



**SURESH**  
**GYAN VIHAR**  
**UNIVERSITY**  
Accredited by NAAC with 'A+' Grade

# **Bachelor of Computer Application**

## **(B.C.A.)**

**Modern Operating Environment and MS Office**  
**Semester-I**

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**SURESH GYAN VIHAR UNIVERSITY**  
**Centre for Distance and Online Education**  
**Mahal, Jagatpura, Jaipur-302025**

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## Semester 1

### Modern Operating Environment and MS Office

#### Learning Objective

- The students will be able to understand the basic concepts of computer and related peripherals.
- Develop the proficiency in routine use of a computer and all the related components of the same in terms of computer language, programming, etc.
- The objective of this Course is also making the student understand the functioning of operating systems and network related components.
- 

The course aims to train them in communicating efficiently in the workplace and professional contexts.

#### Unit 1

Introduction, what is a computer? History of Computers, Characteristics of Computers, Concepts of Hardware and Software, Types of Software, Evolution and Generation of Computers, Types of Computers, Limitations of Computers, Application Areas of Computers, Block Diagram of a Computer, CPU (Central Processing Unit, Bus Structure, input / Output Devices, Input Devices, Output Devices

#### Unit 2

Computer Memory, Primary (Semiconductor) Memory, Secondary Memory and Storage Devices, Computer Language and Software

#### Unit 3

Algorithm, Flowchart, Types of Programming Lan, Compilers and Interpreters, Characteristics of a Good Programming Language, Software,

#### Unit 4

Operating system, Functions of Operating System, Types of Operating Systems, Windows Operating System, Components of the Windows O.S., Running Windows Applications, Switching between Applications, Windows Accessories.

#### Unit 5

Networking, Introduction, Computer Network, Communication Modes, Data Transmission, Direction of Transmission, Data Transmission Media, Network Structure, Network Topologies, Internet, MS-Office, Modern Operating.

#### References

- How to solve it by Computer – R. G. Dromy
- Fundamentals of Data Structures – Horowitz and Sahani
- Introduction to algorithms – Cormen, Leiserson, Rivest, Stein

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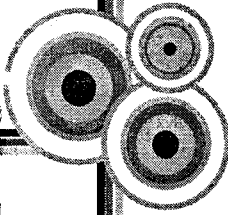
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# **INTRODUCTION TO COMPUTER**



## **1. Introduction**

As this is the era of information technology, it has brought a great revolution and impact in our lives. Nowadays, Technology has played a massive role in solving social ills. Every technology has been created for a purpose. Computer is one such technological innovation, which were invented in the process of coming up with a faster calculating device, with each being better than the previous one. Today computer has taken deep root in every individual's life. This is an era of computers because computer brings revolution in almost all the fields.

Imagining our lives without computers is next to impossible. Ubiquity of these machines goes to show our incorrigible dependence on them. When computers were supplemented by Internet, it caused a great shift in the way we functioned. It ironed out several creases in long distance communication. This gave an impetus to globalization, bringing the world closer and opening new avenues to explore the human reach. As technology progressed, simple things such as shopping, booking tickets, buying a new house, searching for schools and colleges, applying to the same, researching for projects and medical information became a lot easier with entry of computers in every household.

Computer being an indispensable tool in our lives, which has changed the way we think in many more ways. Today, all you have to do to find answers is, just 'Google it!' The online world of blogging, instant messaging, chatting and social networking not only leaves virtual traces, but unites the world in a completely unimagined way. This powerful medium is a great mode of mass communication which affects our thinking by allowing people a platform to voice their opinions and discussions that have brought about a change in the world.

## 2. What is a Computer?

The word **computer** comes from the word *compute* which means *to calculate*. Hence, a computer is normally considered to be a calculating device that can perform arithmetic operations at an enormous speed. It can be defined as:

*A computer is an electronic device which processes raw-data to give meaningful information.*

In the above statement, raw-data is the source data which needs to be worked upon to make it informative or usable for the user. In the IT jargon it is called as **Input**. Meaningful Information is the result obtained after the data is worked upon. It is called as **Output**. The term process implies the work done upon the Input to get the Output. The computer processes the data as per the instructions given by the user.

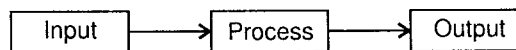


Figure 1.1

Computers can manipulate large volumes of data at very high speed and with great accuracy according to a predefined set of instructions.

*All computers perform the following five basic functions.*

- i. **Inputting:** The process of entering data and instructions into the computer system.
- ii. **Storing:** Storing data and instructions to make them easily available for initial or additional processing, as and when required.
- iii. **Processing:** Performing arithmetic operations (add, subtract, multiply, divide, etc.) or logical operations (like equal to, less than, greater than, etc.) on data, to convert them into output.
- iv. **Outputting:** The process of producing useful results for the user.
- v. **Controlling:** Directing and controlling the sequence in which all the above operations are performed.

A computer system is a combination of different elements which are as follows:

- i. **Hardware:** Hardware is the term, which refers to all physical devices that the computer is made of (Electronic Circuits, Cables, etc.)
- ii. **Software:** Software is the term used to describe the instructions that tell the hardware how to perform a task.
- iii. **Data:** Data are individual facts like first name, price, quantity ordered.
- iv. **Information:** Data which has been messaged into a useful form, like a complete mailing address.

### 3. History of Computers

The history of computers can be traced back thousands of years, to a device still used in many villages and sometimes, to teach children to count. It was the Abacus, which was probably developed between 5000 BC and 2000 BC in Asia. It was used extensively in China and Japan, and consists of beads strung on wires or thin rods to aid counting. Expert Abacus users can perform stupendous calculations with the Abacus, which explains why it remained virtually unchanged for thousands of years. In historical terms, it is probably the most robust and most scalable version of the computer.

In 1614, *John Napier* developed a system of multiplication and division using addition and subtraction. These were the famous 'Log Tables', a tabular representation of numbers that could be used to perform calculations like multiplication and division on large numbers quickly. Using the system of log tables, Napier devised a simple calculation tool called 'Napier's Bones' in 1617, which consisted of specially marked rods that, when placed side by side in specific combinations, could give the quotients of large numbers.

Using this system of logarithms or log tables, *William Oughtred* developed the Slide Rule in the 1620s. The Slide Rule consisted of two movable rulers that could be adjusted to perform calculations. The slide rule made a handy pocket calculator and was used well into the 1960s until the development of small electronic calculators.

In the Seventeenth Century, two significant developments took place on the computing scene. In 1647, *Blaise Pascal* developed a mechanical calculator to help his father, a tax collector. The calculator used gears and cogs that could be rotated to perform simple addition. In 1694, *Gottfried Leibnitz* developed a better calculator that could perform multiplication and division as well. These mechanical devices, while very useful, required precision engineering and therefore could not be produced on a mass scale at those times.

In 1821, *Charles Babbage* developed the 'Difference Engine' and in 1832, the 'Analytical Engine'. These were significant developments in computing and the Analytical Engine is considered as a milestone signifying the start of the computer age. To input data into the machine, Babbage used a system of punch cards initially developed by Joseph Jacquard as a means of automating weaving.

The same input system was used by *Herman Hollerith* in his own tabulating machine, developed in 1883. He entered the machine into a competition to determine the best way to analyse data in the 1890 US census and won top spot in the competition. He began to develop the machine for commercial use, putting his company through a series of mergers with other companies. The company created by Herman Hollerith ultimately became "International Business Machines", better known as IBM.

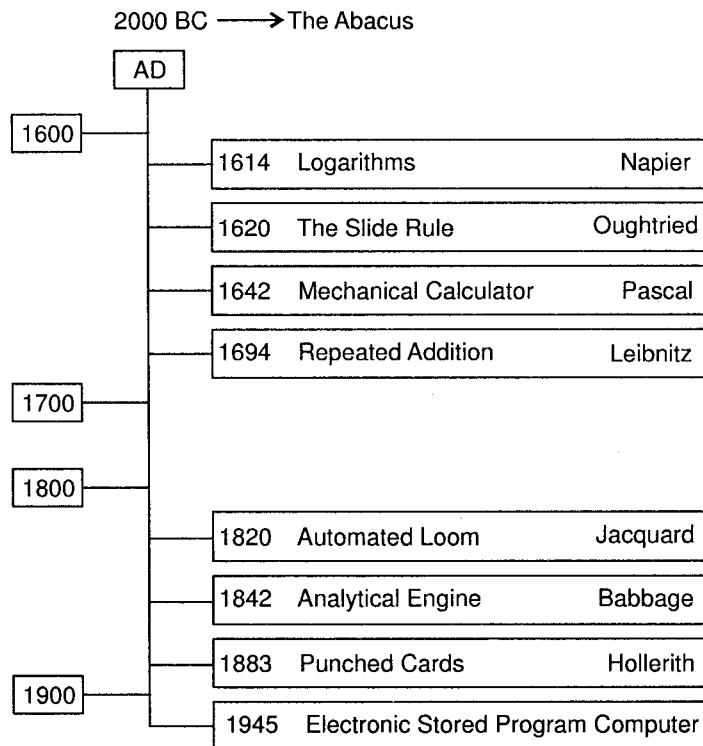
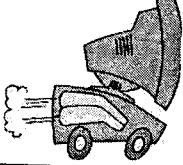

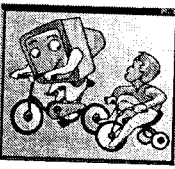


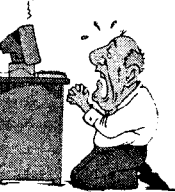


Figure 1.2: Time Scale in Development of Computers

## 4. Characteristics of Computers

Number of questions asked  
**2**

Oct.11, Apr.10- 4M  
Explain the characteristics of Computer.

	<p>a. <b>Speed:</b> This is the most important characteristic of a computer. Computers can work at a speed of milliseconds, microseconds and nanoseconds, i.e., it is capable of processing millions of instructions per second. The speed is measured in MHz (Mega Hertz), GHz (Giga Hertz).</p>
	<p>b. <b>Accuracy:</b> The results produced by a computer are very accurate. Errors, if any, are produced due to faulty data or wrong set of instructions. Thus, if a wrong input is given, the output will be wrong – GIGO (Garbage In Garbage Out).</p>
	<p>c. <b>Versatility:</b> Computers are very versatile machines, i.e., they can be used to perform a variety of tasks ranging from very simple to very complex. They can be used to perform calculations, type letters, play music and movies, communicate with other computers across the world, play games, etc.</p>
	<p>d. <b>Reliability:</b> Computers consistently produce accurate results and hence are very reliable.</p>
	<p>e. <b>Storage:</b> Computers can store a large amount of data which can be accessed very fast whenever required. Data like characters, numbers, graphical images, etc. can be stored.</p>
	<p>f. <b>Diligence:</b> Diligence is the ability of a computer to perform repetitive tasks with the same accuracy consistently, without tiredness. Unlike humans, a computer does not get tired, lack concentration or show signs of fatigue. If the same task is given to the computer over and over again, it will execute the task with the same speed and same accuracy.</p>

## 5. Concepts of Hardware and Software

1  
Number of questions asked.

Oct.2011– 2M  
What is mean by  
Hardware and  
Software?

The term *hardware* generally refers to all the electronic and mechanical components of the computer that we can see or touch, i.e., all physical devices of a computer system that user can use to manage and control the computer's operation, input and output. But *software* comprises that instruction that tells the computer what to do with the help of its hardware.

Computer is an electronic-device which does what the program asks it to do. Hence, it is important to note that a computer cannot do anything on its own. It must be instructed to do a desired job. Hence it is necessary to specify a sequence of instructions that a computer must perform to solve a problem. Such a *sequence of instructions* written in a language that can be understood by a computer is called a *computer-program*.

Here an *instruction* can be defined as a command given to a computer to perform certain operations on the given data. Set of programs written for the computer is known as *software*. Software is the general term describing programs, instructions (commands), languages or routines that makes it possible for an individual to use the computer.

In a short way, we can say that *software means a collection of programs which is used to perform an intended task* and whose objective is to enhance the capabilities of the hardware machine.

### 5.1 Relationship between Hardware and Software

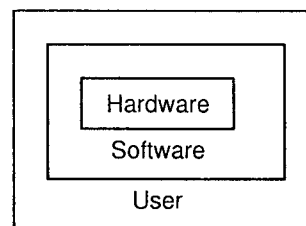


Figure 1.3

In order to do any task, both hardware and software are necessary and they must work together. Thus, there is a special relationship between hardware and software. Both are complementary to each other. Without hardware the role of software is nothing and without software we cannot utilize hardware. That's why this proverb is true that "Both the terms Hardware and Software are like the two sides of a coin", which is very essential for using computer system properly. The *figure 1.3* is very much helpful to explain the relationship of Hardware, Software and the user. The user can interact with computer with the help of software.

## 6. Types of Software

### Two types of computer

- i. System software
- ii. Application software

As already seen, software consists of the instructions to the computer. These instructions specify functions to be performed by CPU when it is executed. A set of such instructions is called as a program and the process of preparing such programs is called as programming. A program is written using a language. The language could be low-level language or high level language. If a program is written using high-level language, it must be translated to machine language before it can be executed.

The nature and purpose of various programs written divide software into two categories, viz. System software and Application software.

### ► System software

It is a set of programs used to operate and maintain a computer system. The development of such software requires a thorough knowledge of programming and specific hardware.

*Example:* Operating system, Utility programs, Language translators, etc.

### ► Application software

It is a set of programs, which perform specific tasks required by the user. Such programs are developed for satisfying requirements of a specific user or an organization.

*Example* Word Processors, Spreadsheets, Accounting and Database packages, Desktop publishing softwares, etc.

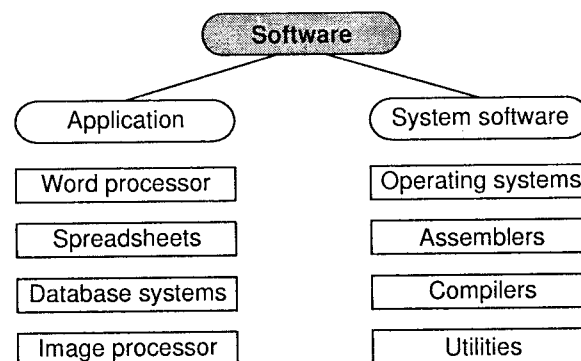


Figure 1.4



## 7. Evolution and Generation of Computers

### 7.1 Evolution of Computers

The evolution of computers can be better understood by discussing some of the early known computers:

- i. **Mark-I Computer (1937-1944):** It was developed in collaboration with IBM by *Howard A. Aiken* of Harvard University. This machine was also known as Automatic Sequence Controlled Calculator as this was the first fully automatic calculating machine.

It was an electro-mechanical device, i.e., used both mechanical and electrical components. It was 50 feet long and 8 feet high and used over 3000 electrically actuated switches to control its operations. The machine could perform five basic arithmetic operations including table reference on numbers as big as 23 decimal digits.

The machine was very reliable, but very complex in design and huge in size.

- ii. **ENIAC (1943-1946):** ENIAC or Electronic Numerical Integrator and Calculator was the first among all electronic computers developed at the University of Pennsylvania, U.S.A. by *John Mauchly* and his team. ENIAC was developed because of military needs and was used for many years to solve ballistic related problems.

ENIAC had a size that occupied the wall of 20X40 square feet room and used 18,000 vacuum tubes. It was much faster than its previous machines taking only about 200 microseconds to multiply two numbers.

- iii. **EDVAC (1946-1952):** EDVAC or Electronic Discrete Variable Automatic Computer was developed using the new concept of stored programs. This concept was introduced by *Von Neumann*. He also introduced the concept of storing data and instructions in the binary form instead of decimal numbers or human readable forms.

The motive of developing this machine was to overcome the shortcoming of ENIAC. ENIAC had programs wired on its board which made it difficult to change the programs. But *Dr. John Von Neumann's* concept helped in overcoming this problem. His idea suggested that a sequence of instructions and data can be stored in the memory of a computer for automatically directing the flow of operations. His idea greatly influenced the development of modern digital computers as it provides the ease with which different programs can be loaded and executed in the same computer.

- iv **EDSAC (1947-1949):** EDSAC or Electronic Delay Storage Automatic Calculator (EDSAC) was developed by British almost at the same time of the development of ENIAC of U.S. It

took 1500 microseconds for addition operations and multiplication took almost 4000 microseconds.

The machine was developed at the Cambridge University by Professor *Maurice Wilkes* and his team.

- v. **UNIVAC I (1951):** UNIVAC or The Universal Automatic Computer, as its name suggests, was the first digital computer to be produced universally. It was not the “one of a kind” machine. It marked the arrival of commercially available digital computers for scientific and business applications. UNIVAC I was the first computer to be used for business by General Electric Corporation (better known as GE Corp) in 1954. The first UNIVAC I was installed in the Census Bureau in 1951 and was continuously used for 10 years.

In 1952, IBM introduced the IBM-701 commercial computer. Later on, many improved versions of UNIVAC I and other 700-series machines were introduced.

## 7.2 Generations of Computers

The term ‘Generations’ in computer industry refers to the major developments in technology (both hardware and software). A brief discussion regarding the First to Fifth Generations of computers follows:

- i. **First Generation:** The first generation of computers was characterized by use of vacuum tubes for electronic components and use of either Cathode Ray Tubes (CRT), acoustic delay lines or ferrite core memory. Assembly language was used for programming and fixed-point arithmetic for calculation. The input output media were the Card Reader and the Punch Card respectively.

Professors Mauchly and Eckert developed the ENIAC (Electronic Numerical Integrator and Calculator) in 1940. This first ‘all-electronic’ computer with 18,000 vacuum tubes, occupying 15,000 sq. ft. of floor space and weighting 30 ton was a thousand times faster than it’s electro-mechanical predecessor. Its specific application was for ballistics in the U.S. Army ENIAC which was followed by UNIVAC 1 (Universal Automatic Computer) developed by the same team in 1951, which proved its capability during vote counting in the Presidential elections. IBM 650 was designed as a logical upgrade to the existing punch card machines, in 1954. Other examples of first generation computers are IBM 700 series, EDVAC, etc.

### *Disadvantages*

- i. Too bulky in size with each computer using more than ten thousand of vacuum tubes. Hence, these machines require large space for installation.
- ii. Air conditioning required as vacuum tubes emit large amount of heat.

Number of the  
**2**  
pages

Oct.2010- 4M  
Explain Generation of Computers.

Apr.2009- 4M  
What is Computer?  
Explain Generation of Computer.

- iii. Power consumption too high.
- iv. Frequent hardware failure, constant maintenance required.
- v. Non portable.
- vi. Manual assembly of individual components.

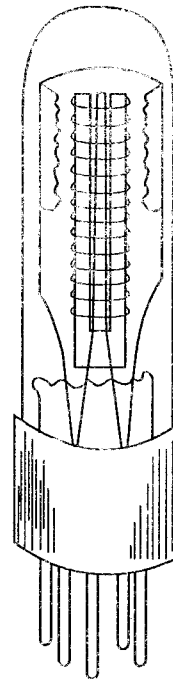


Figure 1.5: Vacuum Tube

- ii. **Second Generation:** The second generation of computers was characterized by the use of transistors for electronic components, ferrite cores for main memory and magnetic disks/drums/tapes for secondary memory. High-level languages like FORTRAN (1956), COBOL (1960), ALGOL(1960) were used for programming and floating-point arithmetic for calculations. I/O processors controlled input – output operations and relieved the CPU (Central Processing Unit) from time consuming routine tasks. Since the computers could handle only one task at a time, they were used as Stand Alone computers.

Some examples are IBM 1620, IBM 1790 I & II, Control Data Corp's CDC 1604, Digital and Data General Corp's PDP – 1, 5 and 8 (Programmed Data Processor) series of mini – computers.

#### **Advantages**

- i. Smaller in size and less expensive as compared to 1<sup>st</sup> generation computers.

- ii. More reliable, less heat generated.
- iii. Less hardware failure, better portability.
- iv. Were more than ten times faster than the first generation machines.
- v. Transistors consumed almost one-tenth the power consumed by a tube.
- vi. The secondary storage was much larger and faster than that of their predecessors.
- vii. These were easier to program and use and hence had a wider reach commercially.

#### *Disadvantages*

- i. Air conditioning required.
- ii. Frequent maintenance required.
- iii. Manual assembly of individual components.

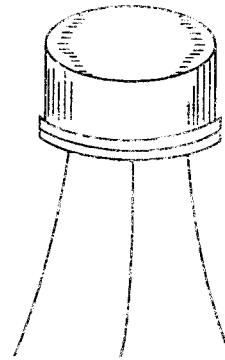


Figure 1.6: Transistor

- iii. **Third Generation:** The third generation of computers was characterized by the use of Integrated Circuits (IC) as CPU components and RAM/ROM semiconductor memories of (Small Scale Integration (SSI): 100 Components/chip, Medium Scale Integration (MSI): 1000 components / chip and LSI: Large Scale Integration). Magnetic disks / drum / tapes were used as secondary memory. Cache memory and virtual memory were introduced to further improve the efficiency of the CPU. Comprehensive Operating System that included support for multiprogramming, multiprocessing and multiprocessors as well as time-sharing, were introduced. The emphasis shifted to software and punch card systems were totally eliminated. High performance printers were introduced, on-line and data entry terminals and usage of large on-line storage, larger fixed disks flourished.

Some examples are IBM 370 series, CDC – 7600, PDP – 11, etc.

#### *Advantages*

- i. Smaller in size and more powerful as compared to 1<sup>st</sup> and 2<sup>nd</sup> generation computers.

- ii. More reliable and easily affordable than 2<sup>nd</sup> generation.
- iii. Less heat generated, less hardware failure.
- iv. Less maintenance cost.
- v. Easily portable.
- vi. Had faster and larger primary and secondary storage as compared to its predecessors.

**Disadvantage**

Highly sophisticated technology is required for the manufacturing of IC chips.

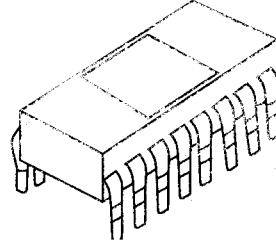


Figure 1.7: IC Chip

- iv. **Fourth Generation:** The fourth generation of computers is characterized by VLSI (Very Large Scale Integration: > 6,000 components / chip) for CPU and memory, cache memory on CPU chip, high-level programming languages like BASIC, PASCAL. This generation also offers extensive support for networking and database management systems for organizing and accessing large collections of interrelated data. However, these computers cannot 'speak or listen'. They have to be programmed and can process only structure tasks. This is an improved version of the third generation computer.

Some examples are IBM/ PS – 2, WIPRO LANDMARK 860, HCL MAGNUM with 68030 CPU, CRAY – Y – MPC, HP – 9000 series, etc. These are the present day computers.

*The characteristics features of fourth generation computers are as follows:*

- i. They consumed much less power than third generation computers.
- ii. They were more reliable and less hardware failure than third generation computers.
- iii. They were totally general-purpose machines.
- iv. During the fourth generation period, the UNIX operating system and the C programming language became popular.
- v. They had faster and larger primary and secondary storage as compared to third generation computers.
- vi. **Graphical User Interface (GUI)** enabled new uses to quickly learn how to use computers.

- vii. Network of computers enabled sharing of resources like disks, printers, etc.
- viii. The PCs of the fourth generation made computers affordable even by individuals for their personal use.
- v. **Fifth Generation:** The fifth generation computers characterized by ULSI (Ultra Large Scale Integration: one million components / chip) chips are still under development in USA and Japan. This generation will differ from the earlier four generations of computers in the basic structure and design, i.e., the earlier generations used the Neumann's structure where in a processor executes simple instructions in a sequence, while in case of the fifth generation of computers, data will flow through the processing units (distributed in the computer) activating each of them as and when required.

The applications of this generation includes Simulation, multimedia, Virtual Reality.

*Characteristic features of fifth-generation are as follows:*

- i. Desktop PCs are several times more powerful than the PCs of fourth generation.
- ii. Portable PCs (notebook computers) are much smaller and handy than the PCs of fourth generation.
- iii. They consume much less power than fourth generation computers.
- iv. They are totally general purpose computers.
- v. They are more reliable and less hardware failure than fourth generation computers.
- vi. Use of standard high level languages allows programs written for one computer to be easily ported to and executed on another computer.
- vii. They have faster and larger main memory and hard disk than fourth generation computers.
- viii. Newer and more powerful applications, including multimedia applications, make the systems more useful everywhere.
- ix. Many of the systems of fifth generation have hot-pluggable feature.
- x. Today, we have a computer for almost any type of user due to so many types of computers in all price ranges.

*The sub systems of this computer would be*

- a. The hardware system consisting of the CPU, memory, etc.
- b. The software system consisting of the operating system (written in PROLOG language which is an intelligent software using artificial intelligence (AI) to make logical inferences).
- c. The user interface wherein the computer will interact/talk to the user in a natural language (like English) and listen to the commands in English.

Table of Comparison

Generation of Computers	Electronic Component	Advantages	Disadvantages
FIRST (1940 - 55)	Vacuum Tubes	<ul style="list-style-type: none"> <li>• Faster and more powerful than the electromechanical predecessors.</li> </ul>	<ul style="list-style-type: none"> <li>• Oversized</li> <li>• Emitted excessive heat,</li> <li>• Air conditioning required.</li> <li>• Unreliable,</li> <li>• Constant maintenance,</li> <li>• Commercial production difficult and expensive</li> </ul>
SECOND (1955 - 64)	Transistors	<ul style="list-style-type: none"> <li>• Smaller in size than above.</li> <li>• Emitted lesser heat.</li> <li>• More reliable</li> <li>• Computational time reduced from milli sec to micro sec.</li> </ul>	<ul style="list-style-type: none"> <li>• Air conditioning required.</li> <li>• Frequent maintenance.</li> <li>• Commercial production difficult and expensive.</li> </ul>
THIRD (1964 - 71)	Integrated Circuits (SSI, MSI & LSI)	<ul style="list-style-type: none"> <li>• Even smaller than above.</li> <li>• Even less heat emission.</li> <li>• Even more reliable.</li> <li>• Less power required.</li> <li>• Computational time reduced from micro sec to nano sec.</li> <li>• Increased commercial Application.</li> <li>• Commercial production cheaper and easier (lesser human labour and cost).</li> </ul>	<ul style="list-style-type: none"> <li>• Air conditioning required.</li> <li>• High tech manufacturing facility required.</li> </ul>
FOURTH (1971 - Present)	VLSI Ic's	<ul style="list-style-type: none"> <li>• No Air conditioning required.</li> <li>• Minimal maintenance.</li> <li>• High component density</li> <li>• Cheapest.</li> <li>• Very reliable.</li> <li>• Computational time even lesser.</li> <li>• Very less heat emitted.</li> <li>• Less power consumption.</li> <li>• Commercial production economical.</li> </ul>	<ul style="list-style-type: none"> <li>• Highly sophisticated component technology required for manufacturing of VLSI chips.</li> </ul>
FIFTH (Present and Beyond)	ULSI ICs	<ul style="list-style-type: none"> <li>• Internet based applications.</li> <li>• Multimedia applications.</li> </ul>	<ul style="list-style-type: none"> <li>• General purpose machines easier to be produced commercially.</li> </ul>

**Note** : Although there was a certain amount of overlapping between generations, the approximate dates indicated against each are generally accepted.

## Types of Computers

Computers can be classified based on their *principles of operation* or on their *configuration*. By configuration, we mean the size, speed of doing computation and storage capacity of a computer.

### Three Types of Computer

- i. Analog Computers
- ii. Digital Computers
- iii. Hybrid Computers

### Types of Computers based on Principles of Operation

There are three different types of computers according to the principles of operation. Those three types of computers are:

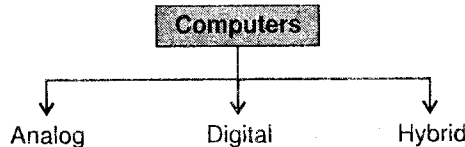


Figure 1.8

**Analog Computer:** This is a computer that can process analog quantities/data. Analog Computer recognizes data as a continuous measurement of a physical property. It performs computations (like summation, multiplication, integration, solving of differential equations, etc.) by manipulating continuous physical variables. The results given by the analog computers will only be approximate since they deal with quantities that vary continuously. It generally deals with physical variables such as voltage, pressure, temperature, speed, etc. The output is graphically represented (usually on a plotter.)

**Digital Computer:** This is a computer that can process discrete quantities / data. Digital Computer represents data as numbers. The computation is done in a finite number system with data in the form of binary digits (bits) 0 or 1. A group of 8 bits is called a byte. Most of the present day computers are digital. Digital Computers can give more accurate and faster results.

Digital computer is well suited for solving complex problems in engineering and technology. Hence digital computers have an increasing use in the field of design, research and data processing.

Based on the purpose, Digital computers can be further classified as,

- a. **General Purpose Computers:** General purpose computers are used for any type of applications. They can store different programs and do the jobs as per the instructions specified on those programs. They can process business data as readily as they process



complex mathematical formulas. As they are so versatile, most business today use general purpose computers.

- b. *Special Purpose Computers:* Special purpose computer is one that is designed and built for a specific application. The program for solving the problems is built right into the computer. For example, special purpose computers may be designed to process only numeric data or to completely control automated manufacturing processes. They often used as training simulators.
- iii. **Hybrid Computers:** This is a computer system that combines the desirable features of both analog and digital computers. The digital computer acts as a controller and provides logical operations while the analog computer generally solves differential equations. It is mostly used for automatic operations of complicated physical processes and machines. Hybrid computers are mainly used for specialized tasks. Such a system finds application in areas of missile guide system, space-crafts and scientific research applications.

## 8.1 Types of Computers based on Configuration

**Four Types of Computer**

- i. Micro Computers
- ii. Mini Computers
- iii. Mainframe Computers
- iv. Super Computers

There are four different types of computers when we classify them based on their performance and computing power. The four types are

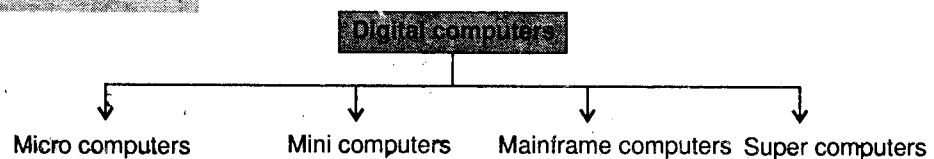


Figure 1.9

- i. **Micro Computers:** A micro computer is a low cost, small, digital computer. Micro computers are considered to be of two types –
  - a. *Personal Computers (PC):* They are desktop or portable computers that can run simple programs such as word processing or spreadsheets. Personal Computers come in several sizes, such as laptops, notebook computer, pocket computer, PDAs, etc.
 

A laptop is a portable computer and looks like a briefcase. Their portability and capacity to operate on battery power have proven to be of great help to mobile users.

A *notebook computer* is also a portable computer that is roughly the size of a thick notebook. They fall in the category of laptops, but are inexpensive and relatively smaller in size.

*Personal digital assistants (PDAs)*, or personal communicators, popularly known as a palmtop are small, pen-controlled, handheld computers.

- b. **Workstations:** These are more expensive, powerful machines with their processor speeds almost 10 times that of PCs. These are the type of computers used for engineering applications, desktop publishing, software development and other types of applications that require a moderate amount of computing power and relatively high quality graphics capabilities. Workstations are desktop computers, but more powerful than personal computers.

The leading manufacturers of workstations are HP, IBM, SUN Microsystems and Compaq.

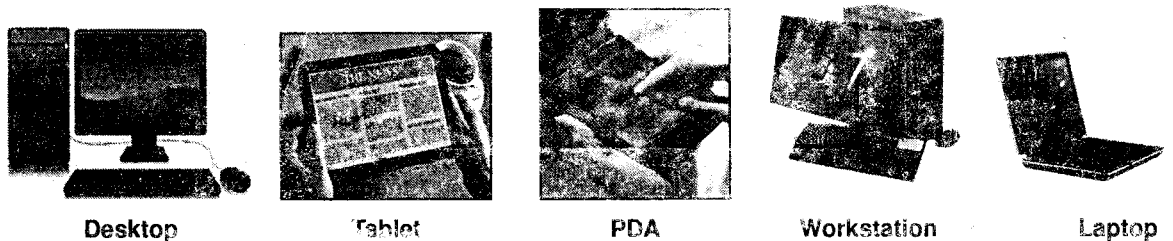


Figure 1.10

- ii. **Minicomputers:** Minicomputers are also known as midrange computers as their cost and computing powers lie in the middle of micro computers and mainframe computers. They are special purpose computers with a powerful processor. These types of computers are widely used in large manufacturing organizations for Distributed Data Processing. They are expensive and with a large data storage capability. In multiuser environment, a mini computer can support upto 64 to 100 terminals. Mini computers are used for multiuser and interactive applications in universities, research organizations, banks, government organizations and industries, etc. Their application areas are very wide including payroll preparation, accounting jobs and scientific computations.

*Example:* VAX by Digital Equipments Corporation (DEC).

- iii. **Mainframes:** Mainframe computers are more powerful and faster computers than mini computers. They are general purpose computers with a large area of applications. The word "mainframe" probably comes from the metal frames, housed in big cabinets, on which computer's electronic circuits were mounted. Such machines are typically operated by professional programmers and technicians. Mainframes can process several million

instructions per second. Large organizations use these systems to handle a large number of instructions and a large amount of data. These machines are very big in size (as large as a room) and are mainly used for extensive applications like in airline systems, banks, Telecom Companies etc.

*Example:* IBM's S/390 machine.

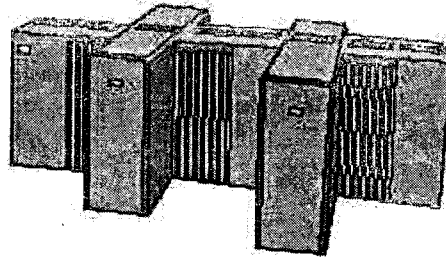


Figure 1.11

- iv. **Supercomputers:** These are the most powerful computers which have the capability of processing many programs concurrently (Parallel processing). These computers consist of thousands of integrated microprocessors which operate in parallel to make it faster. They are used for massive data processing and solving very sophisticated problems. Super computer users are those who need to model complex phenomena. A supercomputer is typically used for scientific and engineering applications that must handle very large databases or do a great amount of computation or both, as weapons research and development, weather forecasting, rocketing, in aerodynamics, seismology, atomic and nuclear research, etc. The first Cray supercomputer was introduced in 1976 – the Cray-1.

*Example:* Y – MP/ C\_90 by Cray Research Inc., PARAM supercomputer by C-DAC (India)

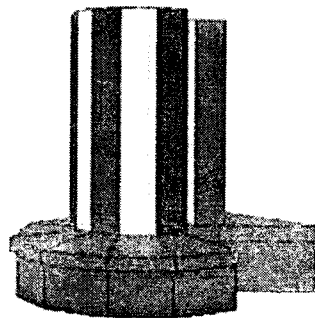


Figure 1.11

## 9. Limitations of Computers

- i. A computer is not an "intelligent" device, i.e., it has no thinking or decision making capability. Hence, it has to be given each and every instruction in order to perform a task.
- ii. A computer cannot detect and rectify erroneous instructions on its own. Hence, every instruction must be correctly specified.
- iii. The capabilities of a computer, if put to good use, can be very beneficial. However they can cause a lot of damage if used unwisely.

## 10. Application Areas of Computers

Computers are almost useful in all areas. Few of the areas where computers are predominantly being used are as follows:

- |                                     |                                |
|-------------------------------------|--------------------------------|
| i. Banks                            | ii. Companies                  |
| iii. Insurance companies            | iv. Offices                    |
| v. Shops                            | vi. Railways                   |
| vii. Airports                       | viii. Architecture             |
| ix. Education                       | x. Space research              |
| xi. Scientific research             | xii. Share markets             |
| xiii. All pure and applied sciences | xiv. Electricity offices, etc. |

*The variety of functions, which can be managed smoothly using a computer, are as follows:*

- |                                  |  |
|----------------------------------|--|
| i. Accounting                    | ii. Costing                            |
| iii. Budgeting                   | iv. Planning                           |
| v. Scheduling                    | vi. Staffing                           |
| vii. On line processing          | viii. Typing and Editing               |
| ix. Calculations                 | x. Reports generation and presentation |
| xi. Data analysis and comparison |  |



# PU Questions

## 2 Marks

[Oct.2011 – 2M]

1. What is mean by Hardware and Software?

## 4 Marks

[Oct.11, Apr.10 – 4M]

1. Explain the characteristics of Computer.

[Oct.2010 – 4M]

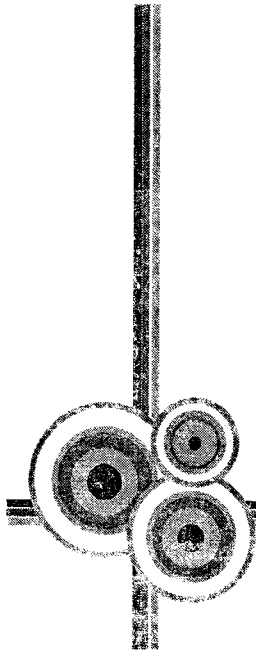
2. Explain Generation of Computers.

[Apr.2009 – 4M]

3. What is Computer? Explain Generation of Computer.



*Chapter 2*  
**STRUCTURE AND  
WORKING OF  
COMPUTER**



## **1. Introduction**

Computers by now are ubiquitous and are used in almost all spheres of life. Computers check out your groceries, pump your gas, dispense money at the ATM, turn the heat on and off, and control the way your car runs. They're everywhere! It is clear that computers affect our lives in many ways by increasing our efficiency and enhancing our abilities. Computers have become an integral part of our life and society, their applications ranging from business transactions to personal communications. As we have discussed a lot of computer in previous chapter lets study the functional block diagram of computer in this section:

## **2. Block Diagram of a Computer**

Computer can be defined as an electronic device which accepts data as input, process it, and gives back meaningful information as output. A Computer consists of number of components or units which are inter-connected to each other and communicate among themselves to accomplish a task. The various components are as shown in the following diagram.

Digital Computer consists of following main components

- i. Input unit
- ii. Output unit
- iii. Storage unit
- iv. Arithmetic and Logic unit
- v. Control unit

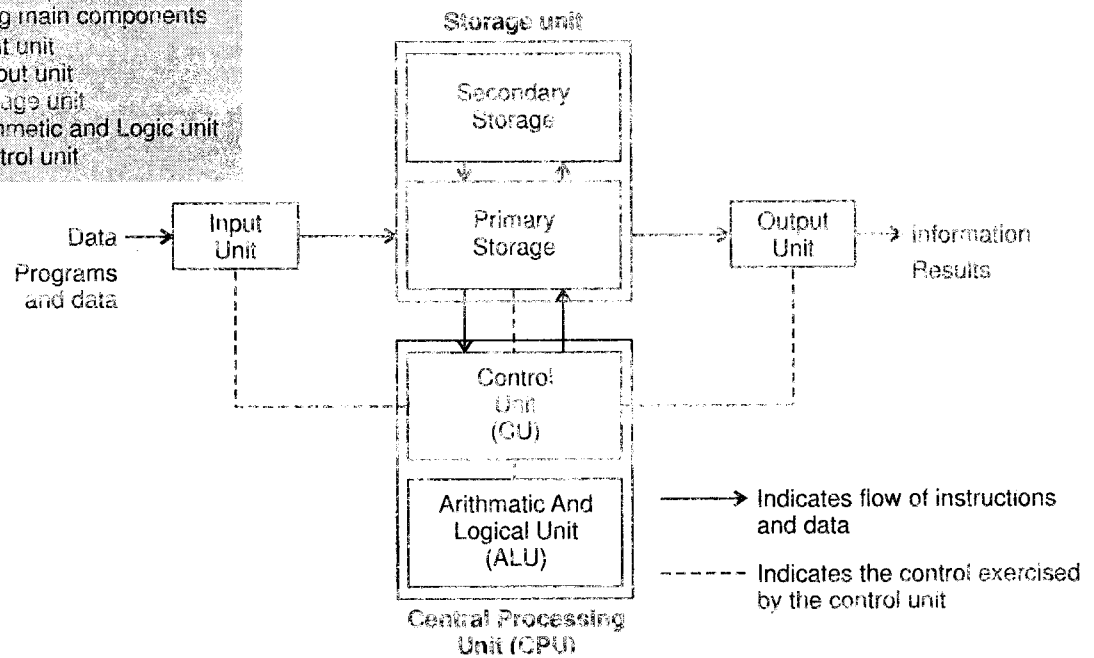


Figure 2.1: Basic block diagram of digital computer

Digital Computer consists of following main components

**i. Input unit**

*The Input unit performs the following major functions:*

- a. It accepts the data and instructions from the outside world.
- b. These instructions and data are converted into the form acceptable by the computer.
- c. It supplies the converted instructions and data to the system for further processing

*For example, Keyboard, mouse, joystick.*

**ii. Output unit**

*The Output unit performs the following major functions:*

- a. It accepts the results produced by the computer which are in coded form and hence can not be easily understood by us.
- b. It converts these coded results into the human readable form.
- c. It supplies the converted results to the outside world.

*For example, Visual Display Unit (VDU) or monitor, printer, plotter.*

### Storage unit

The area of the computer which is responsible to receive, hold and deliver data as per instructions. It stores data in binary format, i.e., in the sequence of 0 and 1.

*The storage unit performs the following major functions:*

- a. It stores the data to be processed and the instructions required for the processing.
- b. It stores intermediate results of processing.
- c. It stores final results of processing before these results are released to an output device.

Storage unit are of two types: Primary Storage and Secondary Storage.

#### *Primary Storage*

- a. It is used to store pieces of program instructions and data, intermediate results of processing, and recently produced results on which computer is currently working.
- b. Primary Storage can hold information only while computer system is on. As soon as the computer system switches off or resets, the information held in primary storage is erased.
- c. The size of this memory is comparatively much smaller than that of secondary memory but the CPU communicates directly with this memory at a high speed.
- d. It is very expensive.
- e. It is of two types: RAM and ROM.
  1. *ROM (Read Only Memory):* The CPU can only read its contents. Permanent information is stored here. It is non-volatile. The most important program of ROM is the Basic Input Output System (BIOS) which activates the hardware to communicate with the system and the application software.
  2. *RAM (Random Access Memory):* This is read/write memory, which is used for user data and programs. It is volatile, i.e., data is lost as soon as the power is switched off. Temporary information is stored here.

#### *Secondary Storage*

- a. It is also known as Auxiliary storage which is used to store data permanently, and the data which the computer system is not currently working on, but needs to hold them for processing later.
- b. It can retain information even when a computer system switches off or resets.
- c. It is less expensive than primary memory.
- d. This memory operates at a comparatively slow speed but is capable of storing large volumes of data.



e. For example, Floppy disks, magnetic disks, magnetic tapes and compact disks, DVD,

The Input, Output Units and Secondary Memory are called *peripheral devices*.

- iv. **Arithmetic and Logic unit (ALU):** Here the actual processing of instructions takes place during the processing of data into information. ALU is designed to perform calculations like addition, subtraction, multiplication and division and logical operations or comparisons such as less than, greater than or equal to.
- v. **Control unit:** This unit co-ordinates and controls the activities of all units of the computer. Although it does not perform any actual processing on the data, it acts as a '*Central nervous system*' for other components of the computer system. It manages and co-ordinates the entire computer system. The main functions performed by the control unit are as follows:
  - a. It obtains the instructions stored in the memory unit.
  - b. It understands the received instructions.
  - c. It ensures that data reaches the correct place at the correct time.
  - d. It brings the next instruction after the previous instruction has been executed.

### 3. CPU (Central Processing Unit)

Control Unit and ALU of computer system are jointly known as the CPU. The CPU is the brain of computer system.

The computer system receives the data and instructions through the input device. It transfers them to the primary storage through the control unit. Control unit fetches the data and instruction from RAM, determines if it needs to be processed upon, sends it to the ALU for processing, fetches the result and stores them back into RAM. The output stored in the primary storage is displayed to the user through the output device as directed by the control unit.

Although the control unit does not perform any actual processing of data, it works as the control nervous system for all the components of computer. It has some special purpose registers and a decoder to perform these activities.

**Registers:** The *instruction registers* and *program control registers* hold the current instruction and the next instruction, to be executed respectively. Hence these help the unit in instruction selection.

**Decoder:** It has the required circuitry to decode and interpret the meaning of every instruction supported by the CPU.

### 3.1 Types of Processors

#### Types of Processors

- i. CISC Processor
- ii. RISC Processors
- iii. EPIC Processors

- i. **CISC Processors:** CISC stands for Complex Instruction Set Computer architecture. CPUs with CISC can handle large instruction set, variable-length instructions and a variety of addressing modes.

Employing more and more instructions in the CPU makes it easier to translate high-level language programs to machine language and ensures their execution more effective. Addition of more instructions makes the hardware circuitry more complex.

Also, to optimize the CPU memory, designers packed more instructions in memory by using instructions of variable length. If it was possible to include an instruction with lesser bits, was done so. Thirdly, CPUs were designed to support a variety of addressing modes. As stated above, addition of these three features led to a new technology of processors called CISC.

- ii. **RISC Processors:** RISC or Reduced Instruction Set Computer architecture was designed when it was found that many instructions supported by a CISC processor were not used effectively. Thus, a new processor was designed which implemented only basic set of instructions and some of the more frequently used instructions in the CPU circuitry. Other complex set of instructions could always be implemented in software. Also, it was decided to make all the instructions of uniform length which made the decoding and execution of all the instructions fast and simple. Furthermore, the address modes were designed so as to retrieve operands stored in registers in CPU rather than from memory. All these changes produced less expensive, less complex and faster processors.

- iii. **EPIC Processors:** EPIC or Explicitly Parallel Instruction Computing technology allows the software to communicate explicitly to the processor when operations can be done in parallel. This requires tighter coupling between the compiler and the processor. This technology makes the compiler extract maximum parallelism in the original code and explicitly describe it to the processor.

EPIC processors are simpler and more powerful than traditional CISC or RISC processors. They are designed for 64-bit, high-end server and workstation market. These are not designed for personal computers.

#### ► Math Co-processor

Math Co-processor assists the CPU in performing its mathematical operations if the program is designed to use it. But computers above 486 grade do not have a separate math co-processor as now it is already built-in the CPU chip.

## 4. Bus Structure

A **bus** is a collection of wires that connect several devices within a computer system. A bus can be defined as an electronic pathway through which bits are transmitted within the CPU and between CPU and other devices in the system unit. The larger the system bus, the faster it operates. Here the term larger refers to the width of the bus, that is, how many bits it can transmit at a time. For example, in modern computers, usually 32-64 bit buses are used which are four to eight times faster than those earlier computers using 8-bit buses.

There are mainly three types of buses

- i. **Data Bus:** This is used to carry data from CPU to memory or vice-versa. It is bi-directional.
- ii. **Address Bus:** This is a unidirectional bus that carries the addresses of various memory locations.
- iii. **Control Bus:** Control bus is also bi-directional and used to transmit control signals generated during any processing. It indicates the direction of data transfer and coordinates the timing of events during the transfer.

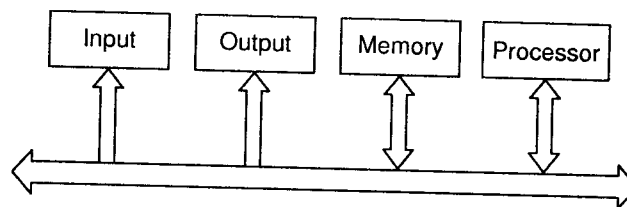


Figure 2.2

### ► Single Bus Structure

All units are connected to a single bus, so it provides the sole means of interconnection. Single bus structure has advantages of simplicity and low cost.

Single bus structure has disadvantages of limited speed since usually only two units can participate in a data transfer at any one time. This means that an arbitration system is required and that units will be forced to wait.

Only two units can actively use the bus at any given time. Bus control lines are used to arbitrate multiple requests for the use of the bus.

**Buffer Registers** are used to hold information during transfers.

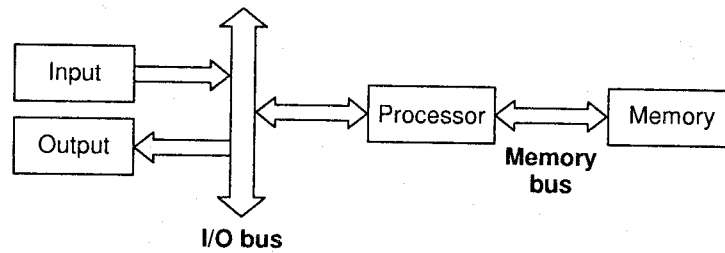
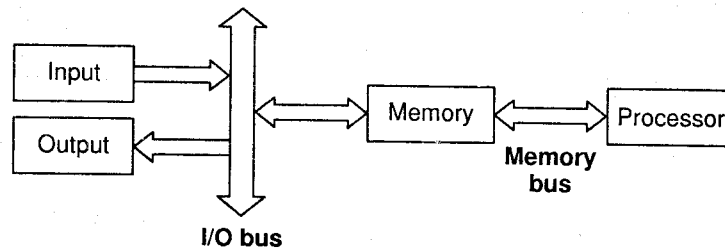
**Configuration 1****Configuration 2**

Figure 2.3

**► Two Bus Structure**

In the first configuration, the processor is placed between the I/O unit and the memory unit. The processor is responsible for any data transfer between the I/O unit and the memory unit. The processor acts as a “messenger.” In this structure, the processor performance and capability is not being maximized. Most of the time, the processor is doing data transfer between these units instead of performing more complex applications. Also, the processor is idle most of the time waiting for these slow devices.

In the second configuration, I/O transfers are made directly to or from the memory. A special purpose processor called peripheral processor or I/O channel is needed as part of the I/O equipment to control and facilitate such transfers. This special processor is the Direct Memory Access(DMA) controller. It allows main memory to perform data transfer between I/O units.



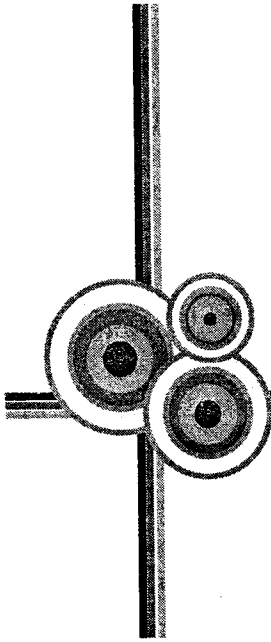
## Exercise

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1. Explain the functional block diagram of a computer?
2. What is memory? Explain different types of memory.
3. Explain the Central Processing Unit in detail.
4. Explain the bus structure of Digital Computer.



Chapter 3  
**INPUT / OUTPUT  
DEVICES**



## 1. Introduction

A computer system interacts with the outside world through the input/output devices. While input devices are used to take in data into the primary storage, the output devices are used to give the results from the primary storage to the outside world.

Together input and output devices are called peripheral devices as these are at the periphery of the CPU.

## 2. Input Devices

The input devices are those peripheral devices that are used to enter data and instructions into the computer for processing. Input devices translate data to be fed in computer in binary form.

Number of questions asked  
**1**

Oct.2008 – 4M  
List different input devices. Explain any two in detail.

### Types of input devices

- i. Keyboard
- ii. Mouse
- iii. Scanner
- iv. MICR
- v. OMR



## ► Types of Input

- . **Data** is the raw *facts* given to the computer.
- i. **Programs** are the sets of *instructions* that direct the computer.
- ii. **Commands** are special codes or *keywords* that the user inputs to perform a task, like RUN "ACCOUNTS". These can be selected from a menu of commands like "Open" on the File menu. They may also be chosen by clicking on a *command button*.
- v. **User response** is the user's answer to the computer's question, such as choosing OK, YES, or NO or by typing in text, *for example*, the name of a file.

The keyboard is the most common input device. Some of the other input devices are explained below.

## 1.1 Keyboard

The keyboard is one of the earliest and the most commonly used input device for entering data and commands into the computer system.

It is a collection of different switches or keys.

Each key has a different code/character associated with it.

Some represent alphabets, digits and symbols whereas some keys represent non-printable characters and are responsible for some function.

**Keyboard Layout:** The most commonly used keyboard is the IBM-101 key keyboard. The keys are arranged in different groups as shown.

- a. **Alphanumeric Keys:** This set contains alphabetic, numbers and special characters.
- b. **Numeric Keypad:** This set of keys act as numeric keys when Num Lock (a key on the keyboard) is ON and act as cursor movement keys when Num Lock is OFF.
- c. **Cursor Movement Keys:** The four keys (up, down, left and right arrow keys) are used for moving the cursor to a desired location.
- d. **Function Keys:** The 12 keys F1 to F12 represent a function. The purpose of each key depends on the application being used. These keys can be programmed for use as per each application.
- e. **Special Purpose Keys:** These keys perform specialized functions. They are Esc, Pause, Insert, Delete, etc.

- f. **Modifier Keys:** They are used to modify the input of other keys. They are used by holding down the modifier key while pressing another. They are Shift, Ctrl and Alt.

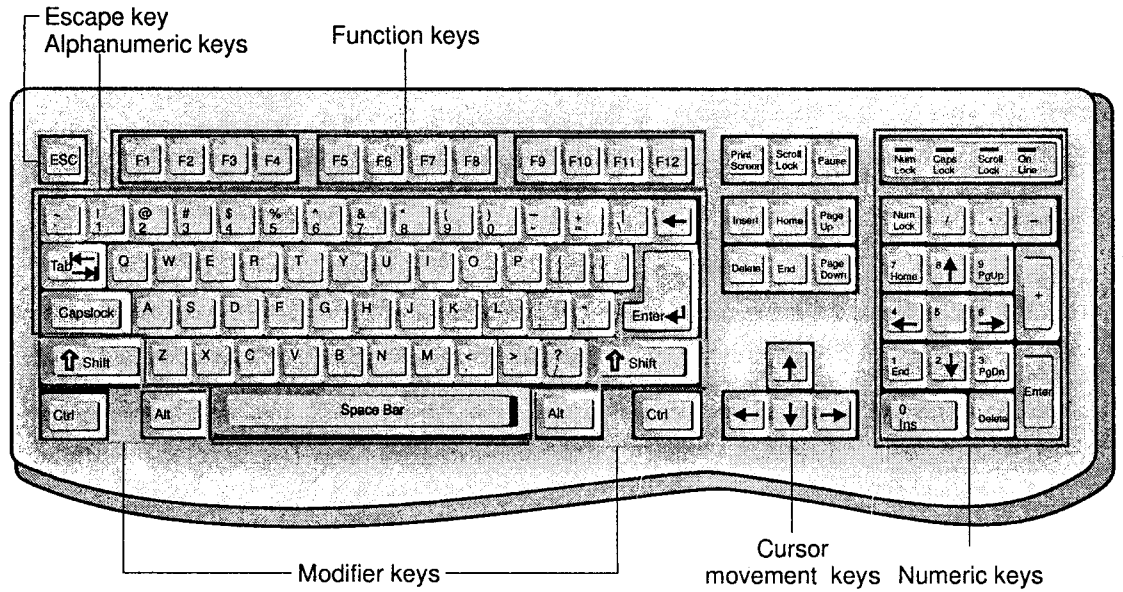


Figure 3.1: Keyboard

ii. **Process of accepting input from the keyboard**

- a. When a key is pressed, a computer circuit called keyboard controller puts a code (scan code of the key) into a memory called keyboard buffer.
- b. The keyboard controller signals the computer's system software that a key has been pressed by sending an interrupt request.
- c. The system software then reads the keyboard buffer and sends the key's scan code to the CPU.

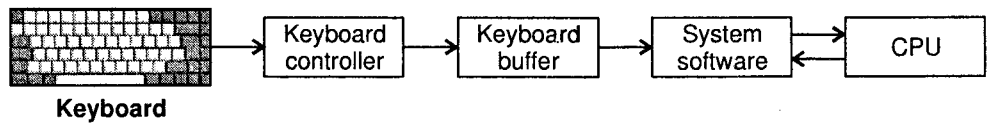


Figure 3.2



## 2.2 Pointing Devices (Graphical User Interface)

These devices are specially used for Graphical User Interface (GUI) based applications where some sort of selection has to be made or in applications where a user has to input a free-hand input like a signature.

### Pointing Devices

- i. Mouse
- ii. Trackball
- iii. Glide Pad
- iv. Light Pen
- v. Touch Screen
- vi. Digitizers and Graphic Tablets
- vii. Joystick

### ► Mouse

This is one of the most popular and effective pointing device for GUI applications. It allows the user to move a cursor or pointer on the screen to any desired location. It is held in one hand and moved across the flat surface. Its movement and the direction of the movement are detected by two rotating wheels which are present on the underside of the mouse. These wheels have axes at right angles. Each wheel is connected to the 'shaft encoder' which emits an electrical signal for every incremental movement of the wheel. The pulses transmitted by the mouse determine the distance moved.

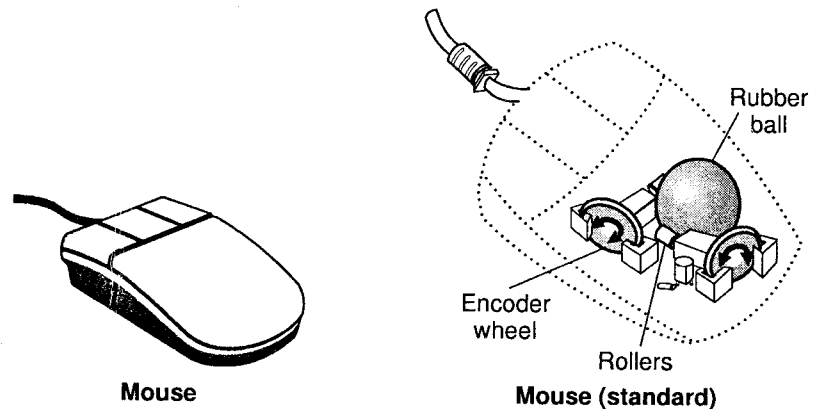





Figure 3.3

*The operations can be performed using a mouse in two steps:*

- i. Pointing
- ii. Clicking, Double-clicking, Dragging or Right-clicking the buttons, which are on the mouse. These points are explained below:

**Clicking:** Pointing to an item and quickly pressing and releasing the mouse button is called as clicking.

	<p><b>Left clicking:</b> Clicking the left button while the pointer is over something on the screen will select it.</p>
	<p><b>Right clicking:</b> Clicking the right button while the pointer is over something on the screen will bring up a menu of options. This menu lists things that can be done with that object (<i>example:</i> copy and paste).</p>
	<p><b>Double clicking:</b> Double-clicking means clicking twice with your left mouse button very fast. This is used to begin programs.</p>

**Dragging:** Holding down the mouse button while over an object will grab on to it. If you move the mouse while holding down the mouse button you will be able to move (drag) the object to a new place on the screen.

**Dropping:** After dragging an item, releasing the mouse button will leave (drop) the object at the new place on the screen.

### Types of Mouse

- i. **Mechanical Mouse:** The mouse has a ball on its underside, which rolls when the mouse is moved over a flat surface. There are two rollers, which are placed at 90 degrees to each other. One roller responds to the vertical movements and other to the horizontal movements.

These rollers are attached to a wheel which spins as the rollers roll and relays information about how much each roller spins. The information is sent in the form of electrical signals by the cord attached to the mouse.

The electrical signals are created either by using an opto mechanical method consisting of LED and light sensor or by using metal contacts which generate electrical signals when the wheel spins.

This electrical signal is then converted into the corresponding mouse position on the screen.

- ii. **Optical Mouse:** This mouse does not have a ball and wheel arrangement. It uses a small LED that bounces light off the flat surface. This light is detected by a CMOS sensor which sends signals to a Digital Signal Processor (DSP). The DSP compares the previous images with the current to measure movement. It then sends the corresponding coordinates to the computer, which then moves the cursor on the screen.

This mouse does not have any moving parts and hence there is less wear and tear. It is capable of higher resolution but is expensive.

#### Pointing Devices

- i. Mechanical Mouse
- ii. Optical Mouse
- iii. Wireless Mouse

- iii. **Wireless Mouse:** This can either be a mechanical or optical mouse except that it does not have a cord. It is powered by batteries and sends information to the computer using radio or infrared signals.

These signals are detected by an infrared detector or receiver, which is connected to the computer.

#### *Advantage*

The Mouse moves the cursor around the screen faster than using keystrokes.

#### *Disadvantages*

1. Requires moving hand from keyboard to mouse and back.
2. Repeated motion can lead to carpal tunnel syndrome.

#### ▶ **Trackball**

This is a ball inserted in a small external box adjacent to and in the same unit as the keyboard of some notebook computers (laptops). Instead of moving the whole mouse around, the user rolls the trackball (which is on the top or side) with fingers to move the graphic cursor (as the electronic circuitry detects the direction and speed of the spin and passes the information to the processor).

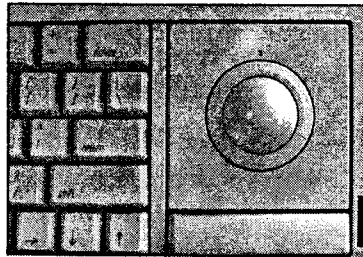


Figure 3.4: Trackball

#### *Advantages*

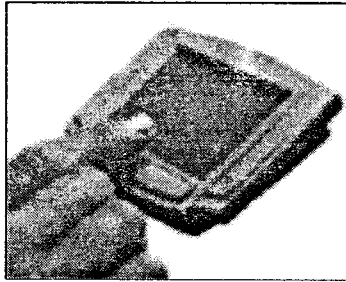
1. Does not need as much desk space as a mouse.
2. Is not as tiring since less motion is needed.

