Computer Repair & Maintenance

Notes
II/II

Website:-

www.arjun00.com.np

Computer:-

gmp → A computer is a programmable machine that receives input stores and manipulate data and provides output in a useful format.

→ Computer is used to as an electronic device that allows inputting data and having it stored, process or otherwise manipulated quickly and efficiently.

* Components of the computer system:-

// Computer Hardware:-

→ The physical component of computer system which can be installed an operating system and a multitude of software to perform the operator's desired function.

* Hardware components:-

1) Input Device:- input devices are things we used to put information into a computer.

2) output Devices:- output device are things we use to get information out of a computer.

3) Memory:- Refers to devices that are used to store data or programs on a temporary or permanent basis for use in an electronic digital computer.

4) Microprocessor:- A microprocessor in corporates most or all of the functions of a computer's central processing unit (CPU) on a single integrated circuit.

* Computer Software: The intangible part of the computer system.

① Operating System Software :-

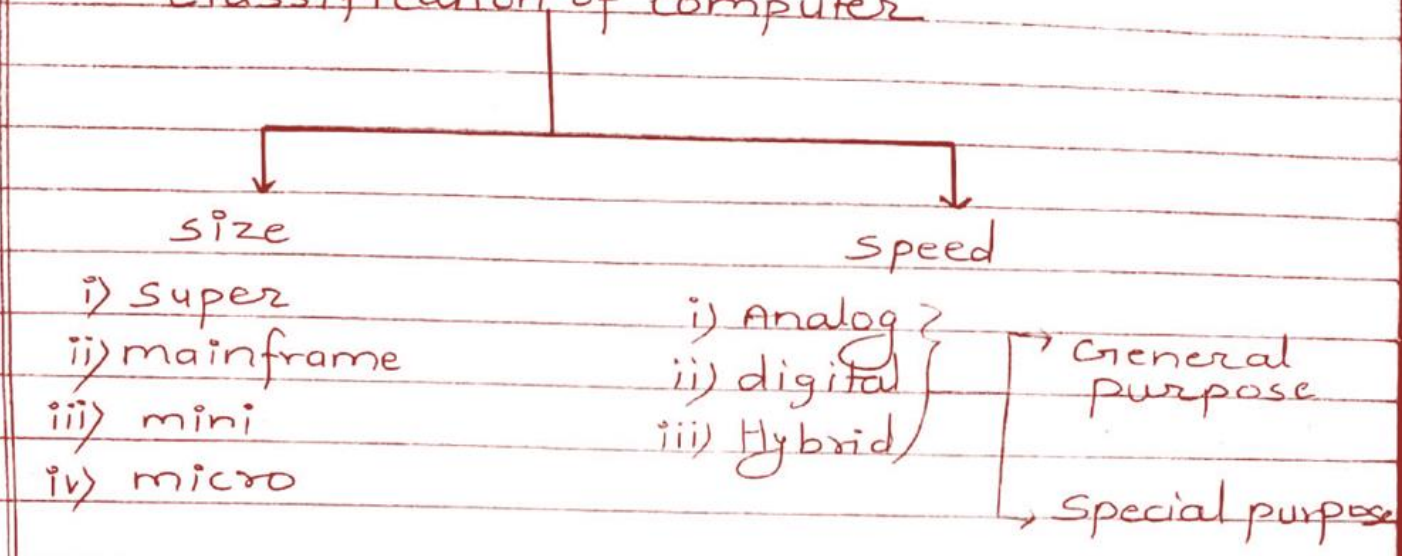
A master control program for a computer that manages the computer's internal functions and provides us with a means to control the computer's operations.

② Software Application :-

→ computer software designed to help the user to perform a singular or multiple related specify tasks. Such programs are also called software application, application or apps.

UNIT-2

classification of computer



Data:- Data is information that has been translated into a form that is more convenient to move or process

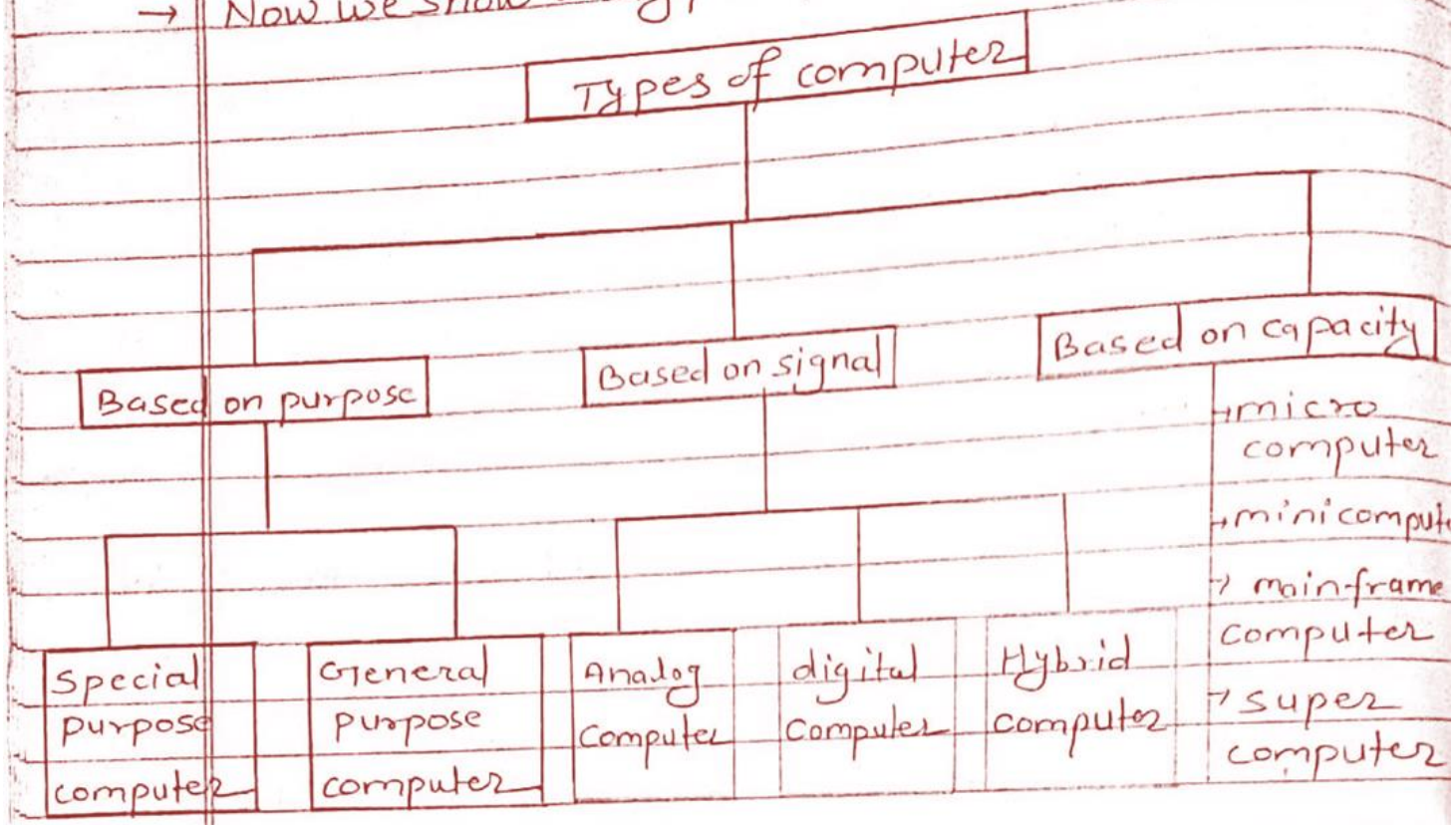
Program:- program is a collection of instruction that perform a specific tasks when executed by a computer.

Information:- Information is a facts provider learn about something or someone.

* first of all we can classify computers mainly in 3 types:-

1) Based on purpose
2) Based on Signal
3) Based on capacity

→ Now we show all types of computer in a diagram:-



classification Based on purpose:-

→ There are two types of computer based on purpose they are:-

1) Special purpose computers:-

→ Special purpose computer designed to be task specific and most of the times their job is to solves one particular problem. They are also known as dedicated computer because they are dedicated perform a single over and over again. These computer are usually to control traffic light to control the collections of tolls on Highway Navigational System an air craft weather forecasting, satellite lunch/tracking in Automobile weapons, games and so on.

2) General purpose computer:
→ Most computers in use today are general purpose Computers. Those computers built for a great variety of processing jobs simply by using a general purpose computer and different software. various task Can be Accomplished including writing and edition (word processing). manipulating facts in a database. Tracking manufacturing inventory making scientific calculations or even controlling organization security system. electric controlling organization security system. electricity consumption Building temperature and so many task.

2) classification Based on signals:
→ There are three types of computers Based on signal They are:

gmp 1) Analog computer:- These computers represent data/ information in a continuous form. That is there are no breaks during signal transmission. They represent information by processing measurable physical quantities.

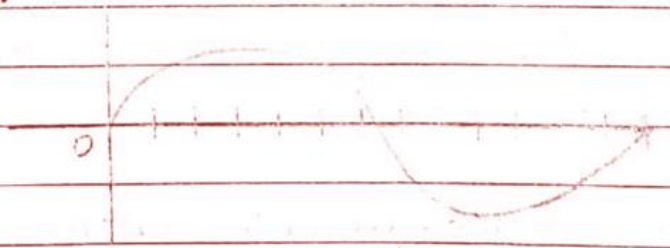


fig. Analog signal representation.

e.g. of Analog computer
- Speedometer
- Thermometer
- Conventional watch.

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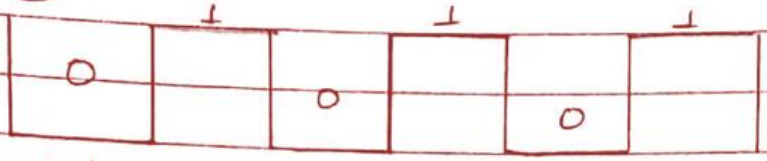
2) Digital computer:

→ These are computer that represent data/information in a binary form. that is they represent signals in just two states. 0's and 1's are used during data communication.



Digital computer signal representation.

e.g.

→ Desktop computer
→ laptop computer
→ mobile phones
→ ipads
→ iphones
→ Scientific calculators.

3) Hybrid computer:

→ These computer exhibit features of analog Computers and digital computers. The digital Component normally serves as the controller and provides logical operations, while the analog Component normally serves as a solve of different equations.

e.g.

→ Automatic teller machine (ATM)
→ Electrocardiagram.

3) Classification based on capacity:-

⇒ There are 4 kinds of computers based on capacity They are:-

1) Microcomputer: Micro computers are mainly knownas personal computers. These types of computers are microprocessor based. The microprocessor called the brain of a micro computer it is a silicon chip which Contains necessary circuit for performing arithmetic and logic operations.

2) Mini computer: Mini computer is small in size than the other computer of those times mini computer are used by small business and firms. mini computer are also called as mid range computers. these are small machines and can be accomodated on a Disk with not as processing and data storage capacities as super Computer and mainframes but it is powerful than micro computer.

3) Mainframe computer: A mainframe computer is very large computer and it can handle major application. it can contains large database that can accessed with a simple terminal although mainframes are not as powerful as Super computer but certainly they are quite expensive and many large firms and government.

organizations uses mainframes to run their run business, the mainframe Computer can be accomodated in large air-conditioned rooms because of its size mainframes are designed to handle very high volume of input and output.

4) Super computer: The most powerful computers in turns of performance and data processing are the super computers. there are specialized-

and task specific computers used by large organization these computers are used for research and exploration purposes, like NASA users Supercomputers for launching space them and for space exploration purpose. the super computers are very expensive and very large in size.

Roles of computer

Use of computer:-

→ Computers play a vital role in every field. They aid industrial processes. They find application in medicine this is also why are education system has made computer education a part of school curriculum and also many people uses the computer for communication is also use in Science, education, medicine engineering, entertainment, business, banking etc.

Application of computers:-

→ Science
→ Education
→ Medicine
→ Engineering
→ Entertainment
→ Communication
→ Business application
→ Banking
→ Others

Uses in science field:-

→ The main impact of the computer on science promises to come not in its role as a powerful research instrument but rather as an active participant in the development of scientific theories.

→ From of computing which uses DNA, biochemistry and molecular biology reading blood group.

* Uses in education field:

→ Computer technology has had a deep impact on the education sector. Thanks to computers, imparting education has become easier and much more interesting then before.

→ Computers facilitate effective presentation of information presentation software like power point and animation software like flash among others can be of great help to teachers while delivering lecture.

→ storage of information Quick data processing Audio-visual aids - in teaching Better presentation of information Access to the internet Quick communication between students teacher and parents.

* Uses in medicine field:

→ The use of computer technology has greatly enhances the medical field. This is particularly so in hospital environments where reliability and quality are critical factors many computer applications such as patient information system monitoring and control systems and diagnostic system have been used to enhance healthcare.

→ Another usage of computer application in the hospital is a patient monitoring and control system. According to Longman information Technology for CXC these systems.

"help doctors treat patients by providing 24 hour service and by this reduce the level of false alarms" for example, Some surgery patients must continuously be monitored.

uses of computer in engineering:

→ The engineering field uses computers a lot for aiding the type of detailed and precise processes used to perform various tasks. The primary software for engineering computers is called computer aided engineering software or CAD software.

→ Computer-aided software assists engineers when analyzing fluild for hydraulic equipment. stress analysis optimizing certain engineering processes. and for analyzing the safety of certain engineering processes and for analyzing the safety of certain processes. CAD is also used in the automotive industry for similar purposes.

Computer in business application:

→ Computer have become a requirement the business industry computers easily complete duties that are tedious and timely for humans. The business users of computers are extensive.

Accounting:

Business success is depending upon accuracy. many business use accounting software and ledgering systems to ensure the accuracy of their financial status.

* Customer interaction:

→ Computers now assist human call centers with any answering customer questions talking payments and providing general assistande. The automated voice systems are available with unrestricated hours and are always friendly.

* Communication:

→ Communication is most important in business Computers provide business with a wide array of Communication methods the include but are not limited to email chat wed confrecing and vorp.

HISTORY OF COMPUTER

* History of computer :-

→ The repetitive process of computation leads to people becoming bored in computing such as Navigational table tide charts and planetary position for astronomical almanacs people were doing these things every day and this is the reason why people invented computers that is to aid it Numerous computation required everyday.

* The Abacus :-

→ The first computing aid that were used to help them in their computation.

* The Napier's Bone :-

→ An Abacus created by Jhon Napier for calculation of products and quotients of numbers that was based on Arab mathematics and lattice multiplication used by fibonacci writing in the Liber Abaci.

* The slide Rule :-

→ used primarily for multiplication and division and also for "Scientific" functions such as roots logarithms and trigonometry. but is not normally used for addition or subtraction.

* The Calculating clock / schickard Calculator :-

→ Consisted of a six-digit machine that could add or subtract.

→ wilhelm schickard developed it on 1623 in Tubingen wurtemberg.

* The pascaline:
→ The first calculator or adding machine to be produced in any quantity and actually used. it could only do addition and subtraction, with numbers being entered by manipulating its dials.

→ designed and built by the french mathematician philosopher Blaise pascal between 1642 and 1644.

* The Step Rockoner:
→ The first calculator that could perform all four arithmetic operations: addition, subtraction, multiplication and division.
→ invented by German mathematician and philosopher Gottfried wilhelm Leibniz around 1672 and Completed 1694.

* The Difference Engine:
→ An automatic machanical calculator designed to tabulate polynomial functions.
→ By 1822 the English mathematician Charles Babbage who is considered as father of the Computer today was proposing a steam duriven Calculating machine the size of room.

* The Hollerith's Tabulating machine:
→ The electro-mechanical tabulator.
→ on the tabulator's desk to the right is a press-like device which would bring an array of pins into contact with a punch card.

* The mark I :-
→ The first large-scale automatic digital computer the USA by Howard H. Aiken, built at IBM and shipped to Howard in february 1944.

* The Apple-I :-
→ An early personal computer.
→ They were designed and hand-built by steve Wozniak.

* The PDP-12 :-
→ A 12 bit machine introduced in 1965. Applications included applied psychology, chemistry, patient monitoring and industrial testing.

* The IBM personal computer :-
→ The original version and progenitor of the IBM pc Compatible hardware platform.

Generation of computer :-
1) first generation computer (1945 - 1954)
i) They used vaccum tube for storage media.
ii) Storage capacity was too small (1 to 4 kb).
iii) processing speed was interms of mili second.
iv) They were used for scientific purpose or research.
v) They were large size and vaccum tubes used to get not every frequently.

2) Second Generation Computer (1955 - 1969)
i) They used transistor instead of vaccum tube for processing.
ii) processing speed was interms of microsecond.

iii) They have comparatively high speed small in size more reliable and less expensive.
iv) They used magnetic core memory as primary storage/magnetic tape as secondary storage.
v) They should understand high level language.

3) Third Generation computer (1965 - 1974)
i) They used integrated circuit (IC) instead of transistor for processing.
ii) Semi-conductor memory was used as primary storage
iii) Speed is high than second generation measures interms of nanosecond.
iv) Size is reduce than second Generation.
v) multi-processing and multi-programming are develop.
vi) They support high level language, C, FORTAN, BASIC, COBOC etc.

4) Fourth Generation computer (1975 - 1991):-

i) They used very large Scale integrated circuit (VLSI) was used as processor.
ii) Size is reduce as desktop or laptop size.
iii) Speed is high than third generation measures interms of picosecond.
iv) They support high level language. C, C++, Java.
v) They support database language ORACAC, Access etc.

5) Fifth Generation computer (1991 - upto present):-

i) They used bio-chip as processor.
ii) They process special characteristics as Artificial intelligence (AI).
iii) Speed is measure interms of fintosecond.
iv) Size is reduce than previous.

style in size:-

→ The computer contains all the hardware components of your pc inside you would find in motherboard. CPU, RAM, hard drive (HDD) and may be a DVD drive computer case is available in different size, shape, color and materials. the style of case is determined by the size of the motherboard and roles of computers. Some of the CASE style which you may see traditional desktop CASE move modern CASE is design with frame use port memory cardreader, headphone parts etc.

