COMPUTER FUNDAMENTALS FOR BEGINNERS

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PREFACE

Computers play a vital role in our day to day lives. It's a digital world and India is taking a giant leap in this direction. We are using computers for mailing, browsing, e- learning, e-governance, e-banking and so many other tasks. ICT is changing the way education was imparted in the past.

This compelling presence of micro-processor based computers has made it necessary for everyone to have some knowledge of the computer machine. Keeping track with this narrative, most of the universities and colleges have incorporated the study of computers in their syllabus. The book *"Computer Fundamentals for Beginners"* has been designed to meet the requirement of the changing syllabus and it showcases the concepts and fundamentals of computers in a well-defined and easy format which is easy to learn.

The purpose of this book is to provide an introductory text for understanding the fundamentals, concepts and applications of computer. A lot of attention has been given to the important topics like architecture of computers, generation of computers, operating system, memory, windows, algorithm and flowcharts.

This book covers topics like Introduction to Computers, Generation of computers, Architecture of computer system, computer memory, Programming language and its types, Types of microprocessor systems, Number systems, Algorithms and flowcharts, Design of algorithm and Flowcharts, Operating systems and its types, Real time operating systems, DOS commands, Windows- Notepad and Paintbrush, Editors and Word processors

This book has been designed keeping in mind the syllabus of top universities of our country in accordance to Digital India slogan given by our Hon'ble PM Narendra Modi.

It contains various references from the notes of my respected professors that they use to give when I was a student like you.

Note: The term 'he' refers to 'user' in general and therefore should not be considered as any favour to male or offence to female gender.

Acknowledgement

We would like to thank the almighty for giving me so much in life. We also acknowledge and thank Khwaja sahib, Sabir pak, Nizamuddin Auliya sahib, Chirag Delhlvi Sahib, Choti Badi Sarkar and all other Sufi saints for their continuous blessings that have blessed our family in a long way.

We would like to thank all my teachers, lecturers and professors who have taught us in our school days and in the university. It is their teaching and guidance only that has made us capable of adopting the noble profession of education.

We thank all my family members for supporting us throughout our life and in everything that we thought of doing, the list includes our parents, elder brother Ihtisham, sister Farah, beloved son SRK (Shahi Raza Khan) and all other members of the family.

We would like to thank Prof. Afshar Alam, VC, Jamia Hamdard, Delhi whom we have always seen as role model and have benefited a lot from his experiences and deep knowledge in Computer Science.

Last but not the least we would like to thank our students and friends for being supportive and encouraging.

Special thanks to our publishers **Kripa Drishti Publications** for bringing out my second book.

Best wishes and thank you all.

Dedication

Dedicated to Daddy, Abbu and Baji

And my family and friends!!!

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Chapter 1

Introduction

1.1 Introduction:

A computer is an electronic device that manipulates information or data. It has the ability to store, retrieve, and process data. You may already know that you can use a computer to type documents, send email, play games, and browse the Web. You can also use it to edit or create spreadsheets, presentations, and even videos.

Hardware is any part of your computer that has a physical structure, such as the keyboard or mouse. It also includes all of the computer's internal parts, which you can see in the image below.

Software is any set of instructions that tells the hardware what to do and how to do it. Examples of software include web browsers, games, and word processors.

Everything we do on our computer will rely on both hardware and software. For example, right now you may be viewing this lesson in a web browser (software) and using your mouse (hardware) to click from page to page. For most of the people, computer is a machine used for a calculation or a computation, but actually it is much more than that.

Precisely, “Computer is an electronic device for performing arithmetic and logical operation.” Or “Computer is a device or a flexible machine to process data and converts it into information.”

To know about the complete process that how computer works, we will have to come across the various terms such as Data, Processing and Information. First of all we will have to understand these terms in true sense.

a. **Data:** “Data” is nothing but a mare collection of basic facts and figure without any sequence. When the data is collected as facts and figure, it has no meaning at that time, for example, name of student, names of employees etc.

b. **Processing:** 'Processing' is the set of instruction given by the user or the related data to output the meaningful information. Which can be used by the user? The work of processing may be the calculation, comparisons or the decision taken by the computer.
c. **Information:** 'Information 'is the end point or the final output of any processed work. When the output data is meaning it is called information

1.1.1 Computer Generations:

Computers developed as the time progressed. As the time passed, the device of more suitable and reliable machine was need which could perform our work more quickly. During this time, in the year 1946, the first successful electronic computer called ENIAC was developed and it was the starting point of the current generation of computers. History of development of computers is being given here under the heading Computer Generations. There are in all, five generations starting from the Vaccum tubes to the current Artificial Intelligence technology. The generations are

A. First Genration:

ENIAC was the world first successful electronic computer which was develops by the two scientists namely J. P. Eckert and J. W. Mauchy. It was the beginning of first generation computer. The full form of ENIAC is "Electronic Numeric Integrated And Calculator" ENIAC was a very huge and big computer and its weight was 30 tones. It could store only limited or small amount of information. Initially in the first generation computer the concept of vacuum tubes was used. A vacuum tube was such an electronic component which had very less work efficiency and so it could not work properly and it required a large cooling system.

B. Second Generation:

As the development moved further, the second generation computers knocked the door. In this generation, transistors were used as the electronic component instead of vacuum tubes .A transistors is much smaller in the size than that of a vacuum tube. As the size of electrons components decreased from vacuum tube of transistor, the size of computer also decreased and it became much smaller than that of earlier computer.

C. Third Generation:

The third generation computers were invented in the year 1964. In this generation of computer, IC (Integrated circuits) was used as the electronic component for computers.

The development of IC gave birth to a new field of microelectronics. The main advantage of IC is not only its small size but its superior performance and reliability than the previous circuits. It was first developed by T.S Kilby. This generation of computer has huge storage capacity and higher calculating speed.

D. Fourth Generation:

This is the generation where we are working today. The computers which we see around us belong to the fourth generation computers. 'Micro processor' is the main concept behind this generation of computer.

A microprocessor is a single chip (L.S.I circuit), which is used in a computer for any arithmetical or logical functions to be performed in any program. The honaur of developing microprocessor goes to Ted Hoff of U.S.A.

He developed first micro-processor, the Intel 4004, as he was working for Intel Corporation, U.S.A with the use of microprocessor in the fourth generation computers, the size of computer become very fast and efficient.

Intel processors are the most popular Microprocessors available today. Starting from 8086-8088 to Pentium, Intel has gone a long way.

E. Fifth Generation:

It is evident that Fifth generation is in progress. In this generation, computer possesses artificial intelligence and would be able to take self-decisions like a human being. The systems of this generation have large memories and powerful processors that allows AI systems to become a reality.

The systems are so powerful that entertainment industry is using the computer systems for simulation, animation and special effects.

1.2 Characteristics Of A Computer:

A computer is an electronic device that manipulates information or data. It has the ability to store, retrieve, and process data. You may already know that you can use a computer to type documents, send email, play games, and browse the Web.

You can also use it to edit or create spreadsheets, presentations, and even videos. Following are the general characteristics of a digital Computer:

Following are the general characteristics of a digital Computer:

a. **Speed**: As you know computer can work very fast. It takes only few seconds for calculations that we take hours to complete. 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 nanosecond (10 to the power -9 part of a second). From this you can imagine how fast your computer performs work.
b. **Accuracy:** The degree of accuracy of computer is very high and every calculation is performed with the same accuracy. The errors in computer are due to human and inaccurate data. Suppose someone 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. Someone 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.
c. **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.

d. **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.
e. **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.
f. **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.
g. **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.
h. **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.

1.3 Block Diagram Of A Computer:

Let's understand how Computer works. How English type commands are understood by the Computer. Computer is an electronic machine which helps us to solve the problems.

Let's understand the functioning of a Computer Machine which will simplify the understanding of block diagram of the computer.

When we give a task to a computer system, processing takes place in few steps. The steps are

a. Firstly, the input units of a computer accepts the data and information
b. Secondly, the computer follows the instruction and fulfill the desires of the users
c. Thirdly, after justifying the needs of the users, it shows the results
d. Fourthly, The results are displayed on the output devices
e. Finally, If the users want it can save the data for future purposes

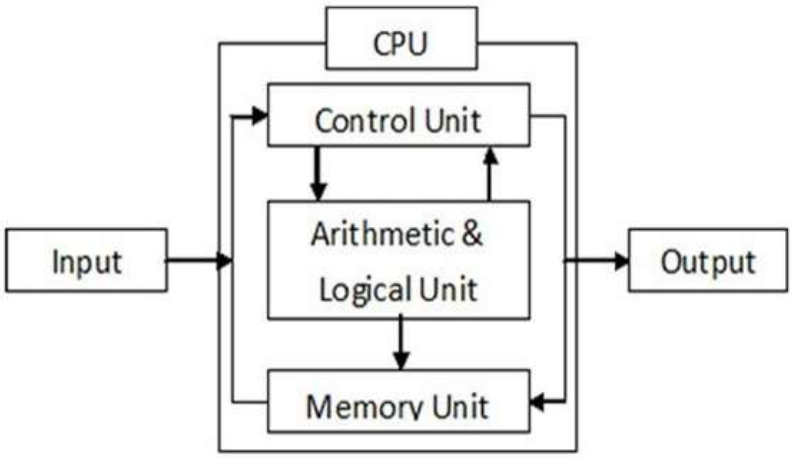


Fig 1.1: Block Diagram of Computer

Computer is an electronic device which performs tasks given by user with extremely fast speed and accuracy.

Like any other device or machine, a computer system has also a number of parts. A computer system can be blocked into mainly three parts:

A. Input Unit: Input unit is a unit that accepts any input device. The input device is used to input data into the computer system. Keyboard is the simplest form of input device.

Functions of input unit:

a. It converts inputted data into binary codes.
b. It sends data to main memory of computer.

B. Central Processing Unit (CPU): CPU is called the brain of a computer. It is an electronic circuitry that carries out the instruction given by a computer program.

CPU can be sub classified into three parts.

a. Control unit (CU)
b. Arithmetic & Logic unit (ALU)
c. Memory Unit (MU)

a. Control unit (CU): the control unit manages the various components of the computer. It reads instructions from memory and interpretation and changes in a series of signals to activate other parts of the computer. It controls and co-ordinate is input output memory and all other units.

b. Arithmetic & Logic unit (ALU): The arithmetic logic unit (ALU), which performs simple arithmetic operation such as +,-, *, / and logical operation such as >, <, =<, <= etc.

c. Memory Unit (MU): Memory is used to store data and instructions before and after processing. Memory is also called Primary memory or internal memory. It is used to store data temporary or permanently.

It is compulsory on the computer. It is also described as main memory. It helps to execute the program and saves the data to make the work easier. On the other hand, this type of memories is not long lasting. That means, when you will switch off the computer, it will lose all the memory.

Generally, RAM (Random Access Memory) is the types of primary memory. It saves the instructions or data on the main memory chip's circuitry which helps to work fastly of the CPU. In all the computer you will find limited memory for primary storage because it is very costly.

Function of CPU:

a. It controls all the working hardware parts, software and data flow of computer.
b. It performs all arithmetical and logical operations (example addition, subtraction, multiplication, division, searching, sorting) that we want the computer to perform.
c. It accepts data from input device like keyboard, scanners and microphone.
d. It sends information to output device like monitor or the printer.
e. Executing computer programs which are stored in memory
f. It stores data either temporarily or permanent basis.

C. Output Unit: Output unit is a unit that constituents a number of output device. An output device is used to show the result of processing.

When input unit works to take the data, output unit helps to show the data. Computer does not know the human language but it displays the data in human-readable ways. In general, output unit works to provide information for outside world.

You can take the information and use it for personal uses with the help of output unit. You can ask, the computer knows the binary only, so how it shows the data in our language. In particular, Computer takes the data on binary and display the results also on the binary. But it provides the information by converting to accessible human language. Most of the commonly used output units are the monitor, sound box as well as Printer.

Function of Output unit:

a. It accepts data or information sends from main memory of computer
b. It converts binary coded information into HLL or inputted languages.

1.4 Types Of Computers:

Just as human beings are different in size and other parameters, computers too are different. Since the invention of the first computer, different types and sizes of computers are offering different services.

Computers can be as big as occupying a large building and as small as a laptop or a microcontroller in mobile & embedded systems. Initially we talked about two types of computers: Analog and Digital. Now we talk of only digital computers.

The four basic types of computers are as under:

1.4.1 Supercomputer:

The most powerful computers in terms of performance and data processing are the Supercomputers. These are specialized and task specific computers used by large organizations. These computers are used for research and exploration purposes, like NASA uses supercomputers for launching space shuttles, controlling them and for space exploration purpose.

Supercomputers are optimized to execute a few number of programs. This makes it possible for them to execute these few programs at a very high speed. Due to their inhibiting cost, they are used in high end places like in scientific research centers. The supercomputer consists of thousands of processors making it clock very high speeds measured by petaflops.

A. Popular Supercomputers:

IBM's Sequoia, in United States

Fujitsu's K Computer in Japan

IBM's Mira in United States

IBM's SuperMUC in Germany

The supercomputers are very expensive and very large in size. It can be accommodated in large air-conditioned rooms; some super computers can span an entire building.

Seymour Cray designed the first Supercomputer "CDC 6600" in 1964. CDC 6600 is known as the first ever Supercomputer. India's first supercomputer was PARAM.

Uses of Supercomputers: Following are the uses of Supercomputers

Space Exploration: Supercomputers are used to study the origin of the universe, the dark-matters. For these studies scientist use IBM's powerful supercomputer "Roadrunner" at National Laboratory Los Alamos.

Earthquake studies: Supercomputers are used to study the Earthquakes phenomenon. Besides that supercomputers are used for natural resources exploration, like natural gas, petroleum, coal, etc.

Weather Forecasting: Supercomputers are used for weather forecasting, and to study the nature and extent of Hurricanes, Rainfalls, windstorms, etc.

Nuclear weapons testing: Supercomputers are used to run weapon simulation that can test the Range, accuracy & impact of Nuclear weapons.

1.4.2 Mainframe Computer:

Although Mainframes are not as powerful as supercomputers, but certainly they are quite expensive nonetheless, and many large firms & government organizations uses Mainframes to run their business operations.

The Mainframe computers can be accommodated in large air-conditioned rooms because of its size. Super-computers are the fastest computers with large data storage capacity, Mainframes can also process & store large amount of data.

Banks educational institutions & insurance companies use mainframe computers to store data about their customers, students & insurance policy holders.

Popular Mainframe computers

Fujitsu's ICL VME

Hitachi's Z800

1.4.3 Minicomputer:

Minicomputers are used by small businesses & firms. Minicomputers are also called as "Midrange Computers". These are small machines and can be accommodated on a disk with not as processing and data storage capabilities as super-computers & Mainframes.

These computers are not designed for a single user. Individual departments of a large company or organizations use Mini-computers for specific purposes. For example, a production department can use Mini-computers for monitoring certain production process.

Minicomputers are mid-sized computers. In terms of size and power, minicomputers are ranked below mainframes. A minicomputer is a multiprocessing system capable of supporting from 4 to about 200 users simultaneously.

Popular Minicomputers

K-202

Texas Instrument TI-990

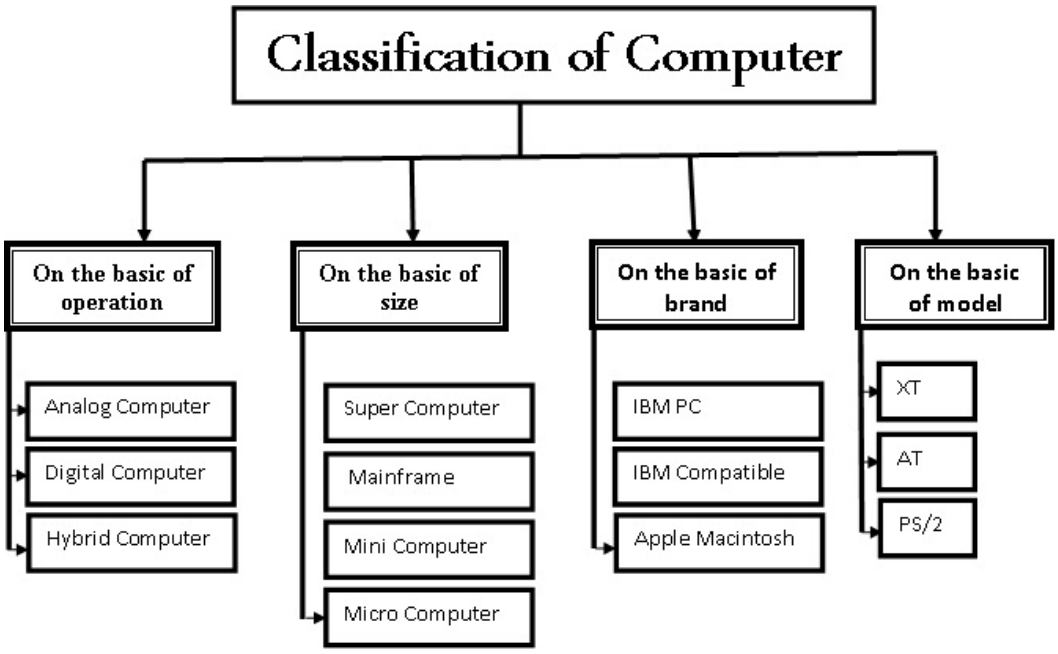
SDS-92

IBM Midrange computers

1.4.4 Microcomputer:

Desktop computers, laptops, personal digital assistant (PDA), tablets & smartphones are all types of microcomputers. The micro-computers are widely used & the fastest growing computers.

