Biyani's Think Tank

Concept based notes

Computer Organisation

BCA

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<u>Preface</u>

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 concepts of the topics. 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.

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 readers for which the author shall be obliged.

I acknowledge special thanks to Mr. Rajeev Biyani, *Chairman* & Dr. Sanjay Biyani, *Director* (*Acad.*) Biyani Group of Colleges, who are the backbones and main concept provider and also have been constant source of motivation throughout this endeavour. They played an active role in coordinating the various stages of this endeavour and spearheaded the publishing work.

I look forward to receiving valuable suggestions from professors of various educational institutions, other faculty members and students for improvement of the quality of the book. The reader may feel free to send in their comments and suggestions to the under mentioned address.

Author
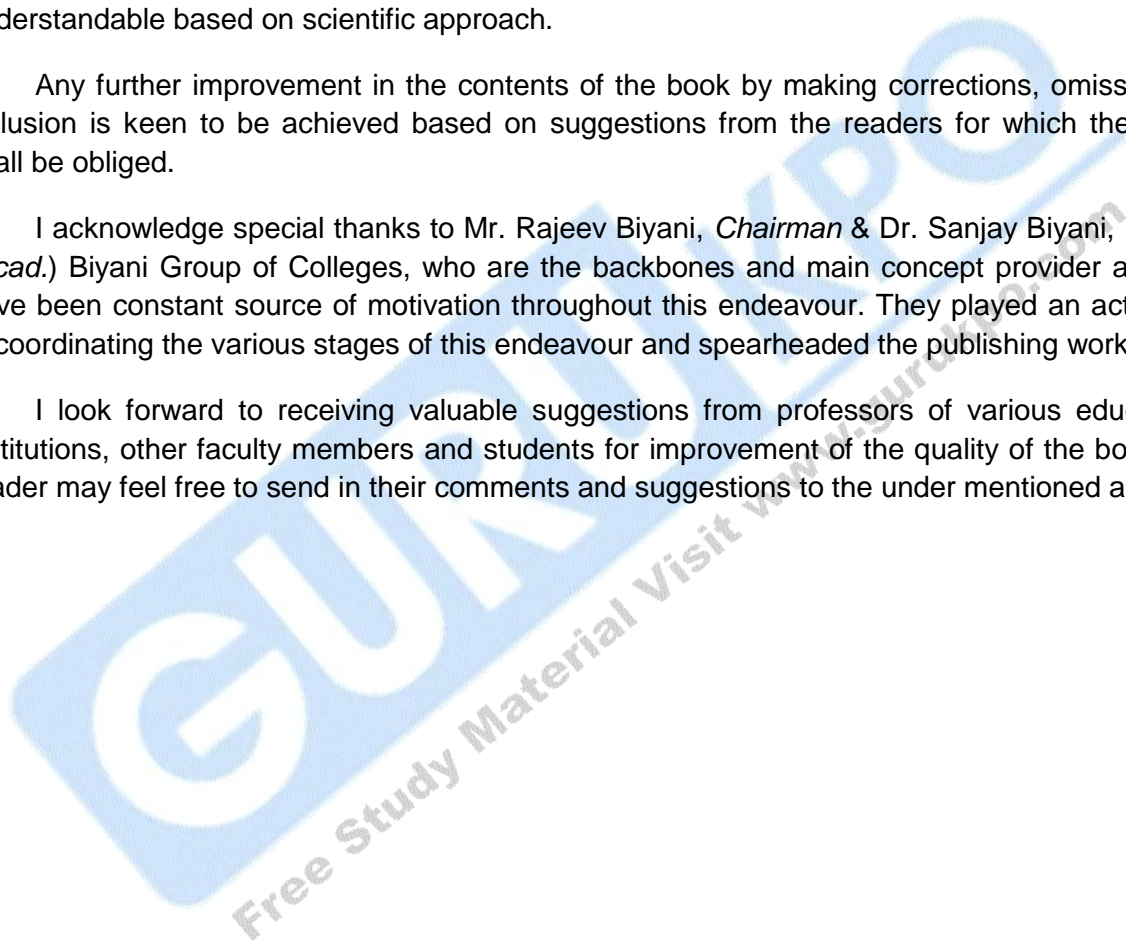
Syllabus

Unit I

Computer System History and Architecture development von Neumann machine, Mother Board, System clock, Bus (Data, Address Control), Bus architecture (ISA, MCA, EISA, PCI, AGP), Expansion slots and cards (Network adapter cards, SCSI card, Sound card, TV tuner card, PC card), Ports (Serial Parallel, AGP, USB Fire Wire), cables (RS 232, BIN), Input devices Output devices , Storage devices, random versus sequential access, formatting, tracks and sectors, speed, storage capacity, Floppy Disk, Hard Disk tracks, cylinders, sectors; Hard Drive Interfaces Optical Disks , Magnetic tape, Modern (Fax/Data/Voice).

UNIT-II

Basic building blocks – I/O, Memory, ALU and its components, Control Unit and its functions, Instruction –word, Instruction and Execution cycle, branch, skip, jump and shift instruction, Operation of control registers; Controlling of arithmetic operations, Classification of Computers (Workstation, Mainframe, Super Computer, Client Server Computer, Notebook, Tablet, PalmTop Computer)

UNIT-III

Basics of Computer organization; system buses and instructions cycles, memory subsystem organization; system buses and instruction cycles, memory subsystem organization 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.

