memory Address Register (MAR).
4. A register for holding temporary data generated during processing. This register is named s Temporary Register (TR).
5. A processor Register also called Accumulator (AC) is required for doing operations on data. This Process Register holds data on which addition, subtraction, multiplication, shift and logical operations are to be carried out.
6. A register that will act as a counter and will act as a counter and will hold the address of next instruction. Such a register is named as Program Counter. (PC).
7. Register for inputting and outputting data. Input Register (INPR) will hold data obtained from user through inputting and outputting data. Input Register (INPR) will hold data that need to be sent to output devices like monitor, printer etc.

Thus, we will need all these registers to hold data temporarily as well as we will need memory unit and control unit.

SIZES OF CPU REGISTERS:

Since Accumulator (AC), Memory Buffer Register (MBR), Instruction Register (IR) and Temporary Register (TR) holds data, these registers should be of 16 pits because each word consists of 16 bits.

Memory Address Register (MAR) and Program counter (PC) store addresses of memory words. Therefore, MAR and PC registers are of 12 bits each because we need to store 4096 addressed and this is possible with a 12-bit register, as $2^{12} = 4096$. Thus, 12 bits would from 4096 different combinations.

INPR and OUTR (Input & Output Registers) are taken to be of 8 bits each. They are supposed to transfer 8 bits at a time to the memory or to other registers or to output devices. This is because of the fact that if we have 16-bit word, we would move it in two parts of 8 bits each. The transfer of bits is done using one byte (or 8 bits) at a time through the bus which connects different parts in a motherboard, The rest of the 8 bits would follow.

BUSES:

In a microcomputer, the input/output devices and memories are connected to the microprocessor by means of wires called Buses. There are three types of buses called.

1. Address bus.
2. Data bus
3. Control bus

Address Bus:

The address bus is used by the microprocessor to transmit the address of the memory location which it wants to access for reading of writing purposes. An address bus is unidirectional i.e. electrical signals are transmitted in one direction only from microprocessor to other devices by this bus.

Data Bus:

The data bus is used to transmit data from the memory to microprocessor and vice versa. It may be used to transmit data to other devices such as output units. The data bus is bi-directional because data has to pass from microprocessor to memory as well as from memory to the microprocessor.

Control Bus:

The Control bus supervises the reading or writing of data. It transmits signals to all the devices at the proper time. In fact, it informs the microprocessor that a particular unit has completed its job.

Instructions:

An instruction is an order for the computer to perform a certain specified operation.
Before a computer is able to execute an instruction, it must be stored in the main memory of the computer.
An instruction is stored in the computer main memory as a certain specified number of bits.

Fields:

If an instruction has n-bits then these bit positions are divided into two or more sections called Fields.

TYPES OF FIELDS:

Opcode:

Opcode (pronounced as oup code), that specifies the operation to be performed. The Opcode may instruct the computer to add two number or compare two numbers or it may direct the computer to stop the execution of the program.

Address Field:

The remaining part of the instruction is called the Address Field. It may be divided into one or more parts, each part containing address of a particular memory location where data for the instruction could be found.

TYPE OF INSTRUCTIONS:

1. Operation Code, abbreviated to Opcode.
2. Address or Addresses of one or more memory locations.

Operation Code:

The operation code of an instruction consists of a group of bits that define certain arithmetic or some other operations, such as addition subtraction, multiplication, division, shifting or complementation. The number of bits required for an operation code depends upon the total number of operations to be performed to be performed by the computer. If the operation code has n bits then the computer is capable of performing 2” distinct operations E.g.: if 16 distinct operations are to be performed by a computer then the Opcode must have at least 4 bits as $2^4 = 16$. The least number of bits needed for the Opcode is 4.
An operations code is a part of an instruction stored in a memory location in the computer memory.

Address:

The operation code of an instruction specifies the operation to be performed. Since the operation is to be performed on data or on a set of data, the instruction must also tell where the data is stored.
The data may be stored in a register or in a memory location.

The data on which the operation to be performed is called an Operand. An instruction must specify the operation to be performed along with the address or addresses of the operands or registers where the result of an operation is to be stored.

Instruction Formats:

An instruction format defines the layout of bits of an instruction in terms of its constituent parts.

Types of Instruction Formats:

The types of commonly used instructions are:

1. Three-Address Instruction.
2. Two-Address Instruction.
3. One-Address Instruction.
4. Zero-Address Instruction.

STACK ORGANIZED CPU:

A tack can be considered as a storage method in which the items are stored in consecutive memory locations and the last element stored is the first element retrieved.
Stack may be finite number of registers bundled together or stack can also be a part of memory unit.

STACK POINTER:

An address register is associated with stacks. The address register called Stack Pointer contains the address of the recently stored element. Stack pointer always points to the topmost element in the stack.

How Push and Pop functions are performed n Stack?

1. „Push" is the term used for inserting an element into a stack and is done by incrementing the Stack Pointer.
2. „Pop" is the term used for removing an element from a stock and is done by decrementing the Stack Pointer.

Polish Notation:

Polish notation, named after the Polish mathematician Jan Lukasiewics, refers to the notation in which the operator symbol is placed before its two operands. This notation is also called prefix notation. For example:

+AB –CD *EF /GH

The fundamental advantage of polish notation is that one never needs parentheses when writing expressions.

REVERSE POLISH NOTATION:

Reverse polish notation refers to the analogous notation in which the operator symbol is placed after its two operands. This notation is also called postfix notation. For example:

AB+ CD– EF* GH/

Any mathematical expression can be evaluated using stacks as follows:

1. First convert the arithmetic expression into equivalent reverse polish notation (postfix notation).
2. Push the operands into stack in the order in which they appear.
3. Use the two topmost operations for evaluation.
4. The stack is popped and the result of the operation is again pushed into the stack.
5. Finally, only the result of the operation is left on stack top.

Internal Working of CPU:

The Central Processing Unit (CPU) is the heart of the computer. It is this unit that accepts data and instructions, processes the data according to the instructions and delivers the output to the output unit. This unit also controls and coordinates the activities of all other unit.

The processing required for a single instruction is called on instruction cycle.