These computers are the cheapest among the other three types of computers. The Micro-computers are specially designed for general usage like entertainment, education and work purposes. Well known manufacturers of Micro-computer are Dell, Apple, Samsung, Sony & Toshiba. Desktop computers, Gaming consoles, Sound & Navigation system of a car, Netbooks, Notebooks, PDA's, Tablet PC's, Smartphones, Calculators are all type of Microcomputers.



Microcomputers Are Classified as Desktop and Portable (Mobile) Computers.

Desktop computers are not built to be mobile. They are moved, but only to a new desktop location and with the power supply inactive.

There are a number of major differences between computers that are intended to be used in one place as a desktop and portables or mobiles that can be easily moved from one location to another.

Desktop computers are large and heavy in comparison to portables. They can be carried in specially manufactured cases, but only to assist a support engineer in moving, not as a frequent procedure. The monitor, keyboard and mouse are all separate items on a desktop.

Desktop computer components and devices, although quite resilient to movement while active are not made to be constantly moved, even less so when they are operational.

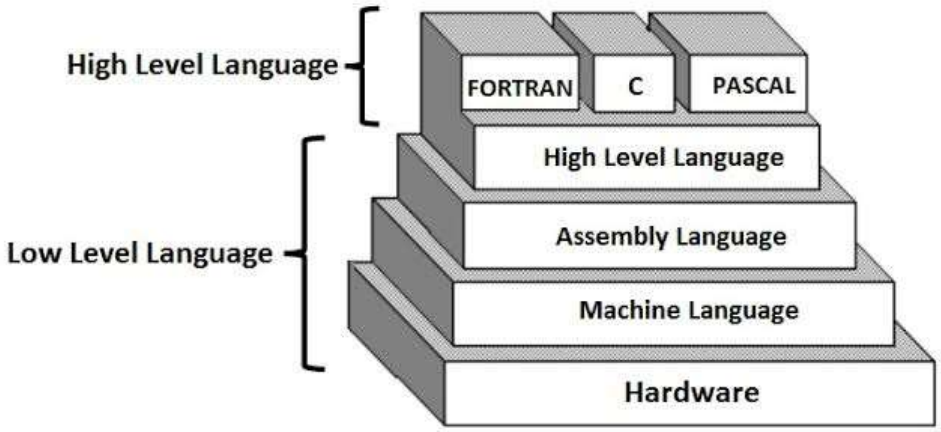
A mains power supply is mandatory, as desktop computers cannot work without a constant supply of electrical power.

Portable computers are laptops or tablets that we all are using now. They are easy to carry because of their sizes and can be used anywhere. Memory and Processors of these portable devices are second to none.

1.5 Types Of Programming Languages:

Just as we have personal languages like English, French and Hindi, Computers understand its own language (Machine level Language).

We program computers to do certain tasks teaching them to act according to a set of rules (algorithms) whenever they receive input of predefined type(s), in order to receive expected output. For all such purposes we use following programming languages



Computer Language and its Types

1.5.1 Machine Languages (MLL):

Imagine them as the "native tongue" of the computer, the language closest to the hardware itself. Each unique computer has a unique machine language. A machine language program is made up of a series of binary patterns (e.g., 01011100) which represent simple operations that can be accomplished by the computer (e.g., add two operands, move data to a memory location). Machine language programs are executable, meaning that they can be run directly. Programming in machine language requires memorization of the binary codes and can be difficult for the human programmer. A nice and interactive example is present here.

Machine language, the numeric codes for the operations that a particular computer can execute directly. The codes are strings of 0s and 1s, or binary digits ("bits"), which are frequently converted both from and to hexadecimal (base 16) for human viewing and modification.

Machine language instructions typically use some bits to represent operations, such as addition, and some to represent operands, or perhaps the location of the next instruction. Machine language is difficult to read and write, since it does not resemble conventional mathematical notation or human language, and its codes vary from computer to computer.

It is a Programming language that can be directly understood and obeyed by a machine (computer) without conversion (translation). Different for each type of CPU, it is the native binary language (comprised of only two characters: 0 and 1) of the computer and is difficult to be read and understood by humans. Programmers commonly use more English-like languages (called high level languages) such as Basic, C, Java, etc., to write programs which are then translated into machine language (called a low level language) by an assembler, compiler, or interpreter.

1.5.2 Assembly Languages (AL):

They represent an effort to make programming easier for the human. The machine language instructions are replaced with simple pneumonic abbreviations (e.g., ADD, MOV). Thus assembly languages are unique to a specific computer (machine). Prior to execution, an assembly language program requires translation to machine language.

This translation is accomplished by a computer program known as an Assembler. Assemblers are written for each unique machine language.

Assembly language is a low-level programming language for a computer or other programmable device specific to a particular computer architecture in contrast to most high-level programming languages, which are generally portable across multiple systems. Assembly language is converted into executable machine code by a utility program referred to as an assembler like NASM, MASM, etc.

Each personal computer has a microprocessor that manages the computer's arithmetical, logical, and control activities.

Each family of processors has its own set of instructions for handling various operations such as getting input from keyboard, displaying information on screen and performing various other jobs. These set of instructions are called 'machine language instructions'

A processor understands only machine language instructions, which are strings of 1's and 0's. However, machine language is too obscure and complex for using in software development. So, the low-level assembly language is designed for a specific family of

processors that represents various instructions in symbolic code and a more understandable form.

Having an understanding of assembly language makes one aware of :

a. How programs interface with OS, processor, and BIOS.
b. How data is represented in memory and other external devices.
c. How the processor accesses and executes instruction.
d. How instructions access and process data.
e. How a program accesses external devices.

Other advantages of using assembly language are: It requires less memory and execution time and

It allows hardware-specific complex jobs in an easier way.

1.5.3 High Level Languages (HLL):

High-level languages, like C, C++, JAVA etc., are more English-like and, therefore, make it easier for programmers to “think” in the programming language. High-level languages also require translation to machine language before execution.

This translation is accomplished by either a compiler or an interpreter. Compilers translate the entire source code program before execution. (Eg.: C++, Java).

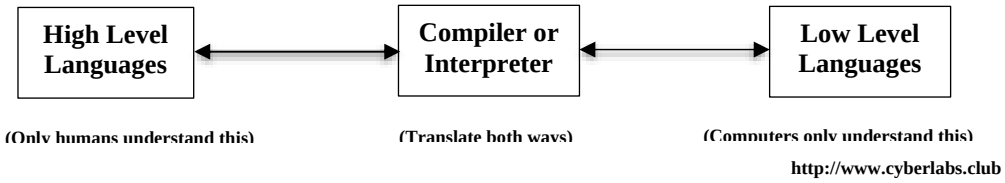
Interpreters translate source code programs one line at a time. (Eg.: Python) Interpreters are more interactive than compilers.

A high-level language is any programming language that enables development of a program in a much more user-friendly programming context and is generally independent of the computer's hardware architecture.

A high-level language has a higher level of abstraction from the computer, and focuses more on the programming logic rather than the underlying hardware components such as memory addressing and register utilization.

High-level languages are designed to be used by the human operator or the programmer. They are referred to as "closer to humans." In other words, their programming style and context is easier to learn and implement than low-level languages, and the entire code generally focuses on the specific program to be created.

A high-level language does not require addressing hardware constraints when developing a program. However, every single program written in a high-level language must be interpreted into machine language before being executed by the computer.



1.6 Data Organization:

Data organization, in broad terms, refers to the method of classifying and organizing data sets to make them more useful. Some IT experts apply this primarily to physical records, although some types of data organization can also be applied to digital records. There are many ways that IT professionals work on the principle of data organization. Many of these are classified under the more general heading of “data management.” For example, re-ordering or analyzing the arrangement of data items in a physical record is part of data organization.

One other main component of enterprise data organization is the analysis of relatively structured and unstructured data. Structured data is comprised of data in tables that can be easily integrated into a database and, from there, fed into analytics software or other particular applications. Unstructured data is data that is raw and unformatted, the kind of data that you find in a simple text document, where names, dates and other pieces of information are scattered throughout random paragraphs.

Experts have developed tech tools and resources to handle relatively unstructured data and integrate it into a holistic data environment.

Businesses adopt data organization strategies in order to make better use of the data assets that they have in a world where data sets represent some of the most valuable assets held by enterprises across many different industries. Executives and other professionals may focus on data organization as a component of a comprehensive strategy to streamline business processes, get better business intelligence and generally improve a business model.

Key Principles of File Organization:

- Spending a little time upfront right at the start, can save a lot of time later on.
- Be realistic: strike a balance between doing too much and too little.
- There's no single right way to do it; establish a system that works for you.

1.7 Drives:

A drive is a location (medium) that is capable of storing and reading information that is not easily removed, like a disk or disc. All drives store files and programs that are used by your computer.

For example, when you write a letter in a word processor the program is loaded from your hard drive and when you save the document it is saved to the hard drive or other disk or drive. We can see different drives listed in Microsoft Windows by clicking My Computer option.

We usually have on our systems, drive A: is the floppy drive, C: is the primary hard drive, D: and E: are partitions of the hard drive, and F: is the CD-ROM drive. Typically, the CD-ROM drive is the last drive letter, so in most situations the hard drive is the C: drive and a CD-ROM or other disc drive is the D: drive.

Types of Computer Drives:

We all use different computer systems and below are some examples of different drives you could have in a computer or that may be accessible by the computer.

- Bernoulli drive (Obsolete)
- Disc drives: Blu-ray, CD-R, CD-ROM, CD-RW, and DVD.
- Floppy disk drive (Obsolete)
- Hard drive
- Local drive
- LS120 drive aka Super Disk (Obsolete)
- Network drive
- RAM disk
- SSD
- Tape drive
- USB drive
- Virtual drive
- Zip drive (Obsolete)

What is A Portable Drive and Removable Disk?

A portable drive and removable disk is any drive or disk that can be transported between computers. The most common portable drives today are the USB card readers, USB jump drives, and USB external hard disk drives.

How to identify a drive:

Understanding how drives work on your computer is the first step in identifying the drives connected to your computer. As mentioned above, on computers running a Microsoft operating system (e.g., MS-DOS and Windows) that have a floppy drive will always be either A: or B: depending on the type of floppy drive. If your

computer does not have a floppy drive (most computers today), the A: and B: drive will be missing.

Your primary hard drive will always be the C: drive. If it is partitioned, it may also have additional drive letters for each partition. However, the primary partition will be C: Next, if your computer has a disc drive, it will default as the next available drive letter. Typically, a disc drive is D: or E: but may be a different letter depending on how many drives and partitions your computer has set up.

Next, if your computer has a card reader, it may assign drive letters to each of the available card slots in the computer. These drives appear on your computer but are inaccessible when you attempt to open the drive.

For example, attempting to open one of these types of drives will give you an error to "Insert a disk into the drive." After inserting a card into one of the slots, the drive assigned to that slot will change and have a different drive label to help identify the drive. Finally, all following drive letters are added as new drives are connected. For example, connecting an external USB drive or a USB thumb drive.

These drives appear as the new drive is connected to the computer. For example, if the next available drive letter is I: when connecting a USB thumb drive to the computer the I: drive will appear and be accessible.

1.8 Files:

Files contain our data and programs. Files can be simple files, containing our resume or C program. The files have to be saved with a name on the drive. Files are identified with their names and I node number internally. Files can be created and deleted and searched with the help of commands.

For example, we can use vi editor for creating a file in UNIX operating systems and Edit command or Copy Con Command to create a file in MS-DOS. Our files have several common characteristics built in.

Each file is made up of data, but also metadata is embedded into the file to help the operating system (OS) manage how the file works and how it is stored.

Metadata records file information such as the author, file creation date, modified date, and file size. The files can have the extensions like .exe., .bat, .com or a C program will have extension.c

1.9 Directories:

Files are not just randomly scattered on a form of storage media, there is what is called a directory. It is like a book almirah with different shelves to keep different kinds of books.

Think of a directory as an invented root system. It starts at the top with a single entity of a computer hard drive. On a PC, the primary drive is called C: (where the ':' indicates the drive letter assigned or mapped).

On a Linux system, the drive prompt is a dollar sign ($). In both these cases, this is called the root of the drive. From here we think of a directory system as a series of branches or folders containing collections of similar files. For example, on the Microsoft Windows OS, the Windows directory contains the vast majority of files necessary for the OS to work and administer files and processes.

Data can be defined as a representation of facts, concepts, or instructions in a formalized manner, which should be suitable for communication, interpretation, or processing by human or electronic machine.

Data is represented with the help of characters such as alphabets (A-Z, a-z), digits (0-9) or special characters (+,-,/,*,<,>,= etc.)

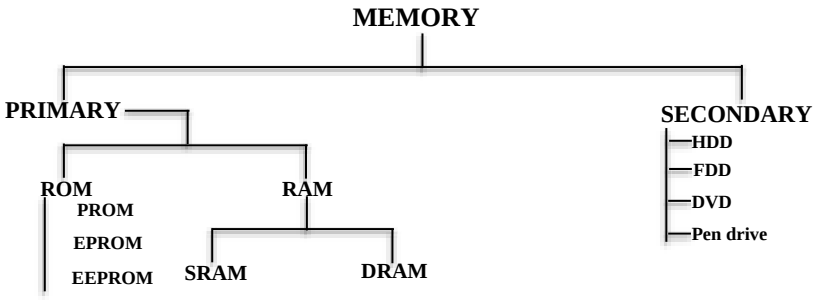
1.10 Types Of Memory:

A memory unit is the collection of storage units or devices together. The memory unit stores the binary information in the form of bits.

Memory is storage part in computer. It is store the data, information, programs during processing in computer. It stores data either temporarily or permanent basis. Memory used to important role in saving and retrieving data.

A memory is just like a human brain. It is used to store data and instructions. Computer memory is the storage space in the computer, where data is to be processed and instructions required for processing are stored. The memory is divided into large number of small parts called cells.

Each location or cell has a unique address, which varies from zero to memory size minus one. For example, if the computer has 64k words, then this memory unit has 64 * 1024 = 65536 memory locations. The address of these locations varies from 0 to 65535.



Types of Memory:

Mainly computer have two types memory

A. Primary Memory / Volatile Memory.
B. Secondary Memory / Non Volatile Memory.

A. Primary Memory / Volatile Memory:

Primary memory is internal memory of the computer. It is also known as main memory and Temporary memory .Primary Memory holds the data and instruction on which computer is currently working. Primary Memory is nature volatile.

It means when power is switched off it lost all data. Primary memory holds only those data and instructions on which the computer is currently working. It has a limited capacity and data is lost when power is switched off. It is generally made up of semiconductor device. These memories are not as fast as registers. The data and instruction required to be processed resides in the main memory. It is divided into two subcategories RAM and ROM.

Characteristics of Primary Memory:

- These are semiconductor memories made up of transistors.
- It is known as the main memory.
- Usually it is called volatile memory as data is lost in case power is switched off.
- It is the working memory of the computer.
- Faster than secondary memories.
- A computer cannot run without the primary memory.

Types of Primary Memory:

Primary memory is generally of two types.

- RAM
- ROM

a. RAM (Random Access Memory):

It stands for Random Access Memory.RAM is known as read /writes memory. It generally refereed as main memory of the computer system. It is a temporary memory.