UNIT-IV

Addressing techniques and registers:

Addressing techniques – Direct, Indirect, Immediate, Relative, Indexed addressing and paging. Registers – Indexed, General purpose, Special purpose, overflow, carry, shift,

scratch, Memory Buffer register; accumulators; stack pointers; floating point; status information and buffer registers. **Memory:** Main memory, RAM, static and dynamic, ROM, EPROM, EEPROM, EAROM, Cache and Virtual memory.

UNIT- V

Interconnecting System components:

Buses, Interfacing buses, Bus formats – address, data and control, Interfacing keyboard, display, auxiliary storage devices and printers. I/O cards in personal computers.

Introduction to Microprocessors and Microcontrollers: introduction to 8085 micropocesor, examples of few instructions to understand addressing techniques. Difference between microprocessor and microcontrollers, RISC v/s CISC.

Recommended Books

1. Andrew S. Tanenbaum , Structured Computer Organization,Printice Hall
2. William Stallings, Computer Organization and Architecture , Sixth Edition, Pearson
3. John D. Carpinelli: Computer Systems Organization & Architecture; 3rd Edition; Person Education Asia,2008
4. M, Morris Mano; Computer System Architectures; III Edition, Prentice Hall of India,2008
5. Malvino B ; Digital Computer Electronics III Edition; TMHL

Chapter 1

Computer History and Hardware

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.

## Q4. Explain the block diagram of computer system?

Ans: A computer can process data, pictures, sound and graphics. They can solve highly difficult hitches quickly and accurately. A computer performs basically five major computer operations or functions. These are

1) It accepts data or instructions by way of input,

2) It stores data,

3) It can process data as required by the user,

4) It gives results in the form of output, and

5) It controls all operations inside a computer.

We discuss below each of these Computer operations
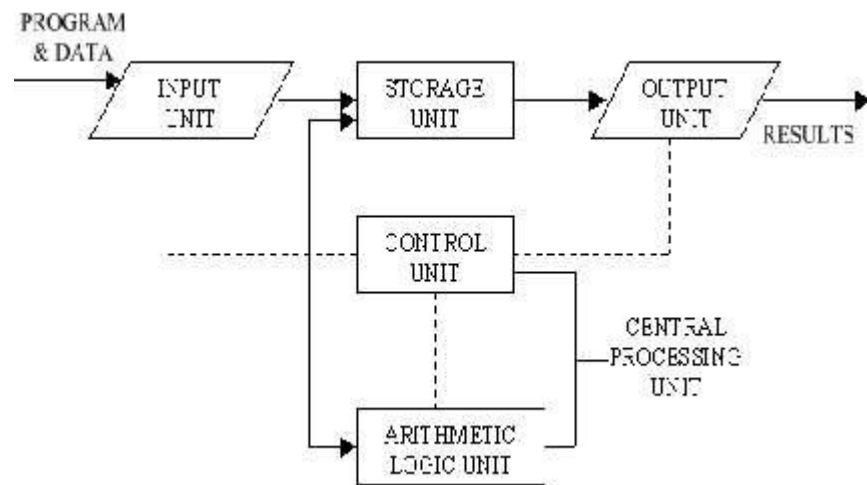
Fig: *Basic computer Operations*

1. Input: This is the process of entering data and programs in to the computer system. You should know that computer is an electronic machine like any other machine which takes as inputs raw data and performs some processing giving out processed data. Therefore, the input unit takes data from us to the computer in an organized manner for processing.

2. Storage: The process of saving data and instructions permanently is known as storage. Data has to be fed into the system before the actual processing starts. It is because the processing speed of Central Processing Unit (CPU) is so fast that the data has to be provided to CPU with the same speed. Therefore the data is first

stored in the storage unit for faster access and processing. This storage unit or the primary storage of the computer system is designed to do the above functionality. It provides space for storing data and instructions.

The storage unit performs the following major functions:

• All data and instructions are stored here before and after processing.

• Intermediate results of processing are also stored here.

3. Processing: The task of performing operations like arithmetic and logical operations is called processing. The Central Processing Unit (CPU) takes data and instructions from the storage unit and makes all sorts of calculations based on the instructions given and the type of data provided. It is then sent back to the storage unit.

4. Output: This is the process of producing results from the data for getting useful information. Similarly the output produced by the computer after processing must also be kept somewhere inside the computer before being given to you in human readable form. Again the output is also stored inside the computer for further processing.

5. Control: The manner how instructions are executed and the above operations are performed. Controlling of all operations like input, processing and output are performed by control unit. It takes care of step by step processing of all operations inside the computer.

Q5. **What do you know by Motherboard? Explain.**

Ans. The motherboard is the piece of computer hardware that can be thought of as the "backbone" of the PC. The motherboard connects all parts of a computer together. The CPU, memory hard drive, optical drives, video card, sound card and other

ports and expansion cards connects to the motherboard directly via cables. Popular motherboard manufactures are Intel, ASUS, AOpen, ABIT, MSI, Biostar.

