Chapter 1

Fundamentals of Computer

Let us begin with the word 'compute'. It means 'to calculate'. We all are familiar with calculations in our day to day life. We apply mathematical operations like addition, subtraction, multiplication, etc. and many other formulae for calculations. Simpler calculations take less time. But complex calculations take much longer time. Another factor is accuracy in calculations. So man explored with the idea to develop a machine which can perform this type of arithmetic calculation faster and with full accuracy. This gave birth to a device or machine called '**computer'**.

The computer we see today is quite different from the one made in the beginning. The number of applications of a computer has increased, the speed and accuracy of calculation has increased. You must appreciate the impact of computers in our day to day life. Reservation of tickets in Air Lines and Railways, payment of telephone and electricity bills, deposits and withdrawals of money from banks, business data processing, medical diagnosis, weather forecasting, etc. are some of the areas where computer has become extremely useful.

However, there is one limitation of the computer. Human beings do calculations on their own. But computer is a dumb machine and it has to be given proper instructions to carry out its calculation. This is why we should know how a computer works.

What is a computer?

Computer is an electronic device. As mentioned in the introduction it can do arithmetic calculations faster. But as you will see later it does much more than that. It can be compared to a magic box, which serves different purpose to different people. For a common man computer is simply a calculator, which works automatic and quite fast. For a person who knows much about it, computer is a machine capable of solving problems and manipulating data. It accepts data, processes the data by doing some mathematical and logical operations and gives us the desired output.

Therefore, we may define computer as a device that transforms data. Data can be anything like marks obtained by you in various subjects. It can also be name, age, sex, weight, height, etc. of all the students in your class or income, savings, investments, etc., of a country. Computer can be defined in terms of its functions. It can i) accept data ii) store data, iii) process data as desired, and iv) retrieve the stored data as and when required and v) print the result in desired format. You will know more about these functions as you go through the later lessons.

Characteristics of a computer:

Let us identify the major characteristics of computer. These can be discussed under the headings of speed, accuracy, diligence, versatility and memory.

Speed:

As you know computer can work very fast. It takes only few seconds for calculations that we take hours to complete. Suppose you are asked to calculate the average monthly income of one thousand persons in your neighborhood. For this you have to add income from all sources for all persons on a day to day basis and find out the average for each one of them. How long will it take for you to do this? One day, two days or one week? Do you know your small computer can finish this work in few seconds? The weather forecasting that you see every day on TV is the results of compilation and analysis of huge amount of data on temperature, humidity, pressure, etc. of various places on computers. It takes few minutes for the computer to process this huge amount of data and give the result. You will be surprised to know that computer can perform millions (1,000,000) of instructions and even more per second. Therefore, we determine the speed of computer in terms of microsecond (10-6 part of a second) or nano-second (10-9 part of a second). From this you can imagine how fast your computer performs work.

Accuracy:

Suppose some one calculates faster but commits a lot of errors in computing. Such result is useless. There is another aspect. Suppose you want to divide 15 by 7. You may work out up to 2 decimal places and say the dividend is 2.14. I may calculate up to 4 decimal places and say that the result is 2.1428. Some one else may go up to 9 decimal places and say the result is 2.142857143. Hence, in addition to speed, the computer should have accuracy or correctness in computing.

The degree of accuracy of computer is very high and every calculation is performed with the same accuracy. The accuracy level is determined on the basis of design of computer. The errors in computer are due to human and inaccurate data.

Diligence:

A computer is free from tiredness, lack of concentration, fatigue, etc. It can work for hours without creating any error. If millions of calculations are to be performed, a computer will perform every calculation with the same accuracy. Due to this capability it overpowers human being in routine type of work.

Versatility:

It means the capacity to perform completely different type of work. You may use your computer to prepare payroll slips. Next moment you may use it for inventory management or to prepare electric bills.

Power of Remembering:

Computer has the power of storing any amount of information or data. Any information can be stored and recalled as long as you require it, for any numbers of years. It depends entirely upon you how much data you want to store in a computer and when to lose or retrieve these data.

No IQ:

Computer is a dumb machine and it cannot do any work without instruction from the user. It performs the instructions at tremendous speed and with accuracy. It is you to decide what you want to do and in what sequence. So a computer cannot take its own decision as you can.

No Feeling:

It does not have feelings or emotion, taste, knowledge and experience. Thus it does not get tired even after long hours of work. It does not distinguish between users.

Storage:

The Computer has an in-built memory where it can store a large amount of data. You can also store data in secondary storage devices such as floppies, which can be kept outside your computer and can be carried to other computers.

History of computer:

History of computer could be traced back to the effort of man to count large numbers. This process of counting of large numbers generated various systems of numeration like Babylonian system of numeration, Greek system of numeration, Roman system of numeration and Indian system of numeration. Out of these the Indian system of numeration has been accepted universally. It is the basis of modern decimal system of numeration (0, 1, 2, 3, 4, 5, 6, 7, 8, 9). Later you will know how the computer solves all calculations based on decimal system. But you will be surprised to know that the computer does not understand the decimal system and uses binary system of numeration for processing.

We will briefly discuss some of the path-breaking inventions in the field of computing devices.

Calculating Machines:

It took over generations for early man to build mechanical devices for counting large numbers. The first calculating device called ABACUS was developed by the Egyptian and Chinese people.

The word ABACUS means calculating board. It consisted of sticks in horizontal positions on which were inserted sets of pebbles. A modern form of ABACUS is has a number of horizontal bars each having ten beads. Horizontal bars represent units, tens, hundreds, etc.