The information stored in this memory is lost as the power supply to the computer is switched off. That's why RAM is also called "Volatile Memory"

Types of RAM: RAM is also of two types:

- **Static RAM:** Static RAM also known as SRAM, retain stored information as long as the power supply is ON. SRAM are of higher coast and consume more power. They have higher speed than Dynamic RAM

- **Dynamic RAM:** Dynamic RAM also known as DRAM, its stored information in a very short time (a few milliseconds) even though the power supply is ON. The Dynamic RAM are cheaper and moderate speed and also they consume less power.

b. ROM (Read Only Memory):

It stands for Read Only Memory. ROM is a Permanent Type memory. Its content are not lost when power supply is switched off. Content of ROM is decided by the computer manufacturer and permanently stored at the time of manufacturing.

ROM cannot be overwritten by the computer. It is also called "Non-Volatile Memory".

Type of ROM: ROM memory is three types names are following-

- **PROM (Programmable Read Only Memory):** PROM chip is programmable ROM.it is PROM chips to write data once and read many. Once chip has been programmed, the recorded information cannot be changed. PROM is also nonvolatile memory.

  EPROM (Erasable Programmable Read Only Memory)- EPROM chip can be programmed time and again by erasing the information stored earlier in it. Information stored in EPROM exposing the chip for some time ultraviolet light.

  EEPROM (Electrically Erasable Programmable Read Only Memory)-The EEPROM is programmed and erased by special electrical waves in millisecond. A single byte of a data or the entire contents of device can be erased.

B. Secondary Memory / Non Volatile Memory:

Secondary Memory is external memory of the computer. It is also known as Auxiliary memory and permanent memory. It is used to store the different programs and the information permanently.

Secondary Memory is nature non volatile. It means data is stored permanently even if power is switched off.

The secondary storage devices are:

- Floppy Disks
- Magnetic (Hard) Disk
- Magnetic Tapes
- Pen Drive
- Winchester Disk
- Optical Disk (CD, DVD)

This type of memory is also known as external memory or non-volatile. It is slower than the main memory.

These are used for storing data/information permanently. CPU directly does not access these memories, instead they are accessed via input-output routines.

The contents of secondary memories are first transferred to the main memory, and then the CPU can access it. For example, disk, CD-ROM, DVD, etc.

Characteristics of Secondary Memory:

- These are magnetic and optical memories.
- It is known as the backup memory.
- It is a non-volatile memory.
- Data is permanently stored even if power is switched off.
- It is used for storage of data in a computer.
- Computer may run without the secondary memory.
- Slower than primary memories.

Differences Between Primary and Secondary Memory

Sr. No.	Primary Memory	Secondary Memory
1	Primary Memory is temporary	Secondary Memory is permanent
2	Primary Memory is directly accessible by Processor/CPU	Secondary Memory is not accessible by CPU

Sr. No.	Primary Memory	Secondary Memory
3	Nature of Parts of Primary Memory varies. RAM-volatile in nature. ROM-Non-volatiler.	It's always Non-volatile in nature.
4	Primary Memory devices are more expensive than secondary storage devices.	Secondary Memory devices are more expensive when compare to primary memory devices.
5	The memory devices used for primary memory are semiconductor memories.	The secondary memory devices are magnetic and optical memories.
6	Primary Memory is also known as main memory or internal memory.	Primary Memory is also known as External memory or Auxiliary memory.
7	Examples: RAM, ROM, Cache memory, PROM, EPROM, Registers etc.	Examples: Hard Disk, Floppy Disk, Magnetic Tapes etc.

1.11 I/O Devices:

An input/output (I/O) device is a hardware device that has the ability to accept inputted, outputted or other processed data. It also can acquire respective media data as input sent to a computer or send computer data to storage media as storage output.

An I/O device is also known as an IO device. Input devices provide input to a computer, while output devices provide a way for a computer to output data for communication with users or other computers. An I/O device is a device with both functionalities.

Because I/O device data is bi-directional, such devices are usually categorized under storage or communications. Examples of I/O storage devices are CD/DVD-ROM drives, USB flash drives and hard disk drives. Examples of communication I/O devices are network adapters, Bluetooth adapters/dongles and modems.

The devices which are used to input the data and the programs in the computer are known as "Input Devices". or Input device can read data and convert them to a form that a computer can use.

Output Device can produce the final product of machine processing into a form usable by humans. It provides man to machine communication.

Some of the I/O devices are explained below:

a. **Keyboard:** Keyboard is used in the input phase of a computer-based information system. Keyboard is most common input device is used today. 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.
b. **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.
c. **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.
d. **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.
e. **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.
f. **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.
g. **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.
h. **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.

i. **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.

j. **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.

I/O devices are used by people or by other systems to communicate with the computer.

Some Output Devices:

a. Monitor (LCD, LED, etc.): The monitor is one of the most important output devices - it is where one views the output. The initial monitors were called CRTs (Cathode Ray Tubes) that had quite a few limitations as compared to the modern ones we have today. The LCDs (Liquid Crystal Displays) arrived next. They were lightweight, clear, easy-to-use, and consumed lesser power. As of today, one prefers using the LED (Light Emitting Diode) monitors that are based on very advanced technology, though they use considerably higher power and are expensive. Laptops, palmtops, tablets, smartphones, etc., obviously do not need the monitor, the screen serves as the output device, and has a high resolution.

b. Plotter: The plotter is a computer printer for printing vector graphics. In the past, plotters were used in applications such as computer-aided design, though they have generally been replaced with wide-format conventional printers. A plotter gives a hard copy of the output. It draws pictures on a paper using a pen.

1.12 Number Systems:

1.12.1 Introduction:

A. Binary Numbers:

A binary number is a positional numeral system with two as the base. The binary number system consists of two different numerals, namely zero and one. These can be used to

represent all other numbers. As it has the advantages of easy implementation by logic gates, it is mostly used in electronic and computer-based devices, networking and digital signal processing.

Binary numbers are often called bits and could be represented by any two mutually exclusive states. A binary number is based on powers of two. Like other numeral systems, binary numbers can do arithmetic operations like addition, subtraction, multiplication and division.

The fundamental Boolean operations are based on binary numbers. With the help of floating point arithmetic, binary numbers can be used to represent fractions, real numerals and large numbers. Binary numbers can be converted to numbers of other numeral system like the decimal system, hexadecimal system and octal system, and vice versa as well. One of the easy methods of converting decimal number into binary is by repeated division of the number by 2 with the remainder in each case being the concerned bit in the binary numeral system.

B. Octal Numbers:

Octal refers to the base-8 numbering system. It comes from the Latin word for eight. The octal numbering system uses the numerals 0-1-2-3-4-5-6-7. In computing environments, it is commonly used as a shorter representation of binary numbers by grouping binary digits into threes. The chmod command in Linux or UNIX uses octal to assign file permissions.

Octal is another way to count numbers. While humans normally count in tens, and machines count in twos, it is possible to use any number as the basis for counting and calculation. Some Native American tribes have used octal by counting the spaces between fingers. Characters in the 2009 film “Avatar” used octal because they had four fingers on each hand. Some mathematicians have proposed the wider adoption of octal.

Using octal is a convenient way to abbreviate binary numbers. Starting from the right, group all binary digits into sets of three. If the last group on the left does not have three digits, then add a zero. Each three-digit binary group translates into a one-digit octal number.

C. Hexadecimal Numbers:

Hexadecimal is a base/positional number system used in mathematics and computer science. It has a base of 16 and uses 16 unique alpha-numeric symbols with the numbers zero to 9 to represent themselves and the letters A-F to represent the values 10 to 15.

Hexadecimal is an easier way to represent binary values in computer systems because they significantly shorten the number of digits, as one hexadecimal digit is equivalent to four binary digits. Hexadecimals are used heavily in computer science and digital electronics as a means of representing binary code as a human-readable form.

A single hexadecimal digit represents four binary bits called a nibble, which is half of an octet (8 bits). Although the number progression for hexadecimal begins with 0 and ends in F, the counting is still very much the same as in decimal, which means that when the last possible number system is reached, the place value is incremented to the left, and the current value becomes zero.

Following this rule in decimal, after 09 is 10, and in the same vein for hexadecimal, after 0F is 10.

1.12.2 Conversion:

A. Binary To Octal:

Step 1: Divide the binary digits into groups of three (starting from the right).

Step 2: Convert each group of three binary digits to one octal digit.

Example

Binary Number: 101012

Calculating Octal Equivalent:

Step	Binary Number	Octal Number
Step 1	10101_2	010 101
Step 2	10101_2	2_8 5_8
Step 3	10101_2	25_8

Binary Number: 101012 = Octal Number: 25

B. Octal To Binary:

Step 1: Convert each octal digit to a 3-digit binary number (the octal digits may be treated as decimal for this conversion).

Step 2: Combine all the resulting binary groups (of 3 digits each) into a single binary number.

Example

Octal Number: 25

Calculating Binary Equivalent:

Step	Binary Number	Octal Number
Step 1	25_8	2_{10} 5_{10}
Step 2	25_8	010_2 101_2
Step 3	25_8	010101_2

Octal Number: 25 = Binary Number: 10101

C. Binary to Hexadecimal:

Step 1: Divide the binary digits into groups of four (starting from the right).

Step 2: Convert each group of four binary digits to one hexadecimal symbol.

Example

Binary Number: 10101

Calculating hexadecimal Equivalent:

Step	Binary Number	Octal Number
Step 1	10101_2	0001 0101
Step 2	10101_2	1_{10} 5_{10}
Step 3	10101_2	15_{16}

Binary Number: 10101 = Hexadecimal Number: 151

D. Hexadecimal to Binary:

Step 1: Convert each hexadecimal digit to a 4-digit binary number (the hexadecimal digits may be treated as decimal for this conversion).

Step 2: Combine all the resulting binary groups (of 4 digits each) into a single binary number.

Example

Hexadecimal Number: 151

Calculating Binary Equivalent:

Step	Binary Number	Octal Number
Step 1	15_{16}	$1_{10}\ 5_{10}$
Step 2	15_{16}	$0001_2\ 0101_2$
Step 3	15_{16}	00010101_2

Hexadecimal Number: 1516 = Binary Number: 10101

E. Binary Addition:

Now that we know binary numbers, we will learn how to add them. Binary addition is much like your normal everyday addition (decimal addition), except that it carries on a value of 2 instead of a value of 10.

For example: in decimal addition, if you add 8 + 2 you get ten, which you write as 10; in the sum this gives a digit 0 and a carry of 1. Something similar happens in binary addition when you add 1 and 1; the result is two (as always), but since two is written as 10 in binary, we get, after summing 1 + 1 in binary, a digit 0 and a carry of 1.

Therefore in binary:

0 + 0 = 0

0 + 1 = 1

1 + 0 = 1

1 + 1 = 10 (which is 0 carry 1)

Example: Suppose we would like to add two binary numbers 10 and 11. We start from the last digit. Adding 0 and 1, we get 1 (no carry). That means the last digit of the answer will be one. Then we move one digit to the left: adding 1 and 1 we get 10. Hence, the answer is

101. Note that binary 10 and 11 correspond to 2 and 3 respectively. And the binary sum 101 corresponds to decimal 5: is the binary addition corresponds to our regular addition.

F. Binary Subtraction:

Binary subtraction is also similar to that of decimal subtraction with the difference that when 1 is subtracted from 0, it is necessary to borrow 1 from the next higher order bit and that bit is reduced by 1 (or 1 is added to the next bit of subtrahend) and the remainder is 1.

Thus, the rules of binary subtraction are as follows:

0 - 0 = 0

1 - 0 = 1

1 - 1 = 0

0 - 1 = 1 with a borrow of 1

1.13 Questions:

1. What are algorithms and what are its characteristics?

2. Explain the properties of algorithm with examples.

3. What are the advantages and disadvantages of algorithm?

4. What do you understand by the complexity of an algorithm?

5. Draw a flowchart for calculating factorial of a number.

6. What are types of flowcharts? Explain with their uses.

7.What are the characteristics of flowchart?

8. What are the advantages and disadvantages of flowchart?

9. Write an algorithm for calculating the average marks of five subjects.

10. Differentiate between algorithms and flowcharts with examples.

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Chapter 2

Algorithm and Flowchart

2.1 Introduction:

In the previous chapter, we studied the generations, languages, basic components of computers and their functions.

In this chapter, we will discuss about solving the problem. The problem can be as simple as finding the sum of two numbers, finding the factorial of a number, checking whether the number is prime or not etc.

Problem can be finding the average height of the class or printing the results of all students of the class. **Algorithm** is the step by step solution of the problem and is independent of the programming language used. Algorithms are designed on paper and help the programmer while coding the problem.

Flowchart is the pictorial representation of the step by step solution of the problem. It depicts the flow of the problem and is quite helpful to the coders.

Algorithm and Flowcharts are important tools of logical design and helps greatly in the coding phase of lifecycle.

Let’s now study about algorithms along with examples in detail.

2.2 Algorithm:

In computer science, an algorithm is an unambiguous specification of how to solve a class of problems. Algorithms can perform calculation, data processing and automated reasoning tasks. An algorithm (pronounced AL-go-rith-um) is a procedure or formula for solving a problem, based on conducting a sequence of specified actions. The word algorithm derives from the name of the mathematician, Mohammed ibn-Musa al-Khwarizmi, who was part of the royal court in Baghdad and who lived from about 780 to 850. Al-Khwarizmi's work is the likely source for the word algebra as well.

A computer program can be viewed as an elaborate algorithm. In mathematics and computer science, an algorithm usually means a small procedure that solves a recurrent problem.

Algorithms are widely used throughout all areas of IT (information technology). A search engine algorithm, for example, takes search strings of keywords and operators as input, searches its associated database for relevant web pages, and returns results.

An encryption algorithm transforms data according to specified actions to protect it. A secret key algorithm such as the U.S. Department of Defense's Data Encryption Standard (DES), for example, uses the same key to encrypt and decrypt data. As long as the algorithm is sufficiently sophisticated, no one lacking the key can decrypt the data.

An algorithm is a step by step method of solving a problem. It is commonly used for data processing, calculation and other related computer and mathematical operations. An algorithm is also used to manipulate data in various ways, such as inserting a new data item, searching for a particular item or sorting an item.

An algorithm is a detailed series of instructions for carrying out an operation or solving a problem. In a non-technical approach, we use algorithms in everyday tasks, such as a recipe to bake a cake or a do-it-yourself handbook.

Technically, computers use algorithms to list the detailed instructions for carrying out an operation. For example, to compute an employee’s paycheck, the computer uses an algorithm. To accomplish this task, appropriate data must be entered into the system.

In terms of efficiency, various algorithms are able to accomplish operations or problem solving easily and quickly. Let’s take a simple example of adding two numbers N1 and N2. Steps of solving this small and simple problem would be like

- Enter two numbers N1 and N2
- Add them up N1+N2
- Print the sum of two numbers

Algorithm steps have English like syntax and they don’t follow any Programming language.

2.2.1 Characteristics Of Algorithms:

Algorithm is a way of solving a problem in a step wise manner. It is written in any natural language. We usually use English like steps to model the problem.

Algorithms are used by the developers to develop code. It's a logical design and can vary from user to user.

The characteristics of a good algorithm are:

- **Precision:** the steps of the solution are precisely stated (defined).
- **Uniqueness:** results of each step of the solution are uniquely defined and only depend on the input and the result of the preceding steps.
- **Finiteness:** the algorithm stops after a finite number of instructions are executed. It must always terminate after a finite number of steps
- **Input:** the algorithm receives input. . An algorithm has zero or more inputs, i.e., quantities which are given to it initially before the algorithm begins.
- **Output:** the algorithm produces output. An algorithm has one or more outputs i.e., quantities which have a specified relation to the inputs.
- **Generality:** the algorithm applies to a set of inputs.

In mathematics, computing, linguistics and related subjects, an algorithm is a sequence of finite instructions, often used for calculation and data processing. It is formally a type of effective method in which a list of well-defined instructions for completing a task will, when given an initial state, proceed through a well-defined series of successive states, eventually terminating in an end-state. The transition from one state to the next is not necessarily deterministic; some algorithms, known as probabilistic algorithms, incorporate randomness.

2.2.2 Advantages Of Algorithms:

Algorithm is a step by step solution of the problem and is independent of the programming language used. Algorithms are designed on paper and help the programmer while coding the problem. It helps by greatly reducing the coding efforts if algorithms are efficient and properly defined.

Following are the advantages of using the algorithms:

- It is a step-wise representation of a solution to a given problem, which makes it easy to understand.
- An algorithm uses a definite procedure and it completely defines the process.
- It is not dependent on any programming language, so it is easy to understand for anyone even without programming knowledge. There is no mention of any programming language like C, C++ or Java while writing the algorithm.
- Every step in an algorithm has its own logical sequence so it is easy to debug.
- By using algorithm, the problem is broken down into smaller pieces or steps hence, it is easier for programmer to convert it into an actual program
- It easy to first develop an algorithm then convert it into a flowchart and then into a computer program.