ASUS P5AD2-E Premium Motherboard
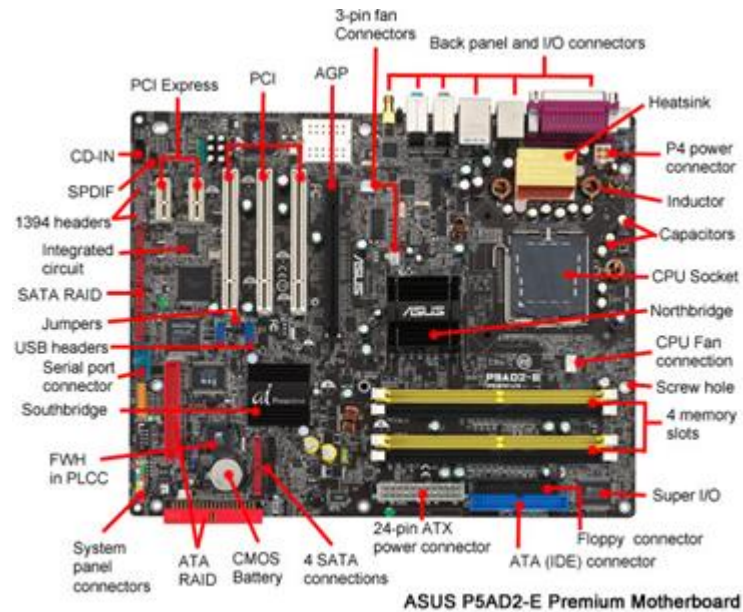
It is a printed circuit board that is the foundation of a computer, located at the bottom of the computer case. It allocates power to the CPU, RAM, and all other computer hardware components. Most importantly, the motherboard allows hardware components to communicate with one another.

Below is a listing of other motherboard components that are not shown in the picture above or were part of older computer motherboards.

BIOS

Bus

Cache memory

Chipset

Diode

Dip switches

Electrolytic

Fuse

Game port and MIDI header

Internal speaker

Keyboard controller

LCC

Network header

Obsolete expansion slots (AMR, CNR, EISA, ISA, VESA)

Obsolete memory slots (SIMM)

Onboard LED

Voltage regulator

Voltage regulator module (VRM) ETC.

Q.6.   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.7.   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 MHz to 10MHz which was further increased to 20 MHz & 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.8 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.

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.
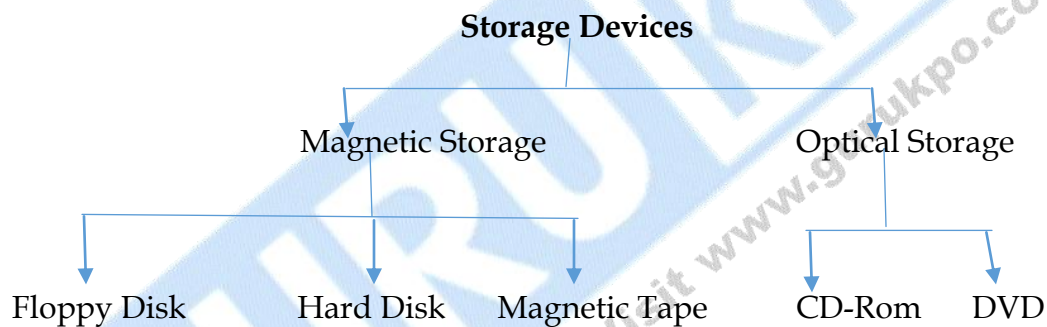
Chapter 2

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 :

Storage Devices
- Magnetic Storage
  - Floppy Disk
  - Hard Disk
  - Magnetic Tape
- Optical Storage
  - CD-Rom
  - DVD

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.
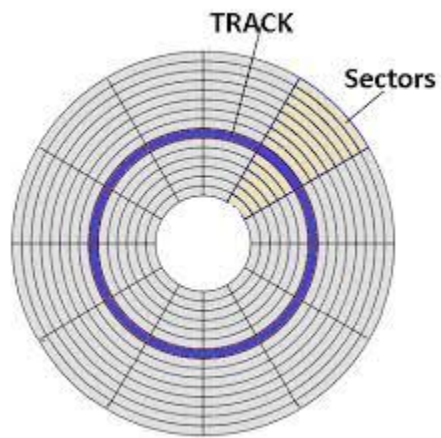
Q4.   Write the Difference between Random versus Sequential Access

Ans.   Sequential Access- A sequential access device is one in which the arrival at the location desired may be preceded by sequential through other locations , so that access time varies according to location. In other words, information on a serial sequence in which it is stored. It is suitable for such applications like preparation of monthly pay slips or monthly electricity bills etc. where each address needs to be accessed in turn. Magnetic tape and punched paper media are sequential storage device.

Random Access- A random Access device is one in   which any location in the device may be selected at random, access to the information stored is direct, and approximate equal access time is required for each location. Magnetic disk and magnetic drum are direct access storage devices.

Q5.   What is speed?

Ans.   Speed refers to access information from a disk. The disk address of the desired data has to be specified. The disk address is specified in terms of the track number, the surface number, and the sector number. Information is always written from the beginning of a sector and can be read only from the track beginning. As soon as a read/write command is received by the disk unit, the read/write heads are first positioned on the specified track number by moving the arm assembly in the proper direction. This involves a mechanical motion of the arm and is slow. The time required to position the head over the proper track is called the seek time or speed. The speed or seek time varies depending on the position of the arm assembly when a read/write command is received.

Q6.   What do you understand by storage capacity?

Ans.   The storage capacity of disk system depends on the tracks per inch of surface and the bits per inch of track .Although the diameter of a standard size magnetic disk is 14 inches but some disks are quite large running upto 4 feet in diameter. Larger disks have more tracks and hence they have greater storage capacity.