#### *Disadvantages*

1. Requires fine control of the ball with just one finger or thumb.
2. A repeated motion of the same muscles is tiring and can cause carpal tunnel syndrome.

### ► **Glide pad**

It uses a touch sensitive pad for controlling cursor. The user slides finger across the pad and the cursor follows the finger movement. For clicking there are buttons, or you can tap on the pad with a finger. The glide pad is a popular alternate pointing device for laptops.



**Figure 3.5: Glide pad**

#### *Advantages*

1. Does not need as much desk space as a mouse.
2. Can readily be built into the keyboard.
3. Has fine resolution. Hence, to achieve the same cursor movement on screen takes less movement of the finger on the glide pad than it does mouse movement.
4. Can use either buttons or taps of the pad for clicking.

#### *Disadvantages*

1. The hand tires faster than with a mouse since there is no support.
2. Some people don't find the motion as natural as a mouse.

### ► **Light Pen**

This is a pointing device used with hand-held computers and digital assistants. This pen-like device (also called stylus) is held in the hand and is used to write on a special pad or directly on the screen. It can also be used like a mouse for selecting commands.

Pen based computers are not generally used to enter large amount of text but for selection of a menu or icon, inputting signatures or messages.

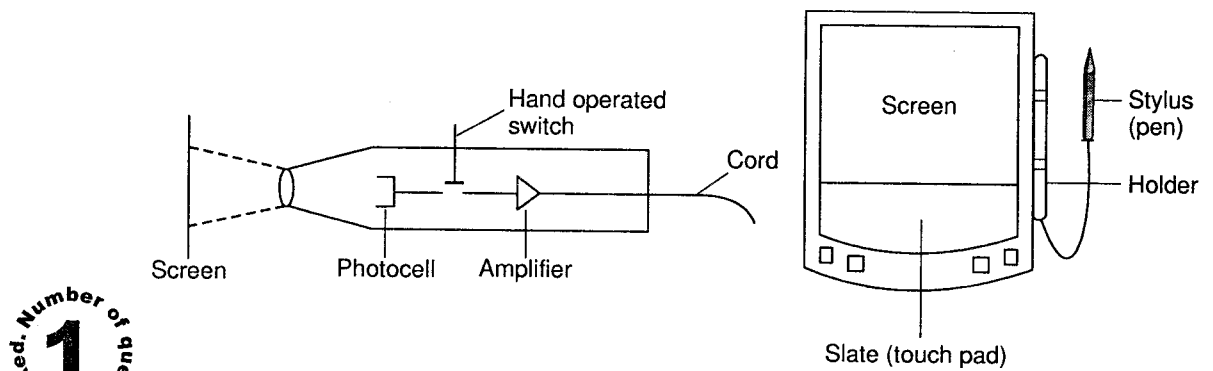


Figure 3.6: Light Pen

Number of questions asked. **1**

Apr.2009 – 4M

Explain working of Light Pen.

**Working of Light Pen:** A light pen system comprises of the light pen itself, the computer and the light-pen driver software.

The light pen contains a lens, aperture and photo diode, which acquires and magnifies the light from the monitor.

This information is relayed to the computer, which determines the position of the light pen and illuminates the underlying pixels.

The light pen can also be used as a stylus to input text and signatures. It has to be moved on a special surface, which converts the movements of the pen into a digital image.

**Pen Input:** Used especially in Personal Digital Assistants (PDA).

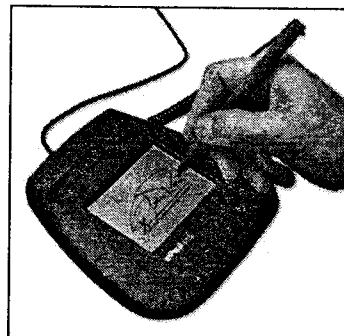


Figure 3.7: Pen Input

*Pen Input is used for*

- a. **Data Input:** By writing, PDA recognizes your handwriting.
- b. **Pointing Device:** Functions like a mouse in moving a cursor around the screen and clicking by tapping the screen.

- c. **Command Gestures:** You can issue commands by moving pen in patterns. So a certain kind of swirl would mean to save the file and a different kind of swirl could mean to open a new file.

#### *Advantages of Pen Input*

1. Can use handwriting instead of typing.
2. Can use gestures instead of typing commands.
3. Small size.

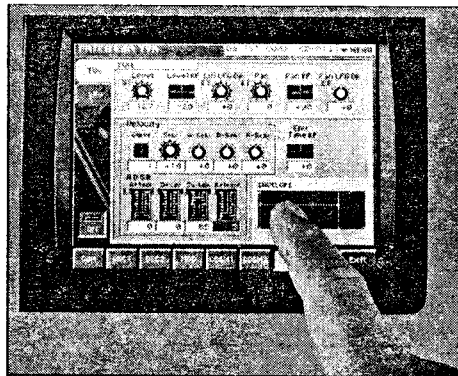
#### *Disadvantages of Pen Input*

1. Must train device to recognize handwriting.
2. Must learn gestures or train device to recognize the ones you create.
3. Can lose the pen which is not usually attached to the device.

### ► **Touch Screen**

Touch screens accept input by allowing the user to place a fingertip directly on the computer screen, usually to make a selection from a menu.

They use sensors in or near the computer's screen to detect the touch of a finger. When the sensor detects the touch of a finger, it sends the information to the CPU and the CPU illuminates the underlying pixels. Further action may then be taken depending upon which part was selected (like displaying a new screen, etc).



**Figure 3.8: Touch Screen**

#### *Advantages*

1. Its natural to do - reach out and touch something.
2. They are well suited for automatic teller machines, supermarkets, departmental stores, public information systems (kiosks), etc.

### ***Disadvantages***

1. Its tiring if many choices must be made.
2. It takes a lot of screen space for each choice since fingers are bigger than cursors.

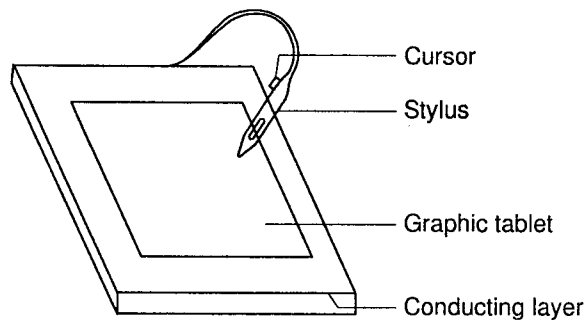
### ► **Digitizers and Graphic Tablets**

Digitizer is an input device which is used for inputting free-hand drawing or text into the computer and storing it in a digital format. The image may be stored as information about X, Y coordinates of each point.

It consists of a flat surface called graphic tablet which may be kept on a table. The graphic tablet has an associated or connected stylus or cursor. Most digitizers use an electrical sensing mechanism to measure the position of the stylus on the tablet. This position is converted into a set of X and Y coordinates data.

In one method, a fine grid of current carrying wires is placed below the tablet surface. When the stylus is placed at any point on the surface, a connection is made which causes current to flow. The strength of the picked up current indicates the X, Y position. When the stylus is moved, a cursor on the CRT screen moves simultaneously to provide visual feedback. Some digitizers also have a Liquid Crystal Display below the surface of the graphic tablet so as to display the stylus movement on the tablet.

Digitizers are commonly used in CAD by architects and engineers to design buildings, machines and many other things. They are also used in Geographical Information System (GIS) for digitizing of maps that are available in paper form.



**Figure 3.9: Digitizer**

### ***Advantage***

Don't have to redraw graphics already created.

### ***Disadvantage***

Expensive.

## ► Joystick

Cursor motion is also controlled by vertical stick (joystick) or arrow buttons (game pad). In case of joystick, a lever that moves in all directions and controls the movement of a pointer or some other display symbols. A joystick is similar to a mouse except that with a mouse the cursor stops moving as soon as you stop moving the mouse. While with a joystick, the pointer continues moving in the direction the joystick is pointing. To stop the pointer, you must return the joystick to its upright position. Most joysticks include two buttons called triggers. Joysticks are mostly used for computer games, but they are also used occasionally for CAD/CAM system and other applications.

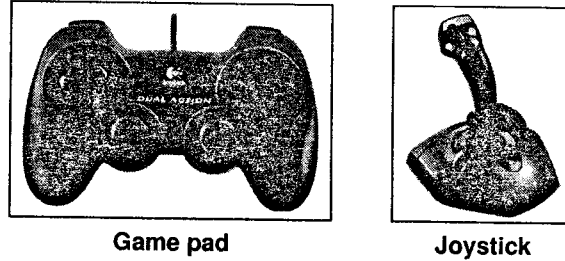


Figure 3.10

### *Advantages*

1. A joystick gives a more natural-feeling control for motion in games, especially those where you are flying a plane or spaceship.
2. Both have more buttons for special functions than a mouse and can combine buttons for even more actions.

### *Disadvantages*

1. More expensive and bulky.
2. Better ones require an additional peripheral card for best performance.

## 2.3 Scanning Devices

This category of devices provides faster and more accurate method of giving input data to the computer. They are used when some data is already printed/written and it has to be read/recognized and then fed to the computer. Some of the Scanning devices are:

### Scanning Devices are:

- i. Magnetic Ink Character Reader (MICR)
- ii. Optical Bar Code Reader (OBCR)
- iii. Optical Character Reader (OCR)
- iv. Optical Mark Reader (OMR)
- v. Scanner



- i. **Magnetic Ink Character Reader (MICR):** In this method, human readable characters are printed on documents using special magnetic ink. A magnetic ink character reader can recognize these characters. The MICR devices use the E13B font, which contains digits 0-9 and 4 special symbols as shown in *figure 3.11*.

MICR is especially used in banking. A bank cheque contains branch code, cheque number and account number preprinted in magnetic ink(iron oxide particles). The MICR reader can read data directly from the cheque into the computer system. This eliminates manual data entry and ensures accurate data entry.

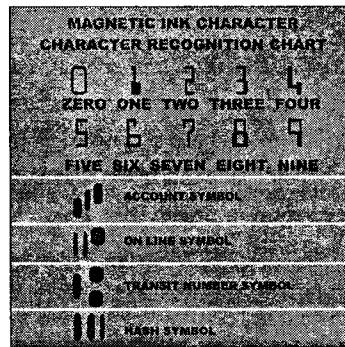


Figure 3.11: Magnetic Ink Character Reader

- ii. **Optical Bar Code Reader (OBCR):** Bar Coding is a method of printing bars of varying thickness and spacing. They are printed on items like books, packages, etc. The bar codes provide information like manufacturer, product code, price, etc. A sample bar code is as follows.



Figure 3.12: Optical Bar Code Reader

In order to read the bar code, a bar code scanner has to be used. This scanner consists of an optical device which analyses the bars for width and spacing and converts this information into electrical pulses for the computer. The bar code reader emits a beam of light frequently, a laser beam, that is reflected by the bars. A detector detects the reflected light and generates corresponding electrical pulses.

*Bar Code Scanners are of two types*

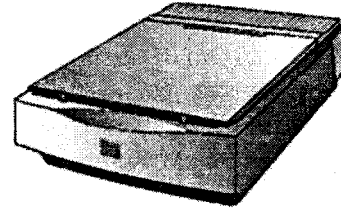
- a. **Hand Held Scanner:** The bar code reader is held in the hand and moved over the bar code image. It is mainly used by courier and delivery agents.
- b. **Flat Bed Scanner:** The flatbed model is most commonly used in supermarkets and departmental stores. The products are placed over the flat rectangular scanner surface with the bar code image in contact with the surface.

The standard coding convention used is the Universal Product Code (UPC).

After the reader has identified the bar code, it converts the individual bar patterns into an alphanumeric value.



Hand held scanner



Flat bed scanner

Figure 3.13

- iii. **Optical Character Reader (OCR):** An optical scanner is a device, which reads an image and converts it into a set of 0s and 1s which can be stored in computer memory. The image may be handwritten, typed or printed document.

In order to speed up the process, American National Standards Institute (ANSI) adopted a standard style of text to be used with Optical Character Reading Devices which converts the characters into a set of 1s and 0s. This is called the 'Bitmap'.

These scanners can be either hand held or flat bed scanners. These scanners emit light pulses. Black areas of the text do not reflect the light as white areas do.

The reflected light is sensed by photo-diodes, which generate electronic pulses corresponding to the light intensity.

In some applications, software is used which converts the bitmaps into text if the scanned document is a text document. It does it by matching the character with a number of possible ways that the character could be written. *Example:* The character 'g' written in different ways.

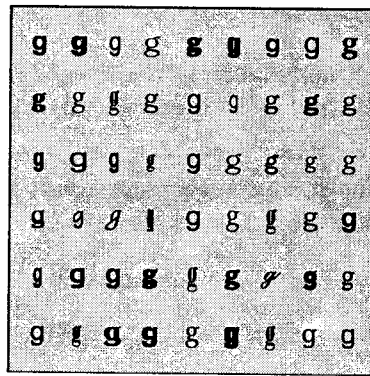


Figure 3.14: Optical Character Reader

- iv. **Optical Mark Reader (OMR):** In this method, special preprinted forms are designed with boxes or circles which can be marked with ink or pencil. The optical mark reader can recognize these marks by converting them into electrical pulses and transmitting to the computer. Based on the information received and the pre-fed information, the computer can evaluate the response as correct or wrong. They are used for objective type examinations, surveys, order forms, etc.

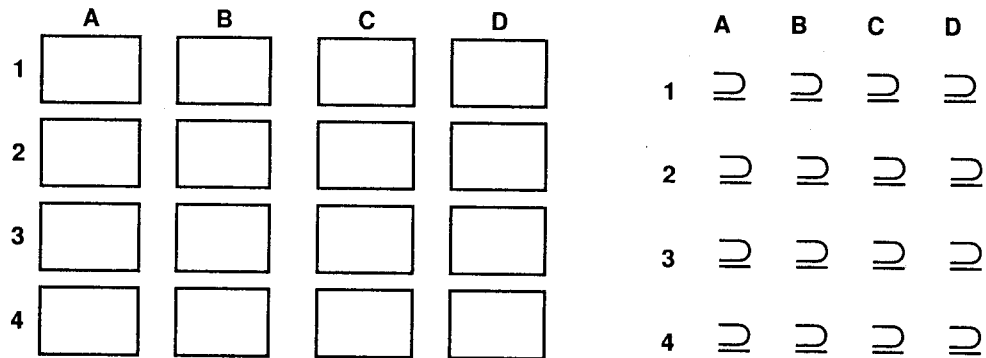


Figure 3.15: Optical Mark Reader

- v. **Scanner:** A scanner or an image scanner translates paper documents into the digital format that can be stored in a computer. The documents of all types can be converted using this device. The digital format of the documents helps in preserving them for a long time.

*Two types of scanners are:*

- a. **Hand-held Scanner:** It holds LEDs (Light Emitting Diodes) inside a small case. The scanner can be held in hand as per convenience. The scanner is dragged very carefully and steadily over the document. Hence, they are used where high accuracy is not required, and where volume of conversion is also low.

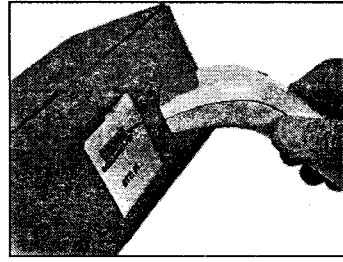


Figure 3.16: A hand held scanner

- b. *Flatbed Scanner:* It looks like a copier and has a glass plate on its top which is covered by a lid. The document to be scanned is placed upside down on the glass plate. A light source, from below the glass plate moves horizontally on activation. It scans one line at a time, with light beam moving up a little to scan the next one. It continues till all the lines are scanned. A 21 cm × 28 cm document is scanned in approximately 20 seconds.

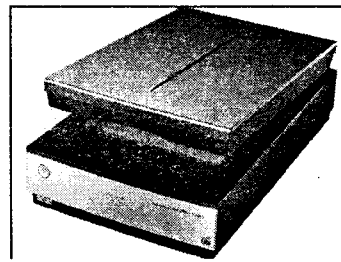


Figure 3.17: A flatbed scanner

### 3. Output devices

The computer processes data accepted from all the input devices to generate useful information. The information, unless presented to the user, is of no use. Output devices are those peripheral devices that are used to translate the information processed by the computer into a human readable form and gives to the user. Monitors and sound systems allow us to see and hear information; printers enable us to have a physical document. In this section, we shall be studying some commonly used output devices.

Number of questions asked. **1**

Oct.2010 – 4M  
List output devices.  
Explain any one output device.

**Output Devices are:**

- i. Monitors
- ii. Printers
- iii. Plotters

## 3.1 Monitors

1  
Number of pages

Apr. 2009 – 4M  
Define output devices?  
Discuss Monitor as  
output devices.

This is the most commonly used output device on most personal computers. It is also called as Visual Display Unit (VDU) or Cathode Ray Tube (CRT) display.

Monitors are of following types:

- i. *Monochrome*: Display only one color against a contrasting background.
- ii. *Grayscale*: Display varying intensities of grey against white background.
- iii. *Color*: Display from 16 colors to 16 million colors.

*Monitors also used with PCs are of following types:*

- a. CRT monitors
- b. Flat-Panel monitors (LCD monitors) used with portable computers
- c. Plasma display
- i. **CRT Monitors**: These monitors have a Cathode Ray Tube (CRT). This tube contains an electron gun at the back, which generates an electron beam, which is guided by magnetic coils to the front of the CRT where there is a screen. The guiding assembly consists of a control grid (to regulate beam intensity), focus grid (to control beam width), an accelerating grid, horizontal and vertical deflection coils to move the beam across the screen. The back of the screen is coated with phosphor, which glows when the electron beam strikes it. A shadow mask is placed very close to the phosphor coating. It is a metal plate with holes. This mask blocks the beam detracting from the brightness of the resulting image.

The electron gun scans the entire screen starting at the top left corner and scanning to the right edge, comes to the start of the next line and continues. Once it reaches the bottom, the process continues from the start (Refreshing).

A color monitor also works in the same way but has three electron guns (Red, Green, and Blue).

The smallest phosphor dot which can be illuminated is called a 'pixel'. Each character is displayed by a matrix of 5 dots along horizontal and 7 dots in vertical direction. A display normally has 80 characters in a horizontal line and 24 such lines vertically.

The CRT consists of a small memory called as buffer, the size of the buffer is normally equal to the total number of characters (usually 1920 – 24 rows and 80 columns) that can be displayed at a time on the CRT screen. Each character entered through the keyboard is stored in the buffer and is also displayed simultaneously on the CRT screen. The data is not sent to the processor until the operator presses an enter-key on the keyboard.

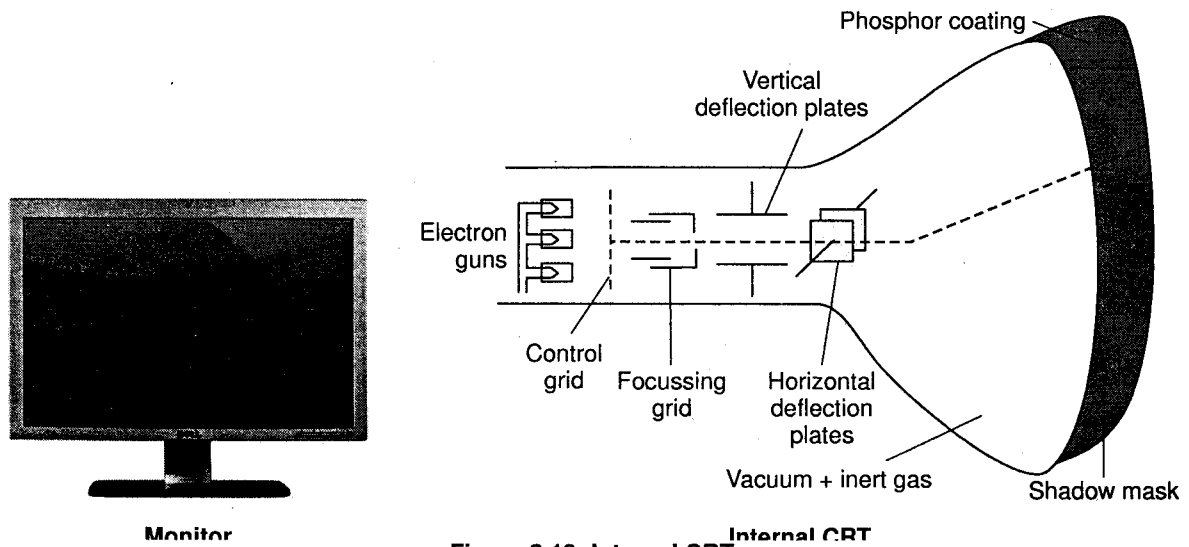


Figure 3.18: Internal CRT

### Quality of Monitor

The quality of the image produced depends upon:

- a. **Resolution:** Number of pixels on the screen expressed as a matrix. *Example:*  $640 \times 480$  (VGA) monitor,  $800 \times 600$ ,  $1024 \times 768$  (SVGA).
- b. **Monitor size:** Screen size measured diagonally in inches. *Examples:* 17 inches, 21 inches, 25 inches.
- c. **Refresh rate:** Number of times per second that the electron guns scan every pixel on screen (measured in Hz).

### Display Modes

The mode refers to the characteristics of the computer display, which are:

1. Maximum number of colors
2. Image resolution

PCs have several display modes

Mode	Maximum colors	Resolution
CGA Color Graphics Adapter	4	320 × 200
EGA Enhanced Graphics Adapter	16	640 × 350
VGA Video Graphics Array	16 256	640 × 480 320 × 200
XGA Extended Graphics Array	16 million 65,536	800 × 600 1024 × 768
SVGA Super Video Graphics Array	16 million	800 × 600
SXGA Super Extended Graphics Array	16 million	1280 × 1024
UXGA Ultra Extended Graphics Array	16 million	1600 × 1200

- ii. **Liquid Crystal Display (LCD):** The Liquid Crystal Display is most commonly used in calculators and is now being used for monitors too.

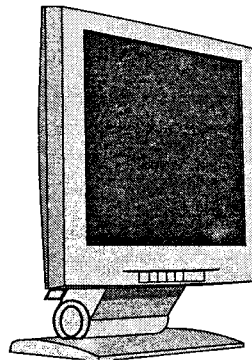


Figure 3.19: Liquid Crystal Display

### *Mechanism*

The LCD consists of a special polymer called Liquid Crystal. The Liquid Crystal is sandwiched between two transparent electrodes or conductors using which an electric field can be applied. On both sides, polarizing filters are placed which polarize the light entering and leaving the crystal. Usually, these polarizers are crossed, i.e., no light will be able to pass through. However, by applying electric field, the liquid crystal will modify the polarization so that light can pass through some areas.

Thus, it is possible to dynamically create tiny spots where light will pass and spots where it will not; thereby creating an image. The electrodes are in the form of a matrix of thin film transistors (one for each pixel) that electrically activate each pixel.

*This display can be of two types:*

- a. *Passive matrix LCD:* There is a transistor for each row and column and the color displayed by a pixel is determined by the electricity coming from the row and column transistor of the pixel.

They are less expensive but they have a narrow viewing angle.

- b. **Active matrix LCD:** There is a transistor for each pixel which can be turned on and off individually. They can be refreshed rapidly thus giving better and lasting images. However, they are complicated, more expensive and require more power.

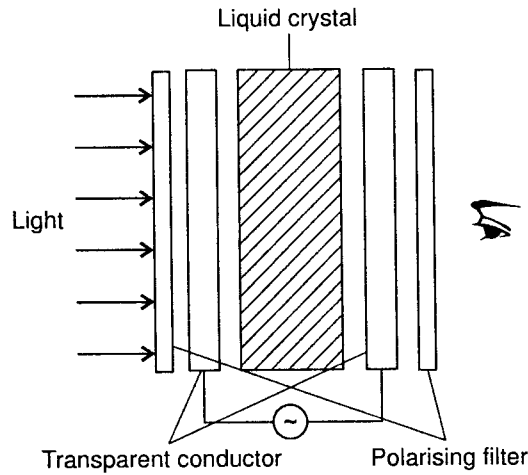


Figure 3.20

- iii. **Plasma Display:** This display device uses specialized technology and are used in specific applications.

**Mechanism**

These are thin displays created by sandwiching a gas (neon and xenon) in thousands of tiny cells between two sheets of glass. The address electrodes are placed behind the cells along the rear glass plate in vertical columns. The display electrodes are placed above the cells along the front glass plate in horizontal rows. They both form a grid.

The intersecting electrodes, when charged, ionize the gas within the cell, which emits photons. This acts as a pixel. By controlling the amount of voltage applied to each grid point, an image can be displayed. Phosphor is coated on the cell walls for enhanced images.

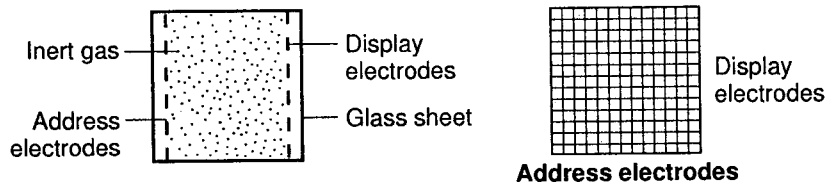


Figure 3.21: Plasma Display

Number of questions  
**1**  
answered

Oct.2008 – 4M  
Explain working of plasma display.



### Features

This display is expensive but provides high quality images and can be much larger than LCDs. Some are as big enough to be hung on a wall and used as large-screen televisions.

## 3.2 Printers

### Printers are of two types

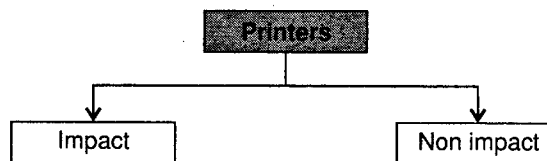
- i. Impact
- ii. Non Impact

A printer is a peripheral output device designed to get a hard copy of the output.

Number of questions asked: **1**

Oct. 2009 – 4M  
Explain different types of printers in detail.

### ► Printers are of two types



**Impact** printers create an image by pressing an ink ribbon against the paper using pins or hammers.

*Example:* Dot matrix printer

**Non-Impact** printers do not use the impact technique but use spray technique or use heat method to form an image on paper.

*Example:* Inkjet, Laser printers

Depending on their speed and approach of printing, printers are also classified as *Character printers, line printers and page printers*.

### ► Features of Printers

- i. **Image quality:** It is measured in dots per inch (dpi). More the dpi, better is the image.
- ii. **Speed:** It is measured in pages per minute (ppm). Different printers have different ppm.
- iii. **Cost:** The cost depends upon the resolution, technique used for printing, color or black and white, etc. Laser printers are the most expensive.
- iv. **Operational cost:** This determines the cost of printing a page (which depends upon the cost of ink cartridges).

## ► Types of Printers

### i. Dot Matrix Printer

It is an impact printer most commonly used in offices, etc. where physical impact with the paper is important, such as when the document has carbon-copies.

#### Types of Printers

- i. Dot Matrix Printer
- ii. Ink Jet Printer
- iii. Daisy Wheel Printer
- iv. Laser Printer
- v. Line Printer

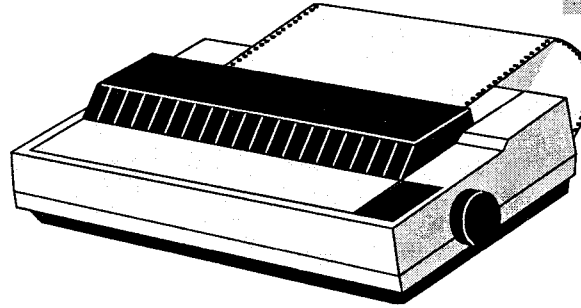


Figure 3.22: Dot matrix printer

#### *Mechanism*

It has a print head, which contains a matrix of pins arranged in one or more columns. The head comprises a matrix of tiny needles, typically  $(9 \times 7)$  seven rows with nine needles in each which hammer out characters in the form of patterns of tiny dots. It may contain 9 pins or 24 pins.

Depending upon the character or image to be created, the CPU gives instructions to the printer to activate certain pins of the print head. These pins are pushed out in various combinations. When they strike the ink ribbon, the ink is transferred onto the paper.

The image is in the form of dots and hence the name - dot matrix.

The print head keeps moving left to right line-by-line in synchronization by a roller-feed mechanism, which moves up the paper line by line.

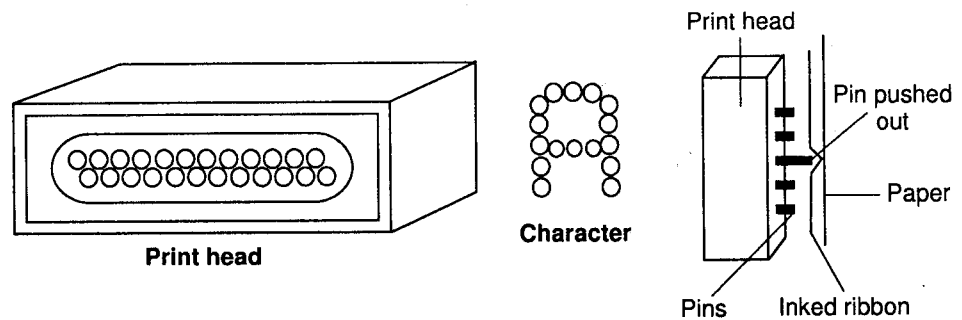


Figure 3.23

These printers have a speed of about 30 cps to 600 cps (characters per second). However, being impact printers they are noisy and print quality is not very good. Since they cost less, they are widely used for daily and bulky printing jobs.

**ii. Inkjet Printer**

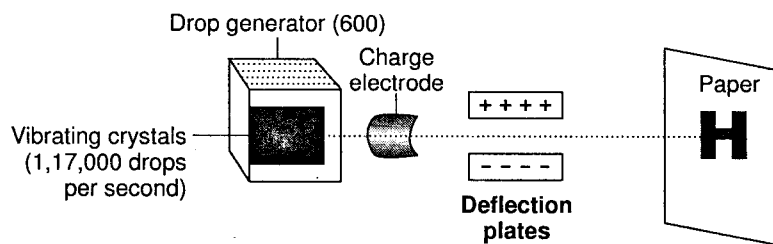
**Mechanism**

These are non impact character printers based on a new technology. They print characters by spraying small drops of ink on the paper.

Its print head has up to 64 tiny nozzles that are selectively heated up within microseconds. Due to heat the ink vaporizes and is ejected through the nozzle.

The droplets are electrically charged after leaving the nozzle which is then guided to the proper position on the paper by electrically charged deflection plates.

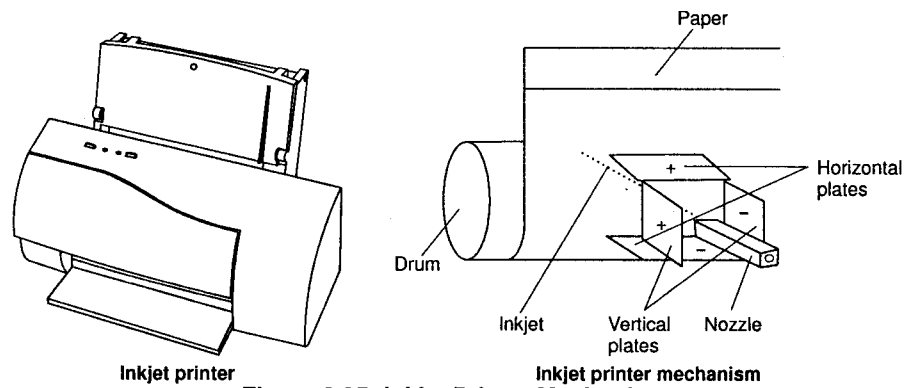
Inkjet printers produce high quality output because the characters are formed by dozens of tiny ink dots. Inkjet printers are the high speed printers.



**Figure 3.24: Function of Inkjet printer**

The print head is attached to an ink cartridge(s) such as separate black and color cartridge or both in a single cartridge.

The cartridges of some inkjet printers include the print head itself. The cartridge has an ink reservoir, which has one or more nozzles. Color inkjet printers have four nozzles (cyan, red, yellow and black).



**Figure 3.25: Inkjet Printer Mechanism**

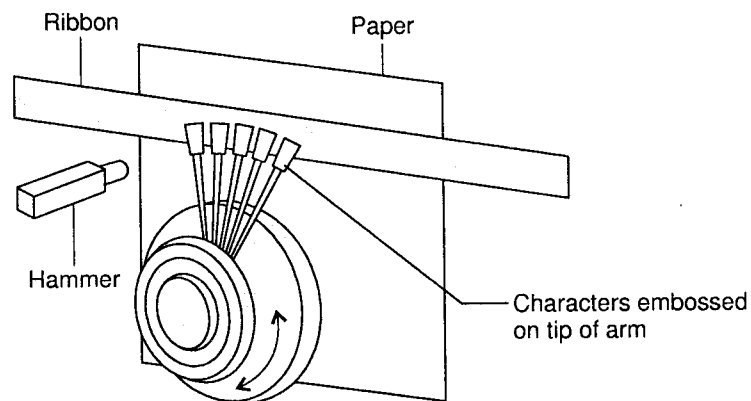
A stepper motor moves the print head assembly (print head and ink cartridge) back and forth across the paper. A roller-feed mechanism moves the paper up one line at a time.

#### **Features**

- a. Inkjet printers generate higher quality output than dot-matrix printers.
- b. They are extensively used for printing graphics.
- c. The resolution is about 360 dpi (dots per inch).
- d. Speed is about 2 to 4 ppm.
- e. Initial cost is less but operational cost is high as compared to dot matrix printers.

#### **iii. Daisy Wheel Printer**

This printer uses a print wheel font known as a daisy wheel. Each petal of the daisy wheel has a character embossed on it. A motor spins the wheel at a rapid rate. When a desired character spins to the correct position, a print hammer strikes it to produce the output. Thus daisy wheel printers are the impact printers. The speed range normally ranges from 10-50 characters per second.



**Figure 3.26: Daisy wheel printer**

#### **iv. Laser Printer**

These printers are more expensive than inkjet printers, faster and give better print quality. These printers have a LASER which is controlled by a processor within the printer. It is a page printer as it scans the entire page to print.

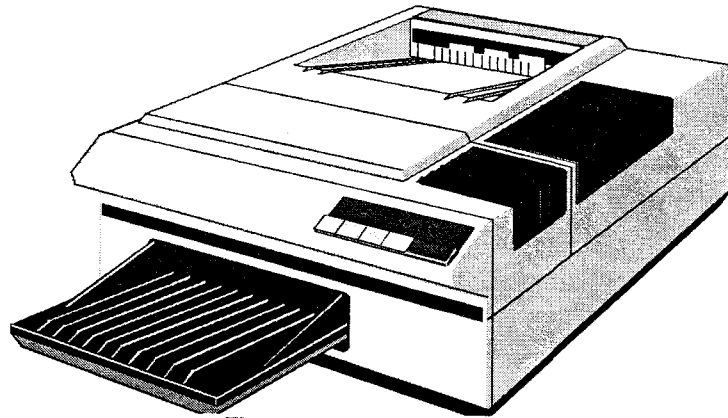


Figure 3.27: Laser printer

### *Mechanism*

The laser when aimed at the electro statically charged drum by the spinning multi-sided mirror creates an electrical charge. *Toner* which consists of tiny particles of oppositely charged ink, sticks to the drum on the places that are charged.

Then, the toner is transferred to the paper by pressure and heat. The drum is continuously rotated so as to form the full image.

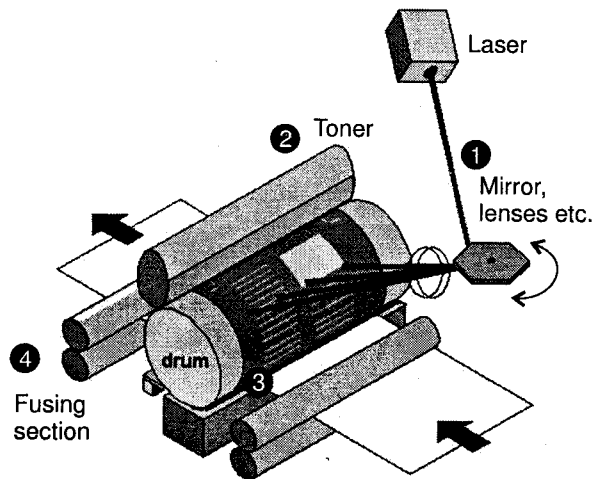


Figure 3.28: Laser printer mechanism

### Features

- a. They have a resolution from 600 dpi to 1200 dpi.
- b. They can print 4 – 16 pages per minute.
- c. They are very expensive.

### v. Line Printers

Line printers are impact printers used with most medium and large computers for producing high volume paper output. They are fast printers having speeds in the range of 300 to 3000 lines per minute.

- a. *Drum Printers:* A drum printer consists of solid, cylindrical drum that has raised characters in bands on its surface. There are as many bands as there are printing positions. Each band contains all possible characters. The drum rotates at a rapid speed. For each possible print position, that is opposite to each band, there is a print hammer located behind the paper.

These print hammers strike the paper, along with the inked ribbon, against the proper character on the drum as it passes. One revolution of drum is required to print each line, it is an impact printer and the speed ranges from 300 lines to 2000 lines per minute.

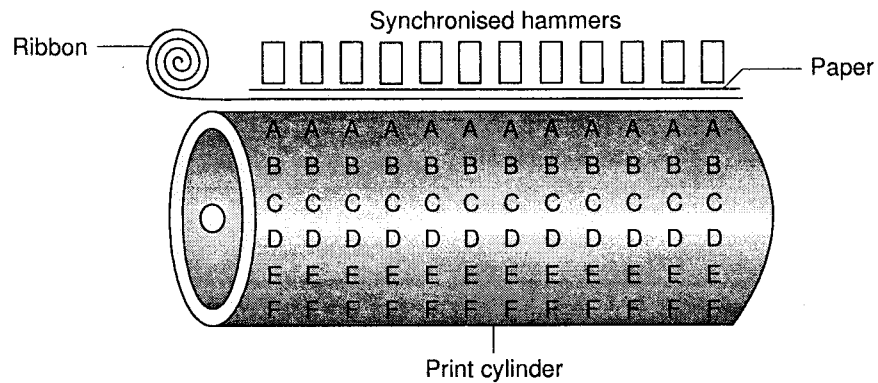


Figure 3.29: Drum printer

- b. *Chain Printers:* They use a rapidly moving chain called as a print chain.

Each link of the chain is a character font. For each possible print position, there is a print hammer located behind the paper. As the print chain or band rotates, the properly timed print hammers strike the paper along with the inked ribbon, against the proper character on the chain/band as it passes. It is an impact printer and speed ranges from 400 to 3000 lines per minute.

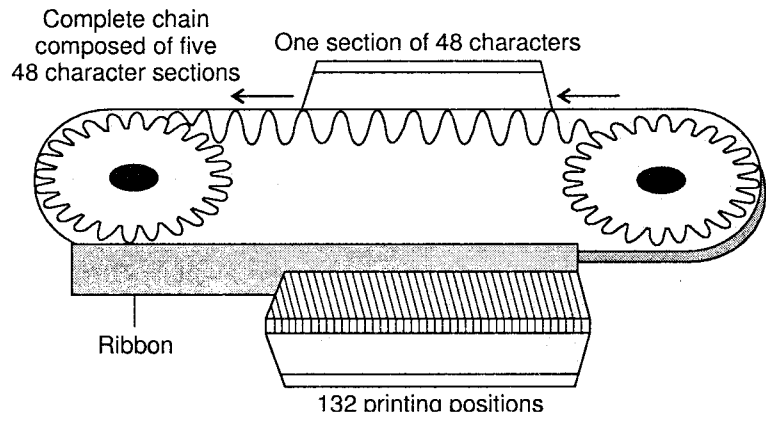


Figure 3.30: Chain printer

2  
Number of times asked.

Oct. 11, Apr.10 – 4M

► Differentiate Impact Printer and Non-impact Printer

	Impact printers	Non-Impact printers
i.	In impact printers, the characters or images are formed by striking a mechanism such as print hammer or wheel against an inked ribbon, leaving an image on paper.	In non-impact printers, the characters and images are formed without making direct physical contact with paper.
ii.	Impact printers are relatively noisy.	Non impact printers are less noisy.
iii.	Since the paper is struck, interleaved carbon paper can be used to create multiple copies of pages in a report.	Non Impact printers cannot create carbon copies.
iv.	The <i>examples</i> of impact printers are dot matrix printer, daisy wheel printer, chain printer, etc.	The <i>examples</i> of non-impact printers are laser printers, inkjet printers and thermal printers.
v.	Impact printers are comparatively less quiet and produce less good quality print than non-impact printers.	Non-impact printers are quieter and produce better quality print than impact printers.
vi.	Impact printers are usually less expensive than non-impact printers.	Non-impact printers are usually more expensive than impact printers.

### 3.3 Plotters

A plotter is a special kind of output device used to print large-format images such as engineering drawings, maps, charts, architectural drawings, etc.

They differ from printers in that they draw lines using a pen as a result of which they can produce continuous lines.

*Plotters are of two types.*

- i. **Table or Flatbed Plotters:** It consists of two robotic arms which holds a set of colored ink pens or pencils. They work in coordination at right angles and draw on a stationary piece of paper.

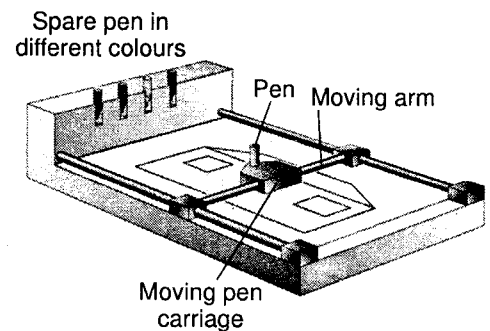
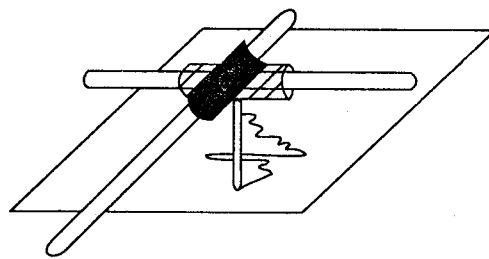


Figure 3.31: Flatbed plotter

- ii. **Roller or Drum Plotter:** It uses only one drawing arm but moves the paper. The drawing arm moves side to side as the paper is rolled back and forth by the roller. It can draw geometric shapes and lines of different colours and thickness.

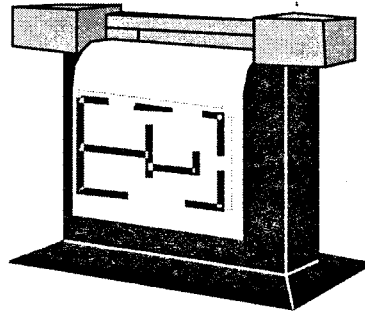


Figure 3.32: Drum plotter

Number of questions asked. **2**

Apr. 10, 09 – 4M  
Explain Plotter in detail.

#### Two Types of Plotters

- i. Table or Flatbed Plotters
- ii. Roller or Drum Plotter





# PU Questions

## 4 Marks

[Oct.11, Apr.10 – 4M]

[Oct.2010 – 4M]

[Apr.2010, 2009 – 4M]

[Oct. 2009 – 4M]

[Apr. 2009 – 4M]

[Apr. 2009 – 4M]

[Oct. 2008 – 4M]

[Oct. 2008 – 4M]

1. Differentiate Impact Printer and Non-impact Printer.
2. List output devices. Explain any one output device.
3. Explain Plotter in detail.
4. Explain different types of Printers in detail.
5. Define Output Device? Discuss Monitor as an Output Device.
6. Explain working of Light Pen.
7. List different input devices. Explain any two in detail.
8. Explain the working of plasma display.



# COMPUTER MEMORY

## 1. What is Memory?

Memory is an essential component of a digital computer. Its function is to store data, programs / instructions, intermediate and final results of computations, or any other kind of information in the form of binary codes. The main memory of the computer is divided into several locations each with a specific address and data is stored in these locations in the form of words (8 bit/ 16 bit/ 32 bit). The memory capacity decides the number of locations available. An 8-bit address bus is capable of addressing  $2^8 = 256$  locations/cells.

### 1.1 Units of Measurement for Storage

Memory is measured in terms of bytes. A byte is a basic unit to measure memory and it contains eight bits, which is the smallest unit. The total number of bytes in main memory is referred to as the computer's memory size.

Computer memory sizes are measured as follows:

- i. **Bit:** In binary number system, each 0 or 1 is called a bit, which is short for 'binary digit'.
- ii. **Byte:** Bits are combined into groups to represent different characters, digits or special symbols. A combination of eight bits is known as a byte.
- iii. **Kilobyte:** A kilobyte is abbreviated as KB and is equivalent to 1024 bytes.
- iv. **Megabyte:** A megabyte is abbreviated as MB and is equivalent to 1024 kilobytes.
- v. **Gigabyte:** A gigabyte is abbreviated as GB and is equivalent to 1024 megabytes.
- vi. **TeraByte:** A TeraByte is abbreviated as TB and is equivalent to 1024 gigabytes.

### ► Memory Cell

A **memory cell** is the smallest part of a computer memory.

A memory cell records a number written in binary form. This number is called the content of the memory cell.

The *figure* below indicates that the cell has content **11010011<sub>2</sub>**.

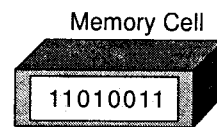


Figure 4.1

A **RAM** (random access memory) cell can have different numbers recorded in it at different times. It is like a cassette tape that can be rerecorded with different songs. However, when a new number is recorded in a RAM memory cell, the old number is FOREVER LOST.

A **ROM** (read only memory) cell has a number permanently recorded in it. It is like a message chiseled in stone. It cannot be lost, even if the power is turned off.

All the numbers recorded in a memory cell always have the same number of bits. Thus if a memory cell has an 8 bit content then:

- i. content **0** decimal is really **00000000<sub>2</sub> = 00<sub>16</sub>**
- ii. content **167** decimal is really **10100111<sub>2</sub> = A7<sub>16</sub>**

Since a memory consists of a large number of memory cells, there has to be a way to keep track of which cell is which.

Thus each cell in a memory has an index number called its *address* which is a sort of "chiseled" into the "edge" of the cell.

The cell pictured below has a content of  $11010011_2$  and an address of  $00110101_2$ .

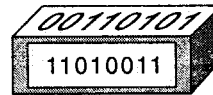


Figure 4.2

A cell address CANNOT be changed. The address numbers *start at 0* and go 1,2,3, etc. The address of a cell is usually different than its content - although they *can* be the same.

### Classification of Memory

In computers, there are two types of memories.

- i. Primary Memory
- ii. Secondary Memory

These memories are explained below in detail.

Number of Questions  
**2**

Oct.11, Oct.09 – 4M  
What is memory?  
Explain different types of memory.

## 2. Primary (Semiconductor) Memory

This is called the main memory of the computer. This memory stores data and instructions for immediate access and use by the CPU.

The main memory is directly connected to the CPU by the address, data and control bus which are signal lines for sending addresses, data and control signals. Since the main memory is directly connected to the CPU, access is much faster.

Physically, the main memory consists of chips either on the motherboard (the main circuit board) or on a small board attached to the motherboard.

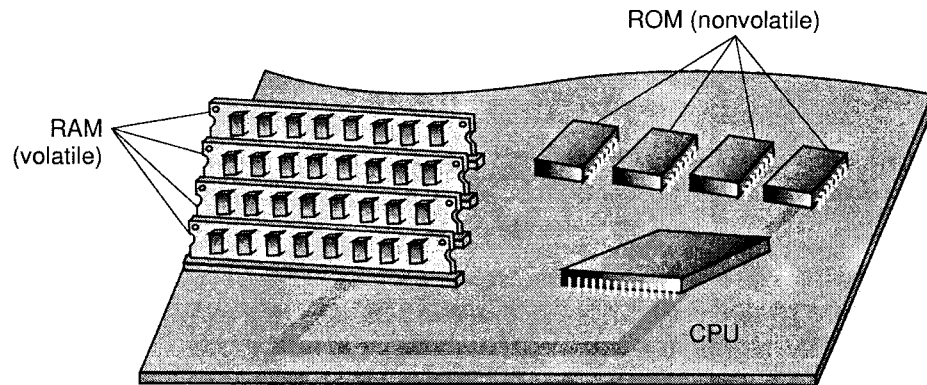


Figure 4.3

## 2.1 Types of Primary Memory

### Types of primary memory

- i. Read Only Memory (ROM)
- ii. Random Access Memory (RAM)

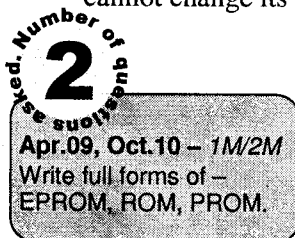
### ► Read Only Memory (ROM)

This is permanent / non – volatile memory which does not lose its stored contents on the power supply being interrupted / switched ‘OFF’. However, the user cannot write to the ROM. It’s contents are written at the time of manufacture.

Hence it is used to store the system BIOS (Basic Input Output System), permanent programs / information required by the computer to execute the user programs. They are also called Mask ROMs. (The components used are diodes and emitter of transistors (BJT / MOSFET).

### Types of ROM

- i. **PROM:** This is *Programmable Read Only Memory*. User can program it according to their needs. An equipment called PROM programmer or PROM burner is used for the programming. The disadvantage of PROM is that it can be programmed only once. Thus user cannot change its contents after it is programmed once.
- ii. **EPROM:** This is *Erasable Programmable Read Only Memory*. User can program its contents more than once. Thus EPROM’s are used to store permanent data that may need updating after sometime. The contents of EPROM can be erased by the exposure of high intensity ultraviolet (UV) light.



There are some limitations of EPROM as follows:

- a. The EPROM chip is removed from the computer's board to erase its contents, thus making the whole process a bit complicated.
  - b. The complete data is erased in this process. User can not erase only some particular data stored in EPROM.
- iii. **EEPROM:** This is *Electrically Erasable Programmable Read Only Memory*. This memory can be electrically programmed and electrically erased any number of times by the user. The disadvantages of EPROM are removed in it. The chip need not to be removed from the computer for erasing. The complete data can be erased in one operation, if desired. Otherwise only selected data can also be erased and reprogrammed on the board on a byte by byte basis.

### ► Random Access Memory (RAM)

Semiconductor RAM is generally used as main memory. The access time of RAM is of the order of 80 ~ 100 nanosec. This is a read/write memory where data can be written into and read from a RAM. It is a volatile memory (i.e., its contents are erased when the power supply is switched off/interrupted). It is called Random Access Memory because any of the locations on a chip can be randomly selected and used to directly store and retrieve data and instructions. The components used are CMOS/BJT i.e., Complementary Metal Oxide Semiconductor / Bipolar Junction Transistor).

It is measured in Megabytes (MB). Most commonly, PCs have 64 MB – 256 MB of RAM.

The amount of RAM affects the processing speed. More the RAM, more data and programs can be loaded and accessed faster. RAM is also used along with video and sound cards.

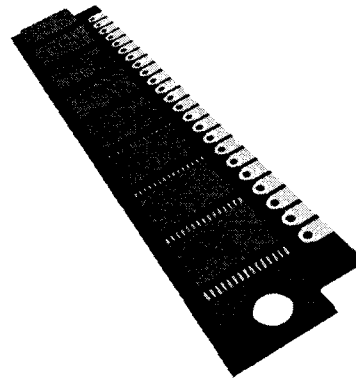


Figure 4.4: RAM Chip

### ***Types of RAM***

- i. **DRAM(Dynamic Random Access Memory):** This type of RAM uses the MOS technology where data is stored in minute MOS capacitors. Thus their capacities are very large and they are cheaper. However, the capacitors tend to lose charge and hence they have to be recharged or refreshed every few milliseconds. They work at moderate speed (Comes in 80, 70, or 60 nanosecond (ns) speed) and consume less power. The lower the number, the faster the memory.
- ii. **SRAM(Static RAM):** This RAM is made of flip flops to store data in a static form, i.e., data is retained as long as there is power. They are however bulky and have less capacity. SRAMs are more expensive and consume more power but are faster than DRAMs.
- iii. **CDRAM(Cached RAM):** Invented by Mitsubishi Electronics. It combines an SRAM cache with 4 or 16 MB of DRAM within a single chip. This onboard SRAM can be used as both a cache or a buffer and gives the RAM an approximate 15 ns access time.
- iv. **EDRAM(Enhanced DRAM):** Developed by Ramtron International Corp. of Colorado Springs. Like CDRAM also incorporates an on-chip SRAM cache.
- v. **EDO RAM(Extended Data Out RAM):** It is a form of DRAM that works by extending the time during which data can be read from memory. Provide from 4 to 15 percent greater performance than standard DRAM.
- vi. **SDRAM (Synchronous DRAM):** Developed from Texas Instruments has its timing synchronized to the system clock. Is about 10 percent faster than EDO RAM.
- vii. **RDRAM(Rambus DRAM):** Developed by Toshiba and Samsung. It's similar to SDRAM, but faster, says Rambus.

### ***Video Memory Types***

- i. **SGRAM(Synchronous Graphics RAM):** It is a form of DRAM for graphics controllers and printers. According to Fujitsu, produces data bandwidth up to five times that of standard DRAM.
- ii. **VRAM(Video RAM):** So-called "dual port" memory types that allow the graphics processor to read from memory and redraw the screen simultaneously.
- iii. **WRAM(Window RAM):** Developed by Samsung Electronics. It is faster (50 percent performance increase) and less expensive than VRAM.

### ***Buffer (To move data into a temporary storage area)***

A temporary storage area, usually in RAM. The purpose of most buffers is to act as a holding area, enabling the CPU to manipulate data before transferring it to a device. Because the processes of

reading and writing data to a disk are relatively slow, many programs keep track of data changes in a buffer and then copy the buffer to a disk. *For example*, word processors employ a buffer to keep track of changes to files. When you save the file, the word processor updates the disk file with the contents of the buffer. This is much more efficient than accessing the file on the disk each time you make a change to the file.

Note that because your changes are initially stored in a buffer, not on the disk, all of them will be lost if the computer fails during an editing session. For this reason, it is a good idea to save your file periodically. Most word processors automatically save files at regular intervals.

Another common use of buffers is for printing documents. When you enter a PRINT command, the operating system copies your document to a print buffer (a free area in memory or on a disk) from which the printer can draw characters at its own pace. This frees the computer to perform other tasks while the printer is running in the background. Print buffering is called spooling.

### **Cache**

Pronounced Cache, a special high-speed storage mechanism. It can be either a reserved section of main memory or an independent high-speed storage device. Two types of caching are commonly used in personal computers: Memory caching and disk caching.

A memory cache, sometimes called a cache store or RAM cache, is a portion of memory made of high-speed Static RAM (SRAM) instead of the slower and cheaper Dynamic RAM (DRAM) used for main memory. Memory caching is effective because most programs access the same data or instructions over and over. By keeping as much of this information as possible in SRAM, the computer avoids accessing the slower DRAM.

Some memory caches are built into the architecture of microprocessors. The Intel 80486 microprocessor, *for example*, contains an 8K memory cache, and the Pentium has a 16K cache. Such internal caches are often called Level 1 (L1) caches. Most modern PCs also come with external cache memory, called Level 2 (L2) caches. These caches sit between the CPU and the DRAM. Like L1 caches, L2 caches are composed of SRAM but they are much larger.

Disk caching works under the same principle as memory caching, but instead of using high-speed SRAM, a disk cache uses conventional main memory. The most recently accessed data from the disk (as well as adjacent sectors) is stored in a memory buffer. When a program needs to access data from the disk, it first checks the disk cache to see if the data is there. Disk caching can dramatically improve the performance of applications, because accessing a byte of data in RAM can be thousands of times faster than accessing a byte on a hard disk.

When data is found in the cache, it is called a cache hit, and the effectiveness of a cache is judged by its hit rate. Many cache systems use a technique known as smart caching, in which the system can recognize certain types of frequently used data. The strategies for determining which information should be kept in the cache constitute some of the more interesting problems in computer science.



### 3. Secondary Memory and Storage Devices

1  
Number of questions

Oct.2010 – 2M

List secondary storage devices and define any one device.

The secondary memories are generally magnetic memories, which retain data even when the power supply is switched 'OFF', i.e., permanent, non-volatile memories. Secondary storage is also called as Auxiliary Storage.

The secondary storage devices are used for bulk storage. The main memory receives data required by the processor for current processing, from the secondary storage unit. The size of the main memory is much lesser as compared to the secondary memory but access times are much better (higher speeds RAM/ROM semiconductor memories).

Various devices can be used as a secondary storage device but the one selected for a particular application depends upon how the stored information needs to be accessed. There are two methods of accessing information:

#### ► Sequential Access

A sequential or serial access storage device is one in which information can only be retrieved in the same sequence in which it is stored. Therefore data is searched in a sequential order, i.e., data stored in the last but one location cannot be accessed unless the preceding applications are accessed. Hence, the access time varies according to the location. *For example:* Punched card, Paper tape, Magnetic tape. This type of processing is suitable for applications where the data records need to be processed one after another. *For example:* preparation of monthly pay slips, monthly electricity bills, and many more of such types.

In serial access if only a particular data needs to be accessed, then the access time is too high (depending upon the location of the data).

#### ► Random Access

A random or direct access storage device is one in which access to any stored information is direct, and approximately equal access time is required for accessing any information irrespective of its location. Hence, use of direct access storage devices is more efficient wherein any location in the device can be randomly accessed and the required data can be retrieved almost instantaneously. *For example:* Floppy Disk, Hard Disk.

This type of processing is suitable for applications where direct and fast access of any specific information is needed.

*For example:* In a bank, at any point in time, it may be required to determine the balance in the savings account of a customer. Also, for airline reservation system immediate access to any particular flight is necessary for making bookings.

### 3.1 Types of Secondary Storage Devices

#### ► Magnetic Storage Devices

These devices use magnetic media to store data. Data is recorded by magnetizing the magnetic material that is coated over some base material.

#### Types of Secondary Storage device

- i. Magnetic storage device
- ii. Optical storage device
- iii. USB device

- i. **Magnetic Tape:** Magnetic tape is a magnetically coated strip of plastic on which the data can be encoded. Tapes for computers are similar to the tapes used to store music. Storing data on tapes is considerably cheaper than storing data on disks. Tapes also have large storage capacities, ranging from a few hundred kilobytes to several gigabytes.

Accessing data on tapes, however, is much slower than accessing data on disks. Tapes are sequential-access media, which means that to get to a particular point on the tape, the tape must go through all the preceding points. In contrast, disks are random-access media because a disk drive can access any point at random without passing through intervening points. Because tapes are so slow, they are generally used only for long-term storage and backup. Data to be used regularly is almost always kept on a disk. Tapes are also used for transporting large amount of data.

Tapes come in a variety of sizes and formats. Tapes are sometimes called streamers or streaming tapes.

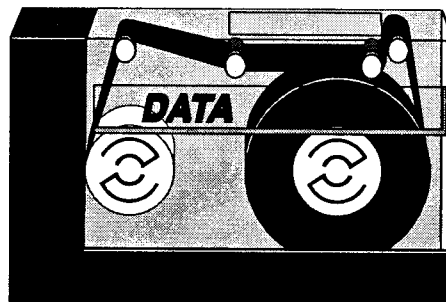


Figure 4.5: Magnetic Tape

#### *Mechanism*

Magnetic tape is one of the most popular secondary storage medium for large volume of data that are sequentially accessed and processed.

The tape is a plastic ribbon usually 1/2" or 1/4" in width and coated with an iron-oxide or chromium dioxide material, which can be magnetized.

The tape ribbon itself is stored in reels of 50 to 2400 feet or a small cartridge or cassette. Information is recorded on the tape in the form of tiny visible magnetized and non-magnetized spots (representing 1's and 0's) on the coated side of the tape. Before the tape unit can perform read or write operation, it must be prepared for the operation. This involves loading the tape along with a take up spool and threading the tape through the read/write mechanism. Vacuum columns are provided to provide rapid acceleration and deceleration of the tape.

Commonly used data recording densities are 400, 556, 600, 1600 or 6250 characters per inch. The tape speed is nearly 35 inch per second. The starting portion of the tape as well as end portion of the tape is kept blank for spooling known as *header* and *trailer* respectively.

Tape is divided into blocks and each block stores 250 bytes of data, the recording on the tape is done record by record, in the mean time due to mechanical pull, some portion of the tape gets wound up on the spool. This portion of the tape is called as *Inter Block Gap (IBG)*.

If the specific instruction is given for writing more than one records on block, the gaps kept between records on the block are called *Inter Record Gap (IRG)* and process is called as *Blocking of records*. Most of the modern tapes have '9' tracks (parallel) and they use the 8-bit **EBCDIC (Extended Binary Coded Decimal Interchange Code)** code format for data recording.

Solved. Number of questions

1

Oct.2011- 1M  
Write full forms of -  
EBCDIC.

