Concept based notes

Computer Architecture

(BCA Part-I)

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Preface

I am glad to present this book, especially designed to serve the needs of the students. The book has been written keeping in mind the general weakness in understanding the fundamental concept of the topic. The book is self-explanatory and adopts the "Teach Yourself" style. It is based on question-answer pattern. The language of book is quite easy and understandable based on scientific approach.

The motive of this text is to guide student about architecture of computer that include I/O devices, storage devices, combinational circuits and sequential circuits etc.

Any further improvement in the contents of the book by making corrections, omission and inclusion is keen to be achieved based on suggestions from the reader for which the author shall be obliged.

Author

Syllabus

B.C.A. Part-I

Computer Architecture

Part-A (Informative only)

Anatomy of a Computer [Information only] : Mother Board (Special reference to Intel 810 Chipset motherboard). CISC Micro Processors (Special reference to Pentium, AMD, Cyrix). RISC processors (Motorola, Power PC, and 680x0 series), Memory (ROM, RAM, Flash, Cache, Virtual, Buffers, CMOS), types of RAM (FPM, EDO, BEDO, SDRAM), Types of memory modules (SIMM, DIMM), System clock, Bus (Data, Address, Control), Bus architecture (ISA, MCA, EISA, PCI, AGP), Expansion slots and cards (Network adapter cards, SCSI card, Soundcard, TV tuner card, PC card), Ports (Serial, Parallel, AGP, USB, Fire Wire), cables (RS 232, BIN), Input devices (keyboard, mouse, trackball, track pad, pen, touch screen, bar code reader, scanner, OMR, OCR, voice input, video input, digital camera) Output devices [Monitors (refresh rate, resolutions, standards-CGA, VGA, SVGA, XGA, SCGA; LCD monitors, Video controllers and VRAM), Printers (Dot-Matrix, Line, Label, Ink0Jet, laser, Color Laser, thermal wax, dye sublimation, fiery, IRIS), Plotters (Pen, Ink-jet, electrostatic), Voice output], Storage devices [Storage types (Magnetic, Optical, magneto-optical, Solid state), random versus sequential access, formatting, tracks and sectors, speed, storage capacity, Floppy Disk (5.25 inch, 3.5 inch; 2HD, Zip, Superdisk, HiFD) Hard Disk tracks, cylinders, sectors; Hard Drive Interfaces (IDE, EIDE, Fast SCSI, Fast/wide, SCSI, Ultra SCSI; Hard Disk Cartridges, RAID); Optical Disks [pits and lands, CD (ROM, R, RW), DVD (ROM, R, RAM)], Magnetic tape (reels, streamers, DAT, DLT, stripe, Smart card), Modem (Fax/Data/Voice).

Part-B (Beginners level only)

Computer System History and Architecture development(the mechanical era, electronic computers, and later generations); von Neumann machine.

Logic gates; basic combinatorial logic, multiplexers, decoders, encorders, comparators, adder and subtracters, BCD to 7 segment decoder; sequential circuits, RS,JK, D and T flip flops, counter and shift registers, programmable logic array (PLA), programmable array of logic (PAL), programmable logic device (PLD).

Addressing methods and machine program sequencing-memory locations addresses, encoding of information, instructions and instructions sequencing, addressing modes, paging, relative, indirect and indexed addressing.

Basics of Computer organization; system buses and instruction cycles, memory subsystem organizations and interfacing, I/O subsystem organizations and interfacing, Register transfer languages.

CPU design : specifying a CPU, design and implementation of a simple CPU (fetching instructions from memory, decoding and executing instructions, establishing required data paths, design of ALU, design of the control unit and design verification), design and implementation of a simple micro sequencer, Features of Pentium microprocessors.

Memory systems, storage media; virtual and cache memory; programmed I/O. Interrupts (types, processing of interrupts, implementing interrupts inside CPU), Direct memory access, I/O processors, serial communication.

Reduced Instruction Set computing (RISC) RISC rationale, RISC instructions sets, instructions pipelines and register windows, RISC vs. CISC.

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Content

Chapter-1

Anatomy of a Computer

Q.1. What is CISC Microprocessor?

Ans.: CISC stands for complex instruction set computer. It was developed by Intel. CISC is a type of design for the computers. CISC based computer will have shorter programs which are made up of symbolic machine language. The number of instructions on a CISC processor is more.

Q.2. What is RISC Microprocessor?

Ans.: RISC stands for reduced instruction set computer architecture. The properties of this design are :

(i) A large number of general purpose registers and use of computers to optimize register usage.

(ii) A limited & simple instruction set.

(iii) An emphasis on optimizing the instruction pyre line.

Q.3. What are the different types of Memory?