1. Fetch cycle
2. Execute cycle

Fetch Cycle:

The fetch cycle is that duration of time in which as instruction stored in the memory is brought to an appropriate register, all this happening under the commands from control unit of the CPU. The process of bringing an instruction from memory to a register is called a Fetch cycle and has to be completed in a specified of time.

Fetching Of An Instruction:

The instructions and data are stored in computer memory as computer as computer words, each word being 16-bit long. These instructions and data are stored in memory in binary coded forms (i.e. in terms of 0s and 1s) and the two are indistinguishable from each other. It is the responsibility of the programmer to keep the track of the instructions and data. Bu fetching of an instruction, we mean transferring an instruction from a memory location to the Instruction Register (IR). This instruction register holds an instruction temporarily only for the time when the instruction and data are being interpreted or decoded. The instruction from a memory location is transferred to Instruction Register via another register called Memory Buffer Register (MBR).

All the instructions and data from memory pass through Memory Buffer Register on their way to other units. The other register used in a fetching operation and Program Counter (PC) and Memory Address Register (MAR). Thus, the registers needed in instruction fetching operations are:

1. Instruction Register (IR)
2. Memory Buffer Register (MBR)
3. Program Address Register (MAR)

The operation of fetching of an instruction from the main memory to the instruction register is performed under the control of the control unit. The dotten lines show the signals form the control unit.

Fetching Operation:

Let us consider a small computer program stored in the main memory in the locations from 0000 to 0008. The first instruction to be fetched is in the location 0000. To start with the Program Counter is set to 0000. Under the signals from control unit this address 0000 is passed to Memory Address Register (MAR) and PC itself gets incremented by 1 and now it holds the address 0001 which is the address of the next instruction. Again the control unit issues commands to MAR to pass on this address to the main memory and under the directions of the control unit the instruction stored at address 0000 in the memory is passed to the Memory buffer Register (MBR). This instruction is held in MBR temporarily and is passed to current Instruction Register under the commands from control unit. Once this is done, the above process is repeated to fetch the next instruction.

Execution of An instruction:

The execution of an instruction by the computer means completion of the work by the computer as specified by the instruction. The fetch cycle brings the instruction to the Instruction Register, which holds this instruction temporarily as long as it is being interpreted (decoded) and executed.

For the computer having word size of say 16-bit, the instruction held in IR has two parts, namely

1. A 4-bit operation code,
2. A 12-bit address of operand.

The operation code is transferred to the control unit. This control unit sends Opcode to decoder where it is decoded. After decoding the Opcode, the control unit issues commands in the form of control signals to various other units such as arithmetic/ logic unit to perform the necessary operations. The address of a partuclar memory location. This address is transmitted to Memory Address Register (MAR) which transmits it to the main memory. Under the directions of the control unit, the operand stored in that particular memory location is transmitted to the Memory Buffer Register, from where is that particular memory location is transmitted to the Memory Buffer Register, from where it is transmitted to the ALU. The most important register of the ALU is Accumulator where all the arithmetic is performed. This operand (data) is passed to the Accumulator in ALU where the necessary arithmetic, as directed by the control unit, is performed and the result of the operation is held in the Accumulator for onward transmission to the main memory.

Steps in Execution of an Instruction:

The instruction stored in the current instruction register is executed in the following steps:

1. The operation code of the instruction is transmitted to the control unit. The control unit decodes this operation code and issues commands to various other hardware units.
2. The address part of the instruction is transferred to a decoder. The decoder interrupts it and communicates this address to the Memory Address Register, which transmits this address to the main memory. In fact, this is the memory address of the operand.
3. Under the instructions from the control unit the operand stored in this memory location is transferred to Memory Buffer Register.
4. Memory Buffer Register transfers the operand to the arithmetic/ logic unit, where the necessary operation is performed on the operands in the Accumulator, one operand already being stored in the accumulator. The result of the operand remains in the accumulator.

This completes the execution cycle.

CHAPTER # 06

SECURITY, COPYRIGHT & THE LAW

COMPUTER CRIME:

Company crime is often defined as any crime accomplished through knowledge or use of computer technology.

The software piracy, theft of hardware, theft of time and services, hacking and electronic trespassing and the spreading of computer viruses are the examples of computer crime.

TYPES OF COMPUTER CRIME:

Software Piracy:

It is illegal duplication of copyrighted software. Millions of computer users have made copies of programs they don‟t legally own. Unfortunately, many people are not aware that copying software is the violation of Pakistan‟s criminal laws which protects intellectual property.

THEFT OF HARDWARE:

Computer hardware, such as microcomputers and printers, have always been valuable items that individuals could steal and resell.

Professional criminals can steal a laptop or cellular phone from someone‟s car.

THEFT OF TIME & SERVICES:

The theft of computer time is more common than you might think. Probably the biggest use of it is people using their employer‟s computer time to play games. Some people also may run sideline businesses.

HACKING & ELECTRONIC TRESPASSING:

A hacker is a person who enjoyed learning the details of computer systems and writing clever programs referred to as hacks. Hackers were, for the most part, curious, enthusiastic, intelligent, idealistic, eccentric and harmless.

Now a days they enter corporate and government computers using stolen passwords and security loopholes and steal information, transfer money to their accounts, and do a lot of other criminal activities. Many hackers cover tracks and leave without a trace.

COMPUTER VIRUSES:

A computer is a program designed to alter or destroy the data stored on a computer system. Computer viruses can be passed from one computer to another on floppy disks, over networks, and over remote modem connections. Spreading a virus may begin as a joke but may cause considerable damage.

COMPUTER VIRUS:

Introduction:

The term was first used by Fred Cohen in 1984.

Definition:

A computer virus is a small program that attaches itself to another program and attacks other software by making copies of itself.

A virus executes when an infected program is executed. Therefore only executable files can be infected.

Computer Viruses are Small:

Virus programs, like the infections microorganisms that are their namesakes, are often small. Only a few lines of program code are required to write a simple virus. The implication is clear: viruses can be easily hidden in healthy software and therefore prove very difficult to find.

Destructive Non-Virus Programs:

Aside from viruses, there are other threats to user systems, including:

- ★ Worms
- ★ Trojan Horses
- ★ Logic Bombs

As well as being potentially destructive by themselves, each can also be used as a vehicle to propagate any virus.