Chapter-3

Basic Building blocks

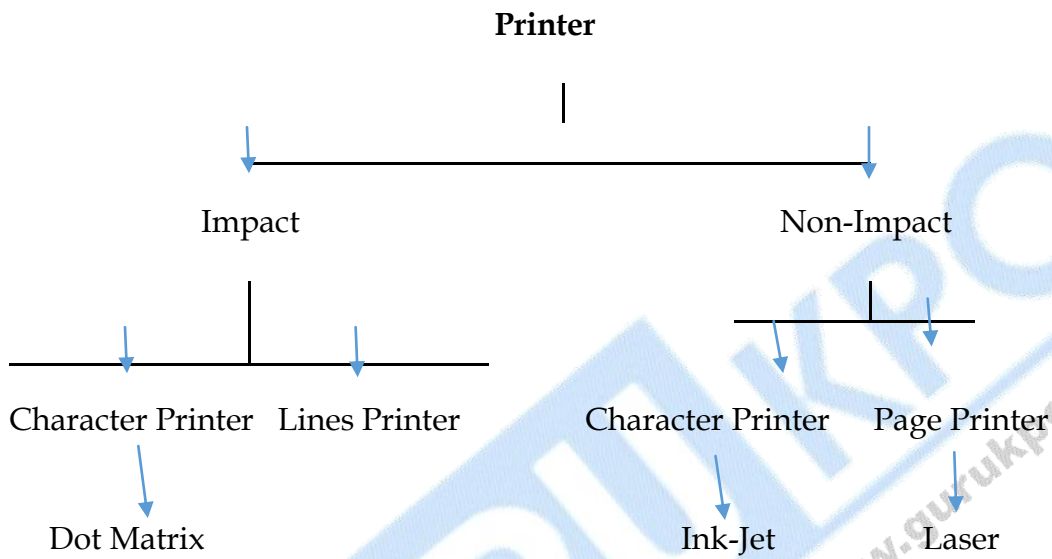**Q.1.   Give short notes on various Input and Output Devices.**

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 Reader**: 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 :

