**Master of Commerce**

**Semester – I**

**Paper Code –** 4

# COMPUTER APPLICATIONS IN BUSINESS

**M.Com (Two Year Course) Semester -I**
**Computer Applications in Business**
**Paper Code:**

M. Marks = 100
Term End Examination = 80
Assignment = 20
Time = 3 hrs

**Course Outcome:**
CO1: To know the basics of Computer System, Computer Software & Hardware and Information processing system.
CO2: To understand the differences of types of computer systems, input-output devices, storage devices, communication devices, configuration of hardware devices and their applications.
CO3: To learn about the personal computers, its components, hardware configuration, RAM, factors influencing PC performance, Types of E-Commerce System: B2B, B2C, C2C, C2B, B2G and G2C, electronic Payment Systems.
CO4: To be familiar with Modern network Technologies i.e. LAN, WAN, MAN, E-mail, Internet technologies, World Wide Web and Internet browsing.
CO5: To get practical learning on M.S. Word, Excel, Power Point, Internet Technology – Applications, manager., control panel, paintbrush, calculator, desk top, my computer, settings, find, run etc.

**Note:** The examiner shall set nine questions in all covering the whole syllabus. Question No.1 will be compulsory covering all the units and shall carry 8 small questions of two marks each. The rest of the eight questions will be set from all the four units. The examiner will set two questions from each unit out of which the candidate shall attempt four questions selecting one question from each unit. All questions shall carry 16 marks each.

**Unit-I**
**Introduction to computer**: Characteristics of computer systems, Various Functional units of computers, Types of computer systems, Introduction to computer Memories: Primary Storage, Secondary storage, Input/Output Devices, Software types: Systems software, Application software, functions of Operating Systems, Computer Networks: Advantages of Networking, Types of Network: LAN, MAN, WAN, Public and Private Network, Data communication Media.

**Unit-II**
**Internet and E-Commerce**: Internet concept and Technologies, Internet applications, Internet Accounts, Extranet and E-Mail, Features of E-Commerce, Elements of E-Commerce, Types of E-Commerce System: B2B,B2C,C2C,C2B,B2G and G2C, E-commerce technologies, Types of an Electronic Payment System, Security Schemes of an electronic Payment Systems, E-Commerce On-line Services. Electronic data Interchange (EDI): Basics of EDI, Application of EDI, Advantages of EDI.

**Unit-III**
**Word processing**: Introduction and working with MS-Word in MS-Office; Word basic commands; Formatting-text and documents; Sorting and tables; Working with graphics; Introduction to mail merge. Spread Sheets: Working with EXCEL-formatting, functions, chart features; Working with graphics in Excel; using worksheets as database in accounting, marketing, finance and personnel areas. Presentation with Power-Point: Power-point basics, creating presentations the easy way; Working with graphics in Power-Point; show time, sound effects and animation effects.

**Unit-IV**

**Accounting Package-Tally** (ERP 9): Features of Tally, Contents of Accounts Info, Menu, Creating Ledgers, Preparation of Vouchers, Inventory Master: Functions in Inventory Information Menu, Inventory Information Menu, VAT (Value added tax) in Tally, Maintenance of Inventory records, Maintenance of Accounting Books and Final Accounts, Generating and Printing of Accounting Reports. Introduction to Statistical Packages (SPSS): Features, Formation of table, Types of graph, uses of SPSS.

**Practical Max. Marks: 40**

The following areas are to be covered:-

Internet Technology-Applications

M.S.Word, PowerPoint , M.S Excel, Tally and SPSS basic commands.