Napier's bones:

English mathematician John Napier built a mechanical device for the purpose of multiplication in 1617 A D. The device was known as Napier's bones.

Slide Rule:

English mathematician Edmund Gunter developed the slide rule. This machine could perform operations like addition, subtraction, multiplication, and division. It was widely used in Europe in 16th century.

Pascal's Adding and Subtractory Machine:

You might have heard the name of Blaise Pascal. He developed a machine at the age of 19 that could add and subtract. The machine consisted of wheels, gears and cylinders.

Leibniz's Multiplication and Dividing Machine:

The German philosopher and mathematician Gottfried Leibniz built around 1673 a mechanical device that could both multiply and divide.

Babbage's Analytical Engine:

It was in the year 1823 that a famous English man Charles Babbage built a mechanical machine to do complex mathematical calculations. It was called difference engine. Later he developed a general-purpose calculating machine called analytical engine. You should know that Charles Babbage is called the God father of computer.

Mechanical and Electrical Calculator:

In the beginning of 19th century the mechanical calculator was developed to perform all sorts of mathematical calculations. Up to the 1960s it was widely used. Later the rotating part of mechanical calculator was replaced by electric motor. So it was called the electrical calculator.

Modern Electronic Calculator:

The electronic calculator used in 1960 s was run with electron tubes, which was quite bulky. Later it was replaced with transistors and as a result the size of calculators became too small.

The modern electronic calculator can compute all kinds of mathematical computations and mathematical functions. It can also be used to store some data permanently. Some calculators have in-built programs to perform some complicated calculations.

Chapter 2

Computer generation:

You know that the evolution of computer started from 16th century and resulted in the form that we see today. The present day computer, however, has also undergone rapid change during the last fifty years. This period, during which the evolution of computer took place, can be divided into five distinct phases known as Generations of Computers. Each phase is distinguished from others on the basis of the type of switching circuits used.

First Generation Computers: (1951 to 1958)

First generation computers used Thermion valves. These computers were large in size and writing programs on them was difficult. Some of the computers of this generation were:

ENIAC: It was the first general purpose electronic computer built in 1946 at University of Pennsylvania, USA by John Eckert and John Mauchy. It was named Electronic Numerical Integrator and Calculator (ENIAC). The ENIAC was 100 feet long, weighed 30 tons, contained 18,000 vacuum tubes, 70,000 registers 10,000 capacitors and required 150,000 watts of electricity. Today your favorite computer is many times as powerful as ENIAC, still size is very small.

EDVAC: It stands for Electronic Discrete Variable Automatic Computer and was developed in 1950. The concept of storing data and instructions inside the computer was introduced here. This allowed much faster operation since the computer had rapid access to both data and instructions. The other advantages of storing instruction were that computer could do logical decision internally.

Other Important Computers of First Generation:

EDSAC: It stands for Electronic Delay Storage Automatic Computer and was developed by M.V. Wilkes at Cambridge University in 1949.

UNIVAC-1: Ecker and Mauchly produced it in 1951 by Universal Accounting Computer setup.

Limitations of First Generation Computer:

Followings are the major drawbacks of First generation computers.

1. The operating speed was quite slow.
2. Power consumption was very high.
3. It required large space for installation.
4. The programming capability was quite low.

Second Generation Computers: (1959 to 1964)

Around 1955 a device called Transistor replaced the bulky electric tubes in the first generation computer. Transistors are smaller than electric tubes and have higher operating speed. They have no filament and require no heating. Manufacturing cost was also very low. Thus the size of the computer got reduced considerably.

It is in the second generation that the concept of Central Processing Unit (CPU), memory, programming language and input and output units were developed. The programming languages such as COBOL, FORTRAN were developed during this period. Some of the computers of the Second Generation were

1. **IBM 1620:** Its size was smaller as compared to First Generation computers and mostly used for scientific purpose.
2. **IBM 1401:** Its size was small to medium and used for business applications.
3. **CDC 3600:** Its size was large and is used for scientific purposes.

Third Generation Computers: (1965 to 1970)

The third generation computers were introduced in 1964. They used Integrated Circuits (ICs). These ICs are popularly known as Chips. A single IC has many transistors, registers and capacitors built on a single thin slice of silicon. So it is quite obvious that the size of the computer got further reduced. Some of the computers developed during this period were IBM-360, ICL-1900, IBM-370, and VAX-750. Higher level language such as BASIC (Beginners All purpose Symbolic Instruction Code) was developed during this period.

Computers of this generation were small in size, low cost, large memory and processing speed is very high.

Fourth Generation Computers: (1971 to 1975)

The present day computers that you see today are the fourth generation computers that started around 1975. It uses *large scale Integrated Circuits* (LSIC) built on a single silicon chip called microprocessors. Due to the

development of microprocessor it is possible to place computer's *central processing unit* (CPU) on single chip. These computers are called microcomputers. Later *very large scale Integrated Circuits* (VLSIC) replaced LSICs.

Thus the computer which was occupying a very large room in earlier days can now be placed on a table. The personal computer (PC) that you see in your school is a Fourth Generation Computer.

Fifth Generation Computer: (1996 to Present)

The computers of 1990s are said to be Fifth Generation computers. The speed is extremely high in fifth generation computer. Apart from this it can perform parallel processing. The concept of Artificial intelligence has been introduced to allow the computer to take its own decision. It is still in a developmental stage.