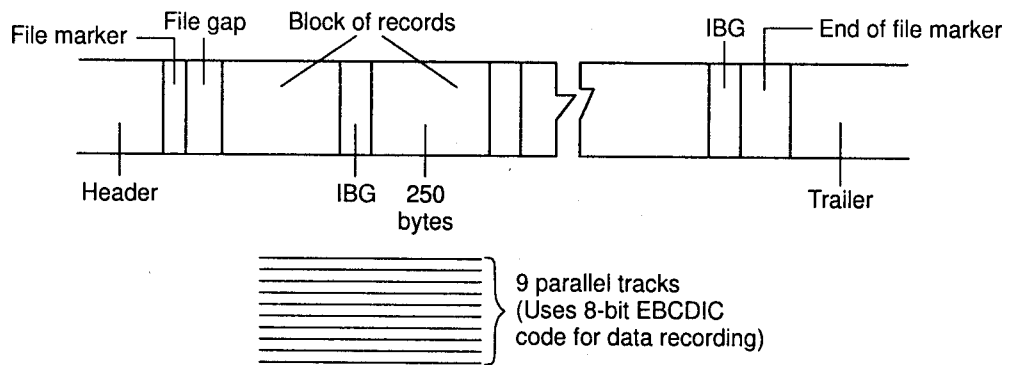


Figure 4.6: Magnetic tape

Suppose tape has data recording density of 1600 characters per inch and length of tape is 2400 feet than total data storing capacity of tape will be  $1600 \times 12 \times 2400$  characters.

*Advantages*

1. Storage capacity high.
2. Cost per bit storage is very low.
3. Easily portable.
4. Tape can be erased and reused many times.

*Disadvantages*

1. Sequential access makes the accessing of data slow, if only a particular data is needed.
2. Dust can cause tape-reading errors.

*Uses of Magnetic Tapes*

1. These are used for storing application files based on sequential data processing.
2. For taking backups of data of an on-line storage device such as a disk. This backup is used for off-line storage.
3. To transfer data between two non-connected computers.
4. For distribution of original software by the vendors.

- ii. **Magnetic Disk:** Magnetic disk is the most popular direct access secondary storage medium/device. A magnetic disk is a thin, circular aluminum plate coated on both sides with a magnetic material like iron oxide. It is very similar in appearance like LP gramophone record plate. In a disk pack information is stored on both the surfaces of each disk plate except the upper surface of upper plate and lower surface of bottom plate. Each surface of disk consists of number of invisible concentric circles called as "tracks" and each track is further divided into number of "sectors". A set of corresponding tracks from all surfaces is called as cylinder. Thus a disk pack having 10 disk plates will have 18 surfaces and hence it will have 18 tracks per cylinder. Information is recorded on the tracks of disk surface in the form of invisible tiny magnetic spots. Magnetized spot represent 1 and non magnetized spot represent 0.

A standard binary code, usually 8-bit EBCDIC code is used for data recording.

The storage capacity of hard disk, i.e., total number of bytes that can be stored in disk pack is equal to number of recording surfaces \* no. of tracks/surface \* no. of sectors/track \* no. of bytes/sectors. *For example*, disk pack has 10 disk plates, each plate has 200 tracks and suppose there are 40 sectors per track and each sector can store 256 bytes of data then total capacity of hard disk pack is  $18 \times 200 \times 40 \times 256 = 36864000$  bytes.

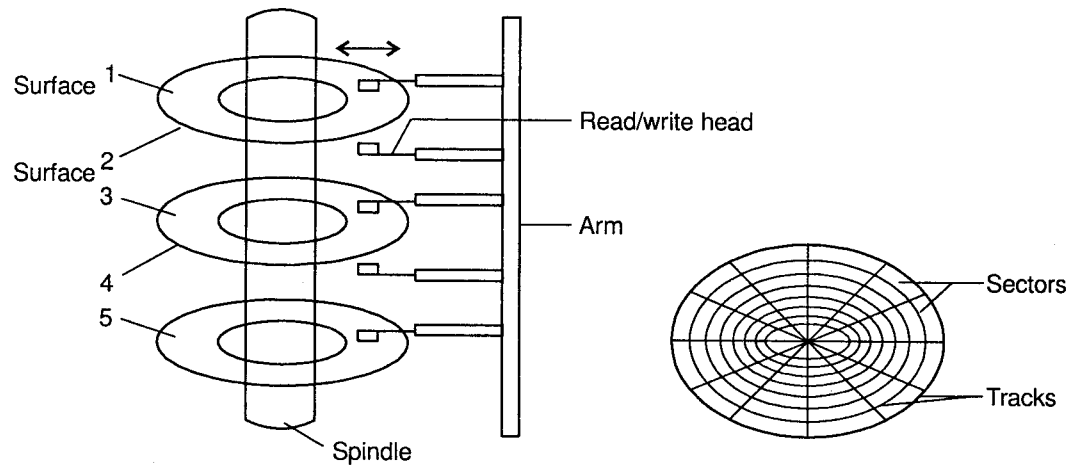


Figure 4.7: Magnetic Disk

### Types of Magnetic Disk

- a. **Hard Disk:** This is the most commonly used and the primary secondary storage device. It is called hard disk to distinguish it from a soft or floppy diskette. It is a random access device, i.e., data can be directly read.

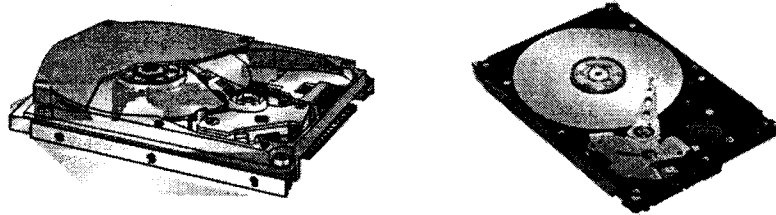


Figure 4.8: Hard Disk and Hard Drive

**Construction:** Hard disks contain one or more circular metal platters (made of aluminum) mounted on a central spindle. Each platter is covered with a magnetic coating. Data is read and written on the platter by a read-write head, one per surface.

The hard disk spins about the spindle at a very high rate of about 3600 rpm to 7200 rpm. The read/write head is moved in order to position it on a specific track. The entire unit is encased in a sealed chamber and mounted on a disk drive. Such a disk drive is known as *Winchester disk drive*.

**Data Organization:** Disks can store data on both sides of the disk. The organization of the disk in tracks and sectors is as discussed above under Magnetic disk. Each sector can store up to 512 bytes. All sectors on the disk are numbered in a sequence.

Hard disk capacity is currently in Gigabytes (GB). *Example:* SeaGate, Quantum are popular Hard Disk manufacturers.

#### Advantages

1. Direct access to data. Hence, can be used for wide range of applications.
2. Makes data readily accessible at all times.
3. Cost per bit of storage low.
4. Can be erased and reused many times.
5. Data transfer rate is higher than the tapes.
6. Suitable for both on line and off line storage.

#### Disadvantages

1. Not portable.
2. A disk crash or drive failure can result in complete data lost.

- b. **Floppy Disk:** A floppy disk (also called diskette) is a portable magnetic disk. It can be removed from the drive which contains the read/write mechanism. Some kinds of new computers come without a floppy disk drive at all.

*It is available in two varieties which are as follows:*

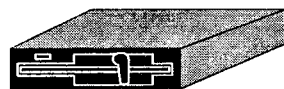
1.  $5\frac{1}{4}$  inch: Storage capacities 360K and 1.2 MB.
2.  $3\frac{1}{2}$  inch: Currently used, they have a capacity of 1.44 MB and encased in a rigid plastic cover.



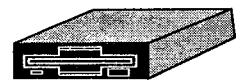
$5\frac{1}{4}$ "



$3\frac{1}{2}$ "



Floppy drive of  $5\frac{1}{4}$ "



Floppy drive of  $3\frac{1}{2}$ "

**Figure 4.9: Floppy disks and floppy drives**

Number of questions asked. **2**

Oct.11, Oct.10 – 4M  
Write a note on Hard Disk.

Number of questions asked. **1**

Apr.2009 – 4M  
Write a note on Floppy Disk.

*Construction:* It contains a circular disk made of a soft plastic material (mylar). This plastic substrate is coated with magnetic iron oxide. The disk is enclosed in a square jacket which protects the magnetic surface.

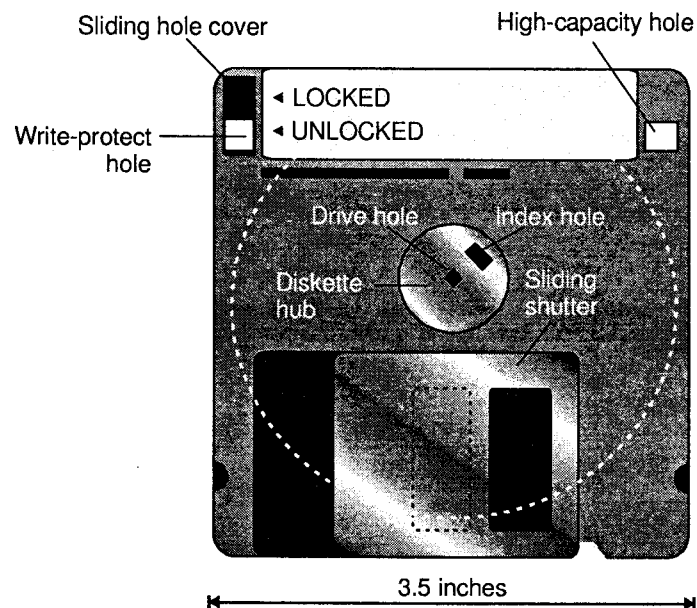
The surface of the disk is divided into number of concentric circles called as tracks and each track is divided into number of sectors. Information can be recorded in the form of tiny invisible magnetized (1) and non magnetized (0) spots. It uses standard 8-bit binary code, i.e., EBCDIC for data recording. The disk is rotated at about 300 revolutions per minute (rpm) and the read/write head is positioned to the appropriate track in order to read or write data.

There is read/write window to provide read and write operation. On 3.5" floppy disk, read/write window is covered by sliding metallic cover called as metallic shield. There is write protect notch to protect the stored data. In 3.5" disk, plastic button is used for this purpose which can slide into either of two positions. One position permits reading, writing and also deleting/erasing and other position permits only reading. The index hole is used to locate the first sector of each track. A metallic diskette hub ring is fitted at the center of floppy disk, used to protect the inner edge of the disk from spindle drive.

There is a hole at the center of disk called drive hole used by spindle drive which rotates the diskette.

In the 3½" floppy, there are 80 tracks and 18 sectors per track.

With 512 bytes per sector, the total bytes on both sides =  $80 \times 18 \times 512 \times 2$   
 = 14,74,560, i.e., 1.44 MB.



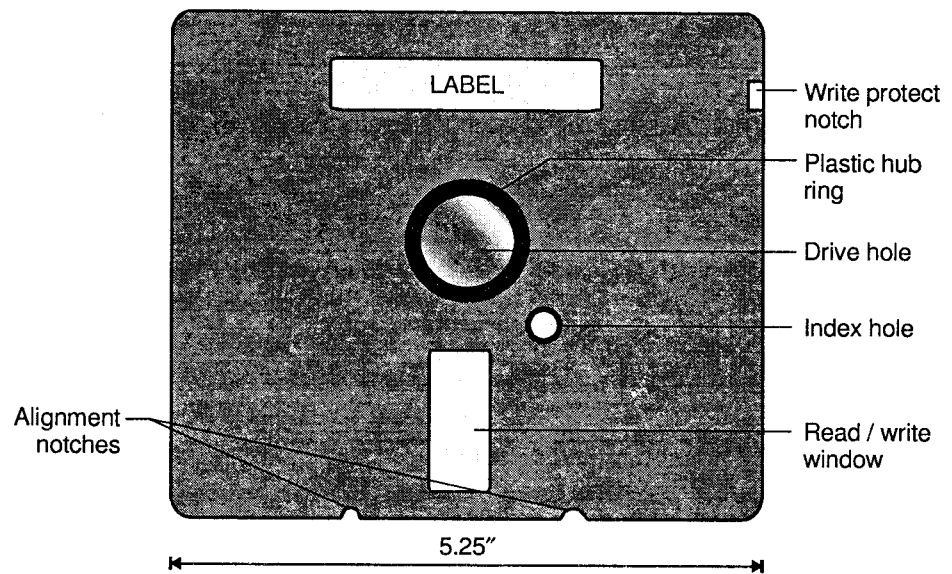


Figure 4.10

*Advantages*

1. Since they are small and portable, they are easy to carry.
2. They can be used to take backups.
3. Used to transfer data between non-connected computers.

*Disadvantages*

1. They are very prone to dust and moisture and hence get damaged easily.
2. Cannot be used for storing large volumes of data.

c. **Zip Disk**

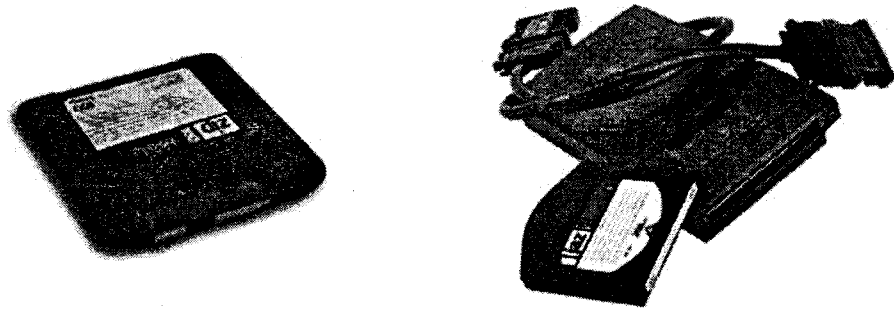


Figure 4.11: Zip Disk and Zip Drive



Several other kinds of removable magnetic media are in use, such as the popular Zip disk. All of these have a much higher capacity than floppy disks (A single ZIP disk has the capacity of 70 floppy diskettes, that is 100 Mb). Larger files that are too big for a floppy are now easily stored and transported via the ZIP disk. Zip disks come in two capacities: 100 MB and 250 MB.

#### *Uses of Magnetic Disks*

1. These are used for storing application files based on random data processing.
2. For taking backups of data for off-line storage.
3. To transfer data between two non-connected computers.
4. It can be used as a shared on-line storage device.

For distribution of original software by the vendors. For this generally floppy disks and zip disks are preferred.

#### ► **Optical Storage Device**

- i. **Compact Disk:** It is an optical disk. The disk is made up of a resin such as polycarbonate. It is coated with a material which will change its property when high intensity laser beams are focused on it. The coating material is highly reflective, usually aluminum.

It uses laser beam technology for storing/retrieval of data and hence are also known as *laser disks* or *optical laser disks*. For recording data, high intensity laser beams are used (25mW) whereas for reading the data low/less intensity laser beams are used (5mW). In some cases, separate laser beams are employed one for reading and other for writing.

To record data, laser beam at varying rate is turned ON and OFF. As a result, tiny pits are burnt into the metal coating of the disk surface along its tracks. The burnt pits are visible only through a powerful microscope.

The beam is strongly reflected by *land* (the coated surface) and weakly reflected by the burnt surface (*pit*). Pit bit represents '0' and land bit represents '1'. The reflected laser beams are sensed by photodiode/sensor to read the data. Intensity of the reflected laser beams changes as it encounters pits.

A pit spreads the light so that the sensor receives little reflected light. But the surface without pit bit, i.e., land bit reflects sufficient light to the sensor. Thus change in reflected light is sensed by sensor and converts it into electrical signals for reading the data.

CDs use long spiral track to store data serially. The track is divided into blocks of same size.

Storage capacity of a CD = Number of sectors \* Number of bytes/sector



### *Advantages*

- i. High storing capacity, i.e., 650 / 700 MB.
- ii. Removable from the computer.
- iii. Cost-per-bit of storage is very low.
- iv. More reliable than magnetic tapes or disks as its drive does not rub against the surface of the disk.
- v. Easy to handle.

The main disadvantage is longer access time as compared to that of magnetic disk.

### *Uses of Optical Disks*

1. These are used for storing application files based on random data processing.
2. For taking backups of data for off-line storage.
3. For distribution of large amounts of data at low costs. *For example:* original software by the vendors, a complete encyclopedia or a dictionary.
4. For distribution of audio and video or both together. *For example:* songs, films. DVDs are mainly used for distribution of movies.
5. For distribution of multimedia like video games.

### *The types of optical disk are*

- i. CD-ROM (Compact Disk Read Only Memory)
- ii. WORM Disk/CD-Recordable disk: WORM is *write-once-read-many*. These are often used by banks to make a permanent record of their applications.
- iii. CD-RW – CD Read/Write Disk: It is similar to WORM disk except that the disk can be written on multiple times. These are a great cost saver as they can be reused many times.
- iv. DVD – Digital Video (Versatile) Disk. It has a storage capacity of either 4.7 GB or 8.5 GB. It also supports CPPM or *Content Protection for Prerecorded Media* security technique to safeguard against copying.

In principle, both CDS and DVDs are same but a DVD is denser in recording media.

DVD is of two types – single layer disk which has a storage capacity of 4.7GB and double-layer disk with storage capacity of 8.5 GB.

DVD also has many types like a CD.

These are DVD-R/RW, DVD+R/RW, DVD-Video, and DVD-Audio.

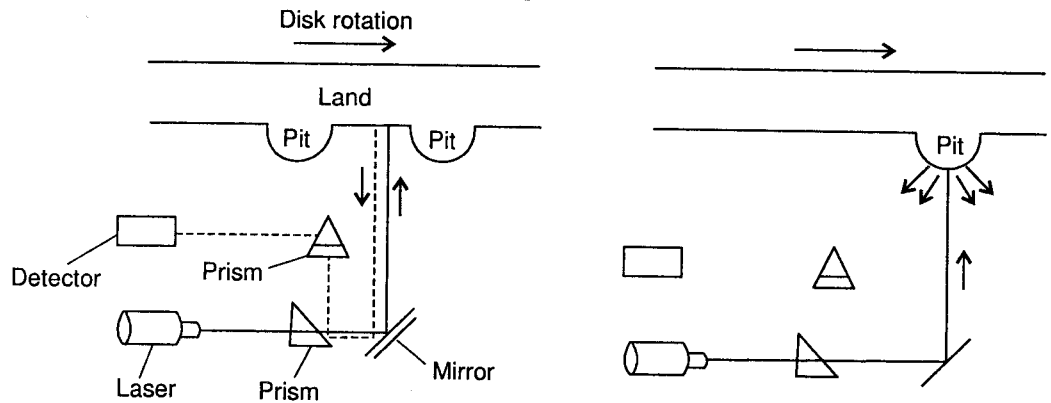


Figure 4.12: CDROM (Reading mechanism)

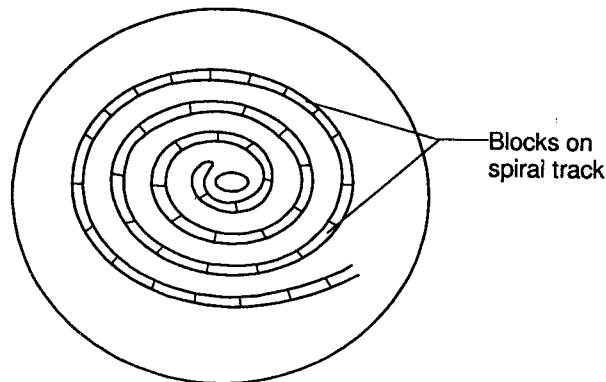


Figure 4.13: Spiral track of CDROM

► **USB Devices (Universal Serial Bus)**

**Pen Drives/Flash Drives**

USB flash drives are compact and easy-to-use devices that are similar in use like your computer hard drive. USB flash drives slip into your pocket, conveniently around your neck or on a keychain for ultimate portable storage. USB flash drives finally fulfil the real promise of the digital edge: complete freedom and mobility.

Despite different brands and names available for USB flash drives – Jump drives, Pocket drives, Pen drives and Thumb drives, they all pretty much operate the same way.

The difference is mostly in price, capacity, design and functions and features (*for example, some have built in MP3 players*).

They are all pluggable, portable and powerful. USB flash drives share some other characteristics too.

- i. Flash drives weigh about the same as a car key. In fact, some USB drives are so light weight that hypothetically it could take 14 ants to carry one!
- ii. USB flash drives are about the size of a stick of gum.
- iii. USB flash drives currently can hold upto 2 GB of data, which is over 650 three-minute songs (33 hrs), recorded as MP3s or about three times the content of a standard compact disk.
- iv. If you share computer, USB flash drives are a great way to store personal information – Use them instead of the computer’s hard drive.

According to some manufacture’s specifications, USB flash drives can maintain data for 10 years; in that same period you will probably have to replace your computer hard drive three times.

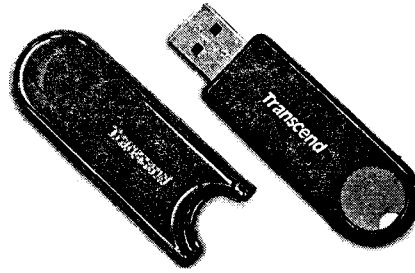


Figure 4.14: USB Flash / Pen drive

Number of questions asked. **1**

Oct.2008– 4M  
Differentiate between Primary and Secondary memory.

### 3.2 Differentiate between Primary and Secondary Memory

	Primary Memory	Secondary Memory
1.	This is also known as Main memory or Semiconductor memory.	This is also known as Auxiliary memory.
2.	The size of main memory is comparatively much smaller than that of secondary memory.	The size of Secondary memory is comparatively larger than that of Primary memory.
3.	It is very fast working memory.	It is slower than that of primary memory.
4.	It is a temporary memory.	It is a permanent memory.
5.	CPU communicates directly with main memory, because of less storage capacity, only the data required for current processing is kept in main memory.	The data must be retrieved from a secondary storage device and placed into RAM before processing can begin.
6.	Primary memory can be classified into RAM and ROM.	Examples are magnetic tapes, floppy disks, hard disks and optical disks etc.



# PU Questions

## 2 Marks

[Oct.2011 – 2M]

1. Write full forms of- EPROM, EBCDIC.

[Oct.2010 – 2M]

2. List Secondary Storage Devices and define any one device.

[Oct.2010 – 2M]

3. Write full forms of: i. ROM ii. PROM.

## 4 Marks

[Oct.2011, 2010 – 4M]

1. Write a note on Hard Disk.

[Oct.2011, 2009 – 4M]

2. What is memory? Explain different types of Memory.

[Apr.2009 – 4M]

3. Write a note on Floppy Disk.

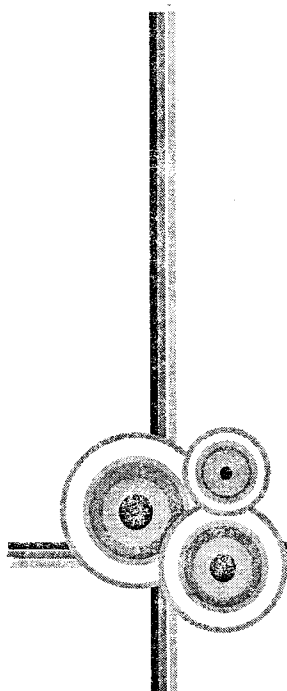
[Oct.2008 – 4M]

4. Differentiate between Primary and Secondary Memory.



# VISION

# **COMPUTER LANGUAGE AND SOFTWARE**



## **1. Introduction**

Ever since the invention of the computer was made, the study of “what” can be done and “how” it can be done has been going on. This study has led to the discovery of many important design methods.

In order to perform a specific task, a sequence of actions have to be performed in a logical order so as to get the desired results.

This logical sequence of steps need to be followed, taking into consideration all possible occurrences and events. An algorithm, which is the fundamental tool in Computer Science for writing a program, is the focus of this chapter. We will study the concept of an “algorithm”, its characteristics and its use in detail.

## 2. Algorithm

2  
Number of  
pages  
suotnes

Oct.11, Oct.10– 2M  
Write the definition of  
Algorithm.

The word “algorithm” has a great significance in computer science. It comes from the name of a Persian author *Abu Ja’far Mohammed ibn Musa al Khowarizmi* (825 A.D.) who wrote a book on mathematics.

It refers to a method that can be used by a computer for the solution of a problem. A lot of research has gone into developing different algorithms for a variety of problems. The choice of a good algorithm affects the efficiency of the program.

### Definition

#### Algorithm

An algorithm is a finite set of instructions that, if followed, accomplishes a particular task.

### Definition

An algorithm is a finite set of instructions that, if followed, accomplishes a particular task.

These instructions are written in a logical order. It is a method that can be used by a computer for the solution of a problem.

### Examples

#### 1. Algorithm: To find the greater among two numbers.

**Step 1:** Start

**Step 2:** Accept two numbers a and b

**Step 3:** If  $a > b$ , then  
Display “a is greater”  
Else  
Display “b is greater”

**Step 4:** Stop.

#### 2. Algorithm: To find the average of 10 numbers.

**Step 1:** Start.

**Step 2:** Assign 1 to count.

**Step 3:** Assign 0 to sum.

**Step 4:** Accept a number num.

**Step 5:** Add num to sum

**Step 6:** Increment count

**Step 7:** If  $\text{count} \leq 10$ , then Go to Step 4.

**Step 8:** Display sum.

**Step 9:** Stop.

## 2.1 Characteristics of an Algorithm

All algorithms must satisfy the following criteria.

- i. **Finiteness:** If we trace the steps of an algorithm, the algorithm must terminate after a finite number of steps for all cases. A related consideration is that the time for termination must be reasonably short.
- ii. **Definiteness:** Each step of an algorithm must be precisely defined, i.e., each instruction must be clear and unambiguous, i.e., it should have a unique meaning.
- iii. **Effectiveness:** Each instruction must be sufficiently basic that it can in principle, be done exactly and in finite time by a person using only paper and pencil.  
*Example:* Add num1 to num2 is an effective operation if num1 and num2 are integers, but if they were real numbers with infinite decimal expansion, the instruction is ineffective.
- iv. **Input:** An algorithm takes zero or more inputs; quantities that are given to it initially before the algorithm begins or dynamically as the algorithm runs.
- v. **Output:** An algorithm generates one or more outputs; quantities that have a specified relation to the inputs.

The first criterion states that an algorithm should contain a finite number of steps. This means that the process must terminate at some point and that the time for termination should be reasonably short. *For example*, let us consider the popular game of chess. In this game, to find the winning move, we have to consider all possible moves and counter moves. In such a case, even the fastest computer will take billions of years to make the decision. Hence, the main concern is the efficiency of the algorithm.

The second criterion is that of definiteness. This means that it must be perfectly clear what should be done. *For example*, steps such as "Multiply a or b with c" is not clear. To ensure this criterion, algorithms are implemented using a programming language. Such languages are designed so that each and every step has a unique meaning.

Criterion three requires the algorithm to be effective. This means that each step must be basic enough. *For example*, integer arithmetic is an effective operation but operations on real numbers is not effective since it may result in infinitely long decimal expansion. Criteria 4 and 5 require that an algorithm should produce one or more outputs and have zero or more inputs that are externally supplied.

Number of questions  
**2**

Apr.10, Oct.08 – 4M/5M

Define an Algorithm.  
State any four characteristics of an Algorithm.





### ► Sample Algorithm

**Euclids Algorithm to find GCD of two positive integers m and n.**

- Step 1:** Start
- Step 2:** Divide m by n and let r be the remainder
- Step 3:** If  $r = 0$ , n is the answer, go to step 5
- Step 4:** Set  $m \leftarrow n$ ,  $n \leftarrow r$ , go to step 2
- Step 5:** Stop

#### *Analysis*

1. **Finiteness:** The above algorithm terminates because after Step 2, r will be  $< n$ . If it is 0, the process terminates. If  $r \neq 0$ , n decreases in Step 4. This decreasing sequence will eventually terminate.
2. **Definiteness:** Since m and n are positive integers, the division operation is sufficiently basic. The instructions will be definite provided that when Step 2 is executed, we must ensure that m and n are positive integers.
3. **Effectiveness:** Since integers can be represented on paper in a finite manner and the division operation is known, the steps are effective.
4. **Inputs:** m and n are two inputs; both taken from the set of positive integers.
5. **Outputs:** There is one output, namely n, in Step 3.

## 2.2 The Importance of Algorithm in Program Design

The importance of algorithms in design of programs cannot be stressed enough. In order to solve a complex programming problem, we cannot start writing the program directly. The first logical step would be to prepare an outline of how the problem can be solved.

The solution has to be specified as a sequence of actions, which have to be performed in a logical order, to get the desired results. These steps have to be written, taking into consideration all possible occurrences and events. This can be written as an algorithm. The algorithm can then be traced to check for errors and whether all possibilities of inputs have been considered or not.

When this is done, it becomes easier to write the program based on the algorithm.



## 2.3 The Study of Algorithms

The study of algorithms is very important branch of computer science. This study includes many active areas of research in algorithms. There are four distinct areas which can be considered:

1. How to devise algorithms?
2. How to validate algorithms?
3. How to analyze algorithms?
4. How to test a program?

Let us consider each one of them in detail.

1. **How to devise algorithms:** Writing algorithms is an art. There are several design techniques which help in designing good algorithms. These design strategies are extremely useful in solving several complex engineering and mathematical problems. Some *examples* are divide and conquer, backtracking, dynamic programming, etc.
2. **How to validate algorithms:** The process of algorithm validation is the process by which it is shown that the algorithm does yield the correct answer for all possible legal inputs. Once the validity of an algorithm has been proved, then the program can be written and the next phase is called program verification.
3. **How to analyze algorithms:** Algorithm analysis is an extremely important aspect of writing an algorithm. Algorithm analysis refers to the task of determining how much computing time and storage an algorithm requires. This is a challenging area and requires mathematical skill. Often, several algorithms can be written for the same task. This study helps in making a comparative study of the algorithms. It is also important to find out the performance of the algorithm in the best case, worst case and average case.
4. **How to test a program:** Once the program is written on the basis of the algorithm, the program has to be tested. Testing is done in two phases: **Debugging** and **Performance Measurement**. Debugging is the process of removing the logical errors made in a program. This is done by executing the program for various sets of inputs and identifying the fault and correcting it.

Performance Measurement is the process of running a correct program on data sets and measuring the time and space the program takes to give the results. This study is important to identify areas of optimization so that the performance can be improved.

## 2.4 Relationship between Data Structures and Algorithms

There is a very intimate relationship between data structures and algorithms. These two should be considered as a unit; both are incomplete without the other.

The use of structured data makes it possible to use better algorithms. *For example*, if we have a list of 'n' students, each having roll number and name,  $(R_1, N_1), (R_2, N_2), \dots, (R_n, N_n)$ . If we want to search for a specific roll number and display the corresponding name, then we would have to search the entire list for the required roll number. This would obviously take a lot of time. However, if we order the list according to roll numbers, then the searching process would be more efficient.

Another way of storing the information would be to have another list which told us where roll numbers beginning with 1, 2, 3, . . . ,9 respectively were. Thus, if we wanted to search for roll number 753, we could directly start searching from the position where roll numbers beginning with 7 are stored, instead of searching the entire list. Thus, by changing the way data is organized, we can use a different algorithm.

Thus, data structures and algorithms go hand-in-hand. For efficient programming, we have to gain mastery of two techniques:

1. The ability to devise different forms of data representations.
2. The ability to write and analyze algorithms, which operate on that data structure.

We have to first decide the data representation and then write the algorithm, which suits the data structure.

## 2.5 Algorithm Design Tools

In the previous sections, we have seen what an algorithm is, what should be the characteristics every algorithm must follow and we have also seen some examples. Let us now turn our attention to different ways of writing algorithms and the design tools that can be used.

*There are several ways to write an algorithm.*

- i. Use a natural language like English.
- ii. Use graphical representations like Flowcharts.
- iii. Use Pseudocode that resembles languages like C and Pascal.

Using a natural language like English is a universally accepted method. However care should be taken to ensure that the instructions are definite. The algorithm design usually starts from general statements which have to be refined subsequently into smaller, more definite instructions.

The use of graphical representations like flowcharts are also popular but they work well only if the algorithm is simple and small.

Pseudocode is a combination of the free style algorithm and the structured nature of a program. It is general purpose and does not depend on any programming language. However, it has a structure, which has to be followed. Thus, the use of pseudocode closely models a program and hence, developing programs from pseudocode is easier.

In the following sections, we will study the Flowchart in detail.

### 3. Flowchart

The use of flowcharts is a very popular method of specifying the solution to a programming problem.

It is a graphical representation of an algorithm. It is a diagrammatic way of specifying the steps to be followed to achieve the desired results.

It is a very effective method of showing the algorithm in a graphical manner. From the flowchart it is very easy to understand the way the process is carried out and to trace the sequence of operations for various inputs. There are a large number of symbols used to depict various instructions. These symbols are interconnected to each other to form a single block of symbols. The process of drawing a flowchart for an algorithm is known as flowcharting.

#### **Definition**

Flowchart is a pictorial or symbolic representation of an algorithm. It shows the flow of the whole process, which includes the data inputs, operations or computations performed, decisions taken and the output generated.

#### **Advantages of using Flowchart**

1. The use of graphical symbols makes it easier to present the solution.
2. The process and data flow can be easily traced for all possible cases.

Number of questions asked. **1**

Oct.2011– 2M

Write the definition of Flowchart.

#### *Definition*

##### **Flowchart**

Flowchart is a pictorial or symbolic representation of an algorithm. It shows the flow of the whole process, which includes the data inputs, operations or computations performed, decisions taken and the output generated.

3. Flowcharts are better way of communicating the logic of a system to all concerned.
4. With the help of flowchart, problem can be analyzed in more effective way.
5. Program flowcharts serve as a good program documentation, which is needed for various purposes.
6. The flowcharts act as a guide or blueprint during the systems analysis and program development phase.
7. The flowchart helps in debugging process.

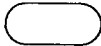


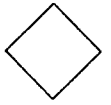
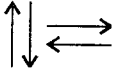
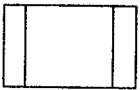
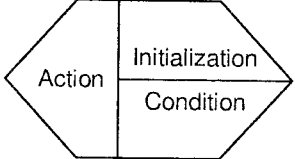
3  
Number of questions

**Oct.11, 08– 4M/5M**  
Draw a symbols used in Flowchart with their name and purpose.

**Oct.2010– 2M**  
Draw any four Flowchart Symbols.

### 3.1 Flowchart Symbols

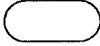
The various symbols used in flowcharts are shown in the chart below along with their meaning.

Symbol	Name	Use
	Terminal	Indicates start and stop of the process.
	Input/Output	Indicates an input or output task.
	Process	Contains Arithmetic or Assignment task.
	Decision	Indicates a condition and two or more alternatives.
	Flow lines	Shows direction of flow of control.
	Module call	Used for calling an external module.
	Loop	This indicates a loop structure.



	Connector	It is used to connect different flowlines or used to show continuity of flowchart on separate pages.
	Block	Indicates a block of statements.
	Multiway selection	Allows selection of one out of many alternatives.

Let us study each one in detail with an *example*.

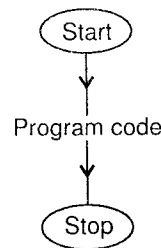
**1. Terminal Symbol** 

This symbol is used to indicate the start and end of a flowchart. Every flowchart has to have one Start and one Stop symbol.

To indicate the beginning of a flowchart, we write “**START**” within the oval as shown. To indicate the end of the flowchart, write “**STOP**” within the oval.

For a module, i.e., function or sub-routine, instead of STOP, we write **RETURN**.

*Example:*



**2. Input-Output** 

Any program accepts certain information from the user when it runs, processes this information and generates some output.

This symbol is used for both, accepting information as well as displaying the output. In many cases, we also have to display certain messages. This symbol is also used display messages for the user.

Example:

Read a, b

Accept n numbers

Display sum

3. **Process** 

A program performs operations on data.

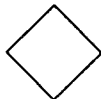
These operations are indicated using the above symbol. The operation is usually an assignment operation, which assigns the value of an expression to a program element.

Example:

Sum = A + B

Assign 1 to N

Compute  $D = B^2 - 4AC$

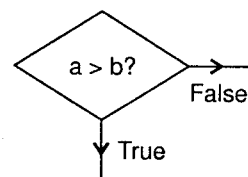
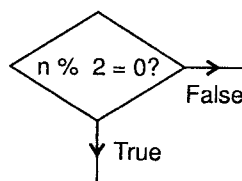
4. **Decision** 

In a program, we may have to check for certain conditions and decide which operations are to be performed if the condition is satisfied or not satisfied. This symbol is used to check for a condition.

There are two paths, which the program may take.

One if the condition is True and the other if it is False. Thus, it is a two-way selection statement. The condition is written within the diamond shaped symbol.

Example:

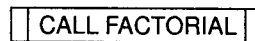


5. **Flow Lines** 

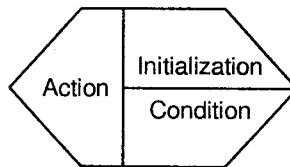
These arrows denote the flow of control. If we start from the START symbol and trace these lines, they should lead to the STOP symbol.

6. **External Module** 

In many cases, a program may invoke or call external sub routines to perform certain operations. The module can be called using this symbol. The name of the module is written within this symbol.




7. **Loop Statement**

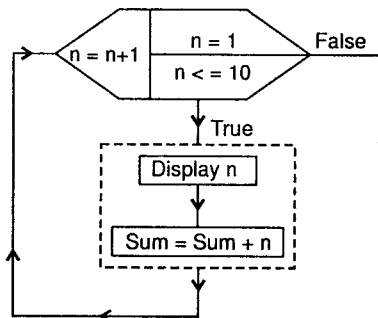


This symbol is used to indicate a loop or a repetitive structure.

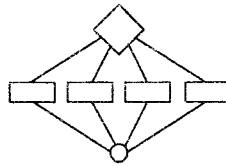
It consists of three parts – the initial value, the termination condition and the action to be performed. This followed by the block of statements are to be repeated. The block will be repeated as long as the condition is True.

The block of statements is enclosed in the symbol: 

*Example:*



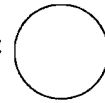




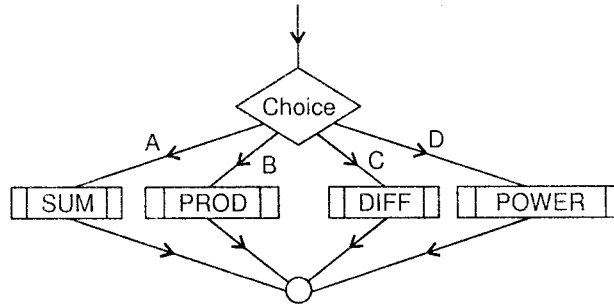
**8. Multiway Selection**

We have seen the two-way selection symbol earlier. If we have to choose between one of many alternatives, then we can use this symbol.

All the choices are finally joined using the connector symbol:



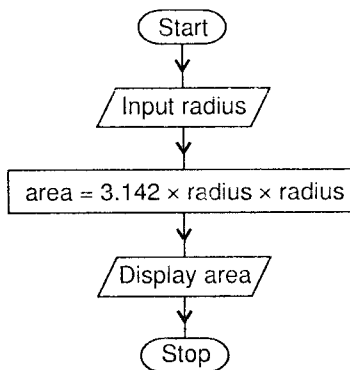
Example:



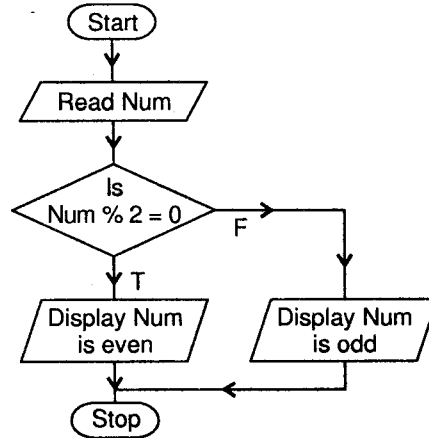
Let us now see some flowcharts using the above symbols.

**Program Flowchart**

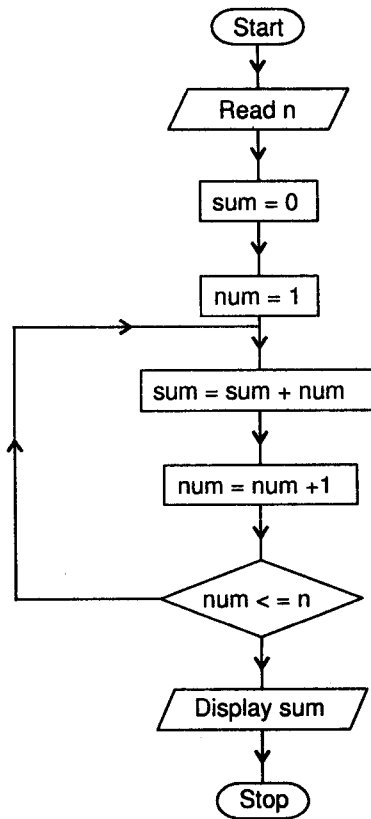
**1. Flowchart to calculate area of a circle.**



2. Flowchart to check if a number is even or odd.



3. Flowchart to calculate sum of first N numbers, i.e.,  $1 + 2 + 3 + \dots + n$



2  
Number of pages  
solved.

Apr. 10, .09– 5M  
State advantages and  
disadvantages of  
Flowcharts.

### Advantages of Flowcharts

1. The use of graphical symbols makes it easier to present the solution.
2. The process and data flow can be easily traced for all possible cases.
3. It is easy to understand the program logic using a flowchart.
4. It is language independent and hence it is a general-purpose tool.
5. Branching (Decision Making) and looping can be easily depicted.

### Disadvantages of Flowcharts

1. Flowcharts are useful only if the algorithm is simple and small.
2. Usually the flowchart runs into several pages.
3. It is difficult to make modifications in a flowchart.
4. The process is time consuming.

### Solved Examples

#### 1. To calculate roots of a quadratic equation.

A quadratic equation is  $ax^2 + bx + c = 0$ .

The roots are calculated as  $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Case 1: If  $a = 0$ , invalid condition.

Case 2:  $b^2 - 4ac < 0$ , roots are imaginary.

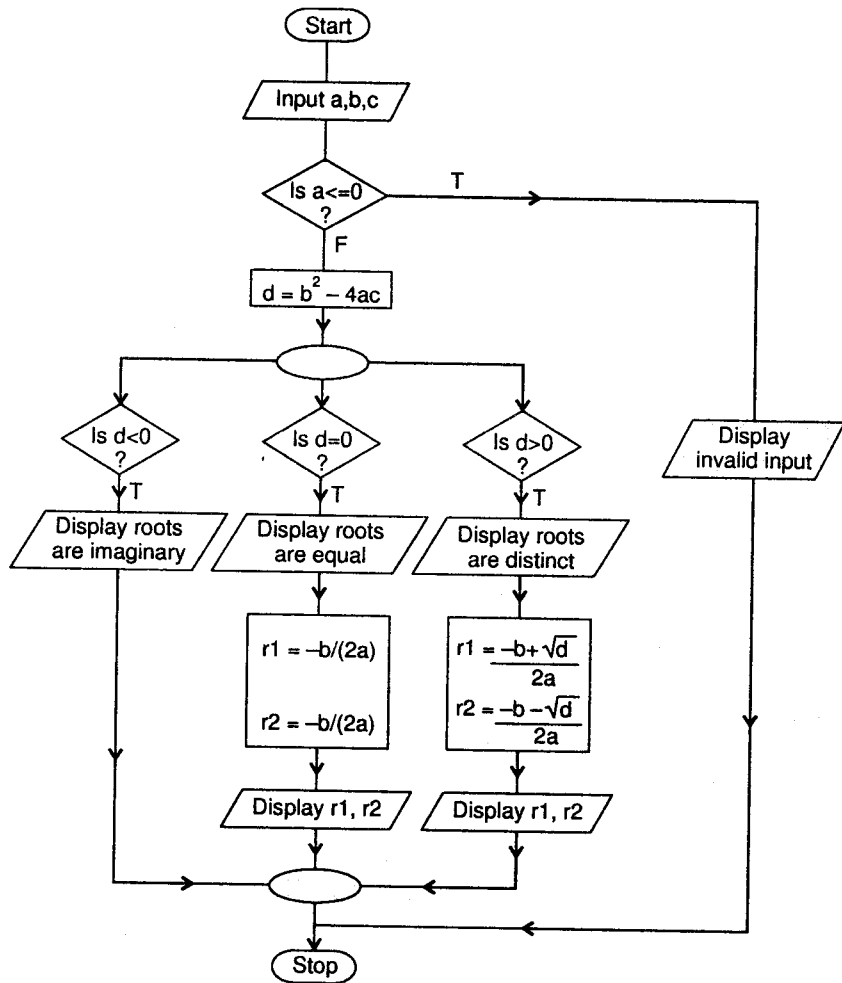
Case 3: If  $b^2 - 4ac = 0$ , roots are real and equal.

Case 4: If  $b^2 - 4ac > 0$ , roots are real and distinct.

#### Algorithm

- Step 1: Start
- Step 2: Input a, b, c
- Step 3: If  $a = 0$ , then  
Display "Invalid"  
goto step 8
- Step 4: Calculate  $d = b^2 - 4ac$
- Step 5: If  $d < 0$  then  
Display "Roots are imaginary"  
goto step 8

- Step 6: If  $d = 0$ , then  
 $r_1 = r_2 = b / 2a$   
 Display  $r_1$  and  $r_2$   
 Goto step 8
- Step 7: If  $d > 0$  then  
 $r_1 = \frac{-b + \sqrt{d}}{2a}$   
 $r_2 = \frac{-b - \sqrt{d}}{2a}$   
 Display  $r_1$  and  $r_2$ .
- Step 8: Stop



1  
Number of questions asked.

Oct.2011- 4M

Draw a flowchart to find the largest of three numbers.

2. Write an algorithm and draw a flowchart to find the greatest among three numbers a, b, c.

The greatest can be found by different methods, one of which is given below.

*Algorithm*

Step 1: Start

Step 2: Input values of a,b,c

Step 3: If a is > b then

Assign a to max

Otherwise

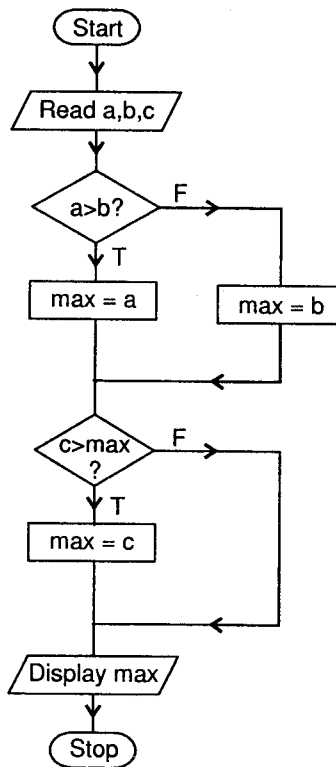
Assign b to max

Step 4: If c is > max then

Assign c to max

Step 5: Display max

Step 6: Stop



**3. To check whether a number is prime or not.**

A number  $n$  is prime if it is divisible only by 1 and itself, i.e., it should not get divided by any number between 2 to  $n-1$ .

*Algorithm*

Step 1: Start

Step 2: Accept number  $n$

Step 3: Initialize prime to 1 (true)

Step 4: Initialize  $i$  to 2

Step 5: If  $i > n-1$ , then

    Go to step 7

otherwise

    If  $n$  is divisible by  $i$

        Assign 0 to prime (false)

        goto step 7

Step 6: Increment  $i$  by 1

    goto step 5

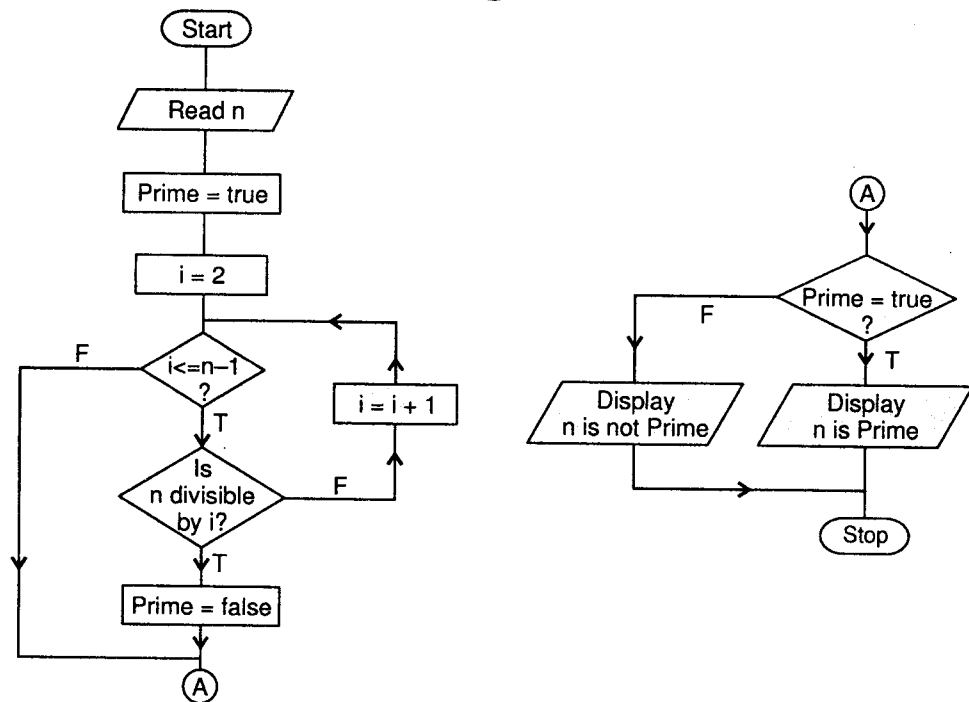
Step 7: If prime is 1

    Display  $n$  is prime

else

    Display  $n$  is not prime

Step 8: Stop



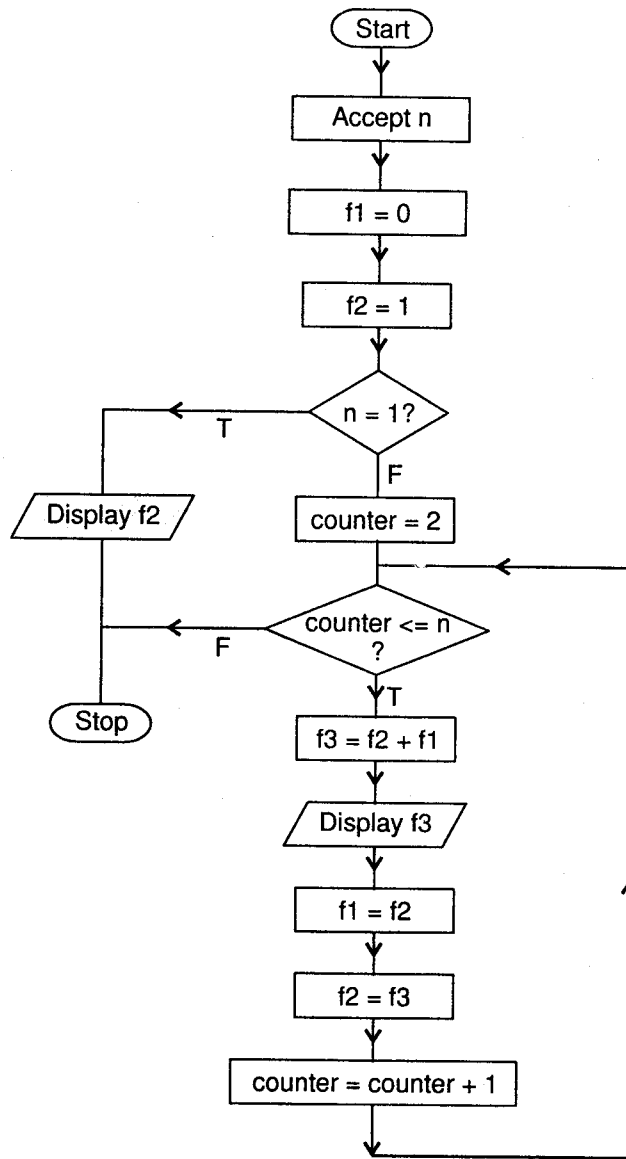
#### 4. Display first n Fibonacci numbers: 1 1 2 3 5 8 ...

A Fibonacci number is obtained by adding the previous two Fibonacci numbers.

##### Algorithm

- Step 1: Start
- Step 2: Accept N
- Step 3: Assign 0 to f1
- Step 4: Assign 1 to f2
- Step 5: If n = 1  
display f2  
goto step 14
- Step 6: Assign 2 to counter
- Step 7: If counter > n, goto step 14
- Step 8:  $f3 = f2 + f1$
- Step 9: Display f3
- Step 10: Assign f2 to f1

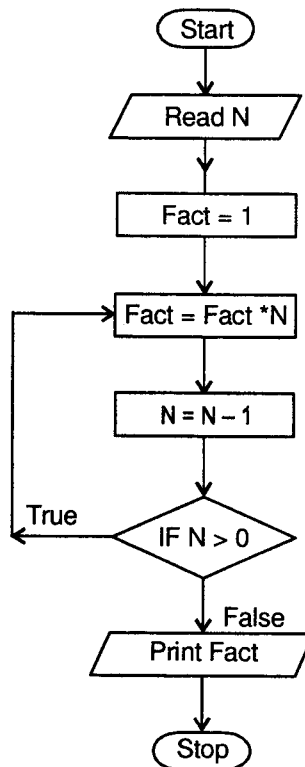
- Step 11: Assign f3 to f2
- Step 12: Increment counter by 1
- Step 13: Go to step 7
- Step 14: Stop



5. Draw a flowchart to find factorial of a number.



1  
Number of questions  
Oct.2010- 4M

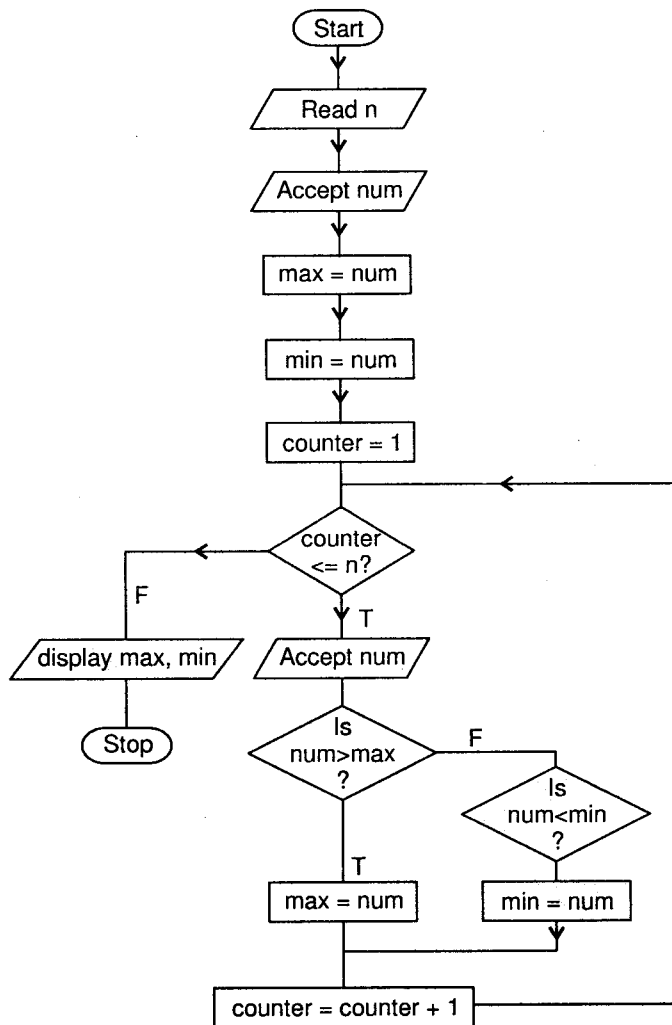


**6. Find the largest and smallest number from n numbers.**

We will accept the n numbers one-by-one. The first number will be the maximum and minimum. The remaining numbers will be compared with this to find the correct maximum and minimum.

- Step 1: Start
- Step 2: Accept n
- Step 3: Accept num
- Step 4: Assign num to max and min
- Step 5: Assign 2 to counter
- Step 6: If counter > n then  
goto step 12
- Step 7: Accept num
- Step 8: If num > max then

- Assign num to max
- Step 9: If num < min then
  - Assign num to min
- Step 10: Increment counter by 1
- Step 11: Go to step 6
- Step 12: Display max and min
- Step 13: Stop



1  
Number of questions asked.

Oct.2011- 4M

1  
Number of questions asked.

Apr.2010 - 5M

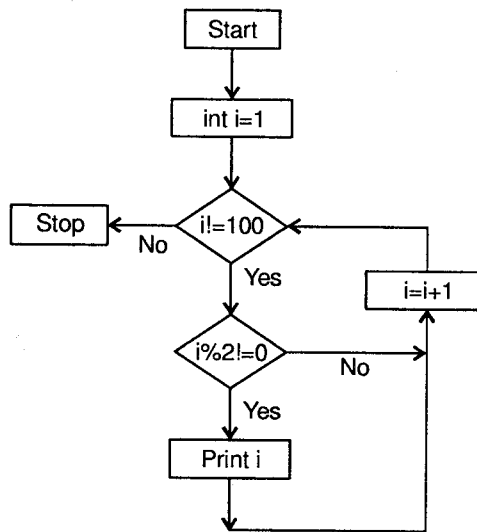
1  
Number of questions asked.

Apr.2010 - 5M

7. Write an algorithm to print the sum of 1 to 10 numbers.

- i. Start
- ii. Take variable A=1
- iii. Display A
- iv.  $A = A + 1$
- v. If  $A \leq 10$ ,  
Then Go to Step 3
- vi. Stop

8. Draw a flowchart of print all odd numbers between 1 and 100.



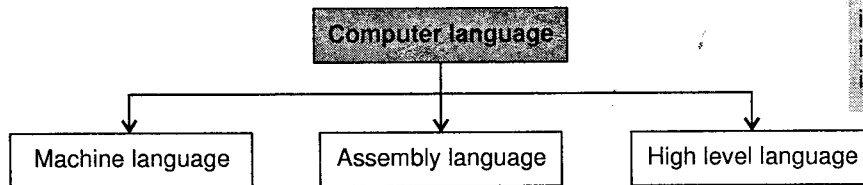
9. Write an Algorithm to find factorial of a number.

- i. Take a number as an input from the user.
- ii. Initialize a variable fact = 1.
- iii.  $Fact = fact * number$ .
- iv.  $Number = number - 1$ .
- v. Repeat step 3 to 5 if  $number > 0$ .
- vi. Print the value of fact variable.

## 4. Types of Programming Languages

A language is a system of communication. A computer language is a system of communication used for communication between computer and people. With the help of computer language, a programmer tells a computer what he wants it to do.

Computer languages are classified into following three categories:



Three types of programming languages

- i. Machine language
- ii. Assembly language
- iii. High level language.

Number of questions asked. **1**

Oct. 2009 – 5M

Explain different types of Programming Languages.

### 4.1 Machine Language

These languages were the earliest languages developed. Features of Low Level Languages are

1. These languages are greatly hardware dependent, i.e., the code has to be written for specific hardware.
2. Programs written on one machine will not run on another (Non-portable).
3. Programmers are required to have knowledge about the hardware as well.

It is one of the earliest language (1940s). All the computers use binary digits (1 and 0) for performing internal operations. Hence, most computers' machine language instructions consist of strings of binary numbers. 1s and 0s indicate the on and off states of electronic circuit of computer hardware. It is also called as low level programming language. These languages are machine dependent or hardware dependent. This is the only language that the computer understands without a translator. It is very difficult to remember the machine language instructions because they are different combinations of 1's and 0's. For programming in machine language, detailed knowledge of hardware is essential.

#### *Advantage*

Since the computer circuits can directly interpret 0 and 1, execution of programs is very fast.

### *Disadvantages*

1. Writing programs in binary is very difficult.
2. It is very easy to make errors during writing or data entry.
3. Debugging is very difficult.
4. There is no distinction between the instruction and operands or data.
5. It is difficult to understand the program logic by looking at the program.

## **4.2 Assembly Language**

These were developed in the 1950s to remove the disadvantage of Machine Language. It is one of the first step in improving the program preparation process. In these languages, small English like words, called **mnemonics** were used for instructions (*For example:* ADD, SUB, etc) and hexadecimal codes were used for data.

Assembly language provided pseudo-instructions in the instruction set for instructing the system how the program needs to be assembled in computer's memory. With this feature, a programmer need not keep track of storage locations of the data and instructions while writing an assembly language program. Therefore, it is a language that allowed instructions and storage locations to be represented by symbols and letters instead of binary numbers which is called symbolic language or assembly language.

This is also machine dependent and vary from CPU to CPU. Programming using assembly language also required detailed knowledge of hardware. The only advantage is its instruction set is in English language like MOV, ADD, SUB, PUSH-----etc. Programs written in this language cannot be directly executed by CPU.

⇒**How this language is accepted by CPU as CPU only works on 1s and 0s?**

CPU cannot understand assembly language mnemonics. CPU only understands binary patterns. Therefore Assembly language mnemonics are converted into corresponding binary patterns. This conversion is done by using another program called as **Assembler**. Assembler is system software supplied by computer manufacturers. The assembler is so called because besides translating, it also assembles the machine language program in the main memory of the computer and makes it ready for execution.

*Figure* shows use of assembler to convert Assembly language mnemonics into binary patterns.

Assembler takes assembly language mnemonics as input and provides corresponding binary patterns to the CPU.

### **Advantages**

1. Writing of programs became easier.
2. Errors were reduced.
3. Identification and modification of errors became easy.
4. There was a distinction between instructions and data.
5. Programs could be easily understood.
6. Had the efficiency of machine language due to one-to-one correspondence between the instructions of an assembly language program and its corresponding machine language program. Hence, only the translation time required by the assembler would be extra.