Drive Bay:-

→ A Drive Bay is a system unit space reserve for the installation of any drive on other computer parts. A computer drive Bay is a standard size area in computer where hard drive floppy disk DVD drive can be installed. most drive Bay are fixed inside of CASE but some internal Bay cannot access from outside and are use for internal drivers. e.g. USB, floppy disk, DVD drive, optical disk etc.

NIC (Network interface card):-

→ NIC provides the physical interface between computer and cabling.

→ It prepares data sends data and controls the flow of data. It can also receive and translate data into bytes for the CPU to understand.

→ It has specific MAC address (48 bit).

→ ethernet is a physical and data link layer -

technology for local area network (LANs).

* What are Networking Devices?

→ Network devices are components used to connect computers or other electronic device together, so that they can share files or resources like printer or fax machines devices used to setup a local area Network (LAN) are the most common type of Network devices used by the public. A LAN requires a, hub, switch, router.

Network Devices:

→ NIC (Network interface card)
→ Repeater
→ modem
→ Bridge
→ HUb
→ Switch
→ Router

2) Repeater: Network repeators regenerate incoming electrical, wireless or optical signals with physical media like ethernet or wifi data transmission can only span a limited distance before the quality of the signal degrades. repeators attempt to preserve signal integrity and extend the distance over which data can safely travel.

→ Repeators remove the unwanted noise in an incomming signal.
→ It can't filter the signal traffic.
→ It works in physical layer of OSI model.

3) Modem:- The word modem comes from "modulator" demodulator"
modulation:- digital information to analog signal.
Demodulation:- Analog signals back into useful digital information.

→ An ISP (Internet service provider) is represented to complete connection to the internet.

Types of modem

DSL (Digital Subscriber line)

ADSL (Asymmetric digital subscribe line)

4) HUB:- There are two types of hubs active & passive.

→ passive hubs simply connect all parts together electrically and are usually not powered.

→ Active hubs use electronics to amplify and clean up the signal before it broadcast to the other part.

→ Hubs are device used to link several computers together.

→ They repeat any signal that comes in on one part copy it to the other port. The process also called broadcasting.

5) Bridges:

→ They join similar topology and are used to divided network segments.

→ It can filter trafic on the basis of MAC address.

→ If it is aware of the destination address, it is able to forward packets, otherwise bridge will forward the packets to all segments. they are more intelligent than repeaters but unable to more data across multiple networks simultaneously.

6) Switches:

→ A network switch is a computer networking device that connects network segments.

→ popular MAC address table on the basis of source MAC address of a frame.

→ Network switches are capable of inspecting data frames as they are received determining the source and defination device of that frame and forwarding it appropriately.

→ A vital difference between a hub and switch is that all the nodes connected to a hub share the bandwidth among themselves, while a device connected to a switch port has full bandwidth all to itself.

7) Router:

→ Router are highly intelligent devices, that connect multiple network types and determine the best path for sending data.

→ Router are normally used to connect one LAN to another.

→ These devices examine incoming packets to determine the defination address of the data.

→ However, they are slower than bridge because they are more intelligent device as such they analyze every packets causing packet forwarding delays. because of this intelligence it is expensive
→ Router are OSI Network layer 3 devices.
→ Filter trafic on the basis of ip address.

Form factor :- Specifies size, shape and features of a device determined by motherboard.

* Using the same form factors :-
→ Motherboard fits the case.
→ power supply cards provides proper voltage.
→ Motherboard & case holes align properly.
→ Case and motherboard ports align.
→ wires on case match connections on motherboard.
→ power supply holes align with case.

* Types of form factors :-
1) ATX form factor :
→ Motherboard dimensions : upto 12" x 9.6"
→ versions :
→ ATX version 2.1 specification added 4-pin auxilary Connector.
→ ATX version 2.2 allowed for 24-pin pI connection

2) Micro ATX form factors :
→ Reduce total cost of a system.

3) Flex ATX :-
→ variation of micro ATX with maximum flexibility.

4) BTX (Balance Technology extend):-

→ Developed to improve older & similar LPX form factors.

* LED: (Light emmiting Diode):-

→ A Light emmiting diode is essential a pN junction up-to Semi-conductor that emits a monochromatic (single color) light when operated in a forward biased direction.

LED Convert electrical energy into light energy. they are frequently used as "pilot" light in electronic application to indicate whether the circuit closed or not.

* Application of LED:-

→ Mobile application
→ Senser application
→ Sign application
→ LED signals
→ optical switches
→ Illuminations
→ Indicators
→ Automative uses

What is motherboard?

→ The motherboard is the backbone of a computer. It provides the foundation for the computer. Every piece of hardware directly or indirectly plugs into the motherboard the components of the motherboard provides basic services needed for the machine to operate and provides a plate from for devices such as the processor, memory, disk device and expansion devices. It is a large flat multi-layered PCB (printed circuit Board) covered with sockets, other electronic parts and various chips. the layer contain a highway of wires, carrying databack and forth between CPU, RAM and peripherals.

Function of motherboard:-

→ Motherboard connects all system components.
→ Allows input and output devices to communicate with system unit.
→ It is the communication medium for entire computer system.
→ It acts data path for various components.

characteristics of motherboard's

i) Form factors
ii) chipset

ii) chipset: Motherboard is generally identified by its chipset number. The chipset devices the type of processors and the motherboard. it concept the type and capacity of RAM and type of internal and external devices supported by motherboard.

They vary in features performance & stability this set of chips contain how motherboard behaves.

⇒ Types of chipset:
- North bridge
- South bridge

i) North bridge:
→ The north bridge chipset on motherboard helps the cpu to work with RAM and graphic card.
→ North bridge have a very huge amount of data processing device connected so it get hot so there covered with heat Sink and sometime by fan assembly.
→ It is also connected to south bridge.

ii) South bridge:
→ It contains mass storage devices, USB, PCI, BUS and other expansion buses.
→ South bridge is one of the two chips which control the function of processor except memory, pci and AGP.
→ Most south bridge don't need extra cooling fan.

CPU Socket:
→ modern motherboards come with either PGA or LGA cpu socket.
→ Both sockets are ZIF (zero insertion force) type, which require zero force for cpu placement and has a locking level to secure it.

Memory slot:
→ This are used to install memory sticks on the motherboard.

→ modern motherboard usually has at least two or RAM slots may have four or six.
→ RAM slots are very specific and will accept only certain types of RAM base on specification of motherboard.

power connector:-
→ It is used to connect main power connectors from SMPS to the motherboard.
→ In AT motherboard it consist of 12 pin connector.
→ In ATx motherboard it consist of 20 or 24 pin has a match of one side.

IDE/PATA:-
→ It is a 40 pin socked on motherboard which provides a interface to connect storage devices like hard disk & optical disk.
→ We can connect maximum 2 IDE device to each IDE interface.
→ ATx motherboard has two IDE interface, but today's modern motherboard has only one. It replace by SATA.

SATA:
→ It is a latest interface that connects mass storage devices like hard disk & optical disk.
→ It transmitted data serially.
→ SATA drivers provides faster transfer rate as compared to PATA.
→ It supports only one device per port.

CMOS battery (complimentry metal-oxide semiconductor)
→ CMOS stores bios setting.

→ It's a 3v battery known as CMOS battery.
→ If this battery falls, than pc couldnot store date & time.

BIOS chip:
→ It is the special memory chip that contains BIOS software which tells the processors how to interact with the rest of the software in the computers.

Expansion slots: These are used to expand the capacity of the computer by installing the cards like, sound card, video card (graphic) network modem etc.

PCI (peripheral component interconnect):

→ It is the most commonly used internal expansion slots found inside the pc.
→ PCI will be replaced by PCIe.

AGP (Advance graphic part):
→ It is brown color slot mostly used installing graphic card.

PCIe (X1):
→ It is used to interface modem expansion card. like TV card, NIC, sound card etc.

PCIe (X16):
→ It is used to interface recent graphic cards.

Ⓐ PS/2: The personal system/2 in 6 pin connector like keyboard, mouse.

→ It's name come from IBM personal system/2 series of personal computer. PS/2 connector was replace by USB.

VGA port:-(video graphic adapter):-

→ It is 15 pin port.
→ It is used display device like monitor.

HDMI (High definition multimedia interface):-

→ It is a audio, video interface for transfering video data & digital audio data from an HDMI.

USB port (universal series BUS):-

→ It is used to 4 pin connecter.
→ It is connect USB device like keyboard, printer.

1. INPUT DEVICE

Input Device :

→ The device which is used to enter data, instruction or any information into computer system is called input device.

→ Types of input device

→ Barcode Reader
→ MICR
→ OMR
→ Magnetic Strip
→ Joystic
→ chip reader
→ Track ball
→ Scanner
→ Touch pad
→ light pen
→ web cam
→ keyboard
→ mouse
→ microphone
→ OR Scanner

i) Barcode Reader :

→ A barcode Reader is an electronic device for reading printed barcodes like a flatbed scanner. it is consist of a light source a lens and light sensor translating optical impulses into electrical ones where supermarket it used to read prize.

ii) MICR : magnetic ink character Recognization or MICR is a character recognization technology used primarly by the banking industry to facilate the processing of -

cheques. the technology allows computers to read information (such as account number) of printed documents unlike barcodes or similar technology however MICR codes can be easily read by human.

iii) OMR: (optical mark recognization):

→ optical mark recognization (also called optical mark reading and OMR) is the process of capturing human-marked data from document forms such as survery tests and questionnaire.

Where school, company for making examinations.

iv) Mgnetic Strip:-

→ A magnetic strip card is a type of card capable of storing data by modifying the magnetism of tiny iron-based magnetic particles on a band on magnetic materials on the card. the magnetic strip sometime called a mggstrip is read by physical contact & swiping past a reading head. Where shopping mall, supermarket paying money.

V) Joystick:

→ A joystick is an input device consisting of a stick that pivots on a base and reports is angle or direction to the device it is controlling. joysticks are often used to control video games, and usually have one or more push-buttons whose state can also be read by the computer. A popular variation of the joystick used a modern video game consoles is the analog stick

→ Games shop, home, Aircraft, cranes, Trucks.

→ playing Games (play station and computer), controlling machines.

vi) Track Ball:-

→ A tracker Ball is an input devices where a finger is used to rotate a ball. This moves a pointer on the screen.

→ computer

→ to move the pointer on the screen.

vii) Scanner :-

→ A scanner is a device that captures images from photographic prints, posters, magazine pages and similar sources for computer editing and display.

→ office, school etc.

→ Scanning information into the computer.

viii) Touch pad:

→

power suply

Rating:-

The overal power drop on the device is limited by fact that all of the comes through one transfer and any its primary side circuit like switching component, total power require for personal computer many range from 250 watt to 1000 watt for high performance computer with multigraphic cards personal computer reasly required more than 300 watt to 500 watt power.

The system power consumption is sum of the power rating for all the components of the computer system that draw the power supply may fully serve.

Working principle of power supply:-

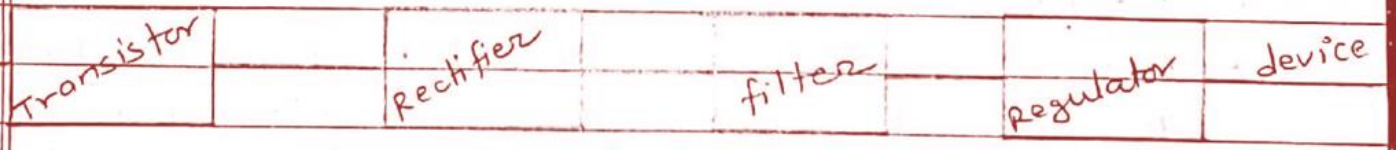
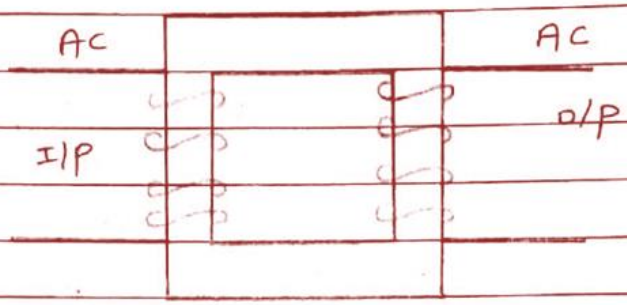


fig. Block diagram of working principle of power supply.

Every electronic device get its power from a direct current (DC) supply. like computer, cellphone music player; etc. It cannot run directly alternating current (AC). then the household electrical used circuit that convert AC to DC.

following are component of circuit:

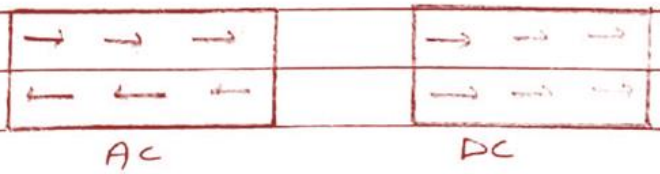
① Transformer :-



⇒ Transformer is a device with two coils surrounded by an iron efficiency reduce the voltage to the level of the circuit need. The transformer used only AC power supply it reduce the incoming voltage as need.

② Rectifier :-

→ After reducing the voltage of power supply convert AC to DC with device called rectifier. In ac current flow backward & DC flow in one direction. The diode inside a rectifier act as fast one way switches reverse the current when the AC flow backward because rapid switching action.



③ Filter :-

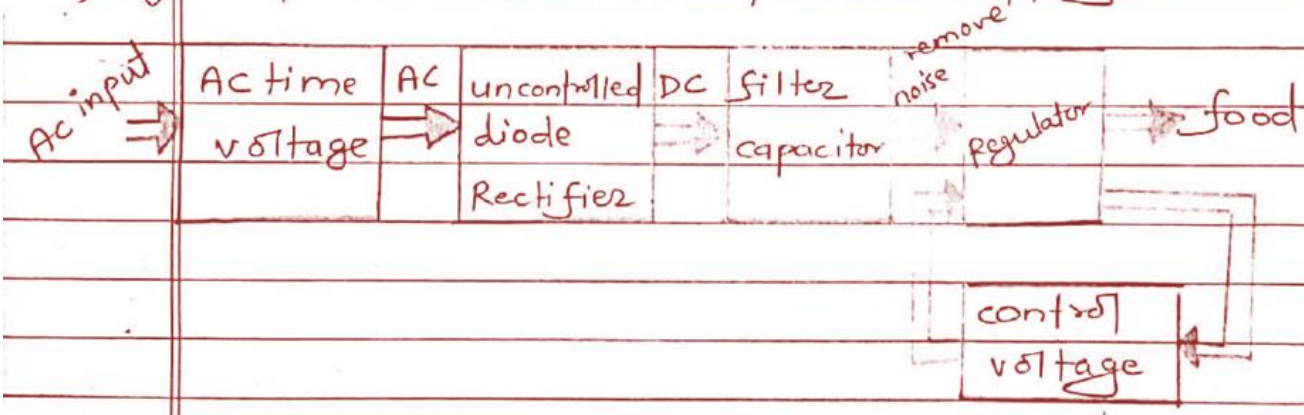
→ To remove the electrical noise that rectifier produce. DC power supply use one or more large capacitors these component observe the noise.

energy something it output. The capacitor also acts as reservoir providing additional electrical current for brief of greater demand for an example an audio amplifier use more current during music player.

4) Regulator:-

→ DC power supply white filter remove the electrical noise from DC. its voltage is decrease when a device use more current the household demand regular voltage to a fixed value a good regulator will hold voltage steady to within a few percentage of its name rating.

gms #) SMPS (Switch mode power supply):-



→ Switch made power supply is must prevalling architecture for DC power supply in New Technology (system) primary for its capacity to handle holds the power supply is becoming a great area of Concern for power supply design on AC to DC Convert smps circuit having a power most feet for switching operation and pwm (power switch mode) base feedback circuit for driving the switching mode of the most feet. In design the line

voltage at 220V/50Hz is taken as input, this voltage is step down rectifier and passed through filter capacitor to given an on regulator. DC voltage This unregulator voltage is chopped using mostfeet switch driven by pwm feedback signal to convert output voltage.

Application of SMPS:-

→ used for TV, monitor, PC, Laptop, printer, fax machine, CD player etc.

→ To reduce the cost, size and weighted of power supply.

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Processor (CPU)

* Introduction:-

→ A processor is the logic circuitry that response to the processes. the term processor has generally replaced the term central processing unit (CPU). The processor in a personal computer or embeded in small device is often called microprocessor

Microchip implanted in CPU's hard drive that process instruction sent to it by the computer software program. processor come in number of size and manufacture by such corporation as intel and advance microdevices. the greater gigahertz (GHz) capacity & quicker. then computer will be able to process instruction sent to it.

Example: Intel, pentium, dual core, Guard core, octa core, I3, I5, I7, AMD, celeron.

* ALU (Arithmetic logic unit):

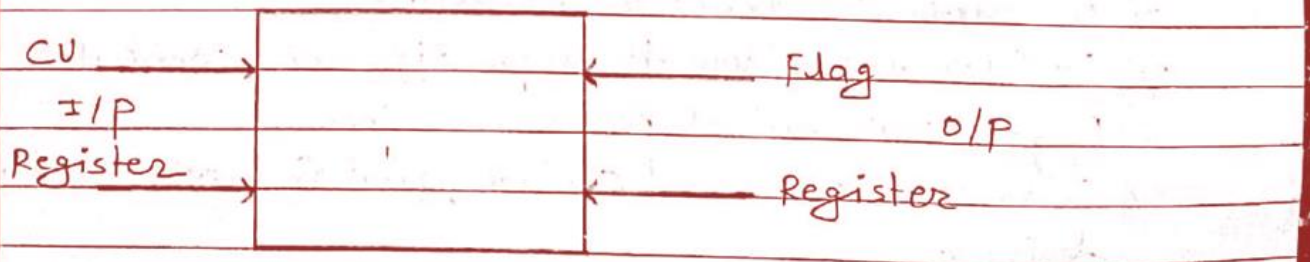


fig. I/o cycle of ALU

→ ALU stand for arithmetic logic unit. An ALU is an integrate circuit with in a cpu. that perform arithmetic and logic operations. Arithmetic instruction include addition, subtraction, multiplication, division and shifting the operation while logical instruction

Include composition such as AND, OR, X-OR, NOT operation.