Ans.: The memory in a computer is made up of semi-conductions. Semi-conduction memories are of two types :

(1) **RAM :** Random Access Memory

(2) **ROM :** Read Only Memory

(1) **RAM :** The Read and write (R/W) memory of a computer is called RAM. The User can write information to it and read information from it. In Random Access, any memory location can be accessed in a random memory without going through any other memory location. The RAM is a volatile memory, it means information written to it can be accessed as long as power is on. As soon as the power is off, it can not be accessed. There are two basic types of RAM :

(i) Static RAM

(ii) Dynamic Ram

(i) **S-RAM** retains stored information only as long as the power supply is on. Static RAM's are costlier and consume more power. They have higher speed than D-RAMs. They store information in Hip-Hope.

(ii) **D-RAM** loses its stored information in a very short time (for milli sec.) even when power supply is on. In a DRAM, a binary static is stored on the gate to source stray capacitor of a transfer the presence of charge on the stray capacitor shows 1 & absence 0.

D-RAM's are cheaper & lower.

Some other RAMS are :

(a) **EDO (Extended Data Output) RAM :** In an EDO RAMs, any memory location can be accessed. Stores 256 bytes of data information into latches. The latches hold next 256 bytes of information so that in most programs, which are sequentially executed, the data are available without wait states.

(b) **SDRAM (Synchronous DRAMS), SGRAMs (Synchronous Graphic RAMs) :** These RAM chips use the same clock rate as CPU uses. They transfer data when the CPU expects them to be ready.

(c) **DDR-SDRAM (Double Data Rate – SDRAM) :** This RAM transfers data on both edges of the clock. Therefore the transfer rate of the data becomes doubles.

(2) **ROM :** Read only memory: Its non volatile memory, ie, the information stored in it, is not lost even if the power supply goes off. It's used for the permanent storage of information. It also posses random access property. Information can not be written into a ROM by the users/programmers. In other words the contents of ROMs are decided by the manufactures. The following types of ROMs an listed below :

(i) **PROM :** It's programmable ROM. Its contents are decided by the user. The user can store permanent programs, data etc in a PROM. The data is fed into it using a PROM programs.

(ii) **EPROM :** An EPROM is an erasable PROM. The stored data in EPROM's can be erased by exposing it to UV light for about 20 min. It's not easy to erase it because the EPROM IC has to be removed from the computer and exposed to UV light. The entire data is erased and not selected portions by the user. EPROM's are cheap and reliable.

(iii) **EEPROM (Electrically Erasable PROM) :** The chip can be erased & reprogrammed on the board easily byte by byte. It can be erased with in a few milliseconds. There is a limit on the number of times

the EEPROM's can be reprogrammed, i.e.; usually around 10,000 times.

Flash Memory : Its an electrically erasable & programmable permanent type memory. It uses one transistor memory all resulting in high packing density, low power consumption, lower cost & higher reliability.

Its used in all power, digital cameras, MP3 players etc.

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Chapter-2

Basic Computer Architecture

Q.1. Explain the different types of Memory Modules.

Ans.: There are two types of memory modules :

(i) **SIMM :** Single Inline Memory Modules

(ii) **DIMM :** Double Inline Memory Modules

These are small printed circuit cards (PCC) on which several DRAMS memory chips are placed. Such cards are plugged into the system board of the computer. The SIMM Circuit cards contain several memory chips with contacts placed on only one edge of this PCC whereas in DIMM, it's on both sides of the PCC.

Q.2. Explain about the System Clock.

Ans.: Every computer has got a system clock. It's located in the microprocessor. The clock is design by a piece of quartz crystal. The system clock keeps the computer system coordinated. It's an electronic system which keeps oscillating at specified times intervals, between 0 & 1. The speed at which this oscillation takes place is called the cycle of the clock. The time taken to reach from '0' to '1' and back is called clock cycle the speed of the system clock is measured in terms of Hz.

Q.3. Explain about the System Bus.

Ans.: Bus means the electronic path between various components Bus refers to particular types of a cable. Each cable of a bus carries information of one bit. Buses are of 3 types :

(1) Address Bus

(2) Data Bus

(3) Control Bus

(1) **Address Bus :** It carries the address of memory location of required instructions and data. The address Bus is unidirectional, i.e., data flows in one direction from CPU to memory. The address bus data determines the maximum number of memory addresses. This capacity is measured in binary form. E.g. A 2 –bit address bus will provide 2^2 addresses.

(2) **Data Bus :** Data bus is an electronic path that connects CPU, memory & other h/w devices. Data bus carries the data from CPU to memory or I/P–O/P devices and vice versa. It's a directional bus because it can transmit data in either direction. The processing speed of a computer increases if the data bus is large as it takes more data at one time.