### **Disadvantages**

1. Because a computer does not understand symbolic language, it has to be translated to machine language.
2. Like machine language, it is also machine dependent.
3. Knowledge of hardware required.

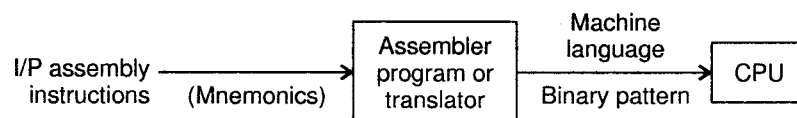


Figure 5. 1

## **4.3 High-level Language**

This language is machine independent or hardware independent. Programming in high-level languages does not require more knowledge of hardware and CPU.

### **High-level languages were developed to**

1. Improve programmer efficiency.
2. Shift focus from the computer to problem solving.
3. Develop portable applications.

Number of questions asked  
**1**

Oct.2008 – 4M  
Explain Machine and High Level Language.

### *Features of high-level languages*

1. Do not require the programmers to know anything about the internal structure of the computer. The programmer might even be completely unaware of the system on which his program will actually run.
2. Use of English-like words for instructions.
3. Support to multiple data-types like characters, integers, real-numbers, etc.
4. Hardware independent instruction set (portability).
5. Programs have to be converted from high-level language to machine language.
6. Conversion is done by special software (compiler or interpreter).
7. One high level language statement is translated into many machine language statements. Therefore it is one-to-many translation.

*Example:* PASCAL, FORTRAN, COBOL, BASIC, JAVA, C, C++.

### *Advantages of High Level Language*

1. **Machine independence:** A program written in high level language can be executed on different types of computers. Hence, the commercial software will have a larger market because the software need not be restricted to one type of computer. Therefore, the time and effort spent on software development will fetch more results.
2. **Easy:** High level languages are easy to learn and use because of their similarity to natural languages used by us. Also, usage of high level languages does not require the programmer to know the internal details of a computer.
3. **Few Errors:** Since compilers and interpreters detect and indicate errors automatically, the programs result in fewer errors and the programmer need not worry about other factors than to concentrate on the logic of the program. The indicated errors can be corrected easily by the programmer resulting in error free programs in no time.
4. **Low cost:** All the phases of program preparation – coding, debugging, testing in high level language require less time and effort than with a machine/assembly language.
5. **Easy to maintain:** Since programs written in high level language are easy to understand, it is easy to locate, correct, and modify instructions whenever desired. Hence, major changes can be incorporated with very little effort.

### *Disadvantages of High Level Language*

1. Programs written in these type of languages have lower efficiency as compared to the machine/assembly language. These programs result in multiple machine language instructions taking more time to execute and also require more memory space. But with the advent of efficient and optimizing compilers, this problem is almost non-existent now.

2. Most of the high level languages do not have instructions or mechanisms to control a computer's memory, CPU, and registers. This lack of flexibility means that some tasks cannot be done or can be done only with great difficulty.

As seen above, advantages of a HLL are much higher than its disadvantages. Therefore, high-level languages are used for writing most programs and assembly languages are used for doing only special tasks.

## 5. Compilers and Interpreters

Programs written in a high level language have to be converted into machine code in order to be executed. The software which does this translation is called a Compiler or Interpreter. Some high level languages use a compiler whereas some use an interpreter.

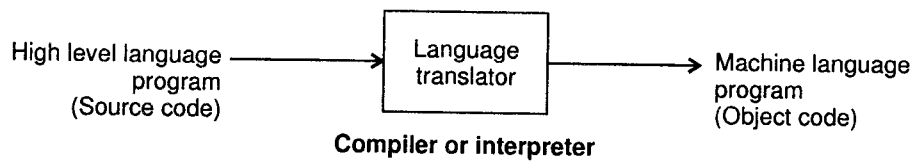


Figure 5.2: Language Translators for High- Level Language

### 5.1 Compiler

A compiler is a program used to translate a high-level language program into machine language prior to the execution of that program. The code (or programming instructions) written in a high-level language is called the source code. The compiler translates this source code into machine language and the resulting code is known as the object code. The object code produced by the compiler can be executed or it can be saved. The saved object code can be executed later as many times as desired.

A compiler is a large program and requires more memory. It reads and translates the entire program into machine codes rather than translating it line by line. It checks for syntax errors and some logical errors before translating the source code into the object code.

*Examples* of high-level languages using compilers as PASCAL, COBOL, FORTRAN, C, etc.



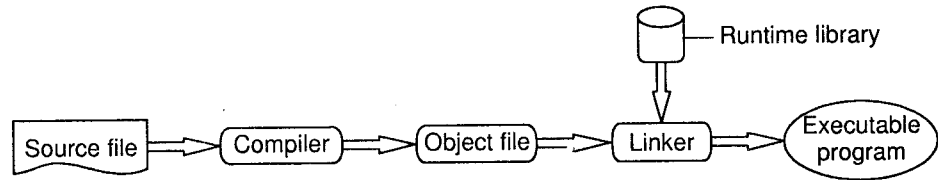


Figure 5.3

## 5.2 Interpreter

An Interpreter is also a system software. It is another type of language translator that is used to translate a high level language program into its machine language equivalent. It translates the source code into machine code line by line and immediately executes the translated line. It means that as soon as first line of the code is translated by an interpreter the control unit executes the resulting object code, then next line is translated and executed, and so on. It makes it a slow process as compared to the compilation. But interpreters are simple to develop and require less memory. Thus it can be used in a smaller system with less memory space.

The object code is not saved in this case. Therefore each and every time the source code is translated and then executed line by line.

Examples of high-level languages using interpreter are BASIC, Smalltalk, etc.

### ► Difference between Compiler and Interpreter

No.	Compiler	Interpreter
1.	A compiler takes the entire program and generates the object code for the program.	An interpreter takes a single instruction of the program, converts it to object code and executes it.
2.	An intermediate object code file is created.	No intermediate file is created.
3.	Once the object code is created, the program need not be compiled every time before execution.	Every time a program is executed, conversion from high level to machine code has to be performed.
4.	A compiled program executes faster especially if the program contains loops.	An interpreter is slower than a compiler.
5.	The compiler is not involved in the execution of the program.	An interpreter also executes the instruction.
6.	There is more memory requirement since object files are created.	Memory requirements are less.
7.	A list of errors is generated after the entire program is checked.	Errors are displayed for every instruction interpreted. Therefore debugging is easier.
8.	PASCAL, C use compilers.	BASIC has an interpreter.

Assemblers, Compilers and Interpreters are also called as *language processors* since they are used for processing language instructions.

## 6. Characteristics of a Good Programming Language

Several characteristics are needed to make a good programming language:

- i. **Natural:** A good programming language should be natural for its use. *For example*, FORTRAN and COBOL are aptly designed for use in scientific and business applications.
- ii. **Simple:** Any good programming language should be simple and easy to use and learn. But the power of the language should not be given up for its simplicity.
- iii. **Efficient:** Programs written in a good language are translated efficiently, and also execute efficiently. They also acquire less space in the memory. Hence, a good programming language comes with a good compiler/interpreter.
- iv. **Extensible:** A good language should allow extensibility through subprogram definition mechanisms.
- v. **Abstract:** A good programming language should allow for abstraction and reusability of the code. Abstraction is the ability to define and then be able to use complex operations or structures whereby allowing its details to be ignored. Higher the degree of abstraction, greater is the ease in programming. *For example*, Object-oriented languages like C++.
- vi. **Compact:** A good programming language is compact in style so that it is more concise in nature and does not lose its readability.
- vii. **Environment suitable:** Language defined for a particular type of application must also be suitable to the environment of the application. For instance, a data-processing language should be operative in batch-mode.
- viii. **Structured programming support:** Programmers should be able to program in a good programming language on the lines of structured programming concepts. This helps in writing, testing and maintaining a program.

### Characteristics of good programming languages

- i. Natural
- ii. Simple
- iii. Efficient
- iv. Extensible
- v. Abstract
- vi. Compact
- vii. Environmental suitable
- viii. Structured programming support.

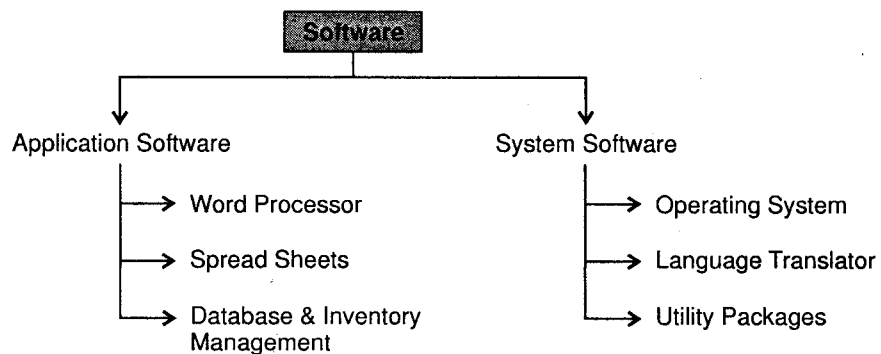
## 7. Software

Software is a general term for the various kinds of programs used to operate computers and related devices. It is a set of programs that is used to operate on data. The term hardware describes the physical aspects of computers and related devices.

A computer needs both, software and hardware for its functioning. Other than software and hardware, there is something called firmware. These are the software (programs or data) that are permanently stored on ROM. Firmware is thus combination of hardware and software.

### 7.1 Classification of Software

Software is often divided into two categories



- i. **Application Software:** Includes programs that do real work for users. It is a software that has been developed to solve a particular problem, to perform useful work on specific tasks, or to provide entertainment.

*For example, the commonly used application softwares are:*

- a. *Editor:* Notepad, Edit.
- b. *Word Processors:* WordStar, WordPad, MS-Word, Lotus Word Pro
- c. *Spreadsheets:* Lotus - 123, MS- Excel
- d. *Database:* dBase, Fox Pro, MS Access, Oracle, etc.
- e. *Presentation:* Power point, free lance graphic

And apart of this the Desktop publishing software, Entertainment and education software also fall under the category of applications software.

The applications such as Edit, WordStar, dbase, Fox Pro, etc, are DOS based softwares Whereas the applications such as Notepad, WordPad, Ms- Word, Word Pro, Ms- Access are Windows based software.

- ii. **System Software:** System Software refers to all the programs which makes the computer work. System software also controls the utilization of hardware resources and enables the application software to run. Without system software, application packages cannot be run on the computer system.

Well, it is the system software that enables the users and application software to interact with the computer and helps the computer to manage its various resources. *It acts as an interface between the hardware of the computer and the application software that users need to run on the computer.*

The system software mainly includes the following:

- i. **Operating system:** It is an integrated set of specialized programs, which is used to manage resources and overall operations of a computer.  
*For example, DOS, Windows, UNIX and Linux are operating systems.*
- ii. **Utility program:** It is a program, which assists in maintaining and improving the efficiency of a computer system.  
*For example, Disk defragmenters, System Profilers, Network Managers and Virus Scanners.*
- iii. **Language translator:** It is a program which translates an Assembly Language Program or high level language program into a machine language code and it also checks for language syntax.  
*For example, Assembler, Compiler and Interpreter.*

#### ► Difference between Application Software and System Software

	Application Software	System Software
1.	These are set of programs which are written to perform a specific task (or a group of related tasks).	System software is the code which makes the computer work.
2.	These programs are designed to suit the needs of the user to perform a particular job.	These programs are provided by the manufacturers along with the computer machine.
3.	The performance of computer is not at all concerned with application software.	The performance of computer system depends to a large extend upon the system software.
4.	Application Softwares are easier to be understood by normal users because they directly deal with the normal real life applications.	But the System Softwares are the software which deals with the system or hardware. <i>For example, Disk Management Tools which are used to partition or format the disk.</i>
5.	<i>Example</i> of application software Word Processors, computer games, etc.	<i>Example</i> of system software Operating system, Language translators, etc.



# PU Questions

## 2 Marks

- [Oct.2011 – 2M] 1. Write the definition of Algorithm.
- [Oct.2011 – 2M] 2. Write the definition of Flowchart.
- [Oct.2010 – 2M] 3. Draw any four Flowchart Symbols.
- [Oct.2010 – 2M] 4. Define Algorithm.

## 4 Marks

- [Oct.2011 – 4M] 1. Draw a flowchart to find the largest of three numbers.
- [Oct.2011 – 4M] 2. Draw symbols used in Flowchart with their name and purpose.
- [Oct.2011 – 4M] 3. Write an algorithm to print the sum of 1 to 10 numbers.
- [Oct.2010 – 4M] 4. Draw a flowchart to find factorial of a number.
- [Oct.2010 – 4M] 5. What is flowchart? Explain characteristics of Flowchart.
- [Oct.2008 – 4M] 6. Explain Machine and High Level Language.

## 5 Marks

- [Apr.2010 – 5M] 1. Explain advantages and disadvantages of Flowcharts.
- [Apr.2010 – 5M] 2. Define an Algorithm. State any four characteristics of an Algorithm.
- [Apr.2010 – 5M] 3. Draw a flowchart to print all odd numbers between 1 and 100. .
- [Apr.2010 – 5M] 4. Write an Algorithm to find factorial of a number.
- [Oct.2009 – 5M] 5. State advantages and disadvantages of Flowchart.
- [Oct.2009 – 5M] 6. Write an algorithm to print numbers in reverse order.
- [Oct.2009 – 5M] 7. Draw a flowchart to check if given number is palindrome.
- [Oct.2009 – 5M] 8. Explain different types of Programming Languages.
- [Oct.2008 – 5M] 9. Describe the symbols used in Flow chart.
- [Oct.2008 – 5M] 10. Define an Algorithm. State any four characteristics of an Algorithm.
- [Oct.2008 – 5M] 11. Draw a flowchart to print sum of digits of a number.
- [Oct.2008 – 5M] 12. Write an Algorithm to print Multiplication Table of a given number.



## 1. Introduction to O.S.

A computer system can be divided roughly into 4 components: hardware, operating system, application programs and the users.

- i. **The hardware:** CPU, memory, input output devices provide the computing resources.
- ii. **The application programs:** Word processors, spreadsheets, and web browsers define the way in which these resources are used to solve the computing problems of the users.
- iii. **The operating system:** Controls and coordinates the use of the hardware among the various application programs for the various users.
- iv. **Users:** Include people, machines and other computers.

### ***Definition***

1. An operating system is a program that acts as an intermediary between a user of a computer and the computer hardware. It manages the computer hardware.
2. An operating system is a layer of software whose job is to provide an environment in which a user can execute desired program.

The main purpose of an operating system is thus to make the computer system convenient to the end user.

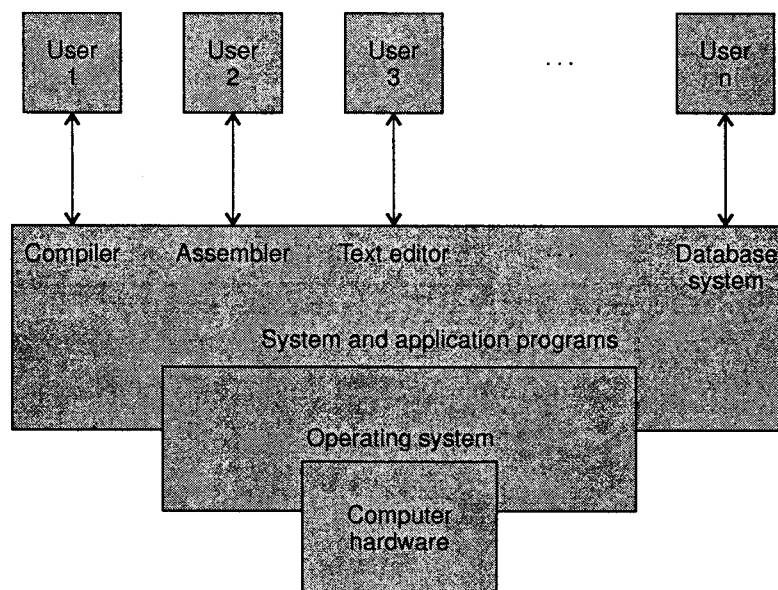


Figure 6.1: Components of a Computer System

The hardware, the CPU (Central Processing Unit), the main memory, and the I/O (Input/Output) devices provide the main computing resources. The application programs such as database system, business program define the ways in which these resources are used to solve the computing problems of the users.

Operating system is the most important program that runs on a computer. Every general purpose computer must have an operating system to run other programs. If you have any hands-on experience on a computer, you know the operating system must be loaded and activated before you can accomplish other task. This emphasizes that operating systems are the most indispensable component of the software interface between users and the hardware of their computer systems.

Operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers.

The operating system controls and coordinates the use of the hardware among the various applications programs for the end users. It plays an important role in managing CPU time, memory space, files storage space, I/O devices and many other resources and allocates them to specific programs and users as necessary for tasks.

An operating system is a control program. A control program controls the execution of user programs to prevent errors and improper use of the computer. An operating system may be viewed as an organized collection of software extension of hardware, consisting of control routines for operating a computer and for providing an environment for execution of programs. Other programs rely on facilities provided by the operating system to gain access to computer system resources, such as files and I/O devices.

The primary purpose of an operating system is to maximize the productivity of a computer system by operating it in the most effective manner and minimizing the amount of human intervention required. An operating system also simplifies the job of computer programmer, since it includes programs that perform common input/output and storage operations and other standard processing functions.

Many operating systems are designed as a collection of program modules, which can be organized in combination with various capabilities around a central module, or kernel. Such operating systems can be tailored to fit the processing power and memory capability of a computer system and the type of processing jobs that need to be done on it. *For example*, some operating system package includes a selected number of utility programs, language translator programs (compilers and interpreters), and even some application programs. *Examples* of popular microcomputer operating systems are Ms-Windows, Ms-DOS, OS/2 for PCs and Mc OS for Apple computers, etc. Some *examples* of operating systems for minicomputers are UNIX, OS/400, etc. An *example* of an operating system for a mainframe is MVS.

Operating systems vary in complexity from those that support single user microcomputers to those that handle multi-user mainframes. Their complexity depends on the computer system's size and scope, together with the type of performance provided to its users. A single stand-alone microcomputer will have a relatively simple operating system, whereas a mainframe that supports hundreds of users accessing the system simultaneously will have one that is far more complex. The memory requirements and features included, however, vary greatly across operating systems. Some take up less than one megabyte of space and lack even a full screen editor, whereas others require hundreds of megabytes of space and include spell checkers and entire window system.

Hence, an O.S. can be summarized as an integrated set of programs that controls the resources of a computer system and provides its users with an interface that is easier to use.



## 2. Evolution of Operating System

The first computers used batch operating systems, in which the computer ran batches of jobs without stop. Programs were punched into cards that were usually copied to tape for processing. When the computer finished one job, it would immediately start the next one on the tape.

Professional operators, not the users, interacted with the machine. Users dropped jobs off and then returned to pick up the results after their jobs had run.

This was inconvenient for the users, but the expensive computer was kept busy with a steady stream of jobs.

In the 1960s, time-shared operating systems began replacing batch systems. Users interacted directly with the computer via a printing terminal like the Western Electric Teletype shown here.

Several users shared the computer at the same time and it spent a fraction of a second on each one's job before moving on to the next. A fast computer could work on many user's jobs at the same time, while creating the illusion that they were receiving its full attention.

Printing terminals required that programs had character or Command-Line User Interfaces (CLI), in which the user typed responses to prompts or typed commands. The interaction scrolled down a roll of paper.

Printing terminals were later replaced by video terminals that could only display fixed size characters. Some could be used to create forms on the screen, but many simply scrolled like a "glass teletype."

Personal computers became affordable in the mid 1970s. The Altair 8088, shown here, was the first commercially viable personal computer marketed to individuals. Beginning in January 1975, the Altair was sold to hobbyists in kit form. The Altair did not have an operating system, since it had only toggle switches and light-emitting diodes for input and output.

People soon connected terminals and floppy disk drives to Altair's. In 1976, Digital Research introduced the CP/M operating system for the Altair and computers like it. CP/M and later DOS had CLIs that were similar to those of the time-shared operating systems, but the computer was dedicated to a single user, not shared.

As hardware prices fell, personal computers with bit-mapped displays that could control individual pixels were developed. These made personal computer with graphical user interfaces (GUIs) possible.

The first commercial success was the Apple Macintosh which was introduced in 1984. The initial Macintosh pushed the state of the hardware art and was restricted to a small, monochrome display.

As hardware continued to evolve, larger, color Macs were developed and Microsoft introduced Windows, their GUI operating system.

The Macintosh operating system was based on decades of research on graphically-oriented personal computer operating systems and applications.

Ivan Sutherland's pioneering program Sketchpad in the early 1960s. Sketchpad foreshadowed many of the characteristics of a modern GUI, but the hardware cost millions of dollars and filled a room. After many generations of research projects on large computers and improvement in hardware, the Macintosh became economically feasible.

Research prototypes like Sketchpad are still being developed at universities and in research labs. They will form the basis of future products.

### 3. Functions of Operating System

- 1. User Interface:** The most popular function of the O.S. is to provide an environment for the user to work with the computer. It acts as an interface between the user and the computer. The O.S. should provide a User Interface which could be Command Line or Graphical.
- 2. Command Interpretation:** The O.S. interprets the user commands and directs system resources to execute the commands. The end-user, therefore, is not much concerned about the basic hardware functioning of the system.
- 3. Resource Management:** The operating system is a resource manager and has total control of all resources. It controls the flow of data from input devices and to output devices. It also manages the entire network and communication tools. It also manages the CPU time, determines which resource is needed for which application, prioritizes it and allocates them to keep a smooth flow of data and information.  
  
When the user wants to run application programs, the O.S. should identify the priorities, determine whether appropriate resources are available and allot the resources at the appropriate time.
- 4. Memory Management:** The Operating System has to manage the main (primary) as well as the usage of the secondary memory devices like floppy, hard disk, CD-ROM, etc. It takes care of allocation and de-allocation of memory space to programs in need of this resource.
- 5. File Management:** The O.S. also manages filing activities like storage, retrieval, naming, organization, sharing and even their protection.

Number of pages  
1

Oct.2011- 4M

What is Operating System? Give any two functions of Operating System.

6. **Process Management:** The O.S. performs creation, deletion and scheduling of system resources to different processes requesting them. It also synchronizes and communicates between processes.
7. **Security:** The O.S. has to ensure that data and application are secure. This is done by user logins and passwords, assigning rights to files. Making some files read-only or hidden files providing appropriate warnings and security messages, etc.
8. **Accounting Resource Usage:** The O.S. logs memory usage so that the amount of free and occupied memory can be known.
9. **Providing Utilities and Services:** The O.S. provides services that the user can use to control the system. These services include File Services which enables the user to copy, move, delete, rename files, System services to check the secondary disks for errors etc.

## 4. Types of Operating Systems

2  
Number of questions asked

Oct.2008 – 5M

Explain in short different types of Operating System.

Oct.2009 – 4M

Define Operating System. Explain different types of Operating Systems.

When operating system is viewed as resource manager, its functions include multiplexing or sharing resources in two ways: in time and in space.

1. When a resource is time multiplexed, different programs or users take turns or time slots using it. Determining how the resource is time multiplexed – who goes next and for how long – is the task of operating systems.
2. In space multiplexing, instead of customers taking turns, each one gets part of resource. *For example*, main memory can be divided into several running programs, so each one can be resident at the same time. It is more efficient to hold several programs in memory at once rather than give one of them all of it, especially if it needs a small fraction of the total.

### 4.1 Batch Operating Systems

Running of several computer programs one after another without the need of human intervention to run each program individually is called batch processing.

A batch operating system accepts jobs and places them in a queue for execution. These jobs are executed on a First-In-First-Out-basis. Jobs may also be assigned priorities in which case they will be executed on the basis of their priorities. When the CPU time is available, these jobs are executed serially. The O.S. has to keep track of the resources allocated to each job.

This method of execution is often time consuming since until one job is processed, the next has to wait. This results in inefficient utilization of resources. To speed up processing, jobs with similar needs were batched together and were run through the computer as a group.

### **Example**

If a job is a printing job, the CPU will remain idle till the printing job is over.

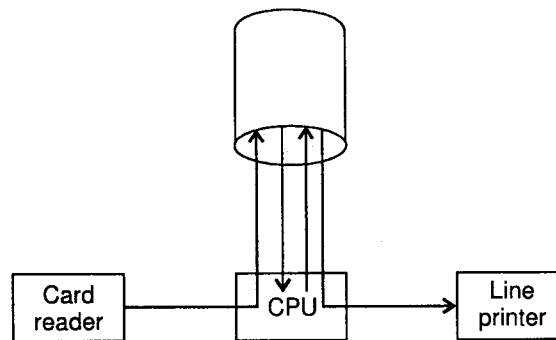
To facilitate batch processing of control statements Job Control Languages (JCLs) were introduced. Control statements were used by OS to identify a new job and its resources required, for execution. These statements were written in JCL. Hence each program, besides the program itself has a set of instructions called JCL instructions which help the user to identify the job.

Batch operating system was popular in mainframe computers of 1960s primarily used for computations in science and engineering.

Spooling, an acronym for *Simultaneous Peripheral Operation On-line*, uses the disk as a huge buffer, for reading as far ahead as possible on input devices and for storing output files until the output devices are able to accept them. The Spooling is also used for processing data at remote sites.

The CPU sends the data via communications paths to a remote printer. The remote processing is done at its own speed, with no CPU intervention. The CPU just needs to be notified when the processing is completed, so that it can spool the next desired batch of data.

The Spooling overlaps the I/O of one job with the computation of other jobs. Even in a simple system, the spooler may be reading the input of one job while printing the output of a different job. Spooling has a direct beneficial effect on the performance of the system. For the cost of some disk space and a few tables, the computation of one job can overlap with the I/O of the other jobs. Thus, spooling can keep both the CPU and the I/O devices working at much higher rates.



**Figure 6.2: Spooling in Batch Processing**

## 4.2 Multiprogramming

Multiprogramming is the capability of the CPU to execute more than one programs concurrently. Multiple programs are loaded into the main memory and the CPU allocates resources to each of them (i.e., a different resource to each) and it monitors the activities. When any resource becomes free, it is given to another program that requires it.

Multiprogramming operating systems succeeded batch operating systems. In this new O.S. a number of programs belonging to different users are kept at the same time in distinct areas in the main memory along with the monitor O.S.

This method requires more memory and extensive management. Appropriate security measures have to be taken to prevent overwriting of data or wrong inputs to a program.

### *Example*

The UNIX O.S supports multiprogramming.

All the jobs that enter the system are kept in the job pool. This pool consists of all processes residing on mass storage awaiting allocation of the main memory. If several jobs are ready to be brought into memory, and there is not enough room for all of them, then the O.S. must decide which of these ready jobs should be allocated to CPU for execution. Making this decision is called *job scheduling*. Multiple jobs running concurrently require that their ability to affect one another be limited in all phases of the operating system; including process scheduling, disk storage and memory management.

To increase resource utilization, actual multiprogramming system usually allows more than two programs to compete for system resources at any time. The number of programs actively competing for resources of a computer system is called the degree of multiprogramming. Actually the higher degrees of multiprogramming should result in higher resource utilization.

A single user cannot, in general, keep either the CPU or the I/O devices busy all times. Multiprogramming increases CPU utilization by organizing jobs such that the CPU always has one to execute. We can also display the multiprogramming in the following *figure*.

In multiprogramming system it is necessary to prevent a process from writing in areas of memory occupied by another program. For this reason, specific areas in memory are reserved for each program. Also, the program is provided with a *protection lock* by the hardware. A process is allowed to write in area of memory only if its key fits the protection lock. This hardware the *memory protect feature*.

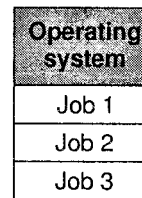


Figure 6.3: Memory Layout of Multiprogramming system

### ► Requirements of Multiprogramming

Multiprogramming systems have better throughput as the CPU idle time is reduced considerably. But this system requires following additional hardware and software features:

1. **Larger memory:** Multiprogramming requires large main memory to accommodate large number of user programs along with operating system.
2. **Job status preservation:** A multiprogramming operating system maintains a *process control block* (PCB) for each loaded process. Before taking away CPU from a running process and giving to another job, its status is preserved in its PCB. The status is restored back before the process resumes execution when CPU is given to it again later. Hence, the process can continue execution without any problem.
3. **Adequate job mix:** There should be the right mix of I/O-bound and CPU-bound jobs so as to overlap the operations of CPU and I/O devices effectively. The objective is to ensure that at least one job is always available to utilize the CPU.
4. **CPU scheduling:** In a multiprogramming operating system, often there are many jobs waiting for CPU allocation, but the O.S. must decide which of those ready jobs should be allocated to the CPU for execution. CPU *scheduler*, a part of the operating system, takes this decision and the algorithm used for it is called *scheduling algorithm*.
5. **Memory protection:** Multiprogramming should not allow a job in one memory partition to change another job's program/data in another partition. This is called as memory protection and is done with the help of hardware and software protection mechanism. This mechanism restricts one job from addressing beyond the limits of its own allocated area.

## 4.3 Multitasking

Although multiprogramming and multitasking may look technically the same, the former is used for multi-user systems like mainframes and server-class systems; the latter is used for single-user systems. Both multiprogramming and multitasking are performed by uniprocessor systems (having only one CPU).

Under multitasking operating systems more than one task is loaded in the main memory. These tasks share CPU time. Every program is assigned a fixed period of time called **time slice**. The CPU allocates resources to a program for that period of time after which it switches to another program. However, since switching is done very fast, it gives the feel of multiple programs running concurrently.

The control is given to programs usually in a round robin manner. However priorities can be assigned to each program with the higher priority program being given more time slices.

#### *Example*

Windows 9x uses multitasking.

## **4.4 Multiprocessing**

Multiprocessing involves simultaneous execution of several program segments of the same or different programs.

Multiprocessing systems are of two types namely, *tightly-coupled systems* and *loosely-coupled systems*. In tightly-coupled systems, there is a single primary memory shared by all processors while in loosely-coupled systems, the processors do not share memory, and each processor has its own local memory.

Multiprocessing systems are better performing, i.e., have a shorter response time and higher throughput, and are more reliable than single-processor systems. If one of the processor breaks down, the other processors take over the system workload automatically until the faulty processor is repaired. Therefore, a complete breakdown of such systems can be avoided. But, these systems have higher initial cost and their regular operation and maintenance is higher than the single-processor systems.

Under multiprocessing, a single program is processed by multiple CPUs, called multiprocessor systems. These systems execute multiple processes concurrently. These systems either process instructions from different and independent programs or different instructions from the same programs simultaneously.

#### *Example*

In the IBM PC, all mathematical computations are done by a math coprocessor. Similarly, in some cases, graphics and multimedia is handled by a separate processor.

## 4.5 Multithreading

Under this scheme, different parts of a single program are run concurrently. The program is divided into independent streams of execution called *threads* which are then run at the same time. All the threads are owned by a single user.

Reasons for using a multithreaded process instead of single-threaded process are as follows:

1. The overheads involved (*For example*, creating address space) in creating a new process is quite higher than that for creating a thread within a process.
2. Due to the sharing of resources of O.S. and address space among the threads of a process, the overheads involved in CPU switching among peer threads is much lesser than that in the case of processes having their own address spaces. Therefore, the threads are called *lightweight processes* and the processes are called as *heavyweight processes*.

### *Example*

Window 9x uses multithreading

## 4.6 Real-Time

There are operations in which a computer is expected to control the operation of a physical system. Hence, the control has to be exercised during the actual functioning of the system. Real-time O.S have to work within strict time limits for critical jobs. Real time systems are required to be highly reliable as any failure could be disastrous. Some real time applications are temperature control, space applications, monitoring systems, etc.

### *Examples*

RTOS is a real time multitasking O.S

## 4.7 Multi-user Operating System

Some systems allow multiple users to work at the same time. Usually, each user works at a terminal connected to the main computer. The computer is usually mainframe or minicomputer.

The O.S assigns each user a portion of the RAM. Thus O.S switches between users in a time-sharing manner.



The O.S. has to have a very large RAM; it must keep track of the memory area of each user, authenticate users and protect their data,

The advantage is that many users can gain access to central data.

### *Example*

Staff of a company can access the central database of the company and view records.

## **4.8 Time Sharing System**

It is a mechanism to provide simultaneous interactive use of a computer system by many users in such a way that each one feels that he is the sole user of the system. This technique involves the use of multiprogramming with a special CPU algorithm.

A time sharing system has many terminals connected to a single computer at the same time which enables multiple users to connect to the system simultaneously. Multiprogramming allows multiple programs to reside in the main memory simultaneously and the special CPU algorithm meant for time sharing allocates a short period of CPU time to each user process. This time period is called as time slice or quantum. The process uses the CPU until the time slice expires, or it completes its execution during this period.

A time sharing system needs a relatively large memory to perform multiprogramming. Although time sharing systems are a little complex, they help reduce the CPU idle time and ensure quick response time to all users.

### ► **Requirements of Time Sharing System**

1. A number of terminals should be connected to a system simultaneously for multiple users to use it simultaneously in an interactive mode.
2. Large memory is required to support multiprogramming.
3. Memory protection mechanism to protect one job's instruction and data from the other.
4. Job's status information should be preserved when CPU is taken away from it, and restoring this information back, when CPU is given to it again.
5. A CPU scheduling algorithm to allocate CPU for a short period to each user process in a circular manner.
6. An alarm clock mechanism to send an interrupt signal to CPU after every time slice.

► **Advantages of Time Sharing System**

1. These systems help in reducing CPU idle time and, in turn, provide increased system throughput.
2. The special CPU scheduling algorithm used in a time-sharing system ensures quick response time to all users. This helps in making interactive programming and debugging much simpler.
3. Small users can gain access to more sophisticated hardware and software than they could otherwise afford.

## **5. Windows Operating System**

### **5.1 Microsoft Windows**

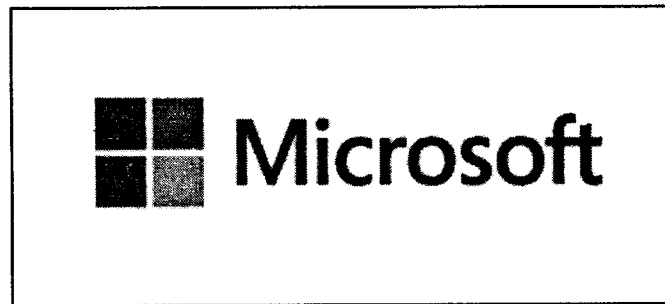


Figure 6.4

**Microsoft Windows** is a series of graphical interface operating systems developed by Microsoft.

Windows based operating systems provide graphical user interface. It means that the user interacts with the computer through graphical images (icons) rather than by typing commands. First Windows 3.X is developed by Windows O.S.

It was an operating environment, not an operating system. Windows 95 and 98 are later versions that are true operating systems. The latest service packs for Microsoft Windows includes Windows 2000, Windows XP, Windows Vista , Windows 7 and Windows 8.

## 5.2 Features of MS-Windows

1. **Graphical User Interface:** The Graphical-User Interface (**GUI**) is a type of user interface which allows the users to interact with a computer system by the help of graphical objects (icons), menus, buttons, etc.

Clearly it is the easiest way to interact with the computers. GUIs relieve the user from remembering and typing long and complex commands. They provide a more user-friendly environment.

The Graphical-User Interface (GUI) requires less amount of typing for routine jobs. A mouse is more commonly used with the GUI. The user of the computer utilizes a pointing device, like a mouse, to manipulate these icons and controls. This is considerably different from the Command Line Interface (CLI) in which the user types a series of text commands to the computer (as in the case of DOS and UNIX).

2. **Consistent User Interface:** All the applications which run under the Windows environment have the same look and feel. Hence it is easy to use different applications.
3. **Multitasking:** This O.S. provides the facility of opening multiple applications at a time. The O.S. manages the resources like CPU, memory, peripheral devices for all the open tasks. A user can switch from one task to another.
4. **Data sharing between applications:** The Windows O.S. provides a very important facility of transferring data from one application to another.

This allows a user to insert pictures into a text based document, put graphs, charts in reports, etc.

5. **WYSIWYG (What You See Is What You Get):** This means that the printed document will look exactly as it is seen on the screen. This allows a user to create attractive documents, reports, create graphical images, etc.
6. **Other Utilities:** The Windows O.S. provides a set of utilities which help the user in managing files and hardware, provide help on all the features and applications, provide accessories like calculators, etc. to improve efficiency. These utilities are: Windows Explorer, Accessories, and Control Panel, etc.

## 6. Components of the Windows O.S.

### 6.1 Desktop

In the Windows O.S., a user sees and interacts with set items on the screen. The *desktop* is the entire screen area containing various objects (Icons, Windows, etc.)

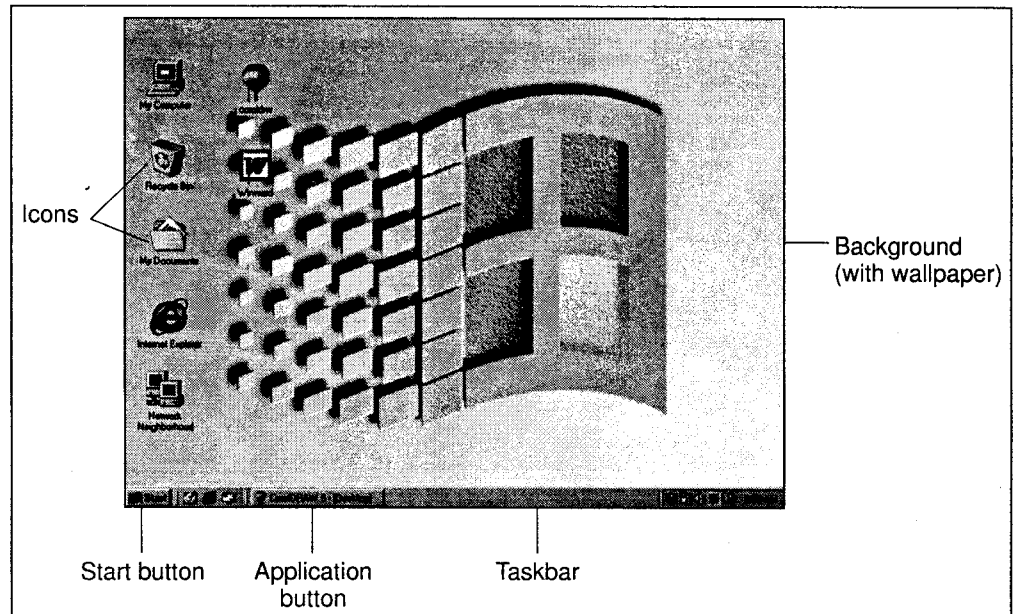


Figure 6.5: Desktop

The user can change the desktop settings like background, color scheme, resolution, text appearance, etc. It can be done by right clicking the mouse and selecting Properties or by selecting Start → Settings → Control Panel → Display.

## ► The Display Properties Dialog Box

This dialog box allows a user to customize the desktop and specify the way various components on the desktop should look.

Background tab	To set a wallpaper or a pattern as the background for the desktop.
Screen saver tab	A screensaver is a program that is activated when the computer is idle for a long period of time. This tab allows setting of a screensaver.
Appearance tab	To change the way items on the desktop look. Standard schemes can be used or the user can specify his own color scheme for various elements on the desktop.
Effects tab	To change the appearance of a desktop icon, change visual settings for the desktop.
Web tab	To add web content to the desktop.
Settings tab	To change screen resolution, screen area, colors and advanced monitor settings.

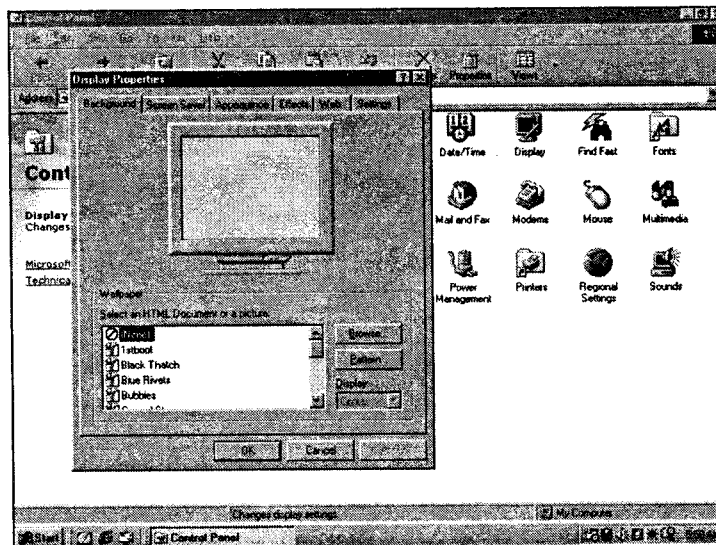


Figure 6.6: Display Properties













## 6.2 Icons

Icons are pictures that represent

- i. Parts of the computer like printers, files, directories, disk drives, etc.
- ii. Software applications.

A user interacts with one of them by activating or selecting the corresponding icon with the help of a mouse. Icons are displayed on the desktop as well as in tool bars, menus and taskbar.

*Some of the default icons are*

Icon	Represents	Description
	My Computer	Displays computer's contents.
	Recycle Bin	Recycle Bin is a storage place for deleted files. They can be viewed or undeleted.
	Network Neighborhood	If the computer is connected to a network, network configuration and resources can be seen.
	CD ROM Drive	Displays contents of CD-ROM disk.
	Folder	Represents a directory which can contain files and other folders.
	Program group	Represents an executable file
	Program File	Represents an executable file
	Printer	Represents Installed Printers
	Mouse	Represents a mouse
	File	Represents a text file
	Word File	Represents a Word Document
	DOS Application	Represents a DOS executable file

## 6.3 Taskbars and Start Menu

When the Windows O.S. starts, the desktop contains a horizontal bar at the bottom (task bar).

This taskbar contains a button called *Start* which, when selected, displays a menu (list of choices) called start menu.

The start menu contains an option called Programs. On selecting this option, a submenu is displayed. This submenu contains a list of software applications.

**Note:** An application can be started either by double clicking its icon from the desktop (if it is present) or by selecting Start → Programs → Application name.

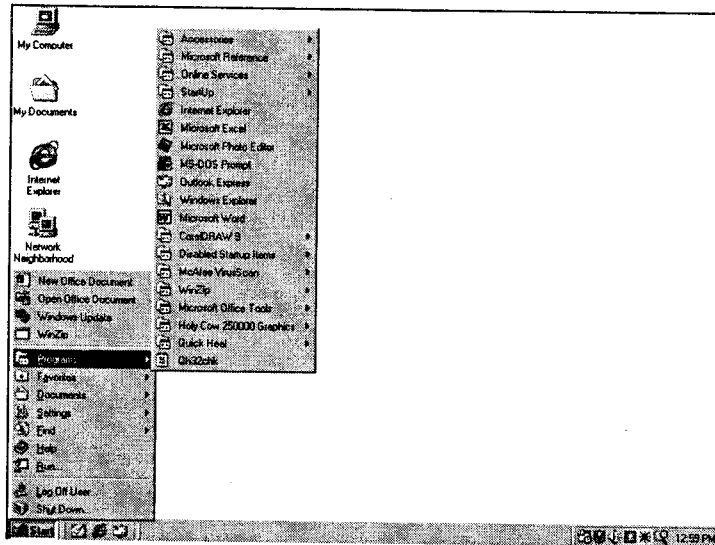


Figure 6.7

1. **Taskbar:** Taskbar is horizontal bar appearing at the bottom of the screen and contains Buttons representing programs currently running on the computer. It contains a Start button on its extreme left. On the right hand corner, it contains the icons of other utilities that are currently running in the machines.

When an application is opened, a button for that program appears on the taskbar. This button disappears when the application is closed.

2. **Start Menu:** This button is located on the extreme left of the taskbar. When you click the start button, a cascading menu appears on the screen. Using this, we can begin using Windows.

This menu consists of the following items.

Programs	Displays a list of applications that can be opened.
Documents	Displays a list of documents that have been recently accessed.
Settings	Displays a list of system components for which settings can be changed.
Find	Enables a user to find a file, folder, computer on the internet, mail message.
Help	Starts the help application, which provides documentation about Windows.
Run ...	Starts a Program or opens a folder.
Shut Down ...	Shuts down or restarts the computer.

### 6.4 Application Window

Since Windows is a Multitasking O.S., many applications can be opened simultaneously. Each application is represented on the desktop as a “window”. The structure of the window is the same for all applications.

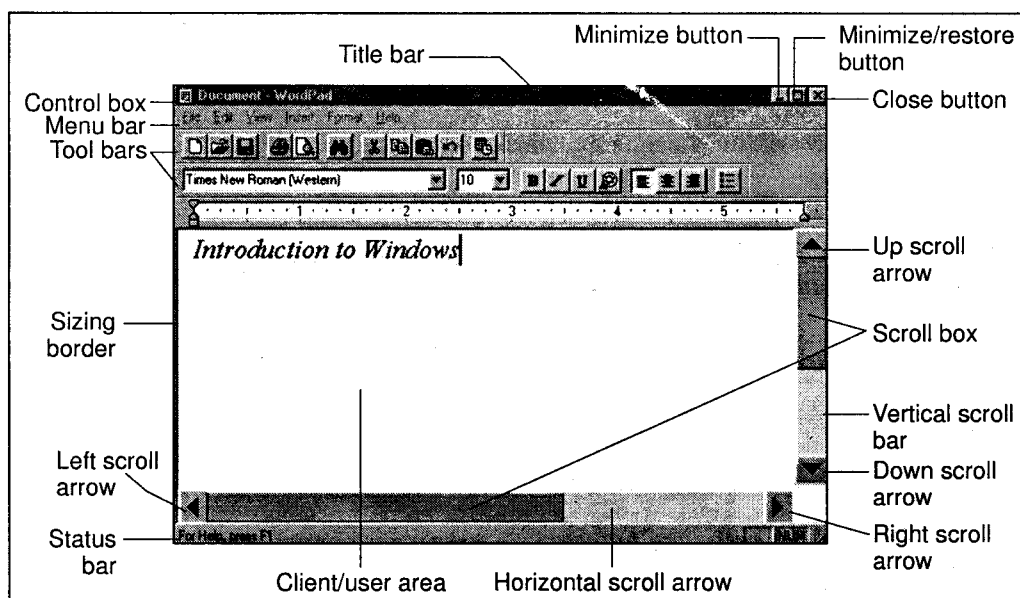


Figure 6.8

The various components are

- i. **Title Bar:** This is at the top of the window and it displays the name of the application. It's color suggests whether the application is currently active or inactive.



- ii. **Menu Bar:** It is placed below the title bar and provides a horizontal list of options (which can be selected using the mouse or the Alt button). On selection of a menu option, a submenu is displayed.
- iii. **Control Box:** This is on the top left corner of the window and provides a menu when clicked.

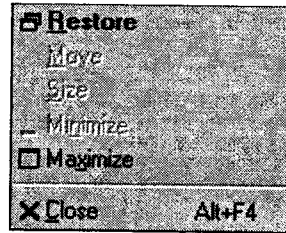


Figure 6.9: Control Box

*Its options are*

1. **Restore:** To bring the window to its original size if the window is enlarged.
  2. **Move:** To move the window to any location on the desktop.
  3. **Size:** The size of the window can be changed as per the requirements. The sizing border can be used for this purpose.
  4. **Minimize:** If a user does not want to work with a particular window, it can be minimized in order to reduce the number of open windows on the desktop.
  5. **Maximize:** This option expands the window to fit the desktop area.
  6. **Close:** An application can be closed when execution is to be stopped.
- iv. **Minimize, Maximize/ Restore, Close Buttons:** This appear on the top right corner and perform the same functions as those in the control box.
  - v. **Scroll Bars:** If the client/ user data is too large to fit in the window, scroll bars are automatically provided for navigation. They can be
    1. Horizontal scroll bar
    2. Vertical scroll bar.
  - vi. **Status Bar:** This is at the bottom of the window and displays status and error messages for the user.
  - vii. **Sizing Border:** When the window is not maximized, it can be resized by using sizing borders. Positioning the mouse on the sizing border makes a small two-headed arrow appear, using which the window size can be changed.

## 6.5 Menus

A menu is a Windows component which provides the user a list of options – each for a specific purpose or task. Various types of menus are provided in Window Applications. These are:

- i. Menu Bar
- ii. Pull Down Menu
- iii. Cascade Menu
- iv. Shortcut Menu

### i. Menu Bar

This is a horizontal list of options which is provided in all applications. Each option in the Menu Bar can be selected using the mouse, arrow key or by using Alt + Underlined character.



Figure 6.10: Menu Bar

### ii. Pull-Down Menu

When any item or option on the Menu Bar is selected, a sub-menu or pull down menu is displayed. Unless the menu-bar option is selected, this menu will not be displayed.

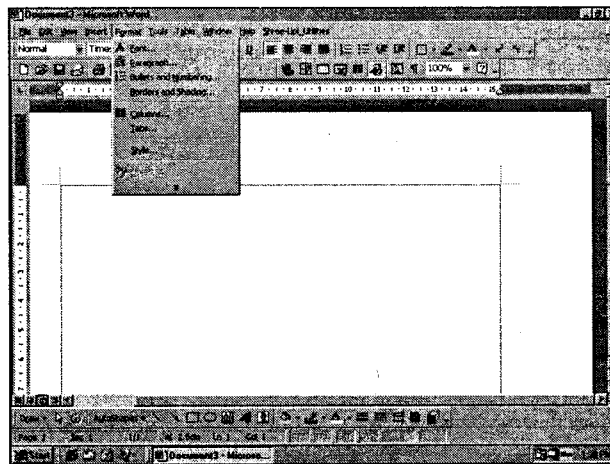


Figure 6.11: Pull down Menu

Number of questions asked. **1**

Oct.2008– 5M

What do you mean by a Menu? Explain different types of Menus.

### iii. Cascade Menu

For a selected pull-down menu option, if there are more options to be selected from, a cascade menu is displayed. The option which has a cascade menu contains an arrowhead at its right (▶) indicating a cascade menu.

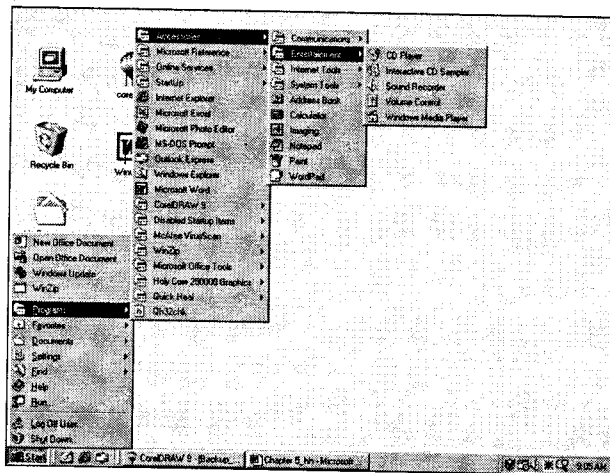


Figure 6.12: Cascade Menu

### iv. Shortcut Menu

This is a menu which is displayed by right-clicking the mouse on a Windows component. It displays certain options related to that component.

The diagram shows the shortcut menu for the Windows desktop (right-click anywhere on the desktop).

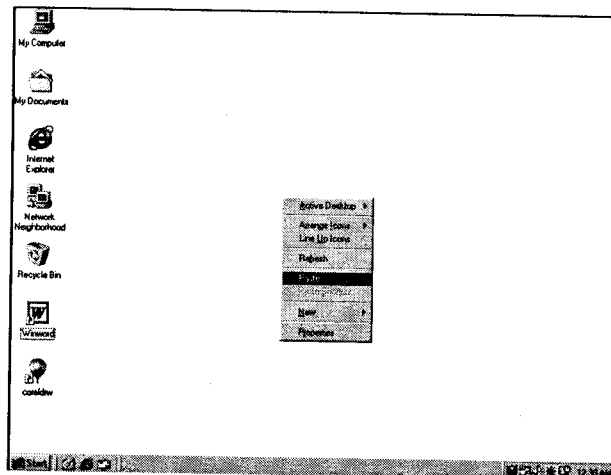


Figure 6.13: Shortcut Menu

## 6.6 Toolbar

The toolbar is a horizontal bar which contains a number of buttons with icons. It is displayed below the menu bar. It contains buttons for some standard tasks as well as some application-specific tasks.

The buttons on a toolbar represent some commonly required menu commands. In order to find out what task the button represents, the mouse pointer can be positioned on it. A small box appear below the button displaying its name (tool-tip).

Toolbars can be hidden if not required (Toolbar option of View menu and activated when needed).

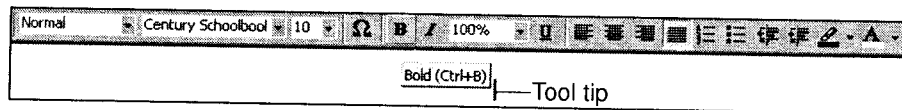


Figure 6.14: Toolbar

## 7. Running Windows Applications

*A windows application can be executed in four different ways.*

1. **Using its icon:** If the application's icon is present on the desktop, the application can be directly executed by double-clicking the icon.
2. **Using the Programs option in Start menu:** The application can be executed by selecting its option from the menu as follows.
  - i. Click on the Start button
  - ii. Select the Programs option
  - iii. From the submenu, select the name of the Application to be opened.
3. **Using the run option**

The Start menu has a *Run* option. On selecting this option, a *dialog* box appears.

Number of Questions  
**3**

Apr.10,09 – 5M

Oct.10– 5M

Explain the following terms:

- i. Desktop
- ii. Menus
- iii. Toolbar
- iv. Taskbar
- v. GUI

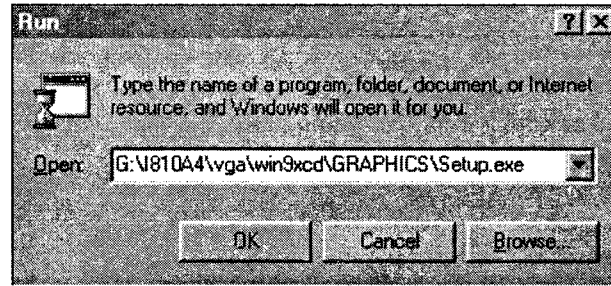


Figure 6.15: Run Option

The name of the executable file of the application has to be typed here.

*Example:* To open the MS WORD application, its executable file is Winword .exe.

If the exact location of the file is not known, it can be searched using the *Browse* button.

#### 4. Using the DOS prompt

Just as in the DOS O.S., an application can be executed from the DOS prompt.

- i. Click the Start Button.
- ii. From Programs submenu, select the MS-DOS Prompt option.
- iii. This displays the DOS prompt.
- iv. Type the name of the application's executable file (by giving the appropriate path).

## 8. Switching between Applications

Since Windows is a Multitasking Operating System, it allows multiple applications to be opened at a time. Each application is represented as a window on the screen (desktop). Thus, at any given time, there may be zero or more Windows displayed on the desktop as shown below.

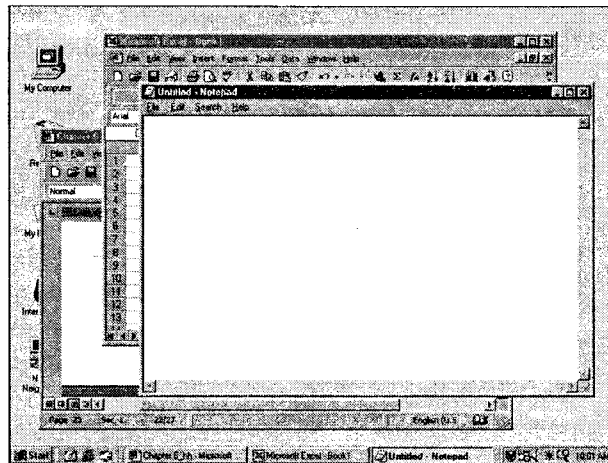


Figure 6.16

A button for each open application is displayed on the taskbar. Even though many applications are open, only one of them is 'Active'. The active application has a highlighted title bar.

*To switch between applications, several methods are available.*

- i. Click on the corresponding applications button on the taskbar to make it active.
- ii. Press the Alt key and use the tab key to select the desired application.
- iii. Press the Alt key and then press the Esc key till the desired window is visible.
- iv. Click anywhere on the required program window's visible part.

## 8.1 Control Panel

This is a very important utilities application that provides a set of applications for managing peripheral devices, adding / removing applications, configuring the system date, time and other settings etc. The icons appearing in the control panel depend upon the hardware and software installed in the computer.

It can be opened from Start → Settings → Control Panel

Number of questions asked  
**1**

Oct.2009 – 4M  
Explain Control Panel in Windows O.S.

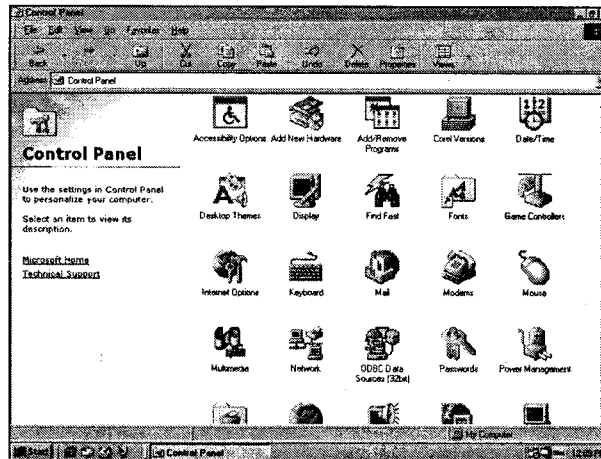


Figure 6.17: Control Panel

*The commonly used options are*

- i. **Accessibility options** : Changes accessibility options for the system.
- ii. **Add/New Hardware** : Allows user to install/ remove hardware devices.
- iii. **Add/Remove Programs** : Installs/ Removes software applications.
- iv. **Date/Time** : Allows a user to view / change system date, time and time zone.
- v. **Display** : To change the way items on the desktop look.
- vi. **Find fast** : Microsoft Find Fast content indexer.
- vii. **Fonts** : Allows adding, deleting and viewing fonts in the computer.
- viii. **Internet option** : Changes Internet Settings.
- ix. **Keyboard** : Changes settings for the keyboard.
- x. **Mouse** : Changes settings for the mouse.
- xi. **Multimedia** : Changes settings for multimedia devices.
- xii. **Network** : Configures network hardware and software.
- xiii. **Passwords** : Changes passwords and sets security options.
- xiv. **Power Management** : Changes Power Management Settings.
- xv. **Printers** : Adds, removes and changes printer settings.
- xvi. **Regional Settings** : Changes how numbers, currencies, date and time are displayed.
- xvii. **Sounds** : Changes system and program sounds.
- xviii. **System** : Provides system information and changes advanced settings.
- xix. **Users** : Sets up and manages multiple users on the computer.

## 9. Windows Accessories

The Windows Accessories are a set of useful tools and are normally comes along with the Windows OS.

Following are well known Windows – Accessories tools that are supported by all the Windows OS.

- i. Calculator
- ii. Paint
- iii. Game
- iv. Notepad
- v. Word Pad
- vi. Windows Explorer

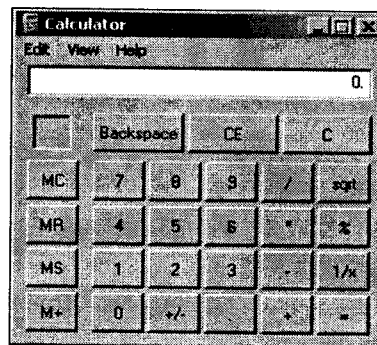
### ► Calculator

A windows Calculator works exactly like a handheld calculator which comes in two versions, a Standard Calculator and a Scientific Calculator.

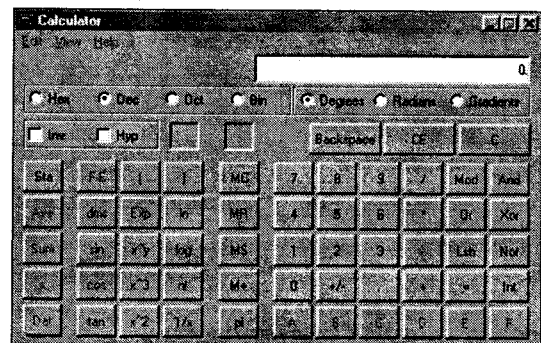
To start a calculator, we have two options:

- i. Start → Run → type- calc
- ii. Start → Programs → Accessories → Calculator.

A Standard Calculator is used for normal mathematical calculations. Whereas the scientific calculator provides all the operations in the standard calculator along with include advanced features such as number base conversions, statistical analysis and trigonometric operations on data in different number systems.



Standard calculator



Scientific calculator

Figure 6.18

User can use the Standard Calculator to perform simple calculations or in scientific view to perform advanced scientific and statistical calculations.



## ► Paint

The paint application in Windows is used for creating/ viewing/ editing bitmap images.

Created images can be stored and inserted into document, reports, etc.

It can be opened by selecting Start → Programs → Accessories → Paint.

The window that is opened is as shown in *figure*.

- i. The *File* Menu provides options open to new, open existing, save, print bitmaps.
- ii. The *View* Menu allows viewing the Tool Box, Color Box, Zooming the bitmap, etc.
- iii. The *Edit* Menu allows standard options like Undo, Repeat, Cut, Copy, Paste, etc.
- iv. The *Image* option allows the image to be rotated, flipped, color inversion, stretch and skew.
- v. The colors menu allows creation of a new color palette, adding/ removing colors to the palette.