Control unit (CU):

→ A control unit (CU) handle all processor control signals. It directs all input and output flow, fetches code for instruction from microprograms and directs other units and models by providing control and timing signal. A CU component is considered the processor brain because it issue orders to just about everything and ensure correct instruction execution.

A CU takes input from the instruction and status register. It roles of operation or microprogram are encoded on a programmable logic array (PLA) Random Read only memory (ROM).

* Function of CU:

1) control sequential instruction
2) Intrupts instruction handling
3) Guides data flow through different computer
4) Regulate & control processor time.
5) Send and recieved control signal from other computer devices.
6) Handles multiple tasks such as fetching, decoding, execution handling and storing result.

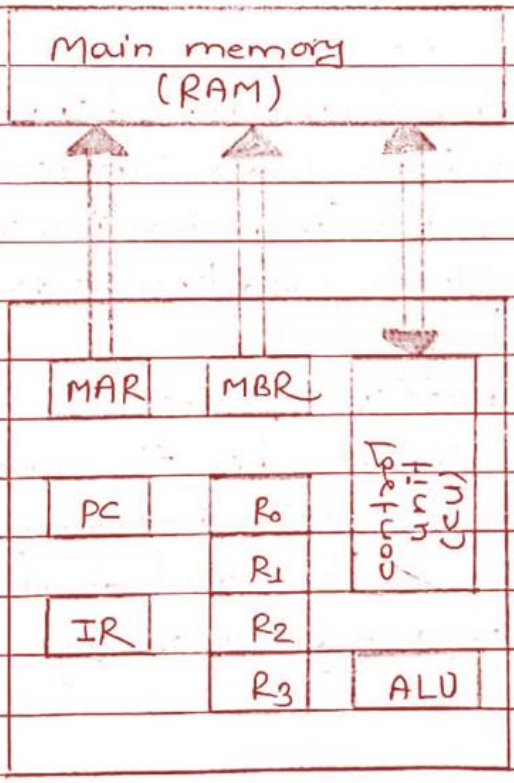
2nd

* Register:

→ A Register is one of a small set of data holding place that are part of a computer processor. A register may hold a computer instruction storage address or any kind of data (such as a bit sequence or individual character) Some instruction specify register of part of instruction.

There are many register used in computer

1) MAR (memory address register)
2) PC (program counter)
3) Ac (Accumulator counter)
4) IR (Index Register)
5) MBR (memory Buffer Register)



1) MAR:
→ This register holds the memory address of data and instruction. It is used to access data instruction from memory during the execution phase of an instruction.

2) PC (program counter):
→ The program counter commonly called the instruction pointer (Ip). Some time called instruction address register.

3) AC (Accumulator counter):
→ The register is used for storing result. there are produce by system.

4) IR (Index Register):
→ A hardware element which hold a number that can be added to (or in some cases subtract from) the address position of a computer instruction to form as effective address also known as base register.

5) MBR (Memory Buffer Register):
→ Memory Buffer Register hold the contents of data or instruction from or written in memory. It mean that this register is used to stored data/instruction comming from or going to memory.

Machine cycle:

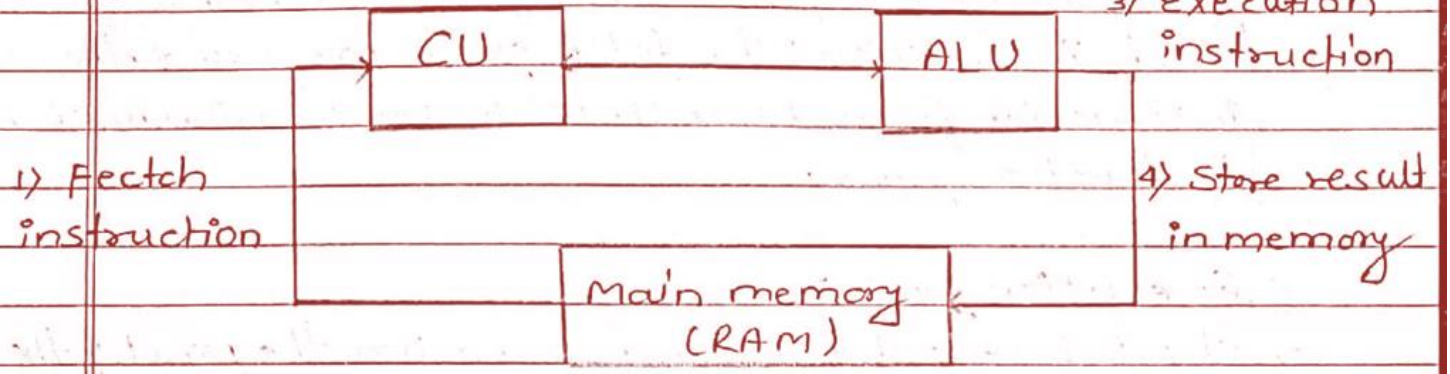


fig. machine cycle.

→ The machine cycle include 4 phase fetch, decode, execute & store.

1) Fetch instruction :-
→ Fetch instruction Fetch the data and instruction from main memory to computers program counters stored address which contain next instruction that is to be executed.

2) Decode :-
→ The instruction decode interprets the instruction all required data = Fetch from main memory and put into data register.

3) Execution instruction :-
→ CU passes the decode instruction to different parts of CPU to perform the action that are required.

4) Store result :-
→ Result of calculation in cpu stored in main memory or send to to output devices.

2) Instruction cycle:

→ Step1, Step2 of the machine cycle are called fetch cycle (instruction cycle) These steps are same for each instruction. The fetch cycle processed the instruction from the instruction word which machine instruction cycle.

3) Execution cycle:

→ Step 3 & step 4 of machine cycle are the part of the execution cycle. These steps will change with each instruction execution & then stored the result or output

(#) Bus Architecture:

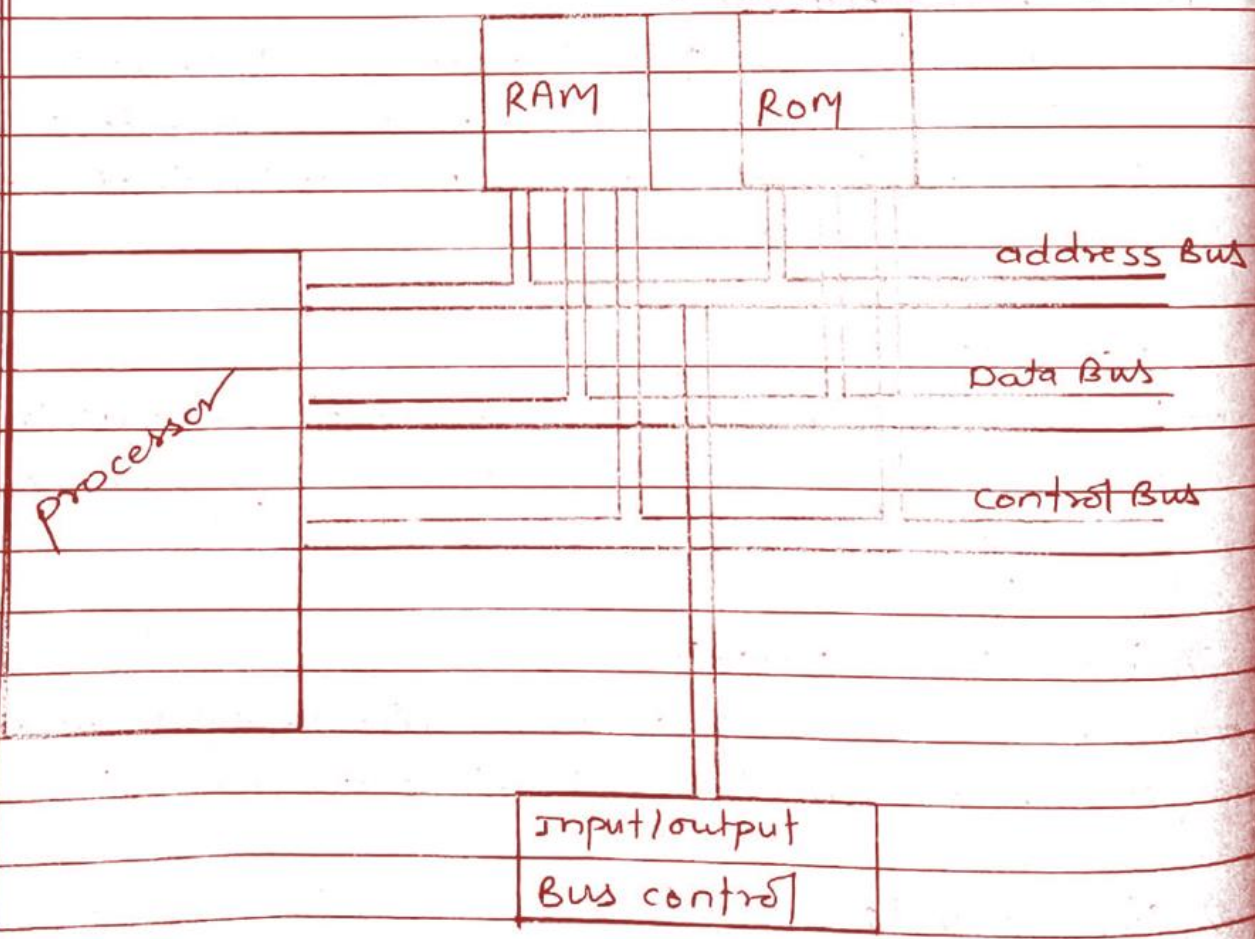


fig. Bus Architecture

1) Address Bus:-

→ processor issues the address of instruction (byte or word) to the memory system through the address bus. processors execution unit when required issues the address of the data to the memory system through address bus. the address bus of 32 bit fetches the instruction or data from address specified by a 32 bit number.

2) Data Bus:-

→ When the processor issues the address of the instruction. It gets back the instruction through the data bus. When it issues the address of the data it load the data through the data bus. When it issues the address of the data it stores the data in memory through the data bus.

A data bus 32-bits fetches, load or store the instruction data of 32-bit.

3) Control Bus:-

→ It issues signals to control the timing of various actions during interconnection Bus signals synchronize the Subsystem control Bus system from processor to meinory read memory write, I/o read, I/o write. Control bus signal from processor to address fetch enable or data valid

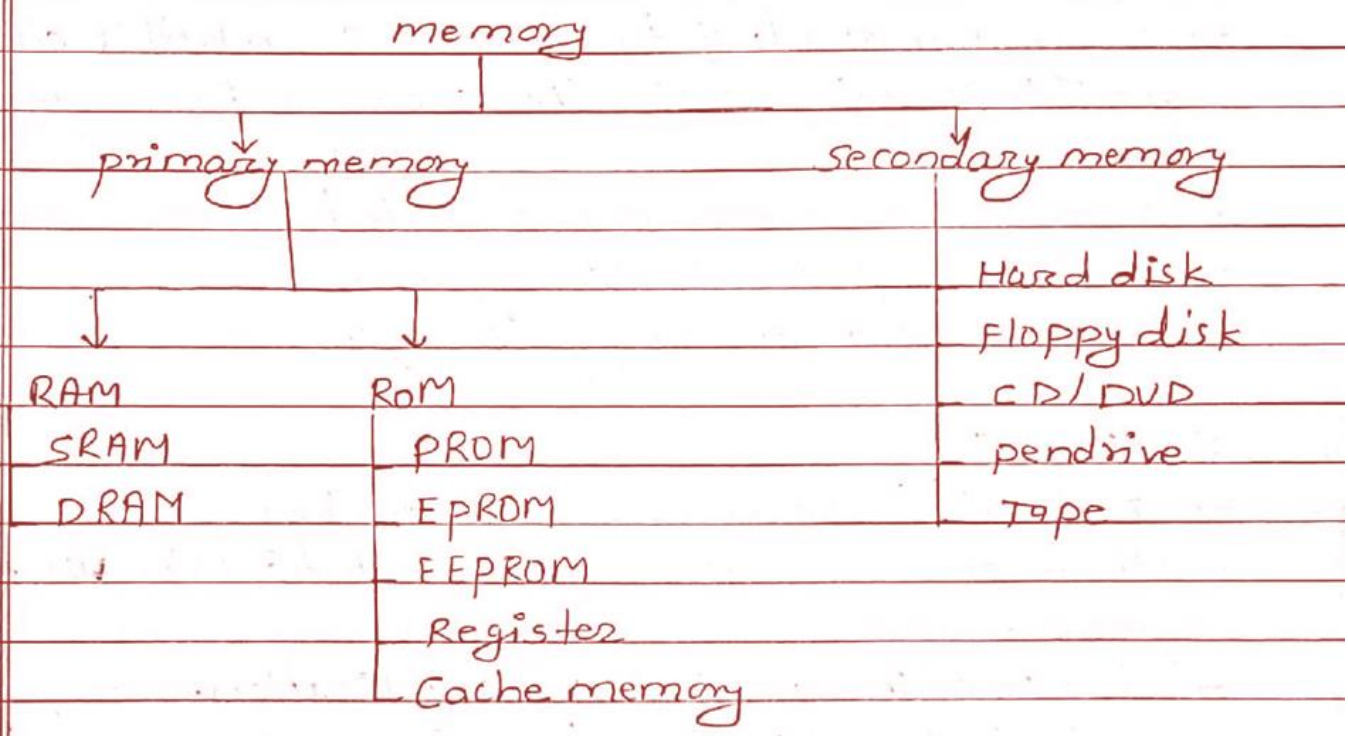
UNIT-10

Storage Device

* Memory:

→ Computer memory is a data stores devices. there are two categories:

① primary memory
② Secondary memory



1) primary memory (RAM):

→ The term random access means that any word in the memory may be accessed, without having to go through all the other words to gets to it.

→ it can read & write
→ memory consists of integrated circuit eithers or motherboard or small circuit board attached to motherboard.
→ Memory enhance easily by adding memory chip
→ It is volatile form of memory.
→ It is two types:

① DRAM
» SRAM

i) DRAM:
→ It only holds data if it is continuously accessed by a refresh circuit.
→ Many hundreds of times each second, this circuit reads and then write the contents of each memory cell.
→ It is slower & more complicated than SRAM
→ It is cheap & take less space.
→ It is used as primary storage.

ii) SRAM:
→ It is also a volatile storage devices.
→ These chips are more complicated & take up more space.
→ It is used in specialized application.
→ It is fast and access time 80 nano-second to read from or write into any location.
→ It is expensive.

2) ROM:
→ ROM is built in computer memory containing data that normally can only be read not write to.
→ ROM memory is pre-set memory.
→ ROM is one in which information are stored permanently.
→ The access time is very fast.
→ ROM is very expensive to design & manufactured.
→ ROM is non-volatile memory.

* Types of ROM :-

i) PROM
ii) EPROM
iii) EEPROM

i) PROM (programmable Read only memory) :-

→ PROM are programmable to record information using a facility known as PROM programmer.
→ The recorded information cannot be changed.
→ It is also non-volatile storage.
e.g. videogames, mobile phones etc.

ii) EPROM (Erasable programmable read only memory) :-

→ It was developed to allow programmers to reprogram permanent read only chips.
→ It is erased an a reprogrammed by exposing ultra violet light inside the chips.
→ It were used in the IBM old pcs and XTs for storing the BIOS information.

iii) EEPROM (Electrically Erasable programmable Read only memory)

→ It allow the erase of ROM chips on the fly.
→ It send a series of special electrical signals through the chip erases EEPROM chips.
→ EEPROM chip is often referred to as CMOS BIOS chip in Computer.
→ Information erased by electrical pulse like flash memory.

④ Cache memory :-

→ Cache memory is the faster memory in a computer. It is typically integrated on the motherboard and directly embeded on the processor and main memory.

→ Cache memory provides faster data storage and access by storing an instance of programs and data routing accessed by processor. Thus when a processor requests data that already has an instance in the cache memory, it doesnot need to go to the main memory or hard disk to fetch the data.

⑤ Register :-

→ In a computer, a register is one of a small set of data holding places that are part of a computer processor. A register may hold a computer instruction, a storage address or any kind of data (such as a bit sequence or individual character).

2) Secondary storage device :-

→ This section of the memory is also referred to as backup storage.

→ The storage capacity of secondary storage is large than primary.

→ The secondary storage also known as external storage or auxilary storage. It is not directly access by processor.

Types of secondary storage

i) Hard disk

ii) Floppy disk

iii) Compact disk
iv) Tape devices
v) USB Storage

i) Hard disk:-
→ Hard disk has the storage capacity of 20GB, 40GB, 80GB, 500GB, 1TB.
→ CPU use the hard disk to Load programme and data as well as to store data.
→ To prevent hard disk crash must operate the pc within dust free and cool room.

ii) Floppy disk :
→ It is a flexible circular disk of diameter 3 inches made of plastic coated with a magnetic material.
→ It is a square plastic jacket.
→ It can store 1.4mB of data.
→ It can be read & write.
→ It has limited life time.
→ It has to be recycle periodically to keep alive. 3 to 4 year.

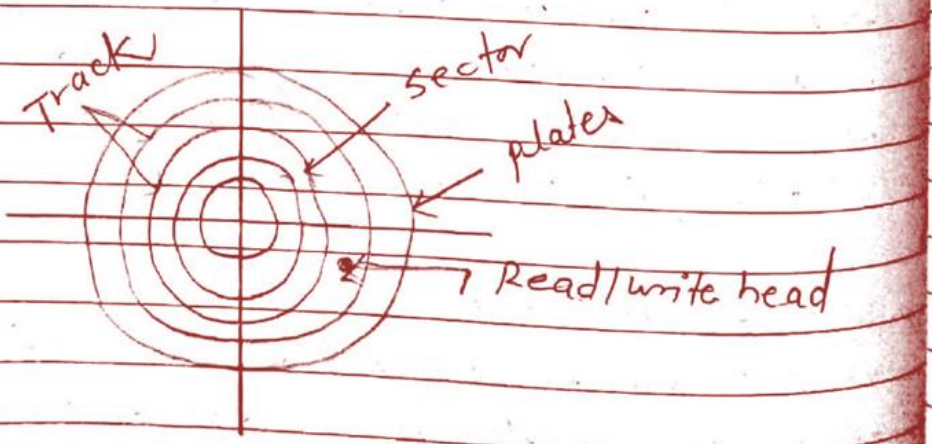
iii) Compact disk (CD):
→ A CD ROM was a laser scan to record and read data along spiral tracks on a 5 1/4 disk.
→ A disk can store around 650 mB of data
→ A CD-ROM are normally used to store data as back-up.
→ Lots of information can be written on CDROM and stored for future used.

iv) Tape devices :
→ It is one of the oldest of Storage technology.
→ It can hold the most data on a single cartridge.