(3) **Control Bus :** Control Bus controls the memory and I/O devices. This bus is bidirectional. The CPU sends signals on the control bus to enable the O/P of the addressed memory devices.

Data Bus Standard : Bus standard represents the architecture of a bus. Following are important data bus standards :

(i) **Industry Standard Architecture (ISA) :** This bus standard was the first standard released by IBM. It has 24 address lines & 16 data lines. It can be used only in a single user system. ISA bus is a low cost bus. It has a low data transfer rate. It could not take the full advantage of the 32-bit micro processor.

(ii) **Micro Channel Architecture (MCA) :** IBM developed MCA bus standard. With this, bus speed was elevated from 8.33 MH_z to 10MHz which was further increased to 20 MH_z & bandwidth increased from 16 bits to 32 bits.

(iii) **Enhanced Industry Standard Architecture (EISA) :** These buses are of 32 bit & helpful in multiprogramming. Due to low data transfer speed, ISA cannot be used for multi tasking & multi-user-systems. EISA is appropriate for multi user systems. The data transfer rate of EISA is double of that of ISA. The size of EISA is same as that of ISA, so both EISA & ISA cards can be fixed in EISA connector slot. EISA connectors are quite expenses.

(iv) **Peripheral Component Interconnect (PCI) :** This bus standard was developed by Intel. It's a 64 bit bus & works on 66 MHz. Earlier, a 32 bit PCI bus was developed having a speed of 33 MHz. PCI bus has greater speed and has 4 interrupt channels. It also has a PCI bridge through which the bus can be connected to various other devices.

Q.4 Explain the role of Expansion Slots.

Ans.: The main function of the mother board is to enable connectivity between various parts of a computer with processor & memory. Various hardware cards can be

fixed on the mother board to save different purposes. Mother boards have slots to fix the various cards-like video card, modem, sound cards etc, expansion slots on the motherboard can be used fro the following purposes:

(i) To connect the internal devices of a computer eg. Hard disk etc. to the computer bus.

(ii) To connect the computer to the external devices like mouse, printer etc.

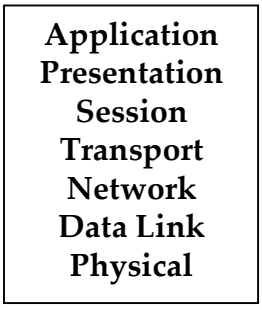
The above functions are carried out with the help of adapters.

Q.5. List out various Cards and elaborate about them?

Ans.: (1) **Sound Card** : This card is used for I/P& O/P sound. Microphone is used to I/P& speaker is used to O/P the sound. The sound card converts the sound into computer language & vice versa. All sound cards are based on MIDI (Musical Instrument Digital Interface) which represents the music in electronic form. The main part of sound card is DSP (Digital signal processor) which uses arithmetic logic to bring out sound effects. Sound card comes with 16-bit computers. DAC (Digital to Analog) and ADC (Analog to Digital) sound card uses DMA (Direct memory Access) channel is to read & write the digital audio data.

(2) **SCSI (Small Compute System Interface)** : This technology is used in high speed hard disk. It's often used in servers where high volume of data is used. At present different versions of SCSI are used. The capacity of the SCSI is determined by the bus width and speed of the interface. Through SCSI the computers bus is extended by means of the cable. It's an extension of the computer bus.

(3) **Network Cards** : N/W card is a versatile device because it performs a number of tasks that contribute to the entire process of transmitting and receiving data between computers. It links a computer to another computer of the n/w through cable wires. A seven-layer model of OSI (Open System Interface) is used in the Internet for receiving and transmitting of data. The information passes through there seven layers. N/W card implements the physical layer and half of the data link layer.



OSI Model

Q.6. Describe briefly about different types of Ports.

Ans.: Computers have an interface called ports. Peripheral devices are interfaced to the computers through these ports. Data flows in & out through these ports. Ports are of 2 types, Parallel & Serial.

A parallel port allows the transfer of all the bits of a word simultaneously. In parallel interface there are multiple lines to connect the peripherals to the port. A parallel interface is used to transfer data at a faster rate for higher speed peripherals such as disk and tapes.

A Serial port allows serial data transfer. In serial data transfer, one bit of data is transmitted at a time. In serial interface, only one line or a pair of line is used to transmit data. It's used for slow speed peripherals such as terminal. Printers employ either serial interface or parallel interface. The disadvantage of a serial/ parallel port is that only one device can be connected to a port.

Q.7. Explain about RS 232 C.