Worms:

A worm is a program (usually stand-alone) that worms its way through either the computer‟s memory or a disk and alters data that it accesses. It is different from a computer virus since it does not require a host. For example, suppose a worm program instructs a bank‟s computer to transfer funds to an illicit account. The fund transfers may continue even after the worm is destroyed. However, once the worm invasion is discovered, recovery is much easier because there is only a single copy of the worm program to destroy since the replicating ability of the virus is absent. This capability may enable it to re0-infect a system several times.

Trojan Horse:

A Trojan Horse is a destructive program that has been disguised (or concealed in) an innocuous piece of software.

Worm and virus programs may be concealed within a Trojan Horse.

Trojan Horses are not viruses because they do not reproduce themselves and spread as viruses do.

Logic Bombs / Time Bomb:

A program that is activated or triggered after or during a certain event. This may be several executions or on a certain day like Friday the 13th.

Writing a logic bomb program is similar to creating a Trojan Horse. Both also have about the same ability to damage data, too. Logic bombs include coding similar to that used in logic bombs, but the bombs can be very destructive on their own, even if they lack the ability of the virus to reproduce. One logic bomb caused problems in the Los Angeles water department‟s system. (or download) the software and run it.

Rabbit:

Replicated itself without limit to exhaust a resource

Types of Viruses:

There are several different types of viruses that can infect PC systems including:

- ★ Boot sector viruses
- ★ File infecting viruses
- ★ Polymorphic viruses
- ★ Stealth viruses
- ★ Multi-Partite viruses
- ★ Macro Viruses

Boot Sector Infector:

Hides in the boot sector of a disk or the partition table of a hard disk and takes over control of the computer system when it is booted. It then copies itself into the computer‟s memory. When other disks

are used, the virus transfer to their boot sectors. The most common boot sector viruses are the Pakistani Brain virus and the Stoned/Mariuana virus.

Application Program Infector:

The most infectious type of computer viruses is the application program infector or file virus. They may attach any executable file usually.COM and .EXE files. An application program infector takes control after the initial use of the infected program. Once the virus is in place in the RAM of the computer is shut off. The most widespread virus today is the Jerusalem virus.

Stealth Viruses:

Viruses which attempt to hide their presence. Some of the simple technique include hiding the change in date and time and hiding the increase in file size. Some even prevent anti-virus software from reading the part of the file where the virus is located. Some also encrypt the virus code using variable encryption techniques.

Polymorphic Viruses:

Change their appearance with each infection. Such encrypted viruses are usually difficult to detect because they are better at hiding themselves from anti-virus software. That is the purpose of the encryption.

Dark Avenger Mutation Engine:

Polymorphic encryption program used by virus developers to encrypt the virus in order to avoid detection. The engine use a special algorithm to generate a completely variable decryption routine each time. No three bytes remain constant from one sample to the next.

Multiparite Virus:

Virus which infects both the boot sector of a disk as well as application programs. Multi-particle viruses are the worst viruses of all because they can combine some or all of the stealth techniques, along with polymorphism to prevent detection.

Macro Viruses:

Virus which attaches to a word processing or spreadsheet file (typically a MS word or Excel file) as a macro. Once the file is accessed, it replaces one of the word or Excel standard macros with an infected version which can than infect all subsequent documents.

Preventing Infection:

Viruses pose a serious threat to computer systems. Thousands of viruses are in existence and more are being written each day and also some of them are self-
modifying and these all viruses making difficulty to protect the computer.

Many good antivirus programs, often called vaccines are available at minimal cost. Also some new microcomputers include built-in virus protection capabilities. Some virus programs can continually monitor the computer system and provide an alert or even lock the system when any unusual activity occurs. Some popular antivirus programs include the following:

- ★ McAfee Virus Scan
- ★ Norton Antivirus
- ★ NOD 32 Antivirus
- ★ Avast Antivirus
- ★ Avira Antivirus
- ★ Symantec Antivirus

New viruses are appearing all of the time so no program can offer absolute protection against them and virus utilities are constantly updated. But with the help of antivirus programs we can secure the computer systems very much.

COMPUTER SECURITY:

Computer security refers to protecting computer systems and the information they contain against unwanted access, damage, modification or destruction.

NINE RULES FOR DATA SECURITY:

1. Establish data security policies.
2. Establish password management procedures.
3. Control uploading of programs.
4. Test new or upgraded software in an isolated computing environment.
5. Purchase software from reputable sources.
6. Never leave a network workstation unattended.
7. Back up data and programs on a regular basis and store them off site.
8. Establish an effective disaster recovery plan.
9. Practice "Safe Computing".

Computer owners and administrators use a variety of security technique to protect their systems.

PHYSICAL ACCESS RESTRICTIONS:

One way to reduce the risk of insecurity is to make sure that only authorized personal have access to computer equipment. Organizations use a number of tools and techniques to identify authorized personnel.

★ PASSWORDS:

A password is a special word, code or symbol that is required to access to computer system. Passwords are the most common tool for restricting access to computer systems. Passwords are Many systems use passwords to restrict users so they can open only files related to their work. Many companies use call back systems, when a user logs in and type a wrong passwords, the system hangs up.

★ DIGITAL SIGNATURES:

A digital signature is a string of characters and numbers that a user signs an electronic document being sent by his or her computer.

The receiving computer performs mathematical operations on the alphanumeric string to verify its validity. One person creates the signature with a secret private key, and the recipient reads it with a second, public key.

★ FIREWALLS:

A firewall is a gateway with a lock; the locked gate is opened only for information packets that pass one or more security inspections.

★ ENCRYPTION:

Encryption is the encoding of data by converting the standard computer code into a secret code for transmission. After transmission, the data is converted back into standard computer code.

★ AUDITS:

Audit-control software is used to monitor and record computer transactions as they happen so auditors can trace and identify any suspicious computer activity.

★ MAKING BACKUPS:

Making the another copy is called backup.

PRIVACY:

Privacy refers to the right to keep personal information from being used for purposes for which it was not intended.

SOFTWARE PIRACY & LAW:

Law:

Laws are formal of conduct that a sovereign authority, such as a government, imposes on its subjects or citizens.