→ A computer tape drive works similar to a tape recorder or VCR.
→ It is a sequential and non-random access media.
→ It access data slow so tap is mainly used for system back-up.

v) USB storage media:-
→ micro vault media plugs directly into the computer's USB port and acts just like another drive.
→ It is small light, shock-proof and moisture proof.
→ The device is recognized automatically when we connected it to the computer.
→ By connecting it via USB the files can be transferred by dragging & dropping.

④ Construction of HDD:-
→ IBM company developed first hard disk in 1956. It was the size of disk washer with fifty plates each with a two fet diameter these plater could hold 160kB of data. Seagate technology is used developed first winchester 5.25 hard drive with four plater capacity of 5MB data in 1930.



1) Disk plates:
→ The platter is made up of a magnetic material in the that disk part of drive.
→ The data stored in the platter.
→ Each set of magnetic particles is collection a unit called bit.
→ New hard drive technology uses thin-film metals & glass plates to increase efficiency & drive storage capacity.

2) Read/Write head:
→ The heads read & write the information to the drive-platter.
→ The head write magnetic information on the platter.

3) Head ARM:
→ Used for read & write operation.

4) Stepper motor:
→ Use stepper motor for controlling read/write head position.
→ Stepper motor usually use +12V power but some. New Technology reduce it +5V.

#) Disk structure:

a) Tracks:- The HDD is divided into number of concentric circles or circular path is called track.

b) Sector:- Data storage area in one track multiple divided into the multiple block is called sectors each sector can have 512 bytes of the data.

c) Cylinder:- A set of corresponding tracks in all sides of a hard disk is called cylinder.

d) Storage capacity:- Number of cylinder * tracks per cylinder * sector per tracks * byte per sector.

(H) Partition for HDD:- (Hard Disk)

1) primary partition:- windows operating systems must be located in a primary partition only primary partitions can be used to boot the os.

2) Extend partition:- A hard disk may contain only one extended portion. the extended partition can be subdivided into multiple logical partition (other than os is a extended partition).

3) Logical partition:- linux operating system can be installed into (and run form) logical partitions.

4) Active partition:- only one partition on a computer can be set as an active partition or bootable portion. for e.g. if you are using microsoft windows the partition that contain windows is the active

partition.

④ File system in HDD:
1) FAT (File Allocation Table)
2) NTFS (New Technology File system)

1) FAT
→ It is not a security
→ partition size is max 32 GB.
→ Doesnot support data compression
→ Doesnot support disk quota.
→ Windows OS conformability (95, 98 ms-dos)

2) NTFS:
→ It's a security
→ partition size is 1 TB
→ support data compression
→ It support disk quota.
→ windows OS conformability (2000 Xp.

④ Types of interfacing in HDD:
→ There are Three types of interfacing in HDD
i) IDE (PATA)
ii) SATA
iii) SCSI

i) IDE(PATA) → Integrated Device Electronics (PATA) (parallel Advanced Technology Attachment):

→ It has a 40 pin connector
→ Data transfer rate is 133 mbps.
→ When installed this type of hard drives ensure-

that the jumpers are correctly configured.
→ If you have devices connected to core IDE controller (one must be set to master & other must be set to slave).

ii) SATA (Serial Advanced Technology Attachment):
→ It has a 7 pin connector.
→ It is the latest high-speed type of HDD connectors.
→ Data transfer rate is 300 mbps As there are faster than old IDE interface.
→ The latest hard driver are using this type of interface.
→ As there are faster than old IDE interface.

iii) SCSI (Small computer system interface):

→ It has a 50 or 68 pin connector.
→ The data transfer rate is 600mbps.
→ These required a SCSI adapter card connected into the system.
→ Nowdays, most desktop computers didn't used the SCSI.

Display mode

video display mode	Resolution
1) VGA	640 x 480 / 800 X 600
2) XGA	1024 X 768
3) SXGA	1280 X 1024

1) Video Graphics Array (VGA):

→ VGA display system this has become the accepted minimum standard for pcs some VGA monitors are still use today. The maximum resolution dependency on the number of color display displayed choose 16 colors at 640 X 480 or 256 color 520 X 400 is compatible.

2) Extended Graphics Array (XGA):

→ Display as successor to its 3514/A display a latest version XGA-2 offer 800 X 600 pixel resolution level. are perphaps at the most popular in used today.

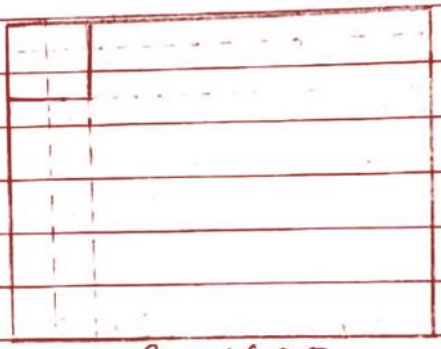
3) Super extended Graphics Array (SXGA) & VXGA):

→ SXGA and VXGA the specification is generally use in reference to screen with 1280 X 1024 resolution VXGA refers to resolution of 1600 X 1200. Nowday the older specification (VGA & SVGA) are often simply in reference to their typical resolution capacity.

④ Resolution:

Resolution is the term used to describe the number of dots or pixels used to display an image. High resolution mean that more pixels are used to display image.

The display or resolution on a monitor it composed of thousands of pixels or data. This display is indicated by a number condition such as 800x600. where 800 dots horizontally across the monitor by 600 lines of dots vertically equaling 4,80,000 dots that makes up the image you see on the screen.



800x600

pixel:

We define a pixel as the smallest elements of an image we also define that a pixel can store a value proportional to the light intensity at that particular location.

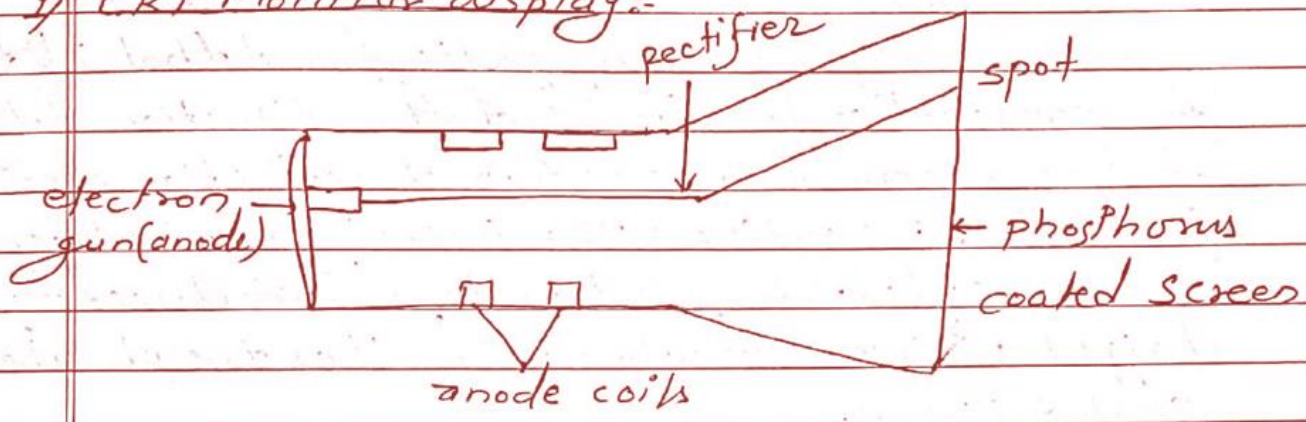
* Aspect ratio: Another important concept with the pixel resolution is aspect ratio. aspect ratio is the ratio between width of an image and height an image. It is commonly explained as two numbers seperated by a colon (8:9) this ratio differs in different images and in different screens.

Monitor

Types of monitor:

i) CRT
ii) LCD
iii) LED

i) CRT Monitor display:



→ A CRT is a electronic tube designed to display electrical data. The basic CRT consists of four major components.

- Electron gun
- Focussing anodes
- Horizontal and vertical deflection plate.
- Evacuated glass envelope

i) Electron gun: It is used to produce of one electron.

ii) Focussing anodes: These are used for producing a narrow and sharply focus beam of electron.

iii) Horizontal and vertical deflection plates:

→ These are used for controlling the path of the beam.

iv) Evacuated glass envelope:

A sealed enclosure either highly executed controlled quality of gas in which electron can be made sufficiently.

* Working principle of CRT:

A cathode ray tube consists of several basic components as illustrated below. The electron gun generated a narrow beam of electrons. The anodes accelerated the electron. Deflecting coils produce an extremely low frequency. Electromagnetic field that allows for constant adjustment of the direction of the electron beam. There are two of deflection of coil horizontal & vertical. The intensity of the beam can be varied. The electron beam produced the bright visible spot when it strikes the phosphor coated screen.

Two popular technique for producing color display with a CRT are;

(i) Beam-penetration method
(ii) shadow mask method

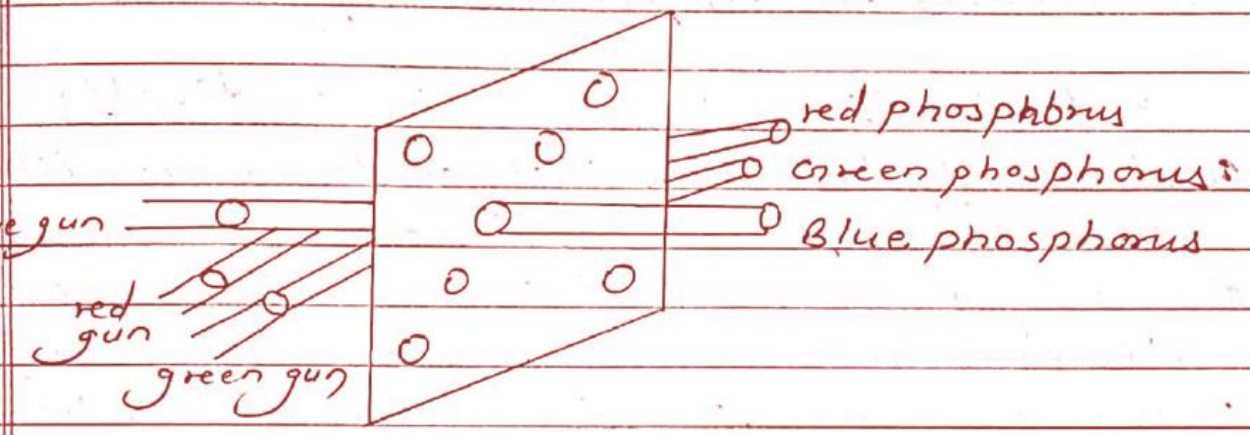
i) Beam-penetration method:

This CRT is similar to the simple CRT, but it makes use of multicolored phosphorus of number of layers. Each phosphorus layer is responsible for one color. All other arrangements are similar to simple CRT. it can produce a maximum of 4 to 5 colors.

ii) The shadow mask method:

→ The shadow mask CRT instead of using one electron gun uses 3 different guns placed one by the side of triangle form or delta as shown in fig

Each pixel point on the screen is also made up of 3 steps of phosphorus to produce red, blue & green colors. Just phosphorus screen is a metal screen called a "Shadow mask".



(H) Vector display (Random scan):
→ The buffer stores the computer produced display list or display program.
→ Display program contain point to point plotting command with (x, y, z) and point co-ordinated by the display processor.
→ The principle of vector system is Random scan the beam is reflected from end point to point as display order command.
→ Display needed to be refreshed 30 Hz.

(H) Raster display:
→ Raster system consists of display processor (input, refresh, scan, video control)
→ Buffer memory (frame buffer) the buffer store premitive pixels another than display list or display program.
→ Video controller reads the pixel content to produce the actual image on screen.

→ The image is represented as a set of raster scan lines and frame a matrix of pixel.
→ It need refresh the raster display 60Hz.

(#) Different between vector display & Raster display

	vector display	Raster display
①	It can only draw line character (x,y)	i) It can draw area filled with color.
②	Scanning is done bet^n the end points.	② Scanning is done one line at a time top to buttom & left to right
③	for complex image a vector scan display may flicker.	③ Even on a complex image raster scan display doesn't flicker.
④	video controller is not required.	④ Video controller is required.
⑤	Refresh rate 30Hz	⑤ Refresh rate 60 Hz
⑥	It costly.	⑥ It is cheaper

(2) LCD (Liquid crystal display) Monitor :-

→ LCD is technology used for display in network and other small computer light emitting diode (LED) and gas plasma technology. LCDs allow display to be much thinner then cathode ray tube (CRT) technology. LCDs consumes much less power than LED and gas display because they work on the principle of blocking light rather than emitting it.

④ How LCDs work ?

→ Liquid crystal display is composed of several layer which include two polarized panel filter and electrodes. LCD technology is used for display the image in notebook or some other electronic device like mini-computers. Light is projected form a lens on a layer of liquid crystal. This combination of color lights with grayscale image of the crystal forms the colored image. This image is than display on the screen.

⊛ Advantages of LCD technology :-

→ doesnot relay on phosphorus.
→ Excellent contrast
→ Screen are available in a vast range of sizes.
→ Energy efficient, low power.
→ superior resolution.

⊛ Disadvantages :-

→ expensive
→ feature poor black on dark imagery.
→ motion bluer is common.
→ fixed resolution.

③ LED monitor :-

→ An LED monitor (short for Light emitting Diode) or LED display is a flat panel computer monitor or television. It has very short depth and light in term of weight. The actual difference between this LED and LCD monitor is the back light

The first LCD monitor used CCFL instead of LED to illuminate the screen.

LED monitor offer many benefit when compared.

i) Typically are less expensive.
ii) Broader dimming range.
iii) Overall more reliable
iv) They run at a lower temperature & consume much less power as few as 20 watts.
v) High dynamic constrast ratio.

(H) Difference between CRT, LCD, & LED

⇒ CRT

① It stand for cathode ray tube which is a tube coated with phosphorus in inner surface when electron produced by E-gun come in ~~contact with~~ contact with phesphorus.

② It is generally used for graphic design

③ power consume is high.

④ cost is low.

⑤ picture quality is high.

⇒ LCD

i) LCD stands for Liquid crystal display which is a thin flat display screen.

② It is generally used at home computer screen.

③ power consume is high than LED but low than CRT.

④ cost is high than CRT & less than LED.

⑤ picture quality is low.

⇒ LED

① LED stands for Light emitting diode which is a Semiconductor diode that emits incoherent native spectrum light when electrically based in the forward direction of the p-N junction. Thus effect is a term of a electroluminescene.

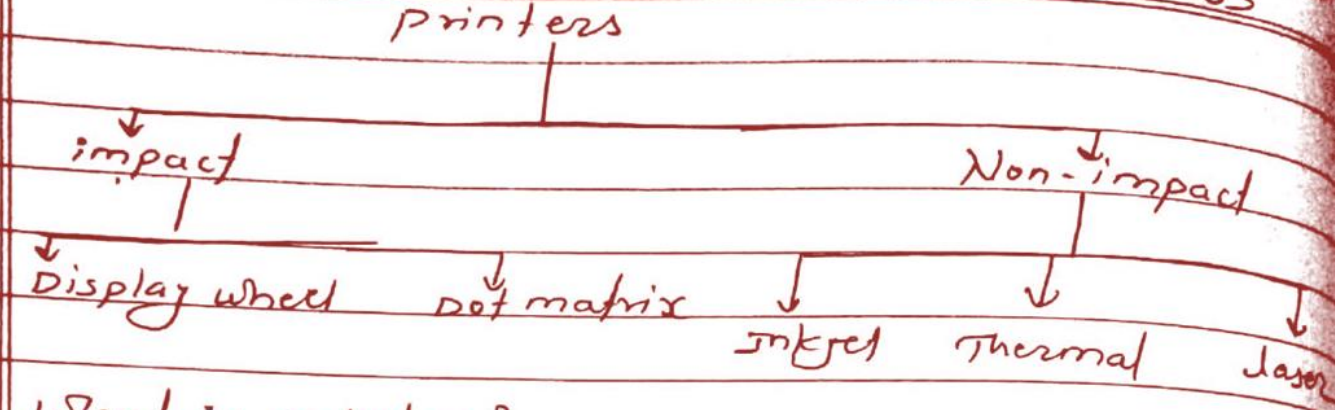
② It can be used regular electrical device like laptop, mobile etc.

③ power consume is low

④ cost is high

⑤ picture quality is high than LCD but less than CRT.

Printer



(*) What is printer?

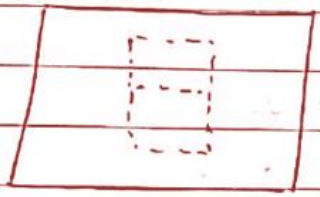
⇒ An external hardware device responsible for tasking computer data and generating a hard copy of data printers are one of the most commonly used peripherals and they print text and still images on the paper. It is generally two types.

① Impact printer:-

⇒ These printers have a mechanism that touches the paper to create an image. these printers work by banging a print head containing a number of metal pins which strike a linked ribbon placed between head and the paper.

⊛ Dot matrix printer:

→ The term dot matrix refers to the process of placing dots to form an image.
→ Its speed is usually 30 to 550 characters per second.
→ This is the cheapest & most noisy printer and has a poor printer quality.
→ Typical dot matrix output.



⊛ Non-Impact printer:

→ These printers create an image on the print medium without the use of force. They don't touch the paper while creating an image. Non-impact printers are much quieter than impact printers as they don't strike the paper.

i) Ink-Jet printer: It is a non-impact printers producing a high quality print. A standard inkjet printer has a resolution of 800dpi. Newer models have further improved dpi. Inkjet printers were introduced in the later-half of 1980 and are very popular using to their extra-ordinary performance.

Advantages:
i) high resolution
ii) Energy efficient
iii) many options to select print quality.