Printer

```
                            Printer
                               |
          ┌────────────────────┴────────────────────┐
          ↓                                          ↓
       Impact                                   Non-Impact
          |                                          |
    ┌─────┴─────┐                            ┌───────┴───────┐
    ↓           ↓                            ↓               ↓
Character   Lines Printer             Character Printer   Page Printer
 Printer
    ↓                                        ↓               ↓
Dot Matrix                               Ink-Jet          Laser
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(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 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

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 cannot be accessed.

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 cannot be written into a ROM by the users/programmers. In other words the contents of ROMs are decided by the manufactures

Q4.   Write ALU and its components?
Ans.   It is a digital circuit that performs integer arithmetic and logical operations. The ALU is a fundamental building block of the central processing units of a computer, and even the simplest microprocessor contain one for purposes such as

maintaining timers.it represents the fundamental building block of the central processing unit of a computer.

Q5. Define the different types of instruction?

Ans. Branch Instruction – When an instruction, instructs the processor to continue execution at the start of the user program is known as branch instruction. In this process the processor will execute the instruction in the user's program until it encounters an ending or error condition. Either event causes the processor to fetch its next instruction from the monitor program thus the phrase "control is passed to a job" simply means that the processor is now fetching and executing instructions in a user program, and "control is returned to the monitor" means that the processor, and "control is returned to the monitor" means that the processor is now fetching and executing instructions from the monitor program.

Skip Instruction – The skip instruction includes an implied address. This express that one instruction be skipped thus, the implied address equals the address of the next instruction plus one instruction length. Because the skip instruction does not require a destination address field, it is free to do other things.

Jump Instruction – In a jump instruction, has as one of its operand the address of the next instruction to be executed. it is also known as branch instruction. Most often, the instruction is a conditional jump instruction. That is, the jump is made only if a certain condition is met. Otherwise, the next instruction in sequence is executed. In jump instruction in which the jumping is always taken is an unconditional.

Shift Instruction – Shift Instruction facilities manipulation of data i.e. modifying part of a 32-bit data word. Such operations includes re- arrangements of bytes in word, "quick" divide or multiplication by any number 2,4, "masking " – Adding or deleting certain fields of a word. There are six types of shift operations:
- Shift left operations
- Logical Right Shift
- Shift right logical
- Arithmetic Right shift(sra)
- Arithmetic Right Shift (2)
- Arithmetic Right Shift

Q6. Explain classification of computer in detail.

Ans. Classification digital Computer based on size and Capability
Based on size and capability, computers are broadly classified into

- Microcomputers(Personal Computer)
  A microcomputer is the smallest general purpose processing system. The   older pc started 8 bit processor with speed of 3.7MB and current pc 64 bit processor with speed of 4.66GB Examples: -IBM
  PCs, APPLE computers

Microcomputer can be classified into 2 types :

1. Desktops
2. Portables
   The difference is portables can be used while travelling whereas desktops computers   cannot be carried around.

The different portable computers are: -
1)   Laptop
2)   Notebooks
3)   Palmtop (hand held)
4)   Wearable computers

Laptop: - this computer is similar to a desktop computers but the size is smaller. They are expensive than desktop. The weight of laptop is around 3 to 5 kg.

Notebook: - These computers are as powerful as desktop but size of these computers are comparatively smaller than laptop and desktop. They weigh 2 to 3 kg. They are more costly than laptop.

Palmtop (Hand held): - They are also called as personal Digital Assistant (PDA). These computers are small in size. They can be held in hands. It is capable of doing word processing, spreadsheets and hand writing recognition, game playing, faxing and paging. These computers are not as powerful as desktop computers. Ex: - 3com palmV.

Wearable computer: - The size of this computer is very small so that it can be worn on the body. It has smaller processing power. It is used in the field of medicine. For example pace maker to correct the heart beats. Insulin meter to find the levels of insulin in the blood.

Workstations:- It is used in large, high-resolution graphics screen built in network support, Engineering applications(CAD/CAM), software development desktop publishing
Ex: Unix and windows NT.

Minicomputer: -A minicomputer is a medium-sized computer. That is more powerful than a microcomputer. These computers are usually designed to serve multiple users simultaneously(Parallel Processing). They are more expensive than microcomputers.
Examples: Digital Alpha, Sun Ultra.

Mainframe computers: - Computers with large storage capacities and very high speed of processing (compared to mini- or microcomputers) are known as mainframe computers. They support a large number of terminals for simultaneous use by a number of users like ATM transactions. They are also used as central host computers in distributed data processing system.
Examples: -   IBM 370, S/390.

Supercomputer: -   Supercomputers have extremely large storage capacity and computing speeds which are many times faster than other computers. A supercomputer is measured in terms of tens of millions Instructions per second (mips), an operation is made up of numerous instructions. The supercomputer is mainly used for large scale numerical problems in scientific and engineering disciplines such as Weather analysis.
 Examples: -   IBM Deep Blue

Chapter 4

Basic Computer Organization and C.P.U Design

Q.1.   What is an Instruction?

Ans.: An instruction is a command given to the computer to perform a specified operation on given data. Each instruction consists of 2 parts: an opcode and an operand. The first part of an instruction, which specifies the operation, to be performed is known as opcode. The second part of an instruction called operand is the data on which computer perform the specified operation.

As a computer understands instructions only in the form of 0 & 1, instruction and data are fed into the computer is a binary form. They are written in binary codes known as machine codes. For the convenience of this user the codes can be written in hexical form.

Instructions are classified into the following three types according to their word length:

(i)   Single Byte Instruction

(ii)   Two Byte Instruction

(iii)   Three Byte Instruction

Q.2.   Explain about the I/O Subsystem.