Ans.: The RS 232 C is a standard for serial data transfer. It specifies standard for 25 signals & hand shake signals which are used between DCE & DTE. The voltage levels, maximum capacitance for there signal lines are also described in this standard. The standard RS-232 C interface is usually provided in computers for serial data transfer. A voltage between -3 V & -15 V under load is used for high logic or mark. A voltage between +3 V & +15 V under load is used for low logic or space. The voltage levels are not TTL compatible.

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Chapter-3

Input Output Devices

Q.1. Give short notes on various Input and Output Devices.

Ans.: The devices which are used to input the data and the programs in the computer are known as "Input Devices'. These devices convert what we input, into a form that is understandable by a computer. It provides man to machine communication. Some of the I/O devices are explained below:

(1) **Keyboard** : The data and instructions are input by typing on the keyboard. The message typed on the keyboard reaches the memory unit of a computer. It's connected to a computer via a cable. Apart from alphabet and numeral keys, it has other function keys for performing different functions.

(2) **Mouse** : It's a pointing device. The mouse is rolled over the mouse pad, which in turn controls the movement of the cursor in the screen. We can click, double click or drag the mouse. Most of the mouse's have a ball beneath them, which rotates when the mouse in moved. The ball has 2 wheels of the sides, which in turn mousse with the movement of the ball. The sensor notifies the speed of its movements to the computer, which in turn moves the cursor/pointer on the screen.

(3) **Scanner** : Scanners are used to enter information directly in to the computers memory. This device works like a Xerox machine. The scanner converts any type of printed or written information including photographs into digital pulses, which can be manipulated by the computer.

(4) **Track Ball** : Track ball is similar to the upside- down design of the mouse. The user moves the ball directly, while the device itself remains stationary. The user spins the ball in various directions to effect the screen movements.

(5) **Light Pen** : This is an input device which is used to draw lines or figures on a computer screen. It's touched to the CRT screen where it can detect **raster** on the screen as it passes.

(6) **Optical Character Rader** : It's a device which detects alpha numeric characters printed or written on a paper. The text which is to be scanned is illuminated by a low frequency light source. The light is absorbed by the dark areas but reflected from the bright areas. The reflected light is received by the photocells.

(7) **Bar Code Reader :** This device reads bar codes and coverts them into electric pulses to be processed by a computer. A bar code is nothing but data coded in form of light and dark bars.

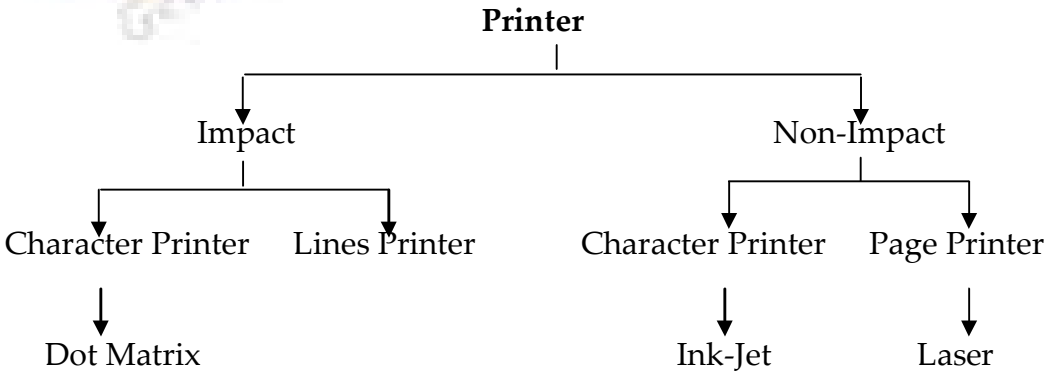
(8) **Voice Input Systems :** This devices converts spoken words to M/C language form. A micro phone is used to convert human speech into electric signals. The signal pattern is then transmitted to a computer when it's compared to a dictionary of patterns that have been previously placed in a storage unit of computer. When a close match is found, the word is recognized.

(9) **Plotter :** Plotter is an O/P device that is used to produce graphical O/P on papers. It uses single color or multi color pens to draw pictures as blue print etc.

(10) **Digital Camera :** It converts graphics directly into digital form. It looks like an ordinary camera, but no film is used therein, instead a CCD (changed coupled Divide) Electronic chip in used. When light falls, on the chip though the lens, it converts light waves into electrical waves.

Q.2. What is a Printer and what are the different types of Printers?

Ans.: Printers are O/P devices used to prepare permanent O/P on paper. Printers can be divided into two main categories :



(1) **Impact Printers** : In this hammers or pins strike against a ribbon and paper to print the text. This mechanism is known as electro-mechanical mechanism. They are of two types.