Disadvantages:
i) Expensive
ii) Special paper required for higher resolution output.
iii) Time consuming in case of graphics printing.

ii) Thermal printer: Thermal printers are in expensive printer mostly used in fax machine the thermal printer are further classified into two types.
i) Electro thermal printers
ii) Thermal wax printers.

iii) Laser printer: Laser printers use very advanced technology and produce a high quality output. Laser printers can also produce high quality graphics image. Resolution is 600 to 1200 dpi.

(I) Advantages of dot matrix printer:
- In expensive
- Low per page cost
- Energy efficient

(II) Disadvantages:
i) Noisy
ii) Low resolution.
iii) Limited fonts & flexibility
iv) poor quality graphic output.

Antivirous

* Computer virus:

A computer virus is a program or piece of code that is located onto your computer without your knowledge & run against your wish.

OR

A virus is illegal computer code that can do such things as after program or destroy data Also the virus can copy itself onto program thereby Spreading its damaging effects.

* Types of virus:

MACRO virus
Boot sector virus
Worms
Trojen Horse
logic Bombs

1) Macro virus:- A macro virus is associated with application software like word and excel when opening the infected document macro virus- is loaded into main memory and the data stored in hard disk.

2) Boot sector virus:- A boot sector virus infect boot Sector of computers During system boot. boot sector virus is loaded into main memory & destroys data Stored in hard disk.

3) Worms virus:- A worm is also destructive program that fills a computer system with self replicating information.
Types of worms virus
i) mail worm
ii) pure worm

4) Trojen Horse:- Trojen Horse is a destructive program. It usually spread from computer games or application software. it executed computer system will be damaged.

5) Logic Bombs:- A logical Bombs is a destructive program that perform an actively when a certain action has occured.

⑪ prevention:-
→ Don't share drive folder without password & with read only restriction.
→ Use Antivirus
→ Delete e-mail file attachment.
→ Use secure operating system linux, unix.
→ Always active defender / firewall.
→ Donot download games & software from unauthorized site.

* Anti-virus:

→ Anti-virus software is a computer program that identify & remove computer viruses and other malicious S/W like worms, Torjans from infeated computer. example Avg. Avast etc.

popular Antivirus
- Kaspersky lab
- MCA free virus scan
- Avira
- Avast
- Avg
- Norton

* useful of antivirus
- protect their storage devices & computers.
- save file & document from virus.
- scan & kill the virus from other portable device.

Backup:
- Backup is the activity of copying files or database so that they will be preserved in case of equipment failure. Backup is usually a routine part of the operation of large business with mainframes as well as the administrators of smaller business. Computer for personal computer users, backup is also necessary but often neglected. The retrival of files you backed up is called restoring.

Types of Backup:-
- Full Backup
- Incremental Backup

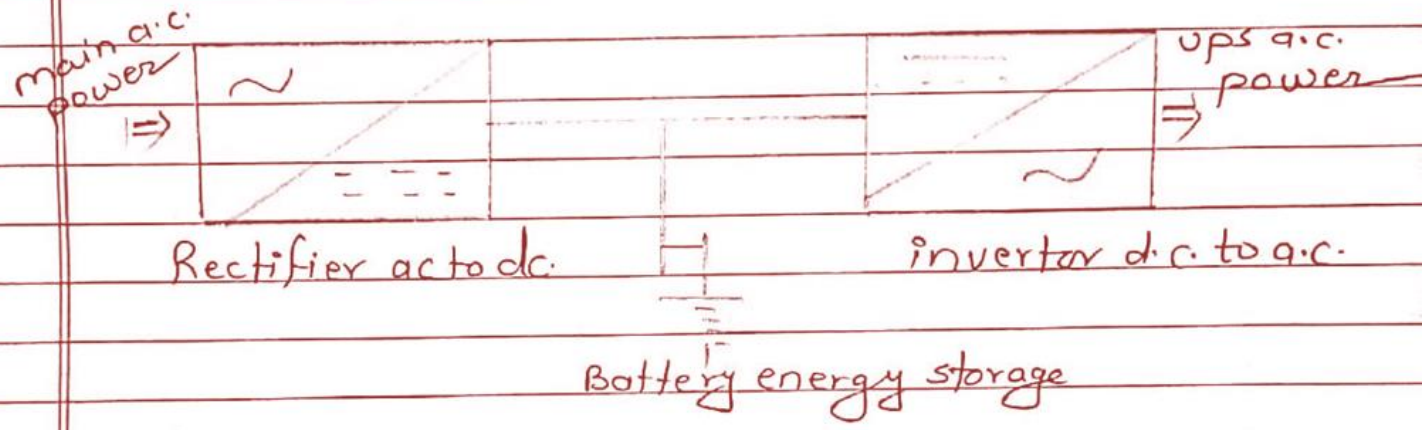
- Differential Backup
- Continual Backup

Backup media
- magnetic tape (cheap & removal)
- magnetic disk
- optical media
- pendrive/flash drive etc.

Uninterruptible power supply (UPS)

* Uninterruptable power supply (UPS):-

→ An uninterruptible power supply also uninterruptible power source, UPS or battery/flywheel backup, is an electrical apparatus that provides energy power to a load when the input power source typically mains power fails.



uses of ups:-

→ Ups differs from an auxiliary or emergency power system.

→ Ups is typically used to protect computers Telecommunication equipment.

→ Emergency power to a load when the input power source, typically the utility main supply is fails.

H.W.
2071

1) What are basic component of built-ins microprocessor? write any four conventions used on schematics.

Ans: Embedded system comes with the typical modern microprocessor which have built-ins auxillary circuit like timer, DMA, I/O pins, address decoding and memory caches. The advantages of this built-ins is the auxillary circuits in our system without having to add extra parts. Each auxillary circuit or peripheral is controlled by writing values to a small collection of registers at some fixed positions in microprocessor address space.

a) Timers: A timer is a counter that counts the number of microprocessor clock cycles and then cause interrupt when the count expires.

b) DMA: microprocessor chip may have a few DMA channel built-ins if both are for the bus certain process are simplified. If microprocessor support memory mapping DMA will by pass it.

c) I/O pins: There are several I/O pins in the microprocessor and can be configured by the software that set high or low through read/write to a registers. These pins can be used to any other purposes like.

d) Address decoding: microprocessor enables chip enable for the RAM and ROM to be used by microprocessor to the address decoding by having chip output in connected to the another chip which is driven by the software which tells to the microprocessor to

assert the various chip enable output with different number of WAIT states depending upon chip enable pin to be asserted.

⇒ Conventions used on Schematics :-

→ Signals are not always shown as continuous lines. Each signal is given a name, they are connected, even though it isn't explicitly shown.

→ The actual pin numbers on the parts that will be used in the finished circuit are shown next to each signal coming out of each part.

→ parts numbered P1, P2, P3 etc are connectors, plug where we can connected circuit to be external devices.

→ parts numbered J1, J2 etc are jumpers places on the circuit where a customer is expected to connect signals together or not, depending upon how he wants to use the circuit.

2) What are ~~four~~ basic interrupt mechanisms? List the steps. (8)

Ans: Interrupt starts with signals from the hardware such as I/O chips, serial ports of network interface needs attention from microprocessor. When event occurs. In serial ports chip receives a character from the serial ports, it needs the microprocessor to read that character from

where it is stored inside the serial port itself and to store it some where in memory. Similarly, when serial port has finished transmitting one character, it needs the microprocessor to send it the next character to be transmitted.

i) Saving and Restoring the context:-

→ pushing all the register at the beginning of a interrupt routine and saving the context.
poping them at the end & restoring the context failing to do this can cause troublesome bug.

ii) Disabling interrupt:-

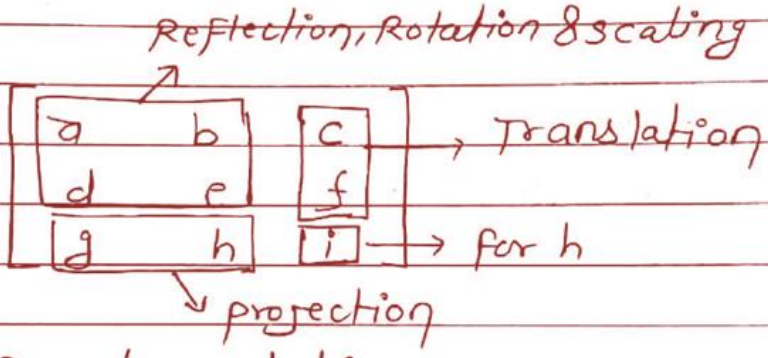
→ Almost every system allows disabling interrupt by using programming and tells the microprocessor to ignore incoming signal at IRQ pin.

→ microprocessor have non-maskable interrupt that cannot be disabled and cause different mechanism for disabling and enabling interrupt.

Homogeneous coordinate

To shorten this process, we have to use 3×3 transformation matrix instead of 2×2 transformation matrix. We have to add dummy coordinate.

In this way, we represent the point by 3 numbers instead of 2 numbers which is called homogenous coordinate system. In this system, we can represent all the transformation equation in matrix multiplication. Any Cartesian point $P(x, y)$ can be converted to homogeneous coordinate by $P'(x_h, y_h, h)$.



for translation

$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & tx \\ 0 & 1 & ty \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

for Rotation

$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

for, Scaling $\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} Sx & 0 & 0 \\ 0 & Sy & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$

For Reflection

→ Reflection about x-axis

$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

→ For Reflection about y-axis

$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

→ Reflection about origin

$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

Q) Rotate triangle (5,5), (7,3), (3,3) about fixed point (5,4) in counter clockwise (CCW) by 90°.

Ans: Solution :-

Here, the required steps are:

→ Translate the fixed point to origin
→ Rotate about the origin by specified θ
→ Reverse the translation as performed earlier

The composite matrix is given below:

$$Comp = T(x,y)\, R_\theta\, T(-x,-y)$$

$$= \begin{pmatrix} 1 & 0 & 5 \\ 0 & 1 & 4 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} \cos 90 & -\sin 90 & 0 \\ \sin 90 & \cos 90 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 0 & -5 \\ 0 & 1 & -4 \\ 0 & 0 & 1 \end{pmatrix}$$

1) Define shared-data problem. Illustrate shared-data problem with suitable pseudo-code.

Ans: When we use interrupt routine on a task code we share data. we must ensure that they dont interface with one another.

First method:-

→ first doing this is to disable interrupt while the task code for user share data.

Second Method:-

→ In this method it should not change the values before and after interrupt occurs in the interrupt routine that access the share data.

```
Static int iTemperatures[2];

void interrupt VReadTemperature(void)
{
  iTemperature[0] = !! read in value from hardware.
  iTemperature[1] = !! read in value from hardware.
}

void main(void){
  int iTemp0; iTemp1;
    while (TRUE)
  {
    iTemp0 = iTemperature[0];
    iTemp1 = iTemperature[1];
    if ( iTemp0 != iTemp1)
    !! set of bowling alarm } }
```

2) What is interrupt latency? Explain in detail about embedded system interrupt.

Ans: It is a amount of time it takes a system to respond for interrupt.

Several factors contribute on system response are:

→ The loggest period of time during which the interrupt is disabled.
→ The period of time to execute any interrupt.
→ How long it takes the microprocessor to stop and start executing the interrupt.
→ Hows long it takes the interrupt routine to save the context and then do respond to the work.

=) Interrupt:-
The microprocessor can be interrupt to stops doing what it is doing and executing. This may be done through other piece of software, the interrupt routine and time to run the interrupt request (IRQ).

microprocessor has several external interrupt request pins which can be connected to the I/o devices. So, the interrupt request has input request pins and assests low in interrupt to processor. The I/o can share interrupt request (IRQ) pins on the microprocessor and the microprocessor response to the input that would be edge or level triggered.

3) What is DMA? Why it is required? Explain various way of DMA implementation? [2+8=10]

Ans: DMA is circuitry that can read from an input/output devices such as serial ports or network and then write into memory or read from memory and write to an I/O devices.

⇒ DMA devices has data to move into RAM of a DMA request (DMAREQ) signal assests to the DMA circuit & (DMA CKT assests the bus requires BUS REQ signal microprocessor.

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3-D Transformation

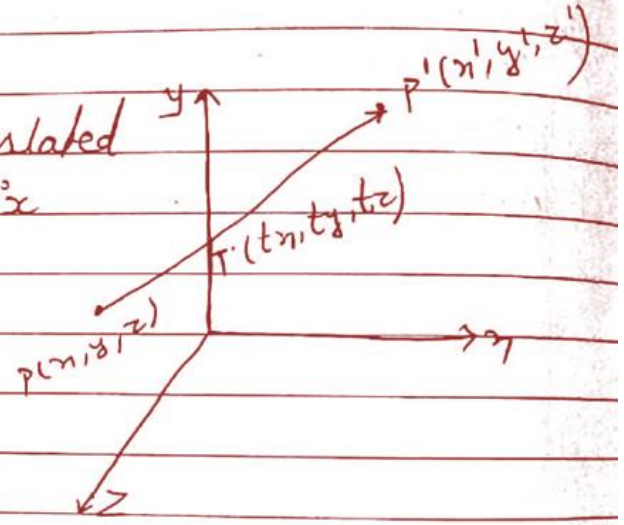
① 3-D transformation:

→ methods for geometric transformations and object modeling in three dimension are extended from two dimensional method by including coordinates for the Z coordinate. we now translate an object by specifying a three dimensional translation vector which determines how much the object is to be moved in each of the three coordinate directions.

② Translation:-

→ A point $p(x,y,z)$ is translated to $p'(x',y',z')$ with matrix operations.

$$p' = Tp$$



$$\begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1 & t_z \\ 0 & 0 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix}$$

Equation form:-

$$x' = x + t_x$$
$$y' = y + t_y$$
$$z' = z + t_z$$

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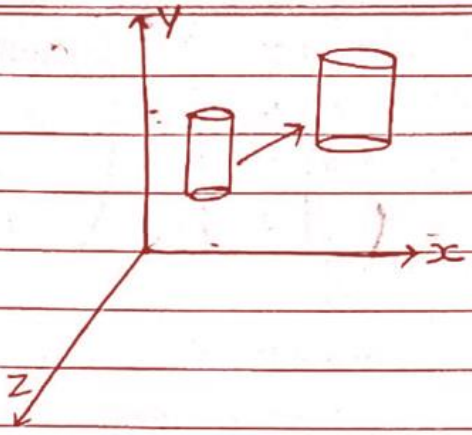
③ Scaling:-

Scaling changes size of an object and repositions the objects relative to the coordinate origin.

→ If transformation parameter are not all equal then figure gets distorted.

→ Matrix expression for scaling transformation of a positio $p = (x,y,z)$ relative to the coordinate origin can be

$$\begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix} = \begin{bmatrix} S_x & 0 & 0 & 0 \\ 0 & S_y & 0 & 0 \\ 0 & 0 & S_z & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix}$$



(B) Rotation:-

→ To generate a rotation transformation for an object in 3D space we require the following

- Angle of rotation
- pivot point
- Direction of rotation
- Axis of rotation

i) 3D Z-axis rotation equation are expressed in homogeneous

$$x' = x\cos\theta - y\sin\theta$$
$$y' = x\sin\theta - y\cos\theta$$
$$z' = z$$

$$\begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix} = \begin{bmatrix} \cos\theta & -\sin\theta & 0 & 0 \\ \sin\theta & \cos\theta & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix}$$

ii) 3D y-axis rotation equation are expressed in homogeneous

$$x' = z\sin\theta + x\cos\theta$$
$$y' = y$$
$$z' = z\cos\theta - x\sin\theta$$

$$\begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix} = \begin{pmatrix} \cos\theta & 0 & \sin\theta & 0 \\ 0 & 1 & \sin\theta & 0 \\ -\sin\theta & 0 & \cos\theta & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \\ 1 \end{pmatrix}$$

iii) 3D x-axis rotation equation are expressed in homogeneous.

$x' = x$

$y' = z\sin\theta + y\cos\theta$ $\quad y\cos\theta - z\sin\theta$

$z' = z\cos\theta - y\sin\theta$ $\quad y\sin\theta + z\cos\theta$

$$\begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos\theta & -\sin\theta & 0 \\ 0 & \sin\theta & \cos\theta & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \\ 1 \end{pmatrix}$$

(4) Reflection:-

→ A three dimensional reflection can be performed relative to a selected reflection axis or with respect to selected reflection plane.

- The matrix representation for the reflection of a point relative to xy-plane is given by

→ This reflection changes the sign of the z-coordinate leaving the x and y coordinate value unchanged.

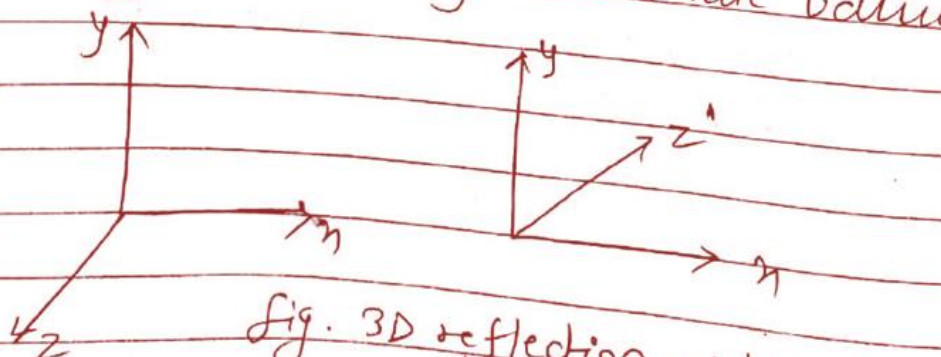


fig. 3D reflection relative to xy plane.

$$\begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix}$$

- The matrix representation for the reflection of a point relative to XZ-plane is given by

→ This reflection changes the sign of the y-coordinates leaving the x and z coordinate value unchange.