Ans.: The Input-Output devices and secondary units of a computer are called peripherals. The term peripheral is used in a under sense includes interfacing devices such as I/P port, programmable peripheral interface, DMA controller, communication interface, counter / internal timers etc.

(i)   **I/P Devices :** Data & instruction are entered into a computer through I/P devices. An I/P device converts I/P data & instruction into suitable binary form which can be accepted by the computer. Examples of I/P devices are:

(a)   keyboards

(b)   Mouse

(c)   Joystick

(d)   Trackball

(e) Touch screen etc.

(ii) **O/P Devices :** The O/P devices receive information from the computer & provide them to the users. The computer sends information to the O/P devices in binary coded forms. The O/P devices count them into a form which can be used by users such as printed form or display on a screen.

Q.3. Explain CPU Organization.

Ans.: The CPU is the brain of the computer. Its main function is to execute programs. It has three main sections :

(i) Arithmetic & Logical Units (ALU)

(ii) Control Unit

(iii) Accumulator & General & Special Purpose Registers

(i) **ALU :** The function of an ALU is to perform basic arithmetic & logical operation take

(a) Addition

(b) Subtraction etc.

It cannot perform exponential, logarithmic, trigonometric operations.

(ii) **Control Unit :** The control units of a CPU controls the entire operation of the computer. It also controls all other devices such as memory input & output devices. It fetcher instruction from the memory, decodes the instruction, interprets the instruction to know what tasks are to be performed & sends suitable control signals to the other components to perform further operation. It maintains the order & directs the operation of the entire system. It controls the data flow between CPU & peripherals.

Under the control of the CU the instructions are fetched from the memory one after another for execution until all the instructions are executed.

(iii) **Register :** A CPU contains a number of register to store data temporarily during the execution of a program. The number of registers differs from processor to processor. Register are classified as follows :

(a) **General Purpose Registers** : There registers store data & intermediate results during execution of a program. They are accessible to users through instructions if the users are working in assembly language.

(b) **Accumulator** : Its the most important GPR having multiple functions. It"s most efficient in data movement, arithmetic and logical operation. It has some special features that the other GPR do not have. After the execution of arithmetic and logical instruction the result is placed in the accumulator.

(iii) **Special Purpose Register :** A CPU contains a number of special purpose register

for different purposes. There are :

(a) Program Counter (PC)

(b) Stack Pointer (SP)

(c) Instruction Register (IR)

(d) Index Register

(e) Memory Address Register (MAR)

(f) Memory Buffer Register (MBR)

(a) **PC :** The PC keeps track of the address of the instruction which is to be executed next. So it holds the address of this memory location, which contains the rent instruction to be fetched from the memory.

(b) **Stack Pointer (SP) :** The stack is a sequence of memory location defined by the user. It's used to save the contents of a register if it's required during the execution of a program. The SP holds the address of the last occupied memory location of the stack.

(c) **Status Register (Flag Register) :** A flag register contains a number of flags either to indicate certain conditions arising after ALU operation or to control certain operations. The flags which indicate a condition are called control flags. The flags which are used to control certain operation are called control flags.

A single micro processor contains the following condition flags :

(1) **Carry Flag :** Indicates whether there is a carry not.

(2) **Zero Flag :** Indicates whether the result is zero or non zero.

(3) **Sign Flag :** Indicates whether the result is positive or negative.

(4) **Parity Flag :** Indicates whether the result contains odd number of 1's or even number of 1's.

(d) **Instruction Register :** It holds the instruction to be decoded.

(e) **Index Register :** They are used for addressing. One or more registers are designated as index register. The address of an operand is the sum of the contents of the index registers and a constant. Instruction involving index register contain constants. This constant is added to the contents of index register to form the effective address.

(f) **Memory Address Register (MAR) :** It holds the address of the instruction or data to be fetched from the memory. The CPU transfers the address of the next instruction from the PC to MAR. From MAR it's sent to be memory through the address bus.

(g)   **Memory Buffer Register (MBR) :** It holds the instruction code or
         data received from on sent to the memory. It's connected to data
         bus. The data, which are written into the memory are held in this
         register until the next operation is completed.

Q4.   Explain DMA ?

Ans. Direct Memory Access (DMA) is a capability provided by some computer
         bus architectures that allows data to be sent directly from an attached
         device (such as a disk drive) to the memory on the computer's
         motherboard. The microprocessor is freed from involvement with the data
         transfer, thus speeding up overall computer operation Usually a specified
         portion of memory is designated as an area to be used for direct memory
         access. In the ISA bus standard, up to 16 megabytes of memory can be
         addressed for DMA. The EISA and Micro Channel Architecture standards
         allow access to the full range of memory addresses (assuming they're
         addressable with 32 bits). Peripheral Component Interconnect
         accomplishes DMA by using a bus master (with the microprocessor
         "delegating" I/O control to the PCI controller).

         An alternative to DMA is the Programmed Input/Output (PIO) interface in
         which all data transmitted between devices goes through the processor. A
         newer protocol for the ATA/IDE interface is Ultra DMA, which provides a
         burst data transfer rate up to 33 MB (megabytes) per second. Hard drives
         that come with Ultra DMA/33 also support PIO modes 1, 3, and 4, and
         multiword DMA mode 2   (at 16.6 megabytes per second).

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Chapter 5

Addressing techniques and Registers

Q.1. **Explain in detail about the concept of Addressing in the Memory.**

Ans.: Each instruction needs data on which it has to perform the specified operation. The data may be in the accumulator, GPR (general purpose registers) or in some specified memory location. The techniques of specifying the address of the data are known as addressing modes. The important addressing modes are as follows :

   (i)   Direct Addressing

   (ii)   Register Addressing

   (iii) Register Indirect Addressing

   (iv)   Immediate Addressing

   (v)   Relation Addressing

   (i)   **Direct Addressing :** In this, the address of the data is specified within the instruction itself. Example of direct addressing is :

   (a)   **STA 2500H :** store the contents of accumulator in the memory location 2500H.

   (ii)   **Register Addressing :** In register addressing, the operands are located in the general purpose registers. In other words the contents of the register are the operands. Therefore only this name of the register is to be specified in the instruction. E.g. of register addressing are :