Copyright:

Pakistan‟s Copyright Law prohibits reproduction of software (Amendment) Act of Pakistan, 1992 (The Amendment Act) is now extended to cover computer software. It is illegal to make or distribute copies of computer without authorization. No other copies may be made without specific authorization from the copyright owner.

Penalty:

Pakistan‟s Copyright Law prohibits reproduction of software without permission from the owner of the copyrighted computer program. If caught with pirated software, you or your company may be prosecuted under the provision of the Copyright Laws. The penalties under the law include a fine of up to Rs.200,000 seizure of products used for illegal copying and a prison sentence of up of three years.

CHAPTER # 07

OPERATING SYSTEM (WINDOWS)

THE OPERATING SYSTEM:

The operating system (OS), also called the software platform, consists of the master system of programs that manage the basic operations of the computer.

Operating system provides resource management services of many kinds. It handles the control and use of hardware resources, such as:

- ★ Disk space
- ★ Memory
- ★ CPU time allocation
- ★ Peripheral device

In general, an operating system written for one kind of hardware will not be able to run on another kind of machine. In other words, different operating systems are mutually incompatible.

TASKS PERFORMED BY OPERATING SYSTEM:

- ★ Booting
- ★ User Management
- ★ Memory Management
- ★ File Management
- ★ Task Management
- ★ Formatting
- ★ Security Management

BOOTING:

Booting is the process of loading of loading an operating system into a computer‟s main memory. The work of the operating system begins as soon as you turn on, or „boot‟, the computer. This loading is accomplished by programs stored permanently in the computer‟s electronic circuitry.

When you turn on the machine the following boot process takes place:

- ★ Programs called diagnostic routines test the main memory, the central processing unit, and other parts of the system to make sure they are running properly.
- ★ BIOS (for basic input/output system) programs are copied to main memory and help the computer interpret keyboard characters or transmit characters to the display screen or to a diskette.
- ★ The boot program obtains the operating system, usually from hard disk, and loads it into the computer‟s main memory, where it remains until you turn the computer off.

Normally, your computer would boot from the hard drive, but if that derive is damaged you can use a floppy disk called a boot disk to start up your computer.

Cold Boot:

When you power up a computer by turning on the power „on‟ switch it is called cold boot.

Warm Boot:

If your computer is already on and restart it, this is called warm boot or a warm start (by simultaneously pressing the Ctrl+Alt+Del keys or pressing the Reset button on your computer.

Use Interface:

User interface is the user-controllable display screen that allows you to communicate, or interact, with the computer.

The user interface is the „public face‟ of computer operating systems.

The look and feel of the user interface is what distinguishes one operating system from another – a Windows 95 from a Windows XP, for instance, or a Windows 98 from Machintosh OS X.

Types of User Interfaces:

- ★ Command Driven Interfaces I Menu Driven Interfaces
- ★ Graphical User Interface (GUI)

Command Driven Interfaces required you to type in strange looking instructions. Menu Driven Interfaces uses the arrow keys on your keyboard or a mouse to choose a command from a menu, or list of activities. Graphical user Interface GUI, pronounced „gooey". The GUI allows you to use a mouse or keystrokes to select icons (small pictorial figures) and commands from menus (lists of activities).

CPU Management:

The supervisor, or kernel, manages the CPU. It remains in main memory while the computer is running and directs other "nonresident" programs (programs that are not in main memory) to perform tasks that support application programs.

Thus, if you enter a command to print your document, the operating system will select a printer (if there is more than one). It will then notify the computer to begin executing instructions from the appropriate program (known as a printer driver, because it controls,) or „drive," the printer). Meanwhile, many operating systems allow you to continue writing. Were it not for this supervisor program, you would operating systems allow you to continue writing. Were it not for this supervisor program, you would have to stop writing and wait for your document to print out before you could resume.

Memory Management:

Keeping track of the locations within main memory where the programs and data are stored. The operating system also manages memory. It can stop portions of data and programs between main memory and secondary storage. This capability allows a computer to hold only the most immediately needed data and programs within main memory.

There are several ways operating systems can manage memory:

Partitioning:

In partitioning, the OS divides memory into separate areas called partitions, each of which can hold a program or data.

Foreground / Background:

Some computer systems divide memory into foreground and background areas. Foreground programs have higher priority, and background programs have lower priority. When you"re working at your microcomputer, the foreground program is the one you are currently working with, such as word processing. The background program might be regulating the flow of print image to your printer.

Queues:

Programs that are to be executed wait on disk in queues. A queues is a temporary holding place for programs or data. The disk area where the programs or documents wait is called a buffer.

Print Jobs are usually spooled – that is, placed in a buffer – where they wait in queue to be printed. This happens because the computer can send-print jobs to the printer faster than the printer can print them, so the jobs mush be stored and then passed to the printer at a rate it can handle. Once the CPU has passed a print job to the buffer, it can take on the next processing tasks.

File Management:

A file is a named collection of related information. A file can be a program, such as word processing program. Or it can be a data file, such as a word processing document, a spreadsheet, images,

songs, and the like.
Files containing devices. The operating system records the storage location of all files. If you move, rename, or delete a file, the operating system manages such changes and helps you locate and gain access to it.
For example:

- ★ You can copy, or duplicate, files and programs from one disk to another.
- ★ You can back up, or make a duplicate copy of, the contents of a disk.
- ★ You can erase, or remove, from a disk any files or programs that are no longer useful.
- ★ You can rename, or give new file names to, the files on a disk.

Task Management:

A computer is required to perform many different tasks at once. In word processing, for example, it accepts input data, stores the data on a disk, and disk, and prints out a document – seemingly simultaneously. Some computers‟ operating systems can also handle more than one program at the same time – word processing, spreadsheet, database searcher. Each program is displayed in a separate window on the screen. Others can accommodate the needs of several different users at the same time. All these examples illustrate tasks management.
A “task” is an operation such as storing, printing, or calculating.
Among the ways operating systems manage tasks in order to run more efficiently are:

- ★ Multitasking
- ★ Multiprogramming
- ★ Time-Sharing
- ★ Multiprocessing

Multitasking:

Multitasking is the execution of two or more programs by one use concurrently on the same computer with one central processor.
Earlier microcomputers could do only single-tasking, whereby an OS could run only one application program at a time. Thus, users would have to shut down the application program they were working in before they opened another application, which was inconvenient. Today, multitasking operating systems are used.
You may be writing a report on your computer with one program while another program plays a music CD. How does the computer handle both programs at once?
The answer is that the operating system directs the processor to spend a predetermined amount of time executing the instructions for each program, one at a time. Thus, a small part of the first program is processed, and then the processor moves to the remaining programs, one at a time, processing small parts of each. The cycle is repeated until processing, is complete. Because the processor is usually very fast, it may appear that all the programs are being executed at the same time. However, the processor is still executing only one instruction at a time.