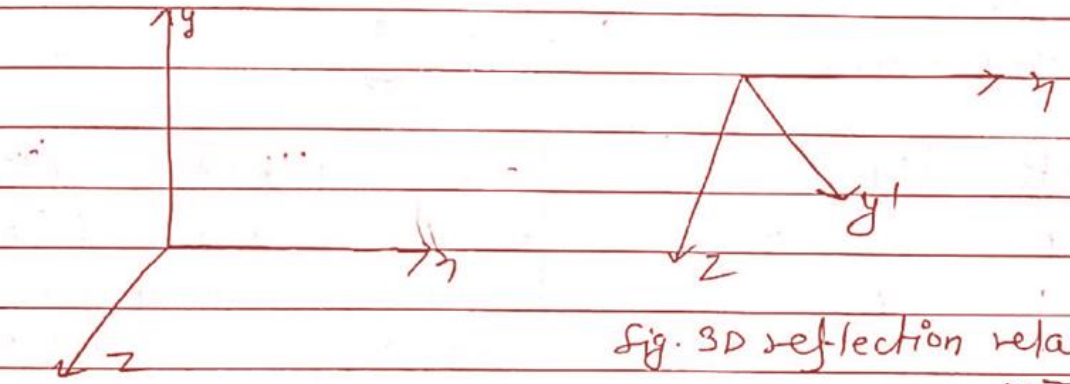


fig. 3D reflection relative to XZ plane.

$$\begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix}$$

- The matrix representation for the reflection of a point relative to yz-plane is given by

→ This reflection changes the sign of the x coordinates leaving the y and z coordinate value unchange.

$$\begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix} = \begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix}$$

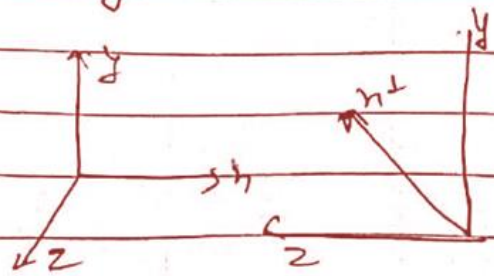


fig. 3D reflection relative to yz plane.

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1.(b) use BLA algorithm to rasterize the line from (5,5) (13,9)

Ans: solution:-

Let,

Starting point $(x_1, y_1) = (5,5)$

Ending point $(x_2, y_2) = (13,9)$

slope of $(m) = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$

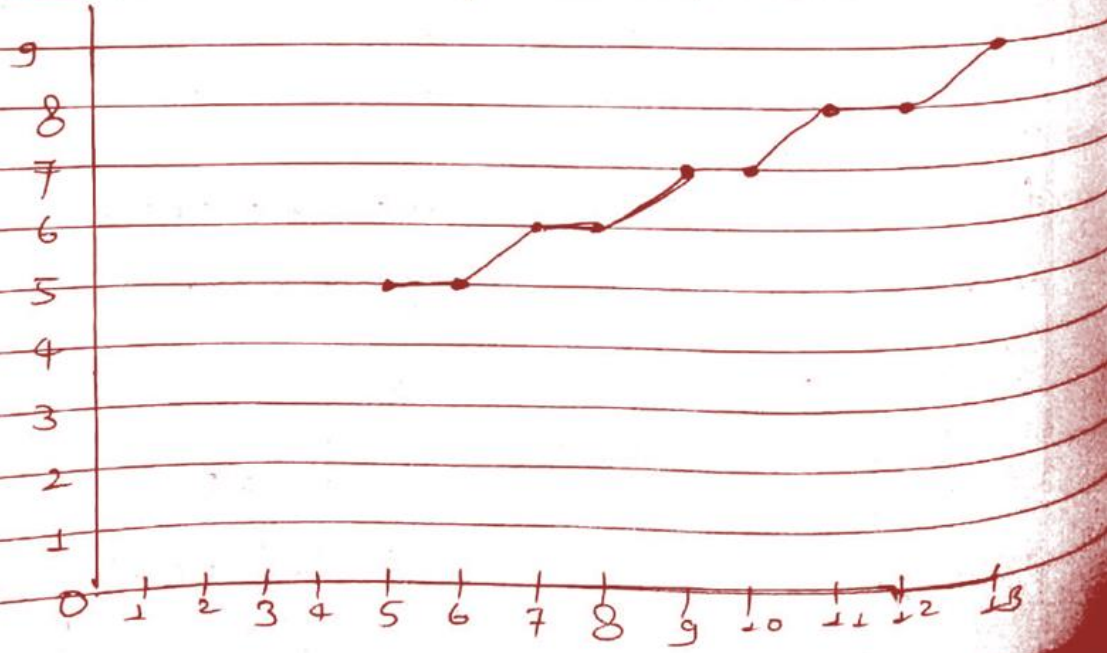
$= \frac{9-5}{13-5} = \frac{4}{8} = 0.5$

$\therefore$ BLA < 1 case for $p_0 = 2\Delta y - \Delta x$

$= 2 \times 4 - 8 = 0$

$= 8 - 8$

k	p_k	x_{k+1}	y_{k+1}	(x_{k+1}, y_{k+1})
0	0	5+1=6	5	(6,5)
1	0+2x4=8	6+1=7	5+1=6	(7,6)
2	8+2x4-2x8=0	7+1=8	6	(8,6)
3	0+2x4=8	8+1=9	6+1=7	(9,7)
4	8+2x4-2x8=0	9+1=10	7	(10,7)
5	0+2x4=8	10+1=11	7+1=8	(11,8)
6	8+2x4-2x8=0	11+1=12	8	(12,8)
7	0+2x4=8	12+1=13	8+1=9	(13,9)



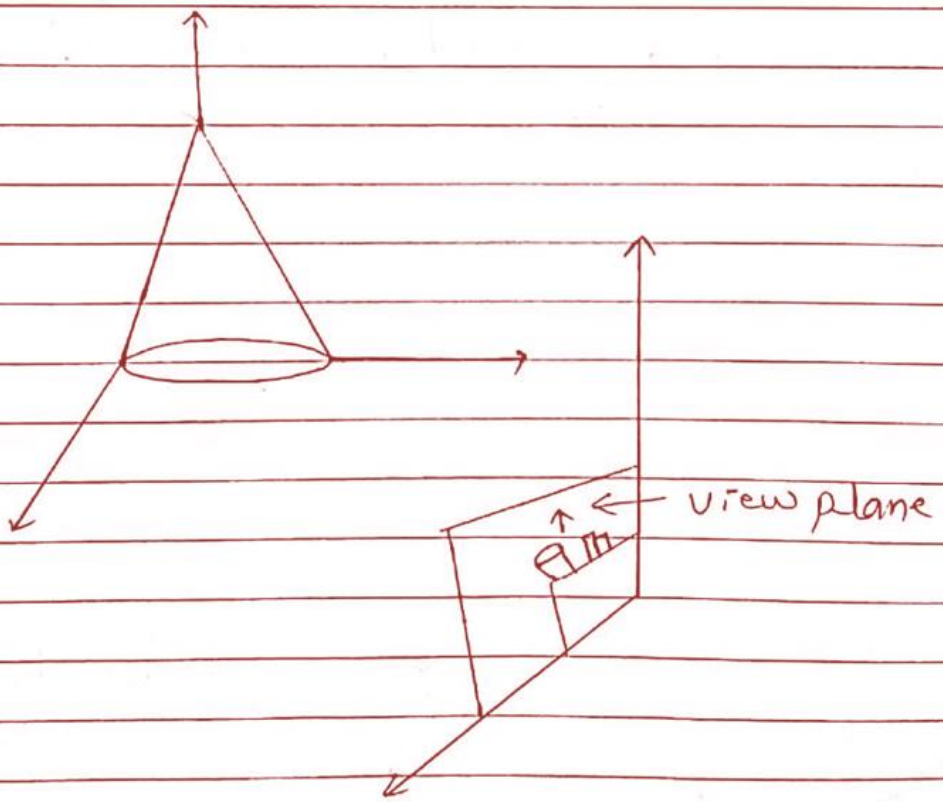
Projection of 3D objects into 2D display devices:

→ Three dimensional viewing coordinate must be transformed into two dimensional devices coordinates to view the scene.

→ To obtain a display of a three-dimensional scene that has modeled in world coordinates. We must first set up a coordinate reference for the plane of the camera film, which is the plane we want to use to display a view of the object in the scene.

→ Object description are then transformed to the camera referenced coordinates and projected into the selected display plane.

→ We can then apply lighting and surface rendering technique to shade the visible surface.



Projection:

→ projection of 3D object is defined by straight projection emanting from center of projection passing through each point of object and intersecting a projection plane to form projection.

Two Types of projection:

1) parallel projection.
2) perspective projection

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1) parallel projection:

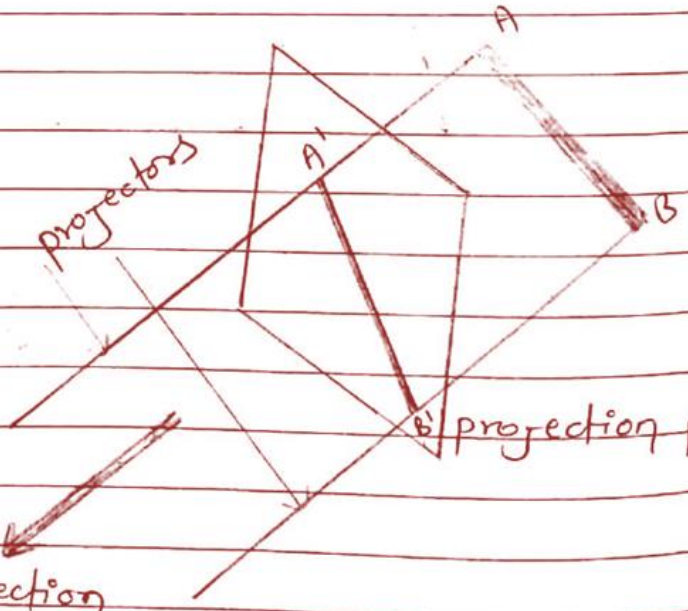
→ In parallel projection coordinate position are transformed to views plane along parallel lines.

→ It preserves relative proportion of object.

→ less realistic view because of no foreshortening.

→ However parallel lines remain parallel.

→ Can be used to for exact measurement so parallel lines remain parallel.



Types of Parallel Projection.

(a) Orthographic parallel projection:-

→ When projection is perpendicular to views plane, we have orthographic parallel projection.

→ It is used to produce the front, side and top view of an object.

→ Top orthogonal projection is called a plane views.

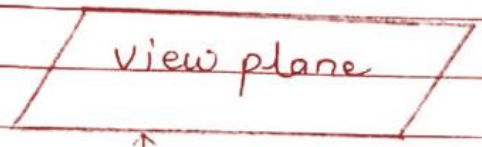


fig. orthographic projection

(b) Oblique parallel projection :-

* Obtained by projecting points along parallel lines that are not perpendicular to projection plane.
* Direction of projection is not equal to the projection plane.

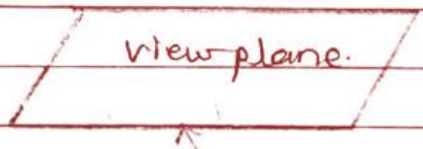


fig. oblique parallel projection.

(2) perspective Projection:-

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Q) define physical layer? write a function of physical layer.

Q) What is transmission media? Difference between guided and unguided transmission media.

Q) What do you mean by transmission media Explain its types with example.

unit:-5 Data link layer :-

Data link layer is second layer of OSI layered model. this layer is one of the most complicated layers and has complex functionalities and liabilities. data link layer hides the details of underlying hardware and represents itself to upper layer as the medium to communicate.

Data link layer works between two hosts which are directly connected in some sense. This direct connection could be point to point or broadcast. Systems on broadcast network are said to be on same link. the work of data link layer tends to get more complex when it is dealing with multiple hosts on single collision domain.

Data link layer is responsible for converting data stream to signals bit by bit and to send that over the underlying hardware. At receiving end data link layer picks up data from hardware which are in the form of electrical signals. assembles them in recognizable frame format, and hands over upper layer.

Ashok

(#) Data link layer has two sub-layers:

i) Logical link control:- It is deals with protocol, flow-control and error control.

ii) Media Access control:- It deals with actual control of media.

(#) Functionality of Data link layer:

i) Framing:- Data link layer takes packets from Network layer and encapsulate them into frames. Then it send frame bit-by-bit on the hardware. At receiver end data link layer picks up signals from hardware and assembles them into frame.

ii) Addressing:- Data link layer provides layer-2 hardware addressing mechanism. Hardware addressing is assumed to be unique on the link. It is encoded into hardware at the time of manufacturing.

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iii) Synchronization:- When data frames are send on the link, both machines must be synchronized in order to transfer to take place.

iv) Error control:- Sometimes signals may have encountered problem in transition and the bits are flipped there errors are detected and attempted to recover actual data bits. It also provides error reporting mechanism to sender.

v) Flow control:- Station on same link may have different speed or capacity. Data link layer ensures flow control that enables both machine to exchange data on same speed.

(H) Hidden surface Removal (visible surface detection) method:

→ A major consideration in the generation of realistic graphics is identifying those parts of a scene that are visible from a choosen viewing positions. There are many approaches or algorithm for efficient identification of visible object but all are differing according to memory requirement, processing time, special application etc.

visible surface detection algorithm are broadly classified as:-

i) object-Space Method (OSM): deal with object definition

→ An object-space method compares objects and parts of objects to each other within the scene definition to determine which surfaces, as a whole, we label as visible. E.g. Back-face detection method

ii) image-space method (ISM): Deal with projected image

→ In an image-space ~~method~~ algorithm, visibility is decided point by point at each pixel position on the projection plane. most visible surface algorithms use image-space methods. E.g. depth-buffer method, scan-line method.

iii) List priority method:-

→ This is hybrid model that combines both object and image precision operation. Here depth comparision and object splitting are done with object precision and Scan Conversion is done with image precision. E.g. depth-sorting method, Bsp tree method.

vi) multi-access: When host on the shared link tries to transfer the data, it has a high probability of collision. Data link layer provides mechanism such as CSMA/CD equip capability of accessing a shared media among multiple system.

vii) Reliable delivery: When a link layer protocol provides reliable delivery services it guarantees to move each network-layer datagram across the link without error.

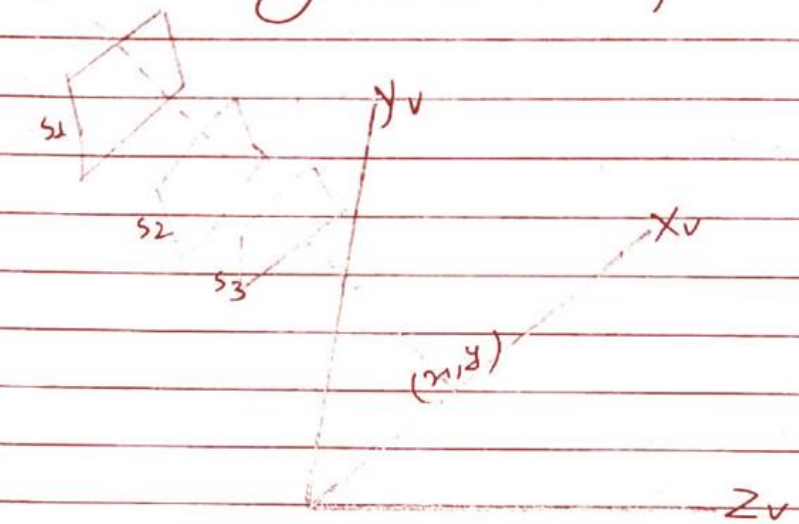
Imp
(#) Error detection & correction:

→ There are many reasons such as noise, cross talk etc, which may help data get corrupted during transmission. The upper layers work on some generalized view of network architecture and are not aware of actual hardware data processing. Hence, the upper layer expect error-free transmission between the system. most of the application would not function expectedly if they receive erroneous data. Application such as voice and video may not be that affected and with some errors they may still function well.

Data link layer used some error control mechanism to ensure that frames (data bit stream) are transmitted with certain level of accuracy. But to understand how errors is controlled, it is essential to known what types of errors may occurs.

(#) Depth-Buffer or Z-Buffer method:

→ It is commonly used image Space method which Compares. Surface depth at each pixel on the projection plane. This procedure is also referred to as the Z-buffer method. Since object depth is usually measured from the view plane along the Z-axis of a viewing system.



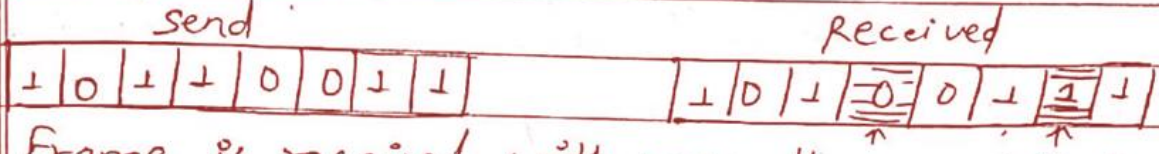
As the name implies, it require two buffer areas. A depth buffer is used to store depth values (Z-values) for each (x,y) position as surfaces are processed and the refresh buffer stores the intensity values for each positions. Initially, all the positions in the depth buffer are set to 0 and the refresh buffer is initialized to the background intensity. Each surface listed in the polygon table then processed Scan-line method at a time, calculating the depth (Z-value) at each (x,y) pixel position. The calculated depth Compared to the value of previously store in the depth buffer at that position. If the calculated depth greater than the value stored in the depth buffer, the new depth value is stored and the Surface intensity at that position is determined and place in the same (x,y) location in the refresh buffer.

⑧ Types of Error :

① Single bit Error :-

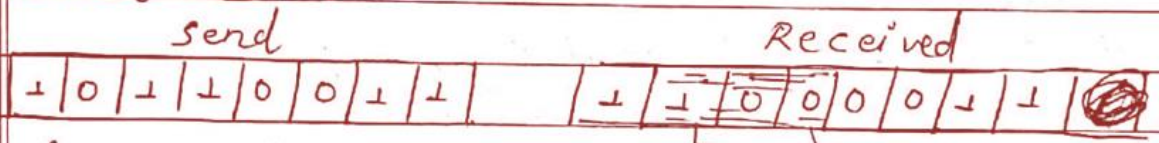
→ In frame there is only one bit anywhere though which is corrupt.

ii) Multiple Error :-



→ Frame is received with more than one bits in corrupted state.

iii) Burst Error :-



→ frame contains more than 1 consecutive bit corrupted.

⑨ ~~Error detection~~ :

Error control mechanism may involve two possible ways.
- Error detection
- Error correction

⑩ Error Detection :-

Errors in the received frames are detected by means of parity check and cyclic Redundancy check (CRC). In both cases few extra bits are send along with actual data to confirm that bits received at other end are same as they were sent. if the counter-check at receiver end fails the bits are considered corrupted.