(i) Character Printer

(ii) Line Printer

(i) **Character Printer :** It prints only one character at a time. It has relatively slower speed. Eg. Of them are Dot matrix printers.

Dot Matrix Printer : It prints characters as combination of dots. Dot matrix printers are the most popular among serial printers. These have a matrix of pins on the print head of the printer which form the character. The computer memory sends one character at a time to be printed by the printer. There is a carbon between the pins & the paper. The words get printed on the paper when the pin strikes the carbon. There are generally 24 pins.

(ii) **Line Printer** : It prints one line of text at a time. They have higher speed compared to character printers. These printers have a poor quality of O/P. Chain printers and Drum printers are examples of line printers.

(2) **Non-Impact Printers** : There printers use non-Impact technology such as ink-jet or laser technology. There printers provide better quality of O/P at higher speed. These printers are of two types :

(i) Ink-Jet Printer : It prints characters by spraying patterns of ink on the paper from a nozzle or jet. It prints from nozzles having very fine holes, from which a specially made ink is pumped out to create various letters and shapes. The ink comes out of the nozzle in a form of vapors. After passing through a reflecting plate, it forms the desired letter/shape at the desired place.

(ii) Laser Printer : It prints the entire page in one go. These printers have photo sensitive drum made of silicon. This drum is coated with recharge photoconductive, which is extremely sensitive to light. This drum is exposed to the laser rays reflected from the shapes to be printed. The area where there rays fall gets discharged. This drum while rotating comes in contact with toner and the toner gets attached to the discharged area on the drum. Then when the drum comes in contact with paper, the toner that has got attached to the drum in the original shape gets attached to the paper & hence printing takes place. The paper is slightly heated and the toner gets permanently attached to it.

Q.3. What is the Refresh Rate?

Ans.: The refresh rate is the number of times in a second that display the data it's being given. This is distinct from the measure of from rate in that the refresh rate includes the repeated drawing of identical while trans rate measures how a video source can lead an entire frame of new data to a display.

Q.4. What are the different kinds of Resolutions in the Monitor?

Ans.: Resolution refers to the sharpness, or detail of the usual image. It's a primary function of the monitor & it's determined by the beam size & dot pitch. The screen is made up of a number of pixels. A completes screen image consists of thousand of pixels & the screen resolution in the maximum no. of displayable pixels. Higher the resolution, the more pixels can be displayed. Resolutions are of different for different video standards as listed below :

(a) **VGA :** 1640 x 480

(b) **SVGA :** 800 x 600

(c) **XGA :** 1024 x 768

(d) **SXGA :** 1400 x 1050

Q.5. Explain about LCD Monitors.

Ans.: LCD stands for Liquid Crystal Display. Each pixel of an LCD typically consists of a layer of molecules aligned between 2 transparent electrodes, & 2 polarizing filters, the axis of transmission of which are perpendicular to each other. The surface of the electrodes that are in contact with the liquid crystal material are treated so as to align the liquid crystal molecules in a particular direction.

Q.6. Explain about Video Controller.

Ans.: A video display controller or VDC is an IC which is the main component in a video signal generator, a device responsible for the production of a TV video signal in a compulsory or games system.

Q.7. Explain the different types of Printer:

Ans.: **Thermal Wax Printer** : It uses wax coated ribbon & heated pairs. As the magenta, yellow & black ribbon passes in front of the print head, heated pins melt the wax on to the paper where it hardens.

Thermal wax printers produce vibrant colors but require very smooth or specially coated paper for best O/P.

Dye Sublimation : It's a printer which employs a printing process that user heat to transfer dye to a medium such as plastic card, Printed paper, Poster paper or fabric. The process is usually to lay one color at a times using a ribbon that has color panels.

IRIS Printer : It's a large format color inkjet printer which is used for digital prepress proofing. It uses a continuous inkjet technology to produce continuous-tone O/P on various media including paper canvas etc. They have low costs.

Q.8. What is Magnet-Optical Storage Media?

Ans.: There are used for erasable disks. MO system includes basic principles of both magnetic & optical storage systems. MO systems write magnetically & read optically. It has two standard forms : **5.25 inches & 3.5 inches.**

Q.9. Explain thee following terms -

Ans.: (i) **IDE** : DE stands for Integrated Drive Electronic, It's a high speed, intelligent pathway to connect peripheral to the computers. IDE is a standard according to which IDE interface is made.

(ii) **EIDE** : Its stands for Enhanced IDE. It can interface hard disks, floppy disks optical disk & tape drives. It provides 4 channels. Two EIDE devices can be connected to each channel. Thus a total of 8 EIDE devices can be interfaced to a PC. A motherboard has 2 connectors for EIDE interface.