2.2.3 Disadvantage Of Algorithms:

Along with the advantages, comes the disadvantage too. Following is the disadvantage of algorithms:

Writing algorithm takes a long time and doubles the time in solving the problem. It is time consuming & cumbersome as an algorithm is developed first which is converted into flowchart and then into a computer program.

Programmers directly code on the system these days or companies have to buy tools that aid in writing and designing algorithms.

2.2.4 Examples Of Algorithms:

Let's see one example of algorithm. This algorithm is written to calculate the Interest of as Bank deposit.

Inputs are amount of the money, years of deposit and the rate offered by the bank. Interest is calculated in step 4 and the calculated Interest is displayed in step 5.

Example 1: Calculate the Interest of a Bank Deposit:

Algorithm:

- Step 1: Read amount,
- Step 2: Read years,
- Step 3: Read rate,
- Step 4: Calculate the interest with formula "Interest=Amount*Years*Rate/100
- Step 5: Print interest

The next example of algorithm is checking whether the given number is Even or Odd. We get the input N from the user and the algorithm further checks its status as Even or Odd.

Example 2: Determine and Output Whether Number N is Even or Odd:

Algorithm:

- Step 1: Read number N,
- Step 2: Set remainder as N modulo 2,
- Step 3: If remainder is equal to 0 then number N is even, else number N is odd,
- Step 4: Print output.

Next example is to determine whether a given temperature is below or above freezing point where the temperature is given as input by the user.

Example 3: Determine Whether a Temperature is below or Above the Freezing Point:

Algorithm:

- Step 1: Input temperature,
- Step 2: If it is less than 32, then print "below freezing point", otherwise print "above freezing point"

Next example is determining whether a student passed the exam or not. Marks are provided as input by the user and the result is generated.

Example 4: Determine Whether A Student Passed the Exam or Not:

Algorithm:

- Step 1: Input grades of 4 courses M1, M2, M3 and M4,
- Step 2: Calculate the average grade with formula "Grade=(M1+M2+M3+M4)/4"
- Step 3: If the average grade is less than 60, print "FAIL", else print "PASS".

2.3 Flowchart:

A flow chart is a type of diagram representing a process using different symbols containing information about steps or a sequence of events.

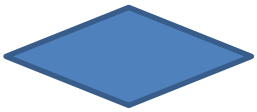
Each of these symbols is linked with arrows to illustrate the flow direction of the process. It's a pictorial representation of steps of solving a problem.

Flowcharts are a methodology used to analyze, improve, document and manage a process or program.

Flowcharts are helpful for:

- Aiding understanding of relationships among different process steps
- Collecting data about a particular process
- Helping with decision making
- Measuring the performance of a process
- Depicting the structure of a process
- Tracking the process flow
- Highlighting important steps and eliminating the unnecessary steps

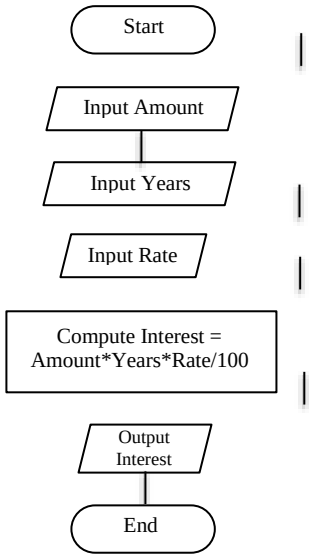
A flowchart in computer science typically has the following types of symbols to represent a process or program:

Symbol	Name	Function
	Start/End	An Oval represents a start or end point
	Arrows	A line is a connector that shows relationships between the representative shapes
	Input/output	A parallelogram represents input or output
	Process	A rectangle represents a process
	Decision	A Diamond indicates a decision

Oval/Rounded Rectangle/Circle: Represents any process having a start and an end activity.

- **Rectangles:** Represents a process activity or step of solving a problem.
- **Diamonds:** Used when there is a decision to be made or a question to be answered, such as Yes/No or True/False. The path to be taken is determined by the answer to the question.
- **Arrow lines:** Used to show the flow of control from one step to the other. They also indicate progress from one step to another.
- **Parallelograms:** Used to represent input/output (as we will see in examples)

A simple example will depict the use of all these symbols of flowchart.



Flowcharts are commonly used in developing business plans, designing algorithms and determining troubleshooting steps. Many software programs are available to design flowcharts.

Some of the commonly used software programs are Smart Draw, Visio (designed for PCs) and OmniGraffle (designed for Macs).

2.3.1 Characteristics Of Flowcharts:

Like algorithms, flowcharts too have their characteristics. Following are the characteristics of flowcharts

- Flowchart should consist of standardized and acceptable symbols.
- The symbols should be correctly used according to flowcharts rules.
- Should have short, clear and readable statements written inside the symbols
- It must have clear one starting point and one ending point.
- Must flow in a logical order.
- Should have acceptable and common keywords such as READ, INPUT, PRINT or WRITE.
- Must have arrows indicating the flow of instructions.

A flowchart is a diagram showing the various steps involved in the accomplishment of a project/job, from the start up to its completion.

As applied in production and in any functional areas of business, it is a clear illustration of how a project will be done reflecting the steps and activities involved from the start of to its completion.

Basically, a flow chart has the following features or part:

- Start of the project/ or task. This is denoted by an elongated circle.
- Instructions to be provided and actions to be done. These are denoted by rectangles.
- Decisions that must be made as indicated by a diamond - shaped figure.
- Possible consequences of the decision as directed by arrows.

2.3.2 Advantages Of Flowcharts:

Flowcharts are an excellent tool of logical design. It helps in explaining the flow of the process and helps in the coding phase.

During program development cycle, the flowchart plays the role of a guide or a blueprint which makes program development process easier. It is easy to convert the flowchart into any programming language code as it does not use any specific programming language concept

Following are the advantages of using the flowcharts:

- Communication: Flowcharts are better way of communicating the logic of a system to all concerned or involved.
- Effective analysis: With the help of flowchart, problem can be analyzed in more effective way therefore reducing cost and wastage of time.
- Proper documentation: Program flowcharts serve as a good program documentation, which is needed for various purposes, making things more efficient.
- Efficient Coding: The flowcharts act as a guide or blueprint during the systems analysis and program development phase.

- Proper Debugging: The flowchart helps in debugging process.
- Efficient Program Maintenance: The maintenance of operating program becomes easy with the help of flowchart. It helps the programmer to put efforts more efficiently on that part

2.3.3 Disadvantages:

- The flowchart can be complex when the logic of a program is quite complicated.
- Drawing flowchart is a time-consuming task.
- Difficult to alter the flowchart. Sometimes, the designer needs to redraw the complete flowchart to change the logic of the flowchart or to alter the flowchart.
- Since it uses special sets of symbols for every action, it is quite a tedious task to develop a flowchart as it requires special tools to draw the necessary symbols.
- In the case of a complex flowchart, other programmers might have a difficult time understanding the logic and process of the flowchart.
- It is just a visualization of a program, it cannot function like an actual program.

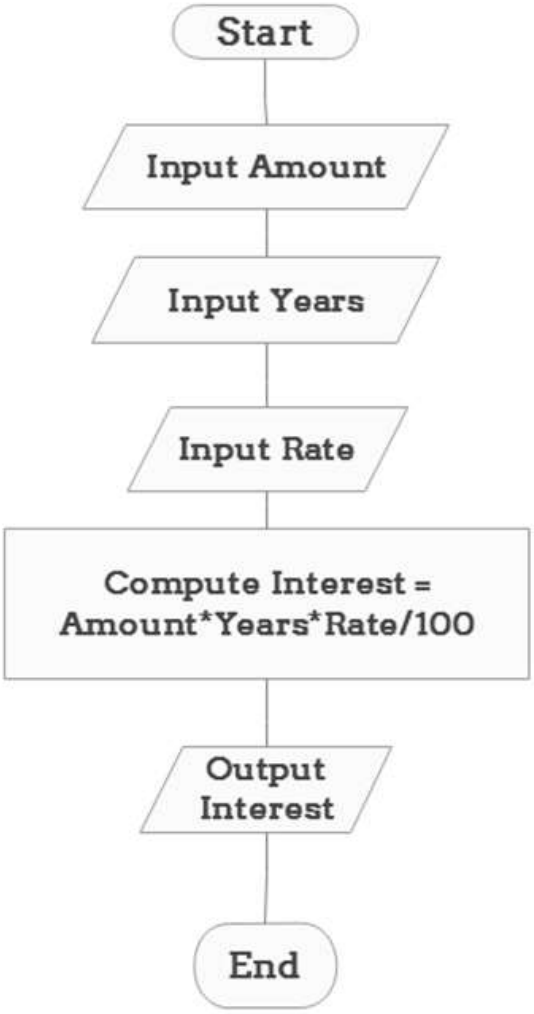
2.3.4 Examples Of Flowcharts For Algorithms:

These examples will help you get a better understanding of flowchart techniques.

Example 1: Calculate the Interest of a Bank Deposit:

Algorithm:

- Step 1: Read amount,
- Step 2: Read years,
- Step 3: Read rate,
- Step 4: Calculate the interest with formula "Interest=Amount*Years*Rate/100
- Step 5: Print interest

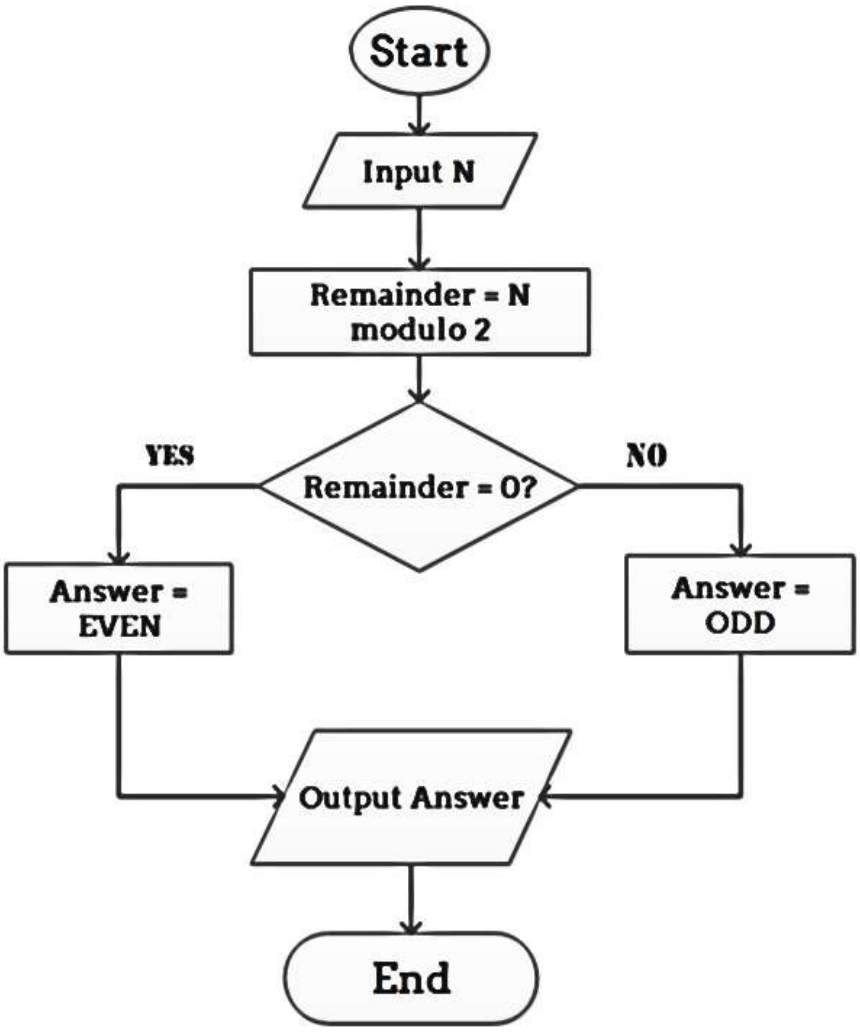


Example 2: Determine And Output Whether Number N Is Even Or Odd:

Algorithm:

- Step 1: Read number N,
- Step 2: Set remainder as N modulo 2,
- Step 3: If remainder is equal to 0 then number N is even, else number N is odd,
- Step 4: Print output.

Flowchart:

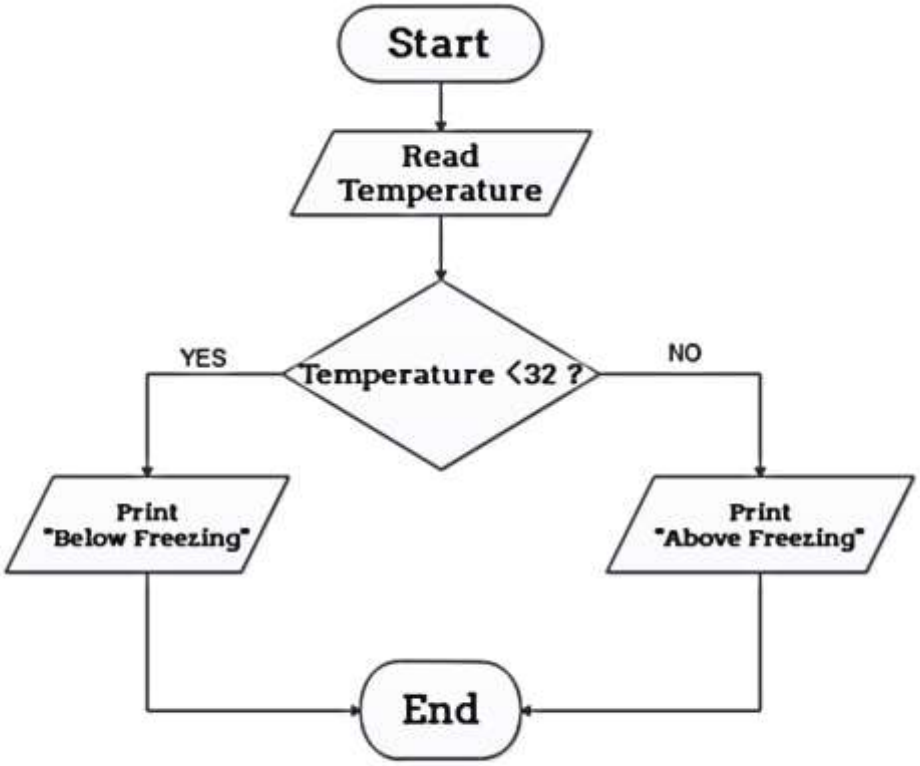


Example 3: Determine Whether A Temperature Is Below Or Above The Freezing Point:

Algorithm:

- Step 1: Input temperature,
- Step 2: If it is less than 32, then print "below freezing point", otherwise print "above freezing point"

Flowchart:

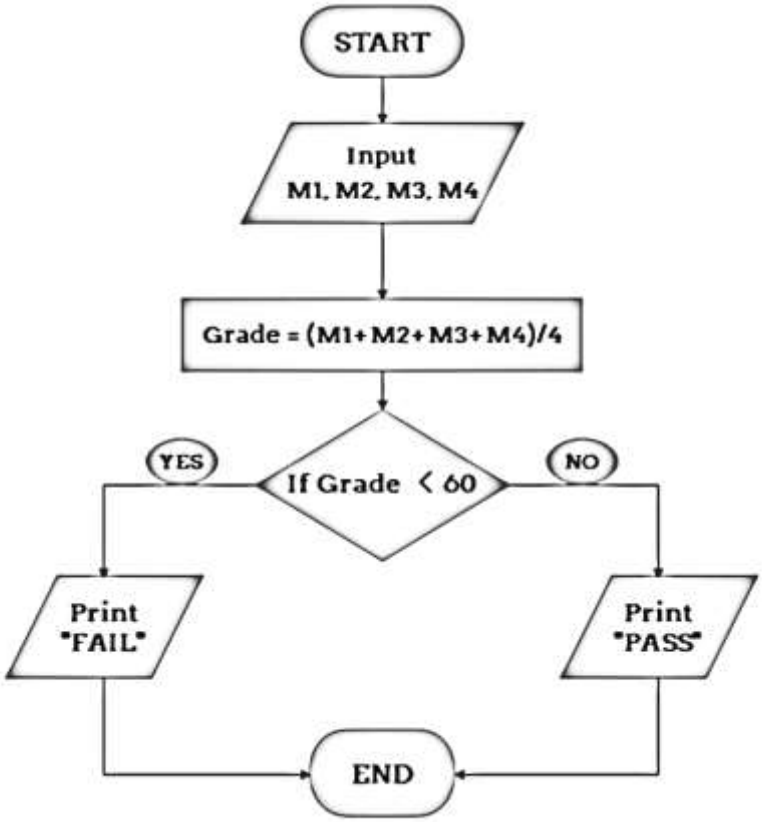


Example 4: Determine Whether A Student Passed The Exam Or Not:

Algorithm:

- Step 1: Input grades of 4 courses M1, M2, M3 and M4,
- Step 2: Calculate the average grade with formula "Grade=(M1+M2+M3+M4)/4"
- Step 3: If the average grade is less than 60, print "FAIL", else print "PASS".