Multiprogramming:

Multiprogramming is the execution of two or more programs concurrently on a multi-user operating system.
As with multitasking, the processor spends a certain amount of time executing each user‟s program. Once again, because the processor works so quickly, it seems as though all the programs are being run at the same time.

Time-Sharing:

In time-sharing, a single computer processor the tasks of several users at different stations in round-robin fashion.

Time-sharing is used when several users are linked by a communications network to a single computer. The computer will first work on one user‟s task for a fraction of a second, then go on to the next user‟s tasks, and so on.
This is accomplished through time slicing. Because computers operate so quickly, they can alternately apportion slices of time (fractions of a second) do various tasks. Thus, the computer may rapidly switch back and forth among different tasks, just as a hairdresser or dentist works with several clients or patients concurrently. Users are generally unaware of the switching process. Multitasking and time-sharing differ slightly. With multitasking, the processor directs the programs to take turns accomplishing small tasks or events, such as making a calculation, searching for a record, or printing out part of a document. Each event may take a different amount of time to complete. With timesharing, the computer spends a fixed amount of time with each program before going on to the next one.

Multiprocessing:

Multiprocessing is processing done by two or more computers or processors linked together to perform work simultaneously – that is, at precisely the same time.
As in multitasking, which involves only a single processor, the processing should be so fast that, by spending a little bit of time working on each program in turn, several programs can be run at the same time. With both multitasking and multiprocessing, the operating system keeps track of the status of each program so that it knows where it left off and where to continue processing. But an operating system capable of multiprocessing is much more sophisticated than that required for multitasking.
Two possible approaches to multiprocessing are:

- ★ Co-Processing
- ★ Parallel Processing

In co-processing, the controlling CPU works together specialized microprocessor called co-processor, each of which handles a particular task.
In parallel processing several full-fledged processors work together on the same tasks, sharing memory.

Formatting:

Formatting, or initializing, a disk is the process of preparing that disk it can store data or programs.
Today it is easier to buy pre-formatted diskettes. However, it‟s useful to know how to format a black floppy disk or reformat a diskette that wasn‟t intended for your machine.

Security Management:

Operating system now allow users to control access to their computers; this is especially important when several people use one computer and when on networks, in which various people use one system. Users gain access in the same manner as accessing their e-mail – via a user name and a password. If you are using a computer at work, you may be assigned a password. When you first boot up a new personal computer, the OS will prompt you to choose a user name and a password. Then, every time thereafter, when you boot up your computer, you will be prompted to type in your name and password.

DEVICE DRIVERS: RUNNING PERIPHERAL HARDWARE:

Device drivers are specialized software programs that allow input and output devices to communicate with the rest of the computer system.
Many basic device drivers come with system software when you buy a computer, and the system software will guide you through choosing and installing the necessary drivers.
If, you buy a new peripheral device, such as a mouse, scanner, or printer, the package will include a derive driver (probably on a CD-ROM). You‟ll need to install the driver on you computer‟s hard disk (by following the manufacturer‟s instructions) before the device will operate.

UTILITIES: SERVICE PROGRAMS:

Utility programs, also known as service program, perform tasks related to the control and allocation of computer resources. They enhance existence functions or provide services not supplied by other system software programs.

Most computers come with built-in utilities as part of the system software. (Windows 95/98/Me/2000/XP/Vista offers several of them.)However, they may also be bought separately as external utility programs (such as Norton Desktop and McAfee utilities).

Among the tasks performed by utilities are the following:

- ★ Backup
- ★ Data Recovery
- ★ Virus Protection
- ★ Data Compression
- ★ File De-Fragmentation
- ★ Disk Scanner

Backup:

A backup utility is used to make a backup, or duplicate copy, of the information on your hard disk.

Examples:

- ★ Norton Backup (from Symantec)
- ★ Colorado Scheduler

Data Recovery:

A data-recovery utility is used to restore data that has been physically damaged or corrupted. Data can be damaged by viruses, bad software, hardware failure, and power fluctuations that occur while data is being written / recorded.

Example:

Norton Utilities

Virus Protection:

Antivirus software is a utility program that scans hard disks, floppy disks, and memory to detect viruses.

A virus consists of hidden programming instructions that are buried within an applications or systems program. Sometimes they copy themselves to other programs, causing havoc. Sometimes the virus is merely a simple prank that pops up in a message. Other times, however, it can destroy programs and data and wipe your hard disk clean. Viruses spread when people exchange floppy disks or download (make copies of) information from computer networks.

Some utilities destroy the virus on the spot. Others notify you of possible viral behavior. Because new viruses are constantly being created, you need the type of antivirus software that can detect unknown viruses.

Examples:

- ★ Norton Antivirus
- ★ Dr. Solomon‟s Anti-Virus Toolkits
- ★ McAfee‟s Virus Scan and Webclean

New viruses appear every day, so it‟s advisable to look or an antivirus utility that offers fragment updates without additional cost.

Although it‟s important to install an antivirus utility on your computer, risks are sometimes exaggerated. With few exceptions, if you don‟t boot your computer with a diskette in the drive, directly run programs downloaded from a network, open unknown files attached to e-mail, or use illegally copied program diskettes, your risk of virus infection is low.

DATA COMPRESSION:

Data compression utilities remove redundant elements, gaps, and unnecessary data from a computer‟s storage space so that less space (fewer bits) is required to store or transmit data. As you continue to store files on your hard disk, it will eventually fill up. You then buy new hard-disk cartridge drive and some cartridges and transfer the old files and programs to those Or you can use data compression utility.

With a data compression utility, files can be made more compact for storage on your hard-disk drive.

With the increasing use of large graphic, sound, and video files, data compression is necessary both to reduce the storage space required and to reduce the time required to transmit such large files over a network. You may also want to compress a file to fit on a floppy disk, for portability.