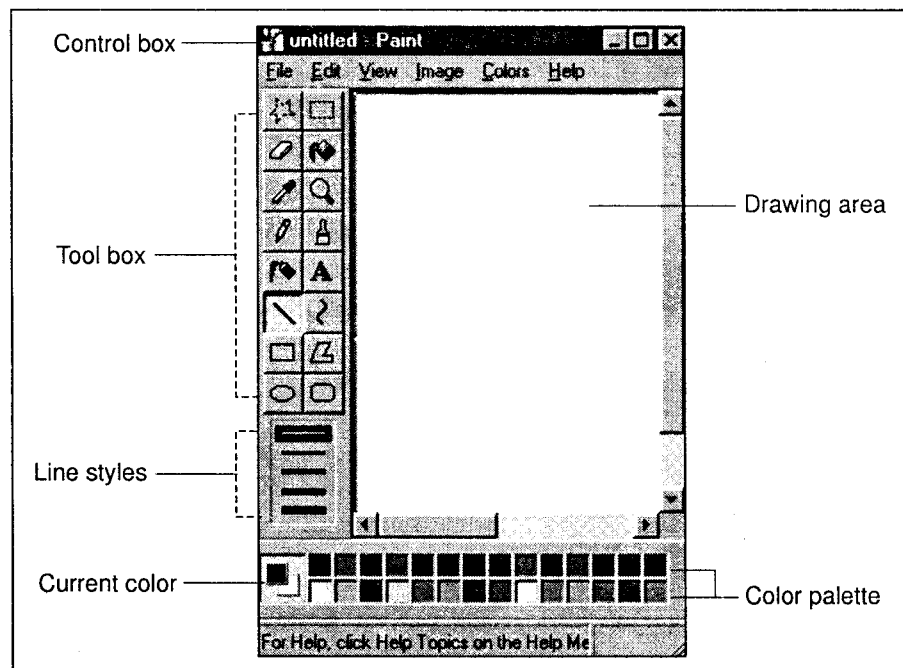


Figure 6.19: The Paint Window

*The Toolbox provides the following buttons*

1. *Free Form Select* (or dotted polygon): Selects part of the picture in a free-form manner to copy, move or edit.
2. *Select* (or dotted rectangle): Selects a rectangular part of the picture to copy, move or edit.

3. *Eraser*: Erases a portion of the picture, using the selected eraser.
4. *Fill*: Fill an area with current drawing color.
5. *Pick Color*: Picks up a color from the picture for drawing.
6. *Magnifier*: Changes the magnification.
7. *Pencil*: Draws a free-form line, one pixel wide. This tool is useful for drawing freehand drawings.
8. *Brush*: Draws using a brush with the selected shape and size.
9. *Airbrush*: Used for drawing by spraying color of a selected size (i.e., width). The color can be chosen from the color palette.
10. *Text*: Inserts text into the picture. The font size and type can be changed by clicking the text toolbar from View menu.
11. *Line*: Draws a straight line with the selected line width.
12. *Curve*: Draws a curved line with the selected line width. Five line width are available.
13. *Rectangle*: Draws a rectangle with the selected fill style.
14. *Polygon*: Draws a polygon with the selected fill style.
15. *Ellipse*: Draws an ellipse with the selected fill style.
16. *Rounded Rectangle*: Draws a rounded rectangle (the corners are rounded) with the selected fill style.

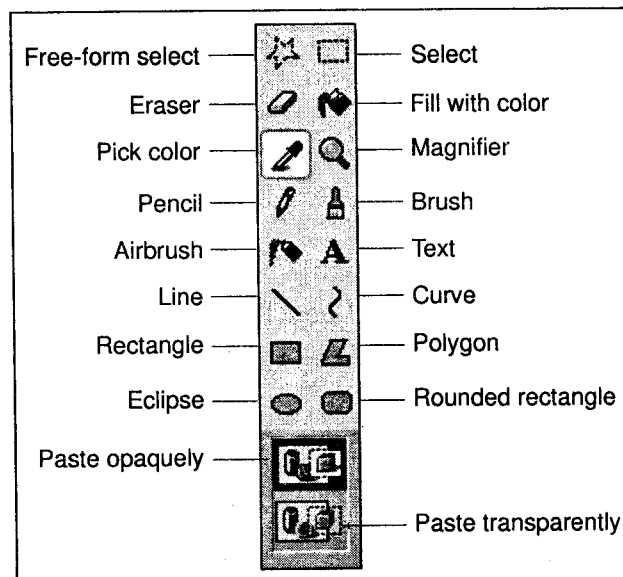


Figure 6.20: Toolbox

## ► Games

The Windows O.S. provides a special Games group which contains simple games. The four standard games provided are as follows:

- i. **Solitaire:** The object of Solitaire is to use all the cards in the deck to build up the four suit stacks in ascending order, beginning with the aces.  
You will be building row stacks and suit stacks.  
*Row stacks:* Cards are stacked in descending order, alternating between red cards and black cards. *For example,* you can play the two of hearts on the three of clubs.  
*Suit stacks:* Cards are stacked in the four areas at the top right of the screen in ascending order, beginning with aces. *For example,* you can play the two of hearts on the ace of hearts.  
You build row stacks to free up cards that you need to build the suit stacks. To move a card or a stack of cards from one row stack to another, drag the card or stack. To move a card to a suit stack, double click it or drag it.

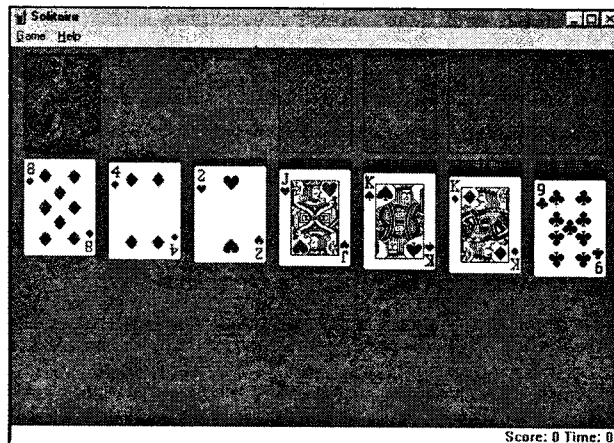


Figure 6.21

- ii. **FreeCell:** The game area consists of four home cells, four free cells and a deck of cards, which is arranged in eight columns at the beginning of the game. The object of FreeCell is to move all the cards to the home cells, using the free cells as placeholders. To win, you make four stacks of cards on the home cells, one for each suit, stacked in order of rank, from Ace to King.

A card from the bottom of a column can move to a free cell. A card from a free cell or from the bottom of a column can move to a home cell. Moves to a home cell must be made in order of lowest to highest, same suit. Aces can move to an empty home cell. A card from a free cell or from the bottom of a column can move to the bottom of another column. Moves to a column must be made in order of highest to lowest, alternating suit colors.

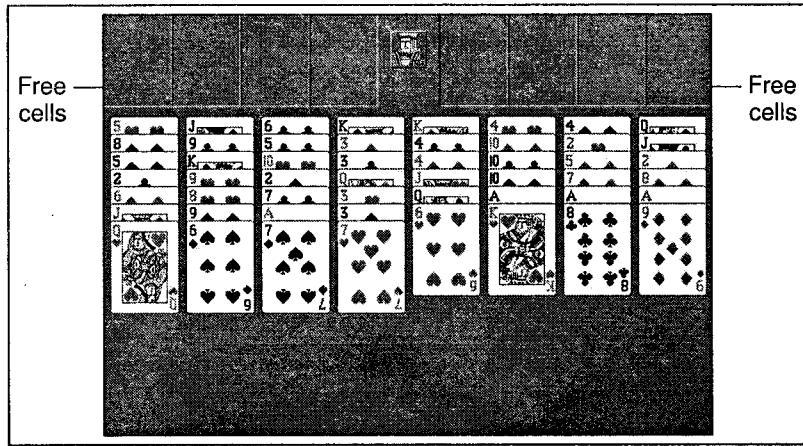


Figure 6.22

- iii. **Minesweeper:** The object of Minesweeper is to find all the mines as quickly as possible without uncovering any of them.

The game area consists of the playing field, a mine counter, and a timer.

You can uncover a square by clicking it. If you uncover a mine, you lose the game. If a number appears on a square, it indicates how many mines are in the eight squares that surround the numbered one.

To mark a square you suspect contains a mine, right-click it.

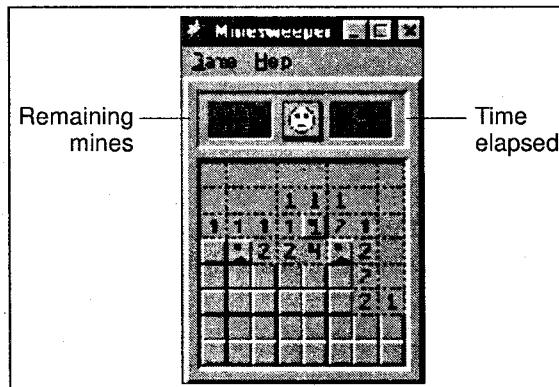


Figure 6.23

- iv. **Hearts:** The object of Hearts is to have the lowest score at the end of the game. You must play a card in the same suit. If you do not have one, you can play any card. The person who plays the highest card of the same suit as the first card played takes the trick.

At the end of each hand (completion of all tricks), you get one point for each heart in your hand and 13 points for the queen of spades. The game continues until one player gets 100

points or more, or until the dealer quits the game. If you win all the hearts and the queen of spades in one hand (called Shooting the Moon), then you get zero points and each other player is penalized 26 points.

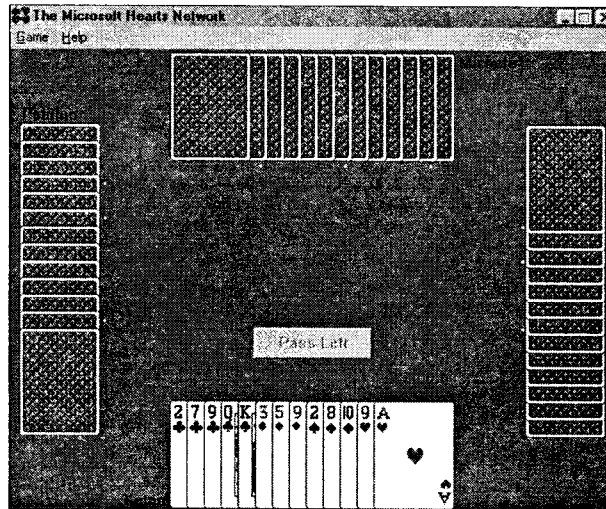


Figure 6.24

### ► Notepad

Notepad is a simple text editor included with all versions of Microsoft Windows since Windows 1.0 in 1985.

Notepad is a common text-only editor. It writes just text. You can use it to write letters, short memos, resumes and other documents. The resulting files – typically saved with the .txt extension – have no format tags or styles, making the program suitable for editing system files that are to be used in a DOS environment. Notepad is distinguished from word processor packages in that it does not have much more formatting features. But, it usually refers to source code editors that include many special features for writing and editing source code mainly by programmers, website designers, and computer system administrators.

#### *Features of Notepad*

- i. Notepad is a basic text editor that can be used to enter the text.
- ii. Notepad is very simple, fast, reliable and easy to use.
- iii. It does not have much formatting capabilities.
- iv. At a time only one file can be opened or edited.
- v. Notepad can not handle very large files.
- vi. Notepad uses little memory.

- vii It provides the facility of Word Wrap. It automatically begins a new line of text once the current line is full. When Word Wrap is turned on, the entire text that the user types, is visible on the screen.

It can be opened by selecting Start → Programs → Accessories → Notepad.  
The window that is opened is as shown.

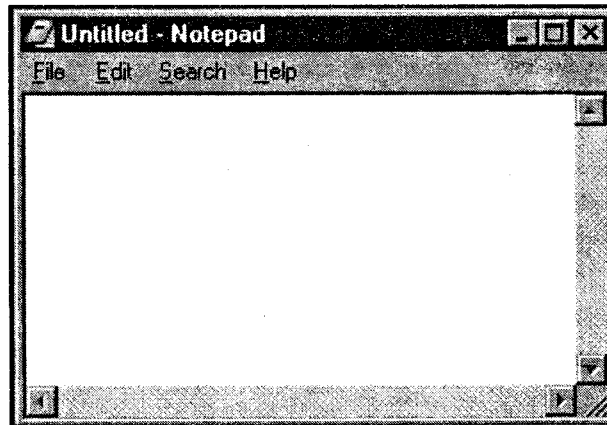


Figure 6.25: Notepad

### Menu Bar Options

FILE	NEW	To open a new text file	Ctrl+N
	OPEN	To open an existing File	Ctrl+O
	SAVE	To save the Current File	Ctrl+S
	SAVE AS	To save the Current File by specifying the location and File name	
	PRINT Setup	To setup the page before printing	
	PRINT	To print the Current File	Ctrl+P
	EXIT	To exit Notepad	
EDIT	UNDO	To undo the previous action	Ctrl+Z
	CUT	To cut the selected text	Ctrl+X
	COPY	To copy the selected text	Ctrl+C
	PASTE	To paste the cut or copied text	Ctrl+V
	DELETE	To delete the selected text	Del
	FIND	To search a specific pattern in the text file	Ctrl+F
	Find Next	To search the next occurrence of the pattern	F3
	REPLACE	To find and replace specific characters or words.	Ctrl+H
	GO TO	To reach the specific number of line	Ctrl+G
	TIME/DATE	To insert current date and time at the current position	F5
FORMAT	Select All	To select the entire text	Ctrl+A
	WORD WRAP	To begin a new line of text once the current line is full	
HELP	FONT	To select font settings for the next	
	Help Topics	To get the help on the topics related to notepad	F1
	About Notepad	To display the information about the notepad	

## ► WordPad

WordPad is a basic word processor that is included with almost all versions of Microsoft Windows. It is more advanced than Notepad, but not as advanced as Microsoft Word. A word processor is a computer program that you can use to create, edit, view, and print text documents. You can also change how the text looks, quickly move sentences and paragraphs around, and copy and paste text within and between documents. But lacks intermediate features such as a spell checker, thesaurus, mail merge, support for tables, etc.

### *Features of WordPad*

- i. WordPad is a very basic text editor that can perform so many editing tasks like cutting and pasting text, change the colour of a given font, etc.
- ii. It has facilities to format and print text, but lacks intermediate features such as a spell checker, tables, and mail merge.
- iii. It is capable for creating and editing documents of any length.
- iv. It is capable for formatting characters, paragraphs and documents.
- v. It also provides the facility of word wrap.

To open WordPad, click the Start button, click All Programs, click Accessories, and then click WordPad.

The window that is opened is as shown.

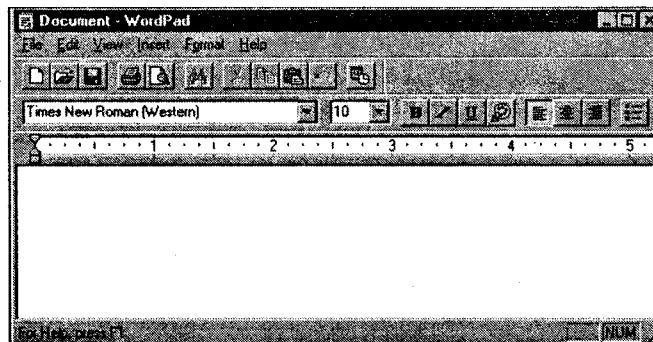


Figure 6.26: The WordPad window

There are four main parts of the WordPad window:

- i. **The toolbar:** The toolbar contains buttons for basic commands, including saving and printing. To find out what a button does, rest your mouse pointer on it. A box pops up showing the function of the button.
- ii. **The format bar:** The format bar contains buttons that you can use to format the text in your document. *For example*, you can choose the font, color, and alignment of your text.

- iii. **The ruler:** Use the ruler to check the layout and placement of text in your document.
- iv. **The document area:** This is where you type your document, make changes to the text, and apply your formatting.

### ► Windows Explorer

*Windows Explorer* is an application that is part of modern versions of the Microsoft Windows operating system that provides a graphical user interface for accessing the file systems. It is the component of the operating system that presents the user interface on the monitor and enables the user to control the computer. Windows Explorer offers the easiest way of viewing files and folders. Moreover, we can see the hierarchy of folders in Windows Explorer.

The Windows Explorer program can be activated from the start menu. To open the *Windows Explorer* click *Start* → *All Programs* → *Accessories* → *Windows Explorer*.

The following figure shows the Windows Explorer window:

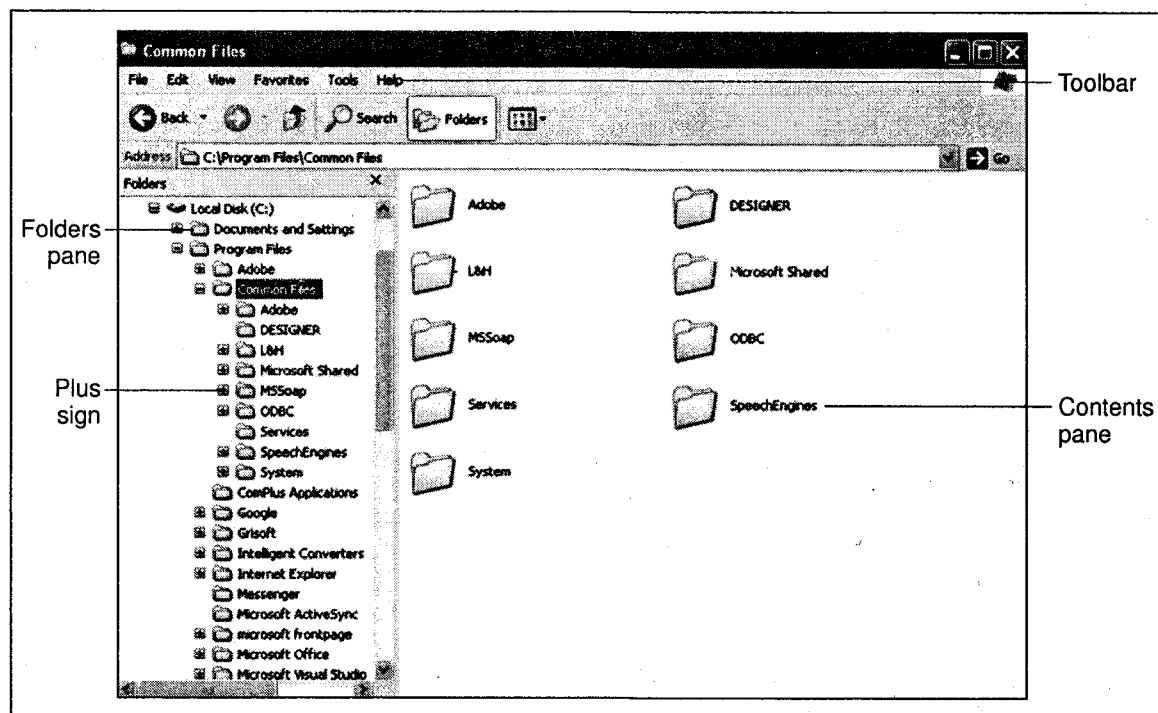


Figure 6.27

Windows Explorer has a two-pane window.

- i. Folders Pane
- ii. Contents Pane



The left pane called *Folders Pane* contains the name of items with a plus or minus sign preceding the item. When we click on plus sign, it will expand to show other folders in the hierarchy and the plus sign will turn into minus sign and the contents of that folder are displayed on the right pane window which is called *Contents Pane*. The contents can be selected and viewed. More than one window of Windows Explorer can be opened at a time.

In Windows Explorer we can also organize our files and folders in a desired manner, move the files from one folder to other or copy them, files or folder can be deleted or renamed easily.

## 10. Difference between DOS and Windows Operating System

	DOS Operating System	Windows Operating System
1.	This O.S. provides a command line interface.	It provides a graphical user interface.
2.	The user has to remember commands and their syntax to perform a task.	A user has to click the corresponding icon or select the menu option to perform a task.
3.	It is a single-task system, i.e., only one application can be executed at a time.	It is a multitasking O.S., i.e., multiple tasks can be opened at a time.
4.	It is not possible to transfer or share data between applications.	Data can be easily shared among Windows applications.
5.	Since only one application is loaded in memory at a time, memory management is easy.	Memory management is complex since the O.S. has to handle multiple tasks in memory.
6.	The application gets the entire usage of CPU and peripheral devices.	Resources have to be shared by multiple tasks.
7.	The size of the O.S. is very small.	The size of the O.S. is very large about (200–300 MB).

## 11. Linux O.S.

A very popular and common form of the UNIX operating system is an operating system called Linux. Now, Linux is a free operating system- you can download it off the Internet for free! Of course, if you really want, you can also buy it at stores.

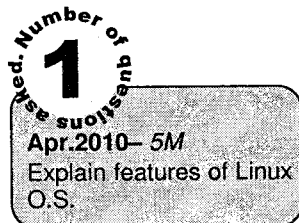
As you know, different operating systems have different ways of interacting with the user- they all have different interfaces. There are different types of Linux operating systems. Some operate using a graphical user interface like Windows and Mac OS. This means that there are icons and images that represent certain programs, applications, and files.

All you need to do is use your mouse, point to the application you want to access, and click. In addition, some Linux operating systems use a command-driven interface, like MS-DOS. In this type of interface, the user has to type in commands that they want the computer to carry out.

As stated above, there are many different types of Linux operating systems. Many different companies produce and distribute this type of operating system, and they all add on their own unique features.

Some of the most popular distributors of Linux include RedHat, Caldera, Suse, Mandrake, and BSD.

## 11.1 Features of the LINUX O.S



- i. Linux is a freeware, i.e., it is distributed freely and its source code is available to all users.
- ii. It is a very stable O.S.
- iii. Linux is extremely reliable and Linux servers are up for hundreds of days without requiring reboots.
- iv. Linux has very powerful features for a variety of tasks.
- v. It comes with a complete development environment, including C, C++, Fortran compilers, toolkits such as Qt and scripting languages such as Perl, Awk and sed.
- vi. Excellent networking facilities: allowing you to share CPUs, share modems, etc.
- vii. A large number of interfaces have been designed for Linux which provide good GUI and are extremely user friendly.
- viii. The ideal environment to run servers such as a web server (e.g. Apache), or an FTP server.
- ix. A wide variety of commercial software is available if user needs aren't satisfied by the free software.
- x. Linux is easily upgradeable.
- xi. Linux supports multiple processors.
- xii. It is a true multi-tasking O.S., i.e., it has the ability to run more than one program at the same time.
- xiii. Linux provides programming facility. The shell provides all features of a programming language.



# PU Questions

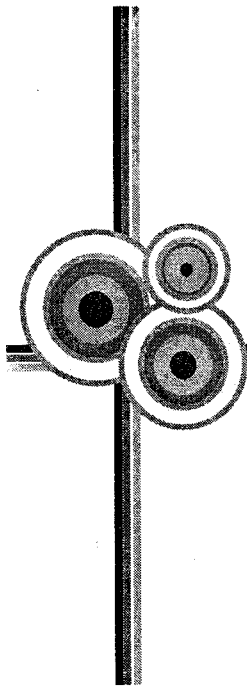
## 4 Marks

- [Oct.2011 – 4M] 1. What is Operating System? Give any two functions of Operating System.
- [Oct.2010 – 4M] 2. What are the different types of Menus available in Windows? Explain any one.
- [Oct.2009 – 4M] 3. Explain Control Panel in Windows O.S.
- [Oct.2009 – 4M] 4. Define Operating System. Explain different types of Operating Systems.

## 5 Marks

- [Oct.2008 – 5M] 1. Explain in short different types of Operating System.
- [Oct.2008 – 5M] 2. What is an Operating System? State different services provided by an Operating System.
- [Oct.2008 – 5M] 3. What do you mean by a Menu? Explain different types of Menus.
- [Apr.2010 – 5M] 4. Which files make-up the D.O.S. Operating System? Explain.
- [Apr.2010 – 5M] 5. Explain features of Linux O.S.
- [Apr.10,09,Oct.09– 5M] 6. Explain the following terms
- i. GUI
  - ii. Desktop
  - iii. Menus
  - iv. Task Bar
  - v. Tool Bar





## **1. Introduction**

Communication, whether between human beings, animals or computers, involves the transfer of information. Communication between computers can be discussed in terms of different levels or layers – at the highest level is the user, wanting to transfer information from one location to another, while at the lowest level is information, in the form of bits, moving between computers.

The merging of computers and communication has had a profound influence on the way computer systems are organized. The old model of single computers serving all computing needs of an organization has been replaced by an interconnection of a large number of autonomous computers. These systems are called *Computer Networks*.

Due to the tremendous impact of computers and networks on society during the past decade, this period has come to be called, “The Information Age”.

The productivity and profitability have been significantly enhanced by these revolutionary tools. They are being used on an increasing scale to conduct personal and professional business.

## 2. Computer Network

A computer network is a system of interconnected computers and other devices which can communicate with each other and share applications and data.

Here, the word interconnected means that the computers are linked with each other via same media (physical or wireless). Physical media includes copper wires and coaxial or fiber optic cables, whereas wireless communication can be through microwaves, radio communications or satellites.

Today computer networks are highly used concept in most of the organizations, big or small, around the world. Computer networks allow people to access information from the remote computer without physically going to that remote location.

### 2.1 Network Goals

- i. **Resource Sharing:** Modern organizations are widely dispersed with offices located in diverse parts of a country and the world. In order to extract, co-relate and share information about the entire organization, it is essential to connect the computers at all these locations.

The goal of resource sharing is to make all programs, data and equipment available to anyone on the network regardless of the physical location of the resource and the user.

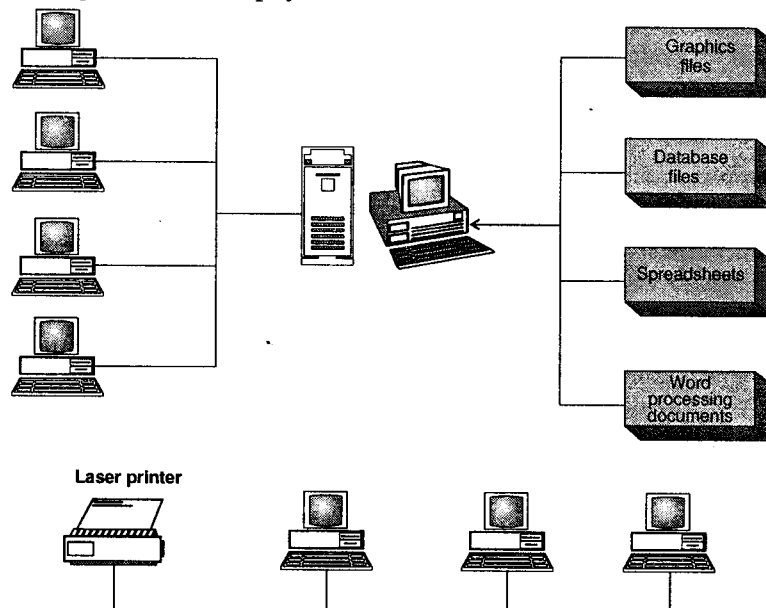


Figure 7.1: Resource Sharing

- ii. **Provide High Reliability:** This can be achieved by having alternative sources of supply. *For example*, replication of files on more than one machine ensures availability of files from at-least one source. The presence of multiple CPUs means that if one fails, the other can take over its work. This is very critical in military, banking, air traffic control and similar applications.
- iii. **Distribution of Workload:** If one computer becomes saturated with too much load, the work can be distributed through the network onto other computers in the network.
- iv. **Saving Money:** Small computers have a much better price to performance ratio as compared to large ones. Thus, it is economical to set up a network of a large number of small computers than invest in a few large ones. The data on the network could be kept on one or more shared, powerful file server machines.
- v. **Expandability:** The size of the network and the performance could be enhanced by gradually adding more processors.
- vi. **Powerful Communication Medium:** Using a network, it is easy for two or more people to communicate effectively. This enhances human-to-human communication because far-flung groups of people can easily exchange and share information, ideas and technology.
- vii. **Protecting Information:** A network provides a more secure environment for an organization's important data. They provide an additional layer of security by way of user accounts, logins and passwords. Different levels of access can be set in a network.
- viii. **Preserving Information:** Information can be backed up to a central location. It is difficult to maintain regular back-ups on a number of stand-alone computers.

## 2.2 Applications of Computer Networks

### i. Business Applications

- a. One of the most important applications of a computer network for business is *resource sharing*. This enables all programs, equipment and data available to anyone on the network regardless of the physical location of the resource and the user.
- b. A computer network provides a powerful communication medium among employees. Daily communication can be done using e-mail; reports and other such documents can be written together; video-conferencing enables employees at distant locations to hold virtual meetings which eliminates cost and time.

- c. Companies can do business electronically with other companies, suppliers and customers. This not only saves time and cost but also reduces the need to hold large inventories, resulting in enhanced efficiency.
  - d. One major emerging application of computer networks is *e-commerce*, i.e., doing business with consumers over the Internet. Banks, Airlines, Bookstores, Retailers, etc allow consumers to do business from home by providing on-line catalogs and taking orders on-line.
- ii. **Home Applications:** Four most popular uses of a computer network for home users are as follows:
- a. *Access to remote information:* This includes surfing the World Wide Web for information like science, sports, travel, entertainment, arts and a wide range of subjects, accessing on-line libraries, reading newspapers, magazines and journals. All these involve interaction between a person and a remote database.
  - b. *Person-to-person communication:* This is by far, the most important reason for the widespread use of computer networks. It includes e-mail and chatting or instant messaging which are used on a daily basis by millions of people. Audio, video, text and pictures can be exchanged in real time.  
  
Newsgroups are commonplace, where discussions on any topic can be held among a select group of people. Internet telephony enables users to talk over the Internet. Another popular and growing area is e-learning.
  - c. *Entertainment:* This is a huge and growing industry. An emerging application is video on demand where it is possible to select any movie or television program and have it displayed on screen instantly. Interactive films and television programs will become common place. Another important application is playing games which may be multiperson real-time, three-dimensional which enables us to have a worldwide shared virtual reality.
  - d. *Electronic commerce:* In recent times, more and more home users are doing home shopping by accessing on-line catalogs. People access financial institutions, pay bills, handle investments, manage bank accounts electronically. As networks grow more secure, electronic commerce is sure to increase.

### 2.3 Basic Elements of a Communication System

Communication is the process of transferring messages from one point to another. The basic elements of any communication system are given below:

- i. **Sender:** It is the computer that is the source of the message or information. It transmits data on the Network for a particular node or a group of nodes.
- ii. **Receiver:** It is the computer on the network that receives the data sent by the sender. The receiver may be a few meters away from the sender or it can be thousands of miles away.
- iii. **Message:** The message is the information (data) to be communicated. It can be text, numbers, pictures, sound, video or any combination of these.
- iv. **Medium:** It is the channel or physical path through which the message is carried from sender to the receiver. The medium can be wired like twisted pair wire, coaxial cable, fiber-optic cable or wireless like laser, radio waves, and microwaves.
- v. **Protocol:** It is a set of rules that govern the communication between the devices. Both sender and receiver follow same protocols to communicate with each other.

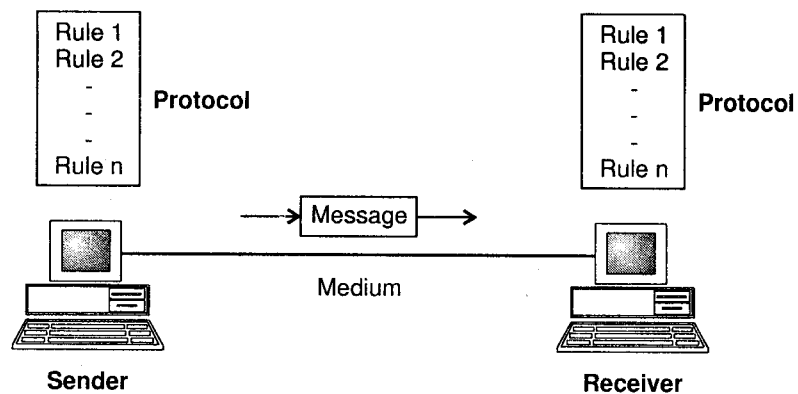


Figure 7.2

### 3. Communication Modes

Computer communication means transfer of data from a source device to a receiver device across a distance located in the same premises or at the other end of the world, via cables and/or satellites. This data transmission takes place by means of electrical signals in digital or analog form.



### 3.1 Analog Signal

An Analog Signal is an electrical signal in the form of a continuous wave, known as carrier wave. These carrier waves are distinguished on the basis of two properties:

- i. **Amplitude:** Amplitude is the height of the wave during a given time period. It is actually the strength of the wave.
- ii. **Frequency:** It is the number of times a wave repeats during a specific time interval. Frequency is measured in cycles per second.

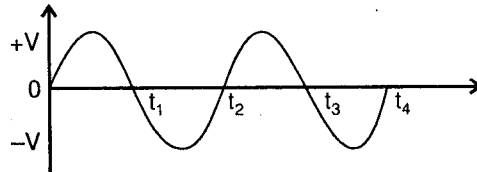


Figure 7.3: Analog Signal

### 3.2 Digital Signal

Digital signals are also electrical signals, but it uses only two states “ON” or “OFF” (Binary Form) in discontinuous or discrete manner.

Digital describes electronic technology that generates, stores and process data in terms of two states:

- i. **Positive:** It is expressed or represented by the number 1 and,
- ii. **Non-Positive:** It is expressed or represented by number 0.

Thus data transmitted or stored with digital technology is expressed as a string of 0's and 1's. Thus digital signals are more efficiently used to represent the binary data as used in computers. Also digital signals are faster and more accurate than analog signals.

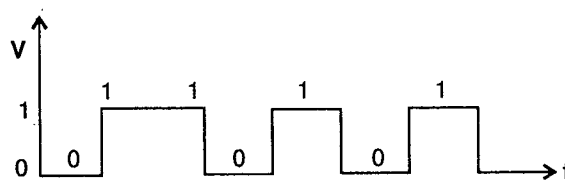
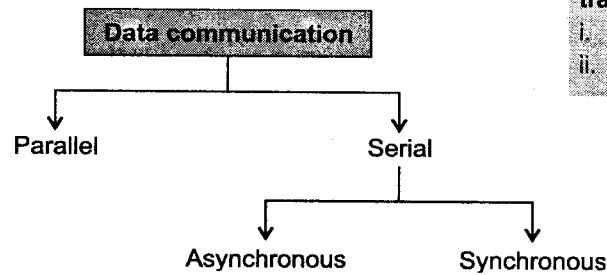


Figure 7.4: Digital Signal

## 4. Data Transmission

Data transmission refers to the movement of data in the form of bits between two or more digital devices. This transfer of data takes place via some form of transmission media (*for example*, coaxial cable, fiber optics, etc.).

Data transmission is of two types:



**Two types of data transmission**

- i. Serial data transmission
- ii. Parallel data transmission

Figure 7.5

- i. **Serial transmission:** In serial mode of transmission, data bits are transmitted sequentially, one after another. It is a slow but more economical data transfer method for large distances. It is the method used in communication lines and modems.

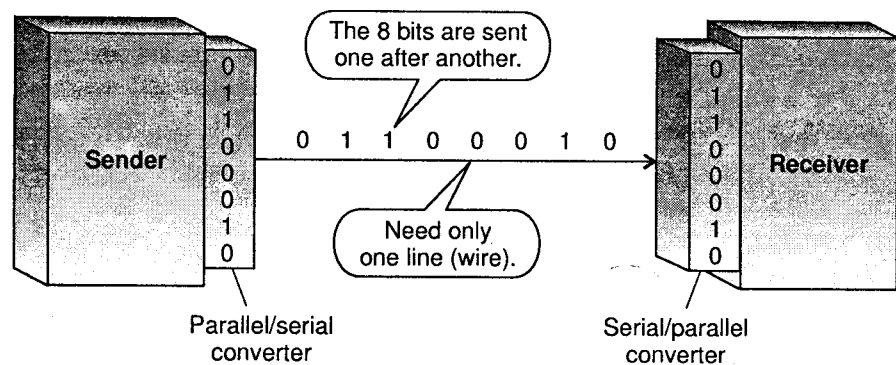


Figure 7.6

- ii. **Parallel transmission:** In Parallel transmission, several bits are transmitted through separate lines simultaneously, i.e., data bits are sent at the same time along multiple paths. This type of transmission is not appropriate for long distance transmission. It is not economic because when distance increases, the wire cost also increases. This is faster than its serial counterpart.

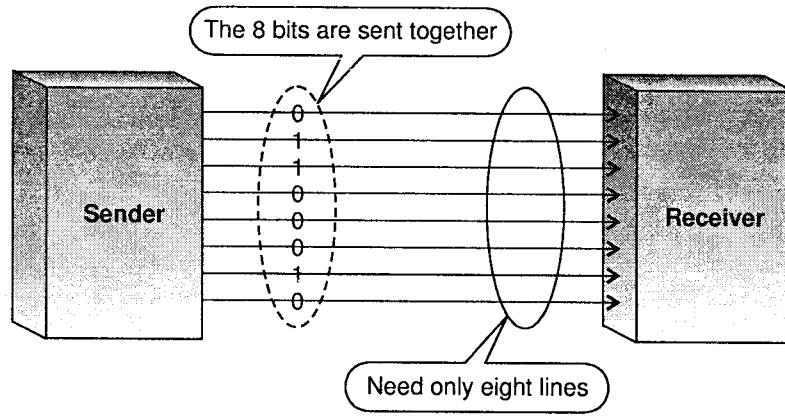


Figure 7.7

### 4.1 Types of Serial Transmission

**Types of serial transmission**

- i. Asynchronous mode
- ii. Synchronous mode

Serial transmission occurs in one of the two ways:

- i. **Asynchronous mode:** In Asynchronous mode data is transmitted one byte at a time. Bit synchronization between two devices is made possible by using two additional bits with each byte to indicate the beginning and the end of each byte. These additional bits are called start and stop bits.

Addition of start and stop increase the number of data bits. Hence more bandwidth is consumed in asynchronous transmission. There is a gap between each byte. It is a slow method as compared to the synchronous transmission.

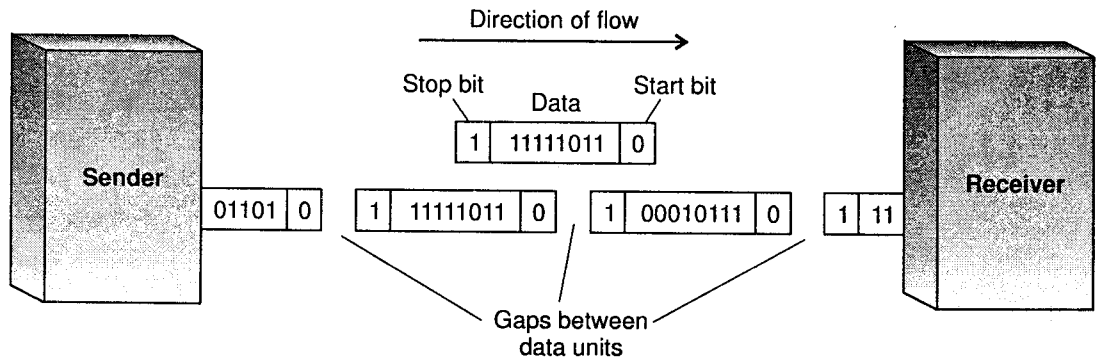


Figure 7.8: Asynchronous transmission

- ii. **Synchronous mode:** In synchronous mode, data is sent in blocks. Synchronous transmission does not use start and stop bits. In this method, bit stream is combined into longer frames that may contain multiple bytes. There is no gap between the various bytes in the data stream. In the absence of start and stop bits, bit synchronization is established between sender and receiver by 'timing' the transmission of each bit. Since the various bytes are placed on the link without any gap, it is the responsibility of receiver to separate the bit stream into bytes so as to reconstruct the original information. In order to receive the data error free, the receiver and sender operates at the same clock frequency.

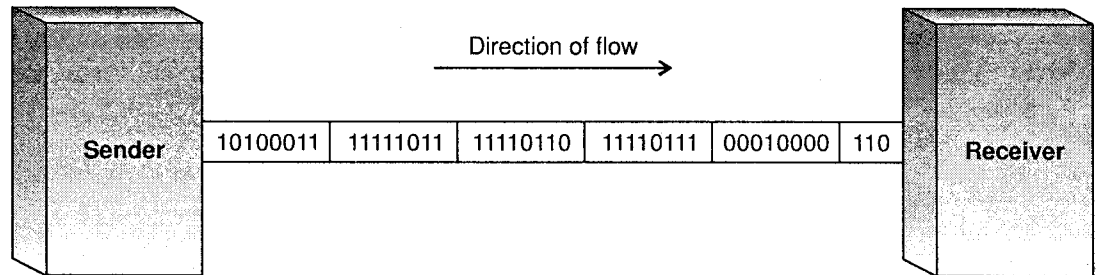


Figure 7.9: Synchronous transmission

### Three types of transmission

- i. Simplex
- ii. Half duplex
- iii. Full duplex

## 5. Direction of Transmission

When there is communication between two computers, it can be of three types

- i. **Simplex:** Data can travel only in one direction in the simplex mode. Radio and TV broadcast are the common *examples* of simplex transmission. In both the cases, the signals are transmitted at only one end and our devices only receive them. There is no return signal and we can not interact with the transmitting devices. This mode of flow of information is Unidirectional.

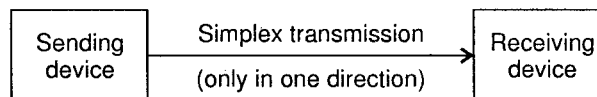


Figure 7.10: Simplex transmission

- ii. **Half-duplex:** In half duplex transmission, data can travel in both directions at a time. This is the most common method of data transmission and used in many applications. The

conversation on Walkie-talkie used in earlier days is an *example* of half duplex transmission. Thus a half-duplex line can alternately send and receive data.

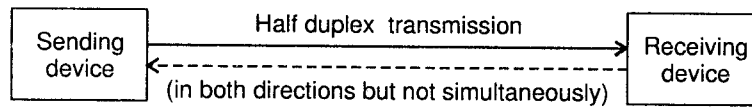


Figure 7.11: Half duplex transmission

- iii. **Full Duplex:** In full duplex transmission, data can travel in both directions at the same time. A very familiar *example* of full duplex transmission is two persons talking on the telephone. We can talk (send data) and listen (receive data) at the same time. Use of full-duplex line improves the efficiency as the line turn-around time required in half-duplex arrangement is eliminated.

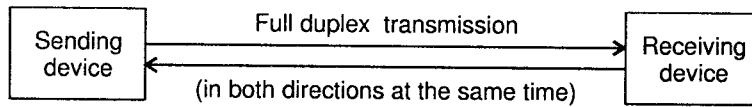


Figure 7.12: Full duplex transmission

## 6. Data Transmission Media

Transmission media can be classified into two types

- i. Wired or Guided Media
- ii. Wireless or Unguided Media

Transmission media is a pathway that carries the information from sender to receiver. We use different types of transmission media (cables or waves) to transmit data. Transmission media is also called Communication channel.

Transmission media is broadly classified into two groups.

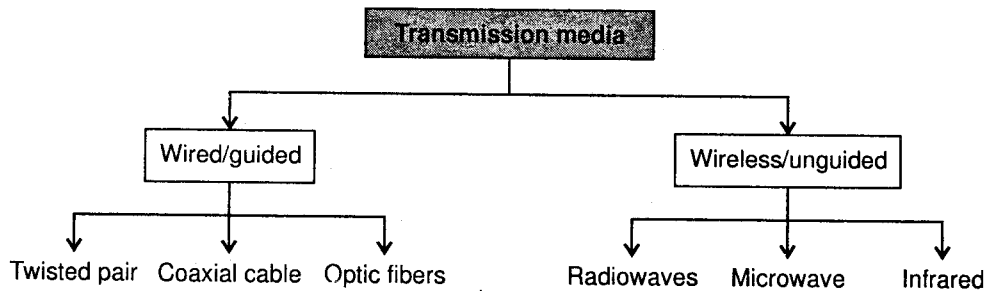


Figure 7.13

**Wired or Guided Media:** Guided media are the cables that are tangible or have physical existence and are limited by the physical geography. Popular guided media in use are twisted pair cable, co-axial cable and fiber optical cable. Each of them has its own characteristics like transmission speed, effect of noise, physical appearance, cost, etc.

### ► Twisted Pair cable

Twisted-pair is a type of cabling that is used for telephone communications and most modern networks. A pair of wires forms a circuit that can transmit data. The pairs are twisted to provide protection against crosstalk, the noise generated by adjacent pairs. When a wire is carrying a current, the current creates a magnetic field around the wire. This field can interfere with signals on nearby wires. To eliminate this, pairs of wires carry signals in opposite directions, so that the two magnetic fields also occur in opposite directions and cancel each other out. This process is known as cancellation.

Two Types of Twisted Pairs are Unshielded Twisted Pair (UTP) and Shielded Twisted Pair (STP).

- i. **Unshielded Twisted Pair (UTP):** UTP is a very flexible, low cost media, and can be used for either voice or data communications. Unshielded twisted-pair consists of four pairs of thin, copper wires covered in color-coded plastic insulation that are twisted together. The wire pairs are then covered with a plastic outer jacket. Its greatest disadvantage is the limited bandwidth, which restricts long distance transmission with low error rates.

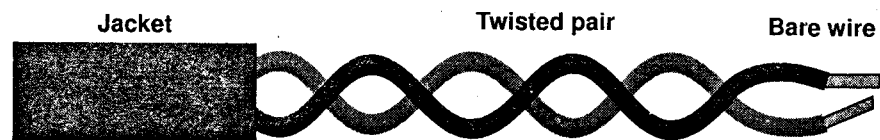


Figure 7.14: Unshielded Twisted Pair

- ii. **Shielded Twisted Pair (STP):** STP is heavier and more difficult to manufacture, but it can greatly improve the signaling rate in a given transmission scheme. Twisting provides cancellation of magnetically induced fields and currents on a pair of conductors. Shielded twisted pair cable consists of one or more twisted pair of cables enclosed in a metal foil or braided mesh to cover each pair of insulating conductors. This is known as metal shield. It reduces the interference of the noise but makes the cable bulky and expensive.

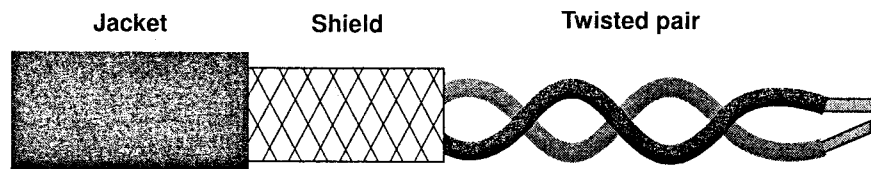


Figure 7.15: Shielded Twisted Pair

### *Advantage*

This is the cheapest form of wiring.

### *Disadvantages*

1. It is not efficient for very long distances.
2. The noise level is high because of electrical interference.

### ► **Coaxial cable**

It is commonly known as “co-ax”. Coaxial cable is an electrical cable consisting of an inner conductor covered by an insulator and surrounded by a cylindrical conducting shield and usually surrounded by a final insulating layer (jacket). They are highly insensitive to EMI and support high bandwidth. They can withstand harsh environment. They are bulky and expensive. The TV cable is a coaxial cable. These cables are also used in LANs.

They can carry voice and data at a faster rate (up to 200 megabits per sec) as compared to that of twisted pair wire (16-100 megabits per sec). Thus coaxial cables can be used for transmitting data to longer distances at higher speeds.

Coaxial cables do not produce external electric and magnetic fields and are not affected by them. This makes them ideally suited, although more expensive, for transmitting signals.

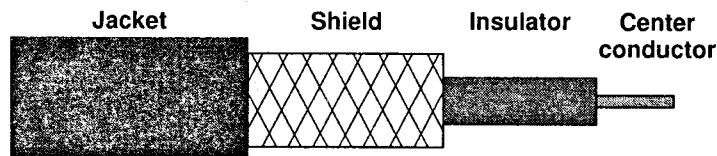


Figure 7.16: Coaxial Cable

There are two kinds of coaxial cables in use:

- i. **Baseband (50-ohm cables):** These cables are used for digital transmission. Baseband is a light and flexible cabling medium that is inexpensive and easy to install.
- ii. **Broadband (0.5 ohm cables):** It is a cable used for analog transmission such as cable TV networks. Since it is thick, it does not bend. It can carry more signals and at a larger distance. This cable is more expensive.

### ► Fiber Optic cable

Fiber optic cable is a thin flexible fiber made up of glass or fused silica which is an ideal cable for data transmission. Fiber optic cable transmits light signals rather than electrical signals. This cable has high bandwidth. It has no problem with EMI and cable runs over several kilometers. Each fiber has an inner core of glass or plastic that conducts light. The inner core is surrounded by cladding, a layer of glass that reflects the light back into the core. Each fiber is surrounded by a plastic sheath. The sheath can be either tight or loose. Loose configuration leaves a space between the sheath and the outer jacket, which is filled with a gel or other material. Tight configuration contains strength wires between conductor and outer plastic encasement. In both cases, the plastic encasement must supply the strength of the cable while gel or strength wires protect the delicate fiber from mechanical damage.

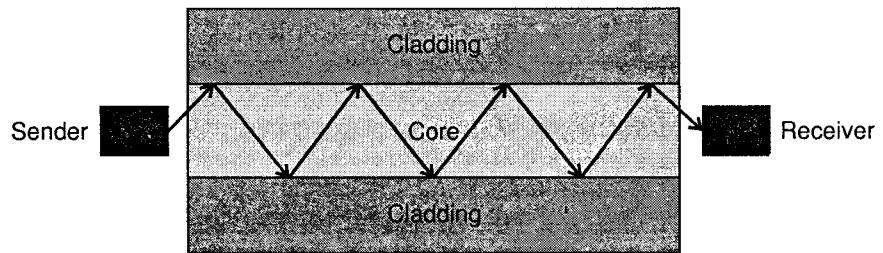


Figure 7.17: Optical fiber

### *Advantages*

1. Transmission through optical fiber is fast.
2. Light pulses are not affected by random electromagnetic interference in the environment.
3. Rate of errors is minimized to a great extent.
4. A fiber optic cable is light in weight and more durable.
5. It provides better security measures because it cannot be easily wire tapped or listened into like other cables.
6. More suitable for transmission of large volume of data at a high speed over long distances.



### *Disadvantages of Optical Fiber*

1. It is more expensive as compared to twisted pair or coaxial cable.
2. It lacks flexibility so it is difficult to bend around corners.

**Wireless or Unguided Media:** Unguided media are the ways of transmitting data without using any cables. These media are not bounded by physical geography. This type of transmission is called Wireless communication. Nowadays wireless communication is becoming popular. This transmission uses Microwave, Radio wave, Infra red are some of popular unguided media.

### ► **Radio Wave Transmission Systems**

It uses electromagnetic radiation to transmit data. Radio waves have frequencies between 10 kilohertz and 1 gigahertz. It does not require a direct physical connection between computers. Radiowaves are omni directional, i.e., they travel in all the directions from the source. Because of this property, transmitter and receiver need not be aligned. Radiowaves can penetrate buildings easily, so they are widely used for communication both indoors outdoors.

The applications of Radiowaves include AM and FM radio, television, cordless telephone, cellular phones, paging and wireless LAN.

### ► **Microwave Transmission Systems**

Microwave communication refers to electromagnetic energy having a frequency higher than radio frequencies to transmit data through space. It produces better throughput and performance. These are generally used to link metropolitan cities as data transmission speeds are about 16 Gbps. Microwaves operate at high operating frequencies of 3 to 10 GHz. This allows them to carry large quantities of data due to their large bandwidth.

#### **Two types of microwave data communication system**

- i. Terrestrial Microwave
- ii. Satellite

There are two types of microwave data communication system:

- i. **Terrestrial Microwave:** Terrestrial microwave systems typically use directional parabolic antennas to send and receive signals in the lower gigahertz range.

Because they do not use cable, microwave links often connect separate buildings where cabling would be too expensive, difficult to install, or prohibited. *For example*, if two buildings are separated by a public road, you may not be able to get permission to install cable over or under the road. Microwave links would be a good choice in this type of situation.

- ii. **Satellite:** Satellite microwave systems transmit signals between directional parabolic antennas. Like terrestrial microwave systems, they use low gigahertz frequencies and must be in line-of-sight. The main difference with satellite systems is that one antenna is on a satellite in geosynchronous orbit about 36,000 km above the earth surface. Because of this, microwave systems can reach the most remote places on earth and communicate with mobile devices.

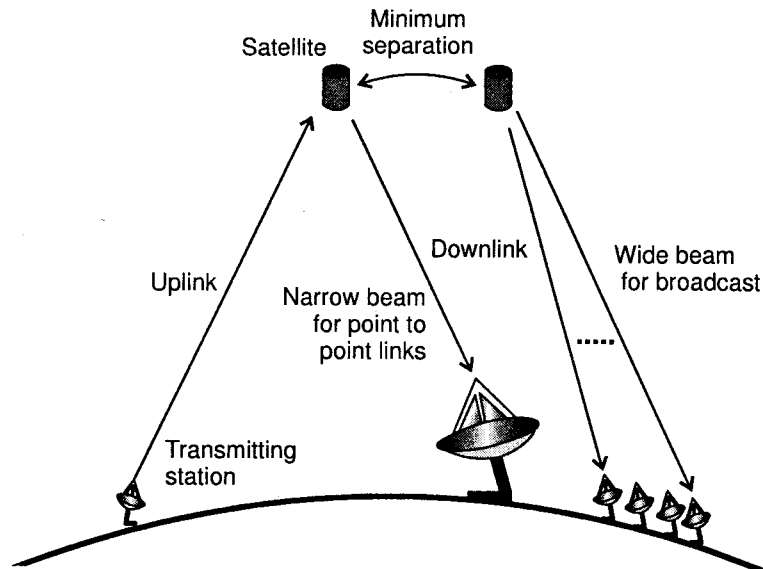


Figure 7.18: Satellite Communication System

### ► Infrared

Infrared media use pure light, normally containing only electromagnetic waves or photons from a small range of the electromagnetic spectrum. It is limited to a small area. Infrared media use infrared light to transmit signals. LEDs transmit the signals, and photodiodes receive the signals. The remote control we use for TV, VCR and CD players use infrared technology to send and receive signals. Some common applications of infrared technology are Car locking systems, Environmental control systems, Headphones, Home security systems, Telephones, TVs, VCRs, CD players, stereos, etc.

Infrared light is transmitted either:

- i. **Point-to-Point:** Infrared beams can be tightly focused and directed at a specific target.  
Laser transmitters can transmit line-of-sight across several meters.  
Using point-to-point infrared media reduces attenuation.
- ii. **Broadcast:** Broadcast infrared systems spread the signal to cover a wider area and allow reception of the signal by several receivers.

One of the major advantages is mobility; the workstations or other devices can be moved more easily than with point-to-point infrared media.

Infrared light can be transmitted across relatively short distances. Remote control of TV uses infrared transmission.

**Advantages**

1. It has low power requirements therefore ideal for laptops, telephones, personal digital assistants.
2. No special or proprietary hardware is required, can be incorporated into the integrated circuit of a product.
3. Directionality of the beam helps ensure that data isn't leaked or spilled to nearby devices as it's transmitted.

**Disadvantages**

1. Transmitters and receivers must be almost directly aligned (i.e., able to see each other) to communicate.
2. Common materials like people, walls, plants, etc. can block transmission.
3. Performance drops off with longer distances.
4. Direct sunlight, rain, fog, dust, pollution can affect transmission.

## 7. Network Structure

**Three types of network**

- i. Local Area Network (LAN)
- ii. Metropolitan Area Network (MAN)
- iii. Wide Area Network (WAN)

In this section, we shall try to understand the different types of networks and how they operate. To do so, we must understand how networks are structured and what Transmission Technology is used.

Networks can be classified according to their *scale*, i.e., the distance or area they cover.

There can be three types of networks:

1. Local Area Network (LAN)
2. Metropolitan Area Network (MAN)
3. Wide Area Network (WAN)

The following table gives an idea about the scale of various networks.

Distance between Processors	Located in same	Example
-----------------------------	-----------------	---------

1m	System	Multiprocessor
10m	Room	Local Area Network
100m	Building	
1Km	Campus	
10 Km	City	Metropolitan Area Network
100 Km	Country	Wide Area Network
1000 Km	Continent	
10,000 Km	Planet	The Internet

## 7.1 Local Area Network (LAN)

- i. A LAN is a privately owned network within a single building or a campus, spanning a few kilometers in area.
- ii. Their communication speed ranges from 10 Mbps to 100 Mbps (Mega bits per second).
- iii. The main use of LAN is in organizations to connect several PCs in order to share resources like: Files, Applications, Hardware resources.
- iv. LAN can be of two types
  - a. *Server based LAN*: Here, a separate computer is set aside as the server which processes requests from many clients or workstations.
  - b. *Peer-to-Peer LAN*: All computers on the network act as resource providers and users.

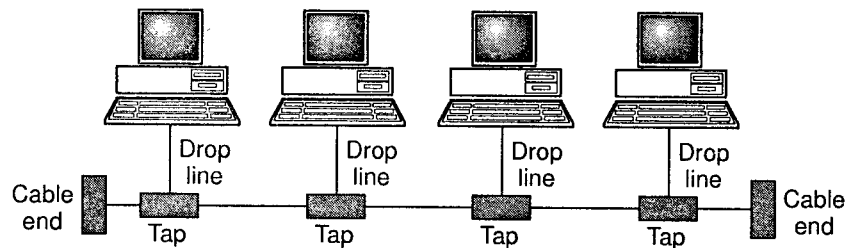


Figure 7.19: Local Area Network

## 7.2 Metropolitan Area Network (MAN)

A Metropolitan Area Network (MAN) a relatively new class of network, it serves a role similar to an Internet Service Provider, but for corporate users with large LANs. There are three important features which discriminate MANs from LANs or WANs:

- i. The network size falls intermediate between LANs and WANs. A MAN typically covers an area of between 5 and 50 km diameter. Many MANs cover an area the size of a city.
- ii. A MAN (like a WAN) is not generally owned by a single organisation. The MAN, its communication links and equipments are generally owned by either a consortium of users or by a single network provider who sells the service to the users.
- iii. A MAN often acts as a high speed network to allow sharing of regional resources (similar to a large LAN). It is also frequently used to provide a shared connection to other networks using a link to a WAN.

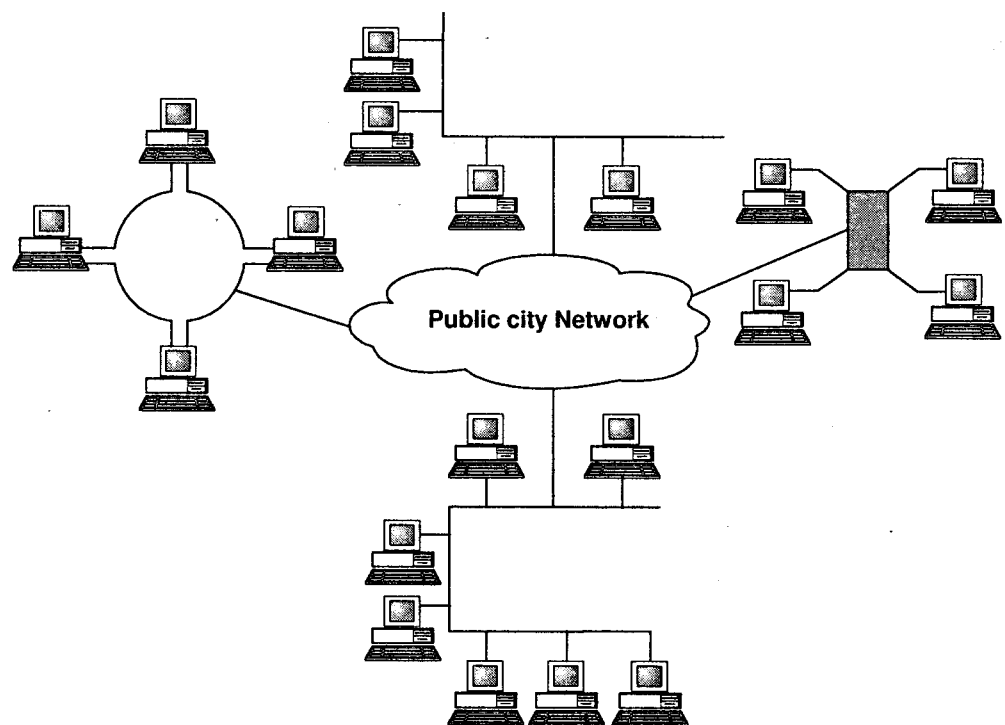


Figure 7.20: Metropolitan Area Network

### 7.3 Wide Area Network (WAN)

They span a wide geographical area; often a country or continent. It is also called “Long Haul Network”.

Typically, a WAN is a connection of multiple LANs. In some cases, the WAN may not include any LAN; it could also be a separate network.

For communicating over such long distances, the WAN uses high speed telephone lines or wireless technologies such as satellites.

The machines on a WAN (called *hosts*) are connected to each other via a *communication subnet*. These subnets consist of

- i. Transmission lines
- ii. Switching elements like routers, gateways, etc.

The subnets uses store-and-forward method to transfer data from one host to another.