Flowchart:



2.4 Questions:

1. What are algorithms and what are its characteristics?
2. Explain the properties of algorithm with examples.
3. What are the advantages and disadvantages of algorithm?
4. What do you understand by the complexity of an algorithm?
5. Draw a flowchart for calculating factorial of a number.
6. What are types of flowcharts? Explain with their uses.
7. What are the characteristics of flowchart?
8. What are the advantages and disadvantages of flowchart?
9. Write an algorithm for calculating the average marks of five subjects.
10. Differentiate between algorithms and flowcharts with examples.

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Chapter 3

Operating System And Services in OS

3.1 Introduction:

An Operating system (OS) is the software that controls a computer's hardware and peripheral devices and allows other programs to function. It is called the heart of the computer system. All the functions (Resource Management, Process Management, Memory Management and File Management) of the computer system are performed by operating system.

Early computers did not have disk drives but were hard-wired to carry out specific computations. Later, computers were able to store instructions loaded into the computer's memory using punch cards and later magnetic tapes. Computer memory space was limited and when the instructions to control a computer were moved onto a disk drive, such as a floppy disk or internal hard drive, it was considered cutting-edge technology.

Today, any modern operating system would be DOS (Disk operating system) or Windows or LINUX.

3.2 DOS:

DOS (Disk Operating System) is an operating system that runs from a hard disk drive. The term can also refer to a particular family of disk operating systems, most commonly MS-DOS (Microsoft Disk Operating System).

Disk operating system is also used to describe several very similar command line disk operating systems.

PC-DOS (Personal Computer Disk Operating System) was the first widely-installed disk operating system used in personal computers running on Intel 8086 16-bit processors. It was developed for IBM by Microsoft Corporation, which also produced its own almost identical version called MS-DOS.

Other computers at the time, such as the Commodore 64, Atari 800, and Apple II, all featured a disk operating system, CBM DOS, Atari DOS, and Apple DOS, respectively. (DOS/360 was an operating system for IBM mainframes which first appeared in 1966, but is unrelated to the 8086-based DOS of the 1980s.

These early operating systems did not multitask, as they were only able to run one program at a time. The command line interface, in which a user has to type in commands, required the user to remember commands to run programs or do other operating system tasks, making it difficult for novices to use.

For example, typing the command "cd \directory_ name" will change the current working directory to the named directory and typing the command "dir" listed the files in the current directory.

When Microsoft first introduced Windows as a graphical user interface (GUI) for MS-DOS, early users had to type "WIN" at the DOS prompt to launch the Windows program. Windows has since evolved from being a GUI program running under DOS to a full operating system taking over as the default OS, though it was not until Windows XP that consumer versions of Windows stopped relying on the DOS program win.com to bootstrap the Windows kernel.

The last retail version of MS-DOS was MS-DOS 6.22. After this release, MS-DOS was still bundled as part of Windows, but no longer required a separate license. It can still be run under Windows using the Command Prompt program. There is an open source version of DOS called Free DOS which is based on and compatible with MS-DOS.

DOS was the first operating system used by IBM-compatible computers. It was originally available in two versions that were essentially the same, but marketed under two different names.

"PC-DOS" was the version developed by IBM and sold to the first IBM-compatible manufacturers. "MS-DOS" was the version that Microsoft bought the rights to, and was bundled with the first versions of Windows.

DOS uses a command line, or text-based interface, that allows the user to type commands. By typing simple instructions such as pwd (print working directory) and cd (change directory), the user can browse the files on the hard drive, open files, and run programs.

While the commands are simple to type, the user must know the basic commands in order to use DOS effectively (similar to Unix). This made the operating system difficult for novices to use, which is why Microsoft later bundled the graphic-based Windows operating system with DOS.

The first versions of Windows (through Windows 95) actually ran on top of the DOS operating system. This is why so many DOS-related files (such as .INI, .DLL, and .COM files) are still used by Windows. However, the Windows operating system was rewritten for Windows NT (New Technology), which enabled Windows to run on its own, without using DOS. Later versions of Windows, such as Windows 2000, XP, and Vista, also do not require DOS.

DOS is still included with Windows, but is run from the Windows operating system instead of the other way around. The DOS command prompt can be opened in Windows by selecting "Run..." from the Start Menu and typing cmd.

3.3 HISTORY:

Let's look into the history of DOS. The most popular operating system for small microcomputers in the late 1970s was CP/M, written by Gary Kildall in about 1974 and marketed by the company he started, Digital Research, Inc. IBM visited Digital Research in August 1980 – some say at the suggestion of Bill Gates – to investigate using "CP/M-86″, their upcoming version for the 16-bit Intel 8088/8086 processor, on the IBM PC then under development. But they were not able to agree on licensing terms, so IBM left and pursued other options.IBM did something very unusual for their 1981 personal computer (PC).

Rather than using IBM proprietary components developed for their many other computers, the IBM PC used industry standard commercial parts. That included adopting the Intel 8088 microprocessor as the heart of the computer.

This "outsourcing" attitude extended to the software as well. Although IBM had prodigious internal software development resources, for the new PC they supported only operating systems that they did not themselves write, like CP/M-86 from Digital Research in Pacific Grove CA, and the Pascal-based P-System from the University of California in San Diego. But their favored OS was the newly-written PC DOS, commissioned by IBM from the five-year-old Seattle-based software company Microsoft.

When Microsoft signed the contract with IBM in November 1980, they had no such operating system. They too outsourced it, by first licensing then purchasing an operating system from Seattle Computer Products variously called QDOS (Quick and Dirty Operating System") and 86-DOS. PC DOS version 1.0, which supported only floppy disks, was shipped when IBM first released their PC in August 1981. Microsoft then substantially rewrote the software to support subdirectories and hard disks; version 2.0 was released with the IBM PC-XT in March of 1983.

Microsoft retained the rights to the operating system and licensed it to other computer manufacturers, calling it MS-DOS. With the permission of Microsoft Corporation, the Computer History Museum is pleased to make available the source and object code to Microsoft's MS-DOS operating system versions 1.1 and 2.0, for non-commercial use.

3.4 MS DOS Files and Directories:

3.4.1 Files in MS DOS:

In a computer, data is stored in files. When you run a program, MS-DOS processes the data stored in the file and passes it to the system.

File is made up of data which is made up of bits and bytes. In MS-DOS a file can be any size, however the file name is more restricted, it can only have a maximum length of 8 characters plus 3 for the extension.

Furthermore, The Files Can Only Contain The Following Characters:

- letters A to Z
- numbers 0 to 9

- the following special characters: $~! # % & - { } ( ) @ ' _ ^

Thus Filenames Must Not Contain:

- Spaces
- Commas
- Backslash
- Dot (Apart from the dot that separates the name and the extension)

nor can they contain any of the following list of reserved names:

CLOCK$ CON AUX COM1 COM2 COM3 COM4

LPT1 LPT2 LPT3 NUL PRN

Organizing Files In Directories Or Folders:

Directories are like shelves of almirah in a home. We keep clothes or books in the shelves of an almirah according to some plan. For example, we keep shirts in one shelf and pants in the other shelf. Similarly, we keep computer books in one shelf and management books in the other shelf.

In the same manner, operating system keeps and organizes the files in directories. Every operating system supports creation of files and directories. DOS has a hierarchical (Inverted tree) structure for directories and files.

Depending on its size a hard drive may contain several thousands of files. However, the more files there are, the more difficult it is to manage them, this is when we need to store them in directories In MS-DOS, directory names are also subject to the same name restrictions.

We use Edit command to edit/open a file. Copy Con command is another command to create a small file. MD is a command to make a directory, CD is a command to change directory and Dir is a command to look into the contents of a directory. We shall see use of these commands in the next topic.

3.5 DOS Internal And External Commands:

DOS is a single user OS and only a single user can work on the system at a time. UNIX is a multiuser OS which supports multitasking too. We shall compare DOS and UNIX at a later stage in the chapter.

In this section, we shall be talking about DOS and its commands. There are two types of DOS commands- Internal and External commands.

Command is an instruction written in a computer acceptable language that user types on the DOS prompt. It will execute and do the appropriate action. There are mainly two types of DOS command.

3.5.1 Internal Commands:

The internal commands are those commands that are automatically loaded in the memory. Some commonly used DOS internal commands are

A. Cls: The purpose of this command is to clear the display screen and redisplay the Dos prompt at the top left corner of the screen.

Syntax:- C : / > Cls

B. Dir: It displays the list of directories and files on the screen.

Syntax:- C : / > dir

Sub options within dir command are:

- **a. C:** / > dir/p – It displays the list of directories or files page wise
- **b. C:** / > dir/w- It displays the list of directories or files width wise
- **c. C:** / > dir/d: –It display list of directories or files in drive D
- **d. C:** / > dir filename . extension – It displays the information of specified file.
- **e. C:** / > dir file name with wild cards.

Wild Cards:

It is the set of special characters wild are used with some commonly used DOS commands there are two types of wild cards.

1. Asterisk (*˜)

2. Question mark (?)

1. Asterisk: (*) The wild word will match all characters.

1. C : / > dir *.* - will display list of all files and directories.

2. C : / > dir R*.* - will display all files stored with first character R.

2. Question mark: This wild card represents a single character that a group or files have in common.

C : / > dir ??? R . doc-will display all files having extension doc and having any first three letters and fourth letter is R.

3. Date: displays the date of the year when user is using the system

Syntax: C : / > date

4. Time: It displays the current systems time, user can also change existing time with new time by using this command.

Syntax: C : / > time

Current time is 12 : 39 - 48 : 36 p

Enter new time:

5. Ver: It displays the version of DOS being used currently.

Syntax: C: / > Ver

MS – Dos version 6: 20

6. Copy Con: The purpose of this command is to create a new file.

Syntax: C: / > copy con filename. extension

Saves the contents of file by pressing ctrl +z key combination at the last time of the file. File name should not be greater than 11 characters out of which 8 characters are for the name and 3 characters are for the extension.

Extension is optional:

C: / > copy con ram

I am a good boy

File with a name ram is created.

7. Type: Allows the user to see the contents of a file.

Syntax: C**:**/ >Type path

C:/ > Type D:/> ramu

8. Ren: The purpose of this command is to rename the old file name with new file name.

Syntax: C: / > ren oldfilename newfilename

C: / > ren ramu somu

It will change the name of the file from ramu to sonu.

9. Del: The purpose of this command is to delete file. The user can also delete multiple files by busing this command and long with while cards.

Syntax: C : / > Del file name . extension

C : / > Del ramu

C: Del x . prg.

10. MD: The purpose of this command is to create a new directly or sub directly i.e sub ordinate to the currently logged directly.

Syntax: C : /> MD directory

C: /> MD sub directory

For example

C : / > MD college

Now user wants to create a sub directory first year in college directory then

C : / > cd college

C : / > college > Md first year

11. CD: The purpose of this command is to change from one director to another directory or sub – directory.

Syntax: C : / > CD directory name

Example

C: / > cd college

C : / > college > CD first year

C : / > college > first year >

If the user wants to move to the parents directory then use CD command as

C : / > college > first year > cd ….

C : / > college >

12. RD: The purpose of this command is to remove a directory or sub directory. If the user wants to remove a directory or sub – directory then first delete all the files in the sub – directory and then remove sub directory and remove empty main directory.

13. COPY: The purpose of this command is to copy one or more specified files to another disk with same file name or with different file name.

Syntax : - C : / > copy source path target path

C : / > copy A :/> ˜ *. * ˜ C : /> chinni

3.5.2 External Commands:

This commands are not permanent part of the memory. To execute or run this commands an external file is required.

Example : [.] Dot exe, bat.

Some commonly used DOS external commands are .

1. Chkdsk: The command CHSDK returns the configuration status of the selected disk. It returns the information about the volume, serial number, total disk space, space in directories, space in each allocation unit, total memory and free memory.

Syntax : - C : / > CHKDSK drive name

Eg:- C : / > CHKDSK e :

If drive name is not mentioned by default current drive is considered.

2. Diskcopy: Disk copy command is used to make duplicate copy of the disk like Xerox copy. It first formats the target disk and then copies the files by collection. From the source disk and copied to the target disk.

Syntax : - C : / > disk copy < source path > < destination path >

Ex: - c : / > diskcopy A : B :

Note: This command is used after diskcopy command to ensure that disk is copied successfully.

3. Format: Format is used to erase information off of a computer diskette or fixed drive.

Syntax : - C : / > format drive name

Ex : C : / > format A:

4. Label: This command is used to see volume label and to change volume label.

Syntax: C : / > label drive name

Ex : C : / > label A:

5. Scandisk: This utility is used to repair and check various disk errors. It also defects various physical disk errors and surface errors.

Syntax: C : / > scandisk < drive names >

C : / > Scandisk A :

6. Move: The purpose of move is move to files from one place to another place.

Syntax: C : / > Move < source path > < target path >

7. Print: This command allowed users to print a text file to a line printer.

Syntax: C : / > Print < files name >

C : / > print ramu

8. Tree : This command displays the list of directories and files on specified path using graphical display. It displays directories of files like a tree.

Syntax: C : / > tree > path

C : / > tree A:

9. Deltree: This command is used to delete files a directories same as by the del and RD commands.

This command is more useful than del and RD commands because it completely removes specified directories ie., disk will all it files and sub – directories at a time.

Syntax: C : / > deltree (path)

C : / > deltree A:/>ramu

In MS-DOS, there are two ways commands are executed: internally and externally. An internal command is embedded into the command.com file, and an external command, which is not and requires a separate file to operate.

For example, if your computer does not have the fdisk.exe file and you try using the fdisk command, you will receive a "Bad command or file name" error message. Fdisk is an external command that only works if fdisk.exe, or in some cases, fdisk.com, is present.

However, as long as MS-DOS is running on your computer internal commands, such as the cd command, will always be available and does not require other files to run.

Each of the commands listed on the MS-DOS help page denote what commands are external and internal.

MS-DOS Commands Perform Tasks Like:

- Manage files and directories
- Maintain Disks
- Configure Hardware and Networking
- Optimize the use of memory
- Customize MS-DOS

3.6 Batch Files:

A batch file is a text file that contains a sequence of commands for a computer operating system. It's called a batch file because it batches (bundles or packages) into a single file a set of commands that would otherwise have to be presented to the system interactively from a keyboard one at a time.

A batch file is usually created for command sequences for which a user has a repeated need. Commonly needed batch files are often delivered as part of an operating system. We initiate the sequence of commands in the batch file by simply entering the name of the batch file on a command line.

In the Disk Operating System (DOS), a batch file has the file name extension ".BAT". (The best known DOS batch file is the AUTOEXEC.BAT file that initializes DOS when you start the system.) In UNIX-based operating systems, a batch file is called a shell script. In IBM's mainframe VM operating systems, it's called an EXEC.

A batch file is simply a text file that you can create by using unformatting text editor tools, e.g. the EDIT command in MS-DOS. (some other methods will be discussed later)

A batch file must be named with an extension BAT, e.g. autoexec.bat, menu.bat

A batch file is a program which contains MS-DOS commands. Each command used in the batch file must be started from a new line and written in a correct syntax. The syntax of a command is just the same as that you use it at the DOS prompt.

There are also Batch commands or Batch files which are text files that contain a list of internal and/or external commands which are executed in sequence when the batch file is executed. AUTOEXEC.BAT gets executed automatically on booting.

3.7 Types of Operating Systems:

An Operating System performs all the basic tasks like managing file, process and memory. Thus operating system acts as manager of all the resources, i.e. Resource manager.