As the use of sophisticated multimedia becomes common, compression and decompression will be increasingly taken over by built-in hardware boards that specialize in this process. That will leave the main processor free to work on other things, and compression/ decompression software utilities will become obsolete.

Example:

★ WinZip ★ PK Zip ★StuffIt

File Defragmentation:

Fragmentation is the scattering of portions of files about the disk in nonadjacent areas, thus greatly slowing access to the files.

When a hard disk is new, the operating system puts files on the disk contiguously (next to one another). However, as you update a file over time, new data for that file is distributed to unused spaces. These spaces may not be contiguous to the older data in that file. It takes the operating system longer to read these fragmented files.

A defragmenter utility & program, commonly called a “Defragger”, will find all the scattered files on your hard disk and reorganize them as contiguous files.

Defragmenting the file will speed up the drive‟s operation.

Disk Scanner (Scan Disk) and Disk Cleanup:

These utilities detect and correct certain types of common problems on hard disks and floppies and search for and remove unnecessary files, such as temporary files (“temp files”). The Windows OS creates files needed only for short tasks and auto-recovery. The computer should delete temp files when a program is closed but this doesn‟t always happen. Thus temp files can take up space.

COMMON OPERATING SYSTEMS:

- ★ Windows 3.x
- ★ Windows 9x
- ★ Windows NT/Windows 2000/Windows Millennium
- ★ Windows vista
- ★ OS/2 warp
- ★ UNIX
- ★ Linux (Developed by Linus Torvalds in 1990 while he was a computer science student at Helsinki University in Finland)
- ★ Mac OS
- ★ Netware

Platform:

The platform is the particular processor model and operating system on which a computer system is based.

CHAPTER # 08

WORD PROCESSING

DOCUMENTS, TOOLBARS & WINDOWS:

Suppose you want to go to a document say, a report you‟re been working on. There are two ways to begin working from the Windows desktop:

- ★ You can click on the Start button at lower left and then make a selection from the pull-up menu that appears. Or
- ★ You can click on one of the icons on the desktop, probably the most important of which is My Computer icon, and pursue the choices offered there.

Either way, the result is the same. The document will be displayed on the window. Clicking on the My Computer icon reveals toolbars and windows.

TOOLBAR:

A toolbar is a bar across the top of the display window. It displays menus and icons representing frequently used options or command.
Examples of menus are File, Edit, View, Favorites and Help.

TASKBAR:

In Windows, the toolbar graphic at the bottom of the screen, which shows the applications that are running is called a taskbar.

WINDOWS:

When spelled with a capital „W‟, Windows is the name of Microsoft‟s system software (Windows 95, 98, Me, XP, Vista and so on). When spelled with a lowercase „w‟, a windows is a rectangular frame on the computer display screen. Through this frame you can view a file of data-such as a document, spreadsheet, or database-or an application program.
In the right-hand corner of the Windows XP toolbar are three icons that represent:

- ★ Minimize
- ★ Maximize
- ★ Close

By clicking on these icons, you can minimize the window (shrink it down to an icon at the bottom of the screen), maximize it (enlarge it), or close it (exit the file and make the window disappear).
You can also move the window around the desktop, using the mouse.
Finally, you can create multiple windows to show operations going on concurrently. For example, one window might show the text of a paper you‟re working on, another might show the reference section-for the paper, and a third might show something you‟re downloading from the Internet.

THE HELP COMMAND:

Don‟t understand how to do something? Forgotten a command? Accidentally pressed some keys that messed up your screen layout and you want to undo it? Most toolbars contain a Help command.
A command generating a table of contents, an index, and a search feature that can help you locate answers. In addition, many applications have context-sensitive help, which leads you to information about the task you‟re performing.

WORD PROCESSING SOFTWARE:

Word processing software allows you to use computers to create, edit, format, print and store text material, among other things.
The best-known word processing programs is Microsoft Word but there are others such as:

- ★ Sun Microsystems
- ★ Star Office
- ★ Corel Word Perfect
- ★ Word Processing components of Lotus Smart Suite

Word processing software allows users to maneuver through a document and delete, insert, and replace text, the principal correction activities. It also offers such additional features as:

- ★ Creating
- ★ Editing
- ★ Formatting
- ★ Printing
- ★ Saving

Creating Documents:

Creating a document means entering text using the keyboard. Word processing software has three features that affect this process – the cursor, scrolling and word warp.

Cursor:

The cursor is the movable symbol on the display screen that shows you where you may next enter data or commands. The symbol is often a blinking rectangle or an I-beam. You can move the cursor on the screen using the keyboard‟s directional arrow keys or a mouse. The point where the cursor is located is called the insertion point.

Scrolling:

Scrolling means moving quickly upward, downward, or sideways through the text or other screen display. A standard computer screen displays only 20-22 lines of standard-size text.. Using the directional arrow keys, or the mouse and a scroll bar located at the side of the screen, you can move)“scroll‟ through the display cscreen and into the text above and below it.

Word warp:

Word wrap automatically continues text on the next line when you reach the right margin. That is, the text „wraps around‟ to the next line. You don‟t have to hit a “carriage return” key or Enter key, as you do with a typewriter.

Editing Documents:

Editing is the act making alterations in the content of your document. Some features of editing are insert and delete, undelete, find and replace, cut/copy and paste, spelling checker, grammar checker, and thesaurus. Some of these commands are in the Edit pull-down menu and icons on the toolbars.

Insert & Delete:

Inserting is the act of adding to the document. Simply place the cursor whenever you want to add text and start typing, the existing characters will be pushed along. If you want to write over (replace) text as you write, press the Insert key before typing. When you‟re finished typing, press the Insert key again to exit Insert mode.

- ★ Deleting is the act of removing text, usually using the Delete or Backspace keys.
- ★ The undo command allows you to change your mind and restore text that you have deleted.

Some word processing programs offer as many as 100 layers of „undo,‟ so that users who delete several paragraphs of text, but then change their minds, can reinstate the material.

Find & Replace:

The find, or Search, command allows you to find any word, phrase, or number that exists in your

document. The Replace command allows you to automatically replace it with something else.