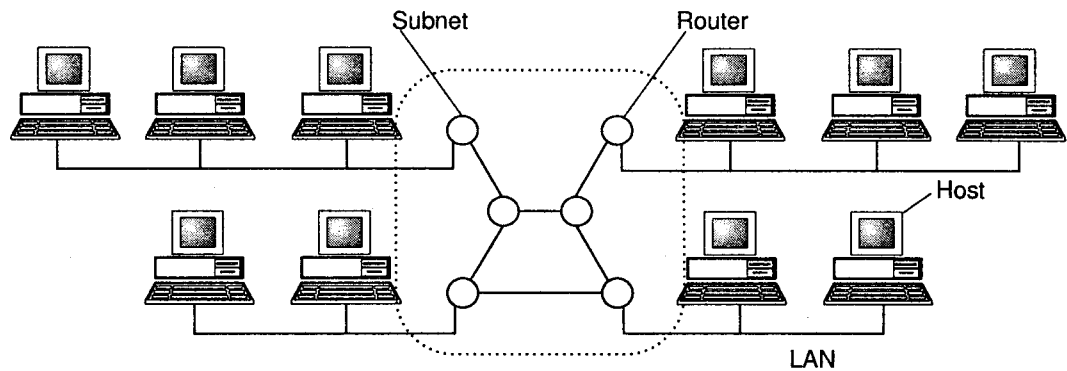


Figure 7.21: Wide Area Network

## 8. Network Topologies

### 8.1 Topology

There are different ways in which the computers are connected in a LAN. "The term network topology refers to the manner in which nodes are geometrically arranged and connected with each other in a network."

- \* There are various topologies where each has its own particular advantages and limitations in terms of reliability, expandability, cost and performance characteristics.

They are listed as follows:

1. Bus
2. Star
3. Ring
4. Mesh (Partially and fully connected)
5. Tree

The choice of a network topology depends upon the following:

1. Performance and reliability desired from the network.
2. Number of nodes and their geographical distribution in the network.
3. Cost of components and services required from them.
4. Expandability of the system.
- \* 5. Communication lines available.
6. Delays in routing information from one node to another.

The LAN topologies are discussed below:

### 8.2 Bus Topology

It is the simplest type of network with the lowest cost. In a bus topology, all the nodes are connected to a single transmission line. This single communication line is called as a bus. In this arrangement,

there is no central server. The cable runs from one end to another in a linear manner. Each communication device transmits electronic messages to other devices.

In bus networks, each and every node is assigned a specific address. When any device transmits, the data in the form of packet is received by all other devices. Each device in this arrangement interrogates the address field for its own address. If the destination field does not match the device address, the packet is discarded back to the bus by the device. Each device accepts the packets that are addressed to itself.

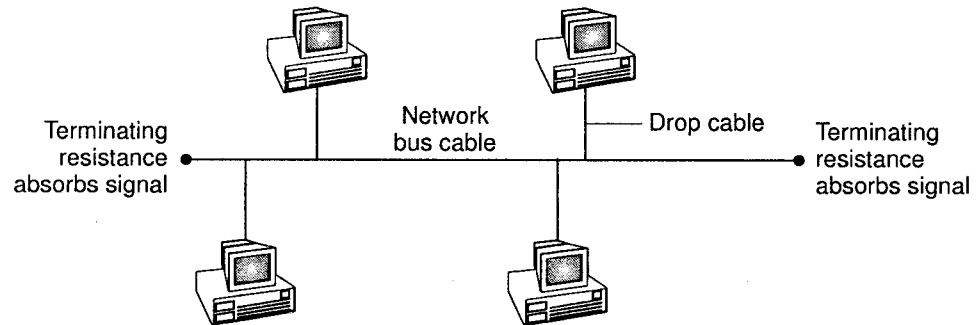


Figure 7.22

#### *Advantages*

1. The bus is simple, reliable and easy to use.
2. It is easy to add or remove the nodes.
3. The transmission medium is highly reliable because of failure of a computer.
4. It does not affect communication among other computer in the network.
5. Requires the least amount of cable to connect the computers and less expensive.

#### *Disadvantages*

1. If the communication line fails, the entire system breaks down.
2. If the number of devices increases, the speed of the network slows down.
3. Difficult to troubleshoot a bus.



### 8.3 Star Topology

A star network is one in which all computers and other communication devices are connected to central server (also known as central node or Hub). In this topology, computers are connected in a star manner. The server is placed at the centre of the star. That is, the computers in the network are not linked directly to each other. All the messages are routed through the central hub to their destinations.

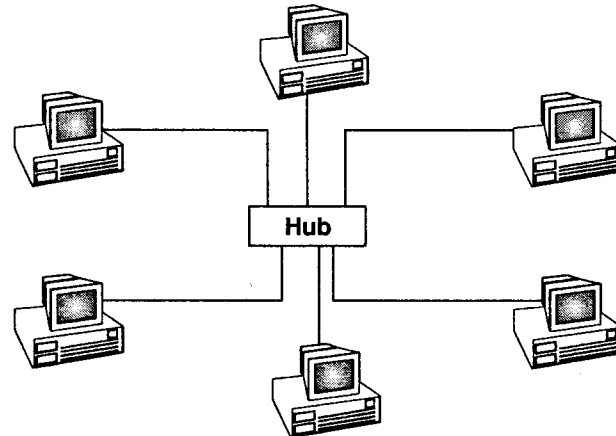


Figure 7.23

#### *Advantages*

1. The concept of central node prevents collisions between the messages.
2. If a connection is broken between any nodes with the hub or any computer fails, the rest of the network will continue operating.
3. Requires minimal line cost because only  $n-1$  lines are required for connecting  $n$  nodes.

#### *Disadvantages*

1. If the hub goes down, the entire network will stop working.
2. More expensive than bus topologies due to the cost of the hubs and more cables.

## 8.4 Ring Topology

In a ring topology, all computers and other communication devices are connected by a single cable in a circular manner. Thus each node is connected to its adjacent node by point-to-point links forming a physical ring. Data is transmitted in the form of data packets from node to node only in one direction around the ring until they reach their destination. There is no central server. A node receives data from one of its two adjacent nodes then it verifies. If it is addressed to it, it utilizes it. Otherwise, it merely passes it on to the next node.

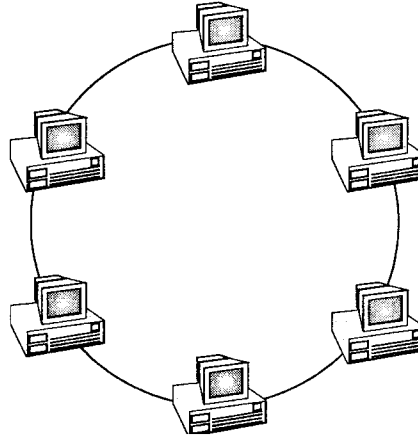


Figure 7.24

### *Advantage*

1. There is no danger of data collisions as the messages flow only in one direction.

### *Disadvantages*

1. If the connection is broken, the entire network goes down, as there is only one path between each pair of nodes.
2. Addition of nodes to the network increase its complexity and its cost.
3. Communication delay is directly proportional to the number of nodes in the network.

## 8.5 Mesh Topology

In a mesh topology, each node is connected to two or more nodes. *Figure* below shows both partially connected and fully connected mesh.

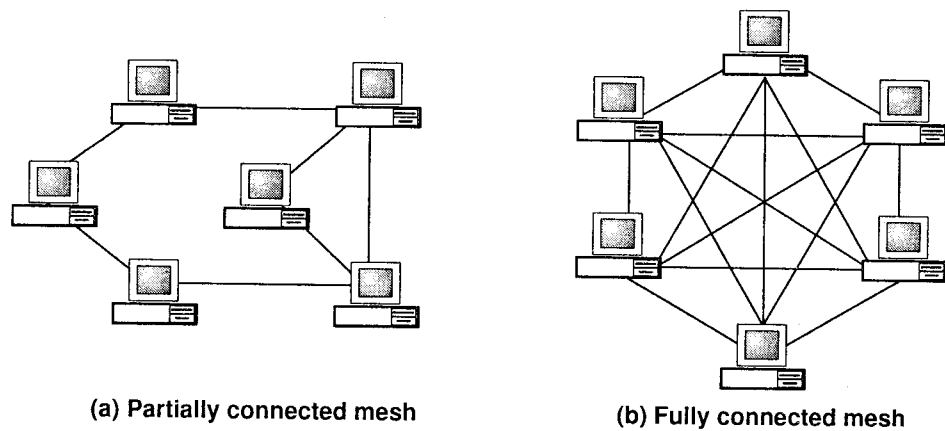


Figure 7.25: Mesh Topology

It can be seen from *figure* that the mesh topology has a typical advantage. In the event if one link between two nodes fails, there are alternate routes (links) available for communication.

Even though this approach is an expensive undertaking, some users prefer the reliability of the mesh network.

### *Advantages*

1. Communication is very fast between any two nodes.
2. Very reliable because any link failure does not affect communication between any two nodes.
3. Basic system can cost less than true star systems.

### *Disadvantages*

1. The most expensive network as per the link cost.
2. Difficulty of installation and reconfiguration.

## 8.6 Tree Topology

A tree network structure represents a complex bus. In this topology, the common point of communication at the top is known as the **headend**.

From the headend, feeder cables radiate outward to nodes, which in turn provide workstations with access to network. There may also be a feeder cable route to additional nodes.

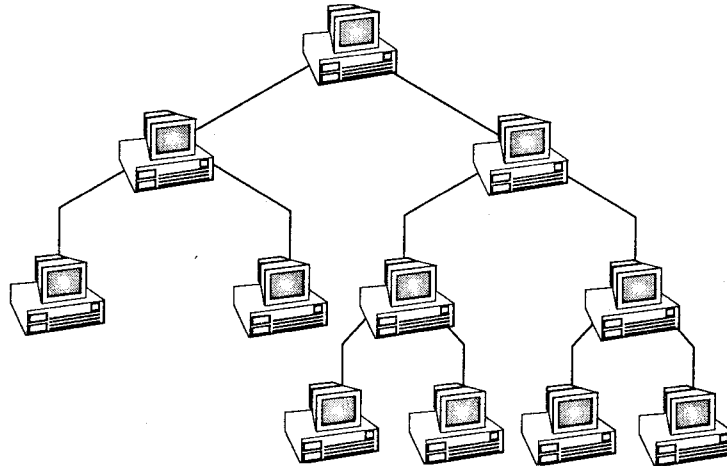


Figure 7.26: Tree Topology

### *Advantages*

1. Point-to-point wiring for individual segments.
2. Supported by several hardware and software vendors.

### *Disadvantages*

1. Overall length of each segment is limited by the type of cabling used.
2. If the backbone line breaks, the entire segment goes down.
3. More difficult to configure and wire than other topologies.

## 9. Internet

The term Internet has been coined from two terms 'interconnection' and 'network'. A network is simply a group of computers that are connected together for sharing information and resources. Several such networks have been joined together across the world to form what is called as the Internet. Thus, it is a network of networks.

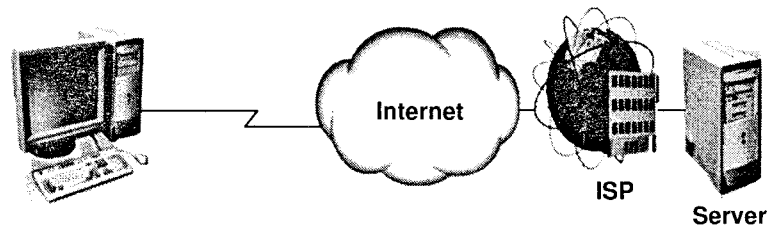


Figure 7.27

The Internet comprises thousands of computers connected together by different means on any given day. It is a global network which connects more than 30 million users in over 100 countries. The Internet is widely used to connect universities, government organizations, companies, etc. No body owns the Internet. Although there are organizations that help manage different parts of the networks, but there is no single governing body that controls what happens on the internet.

### 9.1 History of Internet

In 1969, the American defense department wanted to connect all the computers in the Department of Defense (DOD) offices and military research contractors including a large number of universities doing military founded research. That network was called Advanced Research Projects Agency Network (ARPANET), was also called DARPANET, the D for defense. It started in a small way, connecting few computers in California, but quickly grew to span the whole of America. It was very successful and all the universities wanted to get connected to ARPANET. The military officials wanted to preserve the unity of the DOD, so they divided the network into two parts:

- i. ARPANET
- ii. MILNET (Military Network)

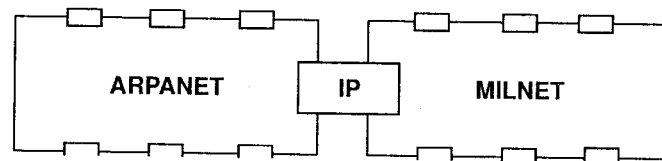


Figure 7.28

These two parts remained connected with a technical scheme called Internet Protocol (IP). The Protocol means “Set of rules which govern the data exchange on the Internet”, if we want to connect a person on another network, we need a protocol. Network designers have designed several protocols now, and some of them are as follows:

- i. Simple Mail Transfer Protocol (SMTP)
- ii. Point to Point (PPP)
- iii. Hyper-Text Transfer Protocol (HTTP)
- iv. Transfer Control Protocol/Internet Protocol (TCP/IP)

During 1994, Several Commercial organizations introduced networks across the globe. They also designed protocols to communicate from one node of a network to another node in another network. As a result of this we now have a network of so many different networks. This network of networks is called the Internet.

## 9.2 Internet Applications

The Internet consists of thousands of networks worldwide, connecting research facilities, universities, libraries and private companies. Many of these networks have host computers dedicated to maintaining archives of information, which are accessible to the public. The applications of Internet may be divided into several categories.

These include

- i. **E-mail (Electronic mail):** The facility to compose, send and receive electronic mail has been around since the early days of the ARPANET and is enormously popular.

Many people get dozens of messages a day and consider it their primary way of interaction with outside world far outdistancing the telephone and the conventional postal mail service. E-mail programs are available on virtually every computer these days. E-mails reach the destination in a near-real-time manner taking only a few seconds to several minutes as it travels from one network to another, until it reaches its destination.

- ii. **Chat and video conferencing:** The chat rooms provide a good resource of intercommunication among groups of like-minded people.

One can open a 'chat' session and put forward the views on a specific topic and get others to respond to the topic in much the same fashion, as some friend circle would discuss over the leisure time. People do enjoy this facility.

Video conferencing has been made possible with availability of higher bandwidth communication channels. With a Web camera connected to the computer and the video conferencing software one can have a live, video assisted discussion for business, official, informal purposes.

- iii. **Newsgroups:** Newsgroups are specialized forums in which users with a common interest can exchange messages. Thousands of newsgroups exist on technical and non-technical topics, including computers, science, recreation and politics. Each newsgroup has its own etiquette, style and customs.

- iv. **Web pages and animations:** The World Wide Web (WWW) has made it possible for a site to set up a number of pages of information containing text, pictures, sound and even video, with embedded links to other pages. By clicking on a link, the user is transported to the page pointed by that link. *For example*, many companies have a "HOME" page with entries pointing to other pages for product information, price lists, sales, technical support, communication with employees, stockholder information and much more.

Numerous other kinds of web pages have come into existence in a very short time, including maps, stock market tables, library card catalogues, recorded radio programs and even a page pointing to the complete text of articles of various journals and magazines as well as books.

Many people have personal information including photo albums, profiles, etc. available.

The vast amount of information available through such web pages, which is stored in the form of Hyper Text Markup Language (HTML), is accessible just at a mouse click.

It includes information on IT, legal, financial, art, sports, entertainment, technology, science and many more topics.

- v. **Databases for information storage and retrieval:** Extensive databases stored all across the globe are accessible. The advantage of WWW is that the information being searched for is available to the user irrespective of its physical location of storage.

Every piece of information stored in the Internet, has a unique address known as Uniform Resource Locator (URL). Several search engines are available for the service of Internet users. These include msn, infoseek, altavista, yahoo, google, and many more. The search engines provide mechanisms for locating the information. All you have to do is type in the keywords for the information being searched and let the search engine do the rest of the job. Within fraction of a second, the search engines present before you a list of web pages, which might contain some information about the key words, along with a summary and hyperlink to the

corresponding web page. One may also directly access the information by keying in the URL address.

- vi. **E - commerce and inventory system:** The Internet has proven to be a good means for marketing, a medium through which one can conduct business. Through the development of e-commerce, the Internet has established an electronic global worldwide market for various goods that operates 24 hours a day.

Organizations and individuals are able to market goods and services through the e-commerce. One can advertise, declare the stock status, handle purchase orders and inventory transactions through the Internet. The purchasing is supported by facilities such as digital signature and encryption. For the physical supply of goods of course one has to rely on the appropriate back-end logistics support network.

- vii. **File Transfer Protocol (FTP):** Using FTP program, it is possible to copy files from one machine on Internet to another. Vast number of articles, databases and other information is available this way.

A user needs access rights for a remote computer to transfer files to/from it. There is also a concept of an *anonymous FTP site* that allows a user to log in with a username of *anonymous* and a password that is user's e-mail address. The user can then download files that have been stored on it for sharing. Such sites are called *publicly accessible sites* because any user on the Internet can access them.

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- viii. **Remote login:** Using Telnet, Rlogin or other programs, users anywhere on the Internet can log into any other machines on which they have an account.

Even if you do not have a machine, agencies like hotmail, rediffmail, mail excite, yahoo, msn host user accounts on their machines and support various services. Through the netcafes or cybercafes one can access these remotely situated accounts and do net surfing or web browsing.

Several Web browsers are available. Internet Explorer and Netscape Navigator are among the popular browser.

#### Uses of telnet

- a. Allows access to a remote computer. Hence, the user can use the computing power of the remote machine.
- b. Software located on the remote computer can be used by a user if it is not available on his local machine.



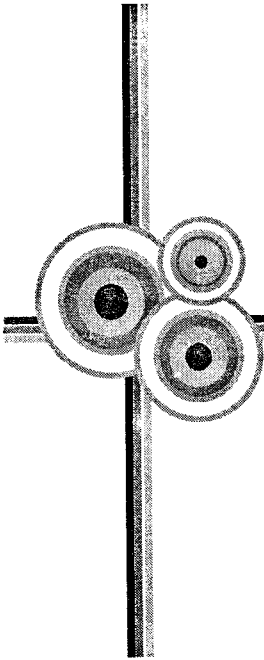
- c. The user can access a remote computer's database or archive which may be of interest to a user.
  - d. If the user is away from his personal computer, he can log on to it using this facility from another location to access some stored information or read his own mails.
- ix. **Usenet groups:** Usenet Groups are a system of "Bulletin Boards", each dedicated to a particular topic, where users can post messages themselves and read messages posted by others. Usenet Groups exist for almost every conceivable topic on earth, including topics associated with business, leisure, physical health, mental health, celebrities, hobbies, etc. In fact, the author doubts there could be any topic an average person could ask about that does not have a Usenet Group dedicated to it.
- x. **LISTSERV:** LISYSERV functions like a Usenet group, except that there is no "Bulletin Board". Instead, all subscribers receive messages posted by any other subscriber through e-mail. Thus, a LISYSERV application necessitates that one must first be a subscriber to the service, after which he/she receives messages posted by other users through e-mail. Similarly, any message posted by this subscriber would automatically be posted to all other subscribers.



## Exercise

---

1. What are the applications of computer networks?
2. Differentiate between analog and digital transmission.
3. Write a short note on WAN.
4. What do you know about Computer Communication?
5. Describe the types of communication.
6. What are communication Networks? Describe each briefly.
7. What do you understand by Network Topologies? Describe each of them briefly.
8. Write in detail about LAN.
9. What is Internet? Why is it gaining popularity?
10. Differentiate between asynchronous and synchronous transmission.
11. Why is digital transmission preferred over analog transmission of digital data?



## 1. Introduction

MS Office (Microsoft Office) is a suite of products developed by Microsoft Corporation that includes Microsoft Word, Excel, Access, Publisher, PowerPoint, and Outlook. Each program serves a different purpose and is compatible with other programs included in the package. The suite of programs is compatible with both Windows and Macintosh operating system.

Microsoft Office is an office suite of desktop applications, servers and services for the Microsoft Windows and Mac OS X operating systems, introduced by Microsoft on August 1, 1989.

Various versions of MS Office are:

- i. MS Office 97
- ii. MS Office 2000
- iii. MS Office 2003
- iv. MS Office 2007
- v. MS Office 2010
- vi. MS Office 2013

Initially, a marketing term for a bundled set of applications, the first version of Office contained Microsoft Word, Microsoft Excel, and Microsoft PowerPoint. Over the years, Office applications

have grown substantially closer with shared features such as a common spell checker, OLE data integration and Microsoft Visual Basic for Applications scripting language.

Microsoft also positions Office as a development platform for line-of-business software under the Office Business Applications brand. Office is reported to now be used by over a billion people worldwide.

## 1.1 Features of MS-Office 2007

- i. **File Menu:** The user interface has been significantly redesigned in the 2007 Microsoft office programs. The File menu has been replaced with the Microsoft Office Button. When you click the Microsoft Office Button you see the same basic commands that were found under the File menu in previous versions of Microsoft Office to open, save, and print your file.

However, in 2007, more commands are now available, such as Prepare and Publish. *For example*, in Word, Excel, and PowerPoint, by pointing to Prepare, and then clicking Inspect Document, you can check a file for hidden metadata or personal information. The program's Options are also found under the Microsoft office Button. This command used to be under Tools and Options in previous versions.

Number of questions asked.  
**1**  
Oct.2010 – 4M  
What are the different types of Menus available in Windows? Explain any one.

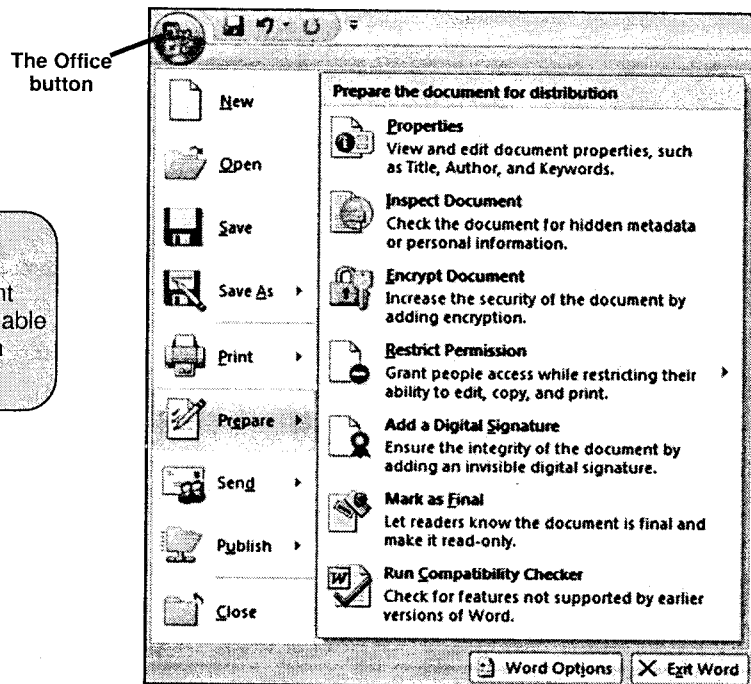


Figure 8.1

- ii. **Office Assistant:** The online Help feature in 2007 has been completely redesigned, and the new design does not include the Microsoft Office Assistant. To access Help click the Microsoft Office Help icon located in the top right corner of the program.

Each program has its own Help home page where you can find product information, Help and how-to articles, training courses, templates, and more.



Office help icon

Figure 8.1

- iii. **Ribbon:** When you first start some of the programs in 2007 you see the ribbon. The menus and toolbars in some programs have been replaced with the Ribbon. The Ribbon is designed to help you quickly find the commands that you need to complete a task.

Commands are organized in logical groups, which are collected together under Tabs. Each Tab relates to a type of activity, such as writing or laying out a page.

There are three basic components to the Ribbon:

- Tabs** sit across the top of the Ribbon. Each one represents the tasks you do in a given program.
- Groups** are sets of related commands, displayed on Tabs. They pull together all the commands you're likely to need for a type of task, and they remain on display and readily available, giving you rich visual aids.
- Commands** are arranged in groups. A command can be a button, a menu, or a box where you enter information.

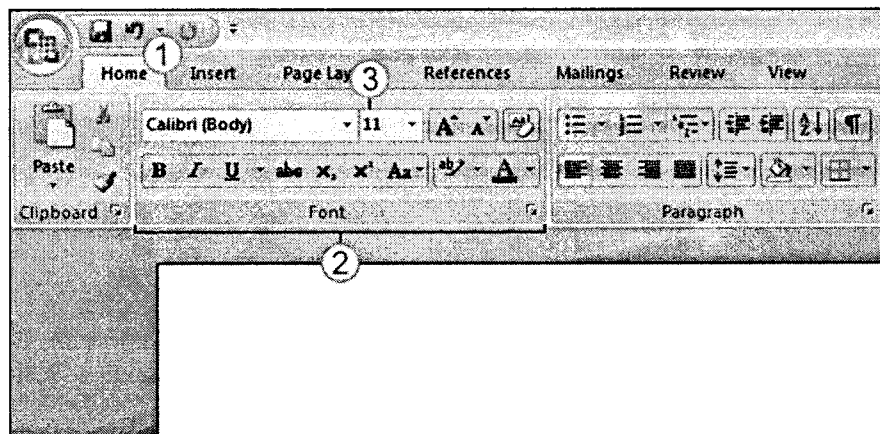


Figure 8.2

- iv. **Galleries:** Galleries are at the heart of the redesigned programs. Galleries provide users with a set of clear results to choose from when working on a document, spreadsheet, presentation, or Access database.

By presenting a simple set of potential results, rather than a complex dialog box with numerous options, Galleries simplify the process of producing professional-looking work. The traditional dialog box interfaces are still available for those who want a greater degree of control over the result of the operation.

For example, Word 2007 provides the following designs when working with tables:

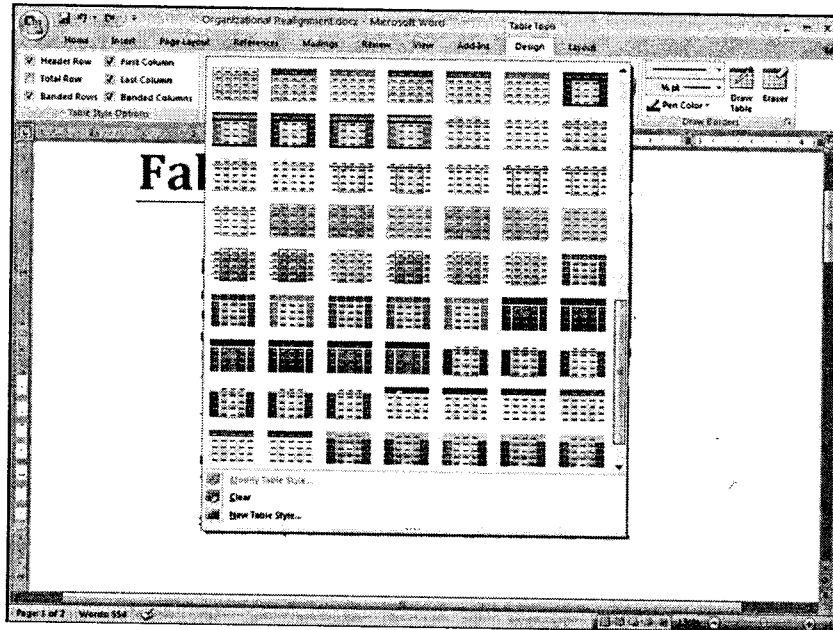


Figure 8.3

- v. **Live Preview:** Live Preview is a new technology that shows the results of applying an editing or formatting change as the user moves the pointer over the results presented in a Gallery. This new, dynamic capability streamlines the process of laying out, editing, and formatting, so users can create professional results with less time and effort. To use Live Preview, rest the mouse pointer on an option. Your document changes to show you what that option would look like before you actually make the selection. After you see the preview of what you want, then click the option to make your selection.
- vi. **Enhanced ToolTips:** The new Microsoft Office system user interface dramatically streamlines access to information about commands and tools. Enhanced ToolTips provide links to auxiliary information, such as training or help topics, directly from the command.

### ▶ **PowerPoint 2007**

PowerPoint 2007 is Microsoft's presentation software, used for creating slide show presentations. Users can import graphs and charts from Excel or text from Word, or use PowerPoint's own tools for creating slide text and graphics. The program also has the capacity to add special effects like fade-ins or fade-outs between slides, as well as audio and video. PowerPoint is included in every edition of Microsoft Office 2007.

### ▶ **Outlook 2007**

Outlook 2007 is Microsoft's e-mail client, and it also includes a calendaring program, address book and contact organizer, and task list. With Outlook, you can manage any number of e-mail addresses and create personal mailing lists. Outlook is included in the Small Business, Professional, Professional Plus, Ultimate and Enterprise editions of Office 2007.

### ▶ **Publisher 2007**

Publisher 2007 is Microsoft's solution for home and business users who want to create posters, flyers, letterhead, brochures or other marketing materials. Publisher simplifies the design process by including a number of predefined color schemes, page borders, as well as clip art and templates for popular types of publications like bake sale flyers, calendars, and personal stationery. Publisher is included with the Small Business, Professional, Professional Plus, Ultimate and Enterprise editions of Office 2007.

### ▶ **Access 2007**

Access 2007 lets users work with data by creating databases, data entry forms and queries. Access can be used as a standalone database program or to interface with Microsoft SQL server databases. Access is included with Microsoft Office Professional, Professional Plus, Ultimate and Enterprise.

### ▶ **Specialized Office Components**

Some of the targeted versions of Microsoft Office include extra programs designed to help customers with specific needs, like small business owners. These programs include:

- i. Accounting Express, which is a financial accounting package aimed at small business owners.
- ii. Groove 2007, a collaboration tool for users who work collaboratively from different physical locations or offline.
- iii. InfoPath 2007, a forms-creation tool for business users and developers.
- iv. Communicator 2007, which is a communications client used for Internet-based audio and video conferencing.
- v. OneNote, which serves as a virtual notebook to store text, graphics, Web links or other information organized by topic, subject or project.

## 2. Introduction to MS-Word 2007

Microsoft Word is the world's leading word processing application. It can be used to work with a wide range of documents from simple letters, memos to complex documents like newsletters, forms and now with blogs too with Word 2007.

Microsoft Word is a component of the Microsoft Office suite of productivity software, but can also be purchased as a stand-alone product.

It was initially launched in 1983 and has since been revised numerous times. Microsoft Word is available on both Windows and Macintosh operating systems.

Microsoft Word is often called simply Word or MS Word.

In 1981, Microsoft hired Charles Simonyi to develop a word-processing application. The first version was released in 1983. It was not initially popular owing to its radically different look compared to WordPerfect, the leading word processor at that time. However, Microsoft improved Word continually over the years, including a 1985 version that could run on a Mac. 1987 brought about the second major release of Word, which included an upgrade of major features in addition to new functionalities such as support for the rich text format.

In 1995, with the release of Windows 95 and Office 95, which offered a bundled set of office productivity software, sales of Microsoft Word increased significantly.

**Microsoft Word offers several features to ease document creation and editing, including:**

- i. **WYSIWYG (what-you-see-is-what-you-get) display:** It ensures that everything you see on screen will appear the same way when printed or moved to another format or program.
- ii. **Spell Check:** Word comes with an built-in dictionary for spell checking; misspelled words are marked with a red squiggly underline. Sometimes, Word auto-corrects an obviously misspelled word or phrase.
- iii. **Text-level features** such as bold, underline, italic and strike-through.
- iv. **Page-level features** such as indentation, paragraphing and justification.
- v. **External support:** Word is compatible with many other programs, the most common being the other members of the Office suite.

The default file format was .doc prior to the Microsoft Word 2007 version; in 2007, .docx became the default file format.

Number of questions asked  
**5**

**Oct.11, 10,09,08 – 4M**

State any four features of MS- Word.

**Apr.2009 – 4M**

Explain features of MS- Windows.

## 2.1 Getting Familiar with Microsoft Word 2007 Window

Open Microsoft Word 2007 by clicking on start menu and then Programs → Microsoft Office → Microsoft Office Word 2007. The Microsoft Word window appears and your screen looks similar to the one shown here:

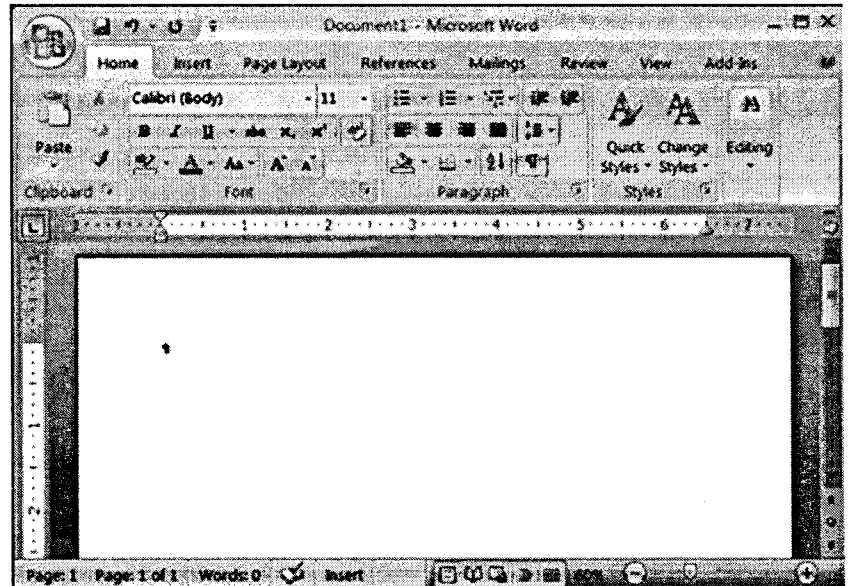
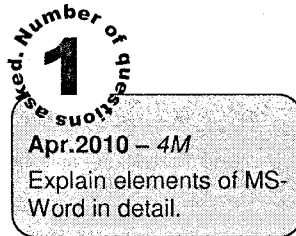


Figure 8.4

### ► The Microsoft Office Button

In the upper-left corner of the Word 2007, window is the Microsoft Office button. When you click the button, a menu appears. You can use the menu to create a new file, open an existing file, save a file, and perform many other tasks.



### ► The Quick Access Toolbar

Next to the Microsoft Office button is the Quick Access toolbar. The Quick Access toolbar provides you with access to commands you frequently use. By default Save, Undo, and Redo appear on the



Quick Access toolbar. You can use Save to save your file, Undo to rollback an action you have taken, and Redo to reapply an action you have rolled back.



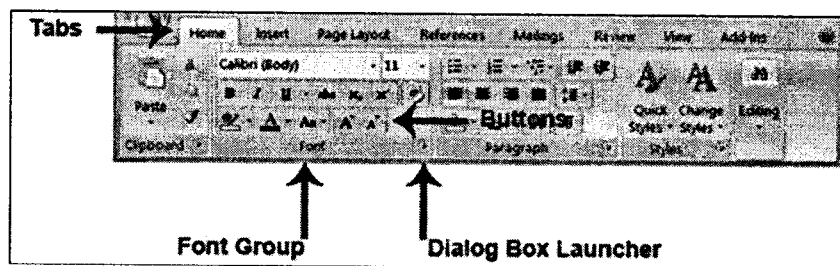
### ► The Title Bar

Next to the Quick Access toolbar is the Title bar. The Title bar displays the title of the document on which you are currently working. Word names the first new **document** you open Document1. As you open additional new documents, Word names them sequentially. When you save **your document**, you assign the document a new name.

A screenshot of the title bar of a Microsoft Word window, displaying the text "Document1 - Microsoft Word".

### ► The Ribbon

You use commands to tell Microsoft Word what to do. In Microsoft Word 2007, you use the Ribbon to issue commands. The Ribbon is located near the top of the screen, below the Quick Access toolbar. At the top of the Ribbon are several tabs; clicking a tab displays several related command groups. Within each group are related command buttons. You click buttons to issue commands or to access menus and dialog boxes. You may also find a dialog box launcher in the bottom-right corner of a group. Clicking the dialog box launcher gives you access to additional commands via a dialog box.



### ► The Ruler

The ruler is found below the Ribbon.



You can use the ruler to change the format of your document quickly.

## ► The Text Area

Just below the ruler is a large area called the text area. You type your document in the text area. The blinking vertical line in the upper-left corner of the text area is the cursor. It marks the insertion point. As you type, your text displays at the cursor location. The horizontal line next to the cursor marks the end of the document.

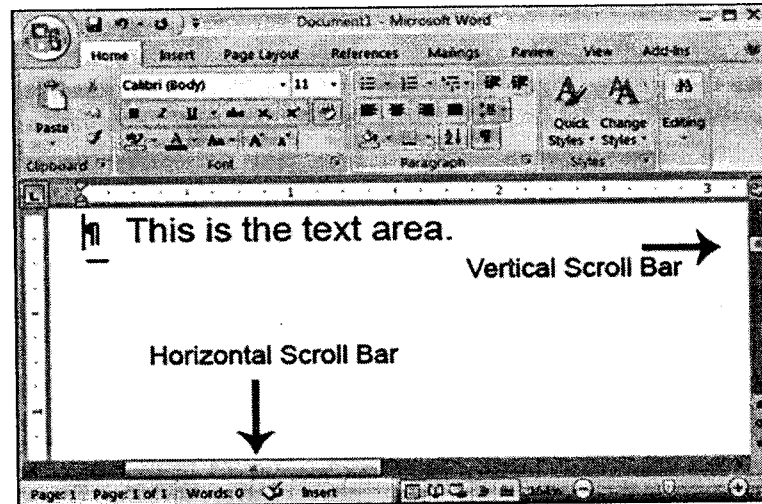


Figure 8.5

## ► The Vertical and Horizontal Scroll Bars

The vertical and horizontal scroll bars enable you to move up, down, and across your window simply by dragging the icon located on the scroll bar. The vertical scroll bar is located along the right side of the screen. The horizontal scroll bar is located just above the status bar.

## ► The Status Bar

The Status bar appears at the very bottom of your window and provides such information as the current page and the number of words in your document. You can change what displays on the Status bar by right-clicking on the Status bar and selecting the options you want from the Customize Status Bar menu. You click a menu item to select it. You click it again to deselect it. A check mark next to an item means it is selected.

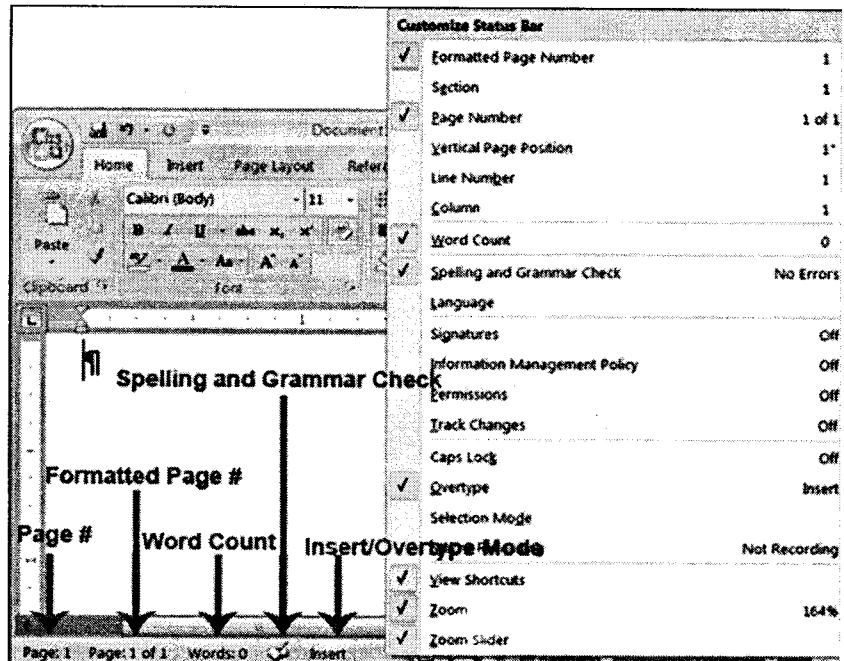



Figure 8.6

## 2.2 Dealing with Document/Letter

### ► Creating New Document / Letter

There are several ways to create new documents, open existing documents, and save documents in Word:

- i. Click the Microsoft Office Button  and Click New or
- ii. Press CTRL+N (Depress the CTRL key while pressing the "N") on the keyboard

You will notice that when you click on the Microsoft Office Button and Click New, you have many choices about the types of documents you can create. If you wish to start from a blank document, click Blank. If you wish to start from a template you can browse through your choices on the left, see the choices on center screen, and preview the selection on the right screen.

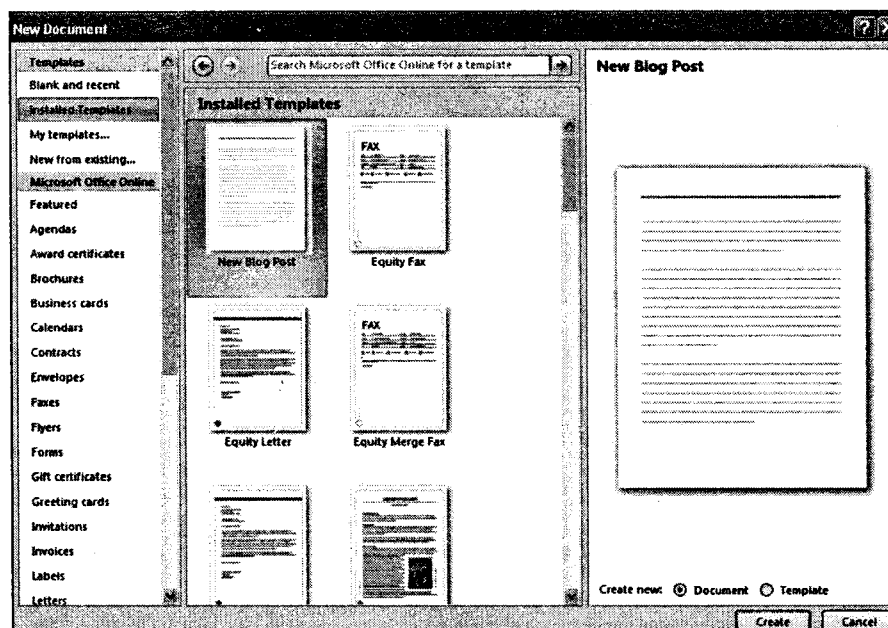




Figure 8.7

### ► Opening an Existing Document

- i. Click the Microsoft Office Button  and Click Open, or
- ii. Press CTRL+O (Depress the CTRL key while pressing the “O”) on the keyboard, or
- iii. If you have recently used the document you can click the Microsoft Office Button and click the name of the document in the Recent Documents section of the window Insert picture of recent docs.

### ► Saving a Document

- i. Click the Microsoft Office Button  and Click Save or Save As (remember, if you're sending the document to someone who does not have Office 2007, you will need to click the Office Button, click Save As, and Click Word 97-2003 Document), or
- ii. Press CTRL+S (Depress the CTRL key while pressing the “S”) on the keyboard, or
- iii. Click the File icon on the Quick Access Toolbar.

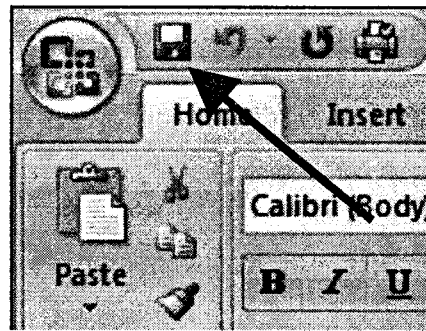



Figure 8.8

### ► Renaming Documents

To rename a Word document while using the program

- i. Click the Office Button  and find the file you want to rename.
- ii. Right-click the document name with the mouse and select Rename from the shortcut menu.
- iii. Type the new name for the file and press the ENTER key.

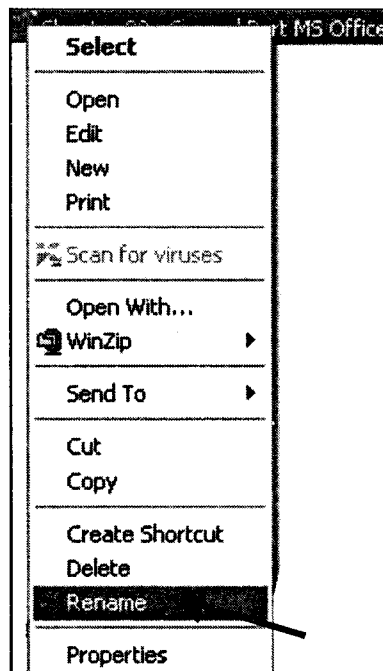


Figure 8.9

## ► Working on Multiple Documents

Several documents can be opened simultaneously if you are typing or editing multiple documents at once. All open documents will be listed in the View Tab of the Ribbon when you click on Switch Windows. The current document has a checkmark beside the file name. Select another open document to view it.

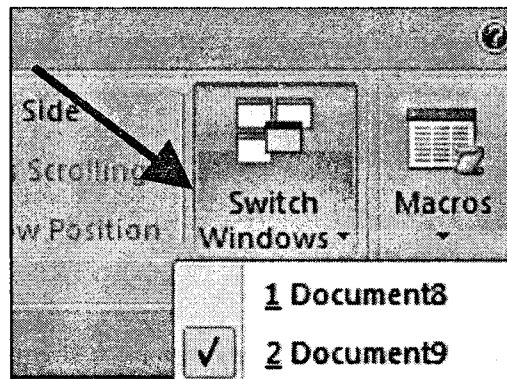
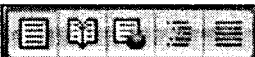


Figure 8.10

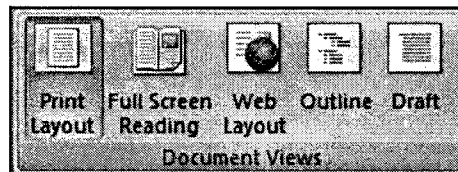
## ► Document Views

**There are many ways to view a document in Word.**

- i. *Print Layout*: This is a view of the document as it would appear when printed. It includes all tables, text, graphics, and images.
- ii. *Full Screen Reading*: This is a full view length view of a document. Good for viewing two pages at a time.
- iii. *Web Layout*: This is a view of the document as it would appear in a web browser.
- iv. *Outline*: This is an outline form of the document in the form of bullets.
- v. *Draft*: This view does not display pictures or layouts, just text.

To view a document in different forms, click the document views shortcuts at the bottom of the screen  or:

- i. Click the View Tab on the Ribbon
- ii. Click on the appropriate document view.



### ► Close a Document

To close a document:

- i. Click the Office Button
- ii. Click Close

## 2.3 Formatting Text

Following figure shows various text formatting options on the ribbon:

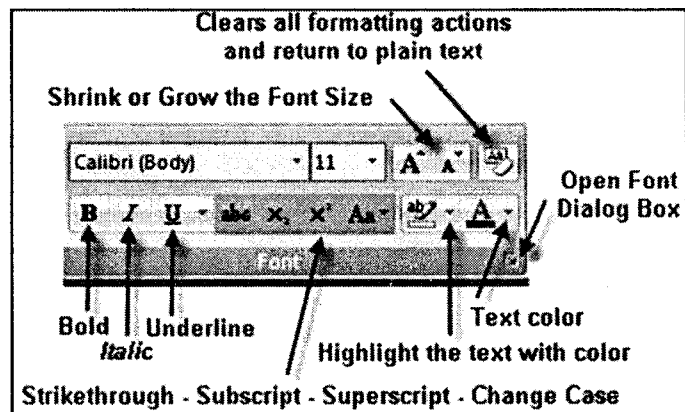


Figure 8.11

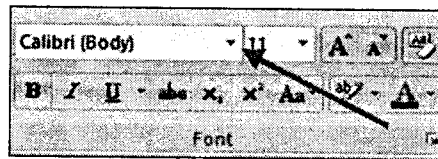
### ► Making Text Bold/Italic/Underline

To make the text bold/italic/underline, you can:

- i. Select the required text
- ii. Press Ctrl+B for bold, Ctrl+I for italic and Ctrl+U for underline Or
- iii. Click on B/I/U button on the ribbon for Bold/Italic/Underline

## ► Dealing with fonts

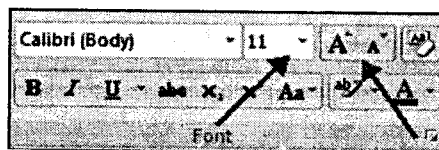
To change the font typeface click the **arrow** next to the font name and choose a font.



You can preview how the new font will look by highlighting the text, and hovering over the new font typeface.

### To change the font size:

- i. Click the arrow next to the font size and choose the appropriate size, or
- ii. Click the increase or decrease font size buttons.



## ► Highlight Text

Highlighting text allows you to use emphasize text as you would if you had a marker.

### To highlight text:

- i. Select the text
- ii. Click the Highlight Button on the Font Group of the Ribbon, or
- iii. Select the text and right click and select the highlight tool
- iv. To change the color of the highlighter click on down arrow next to the highlight button.



## ► Change Text Color

### To change the text color:

- i. Select the text and click the Colors button included on the Font Group of the Ribbon, or



- ii. Highlight the text and right click and choose the colors tool.
- iii. Select the color by clicking the down arrow next to the font color button.



### ► Clear Formatting

To clear text formatting:

- i. Select the text you wish to clear the formatting
- ii. Click the **Styles** dialog box on the Styles Group on the Home Tab
- iii. Click **Clear All**

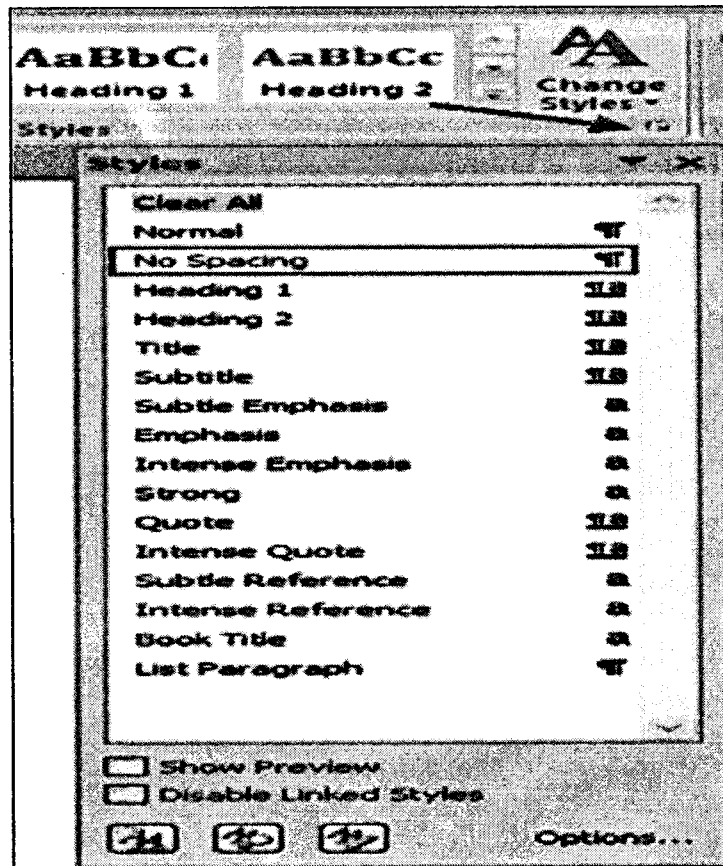
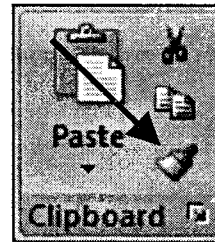


Figure 8.12

## ► Copy Formatting

If you have already formatted text the way you want it and would like another portion of the document to have the same formatting, you can copy the formatting. To copy the formatting, do the following:

- i. Select the text with the formatting you want to copy.
- ii. Copy the format of the text selected by clicking the **Format Painter** button on the Clipboard Group of the Home Tab
- iii. Apply the copied format by selecting the text and clicking on it.



## 2.4 Handling Paragraphs

Formatting paragraphs allows you to change the look of the overall document. You can access many of the tools of paragraph formatting by clicking the **Page Layout** Tab of the Ribbon or the **Paragraph** Group on the Home Tab of the Ribbon.

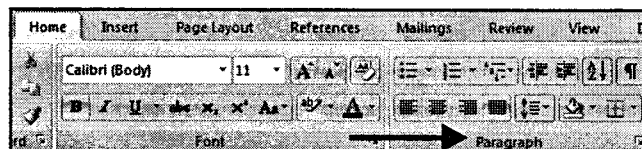
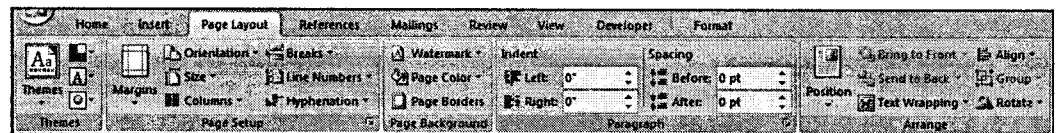


Figure 8.13

## ► Change Paragraph Alignment

The paragraph alignment allows you to set how you want text to appear. To change the alignment:

- i. Click the Home Tab
- ii. Choose the appropriate button for alignment on the Paragraph Group.
  - a. *Align Left*: The text is aligned with your left margin.
  - b. *Center*: The text is centered within your margins.
  - c. *Align Right*: Aligns text with the right margin.
  - d. *Justify*: Aligns text to both the left and right margins.

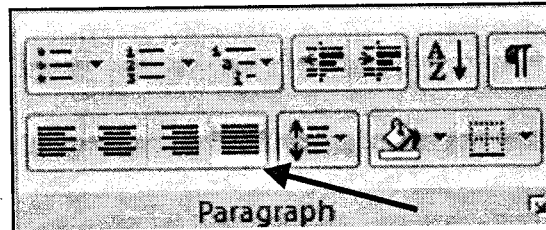


Figure 8.14

## ► Indent Paragraphs

Indenting paragraphs allows you set text within a paragraph at different margins. There are several options for indenting:

- i. **First Line**: Controls the left boundary for the first line of a paragraph.
- ii. **Hanging**: Controls the left boundary of every line in a paragraph except the first one.
- iii. **Left**: Controls the left boundary for every line in a paragraph.
- iv. **Right**: Controls the right boundary for every line in a paragraph.

To indent paragraphs, you can do the following:

- i. Click the **Indent** buttons to control the indent.
- ii. Click the **Indent** button repeated times to increase the size of the indent.

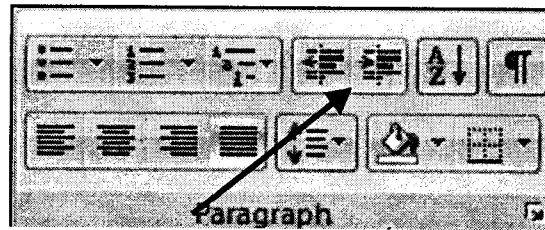


Figure 8.15

### ► Add Borders and Shading

You can add borders and shading to paragraphs and entire pages. To create a border around a paragraph or paragraphs:

- i. Select the area of text where you want the border or shading.
- ii. Click the **Borders** Button on the Paragraph Group on the Home Tab.
- iii. Choose the **Border and Shading**.
- iv. Choose the appropriate options.

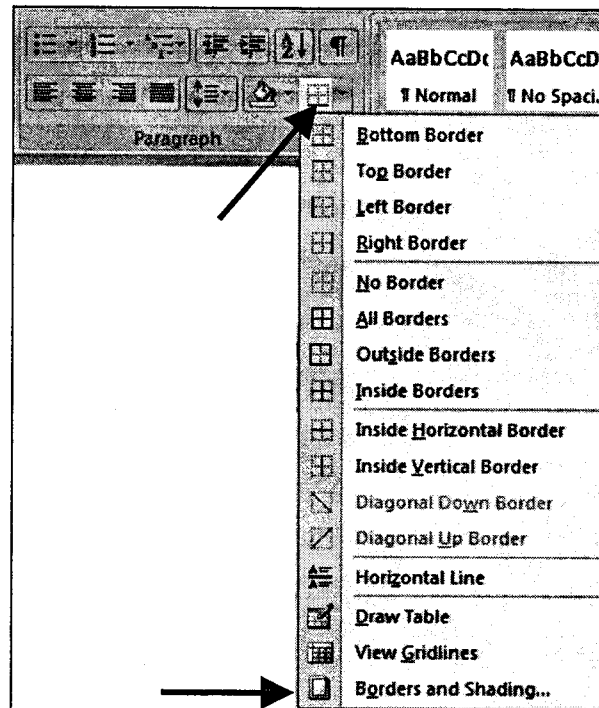


Figure 8.16

## ► Change Spacing Between Paragraphs and Lines

You can change the space between lines and paragraphs by doing the following:

- i. Select the paragraph or paragraphs you wish to change.
- ii. On the Home Tab, click the **Paragraph** Dialog Box.
- iii. Click the **Indents and Spacing** Tab.
- iv. In the **Spacing** section, adjust your spacing accordingly.

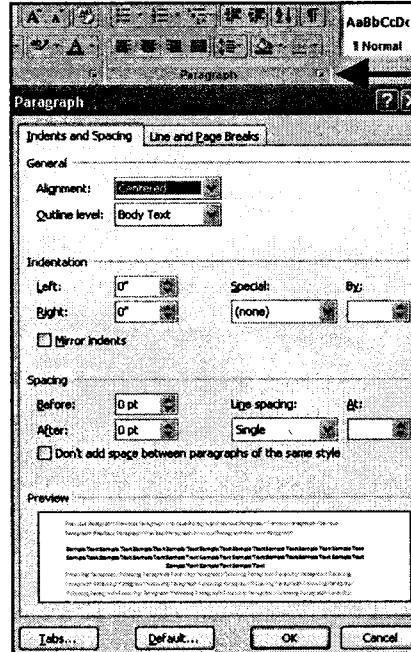


Figure 8.17

## 2.5 Editing a Document

### ► Inserting Additional Text

Text can be inserted in a document at any point using any of the following methods:

- i. **Type Text:** Put your cursor where you want to add the text and begin typing.
- ii. **Copy and Paste Text:** Highlight the text you wish to copy and right click and click Copy, put your cursor where you want the text in the document and right click and click Paste.

Number of questions asked. **1**

Oct 2008 – 4M

Explain different features of Editing Text in MS-Word.

- iii. **Cut and Paste Text:** Highlight the text you wish to copy, right click, and click Cut, put your cursor where you want the text in the document, right click, and click Paste.
- iv. **Drag Text:** Highlight the text you wish to move, click on it and drag it to the place where you want the text in the document.

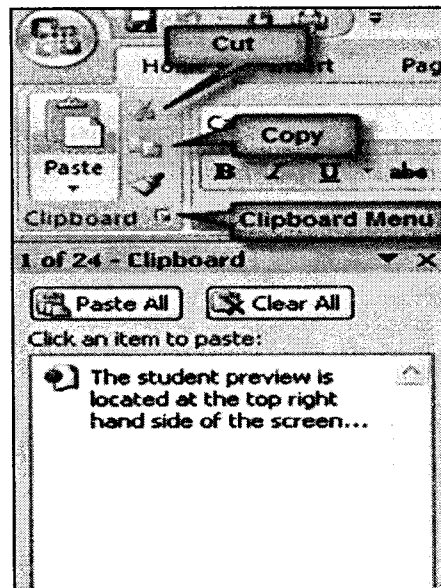


Figure 8.18

### ► Rearranging Blocks of Text

To rearrange text within a document, you can utilize the Clipboard Group on the Home Tab of the Ribbon. Insert picture of clipboard group labeled

- i. **Move text:** Cut and Paste or Drag as shown above.
- ii. **Copy Text:** Copy and Paste as above or use the Clipboard group on the Ribbon.
- iii. **Paste Text:** Ctrl + V (hold down the CTRL and the "V" key at the same time) or use the Clipboard group to Paste, Paste Special, or Paste as Hyperlink.

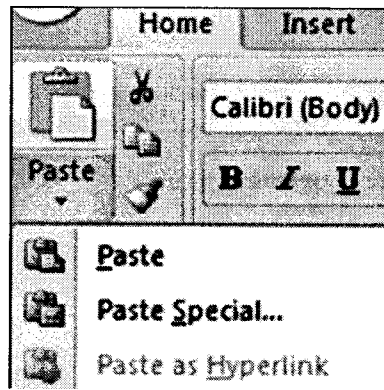
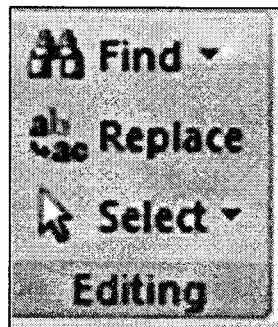


Figure 8.19

### ► Search and Replace Text

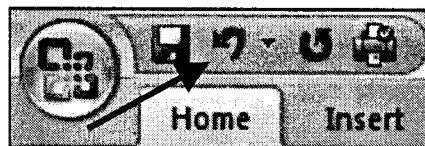
To find a particular word or phrase in a document:

- i. Click Find on the Editing Group on the Ribbon.
- ii. To find and replace a word or phrase in the document, click Replace on the Editing Group of the Ribbon.



### ► Undo Changes

To undo changes: Click the **Undo Button** on the Quick Access Toolbar



## 2.6 Working with Tables

A table is a grid of cells arranged in rows and columns. Tables can be customized and are useful for various tasks such as presenting text information and numerical data.

A table is made up of rows and columns. The intersection of a row and column is called a cell. Tables are often used to organize and present information, but they have a variety of uses as well. You can use tables to align numbers and create interesting page layouts.