(iii) **Fast SCSI** : It has increased the maximum SCSI data through put from 5 MBPS to 10 MBPS. Wide SCSI increased speed from 10 MBPS to 20 MBPS.

(iv) **Ultra SCSI** : Also called "Fast 20" the enhancement of SCSI that results in doubling the fast SCSI data throughput speeds to 20 MBPS for 8 bit & 40MBPS for 16 bit processor.

Q.10. What are RAID Levels?

Ans.: In Redundant Arrays of Independent Disks (RAID) system, multiple disks operate in parallel to store the same information. It improves storage reliability. It eliminates the risk of data loss when one of the disk fails. Also, a large file is stored in several disk units by breaking the file up into a number of smaller pieces and storing these pieces on different disks. This is called data stripping.

Q.11. Explain about the Power PC Processes.

Ans.: Power PC Microprocessors were jointly developed by IBM, Motorola and Apple. They are high performances RISC processors. The term superscalar is used for the architecture which uses more than one pipe line for the execution of

instructions. Power PC is designed to work in multiprocessor systems. All power PC contain floating –point math, processor & memory management unit on the chip. It's a 32 bit, 66 MHz microprocessor.

Q.12. Describe in brief about Motorola Process Microprocessors.

Ans.: Motorola introduced its first 8-bit microprocessor 6800 in 1974. It was widely used in industry for controlling equipment.

In 1979, Motorola introduced an advanced 16 bit MP 68000. Though its data bus is 16 bit wide, its intended architecture was of 32 bits. It could directly address up to 16 MB memory.

The Motorola 680X0 series of MP's were similar from a programming point of view. An improved m/c of this series can run the software of its predecessor of the series. In 1980s, the 680X0 series were used in desktops and serves computers. They are also used in embedded applications.

Q.13. What are Pits and Lands in CD's.

Ans.: To write 1' & 0's on CD, a laser beam is used. To write 1, the laser beam is turned on, which turns a pit up to the reflecting layer. To write 0, the laser beam is not turned on & hence, no pit is burned. The surface when there is no pit is called land.

Q.14. What are the features of Pentium Microprocessor?

Ans.: The Pentium is Intel 32 bit superscalar CISC microprocessor. The term superscalar is used for the processor which contains multiple ALU's to execute more than one instruction simultaneously in parallel per clock cycle. The Pentium contains 2 ALU's & can execute 2 instructions per clock cycle. Besides 2 ALU's, it also contains one on-chip FPU & 28 KB cache memory (one for instruction & other for data). The Pentium has 32-bit address bus and 64 bit data bus. The data bus used is of 64 bit with a view to supply data at faster rates. It has got 4 varieties Pentium II, Pentium III & Pentium IV.

Q.15. What is PLD & PLA.

Ans.: To implement combinational & sequential circuits, we have to interconnect serial SSI & MSI chips by making connection external to the IC package. Logic circuits can also be designed using Programmable Logic Devices (PLDs) that have all the gates necessary for a logic circuit design in a single package. In such devices, there are provisions to perform the inter connections of the gates internally so that the desired logic can be implemented.

Programmable Logic Array (PLA) is a type of fixed architecture logic device with programmable AND gates followed by programmable OR gates. The PLA is used to implement a complex combinational circuit. In VLSI design, PLAs are used because the area required by the regular AND & OR arrays is less than the area required by randomly inter connected gates.

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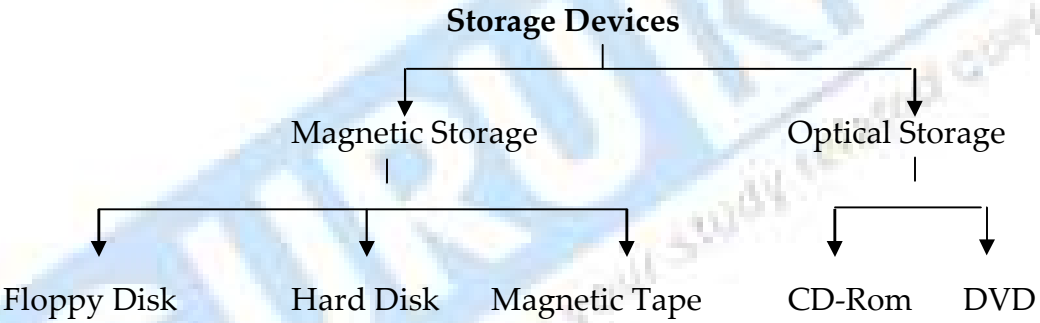
Chapter-4

Storage Devices

Q.1. How can you classify Storage Devices? What are its different types elaborate?

Ans.: Storage devices or secondary storage devices are used to store data and instruction permanently. They are used in computers to supplement the limited storage capacity of RAM.