Types of computer:

Now let us discuss the varieties of computers that we see today. Although they belong to the fifth generation they can be divided into different categories depending upon the size, efficiency, memory and number of users. Broadly they can be divided it to the following categories.

1. **Microcomputer:** Microcomputer is at the lowest end of the computer range in terms of speed and storage capacity. Its CPU is a microprocessor. The first microcomputers were built of 8-bit microprocessor chips. The most common application of personal computers (PC) is in this category. The PC supports a number of input and output devices. An improvement of 8-bit chip is 16-bit and 32-bit chips. Examples of microcomputer are IBM PC, PC-AT.
2. **Mini Computer**: This is designed to support more than one user at a time. It possesses large storage capacity and operates at a higher speed. The mini computer is used in multi-user system in which various users can work at the same time. This type of computer is generally used for processing large volume of data in an organization. They are also used as servers in Local Area Networks (LAN).
3. **Mainframes:** These types of computers are generally 32-bit microprocessors. They operate at very high speed, have very large storage capacity and can handle the work load of many users. They are generally used in centralized databases. They are also used as controlling nodes in Wide Area Networks (WAN). Example of mainframes are DEC, ICL and IBM 3000 series.
4. **Supercomputer:** They are the fastest and most expensive machines. They have high processing speed compared to other computers. They have also multiprocessing technique. One of the ways in which supercomputers are built is by interconnecting hundreds of microprocessors. Supercomputers are mainly being used for whether forecasting, biomedical research, remote sensing, aircraft design and other areas of science and technology. Examples of supercomputers are CRAY YMP, CRAY2, NEC SX-3, CRAY XMP and PARAM from India.

Chapter 3

Computer organization:

In the previous lesson we discussed about the evolution of computer. In this lesson we will provide you with an overview of the basic design of a computer. You will know how different parts of a computer are organized and how various operations are performed between different parts to do a specific task. As you know from the previous lesson the internal architecture of computer may differ from system to system, but the basic organization remains the same for all computer systems.

Basic computer operation:

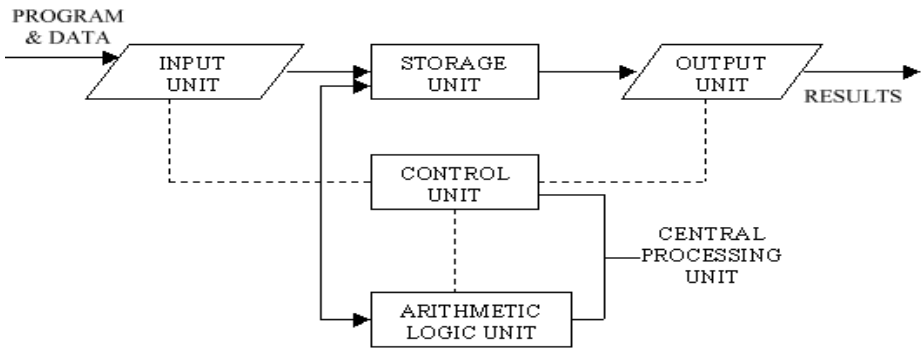
A computer as shown in Fig. 2.1 performs basically five major operations or functions irrespective of their size and make. These are 1) it accepts data or instructions by way of input, 2) it stores data, 3) it can process data as required by the user, 4) it gives results in the form of output, and 5) it controls all operations inside a computer. We discuss below each of these 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:

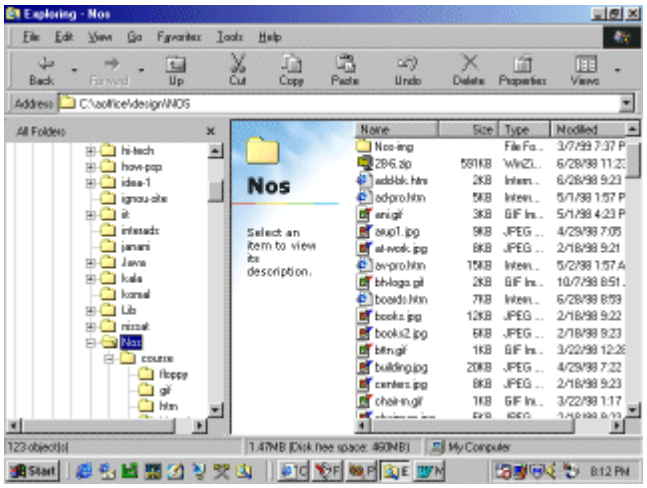
- All data and instructions are stored here before and after processing.
- Intermediate results of processing are also stored here.



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 in side the computer.



HARDWARE **SOFTWARE**

Personal Computer Configuration:

Now let us identify the physical components that make the computer work. These are

1. Central Processing Unit (CPU)
2. Computer Memory (RAM and ROM)
3. Data bus
4. Ports
5. Motherboard
6. Hard disk
7. Output Devices
8. Input Devices

All these components are inter-connected for the personal computer to work.

Memory system in a computer:

There are two kinds of computer memory: primary and secondary. Primary memory is accessible directly by the processing unit. RAM is an example of primary memory. As soon as the computer is switched off the contents of the primary memory is lost. You can store and retrieve data much faster with primary memory compared to secondary memory. Secondary memory such as floppy disks, magnetic disk, etc., is located outside the computer. Primary memory is more expensive than secondary memory. Because of this the size of primary memory is less than that of secondary memory. We will discuss about secondary memory later on.

Computer memory is used to store two things: i) instructions to execute a program and ii) data. When the computer is doing any job, the data that have to be processed are stored in the primary memory. This data may come from an input device like keyboard or from a secondary storage device like a floppy disk.