Cut/Copy & Paste:

Typewriter users who wanted to move a paragraph or block of text from one place to another in a manuscript used scissors and glue to „cut and paste.“ With word processing, it takes keystrokes. You select (highlight) the portion of text you want to copy or move. Then you use the Copy or Cut command to move it to the clipboard, a special holding area in the computer‟s memory. From there, you can „paste or transfer, the material to any point (indicated with the cursor) in the existing document or in a new document.

Spelling Checker:

Most word processors have a spelling checker, which tests for incorrectly spelled words. As you type, the spelling checker – indicates (perhaps with a squiggly line) words that aren‟t in its dictionary and thus may be misspelled. Special add-on dictionaries are available for medical, engineering, and legal terms. In addition, programs such as Microsoft Word have an Auto Correct function that automatically fixes such common mistakes as transposed letter – replacing „the“ with „the“ for instance.

Grammar Checker:

A grammar checker highlights poor grammar, wordiness, incomplete sentences, and awkward phrases. The grammar checker won‟t fix things automatically, but it will flag (perhaps with a different color of squiggly line) possible incorrect word usage and sentence structure.

Thesaurus:

If you find yourself stuck for the right word while you‟re writing, you can call up onscreen thesaurus, which will present you with the appreciate word or alternative words.

Formatting Documents:

In the context of word processing, formatting means determining the appearance of a document. To di this, word processing programs provide two helpful devices:

- ★ Templates
- ★ Wizards

Template:

A template is a preformatted document that provides basic tools for shaping a final document, the text, layout, and style for a letter, for example.

Wizard:

A wizard answers your questions and uses the answers to lay out and format a document. In word, you can use the Memo Wizard to create professional-looking memos or the Resume Wizard to create a resume.

Among the many aspects of formatting are the following:

Font:

You can decide what font – typeface and type size – you wish to use. For instance, you can specify whether it should be Arial, Courier , or Times New Roman. You can indicate whether the text should be, say, 10 points or 12 pints in size and the headings should be 14 points or 16. (There are 72 points in an inch.) you can specify what parts if it should be underlined italic, or boldface.

Spacing & Columns:

You can choose whether you want the lines to be single-spaced or double-spaced (or something else). You can specify whether you want text to be one column (like this page), two columns (like many magazines and books), or several columns (like newspapers).

Margins & Justification:

You can indicate the din tensions of the margins – left, right, top, and bottom – around the text You can specify the text justification – how the letters and words are spaced in each line. To justify means to align text evenly between left and right margins, as in most newspaper columns. To left-justify means to alight text evenly on the left. Centering centers each text line in the available white justify means to align text evenly on the left. Centering centers each text line in the available white space.

Pages, Header, Footers:

You can indicate page numbers and heaters or footers. A header is common text (such as a date or document name) printed at the top of every page. A footer is the same thing printed at the bottom of every page.

Other Formatting:

You can specify borders or other decorative lines, shading, tables, and footnotes. You can even import graphics or drawings from files in other software programs, including clip art – collections of ready-made pictures and illustration available online or on CD-ROM disks.

- ★ It‟s worth noting that word processing programs and (indeed most forms of application software) come from the manufacturer with default settings.

Define Settings:

Default settings are the settings automatically used by a program unless the user specifies otherwise, thereby overriding them.

For example, a word processing program may automatically prepare a document single-spaced, left-justified, with 1-inch right and left margins, unless you alter these default settings.

Printing, Faxing, or E-Mailing Documents:

Most word processing software gives you several options for printing. For example, you can print several copies of a document. You can individual pages or a range of pages. You can even preview a document before printing it out.

Previewing:

Previewing (print previewing) means viewing screen to see what it will look like in printed form before it‟s printed. Whole pages are displayed in reduced size.

You can also send your document off to someone else by fax attachment, if your computer has the appropriate communications link.

Saving Document:

Saving means storing, or preserving a document as an electronic file permanently on a floppy disk or hard disk.

Saving is a feature of nearly all application software. Having the document stored in electronic form spares you retrieve it from the storage medium and make the changes you want. Then you can print it out again.

Web Document Creation:

Most word processing programs allow you to automatically format documents into HTML so they can be used on the Web.

Mail-Merge:

If we want to send out the same letter to different people, you can use a process, often called mail-merge, to print customized form letters, with different names, addresses, and salutations for each letter. This process involves combining a main document with a data source document.

Macros:

A macro is a timesaving feature that lets you abbreviate a sequence of commands or a line of text. In essence, a macro is a shorthand way to record a series of keystrokes and “play” them back at any time.

CHAPTER # 09

SPREADSHEET

SPREADSHEETS:

Traditionally, it was simply a grid of rows and columns, printed on special light-green paper, that was used to produce financial projections and reports. A person making up a spreadsheet spent long days and weekends at the office penciling tiny numbers into countless tiny rectangles. When one figure changed, all other numbers on the spreadsheet has to be recomputed.

In the late 1970s, Daniel Bricklin, a student at the Harvard Business School created the first electronic spreadsheet, now called simply a spreadsheet.

The spreadsheet allows users to create tables and financial schedules by entering data and formulas into rows and columns arranged as a gird on a display screen.

Unfortunately for Bricklin, his version (called VisCalc)was quickly surpassed by others. Today the principal spreadsheets are:

- ★ A worksheet is a single table
- ★ A workbook is a collection of related worksheets

Thus, within your Microsoft Excel spreadsheet file, you might have one workbook headed Checkbook, which would contain worksheets with the history of your checking account for the years 2001, 2002, and so on. You might have another workbook headed Credit cards, containing worksheets for each year.

WORKING & SPREADSHEETS:

A spreadsheet is arranged as follows:

How a spreadsheet is organized – column headings, row headings, and labels

In the worksheet‟s frame area (work area), lettered column heading appear across the top (“A” is the name of the first column, “B” the second, and so on). Numbered row headings appear down the left side (“1” is the name of the first row, “2” the second, and so forth). Labels are any descriptive text, such as APRIL, RENT, or GROSS SALES. You use your computer‟s keyboard to type in the various headings and labels.

Where columns and rows meet – cells, cell addresses, ranges, and values

A cell is the place where a row and a column intersect; its position is called a cell address. For example, “l” is the cell address for the top left cell, where column A and row 1 intersect.