Storage devices can be categorized in two parts :



Floppy Disk : It's a circular disk coated with magnetic oxide and enclosed within square plastic cover (Jacket). It's available in different size, but the most commonly used floppy is 3½. Data up to 1.44 MB can be stored in it. Data is written as tiny magnetic spots on the dish surface creating new data or a disk surface eraser data previously stored at that location. Floppies are available in 2 sizes, 3.5 inch & 5.25 inch. The 3.5 inch size floppy is mostly used. The 5.25 inch floppy is kept in a flexible cover & it's not safe. It can store about 1.2 MB data.

Hard Disk : Hard disks are made of aluminum or other metal alloys which are coated on both sides with magnetic material. Unlike floppy disks, hark disks are not removable from the computer. To remain the storing capacity several disks are packed together & mounted on a common drive to form a disk pack. A disk is also called a platter.

Magnetic Tape : Magnetic tape is a mass storage device. It's used as a back up storage. It's a serial access type of storage device. Its main advantage is that it stores data sequentially. Standard sizes are ½ inch or ¼ inch or 8mm & 3mm

wide. Some Head names of tapes are: DAT (Digital Audio tape) & DLT (Digital Liner Tape) etc.

Optical Memory : Information is written to or read from an optical disk or tape using laser beam. Optical disks are not suitable memory storage units because their access time is more than that of hard disks. Their advantage is that they have very high storage capacity. Types of optical memory are: CD –ROM, CD-R, CD-RW, DVD-ROM, DVD-R and DVD-RW. Information on a CD-ROM is written at the time of manufacture.

CD-R/W of 700 MB are available.

A DVD-ROM is similar to CD-ROM. It uses shorter wave length of laser beam and hence, stores more data than CD-ROM.

Q.2. Explain about Modem.

Ans.: Modem is abbreviation for Modulator – Demodulator. Modems are used for data transfer from one computer to another through telephone lines. The computer works in digital mode, while analog technology is used for carrying massages across phone lines. Modem converts information from digital mode to analog mode at the transmitting end and converts the same from analog to digital at receiving end. Modems are two types :

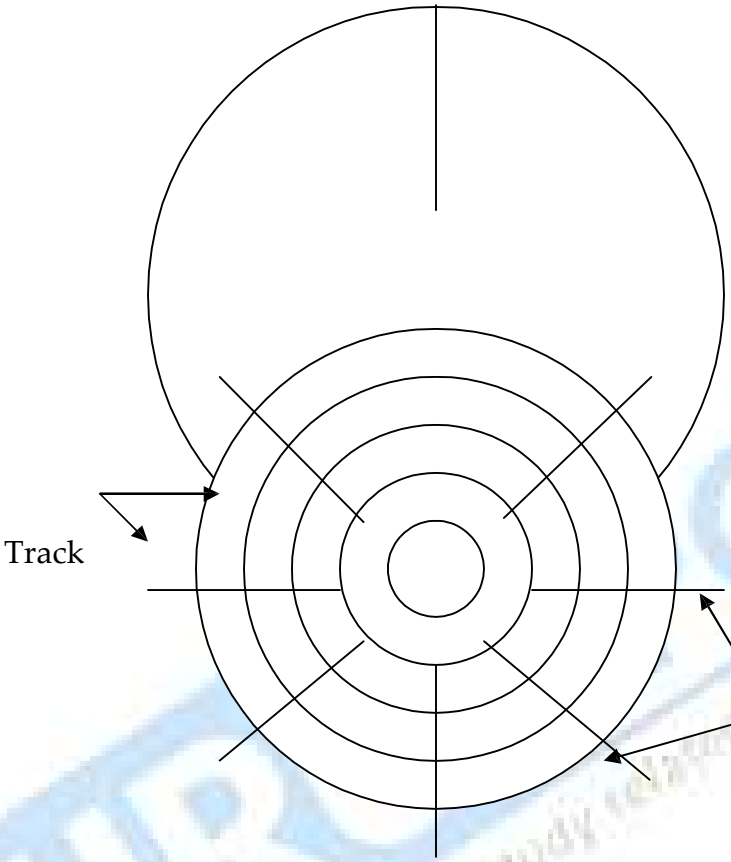
(i) Internal Modem

(ii) External Modem

Q.3. What is Formatting?

Ans.: The process of magnetically mapping of a floppy is called formatting. Before storing the data on a floppy, it needs to be magnetically mapped, so that data can be stored in the right place. Every new floppy needs to be formatted before use. Formatting means, creating tracks & sectors on the floppy. Tracks are in the shape of circles on the floppy which divide it into various segments. The number of tracks depends upon the density of the floppy. In a high density floppy, up to 80 tracks can be created.