As program or the set of instructions is kept in primary memory, the computer is able to follow instantly the set of instructions. For example, when you book ticket from railway reservation counter, the computer has to follow the same steps: take the request, check the availability of seats, calculate fare, wait for money to be paid, store the reservation and get the ticket printed out. The programme containing these steps is kept in memory of the computer and is followed for each request.

But inside the computer, the steps followed are quite different from what we see on the monitor or screen. In computer's memory both programs and data are stored in the binary form. You have already been introduced with decimal number system that is the numbers 1 to 9 and 0. The binary system has only two values 0 and 1. These are called bits. As human beings we all understand decimal system but the computer can only understand binary system. It is because a large number of integrated circuits inside the computer can be considered as switches, which can be made ON, or OFF. If a switch is ON it is considered 1 and if it is OFF it is 0. A number of switches in different states will give you a message like this: 110101....10. So the computer takes input in the form of 0 and 1 and gives output in the form 0 and 1 only. Is it not absurd if the computer gives outputs as 0's & 1's only? But you do not have to worry about. Every number in binary system can be converted to decimal system and vice versa; for example, 1010 meaning decimal 10. Therefore it is the computer that takes information or data in decimal form from you, convert it in to binary form, process it producing output in binary form and again convert the output to decimal form.

The primary memory as you know in the computer is in the form of IC's (Integrated Circuits). These circuits are called Random Access Memory (RAM). Each of RAM's locations stores one byte of information. (One byte is equal to 8 bits). A bit is an acronym for binary digit, which stands for one binary piece of information. This can be either 0 or 1. You will know more about RAM later. The Primary or internal storage section is made up of several small storage locations (ICs) called cells. Each of these cells can store a fixed number of bits called word length.

Each cell has a unique number assigned to it called the address of the cell and it is used to identify the cells. The address starts at 0 and goes up to (N-1). You should know that the memory is like a large cabinet containing as many drawers as there are addresses on memory. Each drawer contains a word and the address is written on outside of the drawer.

Capacity of Primary Memory:

You know that each cell of memory contains one character or 1 byte of data. So the capacity is defined in terms of byte or words. Thus 64 kilobyte (KB) memory is capable of storing 64 _ 1024 = 32,768 bytes. (1 kilobyte is 1024 bytes). A memory size ranges from few kilobytes in small systems to several thousand kilobytes in large mainframe and super computer. In your personal computer you will find memory capacity in the range of 64 KB, 4 MB, 8 MB and even 16 MB (MB = Million bytes).

The following terms related to memory of a computer are discussed below:

1. **Cache Memory:** The speed of CPU is extremely high compared to the access time of main memory. Therefore the performance of CPU decreases due to the slow speed of main memory. To decrease the mismatch in operating speed, a small memory chip is attached between CPU and Main memory whose access time is very close to the processing speed of CPU. It is called CACHE memory. CACHE memories are accessed much faster than conventional RAM. It is used to store programs or data currently being executed or temporary data frequently used by the CPU. So each memory makes main memory to be faster and larger than it really is. It is also very expensive to have bigger size of cache memory and its size is normally kept small.
2. **Registers:** The CPU processes data and instructions with high speed, there is also movement of data between various units of computer. It is necessary to transfer the processed data with high speed. So the computer uses a number of special memory units called *registers.* They are not part of the main memory but they store data or information temporarily and pass it on as directed by the control unit.

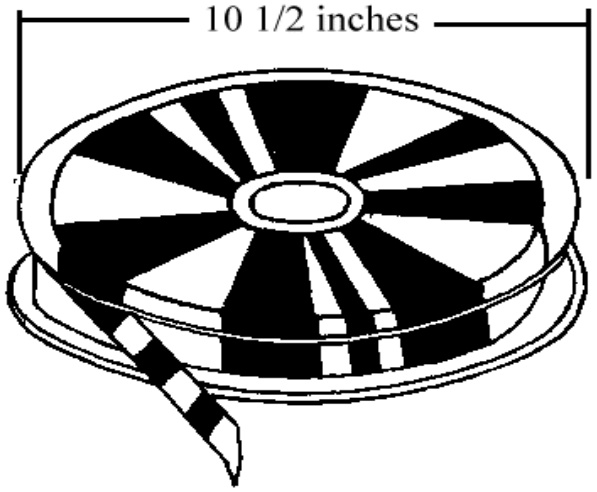
Chapter 4

Secondary storage:

You are now clear that the operating speed of primary memory or main memory should be as fast as possible to cope up with the CPU speed. These high-speed storage devices are very expensive and hence the cost per bit of storage is also very high. Again the storage capacity of the main memory is also very limited. Often it is necessary to store hundreds of millions of bytes of data for the CPU to process. Therefore additional memory is required in all the computer systems. This memory is called *auxiliary memory* or *secondary storage*.

In this type of memory the cost per bit of storage is low. However, the operating speed is slower than that of the primary storage. Huge volume of data are stored here on permanent basis and transferred to the primary storage as and when required. Most widely used secondary storage devices are *magnetic tapes* and *magnetic disk.*

1. **Magnetic Tape:** Magnetic tapes are used for large computers like mainframe computers where large volume of data is stored for a longer time. In PC also you can use tapes in the form of cassettes. The cost of storing data in tapes is inexpensive. Tapes consist of magnetic materials that store data permanently. It can be 12.5 mm to 25 mm wide plastic film-type and 500 meter to 1200 meter long which is coated with magnetic material. The deck is connected to the central processor and information is fed into or read from the tape through the processor. It similar to cassette tape recorder.