### ► Create a Table

- i. Click the Insert tab on the Ribbon
- ii. Click the Table button
- iii. Select Insert Table
- iv. Click the arrows to select the desired number of columns
- v. Click the arrows to select the desired number of rows
- vi. Click Ok

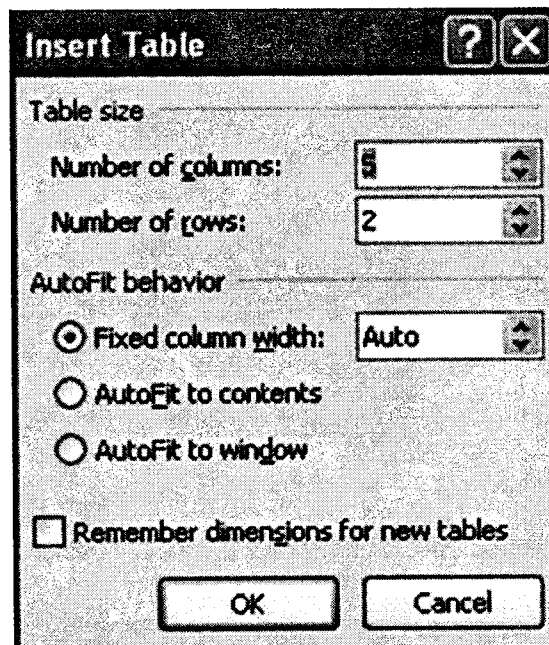


Figure 8.20



### Insert a Row

- i. Position the cursor in the table where you would like to insert a row
- ii. Select the Layout tab on the Ribbon
- iii. Click either the Insert Row Above or the Insert Row Below button in the Rows and Columns group

### Insert a Column

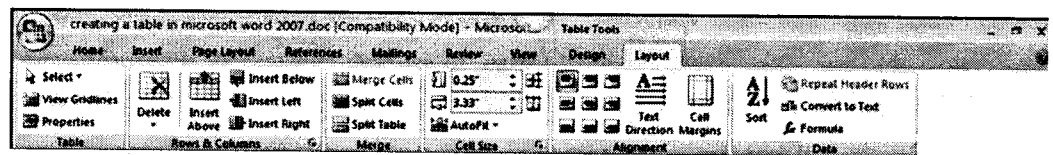
- i. Position the cursor in the table where you would like to insert a column
- ii. Select the Layout tab on the Ribbon
- iii. Click either the Insert Columns to Left button or the Insert Columns to Right button in the Rows and Columns group

### Delete a Row

- i. Position your cursor in the row that you would like to delete
- ii. Select the Layout tab on the Ribbon
- iii. Click the Delete button in the Rows and Column group
- iv. Select Delete Rows

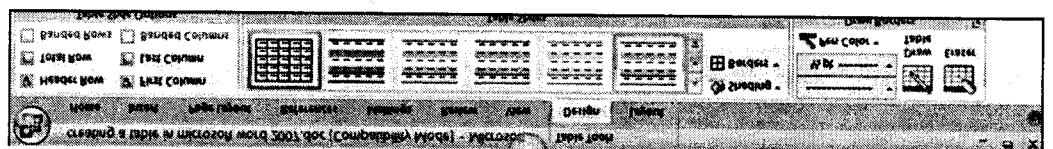
### Delete a Column

- i. Position your cursor in the column that you would like to delete
- ii. Select the Layout tab on the Ribbon
- iii. Click the Delete button in the Rows & Column group
- iv. Select Delete Columns



### ► Formatting a Table

Using Microsoft Word you are able to format a table by changing table lines and colors, shading tables, adjusting row and column size as well as alignment.



**To Shade the Cells/Table:**

- i. Position your cursor in the table
- ii. Click the Layout tab on the Ribbon
- iii. Click the Select button in the Table group
- iv. Choose the item you wish to format
- v. Click the Design tab on the Ribbon
- vi. Click the Shading button
- vii. Select a shading color

**To Adjust the Line Style of a Cell/Table:**

- i. Position your cursor in the table
- ii. Click the Layout tab on the Ribbon
- iii. Click the Select button in the Table group
- iv. Choose the item you wish to format
- v. Click the Design tab on the Ribbon
- vi. Select the Line Style drop-Down Arrow
- vii. Select a style
- viii. Click your mouse in the table where you want to apply the line style to
- ix. Press ESC key on the keyboard when you are finished applying the style

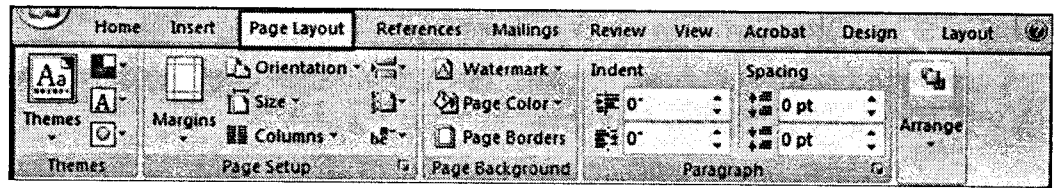
**► Merge Cells in a Table**

- i. Select the cells that you would like to merge in the table
- ii. Click on the Layout tab on the ribbon
- iii. Click the Merge Cells button in the Merge group

## **2.7 Page Layout and Document Formatting**

The Page Layout Tab lets you control the look and feel of your document in Microsoft Word 2007. You can apply a global design to your document by using one of the available themes and color schemes. You can also change the document orientation, page size, margins, indentation, line spacing and paragraph settings.

When you click on the Page Layout tab, this is similar to what you would see.



### ► Themes

Themes is a great feature if you are typing an elaborate document and want to use a variety of fonts and colors and then duplicating those fonts and colors on another document or throughout a long document. A document theme is a set of formatting choices that include a set of theme colors, a set of theme fonts that you can specify a heading and body text font, and a set of theme effects you can choose lines and fill effects.

#### To apply a theme to document:

- i. Click the down arrow under themes.
- ii. You will get a list of pre-designed themes you can apply to your document. Each theme will include font colors, font styles, font sizes and effects including lines, fill effects, and colors. Select the required theme from this list.

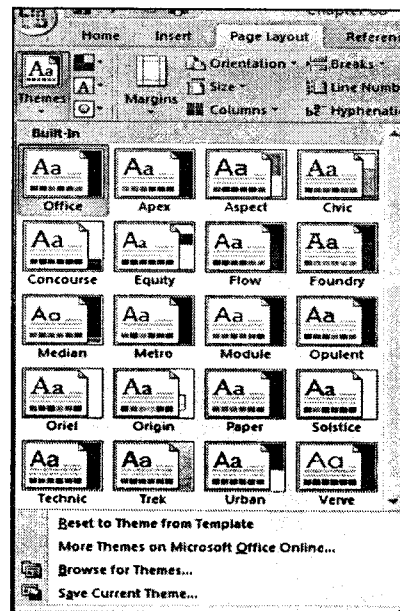


Figure 8.21

## Page Setup

Page setup section under the Page Layout tab is used to set the margins and orientation of the page. It is also used to specify the page size, page breaks, line numbers and dividing page in columns.

### ► Modify Page Margins and Orientations

The page margins can be modified through the following steps:

- i. Click the Page Layout Tab on the Ribbon
- ii. On the Page Setup Group, Click Margins
- iii. Click a Default Margin, or
- iv. Click Custom Margins and complete the dialog box

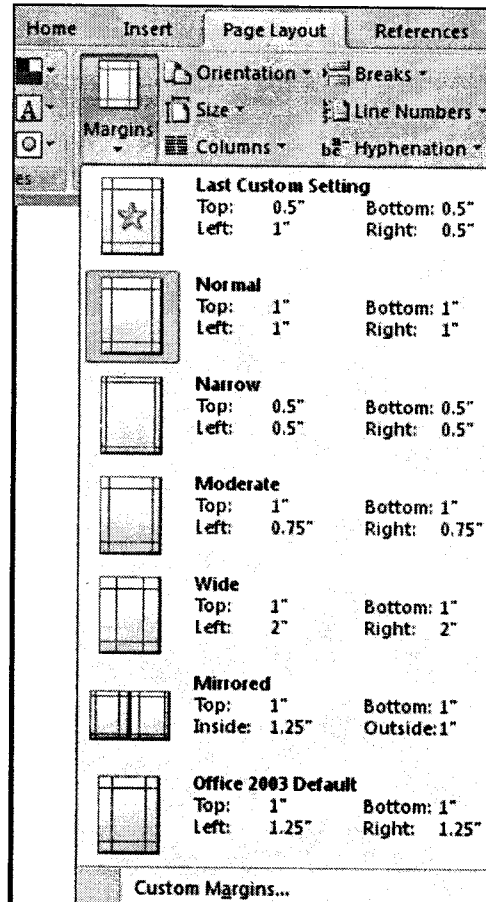
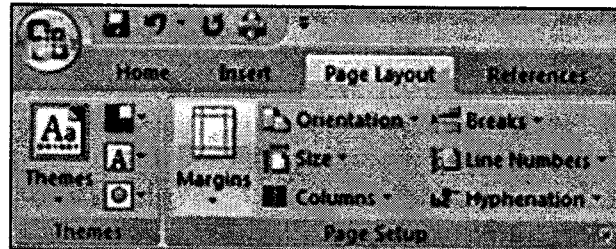


Figure 8.22

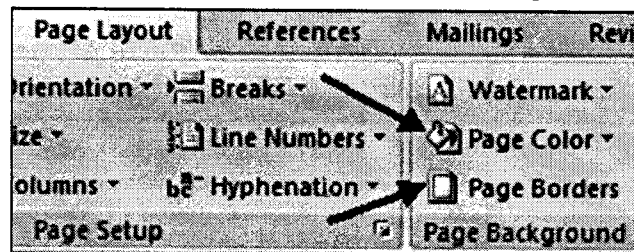
### To change the Orientation, Size of the Page, or Columns:

- i. Click the **Page Layout** Tab on the Ribbon
- ii. On the Page Setup Group, Click the **Orientation, Size, or Columns** drop down menus
- iii. Click the appropriate choice



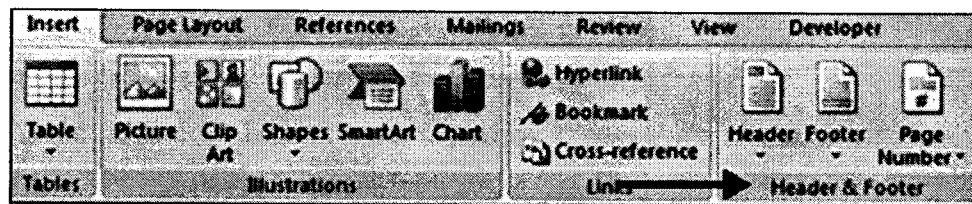
### Apply a Page Border and Color To apply a page border or color:

- i. Click the **Page Layout** Tab on the Ribbon.
- ii. On the Page Background Group, click the **Page Colors** or **Page Borders** drop down menus.



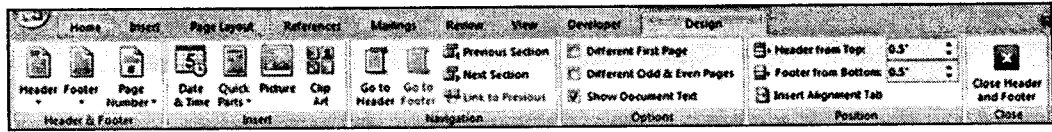
**Insert Common Header and Footer Information** To insert Header and Footer information such as page numbers, date, or title, first, decide if you want the information in the header (at the top of the page) or in the Footer (at the bottom of the page), then:

- i. Click the **Insert** Tab on the Ribbon
- ii. Click **Header** or **Footer**
- iii. Choose a style



- iv. The **Header/Footer Design** Tab will display on the Ribbon

- v. Choose the information that you would like to have in the header or footer (date, time, page numbers, etc.) or type in the information you would like to have in the header or footer.



**Create a Page Break** To insert a page break:

- i. Click the Page Layout Tab on the Ribbon
- ii. On the Page Setup Group, click the Breaks Drop Down Menu
- iii. Click Page Break

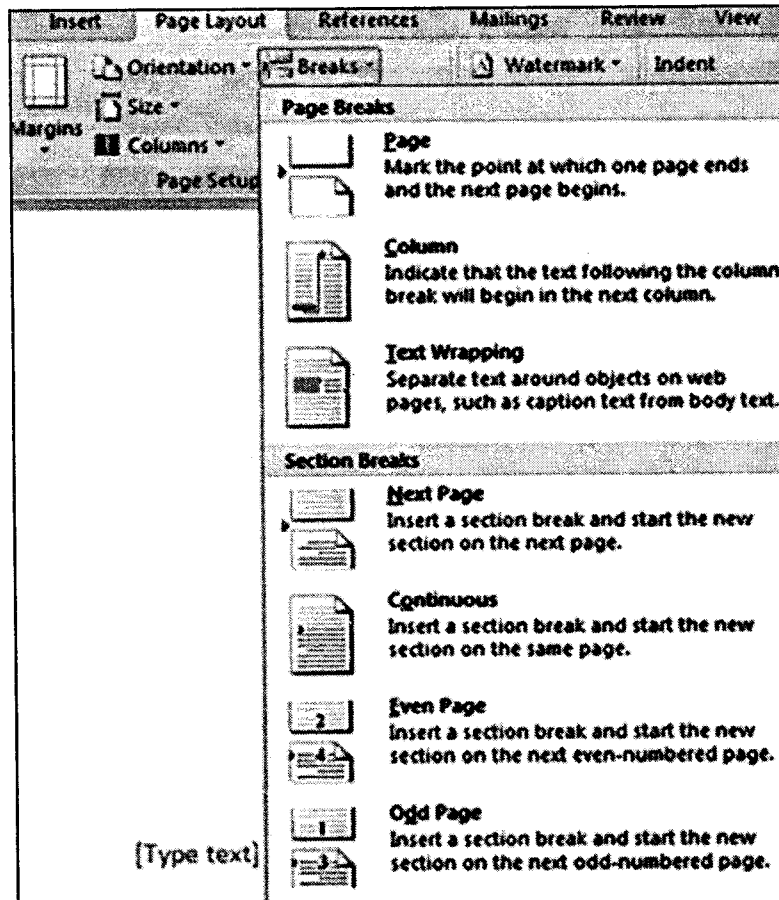


Figure 8.23

## 2.8 Spell Check

*Spell check* is a feature that checks for spelling errors in a document. *Spell check* can be useful in preventing embarrassing mistakes, but *Spell check* is not always right.

Spelling can be checked simultaneously with grammar. Word checks the spelling and grammar as you type. A red squiggly line under a word denotes that Word thinks it has been spelt incorrectly; if the line is green then the grammar may be incorrect. You can check the whole or part of the text for mistakes using the [Spelling and Grammar] button.

Although options and instructions vary slightly by program, the *Spell check* feature is available in all Office programs.

### ► Activating Automatic Spell Check

By default, Spell check is automatically on whenever an Office program is open. When you turn this feature off, Spell check will not run as you work on your document. The feature can be easily activated using the Review command tab. You can also check the spelling in a document after you are finished typing.

From the Review command tab, in the Proofing group, click Spelling and Grammar. The Spelling and Grammar dialog box appears.

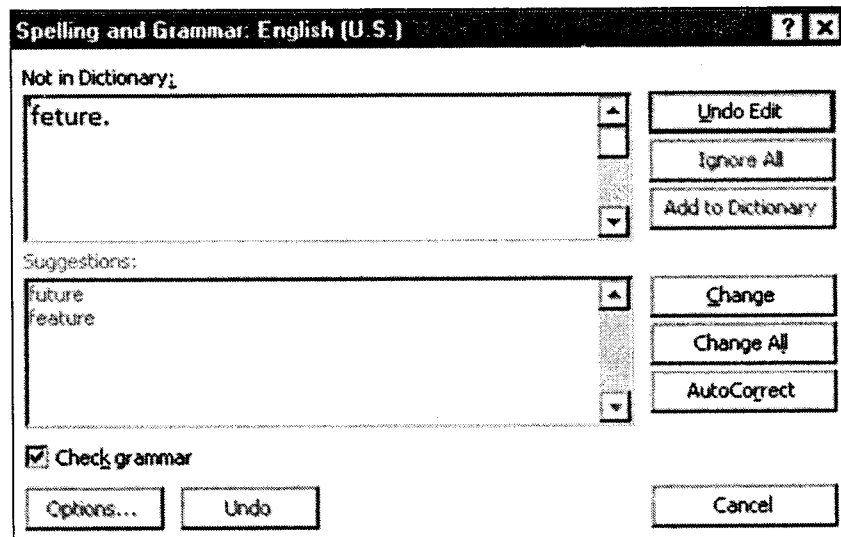


Figure 8.24

- i. In the Spelling and Grammar dialog box, click Options, the Options dialog box appears.

- ii. In the Categories pane, select Proofing.
- iii. To activate Automatic Spell Check, in the When correcting spelling and grammar in Word section, select Check spelling as you type.  
**Note:** The option is selected if a checkmark appears in front of it.
- iv. Click Ok.
- v. To exit the Spelling and Grammar dialog box, click Cancel.

## 2.9 Correcting Spelling

When the dictionary recognizes a word as misspelled, the word is underlined with a wavy red line. You can correct misspelled text through the Quick menu or through a dialog box. For words that are often misspelled or mistyped, you may use AutoCorrect to automatically correct the mistakes as they are typed.

### ► Correcting Spelling: Quick Menu Option

Using the Quick menu to modify misspelled text allows you to manage your misspelled word(s) quickly and easily.

**Right click the misspelled word » select the appropriate option:**

- i. Spelling Suggestions: Gives suggestions for correcting the misspelled word
- ii. Ignore: Ignores that instance of the word
- iii. Ignore All: Ignores that word and every other instance of that word
- iv. Add to Dictionary: Adds the word to the custom dictionary
- v. AutoCorrect: Provides word choices for the automatic correction of the misspelled word
- vi. Language: Allows the misspelled word to be corrected according to the selected language
- vii. Spelling...: Opens the Spelling dialog box, which allows you to change the misspelled word
- viii. Look Up...: Opens the Research task pane, which allows you to search an online reference site

### ► Correcting Spelling: Dialog Box Option

Using the dialog box option is a little more time-consuming, but you have more options for correcting misspelled words.



- i. From the Review command tab, in the Proofing group, click SPELLING & GRAMMAR.

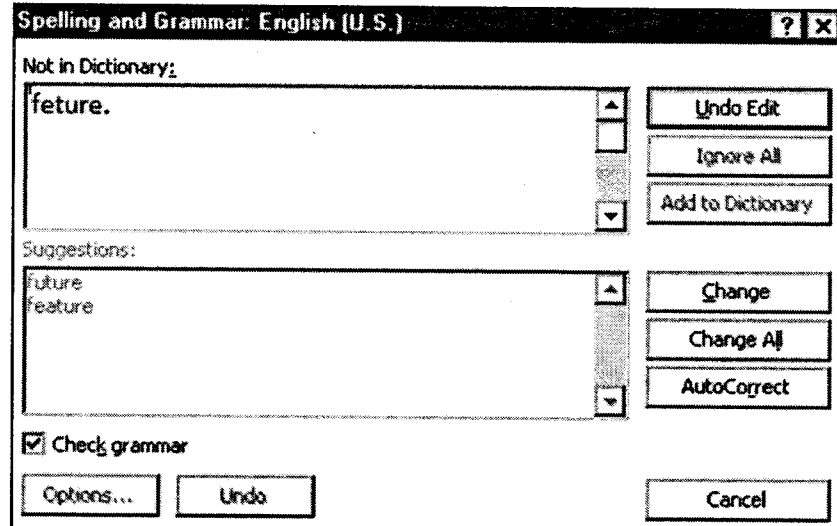


Figure 8.25

- ii. Make the desired selection for each misspelling. The dialog box options include all Quick menu options in addition to the following options:
  - a. *Ignore Once*: Ignores that particular occurrence of that word
  - b. *Change*: Changes the word to the selected suggestion
  - c. *Change All*: Changes all identical misspellings to the selected suggestion

## 2.10 Print Preview

Once you complete your document, you may want to print it for various reasons. When you want to print your document, you can use Print Preview, under the file menu, to see how your document will be printed. When you are ready to print, you can print directly from the Print Preview screen, or use the Print menu option. You can also change the default printer for future documents.

**To Preview the Document Before Printing:**

- i. Click the Microsoft Office Button
- ii. Select Print
- iii. Select Print Preview

The document opens in Print Preview format.

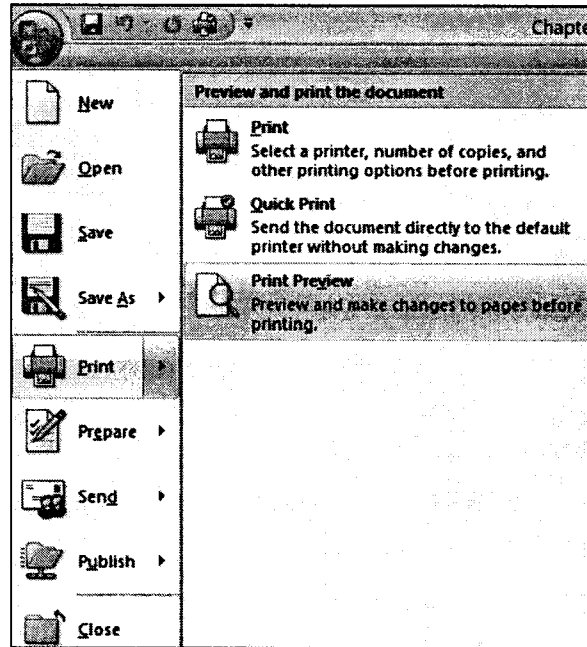


Figure 8.26

In **Print Preview** format, you can do many tasks including:

- i. Modify the margins
- ii. Change page orientation
- iii. Change the page size
- iv. Zoom in and out to view various parts of the document
- v. View multiple pages
- vi. Access Word Options to change many Word settings

**To Print:**

- i. Click the Microsoft Office Button.

- ii. Select **Print**.
- iii. Again select **Print**. The Print dialog box appears.
- iv. Select the pages you would like to print -- either **all pages** or a **range** of pages.
- v. Select the **number of copies**.
- vi. Check the **Collate** box if you are printing multiple copies of a multi-page document.
- vii. Select a printer from the drop-down list.
- viii. Click Ok.

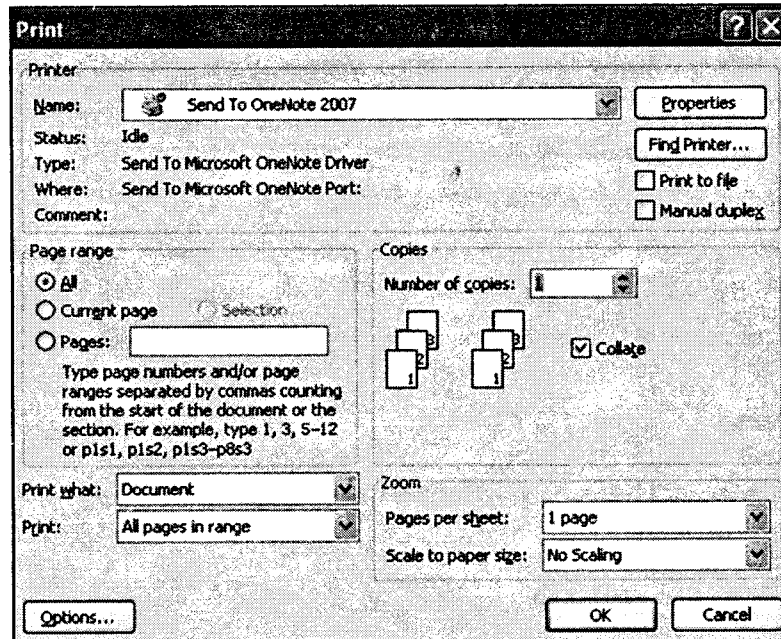


Figure 8.27

## 2.11 Templates

A template is a document type that creates a copy of itself when you open it. In Microsoft Office Word 2007, you can create a template saving a document as a .dotx file, .dot file, or a .dotm file (a .dotm file type allows you to enable macros in the file).

*For example*, a business plan is a common document that is written in Word. Instead of creating the structure of the business plan from scratch, you can use a template with predefined page layout, fonts, margins, and styles. All you have to do is open a template and fill in the text and the

information that is specific to your document. When you save the document as a .docx or .docm file, you save your document separately from the template on which it is based.

You can find Word templates for most kinds of documents on Microsoft Office Online. If you have an Internet connection, click the **Microsoft Office Button**, click **New**, and then click the template category that you want. Alternatively, you can create your own templates.

► **Start with a blank template**

- i. Click the Microsoft Office Button, and then click **New**.
- ii. Click **Blank document**, and then click **Create**.
- iii. Make the changes that you want to the margin settings, page size and orientation, styles, and other formats.
- iv. Click the Microsoft Office Button, and then click **Save As**.
- v. In the **Save As** dialog box, do one of the following:
  - a. On a computer that is running Windows Vista, under **Favorite Links**, click **Templates**.
  - b. On a computer that is running Windows XP, under **Save in**, click **Trusted Templates**.
- vi. Give the new template a file name, select **Word Template** in the **Save as type** list, and then click **Save**.
- vii. Close the template.

► **Create a template based on an existing document**

- i. Click the Microsoft Office Button, and then click **Open**.
- ii. Open the document that you want.
- iii. Make the changes that you want to appear in all new documents that you base on the template.
- iv. Click the Microsoft Office Button, and then click **Save As**.
- v. In the **Save As** dialog box, do one of the following:
  - a. On a computer that is running Windows Vista, under **Favorite Links**, click **Templates**.
  - b. On a computer that is running Windows XP, under **Save in**, click **Trusted Templates**.
- vi. Give the new template a file name, select **Word Template** in the **Save as type** list, and then click **Save**.
- vii. Close the template.

► **Create a new template based on an existing template**

- i. Click the Microsoft Office Button, and then click New.
- ii. Under Templates, click New from existing.
- iii. Click a template that is similar to the one that you want to create, and then click Create New.
- iv. Make the changes you want to the margin settings, page size and orientation, styles, and other formats.
- v. Click the Microsoft Office Button, and then click Save As.
- vi. In the Save As dialog box, do one of the following:
  - a. On a computer that is running Windows Vista, under Favorite Links, click Templates.
  - b. On a computer that is running Windows XP, under Save in, click Trusted Templates.
- vii. Give the new template a file name, click Word Template in the Save as type box, and then click Save.
- viii. Close the template.

## 2.12 Mail Merge

Mail Merge is a way of placing content from a spreadsheet, database, or table into a Microsoft Word document. Mail merge is ideal for creating personalized form letters or labels instead of editing the original letter several times to input different personalized information. As you can imagine, this can save a lot of time as well as worry about not changing all of the information for the new recipient.

In order to create a mail merge, two documents are needed: a Word document and a file with the data or records. This file can take many forms, such as an Excel spreadsheet, a database, or even another Word document that has a table in it.

### Creating Merged Mailing Labels

- i. Open a blank Word document
- ii. From the *Ribbon*, select the **Mailings** tab
- iii. In the *Start Mail Merge* group, click **Start Mail Merge** » select *Labels...*

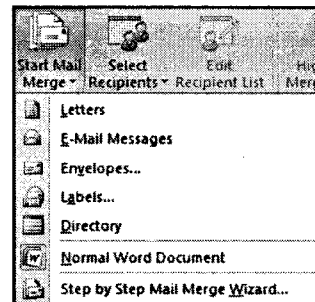


Figure 8.28

The *Label Options* dialog box appears.

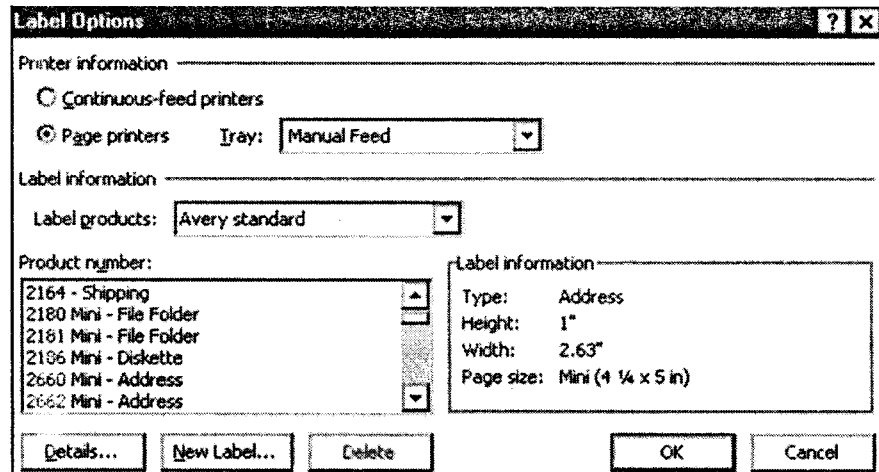


Figure 8.29

- i. From the *Label products* pull-down list, select the brand name of your labels
- ii. From the *Product number* scroll box, select the product number of your labels
- iii. To specify the paper source for printing, from the *Tray* pull-down list, make the appropriate selection
- iv. Click Ok
- v. In the *Start Mail Merge* group, click **Select Recipients** » select **Use Existing List...**

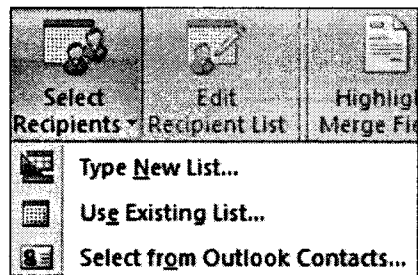


Figure 8.30

- The *Select Data Source* dialog box appears.
  - i. From the *Look in* pull-down list, locate and select the file you will use for your list
  - ii. Click **Open**
  - iii. To select the recipient(s) you want to include in your mail merge,
    - a. In the *Start Mail Merge* group, click **Edit Recipient List**
    - b. Select the recipients
    - c. Click **Ok**
  - iv. To insert merge fields,
    - a. Position the insertion point in the top left label
    - b. In the *Write and Insert Fields* group, click **Insert Merge Field** » select the desired field

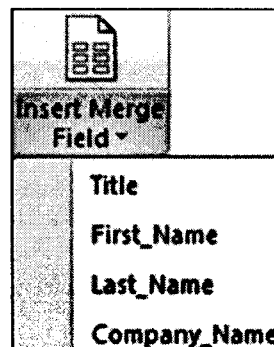


Figure 8.31

- v. To use the same fields and layout for each record, in the *Write and Insert Fields* group, click **Update Labels**
- vii. When finished, click **Preview Results**. A preview of your label(s) appears

- viii. To print the labels,
- Click **Finish and Merge** » select *Print Documents...* The *Merge to Printer* dialog box appears

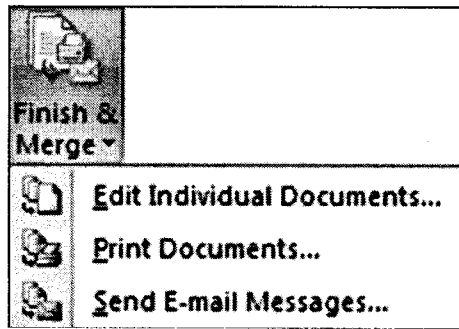


Figure 8.32

- To print labels for all of your records, select *All*  
To print a label for only the record displayed, select *Current record*  
To print labels for only certain records, enter a range in the text boxes.
  - Click **Ok**
  - The *Print* dialog box appears
  - Make any necessary adjustment
  - Click **Ok**
- ix. To make changes to the labels,
- Click **Finish and Merge** » select *Edit Individual Documents...*  
The *Merge to New Document* dialog box appears
  - Make the appropriate selection
  - Click **Ok**
  - Make the appropriate changes in the new document that appears
  - Save the documents

## 2.13 Auto Text

*AutoText* is useful for saving keystrokes while typing in your document. An *AutoText* entry is composed of an abbreviation and an associated phrase.



This is an excellent way to reduce the number of keystrokes for frequently used phrases such as your department name, the University's address, and a signature block on a letter.

*AutoText* entries can include both text and graphics. *AutoText* allows you to retain the formatting (e.g., font, size, justification) used when you created the entry or match the entry to the current document's formatting. Once an entry is created, it can be used throughout the current document and other documents associated with the same template.

### ► Creating an Auto Text Entry

- i. In your Word document, type the desired phrase and/or insert the graphic.
- ii. Select the phrase and/or graphic.
- iii. From the Office Button, click Word Options » select *Proofing*.
- iv. In the *AutoCorrect options* section, click Autocorrect Options...

The *AutoCorrect* dialog box appears.

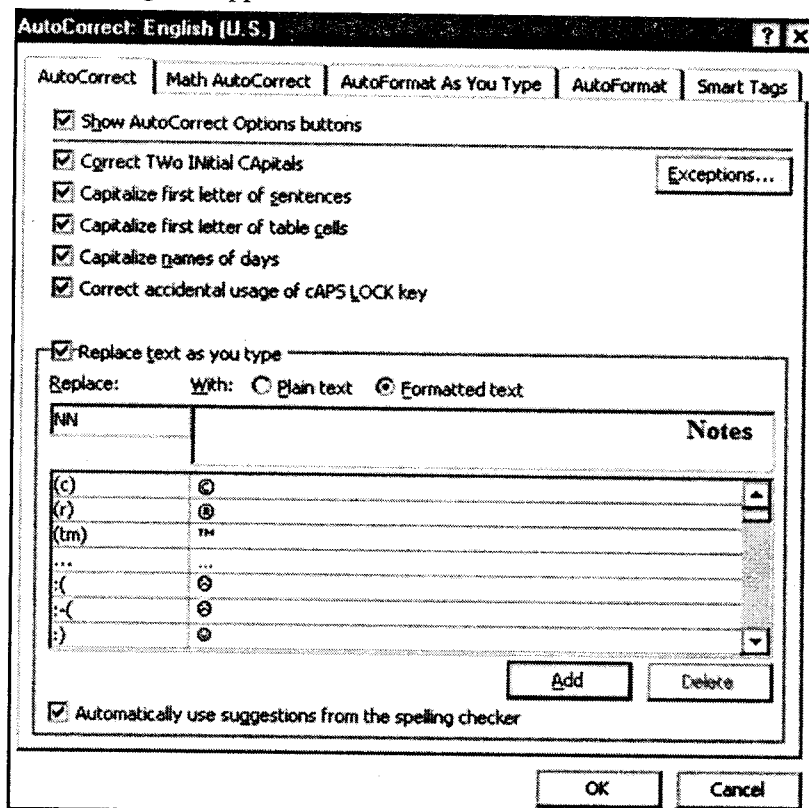


Figure 8.33

- v. In the *Replace text as you type* section, in the *Replace* text box, type the keyword or phrase you want replaced.
- vi. In the *With* text box, type the word or phrase you want to replace the keyword when it is typed in a document.
- vii. Click **Add**.
- viii. Click **Ok**.

## 2.14 Inserting Picture

- i. Place your cursor in the document where you want the illustration/picture.
- ii. Click the **Insert** Tab on the Ribbon.
- iii. Click the **Picture** Button.
- iv. Browse to the picture you wish to include.
- v. Click the **Picture**.
- vi. Click **Insert**.

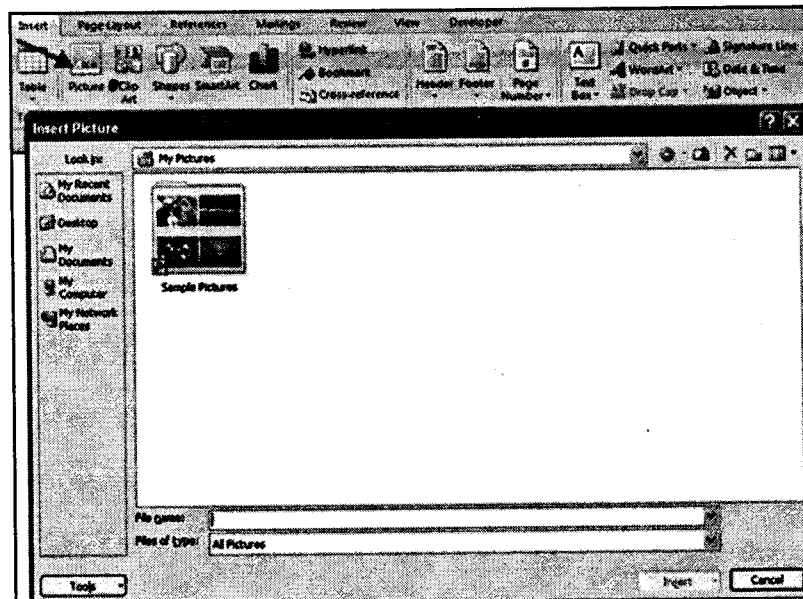


Figure 8.34

## 2.15 Word Art

You can use *WordArt* to make display text (e.g., the heading of your document) more eye-catching. *WordArt* can be resized, moved, and edited to fit your needs.

To insert word art, follow the following steps:

- i. From the *Insert* command tab, in the *Text* group, click *Wordart*. The *WordArt Gallery* dialog box appears.

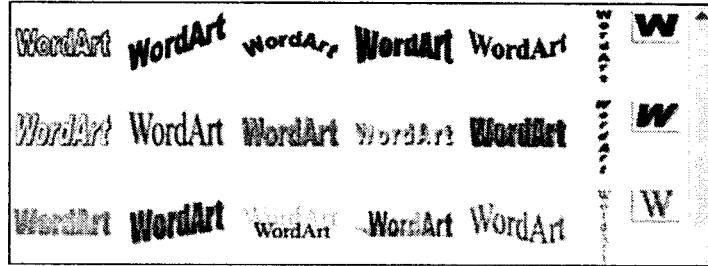


Figure 8.35

- ii. From the *WordArt Gallery*, select the desired style  
The *Edit WordArt Text* dialog box appears.

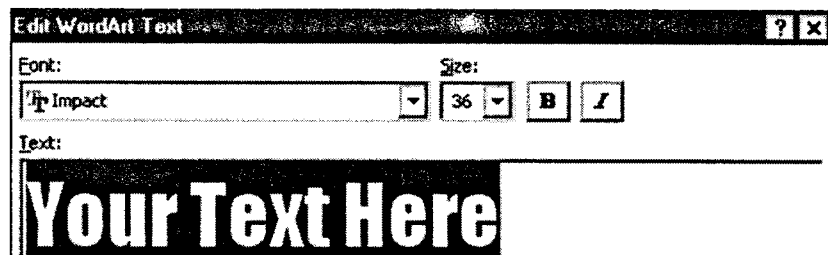


Figure 8.36

- iii. In the *Text* text box, type your text.
- iv. To format your text, from the *Font* or *Size* pull-down lists, make the desired selections.
- v. To change the font style, click **B** or **I**.
- vi. Click **Ok**.

### 3. MS-Excel 2007

1  
Number of questions

Apr.2009 – 4M

What is Spreadsheet?  
Explain usages of  
Spreadsheet.

Microsoft Office Excel is a powerful tool used to create and format spreadsheets. Spreadsheets allow information to be organized in rows and tables and analyzed with automatic mathematics. Spreadsheets are commonly used to perform many different types of calculations.

Excel is all about numbers. There is almost no limit to what you can do with numbers in Excel, including sorting, advanced calculations, and graphing.

Data files created with Excel are called workbooks (in the same way as Word files are called documents). But where Word starts up with a single blank page, Excel files by default contain three blank worksheets. This gives you the flexibility to store related data in different locations within the same file. More worksheets can be added, and others deleted, as required.

#### Definitions

##### ► Workbook vs. Worksheet

When you open Excel, a new file is created called Book 1 (until you name it differently). It is called “Book” because it is a Workbook that is initially made up of three worksheets (accessible from the tabs in the lower left corner of your excel window).

Think of a three ring binder with three sheets of paper in it. As with a binder, you can:

- i. **Insert worksheet:** Click on the new worksheet tab to the right of the tabs for your existing worksheets.
- ii. **Delete worksheets:** By right-clicking on the tab of the worksheet you wish to delete, then select “delete”.
- iii. **Re-arrange them:** By clicking on the worksheet tab and dragging it to the location you desire.
- iv. **Rename worksheets:** By double-clicking on the worksheet title.

##### ► Cell

Cells are the basic rectangular building blocks of a spreadsheet. They are assigned an address, generally referred to as a cell reference, according to their column and row (e.g., the cell in column B at row 3 is referenced as cell B3).

##### ► Row

Rows travel horizontally and are numbered.

► **Column**

Columns travel vertically and are assigned letters.

► **Formula**

A mathematical formula can be used to calculate a result based on data from one or more other cells. Often they consist of some combination of the standard mathematical operators (+, -, \*, /) (e.g.: =(A1+A5)/B13), but they may also include functions. When you type a formula into a cell, that cell will generally display the result obtained by the formula, rather than the formula itself.

► **Functions**

Pre-written formulae perform common calculations, such as summation and averaging. You can combine many functions and operators in a single formula to obtain more complex results (e.g.: =SUM(A1:A13)).

**3.1 The Excel 2007 window**

As in Word 2007, the old menu system has been replaced by the Ribbon and the Office button. The title bar displays the name of your current workbook. Tabs at the bottom of the screen identify the different worksheets available to you.

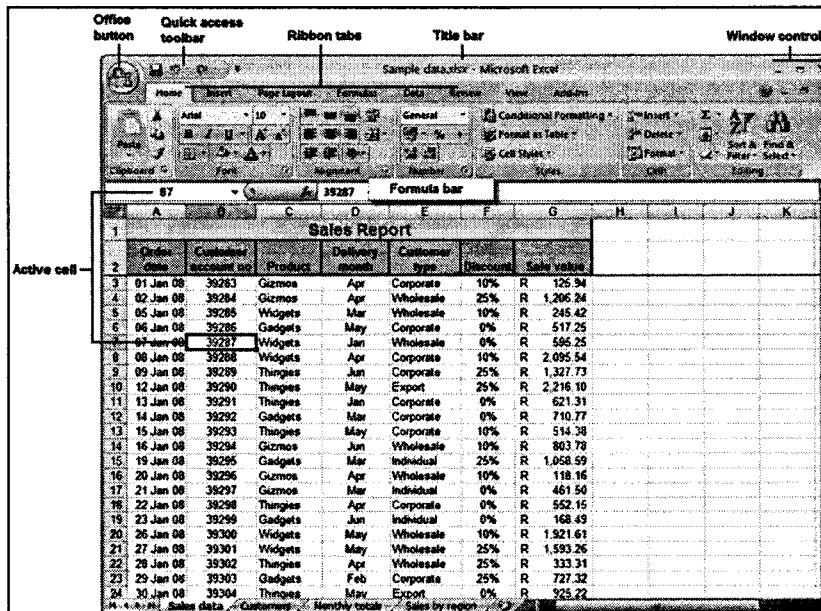


Figure 8.37

Notice how the working area of the screen is divided into rows (1, 2, 3, 4, ...) and columns (A,B, C, D, ...). Together these provide an address, such a C10 or G21 that uniquely identifies each cell in the worksheet.

A range of cells extends in a rectangle from one cell to another, and is referred to by using the first and last cell addresses separated by a colon. For example, the group of cells from A3 to G4 would be written as A3:G4.

In the example above, the current or active cell is B7. It is surrounded by a heavy black border, and its address is displayed in the name box above column A. Its row and column numbers are also highlighted.

On the right of the name box is the formula bar. This displays the value stored in the active cell, and is also the place where you would enter a new data value or formula into that cell.

### 3.2 Overview of data types

Excel allows you to enter different sorts of data into the cells on a worksheet, such as dates, text, and numbers. If you understand how Excel treats the different types of data, you'll be able to structure your worksheet as efficiently as possible.

- i. Numbers lie at the heart of Excel's functionality. They can be formatted in a variety of different ways. You should generally avoid mixing text and numbers in a single cell, since Excel will regard the cell contents as text, and won't include the embedded number in calculations. If you type any spaces within a number, it will also be regarded as text.

2	*	VAT @ 14%		text and numbers mixed
3	✓	VAT @	14%	text and numbers in separate cells

Dates and times are stored as numbers in Excel, so that you can calculate the difference between two dates. However, they are usually displayed as if they are text. If a number is too large to be displayed in the current cell, it will be displayed as "#####".

- ii. Text consists mainly of alphabetic characters, but can also include numbers, punctuation marks and special characters. Text fields are not included in numeric calculations. If you want Excel to treat an apparent number as text, then you should precede the number with a single quotation mark ('). This can be useful when entering, *for example*, a phone number that starts with 0, since leading zeros are not usually displayed for Excel numbers.

- iii. Formulas are the most powerful elements of an Excel spreadsheet. Every formula starts with an “=” sign, and contains at least one logical or mathematical operation (or special function), combined with numbers and/or cell references.

### 3.3 Handling Cell and Cell Data

#### ► Data entry cell by cell

To enter either numbers or text:

- i. Click on the cell where you want the data to be stored, so that the cell becomes active.
- ii. Type the number or text.
- ii. Press [Enter] to move to the next row, or [Tab] to move to the next column. Until you've pressed [Enter] or [Tab], you can cancel the data entry by pressing [Esc]. To enter a date, use a slash or hyphen between the day, month and year, for example 14/02/2009. Use a colon between hours, minutes and seconds, for example 13:45:20.

#### ► Deleting data

- i. Select the cell or cells containing data to be deleted.
- ii. Press the [DEL] key on your keyboard.
- iii. The cells remain in the same position as before, but their contents are deleted.

#### ► Moving data

- i. Select the cells you want to move (they will become highlighted).
- ii. Move the cursor to the border of the highlighted cells. When the cursor changes from a white cross to a four-headed arrow (the move pointer), hold down the left mouse button.
- ii. Drag the selected cells to a new area of the worksheet, then release the mouse button. You can also cut the selected data using the ribbon icon or [Ctrl] + [X], then click in the top left cell of the destination area and paste the data with the ribbon icon or [Ctrl] + [V].

To copy the contents of one cell to a set of adjacent cells, select the initial cell and then move the cursor over the small square in the bottom right-hand corner (the *fill handle*). The cursor will change from a white cross to a black cross. Hold down the mouse button and drag to a range of adjacent cells. The initial cell contents will be copied to the other cells.

**Note** that if the original cell contents end with a number, then the number will be incremented in the copied cells.

### ► Using Autofill

- i. Enter the start of the series into a few adjacent cells (enough to show the underlying pattern).
- ii. Select the cells that contain series data.
- iii. Move the cursor over the small square in the bottom right-hand corner of the selection (the *fill handle*). Hold down the mouse button and drag to a range of adjacent cells.
- iv. The target cells will be filled based on the pattern of the original series cells.

### ► Editing cell contents

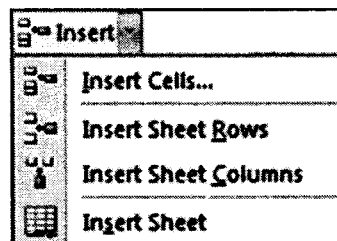
There are two different ways to enter edit mode: either double-click on the cell whose contents you want to edit, or else click to select the cell you want to edit, and then click anywhere in the formula bar.

### ► Inserting or deleting cells

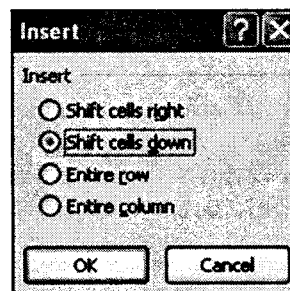
You can insert a new cell above the current active cell, in which case the active cell and those below it will each move down one row. You can also insert a new cell to the left of the current active cell, in which case the active cell and those on its right will each move one column to the right.

#### To insert a cell:

- i. Select the cell next to which you want to insert a new cell.
- ii. On the Home ribbon, find the Cells group and click *Insert* followed by *Insert Cells*.



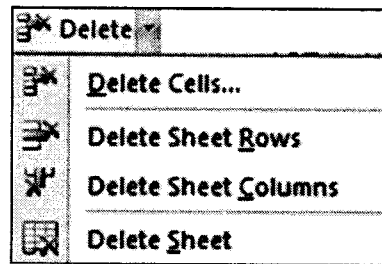
- iii. A dialog box will open. Click the direction in which you want the surrounding cells to shift





**To delete a cell, do as follows:**

- i. Select the cell that you want to delete.
- ii. On the Home ribbon, find the Cells group and click *Delete* followed by *Delete Cells*.



- iii. A dialog box will open. Click the direction in which you want the surrounding cells to shift.

**► Cell formatting**

The icons on the Home ribbon provide you with a variety of formatting options. To apply any of these, just select the cell or cells that you want to format, and then click the desired icon. Commonly used formatting attributes include:

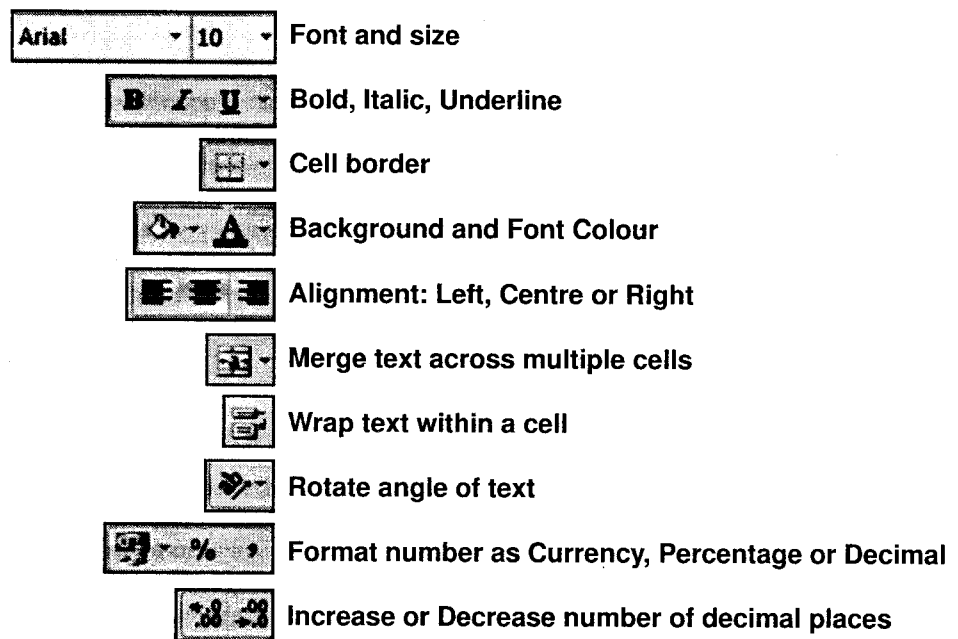


Figure 8.38

The *Format Painter* allows you to copy formatting attributes from one cell to a range of cells.

- i. Select the cell whose formatting attributes you want to copy.
- ii. Click on the Format Painter icon.
- iii. Select the cell or range of cells that you want to have the same formatting attributes.

The cell values will remain as before, but their format will change.

### 3.4 Sorting

**Sorting list** is a common spreadsheet task that allows you to easily reorder your data. Excel's sort feature is a quick and easy way to sort data in a spreadsheet. The options for sorting your data include:

- i. Sort in ascending order - A to Z alphabetically or smallest to largest for number data.
- ii. Sort in descending order - Z to A alphabetically or largest to smallest for number data.
- iii. Custom sort - includes sorting by the cell background color or the font color of the data.

#### ► To Sort in Alphabetical Order

- i. Select a cell in the column you want to sort.
- ii. Click the **Sort and Filter** command in the **Editing** group on the Home tab.
- iii. Select **Sort A to Z**. Now the information in the Category column is organized in alphabetical order.
- iv. You can Sort in reverse alphabetical order by choosing **Sort Z to A** in the list.

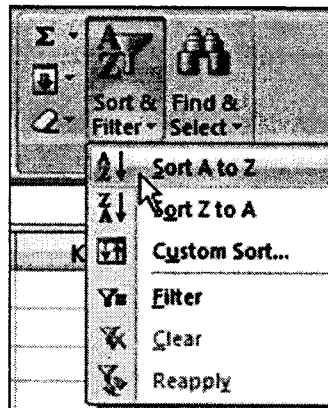


Figure 8.39

► **To Sort from Smallest to Largest**

- i. Select a cell in the column you want to sort (a column with numbers).
- ii. Click the **Sort and Filter** command in the **Editing** group on the Home tab.
- iii. Select **From Smallest to Largest**. Now the information is organized from the smallest to largest amount.
- iv. You can sort in **reverse numerical order** by choosing **From Largest to Smallest** in the list.

► **To Sort Multiple Levels**

- i. Click the **Sort and Filter** command in the **Editing** group on the Home tab.
- ii. Select **Custom Sort** from the list to open the dialog box. OR Select the **Data** tab.
- iii. Locate the **Sort and Filter** group.
- iv. Click the **Sort** command to open the **Custom Sort** dialog box. From here, you can sort by one item, or multiple items.

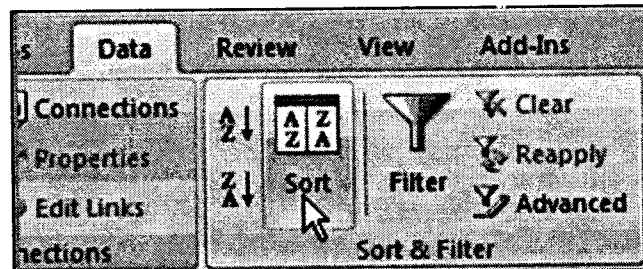


Figure 8.40

Click the drop-down arrow in the **Column Sort by** field, and choose one of the options.

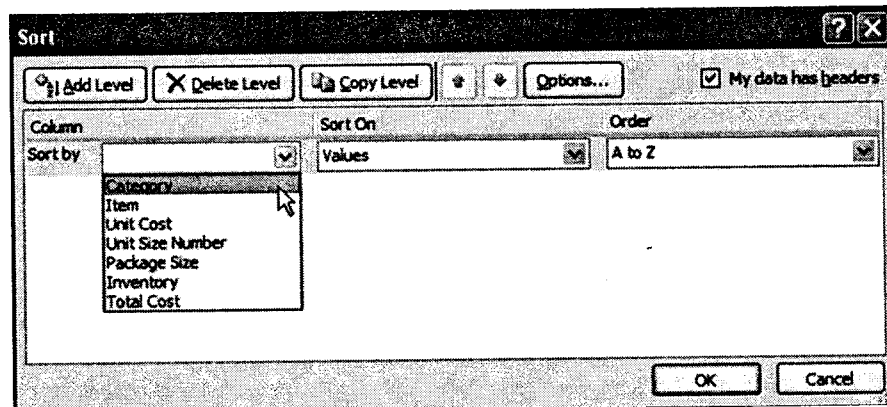


Figure 8.41

- i. Choose what to sort on. In this example, we'll leave the default as Value.
- ii. Choose how to order the results. Leave it as A to Z so it is organized alphabetically.
- iii. Click Add Level to add another item to sort by.

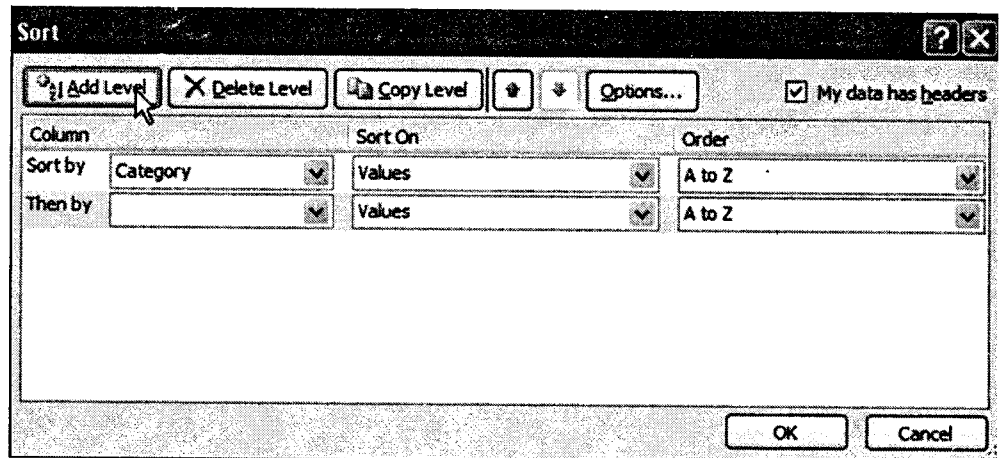


Figure 8.42

- iv. Select an option in the Column Then by field. In this example, we chose Unit Cost.
- v. Choose what to sort on. In this example, we'll leave the default as Value.
- vi. Choose how to order the results. Leave it as smallest to largest.
- vii. Click OK.

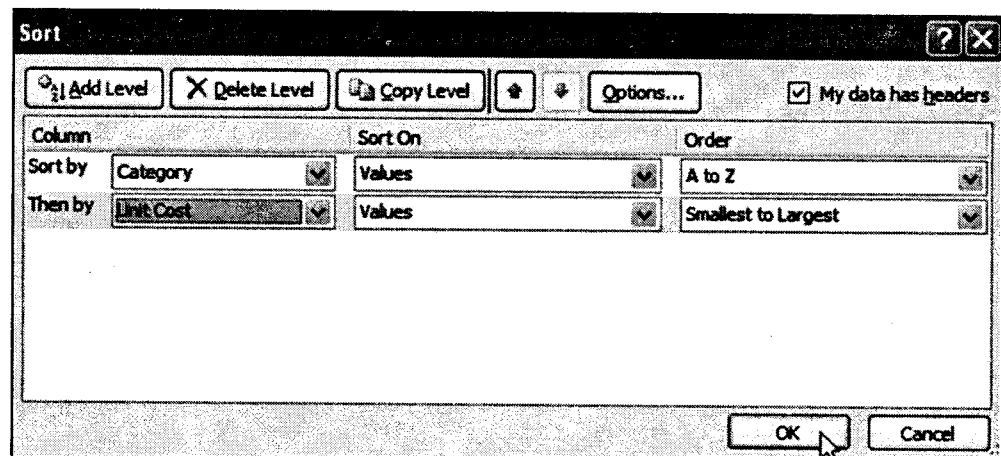


Figure 8.43

The spreadsheet has been sorted. All the categories are organized in alphabetical order, and within each category, the unit cost is arranged from smallest to largest.

### 3.5 Formula in Excel 2007

Formulas are the key to Excel's amazing power and versatility. By using a formula, you can find the answer to virtually any calculation you can think of.

#### ► Creating a Formula

A formula always starts with an equals sign ("="). This lets Excel know that it's going to have to work something out. In the body of the formula, you're going to tell Excel what you want it to calculate. You can use all the standard math's operations, like addition and multiplication, and you can include numbers, cell references, or built in functions.

For example, suppose you have a retail business. You buy stock at cost price, and add a 25% markup to calculate your selling price. VAT must be added to that at 14%. You give a 5% discount to long-standing customers who pay their accounts promptly. Let's look at how formulas can make the calculations simple for you:

	A	B	C	D	E	F	G
							Discounted
1	Stock item	Cost price	Markup	Retail price	VAT	Selling price	price
2	Desk	R 1,500.00	R 375.00	R 1,875.00	R 262.50	R 2,137.50	R 2,030.63
3	Chair	R 600.00	R 150.00	R 750.00	R 105.00	R 855.00	R 812.25
4	Filing cabinet	R 1,000.00	R 250.00	R 1,250.00	R 175.00	R 1,425.00	R 1,353.75
5	Bookcase	R 800.00	R 200.00	R 1,000.00	R 140.00	R 1,140.00	R 1,083.00

Figure 8.44

- i. In column A, the Stock Item labels have just been typed in.
- ii. In column B, the Cost Price values have just been typed in.
- iii. In column C, a formula is used. Cell C2 contains " $=B2 * 25\%$ ". This works out 25% of the value in cell B2 (cost price), and displays the result in cell C2 (markup).
- iv. In column D, a formula is used. Cell D2 contains " $=B2 + C2$ ". This adds the values in cells B2 (cost price) and C2 (markup), and displays the result in cell D2 (retail price).
- v. In column E, a formula is used. Cell E2 contains " $=D2 * 14\%$ ". This works out 14% of the value in cell D2 (retail price), and displays the result in cell E2 (VAT).
- vi. In column F, a formula is used. Cell F2 contains " $=D2 + E2$ ". This adds the values in cells D2 (retail price) and E2 (VAT), and displays the result in cell F2 (selling price).

- vii. In column G, a formula is used. Cell G2 contains “=F2 \* 95%”. This works out 95% of the value in cell F2 (selling price), and displays the result in cell G2 (discounted price).

The great thing about using formulas in Excel, is that you can copy them just as you do values. So once you’ve entered all the formulas in row 2 and checked that they are correct, you just need to

- i. Select the cells in row 2 that contain your formulas (cells C2 to G2).
- ii. Move the cursor over the fill handle in the bottom right corner of the selected cells. It will change shape to a black cross.
- iii. Hold down the mouse button and drag the selected cells over rows 3 to 5. The values in cells C3 to G5 are automatically calculated for you.

### 3.6 Functions

Excel provides a wide range of built-in functions that can be included in your formulas to save you the effort of having to specify detailed calculations step-by-step. Each function is referred to by a specific name, which acts as a kind of shorthand for the underlying calculation. Because a function is used inside a formula, you’ll still need to start off with an equals sign to show Excel that a calculation is required.

#### ► Using AutoSum

Because addition is the most frequently used Excel function, a shortcut has been provided to quickly add a set of numbers:

- i. Select the cell where you want the total to appear.
- ii. Click on the *Sum* button on the Home ribbon.
- iii. Check that the correct set of numbers has been selected (indicated by a dotted line). If not, then drag to select a different set of numbers.
- iv. Press [Enter] and the total will be calculated.