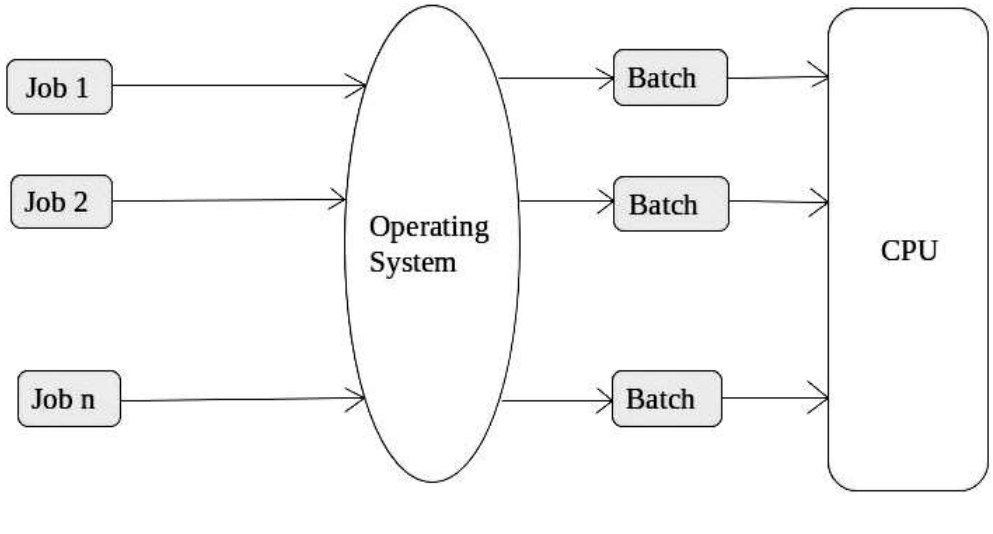
Thus operating system becomes an interface between user and machine. Without the operating system, computer system is like a black box.

In the previous section, we have already talked about DOS which is a single user single tasking system. Now it's time to talk about the types of operating systems. Some of the widely used operating systems are as follows-

3.7.1. Batch Operating System:

This type of operating system do not interact with the computer directly. There is an operator which takes similar jobs having same requirement and group them into batches.

It is the responsibility of operator to sort the jobs with similar needs.



A. Advantages of Batch Operating System:

It is very difficult to guess or know the time required by any job to complete. Processors of the batch systems knows how long the job would be when it is in queue.

Advantages are

- Multiple users can share the batch systems
- The idle time batch system is very less
- It is easy to manage large work repeatedly in batch systems

B. Disadvantages Of Batch Operating System:

- The computer operators should be well known with batch systems
- Batch systems are hard to debug
- It is sometime costly
- The other jobs will have to wait for an unknown time if any job fails

The examples of Batch based Operating System: Payroll System, Bank Statements etc.

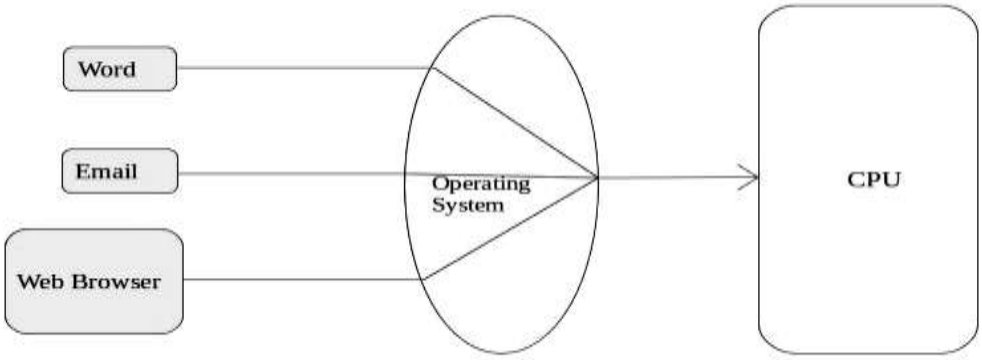
3.7.2. Time-Sharing Operating Systems:

Each task has given some time to execute, so that all the tasks work smoothly. Each user gets time of CPU as they use single system.

These systems are also known as Multitasking Systems.

The task can be from single user or from different users also. The time that each task gets to execute is called quantum.

After this time interval is over OS switches over to next task.



A. Advantages of Time-Sharing OS:

- In time sharing OS, each task gets an equal opportunity
- Less chances of duplication of software on multiple systems
- CPU idle time can be reduced

B. Disadvantages of Time-Sharing OS:

- Reliability problem
- One must have to take care of security and integrity of user programs and data
- Data communication problem

Examples of Time-Sharing OSs are: Multics, Unix etc.

3.8 Windows Operating Environment:

Microsoft Windows is a group of several graphical operating system families, all of which are developed, marketed, and sold by Microsoft. Each family caters to a certain sector of the computing industry.

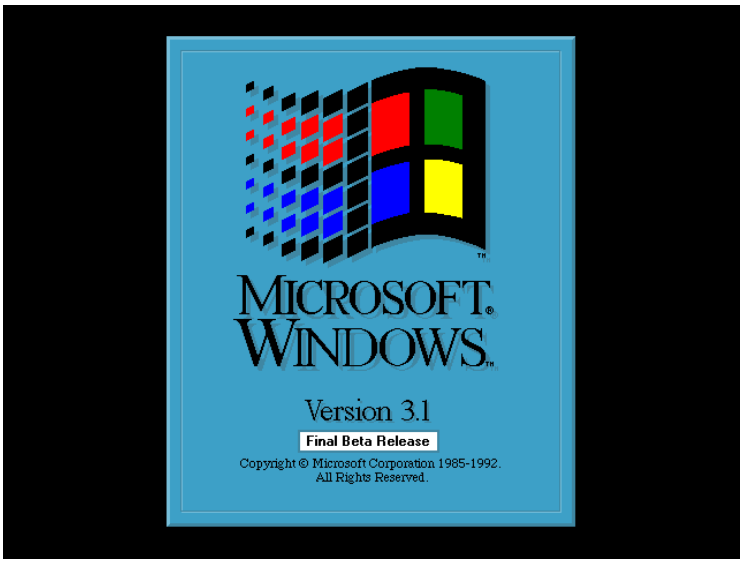
Microsoft introduced an operating environment named Windows on November 20, 1985, as a graphical operating system shell for MS-DOS in response to the growing interest in graphical user interfaces (GUIs).

Active Windows families include Windows NT and Windows Embedded. These may encompass subfamilies, e.g. Windows Embedded Compact (Windows CE) or Windows Server. Defunct Windows families include Windows 9x, Windows Mobile and Windows Phone.

Microsoft Windows came to dominate the world's personal computer (PC) market with over 90% market share, overtaking Mac OS, which had been introduced in 1984. Apple came to see Windows as an unfair encroachment on their innovation in GUI development as implemented on products such as the Lisa and Macintosh (eventually settled in court in Microsoft's favor in 1993).

On PCs, Windows is still the most popular operating system. However, in 2014, Microsoft admitted losing the majority of the overall operating system market to Android, because of the massive growth in sales of Android smartphones.

In 2014, the number of Windows devices sold was less than 25% that of Android devices sold. This comparison however may not be fully relevant, as the two operating systems traditionally target different platforms. As of October 2018, the most recent version of Windows for PCs, tablets, smartphones and embedded devices is Windows 10.



This picture shows Microsoft as it arrived in 1984

3.9 Features Of MS Windows:

3.9.1 Control Panel:

The Control Panel is a component of Microsoft Windows that provides the ability to view and change system settings.

It consists of a set of applets that include adding or removing hardware and software, controlling user accounts, changing accessibility options, and accessing networking settings.

Additional applets are provided by third parties, such as audio and video drivers, VPN tools, input devices, and networking tools.

The Control Panel has been part of Microsoft Windows since Windows 2.0, with each successive version introducing new applets.

Beginning with Windows 95, the Control Panel is implemented as a special folder, i.e. the folder does not physically exist, but only contains shortcuts to various applets such as Add or Remove Programs and Internet Options.

Physically, these applets are stored as .cpl files. For example, the Add or Remove Programs applet is stored under the name appwiz.cpl in the SYSTEM32 folder.

In Windows XP, the Control Panel home screen was changed to present a categorized navigation structure reminiscent of navigating a web page.

Users can switch between this Category View and the grid-based Classic View through an option that appears on either the left side or top of the window.

Let’s look at the figure showing a control panel. It has icons which when clicked, performs certain function.

3.9.2 Taskbar:

A taskbar is an element of a windows graphical user interface which has various purposes. It typically shows which programs are currently running.

The specific design and layout of the taskbar varies between individual operating systems, but generally assumes the form of a strip located along one edge of the screen. On this strip are various icons which correspond to the windows open within a program.

Clicking these icons allow the user to easily switch between programs or windows, with the currently active program or window usually appearing differently from the rest.

In more recent versions of operating systems, users can also "pin" programs or files so that they can be accessed quickly, often with a single click.

Due to its prominence on the screen, the taskbar usually also has a notification area, which uses interactive icons to display real-time information about the state of the computer system and some of the programs active on it.

With the rapid development of operating systems and graphical user interfaces in general, more OS-specific elements have become integrated into and become key elements of the taskbar.

Let's have a look at few pictures of Taskbar in Windows 95, Windows XP and Windows 7

The first implementation of the modern Windows taskbar in Windows 95.

A standard Windows XP taskbar with multiple tasks running. Note the Quick Launch toolbar, introduced in Windows 95 OSR 2.5. When the notification area is full, it can be expanded.

The taskbar in Windows 7 hides application names in favor of large icons that can be "pinned" to the taskbar even when not running. Unlike Windows XP and Windows Vista's notification area, users have a choice to show all their notifications or get a small pop-up window, showing the user notifications without expanding.

3.9.3 Icons:

Another element of Windows, Icons are pictorial representations of objects, important not only for aesthetic reasons as part of the visual identity of a program, but also for utilitarian reasons as shorthand for conveying meaning that users perceive almost instantaneously.

Windows Vista introduces a new style of iconography that brings a higher level of detail and sophistication to Windows.

Aero is the name for the user experience of Windows Vista, representing both the values embodied in the design of the aesthetics, as well as the vision behind the user interface (UI).

Aero stands for: authentic, energetic, reflective, and open. Aero aims to establish a design that is both professional and beautiful.

The Aero aesthetic creates a high quality and elegant experience that facilitates user productivity and even drives an emotional response.

3.9.4 Windows Vista icons differ from Windows XP-style icons in the following ways:

- The style is more realistic than illustrative, but not quite photorealistic. Icons are symbolic images they should look better than photorealistic!
- Icons have a maximum size of 256x256 pixels, making them suitable for high-dpi (dots per inch) displays. These high-resolution icons allow for high visual quality in list views with large icons.
- Wherever practical, fixed document icons are replaced by thumbnails of the content, making documents easier to identify and find.
- Toolbar icons have less detail and no perspective, to optimize for smaller sizes and visual distinctiveness.
- Well-designed icons:
- Improve the visual communication of your program.
- Strongly impact users' overall impression of your program's visual design, and appreciation for its fit-and-finish.
- Improve usability by making programs, objects, and actions easier to identify, learn, and find.

The following images depict what makes the Aero style of iconography in Windows Vista different from that used in Windows XP.

The Windows Vista icons (the lock and key on the left) are authentic, crisp, and detailed. They are rendered rather than drawn, but are not completely photorealistic.

The Windows Vista icons (the two on the left) are professional and beautiful, with attention to details that improve icon production quality.

These Windows Vista icons show optical balance and perceived accuracy in perspective and details. This allows them to look great big or small, up-close or from a distance. Moreover, this style of iconography works for high-resolution screens.

These examples show different types of icons, including a three-dimensional object in perspective, a front-facing (flat) icon, and a toolbar icon.

3.9.5 Desktop:

Desktop is another element of MS windows. When referring to an operating system or GUI, the desktop is a system of organization of icons on a screen. The Microsoft Windows desktop was first introduced with Microsoft Windows 95 and has been included with every version of Windows since then.

Some examples of desktop applications for Windows: Windows File Explorer (to find files on your computer) Microsoft Office applications (Word, Excel, etc.) Web browsers (Chrome, Firefox, Internet Explorer) As a Microsoft Windows 10 developer, we mostly use C# for development of quality apps. C, C++ are lower level languages than C#, therefore application developed with C, C++ perform better and those applications are more robust, smooth & memory efficient. But major advantage of C# is, it is very easy to use.

3.9.6 Windows Accessories:

Windows Accessories – It includes various features included in MS windows as windows accessories. Various accessories as shown in the figure below are

- Calculator. Windows Calculator is a calculating application included in all the versions of Windows. ...
- Snipping Tool. Snipping Tool is another useful of Windows accessories included in Windows 7, Windows Vista, and Experience Pack for Windows XP Tablet PC Edition 2005. ...
- Character Map. ...
- Notepad. ...
- WordPad.

A. Notepad:

Notepad is one of the Computer program which comes under windows accessories category.

Notepad is a simple text editor for Microsoft Windows and a basic text-editing program which enables computer users to create documents.

It was first released as a mouse-based MS-DOS program in 1983, and has been included in all versions of Microsoft Windows since Windows 1.0 in 1985.

The figure shows a Notepad screen. It shows a document with the name dpkg open in Notepad. The contents of the file are “Hello again, world”. As we can see from the figure, there are File, edit, format, view and Help options in Notepad.

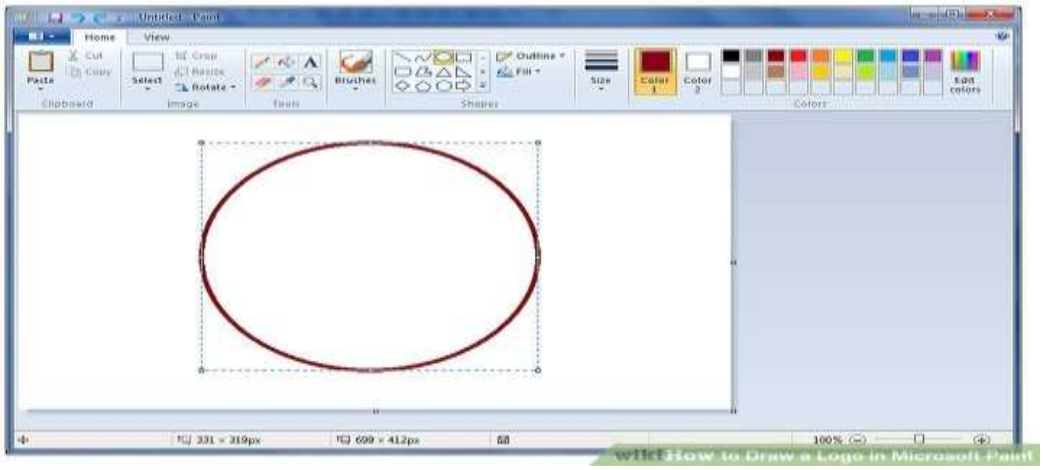
B. Microsoft Paintbrush:

It is another element of MS Accessories. Microsoft Paint is a simple raster graphics editor that has been included with all versions of Microsoft Windows.

The program opens and saves files in Windows bitmap, JPEG, GIF, PNG, and single-page TIFF formats.

The program can be in color mode or two-color black-and-white, but there is no grayscale mode.

Figure showing the screen of MS Paintbrush



3.10 Questions:

1. What is an Operating system and what are its basic functions?
2. Explain Internal and external commands with syntax in DOS
3. What are files and directories and how do we create them in DOS?
4. What are the types of Operating system? Explain with their advantages and disadvantages.
5. What are the advantages of real- time operating systems?
6. What do you understand by batch file and how is it created in DOS?
7. What is Microsoft Windows? What are its features?
8. What are the components of control panel in MS Windows?
9. Explain the use of Paint brush in Accessories section of MS Windows?
10. Explain the use of Notepad in Accessories section of MS Windows?

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Chapter 4

Editors and Word Processors

4.1 Introduction:

After having studied the Introduction, Algorithm and Flowcharts and Operating systems in previous three chapters, we will be reading Editors and Word Processors in this unit. Readers, by now have learnt about the Computer system and its working.

We need to write and use text in computer applications to achieve our goals. Notepad and MS Word are two examples of editors and word processors.

There are many different circumstances under which one will have to work with text. As such, it is important to recognize the uses for which different text-based pieces of software are intended. These programs generally fall under two categories: Word processors and text editors.

We will explore the differences between and the uses of these types of software. When working with text-based data, especially in the digital humanities, text editors are often a much better option. They create nonproprietary files which can be transferred between operating systems without the need for intermediary software.

Additionally, both the files created by text editors and text editors themselves take up an extremely amount of memory compared to word processors. Finally, concerning data, many programs will allow text editor files to be used as input, which is certainly not the case with word processor files, with their formatting which generally renders them unreadable to other programs.

A. Text Editors:

A text editor is a tool for working with plain text. Technically speaking, the only data that a file produced by a text editor contains are the values representing the individual characters, which are displayed as the characters themselves by the program.