Advantages of Magnetic Tape:

Compact: A 10-inch diameter reel of tape is 2400 feet long and is able to hold 800, 1600 or 6250 characters in each inch of its length. The maximum capacity of such tape is 180 million characters. Thus data are stored much more compactly on tape.
Economical: The cost of storing characters is very less as compared to other storage devices.
Fast: Copying of data is easier and fast.
Long term Storage and Re-usability: Magnetic tapes can be used for long term storage and a tape can be used repeatedly with out loss of data.
Magnetic Disk: You might have seen the gramophone record, which is circular like a disk and coated with magnetic material. Magnetic disks used in computer are made on the same principle. It rotates with very high speed inside the computer drive. Data is stored on both the surface of the disk. Magnetic disks are most popular for *direct access* storage device. Each disk consists of a number of invisible *concentric circles* called *tracks*. Information is recorded on tracks of a disk surface in the form of tiny magnetic spots. The presence of a magnetic spot represents *one bit* and its absence represents zero bit. The information stored in a disk can be read many times without affecting the stored data. So the reading operation is non-destructive. But if you want to write a new data, then the existing data is erased from the disk and new data is recorded.

Floppy Disk: It is similar to magnetic disk discussed above. They are 5.25 inch or 3.5 inch in diameter. They come in single or double density and recorded on one or both surface of the diskette. The capacity of a 5.25-inch floppy is 1.2 mega bytes whereas for 3.5 inch floppy it is 1.44 mega bytes. It is cheaper than any other storage devices and is portable. The floppy is a low cost device particularly suitable for personal computer system.

Optical Disk:

1. With every new application and software there is greater demand for memory capacity. It is the necessity to store large volume of data that has led to the development of optical disk storage medium. Optical disks can be divided

2. **Write Once, Read Many (WORM):** The inconvenience that we can not write any thing in to a CD-ROM is avoided in WORM. A WORM allows the user to write data permanently on to the disk. Once the data is written it can never be erased without physically damaging the disk. Here data can be recorded from keyboard, video scanner, OCR equipment and other devices. The advantage of WORM is that it can store vast amount of data amounting to gigabytes (109 bytes). Any document in a WORM can be accessed very fast, say less than 30 seconds.
3. **Erasable Optical Disk:** These are optical disks where data can be written, erased and re-written. This also applies a laser beam to write and re-write the data. These disks may be used as alternatives to traditional disks. Erasable optical disks are based on a technology known as *magnetic optical* (MO). To write a data bit on to the erasable optical disk the MO drive's laser beam heats a tiny, precisely defined point on the disk's surface and magnetises it

What is software?

As you know computer cannot do anything without instructions from the user. In order to do any specific job you have to give a sequence of instructions to the computer. This set of instructions is called a computer *program*. Software refers to the set of computer programs, procedures that describe the programs, how they are to be used. We can say that it is the collection of programs, which increase the capabilities of the hardware. Software guides the computer at every step where to start and stop during a particular job. The process of software development is called ***programming***.

You should keep in mind that software and hardware are complementary to each other. Both have to work together to produce meaningful result. Another important point you should know that producing software is difficult and expensive.

Software types:

Computer software is normally classified into two broad categories.

Application Software
System software

Application Software: Application Software is a set of programs to carry out operations for a specific application. For example, payroll is application software for an organization to produce pay slips as an output. Application software is useful for word processing, billing system, accounting, producing statistical report, analysis of numerous data in research, weather forecasting, etc. In later modules you will learn about MS WORD, Lotus 1-2-3 and dBASE III Plus. All these are application softwares.

Another example of application software is programming language. Among the programming languages COBOL (Common Business Oriented Language) is more suitable for business application whereas FORTRAN (Formula Translation) is useful for scientific application. We will discuss about languages in next section.

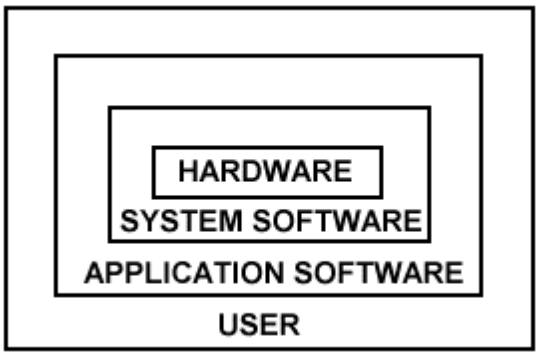
System Software: You know that an instruction is a set of programs that has to be fed to the computer for operation of computer system as a whole. When you switch on the computer the programs written in ROM is executed which activates different units of your computer and makes it ready for you to work on it. This set of program can be called system software. Therefore system software may be defined as a set of one or more programs designed to control the operation of computer system.

System software are general programs designed for performing tasks such as controlling all operations required to move data into and out of the computer. It communicates with printers, card reader, disk, tapes etc. monitor the use of various hardware like memory, CPU etc. Also system software are essential for the development of

applications software. System Software allows application packages to be run on the computer with less time and effort. Remember that it is not possible to run application software without system software.

Development of system software is a complex task and it requires extensive knowledge of computer technology. Due to its complexity it is not developed in house. Computer manufactures build and supply this system software with the computer system. DOS, UNIX and WINDOWS are some of the widely used system software. Out of these UNIX is a multi-user operating system whereas DOS and WINDOWS are PC-based. We will discuss in detail about DOS and WINDOWS in the next module.