If a floppy has 80 tracks with each track having 20 sectors, then the number of sector would be 1600.



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Chapter-5

History of Computers

Q.1. Explain about the evolution of Digital Computers.

Ans.: The successful general purpose mechanical computers were developed. In 1930, mechanical calculations were built for automatic addition, subtraction, multiplication & division. A calculator is not a programmable device. The different eras of the evolution of the computer are listed below:

(1) **Mechanical Era :** There were many attempts to create a m/c that could help to perform various calculations. In 1823, Charles Babbage tried to build a mechanical as computing m/c capable of performing automatic mathematical calculations. This was designed to compute tables of functions such as logs functions etc. In 1830's Babbage made a more powerful mechanical computer. This m/c was designed to perform any mathematical calculation automatically. It could perform addition etc. It had a memory unit. Its capacity was 1000 numbers, each no. consisting of 50 digits. The m/c was a programmable m/c. It had mechanism for enabling a program to change the sequence of its operations automatically. In the late 19th century punched cards were commercially used. Soon IBM was formed in 1924. Konand Zuse developed a mechanical computer, the Z1, in 1938 in Germany.

(2) **The Electronic Era :** The first electronic computer using. Valves were developed by John V. Atanas off in the late 1930's. It contained add-subtract unit. It was relatively a small computer and used about 300 valves. Its memory unit consisted of capacitors mounted on a rotating drum. It used a no. of I/O devices including a card punch and a card reader. The first popular general electronic digital computer was the ENIAC (Electronic Numerical Interpreter and calculator). John von Neumann was the consultant of the ENIAC project. The ENIAC used a high speed memory to store both programs as well as data during program execution. Neumann and his colleagues designed and build the IAS Computers. It used RAM consisting of a cathode ray tube. The transistors were invented in 1948 at AT&T bell laboratories. Slowly they

replaced Vacuum tubes. IC's were first introduced, ie, designed and fabricated in 1958-59. The examples of computers using IC's are-: IBM – 370 & PDP-8. In 1970 LSI chips were introduced is form of memory units. Computers built in 1970's & onwards used micro process and other LSI, VLSI and ULSI components.

Q.2. What were the different Computer Generations?

Ans.: The various generations of the computers an listed below :

(i) **First Generation (1946-1954) :** The digital computes using electronic values (Vacuum tubes) are known as first generation computers. The high cost of vacuum tubes prevented their use for main memory. They stored information in the form of propagating sound waves.

(ii) **Second Generation (1955-1964) :** The second-generation computer used transistors for CPU components & ferrite cores for main memory & magnetic disks & tapes for secondary memory. They used high-level languages such as FORTRAN (1956), ALGOL (1960) & COBOL (1960). I/O processor was included to control I/O operations.

(iii) **Third Generation (1965-1974) :** The third-generation computers used IC's (SSI& MSI) for CPU components. Semiconductor memories were LSI chips, Magnetic disk & tapes were used as secondary memory. Cache memory was also incorporated in the computers of 3rd generation. Micro programming, parallel memory multiprogramming etc were introduced. E.g. Of third generation computers are PDP II etc.

(iv) **Fourth Generation :** In 4th generation computers microprocessors were used as CPU's VLSI chips were used for CPU memory & supporting chips. Computer of this generation were very fast. 8, 16 & 32 bit microprocessors were developed during this period. Main memory used fast semiconductors chips up to 4 M bits size. Hard disks were used as secondary memory. Keyboards, dot matrix printers etc. were developed. OS-such as MS-DOS, UNIX, Apple's Macintosh were available. Object oriented language, C++ etc were developed.

(v) **Fifth Generation (1991- continued) :** 5th generation computers use ULSI (Ultra-Large Scale Integration) chips. Millions of transistors are placed in a single IC in ULSI chips. 64 bit microprocessors have been developed

during this period. Data flow & EPIC architecture of these processors have been developed. RISC & CISC, both types of designs are used in modern processors. Memory chips and flash memory up to 1 GB, hard disks up to 600 GB & optical disks up to 50 GB have been developed.

Q.3. Explain about the Von-Neumann Architectures.

Ans.: In this type of architecture, the computer consisted of a CPU, memory and I/O devices. The program is stored in the memory. The CPU fetches an instruction from the memory at a time and executes it. Thus, the instructions are executed sequentially which is a slow process. Neumann m/c are called control flow computer because instruction are executed sequentially as controlled by a program counter. To increase the speed, parallel processing of computer have been developed in which serial CPU's are connected in parallel to solve a problem.

Even in parallel computers, the basic building blocks are Neumann processors.

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