The text editor is a standard feature on all operating systems; Windows users will likely be most familiar with Notepad, though alternatives exist, such as the open-source text editor, Notepad++, which allows for features such as programming language syntax highlighting, that is, a visual markup applied to commands of a specific programming language.

A text editor may not be ideal if you intend to include any kind of formatting in your text, such as alignment, font face or size, text features such as bolding or italicizing or the incorporation of any non-text elements, such as images. However, it is possible to format such a document by using various markup languages, such as XML.

B. Word Processors:

In contrast to a text editor, a word processor is any program through which text (and, often, other types of media) can be formatted and prepared for printing, whether physical or electronic. These give the user extensive control over the visual qualities of the document.

Files of this type, while preferable for human readers, are generally not suitable for files which need to be processed by a computer, such as a piece of code, or a list of values to be read by a program.

To illustrate the difference between documents created by text editors and word processors on a very basic level, you can do the following on any file created by either program. Simply open the file in a text editor. A file created by a text editor, regardless of whether it was the same text editor or not, will simply display the text contents of the document.

A word processing program allows you to create, edit, format and print many types of documents such as letters, memos, CVs, etc. You can also create World Wide Web pages with some word processing programs. The program used in this book is called Microsoft Word 2007 (often called simply Word).

4.2 Desktop Publishing – Introduction:

Desktop Publishing (DTP) is the creation of electronic forms of information such as documents, presentations, brochures, books, or even website content using computer programs.

DTP has evolved to be an important component of creating and disseminating information as it allows an amalgamation of various tasks that are generally performed independently at printing presses such as layouts, typesetting, graphic design, etc.

4.2.1 Evolution of DTP Software:

Earlier, DTP was specifically meant to cater to printed matter but modern DTP allows for even more forms of electronic content. A modern DTP software can be your word processor, graphic design tool and publishing tool, all rolled into one package.

With the explosive growth of smartphones and mobile PCs, the way people consume information has changed dramatically over the last decade.

Modern DTP software enables content output that caters dynamically to all screen sizes, without the need to republish the same for each device or form factor.

4.2.2 Types of DTP Content:

The content created by DTP software can be broadly classified into two categories −

4.2.3 Electronic Pages:

Electronic pages commonly refer to websites, manuals, eBooks, digital archives, presentations, etc. which are normally not printed but are shared digitally. This tutorial is an example of an electronic page which can be opened in a browser.

4.2.4 Virtual Pages:

Virtual pages on the other hand are electronic pages created in the DTP software which are eventually published as printed pages. Virtual pages allow the author to visualize exactly how the printed page will look and can help in easy editing.

The process is called WYSIWYG which stands for, ‘What You See Is What You Get’. This means all the changes and formatting that are made will be exactly replicated in print.

4.3. Spreadsheets And Databases:

4.3.1. Spreadsheets:

Spreadsheets, in particular the "xls" format used by Microsoft Excel, are one of the most common (if not the most common) methods for transferring data from one organization to another. When you download or receive a spreadsheet, it's often a good idea to make sure that it really is a spreadsheet. Comma-separated files, which are easily read into spreadsheet programs, are often erroneously labeled "spreadsheets" or "Excel files", and may even have an incorrect extension of ".xls".

In addition, Excel spreadsheets are often used to hold largely textual information, so simply finding a spreadsheet that appears to contain data can be misleading. Furthermore, many systems are configured to use a spreadsheet program to automatically open files with an extension of ".csv", further adding to the confusion.

For many years, the only reliable way to read an Excel spreadsheet was with Microsoft Excel, which is only available on Windows and Mac OS computers, users on UNIX were left with no option other than finding a different computer. In the last few years, a number of programs, notably gnumeric and OpenOffice.org (usually available through the ooffice command) have been developed through careful reverse engineering to allow Unix users the ability to work with these files.

To insure its advantage in the marketplace, Microsoft doesn't publish a detailed description of exactly how it creates its spreadsheet files. There are often "secret" ways of doing things that are only known to the developers within Microsoft. Reverse engineering means looking at the way a program handles different kinds of files, and then trying to write a program that imitates what the other program does.

Spreadsheets are organized as a collection of one or more sheets, stored in a single file. Each of the sheets represents a rectangular display of rows and columns, not unlike a data frame. Unfortunately, people often embed text, graphics and pictures into spreadsheets, so it's not a good idea to assume that a spreadsheet has the consistent structure of a data frame or matrix, even if portions of it do appear to have that structure.

In addition, spreadsheets often have a large amount of header information (more than just a list of variable names), sometimes making it challenging to figure out the correct variable names to use for the different columns in the spreadsheet.

4.3.2 Databases:

A database is a collection of data, usually with some information (sometimes called metadata) about how the data is organized. But many times when people refer to a database, they mean a database server, which is similar to a web server, but responds to requests for data instead of web pages.

By far the most common type of database server is known a a relational database management system (RDBMS), and the most common way of communicating with such a database is a language known as SQL, which is an acronym for Structured Query Language.

Some examples of database systems that use SQL to communicate with an RDBMS include Oracle, Sybase, Microsoft SQL Server, SQLite, MySQL and Postgres. While there is an SQL standard, each database manufacturer provides some additional features, so SQL that works with one database is not guaranteed to work on another. We'll try to stick to aspects of SQL that should be available on most SQL based systems.

A Database consists of one or more tables, which are generally stored as files on the computer that's running the DBMS. A table is a rectangular array, where each row represents an observation, and each column represents a variable.

Most databases consists of several tables, each containing information about one aspect of the data. For example, consider a database to hold information about the parts needed to build a variety of different products.

One way to store the information would be to have a data table that had the part id, its description, the supplier's name, and the cost of the part. An immediate problem with this is scheme concerns how we could store information about the relation between products and parts. Furthermore, if one supplier provided many different parts, redundant information about suppliers would be repeated many times in the data table.

In the 1970s when database technology was first being developed, disk and memory space were limited and expensive, and organizing data in this way was not very efficient, especially as the size of the data base increased. In the late 1970s, the idea of a relational database was developed by IBM, with the first commercial offering coming from a company which is now known as Oracle.

Relational database design is governed by a principle known as normalization. While entire books are devoted to the subject, the basic idea of normalization is to try and remove redundancy as much as possible when creating the tables that make up a data base.

Continuing the parts example, a properly normalized database to hold the parts information would consist of four tables. The first would contain a part id to uniquely identify the part, its description, price and an id to identify the supplier. A second table would contain the supplier codes and any other information about the supplier. A third table would contain product ids and descriptions, while the final table would have one record for each part used in each product, stored as pairs of product id and part id.

The variables that link together the different databases are referred to as keys, or sometimes foreign keys. Clearly, making sure that there are keys to link information from one table to another is critical to the idea of a normalized data base. This allows large amounts of information to be stored in manageably sized tables which can be modified and updated without having to change all of the information in all of the tables. Such tables will be efficient in the amount of disk and memory resources that they need, which was critical at the time such databases were developed.

Also critical to this scheme is a fast and efficient way of joining together these tables so that queries like "Which suppliers are used for product xyz?" or "What parts from Acme Machine Works cost between $2 and $4" or "What is the total cost of the parts needed to make product xyz?". In fact, for many years the only programs that were capable of combining data from multiple sources were RDBMSs.

It's very important to understand that SQL is not a programming language - it's said to be a declarative language. Instead of solving problems by writing a series of instructions or putting together programming statements into functions, with SQL you write a single

statement (query) that will return some or all of the records from a database. SQL was designed to be easy to use for non-programmers, allowing them to present queries to the database in a language that is more similar to a spoken language than a programming language. The main tool for data access is the select statement. Since everything needs to be done with this single statement, descriptions of its syntax can be quite daunting.

For example, here's an example that shows some of the important features of the select statement:

SELECT columns or computations

FROM table

WHERE condition

GROUP BY columns

HAVING condition

ORDER BY column [ASC | DESC]

A. MS Excel:

Microsoft Excel is a spreadsheet program included in the Microsoft Office suite of applications. Spreadsheets will provide you with the values arranged in rows and columns that can be changed mathematically using both basic and complex arithmetic operations.

In addition to the standard spreadsheet features, Excel offers programming support via Microsoft's Visual Basic for Applications (VBA), the ability to access data from external sources via Microsoft’s Dynamic Data Exchange (DDE). Microsoft Excel is an Electronic Spreadsheet Computer Program.

Microsoft Excel was first released for Macintosh systems in the year 1985, followed by the first Windows version in 1987.

Microsoft Excel is a software program produced by Microsoft that allows users to organize, format and calculate data with formulas using a spreadsheet system. This software is part of the Microsoft Office suite and is compatible with other applications in the Office suite.

Excel is a commercial spreadsheet application produced and distributed by Microsoft for Microsoft Windows and Mac OS. It features the ability to perform basic calculations, use graphing tools, create pivot tables and create macros.

Excel has the same basic features as all spreadsheet applications, which use a collection of cells arranged into rows and columns to organize and manipulate data. They can also display data as charts, histograms and line graphs.

Excel permits users to arrange data so as to view various factors from different perspectives. Visual Basic is used for applications in Excel, allowing users to create a variety of complex numerical methods. Programmers are given an option to code directly using the Visual Basic Editor, including Windows for writing code, debugging and code module organization.

B. MS Access:

Microsoft Access is a Database Management System (DBMS) from Microsoft that combines the relational Microsoft Jet Database Engine with a graphical user interface and software development tools. It is a member of the Microsoft Office suite of applications, included in the professional and higher editions.

Microsoft Access is just one part of Microsoft's overall data management product strategy. It stores data in its own format based on the Access Jet Database Engine.

Like relational databases, Microsoft Access also allows you to link related information easily. For example, customer and order data. It can also import or link directly to data stored in other applications and databases. As its name implies, Access can work directly with data from other sources, including many popular PC database programs, with many SQL (Structured Query Language) databases on the desktop, on servers, on minicomputers, or on mainframes, and with data stored on Internet or intranet web servers.

Access can also understand and use a wide variety of other data formats, including many other database file structures. You can export data to and import data from word processing files, spreadsheets, or database files directly.

Access can work with most popular databases that support the Open Database Connectivity (ODBC) standard, including SQL Server, Oracle, and DB2.

Software developers can use Microsoft Access to develop application software. Microsoft Access stores information which is called a database. To use MS Access, you will need to follow these four steps:

a) **Database Creation:** Create your Microsoft Access database and specify what kind of data you will be storing.
b) **Data Input:** After your database is created, the data of every business day can be entered into the Access database.
c) **Query:** This is a fancy term to basically describe the process of retrieving information from the database.
d) **Report (Optional):** Information from the database is organized in a nice presentation that can be printed in an Access Report.

C. Components of MS Access:

There are seven major components of Microsoft Access. When we create a component in Access it is an object, and several similar objects grouped together will constitute a class. Let us take a look at the components.

a) **Tables:** In MS Access Tables store the data or the information that you feed the program. The data table can be created with the required field names, properties etc as desired by the user. If the table is not created correctly, the database may be slow in giving results or give wrong results entirely. So it is essential the table be created properly and carefully.
b) **Relationships:** Relationships are the connections that form between one or more table. So the relationships can be one-on-one, one-to-many and then of course many-to-many.

c) **Queries:** Queries are when the user or the programmer requests the database for information. The objects help create a SQL compatible query, which can help store data and retrieve information from the database. Queries can also sort and filter data as per the query statement.

d) **Forms:** This is an object class which allows the programmer/designer to create a user interface for MS Access. A form is defined by tables and queries.

e) **Reports:** Once all the data has been entered into the database, the user will want to view the information. For this he can run reports which will allow him to view the information, or summarize the information. The reports can be customized by the user. The source of the information in these reports are the tables and the queries.

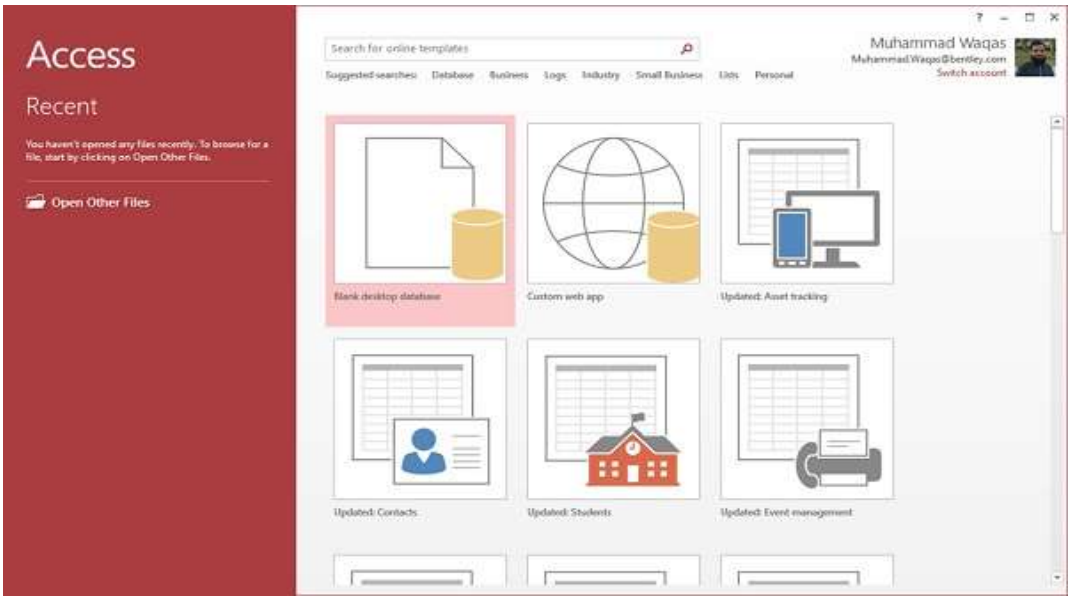
f) **Macros:** Macros are tools on MS Access that allow you to automate tasks on your forms or reports. They are predefined actions that add functionality and efficiency to your database. They can perform a series of actions like open a table, run queries, create reports etc. The command will be performed each time the macro button is clicked on.

g) **Modules:** These are the foundations of the software that allows the programmer to create a set of predefined instructions called sub-routines. These modules can be used throughout the database, they can be used from anywhere in the database.

Microsoft Access has been around for some time, yet people often still ask me what is Microsoft Access and what does it do? Microsoft Access is a part of the Microsoft Office Suite. It does not come with all versions of Microsoft Office, so if you specifically want Microsoft Access make sure the office suite you are purchasing has it.

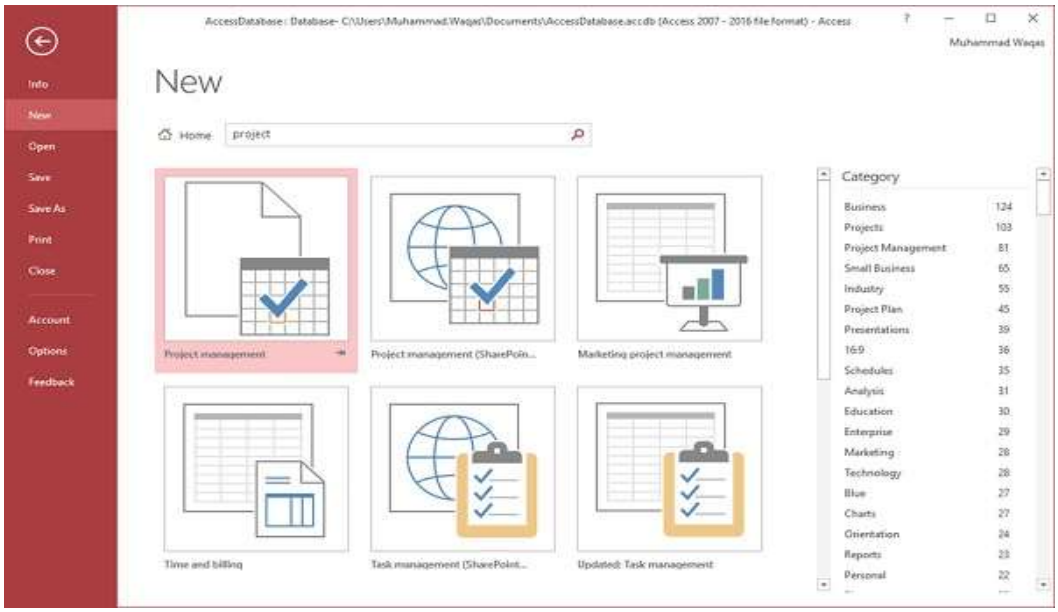
4.4 Creation Of Files In MS Access:

To create a database from a template, we first need to open MS Access and you will see the following screen in which different Access database templates are displayed.