So without system software it is impossible to operate your computer. The following picture is shown in Fig. 3.1 relation between hardware, software and you as a user of computer system.



Chapter 5
Relation between hardware & software

What is language?

You are aware with the term language. It is a system of communication between you and me. Some of the basic natural languages that we are familiar with are English, Hindi, Oriya etc. These are the languages used to communicate among various categories of persons. But how you will communicate with your computer. Your computer will not understand any of these natural languages for transfer of data and instruction. So there are programming languages specially developed so that you could pass your data and instructions to the computer to do specific job. You must have heard names like FORTRAN, BASIC, COBOL etc. These are programming languages. So instructions or programs are written in a particular language based on the type of job. As an example, for scientific application FORTRAN and C languages are used. On the other hand COBOL is used for business applications.

Programming Languages:

There are two major types of programming languages. These are Low Level Languages and High Level Languages. Low Level languages are further divided in to *Machine language* and *Assembly language*.

Low Level Languages:

The term low level means closeness to the way in which the machine has been built. Low level languages are machine oriented and require extensive knowledge of computer hardware and its configuration.

(a) Machine Language:

Machine Language is the only language that is directly understood by the computer. It does not need any translator program. We also call it machine code and it is written as strings of 1's (one) and 0's (zero). When this sequence of codes is fed to the computer, it recognizes the codes and converts it in to electrical signals needed to run it. For example, a program instruction may look like this:

1011000111101

It is not an easy language for you to learn because of its difficult to understand. It is efficient for the computer but very inefficient for programmers. It is considered to the first generation language. It is also difficult to debug the program written in this language.

Advantages:

The only advantage is that program of machine language run very fast because no translation program is required for the CPU.

Disadvantages:

1. It is very difficult to program in machine language. The programmer has to know details of hardware to write program.
2. The programmer has to remember a lot of codes to write a program which results in program errors.
3. It is difficult to debug the program.

(b) Assembly Language:

It is the first step to improve the programming structure. You should know that computer can handle numbers and letter. Therefore some combination of letters can be used to substitute for number of machine codes.

The set of symbols and letters forms the Assembly Language and a translator program is required to translate the Assembly Language to machine language. This translator program is called `Assembler'. It is considered to be a second-generation language.

Advantages:

The symbolic programming of Assembly Language is easier to understand and saves a lot of time and effort of the programmer.

1. It is easier to correct errors and modify program instructions.
2. Assembly Language has the same efficiency of execution as the machine level language. Because this is one-to-one translator between assembly language program and its corresponding machine language program.

Disadvantages:

One of the major disadvantages is that assembly language is machine dependent. A program written for one computer might not run in other computers with different hardware configuration.

High level language:

You know that assembly language and machine level language require deep knowledge of computer hardware where as in higher language you have to know only the instructions in English words and logic of the problem irrespective of the type of computer you are using.

Higher level languages are simple languages that use English and mathematical symbols like +, -, %, /

etc. for its program construction.

You should know that any higher level language has to be converted to machine language for the computer to understand.

Higher level languages are problem-oriented languages because the instructions are suitable for solving a particular problem. For example COBOL (Common Business Oriented Language) is mostly suitable for business oriented language where there is very little processing and huge output. There are mathematical oriented languages like FORTRAN (Formula Translation) and BASIC (Beginners All-purpose Symbolic Instruction Code) where very large processing is required.

Thus a problem oriented language designed in such a way that its instruction may be written more like the language of the problem. For example, businessmen use business term and scientists use scientific terms in their respective languages.

Advantages of High Level Languages:

Higher level languages have a major advantage over machine and assembly languages that higher level languages are easy to learn and use. It is because that they are similar to the languages used by us in our day to day life.

Compiler:

It is a program translator that translates the instruction of a higher level language to machine language. It is called compiler because it compiles machine language instructions for every program instructions of higher level language. Thus compiler is a program translator like assembler but more sophisticated. It scans the entire program first and then translates it into machine code.

The programs written by the programmer in higher level language is called source program. After this program is converted to machine languages by the compiler it is called object program.

Higher Level Language --> (Compile) ---> Program --> Machine Language Program

A compiler can translate only those source programs, which have been written, in that language for which the compiler is meant for. For example FORTRAN compiler will not compile source code written in COBOL language.

Object program generated by compiler is machine dependent. It means programs compiled for one type of machine will not run in another type. Therefore every type of machine must have its personal compiler for a particular language. Machine independence is achieved by using one higher level language in different machines.

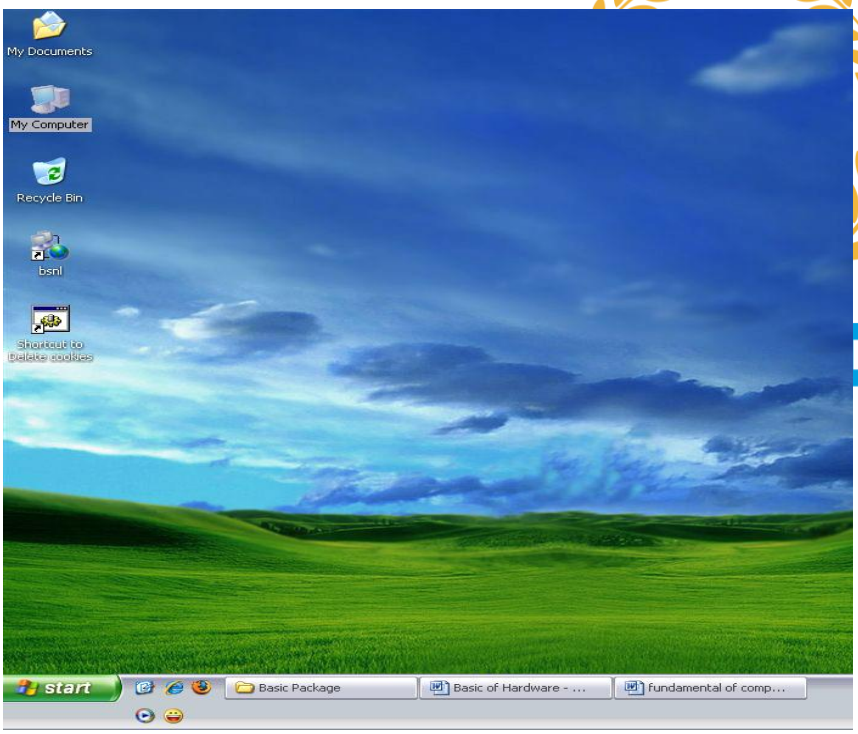
Interpreter:

An interpreter is another type of program translator used for translating higher level language into machine language. It takes one statement of higher level languages, translate it into machine language and immediately execute it. Translation and execution are carried out for each statement. It differs from compiler, which translate the entire source program into machine code and does involve in its execution.

The advantage of interpreter compared to compiler is its fast response to changes in source program. It eliminates the need for a separate compilation after changes to each program. Interpreters are easy to write and do not require large memory in computer. The disadvantage of interpreter is that it is time consuming method because each time a statement in a program is executed then it is first translated. Thus compiled machine language program runs much faster than an interpreted program.

Chapter 6
Windows:

We can work on computer in two interfaces one is the character base and second one is the Graphics means CUI (Character User Interface) and GUI (Graphical User Interface). In GUI we can work with picture. Instead of giving the command by keyboard, we select the command by using some device. Microsoft introduced the Windows a GUI. In Windows we use a pointing device usually called mouse. All the work done in windows shows as graphically. All files, directories and application are representing in the form of icons. In Windows environment a user can do multi task at a time.
After Windows environment Microsoft introduce Operating System, which is based on Windows. First Windows base operating system is Windows 95, which is followed by Windows 98, Windows NT 4.0, Windows 2000, and Windows XP etc.
After the booting of computer system, you get the following display on your monitor.



Desktop:

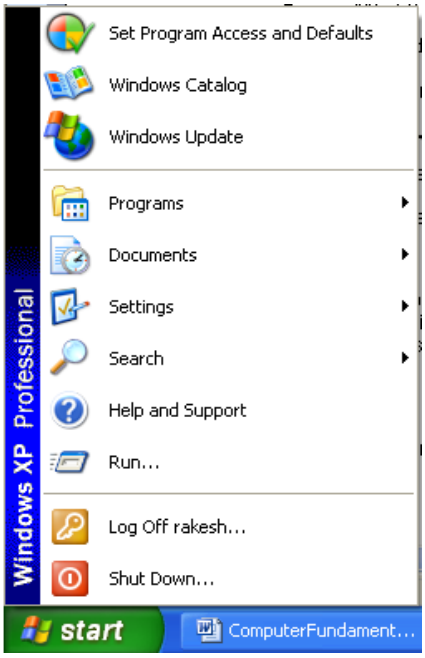
The on-screen work area on which windows, icons, menus, and dialog boxes appear. On start up of windows operating system, which screen you see is called desktop.

Icon:

A small image displayed on the screen to represent an object that can be manipulated by the user. Icons serve as visual mnemonics and allow the user to control certain computer actions without having to remember commands or type them at the keyboard.

Taskbar:

The bar that contains the Start button and appears by default at the bottom of the desktop. You can click the taskbar buttons to switch between programs. You can also hide the taskbar, move it to the sides or top of the desktop, and customize it in other ways.



1. It contains the Start button.
2. It provides easy access to the tools those appearing on the taskbar.
3. Currently opened Windows applications and folders appear as buttons on the taskbar.
4. We can arrange or minimize the windows of open items and selecting options on a shortcut menu by right clicking on the taskbar.
5. If modem is active or we are taking printout, icons for these processes will appear at the respective area of taskbar.
6. We can drag the taskbar to change its size and position.

Start Button:

This button always appears at the left side of the taskbar. This button is the only entry point to work on applications/options. If we click on Start button the following options appears.

Program:

It contain list of application and application sub folder such as accessories folder or Ms-Office folder. A complete, self-contained set of computer instructions that you use to perform a specific task, such as word processing, accounting, or data management. Program is also called application.

Favorites:

Favorites contain the shortcut or link to web site you have added to the Favorites folder.

Documents:

Document contains the list of recently used documents. Any self-contained piece of work created with an application program and, if saved on disk, given a unique file name by which it can be retrieved.

Settings:

Settings allows us to do the different kinds of system settings for Control Panel folder, Printers folder and other sub folder settings like Display, Mouse etc.

Find:

Find allows us to find files, folders etc. It will show the full path of the matching files or folders.

Help:

Help provides the necessary online help for Windows.

Run:

Run allows us to open files or to launch applications. You can directly open the executable files by specifying the path of that file.

My Computer:

My Computer shows you the contents of your floppy disk, hard disk, CD-ROM drive, and network drives. You can also search for and open files and folders, and gain access to options in Control Panel to modify your computer's settings. You can also use Windows Explorer to see the drives and folders on your computer.