   (a)   **MOV A, B :** Transfer the contents of register B to register A.

   (iii) **Register Indirect Addressing :** In this, the address of the operand is given directly. The contents of a register or a registers pairs are the address of the operand.

   Example : LX1 H, 2400H--> load H-L pair with 2400 H.

   (a)   **MOV A, M :** Move the contents of the memory location whose address is

in H-L pair to the accumulator.

(iv) **Immediate addressing :** In this the operand in given in the instruction itself. E.g.

(a) **MVI A, 06 :** Move 06 to accumulator.

(v) **Relation Addressing :** In this a signed displacement is added to the current value of the program counter to form the effective address. This is also known as PC relative addressing.

Q.2. Explain the concept of Paging in contest of Memory.

Ans.: In page oriented memory, the memory is divided into pages. A page has a fixed length, 4KB or 4MB length. The logical address is represented by the page address and the page offset. The page address points to a descriptor table. The function of a descriptor is same as that in the case of a memory Segment Scheme. When the demanded page is not present in the physical memory, a page fault is triggered. This informs the OS to swap the desired page. This type of memory management schemes is known as demand-paged virtual memory scheme.

Q3. Define Registers?

Ans. Registers are used to quickly accept, store, and transfer data and instruction that are being used immediately by the CPU, there are various types of registers those used for various purpose. Among of those mostly used Registers named as AC or accumulator, Data Register or DR, the AR or Address Register, etc.

Q4. Explain the General purpose and Special purpose registers?

Ans

(i) Register : A CPU contains a number of register to store data temporarily during the execution of a program. The number of registers differs from processor to processor. Register are classified as follows :

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From MAR it's sent to be memory through the address bus.

(l)   **Memory Buffer Register (MBR) :** It holds the instruction code or

data received from on sent to the memory. It's connected to data bus. The data, which are written into the memory are held in this register until the next operation is completed.

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 :

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

(4)   **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 nonvolatile memory, i.e, 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 possess random access property. Information cannot 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 within 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: It's 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.

It's used in all power, digital cameras, MP3 players etc.

Q4. Explain the cache memory?
Ans

Cache memory, also called CPU memory, is random access memory (RAM) that a computer microprocessor can access more quickly than it can access regular RAM. This memory is typically integrated directly with the CPU chip or placed on a separate chip that has a separate bus interconnect with the CPU.

The basic purpose of cache memory is to store program instructions that are frequently re-referenced by software during operation. Fast access to these instructions increases the overall speed of the software program.

As the microprocessor processes data, it looks first in the cache memory; if it finds the instructions there (from a previous reading of data), it does not have to do a more time-consuming reading of data from larger memory or other data storage devices.

Most programs use very few resources once they have been opened and operated for a time, mainly because frequently re-referenced instructions tend to be cached. This explains why measurements of system performance in computers with slower processors but larger caches tend to be faster than measurements of system performance in computers with faster processors but more limited cache space.

Multi-tier or multilevel caching has become popular in server and desktop architectures, with different levels providing greater efficiency through managed tiering. Simply put, the less frequently access is made to certain data or instructions, the lower down the cache level the data or instructions are written.

Cache memory levels explained

Cache memory is fast and expensive. Traditionally, it is categorized as "levels" that describe its closeness and accessibility to the microprocessor:

- **Level 1 (**L1**) cache** is extremely fast but relatively small, and is usually embedded in the processor chip (CPU).
- **Level 2 (L2) cache** is often more capacious than L1; it may be located on the CPU or on a separate chip or coprocessor with a high-speed alternative system bus interconnecting the cache to the CPU, so as not to be slowed by traffic on the main system bus.
- **Level 3 (L3) cache** is typically specialized memory that works to improve the performance of L1 and L2. It can be significantly slower than L1 or L2, but is usually double the speed of RAM. In the case of multicore processors, each core may have its own dedicated L1 and L2 cache, but share a common L3 cache. When an instruction is referenced in the L3 cache, it is typically elevated to a higher tier cache.

Memory cache configurations

Caching configurations continue to evolve, but memory cache traditionally works under three different configurations:

- **Direct mapping**, in which each block is mapped to exactly one cache location. Conceptually, this is like rows in a table with three columns: the data block or cache line that contains the actual data fetched and stored, a tag that contains all

or part of the address of the fetched data, and a flag bit that connotes the presence of a valid bit of data in the row entry.

- **Fully associative mapping** is similar to direct mapping in structure, but allows a block to be mapped to any cache location rather than to a pre-specified cache location (as is the case with direct mapping).
- **Set associative mapping** can be viewed as a compromise between direct mapping and fully associative mapping in which each block is mapped to a subset of cache locations. It is sometimes called *N-way set associative mapping*, which provides for a location in main memory to be cached to any of "N" locations in the L1 cache.

Q5   What is virtual Memory?

Ans

Virtual memory is a feature of an operating system (OS) that allows a computer to compensate for shortages of physical memory by temporarily transferring pages of data from random access memory (RAM) to disk storage.

The OS will need to retrieve the data that was moved to temporarily to disk storage -- but remember, the only reason the OS moved pages of data from RAM to disk storage to begin with was because it was running out of RAM. To solve the problem, the operating system will need to move *other* pages to hard disk so it has room to bring back the pages it needs right away from temporary disk storage. This process is known as *paging* or *swapping* and the temporary storage space on the hard disk is called a pagefile or a swap file.

Swapping, which happens so quickly that the end user doesn't know it's happening, is carried out by the computer's memory manager unit (MMU). The memory manager unit may use one of several algorithms to choose which page should be swapped out, including Least Recently Used (LRU), Least Frequently Used (LFU) or Most Recently Used (MRU).