A range is a group of adjacent cells – for example, A1 to A5. A number or date entered in a cell is called a value. The values are the actual numbers used in the spreadsheet – dollars, percentages, grade points, temperatures, or whatever. Headings, labels, and formulas also go into cells. A cell pointer, or spreadsheet cursor, indicates where is to be entered. The cell pointer can be moved around like a cursor in a word processing program.

Why the spreadsheet has become so popular – formulas, functions recalculation, and what-if analysis.

Now we come to the reason the electronic spreadsheet has taken offices by storm. Formulas are instructions for calculations. For example, a formula might be @SUM (A5:A15) meaning Sum (that is, add) all the numbers in the cells with cell addresses A5 through A15.

Functions:

Functions are built-in formulas that perform common calculation. For instance, a function might average a range of numbers off a number to two decimal places.

After the values have been entered into the worksheet, the formulas and functions can be used to calculate outcomes. However, what was revolutionary about the electronic spreadsheet was its ability to easily do recalculation.

Recalculation:

Recalculation is the process of re-computing values, either as an ongoing process as data is entered of afterward, with the press of a key.
With this simple feature, the hours of mind-numbing work required to manually rework paper spreadsheets became a thing of the past.
The recalculation feature has opened up whole new possibilities for decision making, in particular, what-if analysis.

What-if Analysis:

What if-analysis allows the user to see how changing one or more numbers changes the outcome of the recalculation.

Using worksheet templates – pre-arranged forms for specific task:

You may find that your spreadsheet software makes worksheet templates available for specific tasks. Worksheet templates are forms containing formats and formulas custom-designed for particular kinds of work.
Examples are templates for calculating loan payments, tracking travel expenses, monitoring personal budgets, and keeping rack of time worked on projects.
Templates are also available for a verity of business needs – providing sales quotations, invoicing customers, creating purchase orders, and writing a business plan.

Analytical Graphic: Creating Charts:

You can use spreadsheet packages to create analytical graphics, or charts. Analytical graphics, or business graphics, are graphical forms that make numeric data easier to analyze than when it is organized as rows and columns of numbers. Whether viewed on a monitor or printed out, analytical graphics help make sales figures, economic trends, and the like easier to comprehend and analyze.
The principal examples of analytic graphics are bar charts, line graphs, and pie charts.

Database Software:

In its most general sense, a database is any electronically stored collection of data in a computer system. In its more specific sense, a database is a collection of interrelated files in a computer system.
These computer-based files are organized according to their common elements, so that they can be retrieved easily. Sometimes called a database manager or database management system (DBMS), database software is a program that sets up controls the structure of a database and access to the data.

The Benefits of Database Software:

When data is stored in separate files, the same data will he repeated in many files. In the old days, each college administrative office-register, financial acid, and so on-might have a separate file on you. Thus, there was redundancy – your address, for example, was repeated over and over. The advantage of database software is that data is not in separate files rather it is integrated. Thus, your address need only be listed once, and all the separate administrative offices will have access to integrity. That is, the information is more likely to be accurate and up to date.
Databases are a lot more interesting than they used to be. Once they included only text. Now they can also include pictures, sound, and animation. It‟s likely, for instance, that your personnel record in a future company database will include a picture of you and perhaps even a clip of your voice. If you go to

looking for a house to buy, you will be able to view a real estate agent‟s database of video clips of homes and properties without leaving the realtor‟s office.
Today the principal microcomputer database programs are:

- ★ Microsoft Access
- ★ Corel Paradox
- ★ Lotus Approach
- ★ Oracle (For large Systems)

Features of Databases:

Let‟s consider some basic features of databases:

How a relational database is organized – tables, records, and fields

The most widely used form of database, especially on PCs, is the relational database in which data is organized into related tables. Each table contains rows and columns; the rows are called records, and the columns are called fields. An example of a record is a person‟s address-name, street address, city, and so on. An example of a field would be that person‟s first name, a third field would be that person‟s street address, and so on.

How various records can be linked – the key field

The records within the various tables in a database are linked by a key field, a field that can be used as a common identifier because it is unique. The most frequent key field used in the United States is the Social Security number, but any unique identifier could be used, such as employee number.

Finding what you want – querying and displaying records

The beauty of database software is that you can locate records quickly. For example, several offices at your college may need access to your records, but for different reasons: the register, financial aid, student housing, and so on. Any of these offices can query records (locate and display records) by calling them up on a computer screen for viewing and updating. Thus, if you move, your address field will need to be corrected for all relevant offices of the college. A person making a search might make the query, “Display the address of (your name). Once a record is displayed, the address field can be changed. Thereafter, any office calling up your file will see the new address.

Sorting and analyzing records and applying formulas:

With database software you can easily find and change the order of in a table. Normally, records are displayed in a database in the database in the same order in which they are entered. However, all these records can be sorted in different ways – arranged alphabetically, numerically, geographically, or in some other order. For example, they can be rearranged by state, by Social Security number.
In addition, database programs contain built-in mathematical formulas so that you can analyze data. This feature can be used, for example, to find the grade-point averages for students in different majors or in different classes.

Putting search results to use – saving, formatting, printing, copying or transmitting:

Once you‟re queried, sorted, and analyzed the records and fields, you can simply save them to your hard disk or to a floppy disk. You can format them in different ways, altering headings and type styles. You can print them out on paper as reports, such as an employee list with up-to-date addresses and phone numbers. You can use the copy command to copy your search results and then paste them into a paper produced on your word processor. You can also cut and paste data into an e-mail message or make the data an attachment file to an e-mail, so that it can be transmitted to someone else.

Personal Information Manager PIM

A personal information manager (PIM) is software to help you keep track of and manage information you use on a daily basis, such as addresses, telephone numbers, appointments, to-do lists, and miscellaneous notes.

Some programs feature phone dialers, outliners (for roughing out ideas in outline form), and ticklers (or reminders). With a PIM, you can key in notes in any way you like and then retrieve them later based on any of the words you typed.

Popular PIMs are:

- ★ Microsoft Outlook
- ★ Lotus Organizer
- ★ Act

Microsoft Outlook, for example, has sections labeled Inbox, Calendar, Contacts, Tasks (to-do list), Journal (to record interactions with people), Notes (scratchpad), and Files.