My Documents:

A folder that provides you with a convenient place to store documents, graphics, or other files you want to access quickly. When you save a file in a program such as WordPad or Paint, the file is automatically saved in My Documents, unless you choose a different folder.

Network Place:

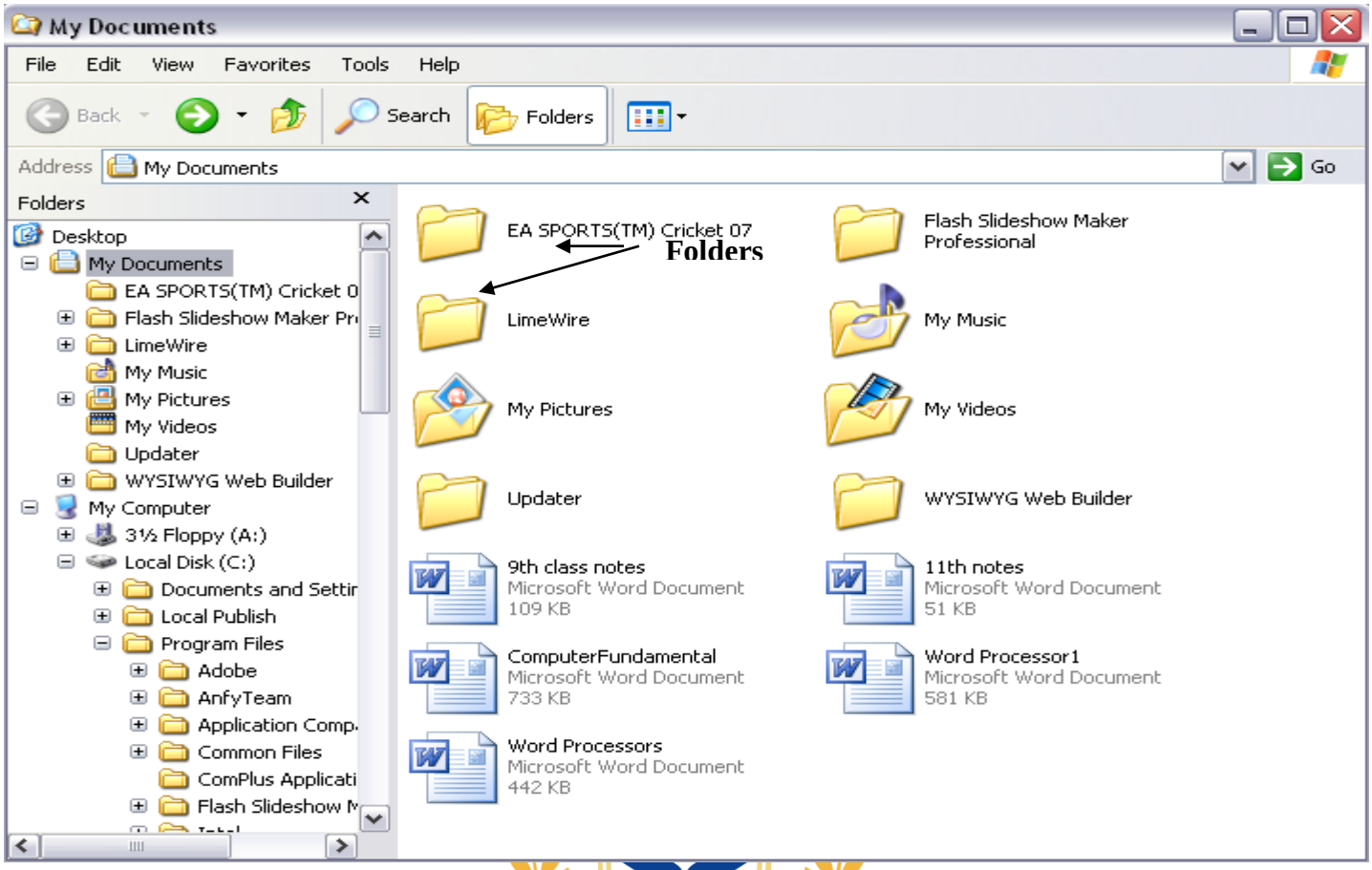
Network place a folder on a desktop. You can view files and folders on Web servers just as you would view files and folders on network servers. However, when you save a file to a network place, the file is saved on a Web server, not on your computer's hard disk. You can create network places by using the Add Network Place Wizard, which is located in My Network Places. Network places are available only on Web servers that support Web Extender Client (WEC), FrontPage extensions, and Distributed Authoring and Versioning (DAV) protocols.

Recycle Bin:

It is the place in which Windows stores deleted files. You can retrieve files you deleted in error, or you can empty the Recycle Bin to create more disk space.

Windows Explorer:

Windows Explorer displays the hierarchical structure of files, folders, and drives on your computer. It also shows any network drives that have been mapped to drive letters on your computer. Using Windows Explorer, you can copy, move, rename, and search for files and folders. For example, you can open a folder that contains a file you want to copy or move, and then drag the file to another folder or drive. To open Windows Explorer, click **Start**, point to **Programs**, point to **Accessories**, and then click **Windows Explorer**.



Window:

It is a portion of the screen where programs and processes can be run. You can open several windows at the same time. For example, you can open your e-mail in one window, work on a budget in a spreadsheet in another, download pictures from your digital camera in another window, and order your weekly groceries on the Web in another window. Windows can be closed, resized, moved, minimized to a button on the taskbar, or maximized to take up the whole screen.

Accessories:

It a utilities group program which provide by the Windows operating system.