① parity check: One extra bit is sent along with the original bits to make number of 1's either even in case even parity or odd in case of odd parity.

The Sender while creating a frame count the number of 1's in it. for example, if even parity is used and number of 1's is even then one bit with value 0 is added. This way number of 1's remain even. if the number of 1's is odd to make it even a bit with added 1.

The receiver simply counts number of 1's in a frame. If the count of 1's even and even parity is used. the frame is considered to be not corrupted and accept. if the count of 1's is odd parity is used. the frame the frame is still not corrupted.

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② cyclic Redundancy check (CRC):

⇒ CRC is a different approach to detect if the received frame contains valid data. The technique involves binary division of the data bit being send. The divisor is generated using polynomials. The sender performs a division operation on the bit being send and calculate the remainder. Before sending the actual bits, the sender adds the remainder at the end of actual bit actual data bits plus the remainder is called a codeword. The sender transmits data bits as codeword.

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(*) Algorithm:-

(i) Initialize the depth buffer and refresh buffer so that for all buffer position (x,y).
depth $(x,y) = 0$ and refresh $(x,y) = I_{background}$

(ii) For each position on each polygon surface compare depth values to previously stored values in depth buffer to determine visibility.
(a) Calculate the depth 'z' for each (x,y) on the polygon.
(b) If $z > depth(x,y)$ then set.
depth $= z$ and refresh $(x,y) = I_{surface}(x,y)$
Where $I_{background}(x,y)$ is background intensity, $I_{surface}(x,y)$ is projected intensity value for surface at pixel position (x,y)

(#) Scan-Line Method:-
→ This image-space method for removing hidden surfaces is an extension of the scan-line algorithm filling polygon interiors where we deal with multiple surface rather than one. Each scan line is processed with calculating the depth for nearest views for determing the visible surface of intersecting polygon. When the visible surface has been determined, the intensity value for that position is entered into the refresh buffer.

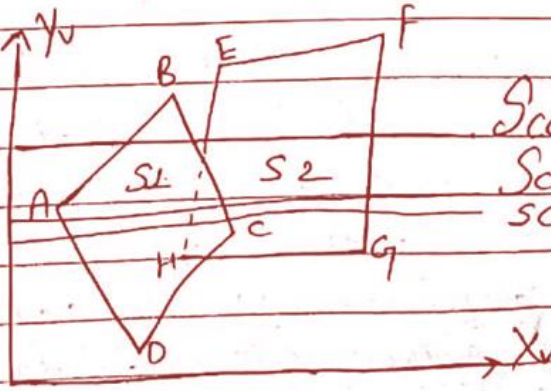

fig: Scan line crossing the projection of the surface S1 and S2 in the view plane. Dashed line indicate the boundaries of hidden surface.

Illumination models and surface Rendering Methods:-

→ An illumination or light model or shading model is used to calculate the intensity of light that we should see a given point on the surface of an object. A surface rendering algorithm uses the intensity calculation from an illumination model to determine the light intensity for all projected pixel position for the various surface in a scene.

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Basic Illumination models

① Ambient light:- In case of ambient light or background light the surface of interest is not exposed directly to a light source but reflections from various surfaces to produce a uniform illumination or visibility due to illuminated nearby objects. Ambient light has no spatial or directional characteristics. The amount of ambient light incident on each object is a constant for all surfaces and over all directions.

② Diffuse Reflections:- Ambient light reflection is an approximation of global diffuse lighting effects. Diffuse reflections are constant over each surface in a scene independent of the viewing direction.

The diffuse-reflection coefficient, or diffuse reflectivity k_d (varying from 0 to 1) define the fractional amount of the incident light that is diffusely reflected.

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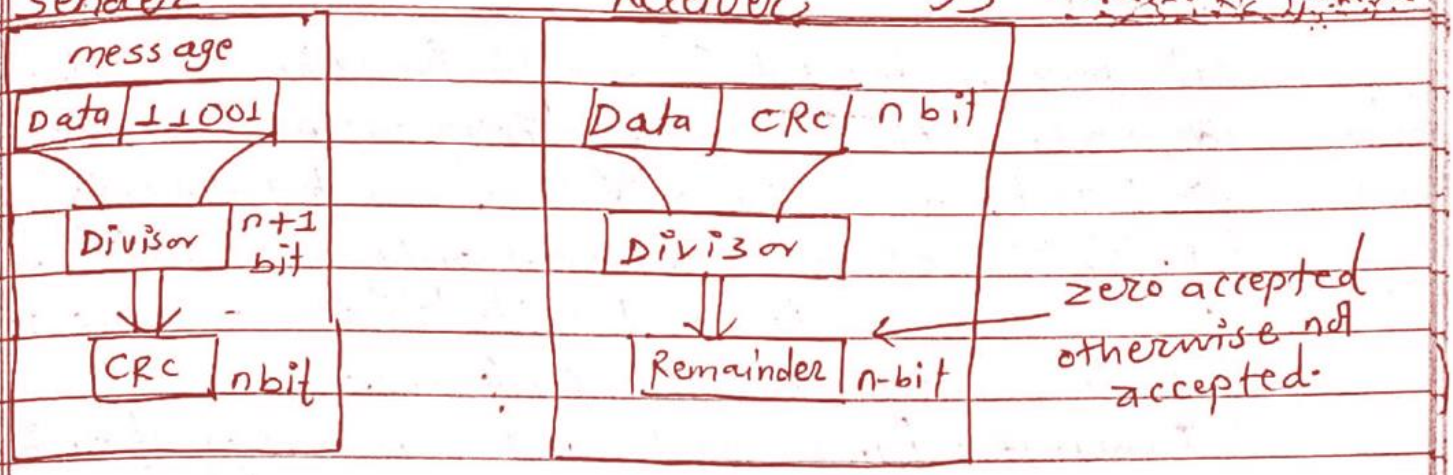


Error correction :- In the digital world, error correction can be done in two way.

- Backward error correction :- When the receiver defect an error in the data received, it request back the sender to retransmit the data unit.

- Forward error correction :- When the receiver detects some error in the data received, it executes error-correcting code which helps it to auto-recover and to correct some kinds of error.

Flow control :- It is the set of procedure that tells the sender how much data it can send before it most wait for an acknowledgement from the receiver.
Two methods have been developed to control the flow of data access Communication link.

- Stop & wait method.
- Sliding window method.

① Stop & wait method :-

The parameter kd (actually function of surface color) depends on the reflecting properties of materail so for highly reflective surface, the kd nearly equal to 1. If a surface is exposed only to ambient light, we can express the intensity of the diffuse reflection at any point on the surface as:.

IambDiff = kd. Ia, (where Ia = intensity of ambient light)

(#) phong model :- Objects other than ideal reflectors exhibit Specular reflections over a finite range of viewing positions around vector R. Shiny surfaces have a narrow Specular-reflection range, and dull surfaces have a wider reflection range. An empirical model for calculating the specular-reflection range is called the phong specular-reflection model, or simply the phong model. sets the intensity of specular reflection proportional to $\cos^{n_s}\phi$. Angle ϕ can be assigned values in the range 0 to 90 degree, so the $\cos\phi$ varies from 0 to 1.

Shiny Surface (Large ns) Dull suface (small ns)

fig. modeling specular reflections (shaded area) with parameter Ns.

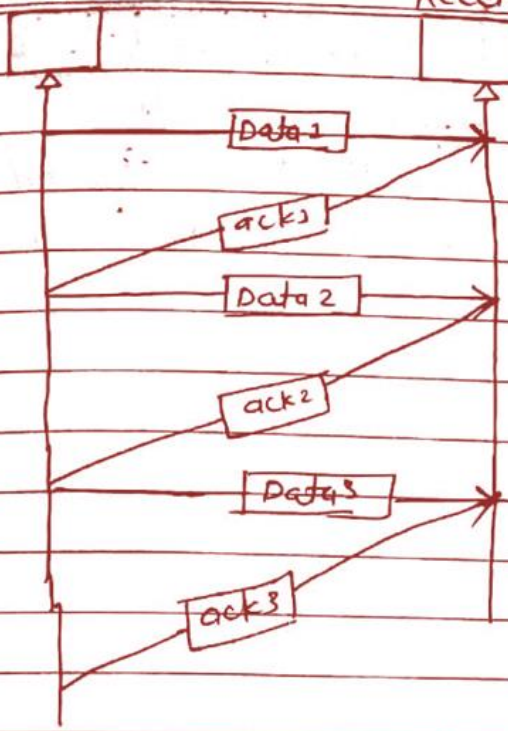


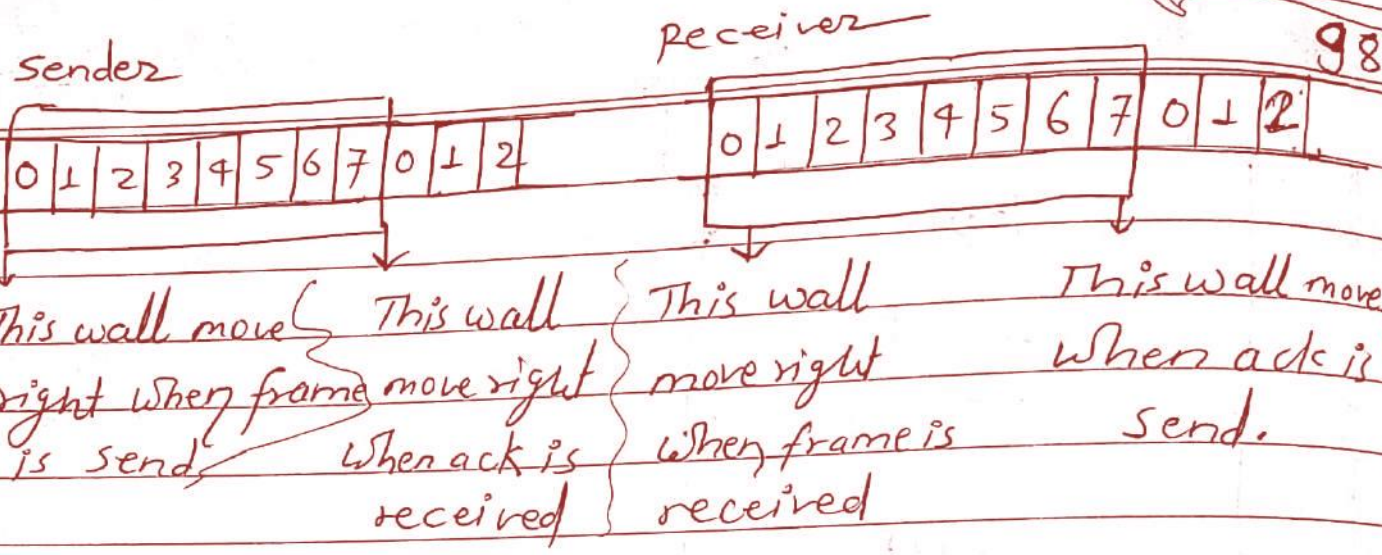
fig. Stop & wait method.

→ An stop & wait method of flow control, sender sent one frame at a time and wait for an acknowledgement before sending the next frame this process of alternatively sending & waiting repeats until the sender transmit and EOT (end of transmision frame)

The advantage of stop and wait method its simplicity in this method each frame check before next frame is send. The disadvantages of this method is its slow method.

iii) sliding windows method :-

→ The sliding window method of flows control the sender can transmit several frame before needing an acknowledge, frames can be send one right after another meaning that link can carry several frame at once and its capacity can be used efficiently. The receiver acknowledge only some of the frame using single ack to conform the received of multiple frame.



polygon-Rendering methods

→ Here, we consider the application of an illumination model to rendering of standard graphics objects formed with polygon surfaces, with the help of Scan-line algorithms.

① Constant-Intensity shading :-

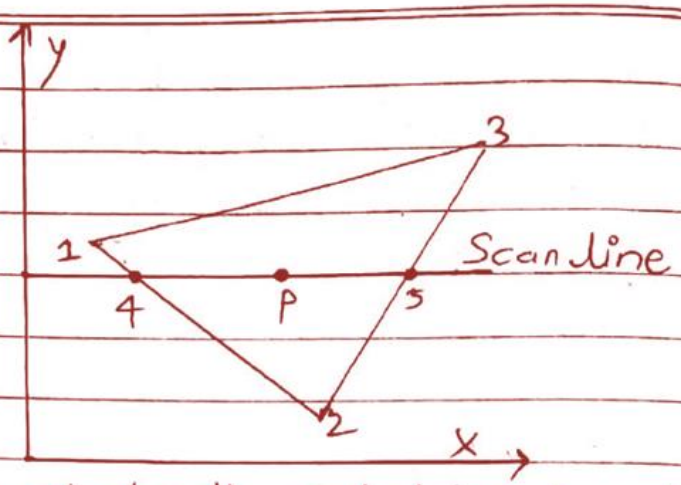
The constant-intensity shading or flat shading is a fast and simple method for rendering an object with polygon surfaces where a single intensity is calculated for each polygon. All points over the surface of the polygon are then displayed with the same intensity value. Constant shading can be useful for quickly displaying the general appearance of a curved surface, but seems the intensity discontinuity.

② Gouraud shading :-

→ This intensity-interpolation scheme renders a polygon surface by linearly interpolating intensity values across the surface. Intensity values for each polygon are matched with the values of adjacent polygons along the common edges, thus eliminating the intensity discontinuities that can occur in flat shading.

→ Each polygon surface is rendered with Gouraud shading by performing the following calculations :-

* Determine the average unit normal vector at each polygon vertex.
* Apply an illumination model to each vertex to calculate the vertex intensity.
* Linearly interpolate the vertex intensities over the surface of the polygon.



The figure demonstrates the next step: interpolating intensities along the polygon edges. For each scan line, the intensity at the intersection of the scan line with a polygon edge is linearly interpolated from the intensities at the edge endpoints.

$$I_4 = \frac{y_4 - y_2}{y_1 - y_2} I_1 + \frac{y_1 - y_4}{y_1 - y_2} I_2 \qquad I_p = \frac{x_5 - x_p}{x_5 - x_4} I_4 + \frac{x_p - x_4}{x_5 - x_4} I_5$$

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(#) Advantages:-

(a) Removes discontinuities of intensity at the edge Compare to constant shading model.

(#) Disadvantages:-

(a) Highlights on the surface are sometimes displayed with anomalous shapes and linear intensity interpolation can cause bright or dark intensity streaks called mach Bands to appear on the surfaces.

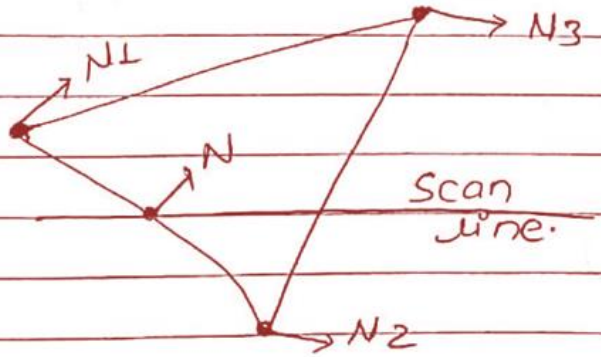
Mach bands can be reduced by dividing the surface into a greater number of polygon faces or phong shading (requires more calculation).

(3) phong shading:-

→ A more accurate method for rendering a polygon surface is phong shading or normal vector interpolation shading which first interpolate normal vectors, and then apply the illumination model to each surface point. It displays more realistic highlights on a surface and greatly reduces the match-band effect.

A polygon surface is rendered using phong shading by carrying out the following steps:-

* determine the average unit normal vector at each polygon vertex.
* linearly interpolate the vertex normals over the surface of the polygon.
* Apply an illumination model along each scan line to calculate projected pixel intensities for the surface points.



→ The normal vector N for the Scan-line intersection point along the edge between vertices 1 and 2 can be obtained by vertically interpolating between edge endpoint normals:-

$$N = \frac{y - y_2}{y_1 - y_2} N_1 + \frac{y_1 - y}{y_1 - y_2} N_2$$

unit-4

Hardware concepts

① Input devices:-

→ Input device are used to feed data or information into a computer system. They are usually used to provide input to the computer upon which reaction, outputs are generated.

① Tablet:- A tablet is a digitizer. In general a digitizer is a device which is used to scan over an object and to put a set of discrete coordinate positions. These positions can then be joined with straight line segments to approximate the shape of the original object. A tablet digitizes an object detecting the position of a movable stylus (pencil-shaped device) or puck (like mouse with cross hairs for sighting positions) held in the user's hand. A tablet is flat surface and it size varies from about 6 by 6 inches upto 48 by 72 inches or more. The accuracy of the tablets usually falls below 0.2 mm.

→ There are three types of tablets:-

① Electric tablet
② Sonic tablet
③ Resistive tablet
④

② Touch panel:-

A touch panel is an input device that accepts user input by means of a touch sensitive screen directly with a finger to move the cursor around the screen or to select the icons. Because of their compact nature and ease of use, touch panels are typically deployed for user interfaces in automation systems, such as high-end residential and industrial control.

followings There three types of touch panel:-
① optical touch panel
② Sonic panel
③ Electric touch panel

⑧ Light pen:- It is a pencil-shaped device to determine the coordinate of a point on the screen (i.e. digitizer). In raster display, y is set at Ymax and X changes from 0 to Xmax the first scanning line. For second line, Y decreases by one and X again changes from 0 to Xmax, and so on. When the activated light pen "sees" a burst of light at certain position as the electron beam hits the phosphor coating at that position, it generates an electric pulse, which is used to save the video controllers X and Y registers and interrupt the computer.

④ Keyboard:- A keyboard creates a code such as ASCII uniquely corresponding to a pressed key (i.e. work on Hall's effect). It usually consists of alphanumeric key, function keys, cursor-control keys, and separate numeric pad.

⑤ Mouse:- A mouse is a small hand held device used to position the cursor on the screen. Following are the mice, which are mostly used in computer graphics.
- Mechanical mouse:- It moves the curser position on the screen according as the moment of the roller in the base of this mechanical mouse.
- optical mouse:- A LED in the bottom of the mouse directs a beam of light down onto the pad from which it is reflected and sensed by the detectors.

output devices:-

(A) Color CRT:- The cathode ray tube (CRT) technology was first used for computer displays, video monitors, televisions, radar displays and oscilloscopes. The CRT is an Evacuated gas tube that uses the filament to produce the electron beams which are focused in proper position of phosphorous coated screen by the help of magnetic focusing & deflection coils. phosphorous are organic compounds characterized by their persistence and their color (blue, Red, green).