#### ► Basic functions

Some of the most commonly used functions include:

- i. SUM() to calculate the total of a set of numbers
- ii. AVERAGE() to calculate the average of a set of numbers
- iii. MAX() to calculate the maximum value within a set of numbers

- iv. MIN() to calculate the minimum value within a set of numbers
- v. ROUND() to round a set a values to a specified number of decimal places
- vi. TODAY() to show the current date
- vii. IF() to calculate a result depending on one or more conditions

A function makes use of values or cell references, just like a simple formula does. The numbers or cell references that it needs for its calculations are placed in brackets after the name of the function. To give a simple illustration:

The formula:	is equivalent to the function:
= 12 + 195 + 67 -43	= SUM (12, 195, 67, -43)
= (B3 + B4 + B5 + B6)	= SUM (B3:B6)
= (B3 + B4 + B5 + B6)/4	= AVERAGE (B3:B6)

Several popular functions are available to you directly from the Home ribbon.

- i. Select the cell where you want the result of the calculation to be displayed.
- ii. Click the drop-down arrow next to the *Sum* button.
- iii. Click on the function that you want.
- iv. Confirm the range of cells that the function should use in its calculation. (Excel will try to guess this for you. If you don't like what it shows inside the dotted line, then click and drag to make your own selection.)
- v. Press [Enter]. The result of the calculation will be shown in the active cell.

As an example, to calculate the average for the following set of tutorial results, you would:

- i. Click on cell F3 to make it active.
- ii. Click on the arrow next to the Sum button, and select Average.
- iii. Press [Enter] to accept the range of cells that is suggested (B3:E3).

F4		=AVERAGE(B4:E4)				
	A	B	C	D	E	F
1	<b>Tutorial results</b>					
2	<b>Student name</b>	<b>Tut 1</b>	<b>Tut 2</b>	<b>Tut3</b>	<b>Tut 4</b>	<b>Average</b>
3	Anne Andrews	63	61	67	70	65.25
4	Bob Botha	50	48	51	45	48.5
5	Colin Campbell	75	78	80	83	79

Figure 8.45

If you want to use a function that isn't directly available from the drop-down list, then you can click on *More Functions* to open the Insert Function dialog box. Another way to open this dialog box is to click the Insert Function icon on the immediate left of the formula bar. The Insert Function dialog box displays a list of functions within a selected function category. If you select a function it will briefly describe the purpose and structure of the function.

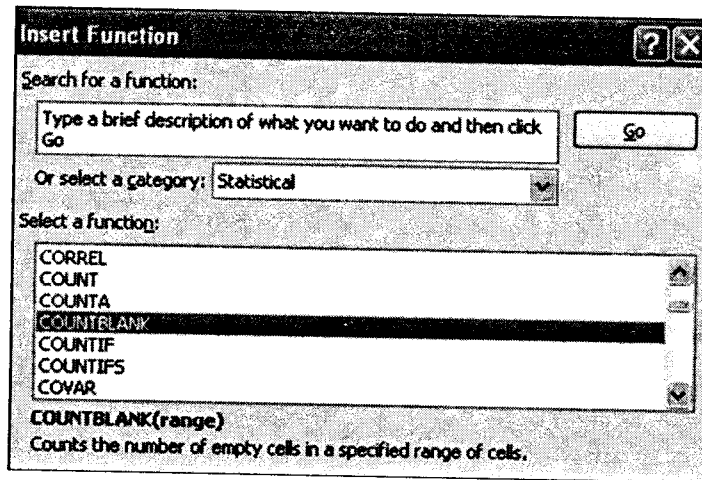


Figure 8.46

When you click the OK button at the bottom of the window, you'll be taken to a second dialogue box that helps you to select the function *arguments* (usually the range of cells that the function should use).

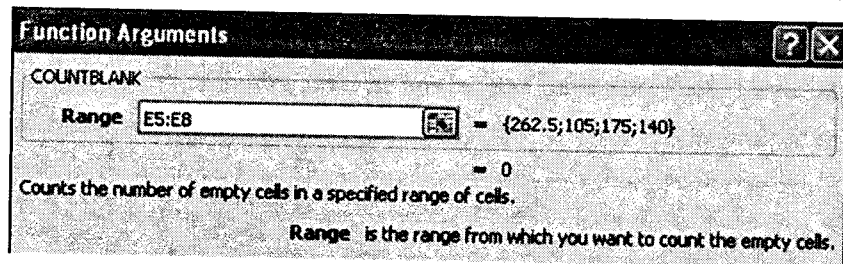


Figure 8.47

Some functions use more than one argument. For example, the ROUND() function needs to know not only which cells to use, but also how many decimal places those cells should be rounded to. So the expression = ROUND(G5:G8, 0) will round the values in cells G5 to G8 to the nearest whole number (i.e., no decimal places).



## ► The IF() function

The IF() function is getting a section all of its own, because for many people it's not as intuitive to understand as the common maths and stats functions. The IF() function checks for a specific condition. If the condition is met, then one action is taken; if the condition is not met, then a different action is taken.

*For example*, you may be reviewing a set of tutorial marks. If a student's average mark is below 50, then the cell value should be FAIL; so the condition you are checking is whether or not the average result is below 50. If this condition is not met (that is, the average result is 50 or more), then the cell value should be PASS.

### Let's see this in action:

The structure of an IF() function is: **=IF (condition, result if true, result if false)**

Using English to describe our example as an IF statement: *IF the average mark is less than 50, then display the word "FAIL", else display the word "PASS"*.

Now for a real worksheet example, look at the formula bar in the screenshot below:

G4							
fx =IF(F4<50,"FAIL","PASS")							
	A	B	C	D	E	F	G
1	Tutorial results						
2	Student name	Tut 1	Tut 2	Tut3	Tut 4	Average	Outcome
3	Anne Andrews	63	61	67	70	65.25	PASS
4	Bob Botha	50	48	51	45	48.5	FAIL
5	Colin Campbell	75	78	80	83	79	PASS

The formula is so constructed because the average mark is stored in cell F4, we need to check whether the value in F4 is less than 50. If it is, then the active cell (G4) must display the word "Fail". If the value in F4 is not less than 50, then the active cell must display the word "Pass".

## 3.7 Querying in Excel 2007

Microsoft Query lets you link to data held in a database and extract a subset of the data to a sheet in Excel. By providing a value in a cell or picking one from a drop - down list, the matching data is automatically passed back from the database to Excel.

### ► Importing Data from Access into a New Query

Data can be imported from an Access (or other) database into Excel via the Import External Data command. You can also import data stored in another Excel file.

- i. Start up Excel to get a new spreadsheet
- ii. Move to the Data tab on the Ribbon then click on [From Other Sources] in the Get External Data group (you may have a [Get External Data] button on the far left then choose From Other Sources)
- iii. Select From Microsoft Query

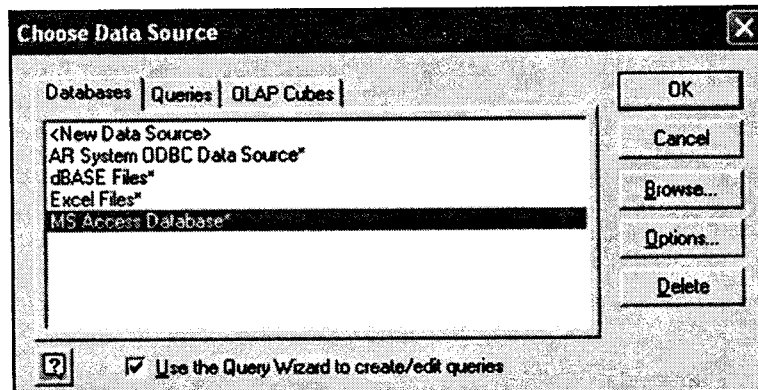


Figure 8.48

- iv. The Choose Data Source dialog box appears - select MS Access Database\* then press <Enter> for [OK].
- v. Select the required.
- vi. The Query Wizard now starts up:
  - a. Select the required table and click on the + to display the fields - move across the fields and include required fields then click on [Next>].
  - b. Set up a filter - click on [Next>].
- vii. Set up any sorting required - click on [Next>].
- viii. Choose Return Data to Microsoft Office Excel to simply paste in the data - click on [Finish].
- ix. Finally, state where you would like your imported data to appear - which cell on which sheet - click on [OK] to finish.

The data appears in Excel as a table. Filters are automatically provided in the cells on the header row; these also give you sorting options.

### 3.8 Graphs / Charts

Often it's much easier to understand data when it's presented graphically, and Excel provides the perfect tools to do this called graphs or charts.

Charts are an important part to being able to create a visual for spreadsheet data. In order to create a chart within Excel the data that is going to be used for it needs to be entered already into the spreadsheet document. Once the data is entered, the cells that are going to be used for the chart need to be highlighted so that the software knows what to include. Next, click on the **Insert Tab** that is located at the top of the screen.

Number of publications  
**1**

Oct.2011 – 2M  
What is Chart

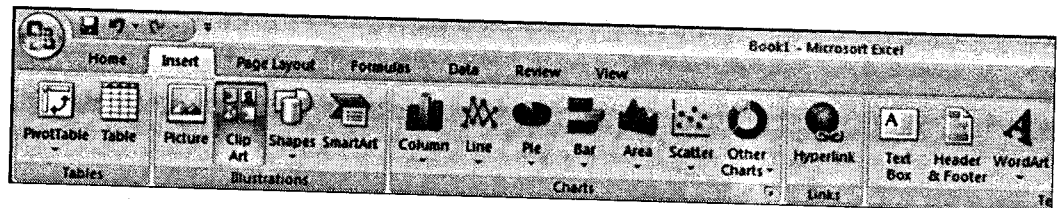


Figure 8.49

You may choose the chart that is desired by clicking the category of the chart you will use. Once the category is chosen the charts will appear as small graphics within a drop down menu.

To choose a particular chart just click on its icon and it will be placed within the spreadsheet you are working on. To move the chart to a page of its own, select the border of the chart and Right Click. This will bring up a drop down menu, navigate to the option that says Move Chart. This will bring up a dialog box that says Chart Location. From here you will need to select the circle next to As A New Sheet and name the sheet that will hold your chart. The chart will pop up larger in a separate sheet, but in the same workbook as your entered data.

#### ► Creating a Chart

It's very easy to create a basic chart in Excel:

- i. Select the data that you want to include in the chart (together with column headings if you have them).
- ii. Find the Charts category on the Insert ribbon, and select your preferred chart type.

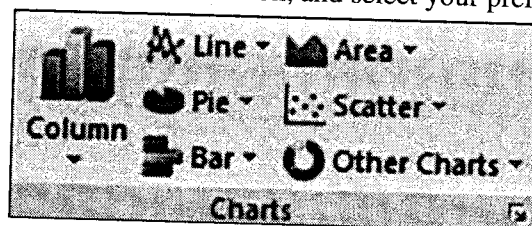


Figure 8.50

- iii. The chart appears in the current window. Move the cursor over the Chart Area to drag it to a new position.

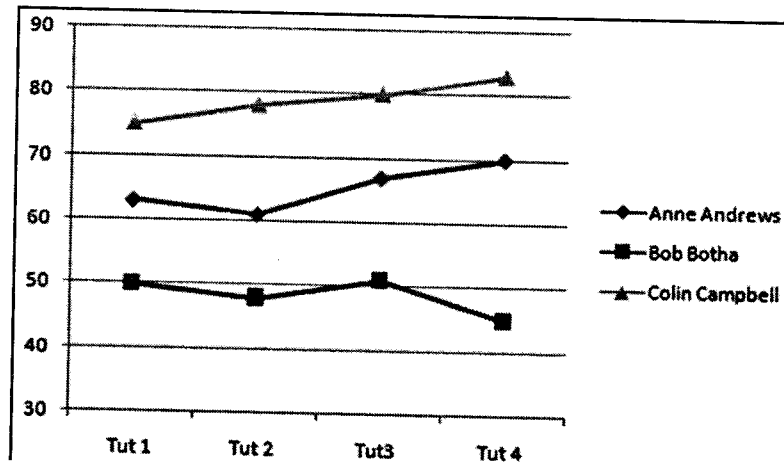
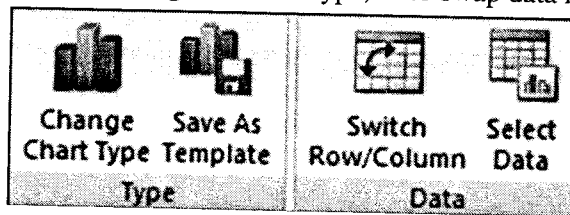


Figure 8.51

### ► Modifying a chart

When you click on a chart, a Chart Tools section appears on your Ribbon, with Design, Layout and Format tabs.

- i. Use the *Design* tab to quickly change the chart type, or to swap data rows and columns.



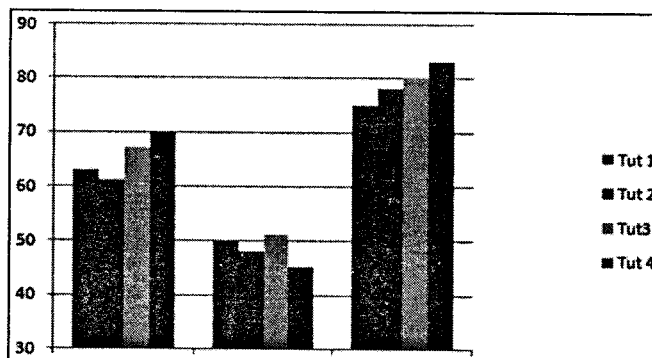


Figure 8.52

- ii. Use the *Layout* tab to add a title, and to provide axis and data labels.
- iii. Use the *Format* tab to add border and fill effects.

► **Inserting graphics in a worksheet**

Sometimes you may want to add graphics, for example a corporate logo, to a worksheet. ClipArt and WordArt are available in Excel, along with a host of call-out shapes that you can use to label your charts. You'll find them all on the *Insert* ribbon.

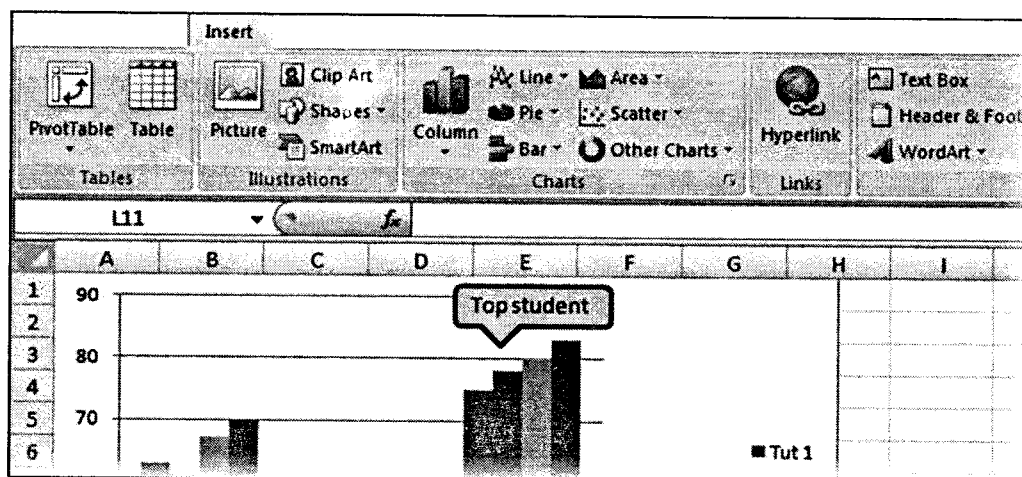


Figure 8.53

## 4. MS-PowerPoint 2007

1  
Number of questions

Oct.2010 – 4M

Write a note on Power Point.

Microsoft PowerPoint is widely used for making professional quality presentations in a variety of formats, including on screen computer slide shows, black and white or color overheads, and 35mm slides. You can also use it for speaker's notes and audience hand outs.

In addition, PowerPoint can be used as a drawing package for preparing pictures, forms, posters and leaflets.

PowerPoint is a presentation graphics package that lets you create formatted presentations which can be used in a number of ways. You can produce projects such as overheads for a team briefing, slides for a business meeting or interactive on-screen presentations on your company's products.

### It allows you to produce:

- i. Animated Presentations shown on a monitor or overhead screen
- ii. Overhead Projector Transparencies
- iii. Paper Printouts of your slides
- iv. Notes for the Speaker
- v. Handouts for the Audience
- vi. 35 mm slides

### 4.1 Creating New Presentation

You can start a new presentation from a blank slide, a template, existing presentations, or a Word outline.

#### To create a new presentation from a blank slide:

- i. Click the **Microsoft Office Button**
- ii. Click **New**
- iii. Click **Blank Presentation**

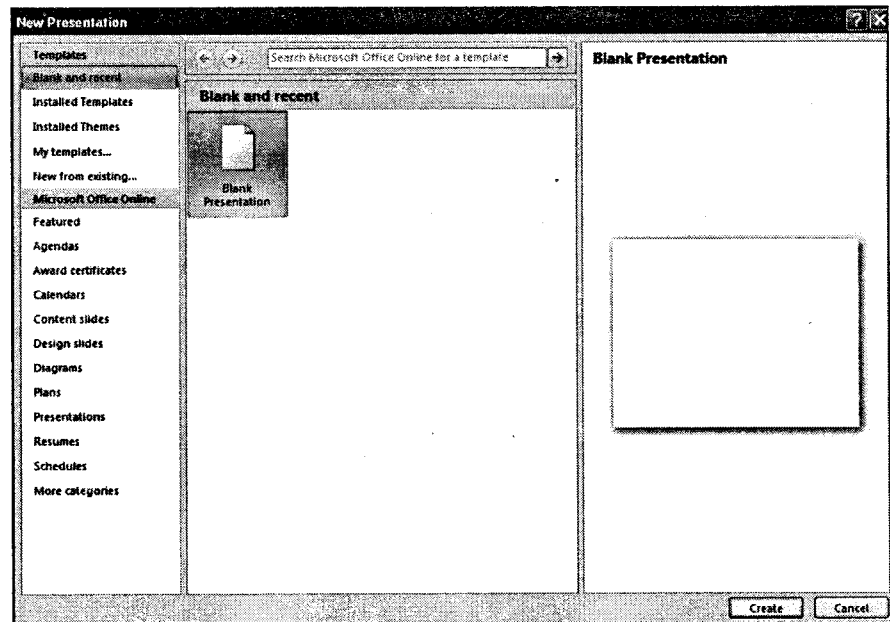


Figure 8.54

**To create a new presentation from a template:**

- i. Click the **Microsoft Office Button**
- ii. Click **New**
- iii. Click **Installed Templates** or **Browse through Microsoft Office Online Templates**
- iv. Click the template you choose

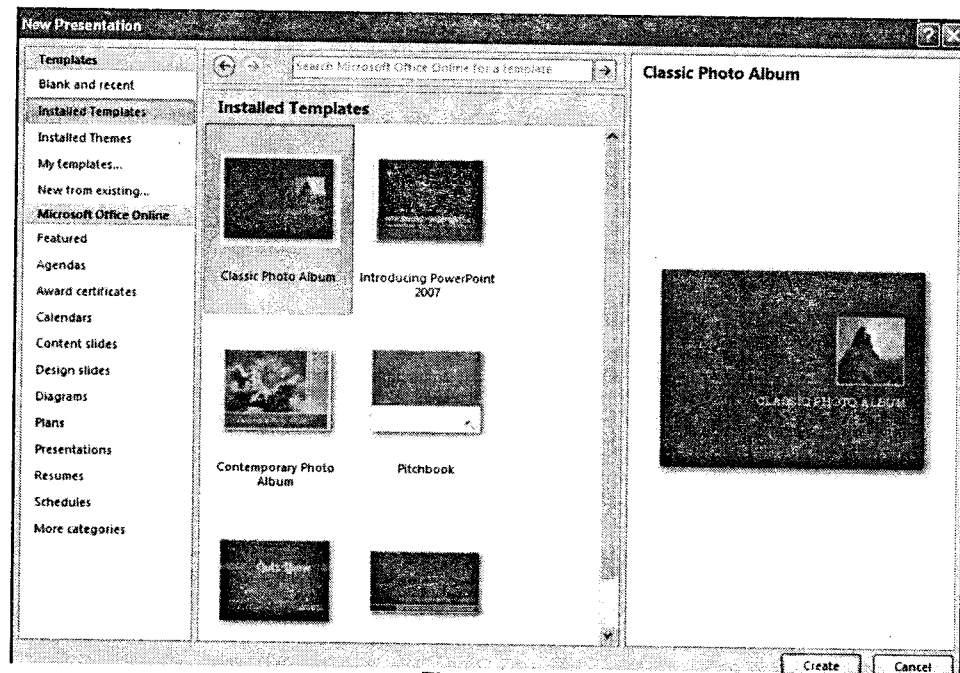


Figure 8.55

To create a new presentation from an existing presentation:

- i. Click the Microsoft Office Button
- ii. Click New
- iii. Click New from Existing
- iv. Browse to and click the presentation

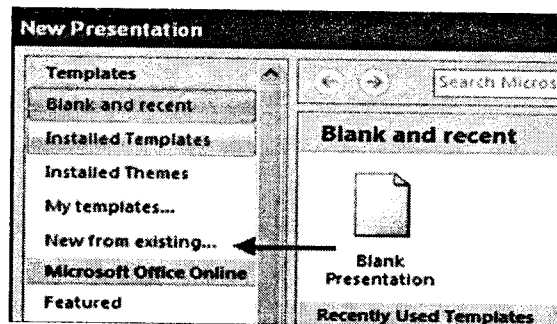


Figure 8.56



**To create a new presentation from a Word outline:**

- i. Click the slide where you would like the outline to begin
- ii. Click **New Slide** on the **Home** tab
- iii. Click **Slides from Outline**
- iv. Browse and click the Word Document that contains the outline

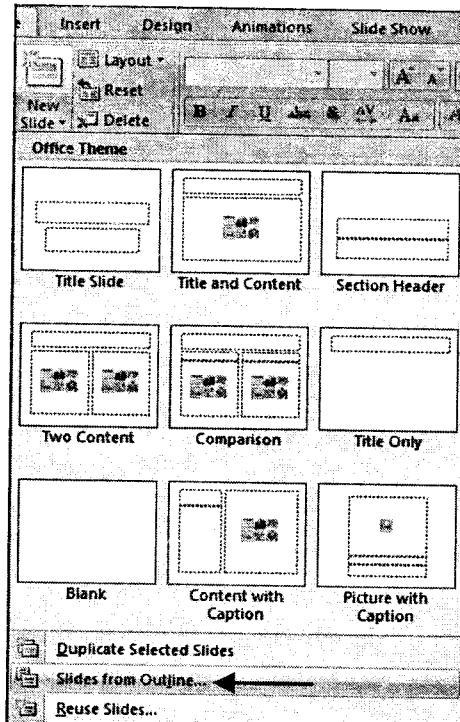


Figure 8.57

**4.2 Add/Create Slides**

There are several choices when you want to add a new slide to the presentation: Office Themes, Duplicate Selected Slide, or Reuse Slides.

**To create a new slide from Office Themes:**

- i. Select the slide immediately **Before** where you want the new slide
- ii. Click the **New Slide** button on the **Home** tab

- iii. Click the slide choice that fits your material

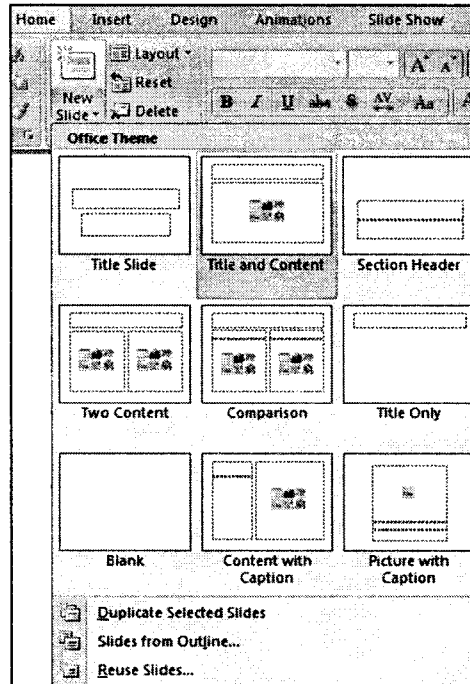


Figure 8.58

**To create a slide as a duplicate of a slide in the presentation:**

- i. Select the slide to duplicate
- ii. Click the **New Slide** button on the **Home** tab
- iii. Click **Duplicate Selected Slides**

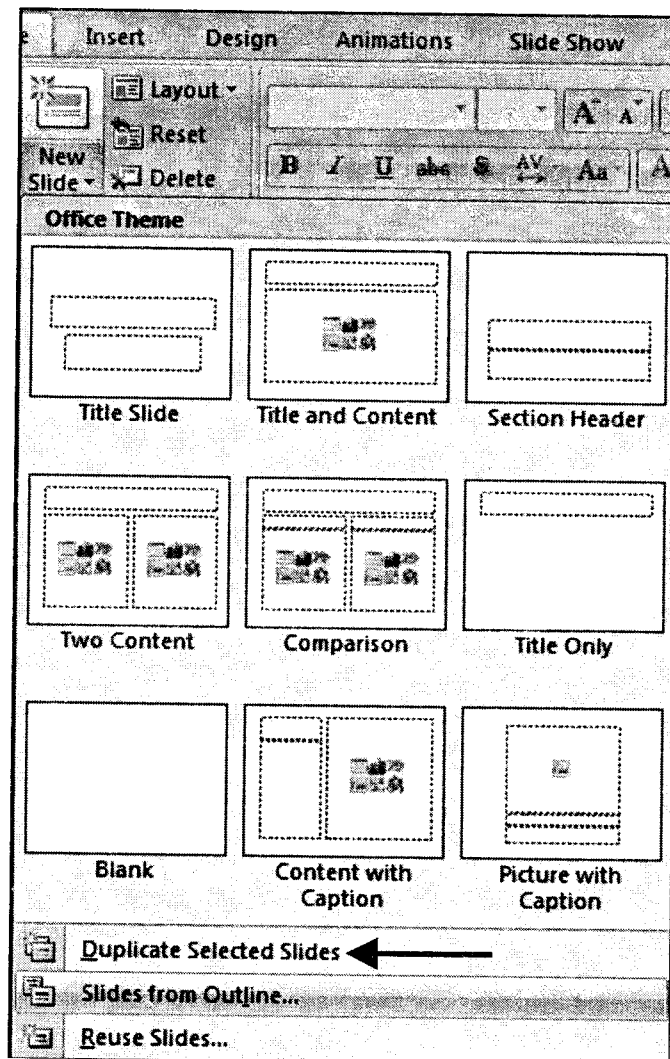


Figure 8.59

**To create a new slide from another presentation:**

- i. Select the slide immediately **Before** where you want the new slide
- ii. Click the **New Slide** button on the Home tab
- iii. Click **Reuse Slides**
- iv. Click **Browse**
- v. Click **Browse File**

- vi. Locate the slide show and click on the slide to import

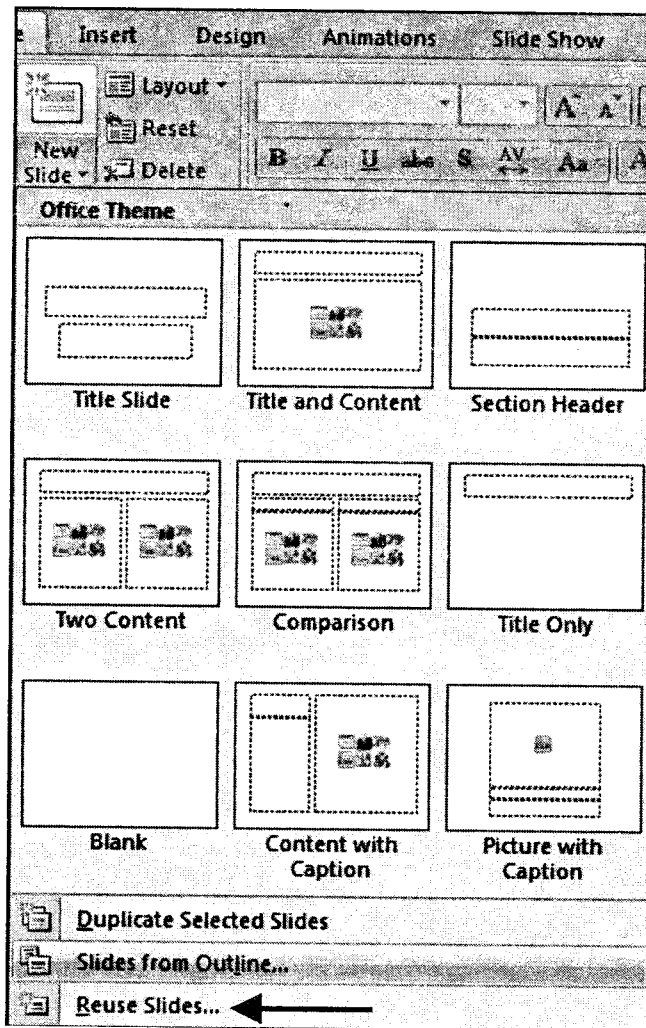


Figure 8.60

### 4.3 Inserting Picture

To add a picture:

- i. Click the **Insert** Tab
- ii. Click the **Picture** Button

- iii. Browse to the picture from your files
- iv. Click the **name** of the picture
- v. Click **insert**
- vi. To move the graphic, click it and drag it to where you want it.

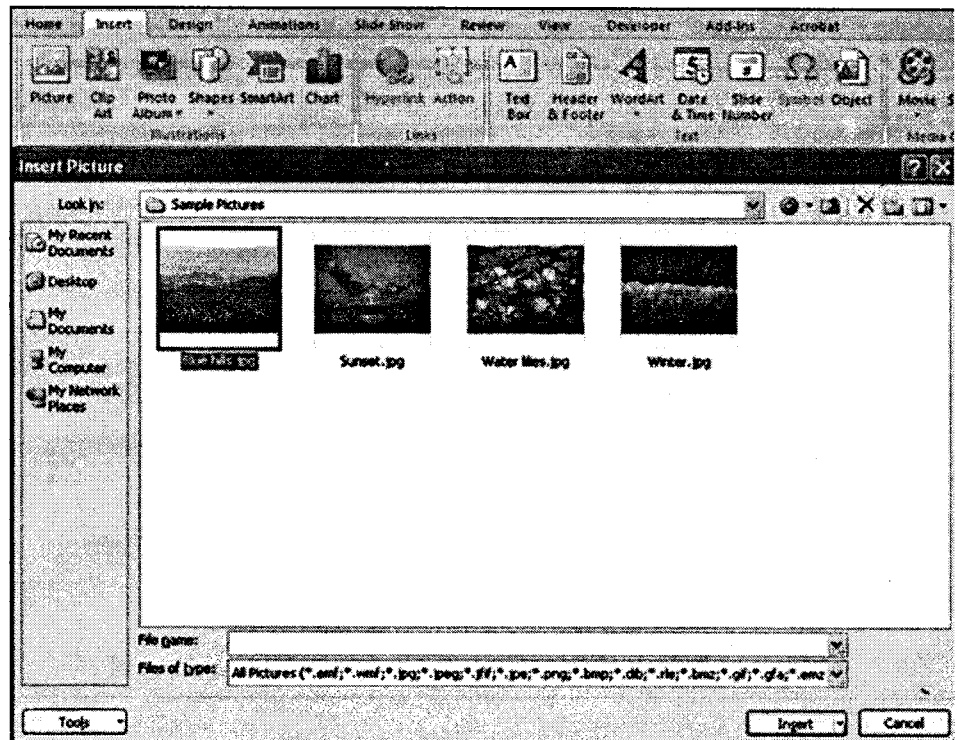


Figure 8.61

## 4.4 Preparing Slide Shows with Animation

Presentations are greatly improved by adding animation. PowerPoint gives you a wide selection of built-in animations, both when moving between one slide and the next and within each slide.

### ► Slide Transitions

Instead of simply moving abruptly from one slide to another during a presentation, slide transitions allow slides to dissolve into each other, using a variety of different special effects. These can make your on-screen presentation look even better and more professional.

- i. Check you are in *Normal* view and that the first slide is selected.
- ii. Move to the Animations tab at the top to show the following ribbon:

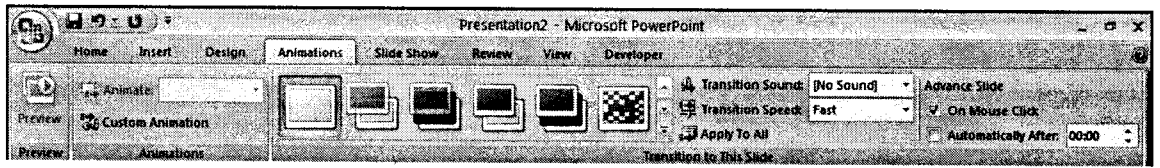


Figure 8.62

Across the middle of the ribbon, you'll see certain transition effects. As you move over each one, you'll see the transition effect on the slide. Just to the right of these is a vertical scroll bar – use the *up* and *down* arrows on the scroll bar to change the set of transition effects that are showing.

- iii. Choose one of the transition effects for the first slide.
- iv. Set the Transition Speed of the transition effect to medium or slow to see the effect more clearly.
- v. Under Advance Slide, set the next slide to appear Automatically after a set number of seconds.
- vi. Move to the next slide and repeat steps 3 to 5, choosing different effects.
- vii. Finally save your presentation (press <Ctrl s>) then run it (<F5>) to see the effects.

### ► Animation Schemes

PowerPoint allows information on your slides to appear one item at a time. This stops your audience from reading ahead of you, making them concentrate on each point individually. Try the following to animate your bullet points:

- i. Click on a slide with a bulleted list on it and make sure that the **Animations** tab is still showing on the *Ribbon*.
- ii. Click within the bullet point area on the slide and then click on the *list arrow* next to **No Animation** in the *Animations* group:

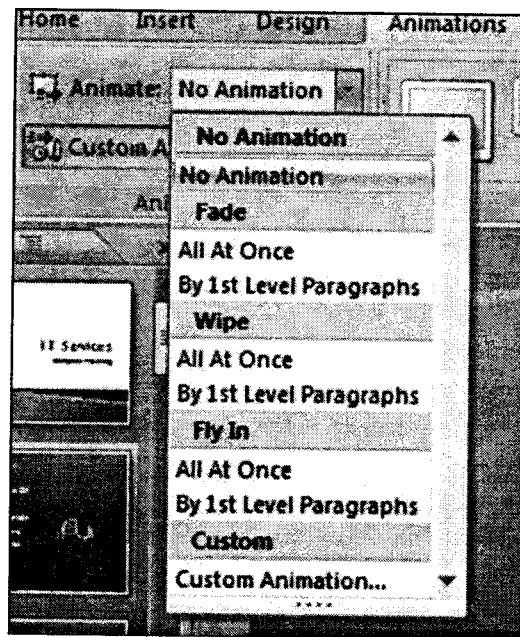


Figure 8.63

Only a few animation schemes are listed. Some bring in all the bullet points together, eg *Fade All At Once*, while others bring them in one by one, e.g., *Fade By 1st Level Paragraphs*. As you move the mouse over the list, you are shown what each animation looks like on the slide. Try setting up various animations for your slides.

- iii. From the list of animations choose one of them, e.g., *Fly In By 1st Level Paragraphs*.
- iv. Repeat steps 2 and 3 for another slide with bullet points, choosing a different animation.
- v. Choose one of the slides with bullet points that you've already animated and click on the slide title (or a picture if there's one on the slide).

On the right-hand side of your PowerPoint window, the *Custom Animation Task Pane* should be showing (this can always be displayed by clicking on the [Custom Animation] button in the Animations group):



Figure 8.64

- vi. Click on the [Add Effect] button followed by **Entrance** from the submenu and then **More Effects...**
- vii. Choose an entrance effect (they range from *Basic* to *Subtle* to *Moderate* to *Exciting!*) then click [Ok].
- viii. Click the [Play] button to check that the changes you have made look correct.  
To change the animation order:
- ix. Click on the object you want to change then use the [Re-Order] buttons to move it up or down the list - click on [Play] again to check the animation is now correct.
- x. Finally, save your presentation (press <Ctrl s>) then run it from the first slide (press <F5>).
- xi. End by closing the *Custom Animation Task Pane*.

## 5. MS-Access 2007

2  
Number of questions asked.

Oct.11,10 – 4M  
Write a note on  
MS-Access.

Access 2007 is a program that allows you to create and manage databases. A database is a place where you can store information related to a specific topic. How you intend to use the information will determine whether you need an Access database or a different program to create and manage your data.

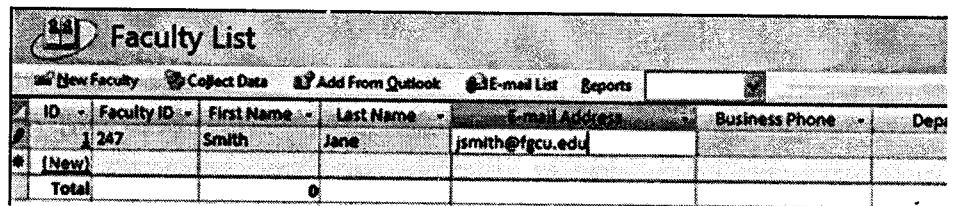


A database allows you to store information related to a specific topic in an organized way. In addition to storing data, you can also sort, extract, and summarize information related to the data. One of the software programs that allow you to do this is Microsoft Office Access 2007, which is a database creation and management program.

## 5.1 Database Terms

### ► Table

A table is a collection of information arranged in rows and columns. Information about an item is displayed in a row. Columns contain the same type of information for each item. The table has a header row that tells you what data is contained in the columns.



The screenshot shows a Microsoft Access table named "Faculty List". The table has the following columns: ID, Faculty ID, First Name, Last Name, E-mail Address, Business Phone, and Department. The first row of data shows Faculty ID 1, First Name Smith, Last Name Jane, and E-mail Address jsmith@fgcu.edu. There is also a row for a new entry and a Total row showing 0.

ID	Faculty ID	First Name	Last Name	E-mail Address	Business Phone	Dept
1	247	Smith	Jane	jsmith@fgcu.edu		
*	[New]					
Total			0			

Figure 8.65

To view data in a table:

- i. Click the arrow to open the navigation pane
- ii. Double-click on the table name to open the table

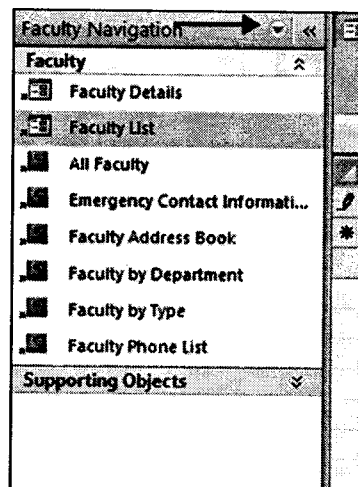


Figure 8.66

## ► Query

Queries select records from one or more tables in a database so they can be viewed, analyzed, and sorted on a common datasheet. A query can also perform calculations and display the results. The resulting collection of records, called a *dynaset* (short for dynamic subset), is saved as a database object and can therefore be easily used in the future. The query will be updated whenever the original tables are updated. Types of queries are *select queries* that extract data from tables based on specified values, *find duplicate queries* that display records with duplicate values for one or more of the specified fields, and *find unmatched queries* display records from one table that do not have corresponding values in a second table.

### To run a query:

- i. Click the arrow to open the navigation pane
- ii. Double-click on the query name

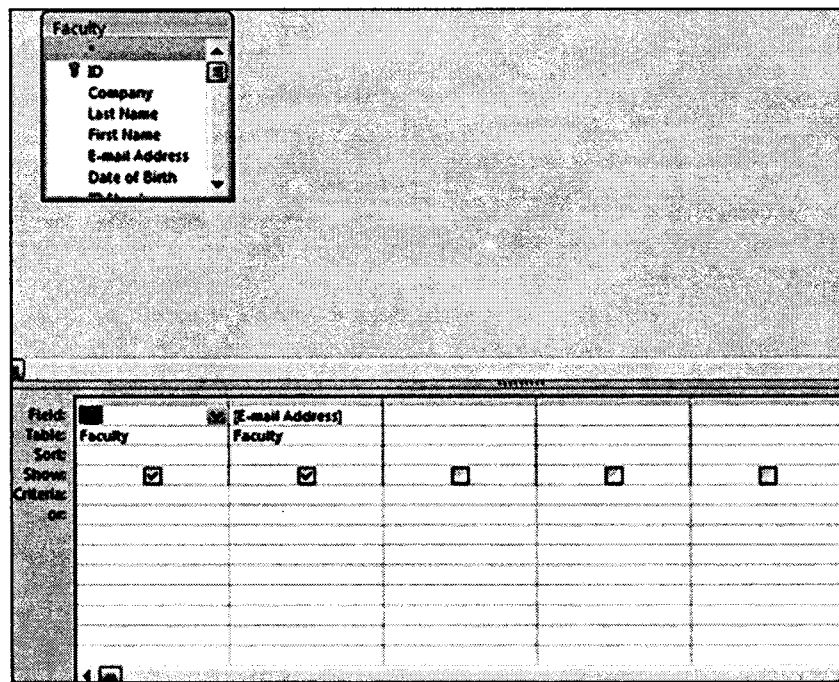


Figure 8.67

## ► Recordset

A recordset is a table that displays groups of records from a base table or as a query result.

► **Form**

A form is a graphical interface that is used to display and edit data. Forms can be developed from a table or a query. Forms can include calculations, graphics and objects.

**To view data using a form:**

- i. Click the arrow to open the navigation pane
- ii. Double-click on the form name

Figure 8.68

► **Report**

A report is an output of data arranged in the order you specify. Reports can perform calculations and display the results. Reports can be used to print data.

**To view data using a form:**

- i. Click the arrow to open the navigation pane
- ii. Double-click on the report name

Name	Faculty ID	Faculty Type	Office	Business Phone	E-mail Address
Jones Sandy	251				sjones@facu
Smith Jane	247				jsmith@facu
Subtotal					2
Total					2

Figure 8.69

## 5.2 Creation and Manipulation of Files and Tables

You can create a new database from scratch or you can create a database from the database wizard.

### ► New Database

To create a new database from scratch:

- i. Click the **Microsoft Office Button**
- ii. Click **New**
- iii. Click the **New Blank Database** icon

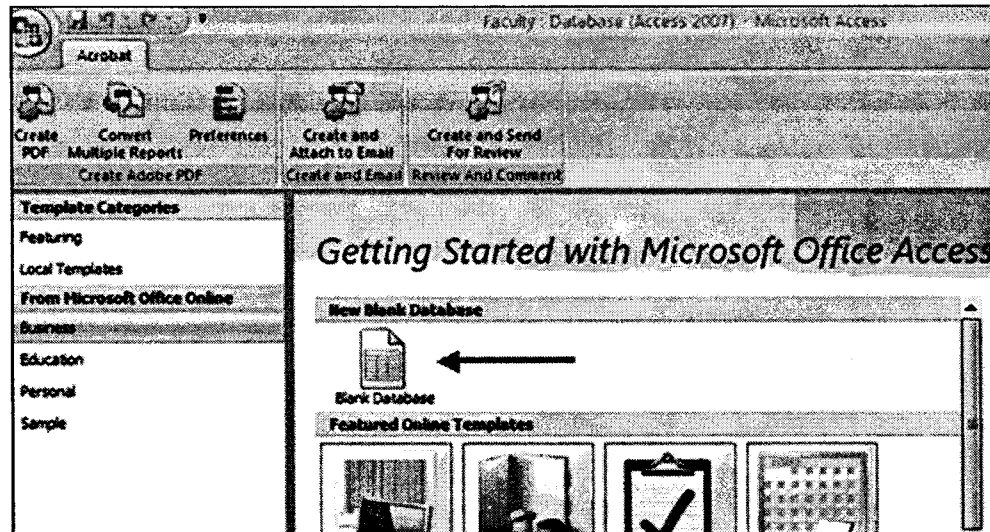


Figure 8.70

- iv. Type in a name for the database
- v. Click **Create**

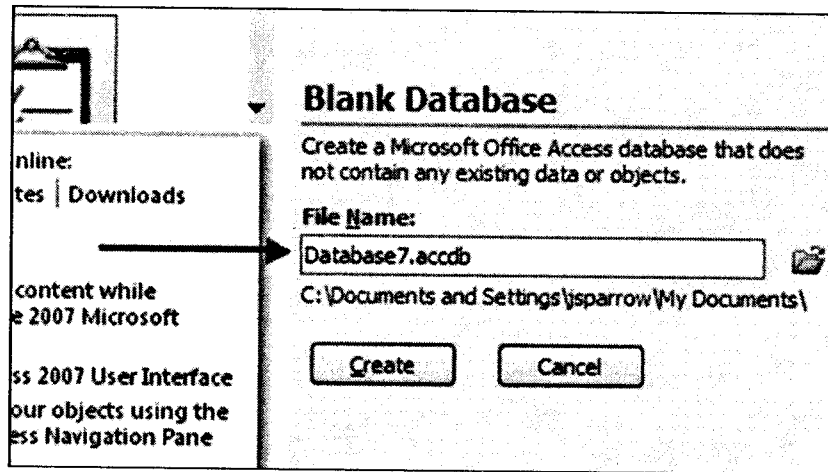


Figure 8.71

### ► Database Templates

To create a new database from the database templates:

- i. Click the Microsoft Office Button
- ii. Click New
- iii. Choose the type of database you wish to create

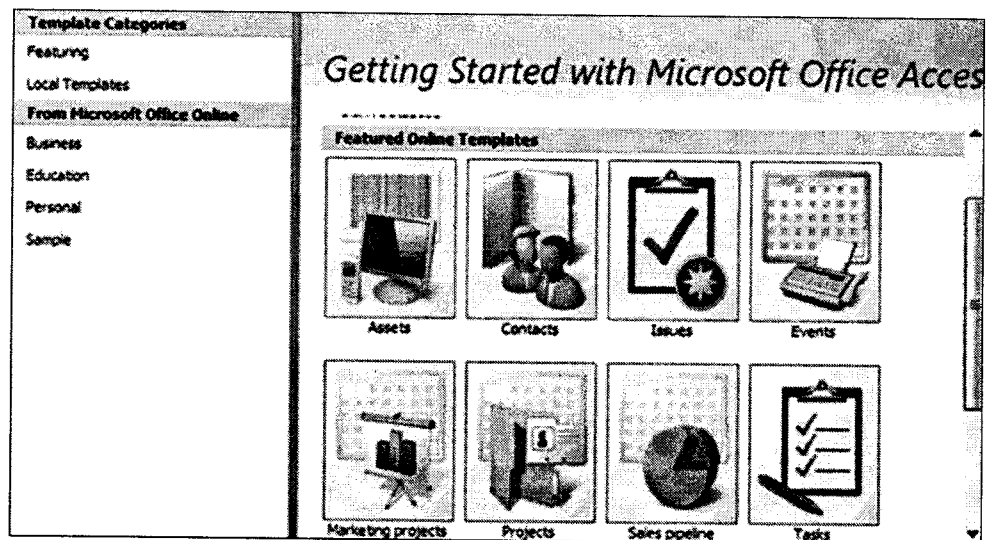


Figure 8.72

- iv. Type in the name for the database
- v. Click Create

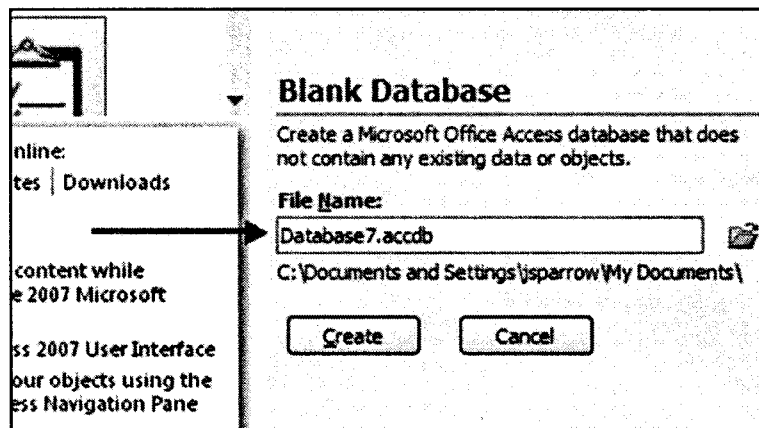


Figure 8.73

### ► Table Views

There are two ways to view a table in Access to add data to the table: **Design View** and **Datasheet View**. In **Design View**, you can view all the fields with the data types and descriptions. The records of information that has been added to the database is not viewable.

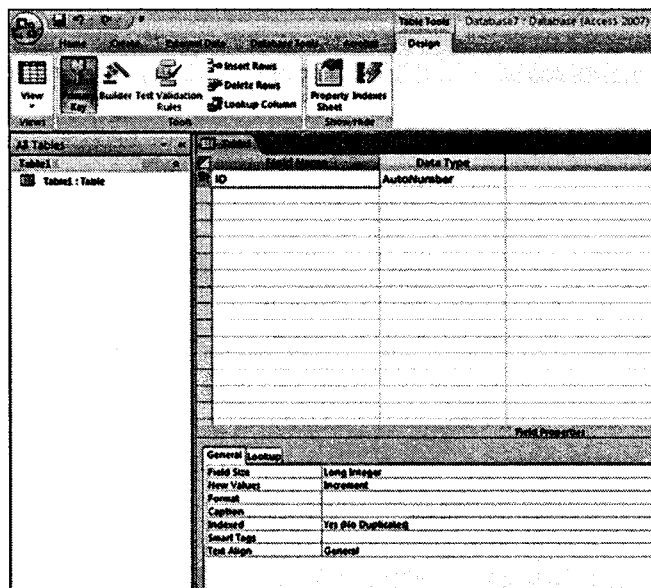


Figure 8.74

**To go to Design View:**

- i. Click the down arrow on the **View** button
- ii. Click **Design View**

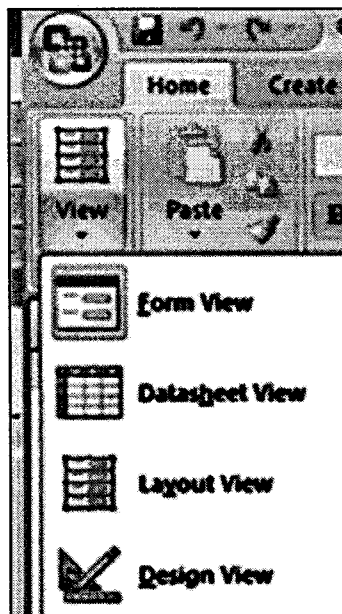


Figure 8.75

In **Datasheet View**, you can display the records in a table, where one row is one record. The column headers are the fields you have defined for the database.

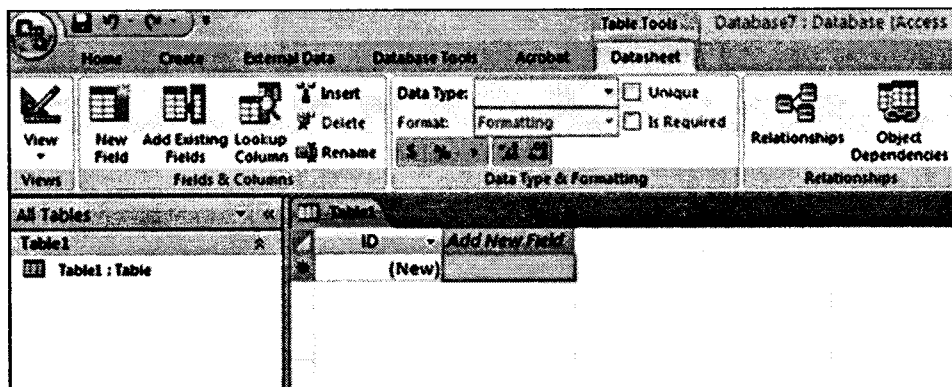


Figure 8.76

**To go to Datasheet View:**

- i. Click the down arrow on the **View** button
- ii. Click Datasheet View

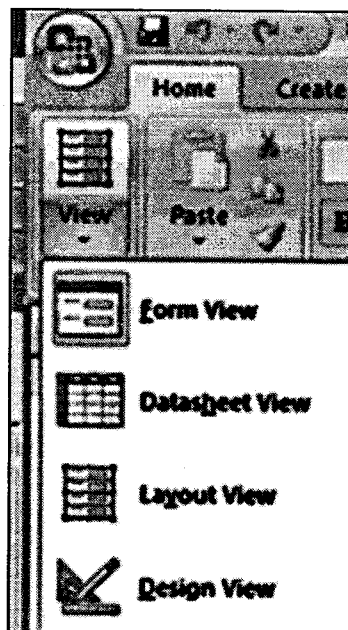


Figure 8.77

**► Adding New Fields**

There are many ways to enter new fields into a database. New fields can be added in the Datasheet View or in the Design View.

There are two ways to add a new field in Datasheet View: Add A New Field or the New Field Button.

**To add a New Field within the Datasheet:**

- Click the Add New Field column



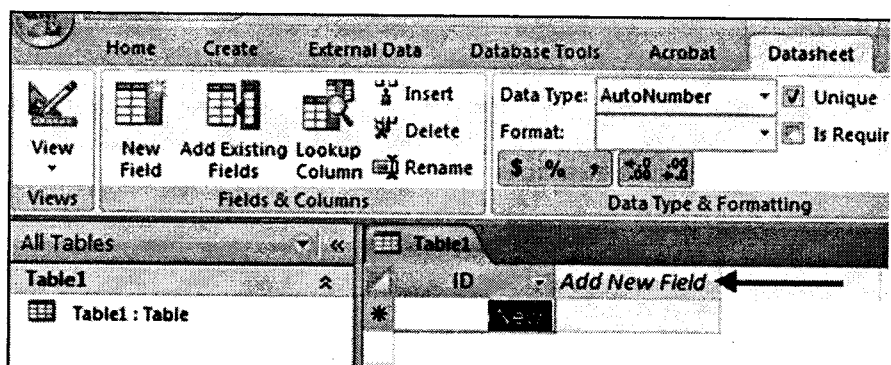


Figure 8.78

### To add a new field by using the New Field Button

- i. Click the Datasheet tab on the Ribbon
- ii. Click the New Field Button
- iii. Choose the type of field you wish to add from the Field Templates window

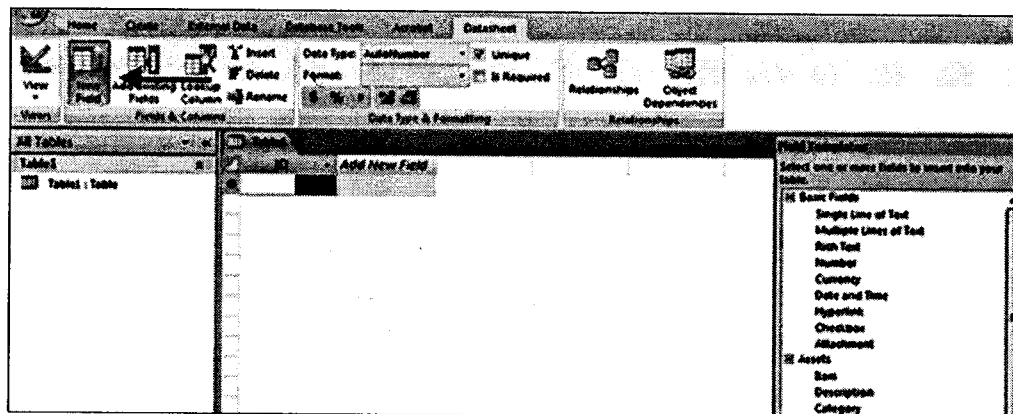


Figure 8.79

### To add a new field in Design View:

- i. Click the Design View button
- ii. Click on the next available field
- iii. Type in the Name of the field

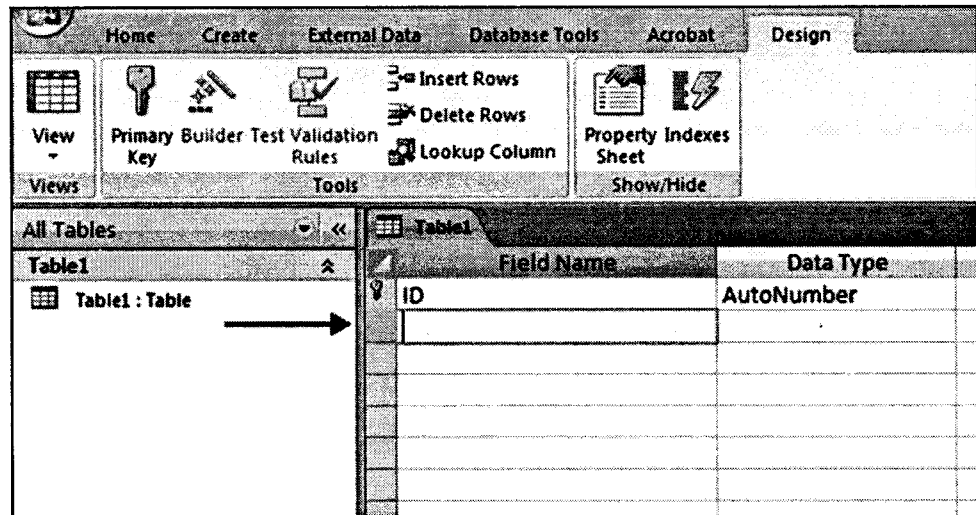


Figure 8.80

### ► Data Types

There are many types of data that a field can be predefined to hold. When you create a new field in a database you should closely match the data type to what will be entered into the field.

#### Editing Data Types in Fields

When creating tables, you should define the data types of the tables to most closely match the type of data that will be entered in the field.

#### To edit the Data Type in Datasheet View:

- i. Click the field you wish to define
- ii. Click the **Datasheet** tab on the Ribbon
- iii. Click the down arrow next to **Data Type**
- iv. Choose the type of data that will be entered into the field

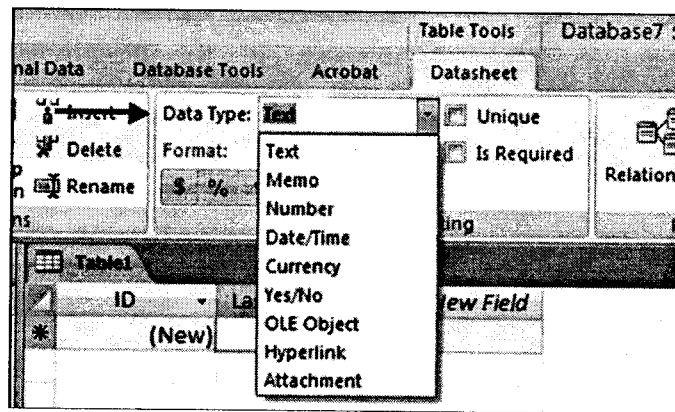


Figure 8.81

To edit the Data Type in the Design View:

- i. Click **Design View**
- ii. Click the field name you wish to define or create a new field
- iii. Click the **Data Type**
- iv. Choose the appropriate **Data Type**
- v. Format the field in the **Field Properties Dialog box**

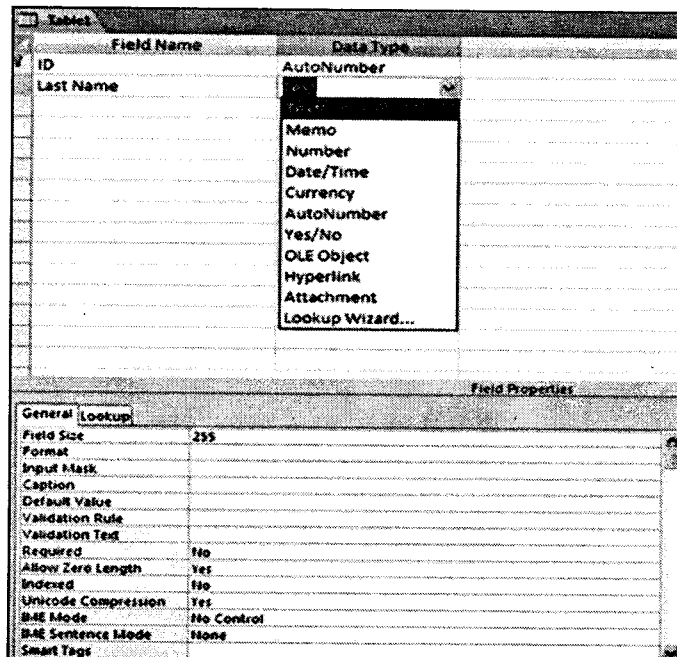


Figure 8.82



# PU Questions

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[Oct.2011 – 2M]

**2 Marks**

1. What is Chart?

[Oct.11, 10 – 4M]

**4 Marks**

[Oct.11, 10,09,08 – 4M]

1. Write a note on MS-Access.
2. State any four features of MS-Word.
3. What are the different types of Menus available in Windows? Explain any one.
4. Write a note on Power Point.
5. Explain elements of MS-Word in detail.
6. Explain different operations for MS-Word.
7. Explain features of MS-Windows.
8. What is Spreadsheet? Explain usages of Spreadsheet.
9. Explain different features of Editing Text in MS-Word.

[Oct.2010 – 4M]

[Oct.2010 – 4M]

[Apr.2010 – 4M]

[Oct.2009 – 4M]

[Apr.2009 – 4M]

[Apr.2009 – 4M]

[Oct.2008 – 4M]



# VISION

## Suggestive Readings

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