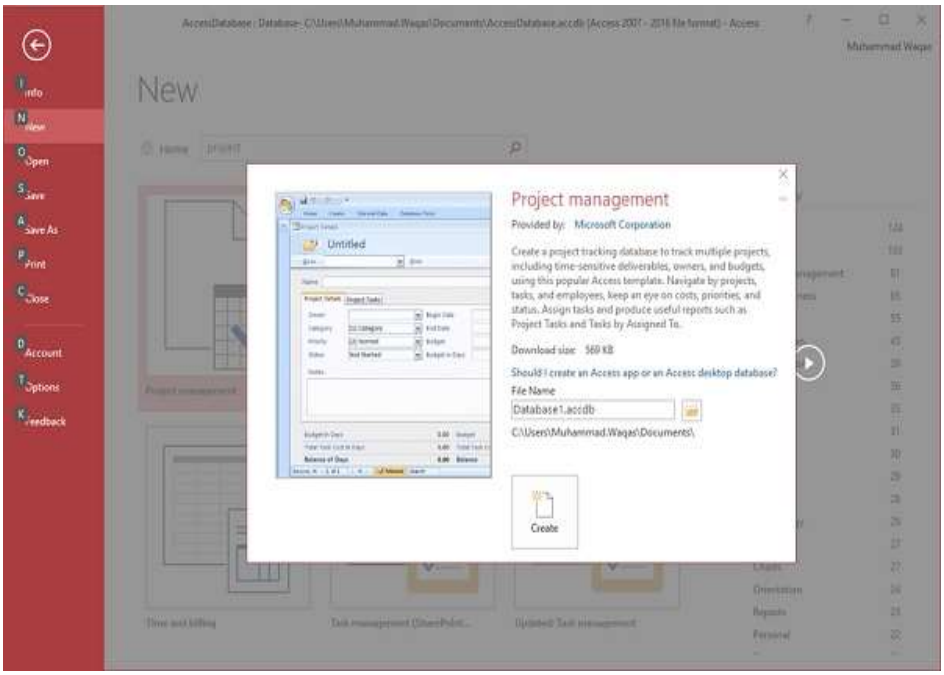


To view the all the possible databases, you can scroll down or you can also use the search box.

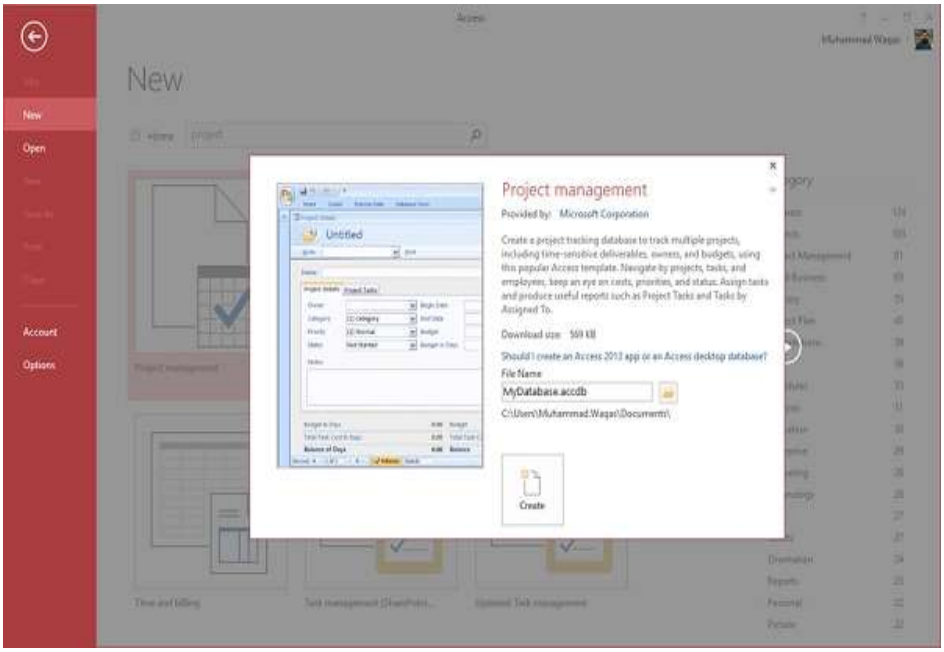
Let us enter project in the search box and press Enter. You will see the database templates related to project management.



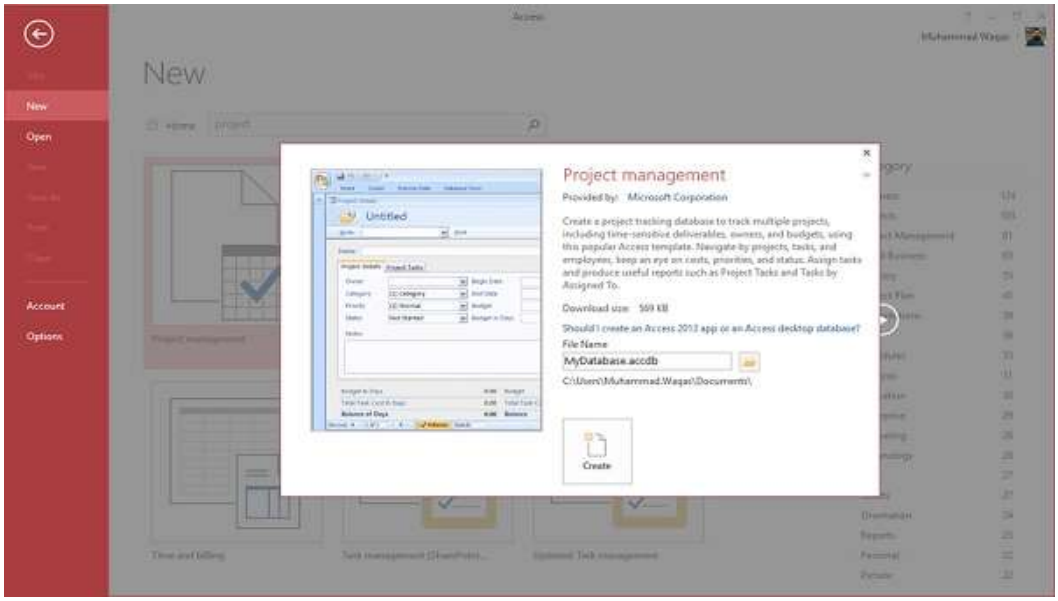
Select the first template. You will see more information related to this template.



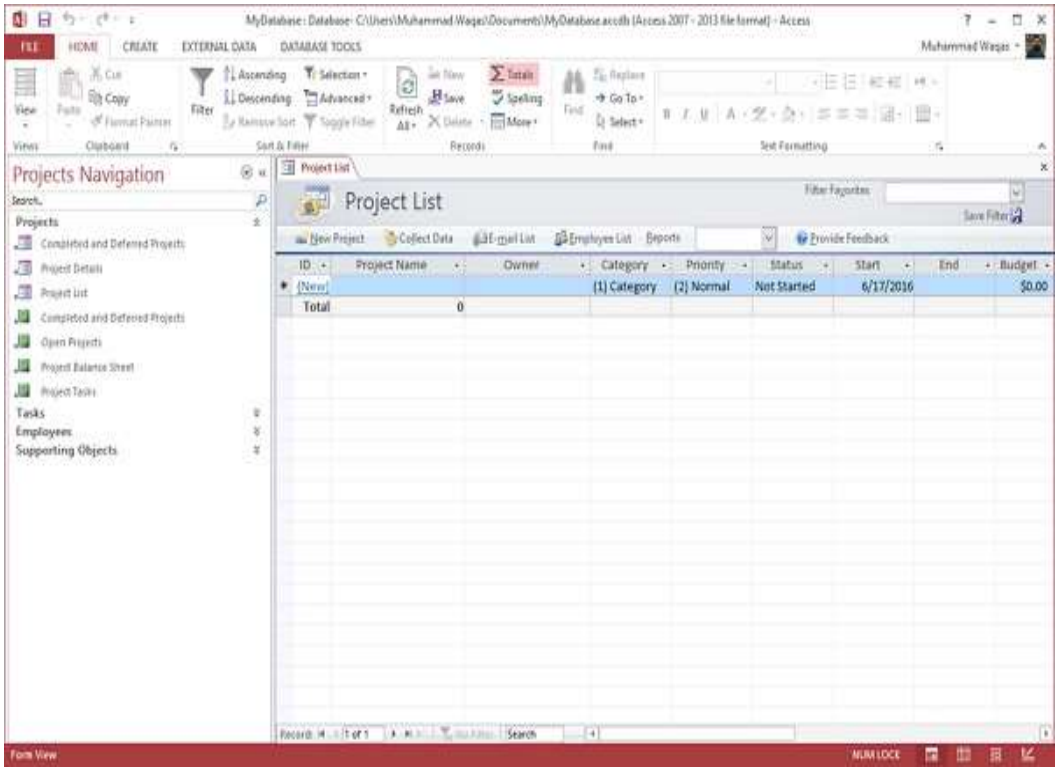
After selecting a template related to your requirements, enter a name in the File name field and you can also specify another location for your file if you want.



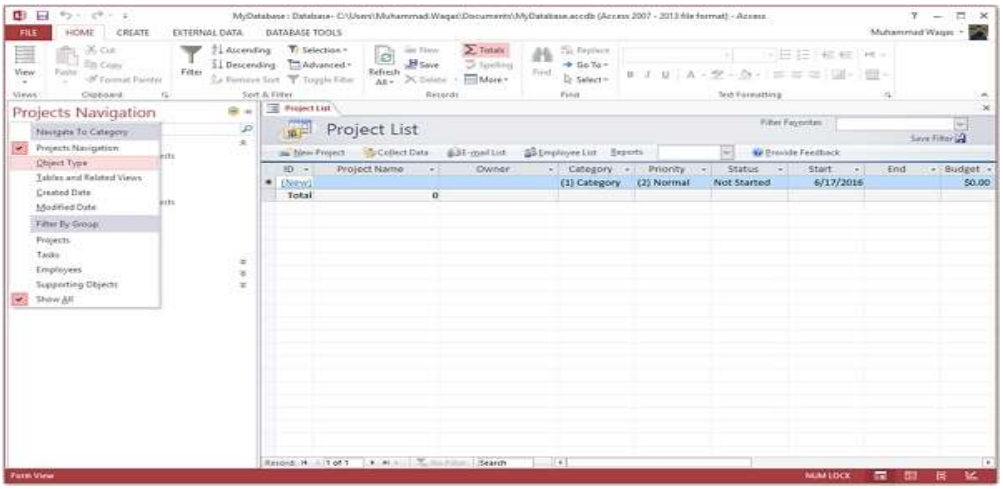
Now, press the Create option. Access will download that database template and open a new blank database as shown in the following screenshot.



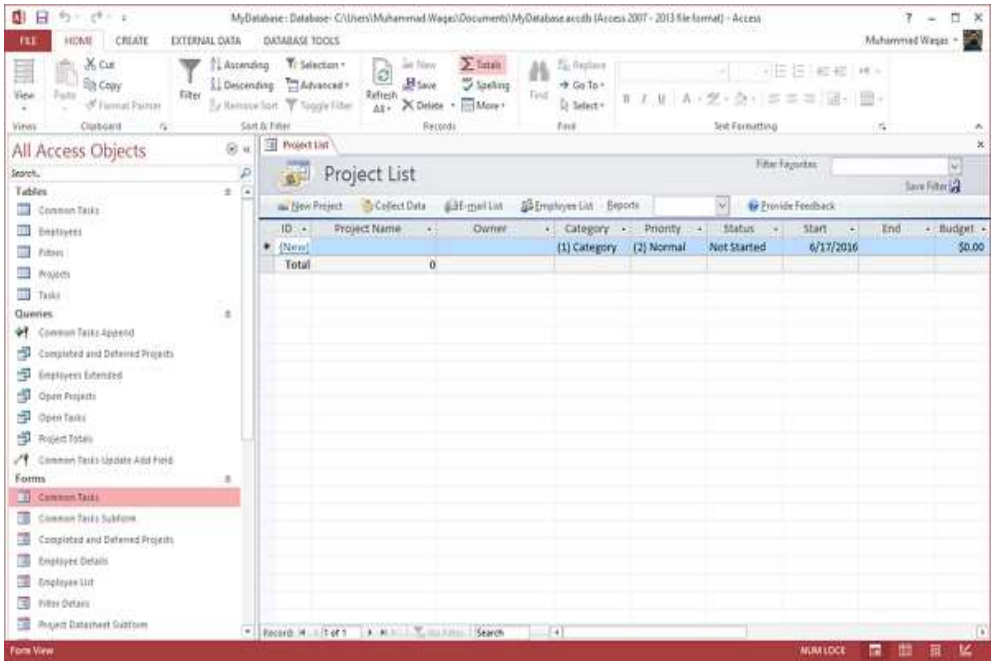
Now, click the Navigation pane on the left side and you will see all the other objects that come with this database.



Click the Projects Navigation and select the Object Type in the menu.



You will now see all the objects types — tables, queries, etc.



4.5 Microsoft PowerPoint:

Microsoft PowerPoint is a powerful presentation software developed by Microsoft. It is a standard component of the company's Microsoft Office suite software, and is bundled together with Word, Excel and other Office productivity tools.

The program uses slides to convey information rich in multimedia. The term "slide" refers to the slide projector, which this software effectively replaces.

PowerPoint was developed by Dennis Austin and Thomas Rudkin at Forethought Inc. It was supposed to be named Presenter, but the name was not adapted due to trademark issues. It was renamed PowerPoint in 1987 as suggested by Robert Gaskins. In August of 1987, Microsoft bought Forethought for $14 million and turned it into its graphics business unit, where the company continued to develop the software. The first iteration was launched together with Windows 3.0 in 1990. It only allowed slide progression in one direction – forward – and the amount of customization was fairly limited.

PowerPoint experienced a very significant change in PowerPoint 97, which added predefined transition effects and allowed the user to time them appropriately so that slides would transition automatically. This allowed a presenter to follow a predefined progression and go on with the presentation without pausing to change or read the slides. PowerPoint 2007 introduced the "ribbon" interface, marking a drastic change from the previous interface style.

Presentation software is the easiest way to create and show the kinds of slides you've likely seen in meetings or in classroom situations.

There are several free options, including LibreOffice, Apache OpenOffice, and SlideDog. However, if you need to collaborate with others on the presentation, integrate with other Microsoft programs (like Microsoft Word), or if you need your presentation to be able to be viewable by anyone on the planet, you'll want to purchase and use Microsoft PowerPoint. If integration with other Microsoft programs isn't important, Google's G Suite has a presentation program that allows for excellent collaboration with others.

As far as Microsoft PowerPoint goes, it also comes with all of the features you'll need to create presentations. You can start with a blank presentation, as is shown here, or you can choose from a variety of preconfigured presentations (called templates). A template is a file that is already constructed with various styles and designs applied. This option provides an easy way to begin a presentation with a single click.

You can also insert pictures and videos from your computer and the internet, draw shapes, and create an insert all kinds of charts. There are ways to transition the slides in and out as you present and animate the items on any slide as well, among other things.

4.6 Questions:

1. What are text editors? Name a few text editors which we use in our systems.
2. Why do we need editors and word processors?
3. What are word processors? What are the uses of word processing?
4. Write a short note on desktop publishing.
5. What are the different types of DTP Contents?
6. Write a short note on spreadsheets and databases.
7. What is MS Excel? How can we use MS Excel in Business applications?
8. What is MS Access? What are its components?
9. What is Microsoft Access made up of?
10. Explain the process of creation of files in MS Access.

About the Book:

The book titled "Computer Fundamentals for Beginners" has been authored keeping in mind the syllabus of various central and state universities. The book has been written in a very simple language so that students from any region in the world can understand the book.

The purpose of the book is to give students insight into fundamentals, concepts and applications of computers in our real life. The book contains self-explaining diagrams to ease the effort.

The book is divided into four chapters. Chapter 1 deals with the computers, generations of computer, architecture of computer, memory and types, programming languages and types of computers. Chapter 2 deals with Algorithms and flowcharts and solved examples. Chapter 3 deals with operating system, types of operating systems, DOS commands, Windows and MS office. Chapter 4 deals with Editors and word processor.

The book will be helpful for anyone who is learning the use of computers.

I think of life as a good book. The further you get into it, the more it begins to make sense.

– Harold Kushner

A book is a dream that you hold in your hand.

– Neil Gaiman

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