Q6   What is paging? Why paging is used?

Ans   OS performs an operation for storing and retrieving data from secondary storage devices for use in main memory. Paging is one of such memory management scheme. Data is retrieved from storage media by OS, in the same sized blocks called as pages. Paging allows the physical address space of the process to be non contiguous. The whole program had to fit into storage contiguously.

Paging is to deal with external fragmentation problem. This is to allow the logical address space of a process to be noncontiguous, which makes the process to be allocated physical memory.

Chapter 6

Introduction to Microprocessor & Micro controller

Q1. What is microprocessor?

Ans A microprocessor, sometimes called a *logic chip*, is a computer processor on a microchip. The microprocessor contains all, or most of, the central processing unit (CPU) functions and is the "engine" that goes into motion when you turn your computer on. A microprocessor is designed to perform arithmetic and logic operations that make use of small number-holding areas called *registers*. Typical microprocessor operations include adding, subtracting, comparing two numbers, and fetching numbers from one area to another. These operations are the result of a set of instructions that are part of the microprocessor design.

When your computer is turned on, the microprocessor gets the first instruction from the basic input/output system (BIOS) that comes with the computer as part of its memory. After that, either the BIOS, or the operating system that BIOS loads into computer memory, or an application program is "driving" the microprocessor, giving it instructions to perform.

Q2. Difference between Microprocessor and microcontroller?

Ans. Microprocessor is an IC which has only the CPU inside them i.e. only the processing powers such as Intel's Pentium 1,2,3,4, core 2 duo, i3, i5 etc. These microprocessors don't have RAM, ROM, and other peripheral on the chip. A system designer has to add them externally to make them functional. Application of microprocessor includes Desktop PC's, Laptops, notepads etc.

But this is not the case with Microcontrollers. Microcontroller has a CPU, in addition with a fixed amount of RAM, ROM and other peripherals all embedded on a single chip. At times it is also termed as a mini computer or a computer on a single chip. Today different manufacturers produce microcontrollers with a wide range of features available in different versions. Some manufacturers are ATMEL, Microchip, TI, Freescale, Philips, Motorola etc.

Microcontrollers are designed to perform specific tasks. Specific means applications where the relationship of input and output is defined. Depending on

the input, some processing needs to be done and output is delivered. For example, keyboards, mouse, washing machine, digicam, pendrive, remote, microwave, cars, bikes, telephone, mobiles, watches, etc. Since the applications are very specific, they need small resources like RAM, ROM, I/O ports etc and hence can be embedded on a single chip. This in turn reduces the size and the cost.

Microprocessor find applications where tasks are unspecific like developing software, games, websites, photo editing, creating documents etc. In such cases the relationship between input and output is not defined. They need high amount of resources like RAM, ROM, I/O ports etc.

The clock speed of the Microprocessor is quite high as compared to the microcontroller. Whereas the microcontrollers operate from a few MHz to 30 to 50 MHz, today's microprocessor operate above 1GHz as they perform complex tasks.

Q3.   Explain pin architecture of 8085 microprocessor?

Ans.   Pin Diagram of 8085 Microprocessor with Description

8085 is a general purpose microprocessor having 40 pins and works on single power supply. To study the pin diagram we groupthe signals into 5 categories:

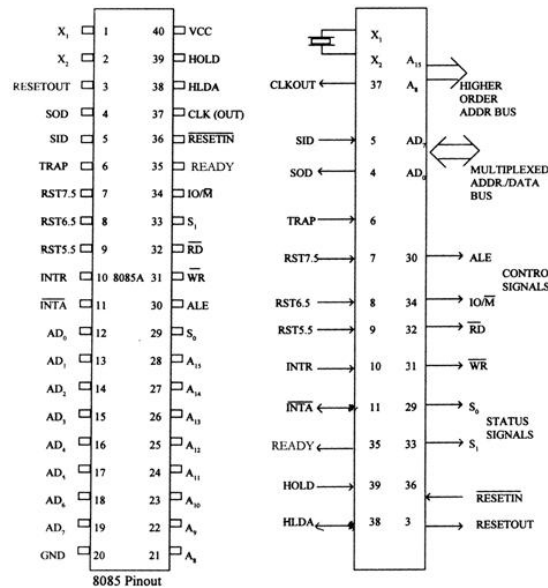**1.Power Supply**

2.Clock Signals

3.Interrupt Signals

4.Address and Data bus

5.Control and Status signals

6.Serial I/O Port

7.DMA Request Signals

8085 Pinout

Power Supply Signal and clock signal:

VCC:- Vcc is to be connected to +5V power supply.

Vss:- Ground reference

X1 and X2:- This pin is used for providing the clock frequency to the microprocessor. Generally Crystal oscillator or LC oscillator is used to generate the frequency. The frequency generated here is internally divided into two. As we know that the basic operating timing frequency of the microprocessor is 3 MHz so 6 MHz frequency is applied.

Serial Input Output port:-

SID and SOD:- These pins are used for serial data communication.

Interrupt Signal:-

Pin 6 to 11:- These pins are used for interrupt signals. Generally and external devices are connected here which requests the microprocessor to perform a particular task.

There are 5 pins for hardware interrupts-

TRAP, RST7.5, RST 6.5, RST5.5 and INTR

INTA is used for acknowledgement. Microprocessor sends the acknowledgement to external devices through the INTA pin.

Address Bus and DATA Buses:-

AD0-AD7:- These are multiplexed address and data bus. So it can be used to carry the lower order 8 bit address as well as the data. Generally these lines are demultiplexed using the Latch.

During the opcode fetch operation, in the first clock cycle the lines deliver the lower order address bus **A0-A7.**

In the subsequent IO/M read or write it is used as data bus D0-D7. CPU can read or write data through these lines.

A8-A15:- These are address bus used to address the memory location.

Control and Status Signal:-

S0 and S1:- It is used for the status signal in microprocessor.

ALE(Arithmetic Latch Enable):- This signal is used to capture the lower address presented on multiplexed address and data bus.

RD:- This is active low input generally used for reading operation.

WR:- This is active low input used for writing operation.

IO/M:-This pin is used to select the memory or input-output through which we want to communicate the data.

READY:-As we know that memory and input -output have slower response than microprocessor. So a microprocessor may now be able to handle further data till it completes the present job. So it is in waiting state. As it completes the present job it sets the READY pin. Microprocessor enters into wait state while READY pin is

disabled.

RESET IN:-This is active low input. This pin is used to reset the microprocessor. An active low signal applied to this pin reset the program counter inside the microprocessor. The busses are tristated.

RESETOUT:-If we want to reset the external devices connected to the microprocessor then a signal applied to this pin resets the external devices.

DMA Request Signal:

HOLD and HLDA:-HOLD is an active high input signal used by the other controller to request microprocessor about use of address, data and control signal. The HOLD and HLDA signal are used for direct memory access (DMA). DMA controller receives requests from a device and in turn issues the HOLD signal to the microprocessor.

The processor releases the system bus and then acknowledges the HOLD signal with HLDA signal. The DMA transfer thus begins.

Q.4   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.5.   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.

Q6.   Explain the feature 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.