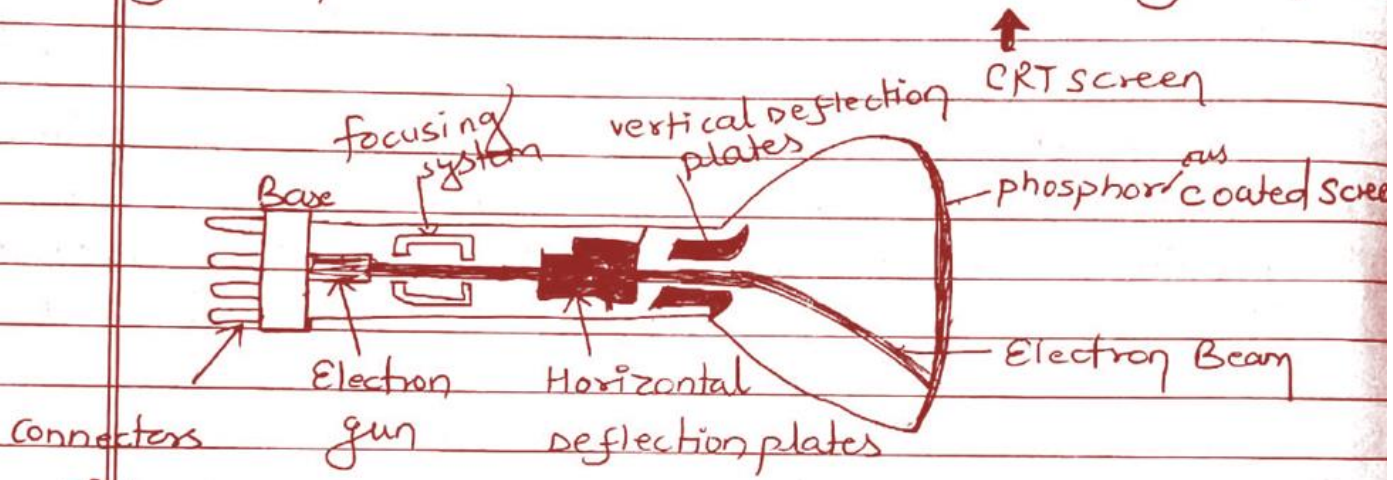


fig. Color CRT (Electrostatic deflection of the electron beam in a CRT)

(Imp)

Methods for color CRT

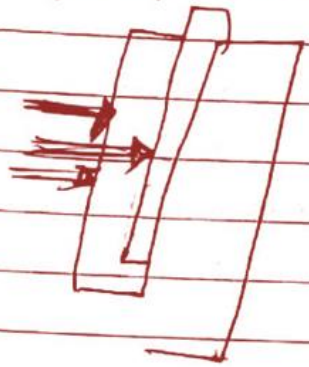
→ Two methods are used in color CRT for the raster display method.

- Beam penetration method
- shadow mask method
  - Delta-Delta CRT
  - precision Inline CRT

(a) Beam penetration method:-

The beam penetration method is for the random scan monitor display where two different layers of phosphor coating are used, Red (outer) and Green (inner) coated on the

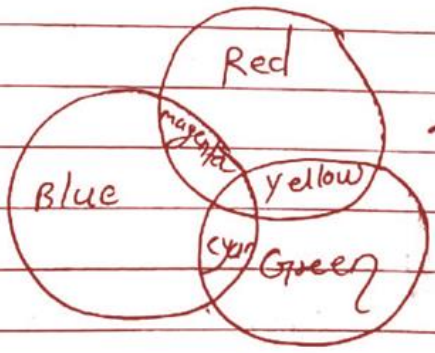
screen. The display of color depends on the depth of penetration of the electron beam into the phosphor layers. screen color is controlled by the beam acceleration voltage. In this method, only four colors possible and hence the poor picture quality.

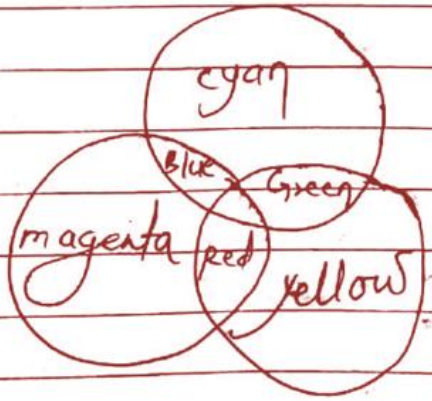


(i) Types of color models

(1) Abdecative colors: Additive color models use light to display color. Colors perceived in these models are the result of transmitted light. (RGB color models)

(2) Subtractive colors: The overlapping of additive colors (red, green and blue) results in subtractive colors (cyan, magenta and yellow).

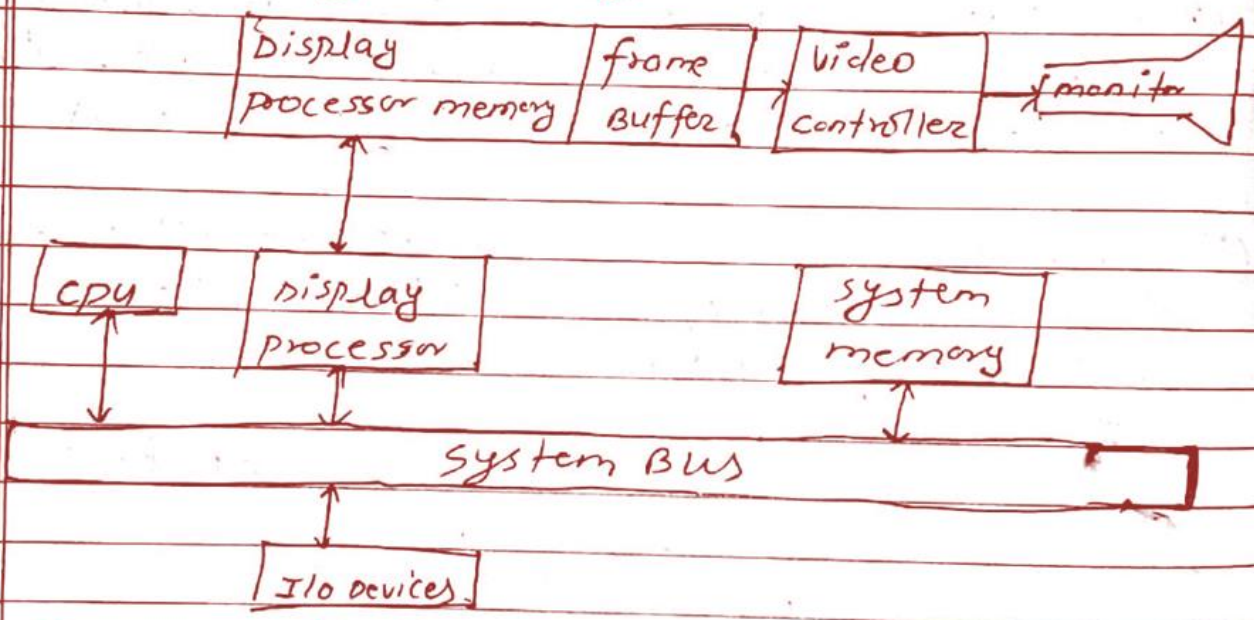




③ Raster Graphics:

* A raster graphics image, digital image, or bitmap, is a datafile or structure representing a generally rectangular grid of pixels, or points of color, on a computer monitor, paper, or other display device.
* The color of each pixel is individually defined; images in the RGB color space, for instance, often consist of colored pixels defined by three bytes - one byte each for red, green and blue.

④ Raster display Technology :-



⇒ When a particular command is called by the application program the graphics subroutine package sets the appropriate pixels in the frame buffer.

→ The video controller then cycles thru the frame buffer one scan line at a time, typically 50 times per second. It brings a value of each pixel contained in the buffer and uses it to control the intensity of the CRT electron beam.

⇒ So, there exists a one to one relationship between the pixel in the frame buffer and that on the CRT screen.

→ 640 pixels by 480 lines is an example of medium resolution raster display & 1600 by 1200 is a high resolution one.

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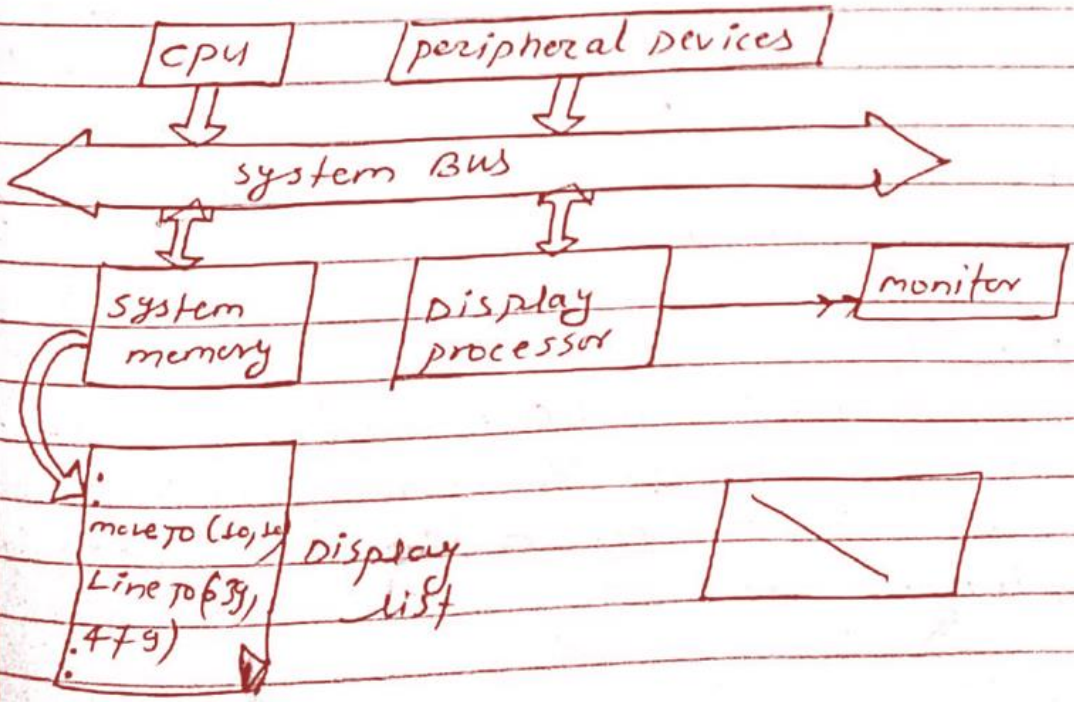
(6) * vector Graphics (random scan displays)

* vector graphics also called geometric modeling or object oriented graphics) is the use of geometrical primitives such as points, lines, curves, and polygons, which are all based upon mathematical equations to represent images in computer graphics. It has complexity on drawing the complex images.

* The vector graphic system is seems on oscillators, medical diagnosis monitor etc.

* All modern current computer video displays translate vector representations of an image to a raster format. The raster image, containing a value for every pixel on the screen, is stored in memory.

(7) vector display Technology



* The architecture of vector display technology consists of a central processing unit, display processor a monitor system memory and peripheral devices such as mouse and keyboard.
* A display processor is also called a display processing unit or graphics controller, which totally responsible for picture draws on the screen according to the command line stored on system memory.
* A graphics ~~package and degree~~ subroutine package creates a display list. A portion of the system memory where display list resides is called a refresh buffer.
* A display list contains point and line plotting commands with end point coordinates as well as character plotting commands.

(I) advantages:

(i) Can produce smooth output with high resolution & better time interval.

(ii) No problem of stair case effect like raster scan display method because the random or vector display method use direct line drawing primitive algorithm not the frame buffer.

(iii) Better than raster for animation, requires only end point information.

(II) Limitations

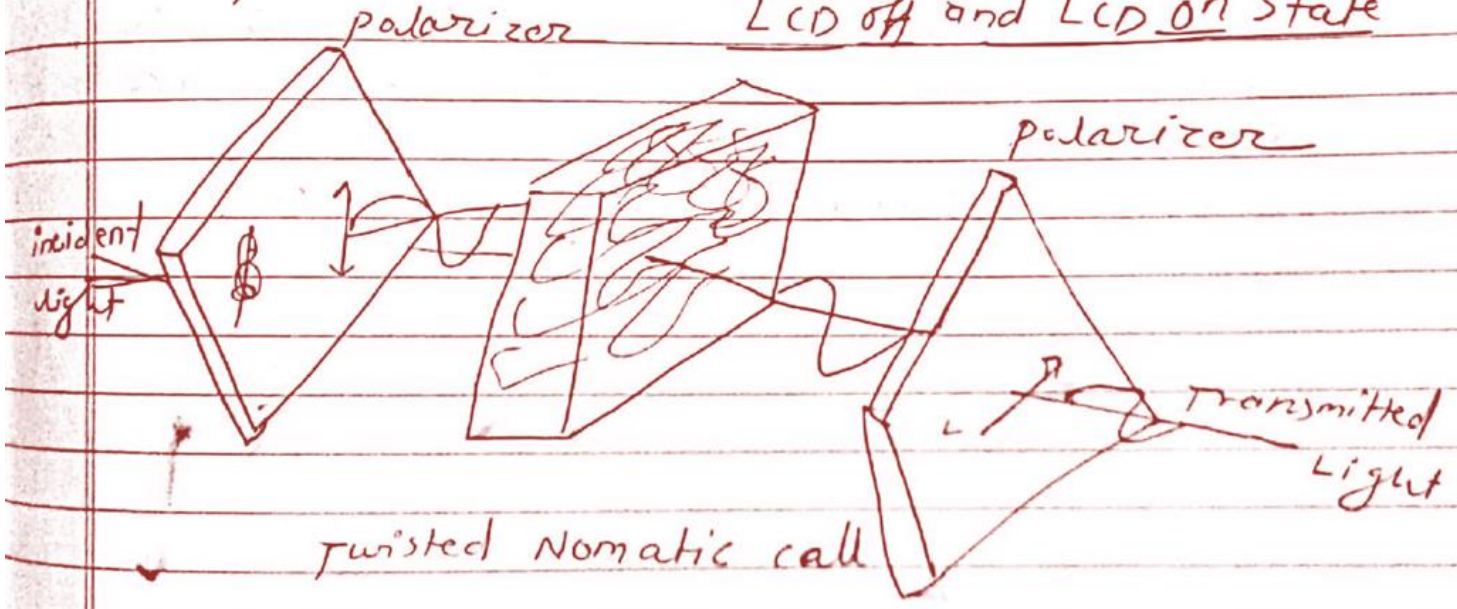
→ Can't fill area with patterns and manipulate bits.

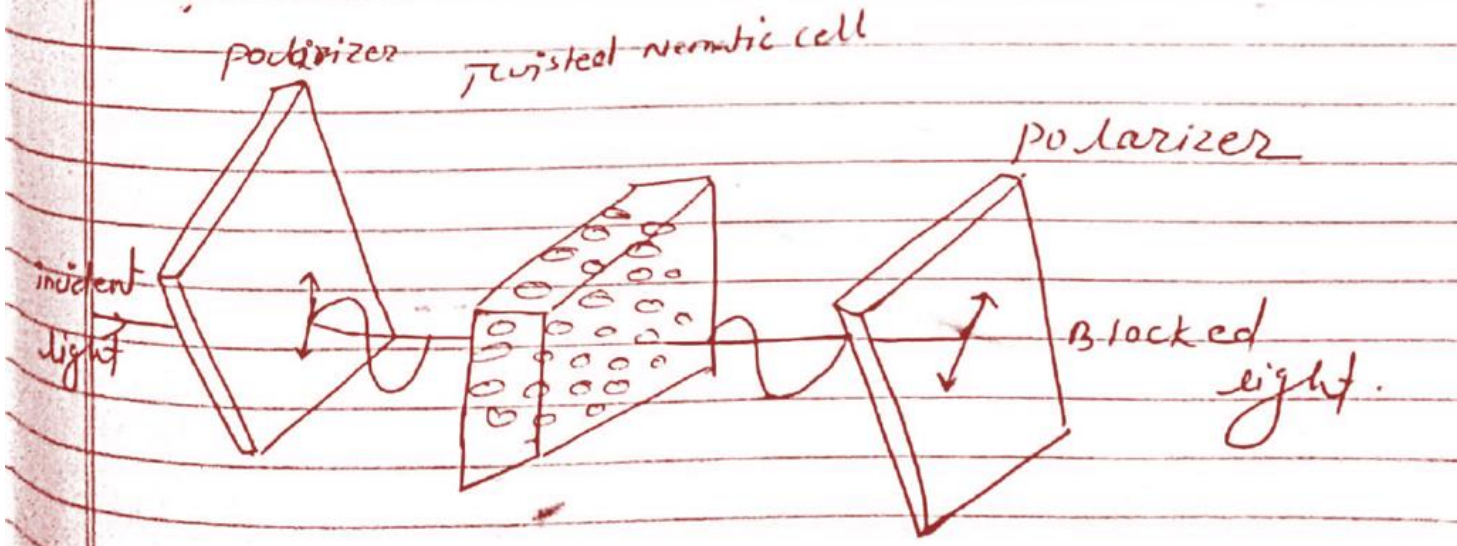
→ Refreshing an image depends upon its complexity (more lines takes longer time), flicker if complex image.

Liquid crystal Display (LCD):-

→ LCDs are organic molecules that, in the absence of external forces, tend to align themselves in crystalline structures.
→ When an external force is applied they will rearrange themselves as if they were a liquid.
→ Some liquid crystals respond to heat (i.e. mood rings); others respond to electromagnetic forces.

① LCD operation:-





- A very small electeric field is required to excite the crystals into their liquid state.
- Most of the energy used by an LCD display system is d to the back lighting.
- LCD's slowly transition back to their crystalline state when the E-field is removed.
- In Scanned displays, with a large number of pixel the percentage of the time that LCDs are excited is very small.
- Thus the crystals spend most of their time in intermediate states, being nether "on" or "off". This behavior is indicative of passive displays.
- LCD displays have a native resolution.