# CONTENTS

**UNIT-1**

# CHAPTER-1

## BASICS OF COMPUTER

### OBJECTIVES OF THIS LESSON

This lesson is aimed to make you understand the following about a computer system:
- Computer system as a data processing tool
- Basics of data processing, data processing cycle and information cycle.
- Historical evolution of computers and computer generations
- Working model of a digital computer and functions of a digital computer
- Basic characteristics of digital computer and types of computers
- Classification of digital computers
- Similarities between human beings and computer system
- Factors influencing performance of personal computers (PC), PC as a virtual office
- Comparison between computer and calculator

### STRUCTURE OF THIS LESSON

## 1.1    INTRODUCTION

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

**Definition of Computer**

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

**Definition:**

"A computer is an electronic machine that operates under the control of instructions, that accepts the input data, processes or manipulates the given data according to the predefined instructions and stores the result for future use".
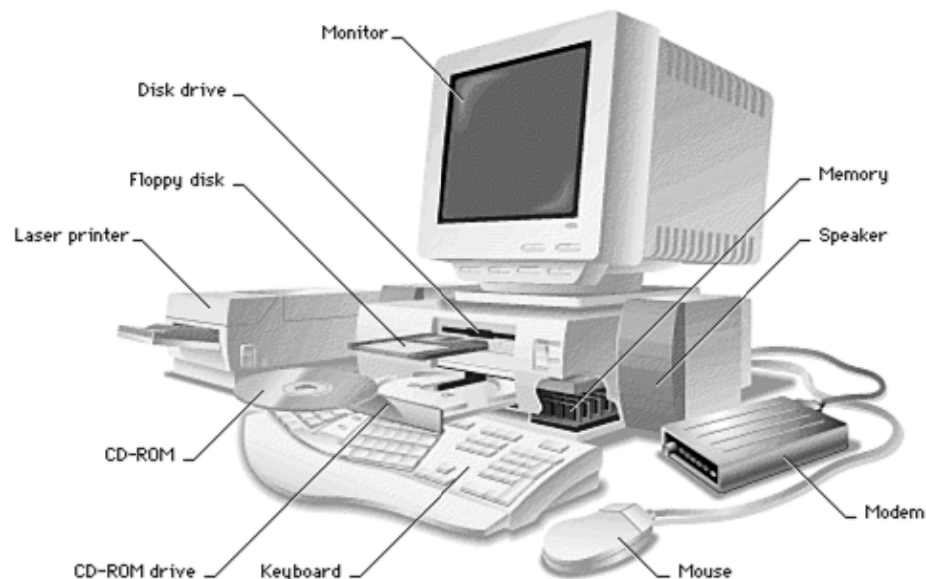


Figure 1.1: Components of a Computer

It can also retrieve the stored results as and when required again. Now-a-days, data is processed with the help of computer. This modern technique to process data is known as Electronic Data Processing (EDP). Computer is also known as Electronic Data Processing machine.

**The term data processing means:**

  ➢ Arithmetic and logical operations on data to get required results.
  ➢ To send and receive information from one location to another.
  ➢ Arranging data into a specific order etc.

## 1.2     COMPUTER SYSTEM AS INFORMATION PROCESSING SYSTEM

A digital computer can store, process and retrieve data as and when desired. The computer processes data with very high speed. In addition to being very fast, computer is also very accurate in calculations. These are the main capabilities of the computer.

Therefore, we may define computer as a device that transforms data. Data can be anything like marks obtained by you in various subjects. It can also be name, age, sex, weight, height, etc. of all the students in your class or income, savings, investments, etc., of a country. Computer can be defined in terms of its functions. It can

- accept data
- store data
- process data as desired, and
- retrieve the stored data as and when required and
- print the result in desired format.

**Data processing** is the collection and manipulation of items of data to produce meaningful information. The term is often used more specifically in the context of a business or other organization to refer to the class of commercial data processing applications.

Data processing i.e. manipulation of data by a computer. It includes the conversion of raw data to machine-readable form, flow of data through the CPU and memory to output devices, and formatting or transformation of output. Any use of computers to perform defined operations on data can be included under data processing. In the commercial world, data processing refers to the processing of data required to run organizations and businesses.

Data processing may involve various processes, including:

- Validation – Ensuring that supplied data is "clean, correct and useful"
- Sorting – "arranging items in some sequence and/or in different sets."
- Summarization – reducing detail data to its main points.
- Aggregation – combining multiple pieces of data.
- Analysis – the "collection, organization, analysis, interpretation and presentation of data."
- Reporting – list detail or summary data or computed information.
- Classification – separates data into various categories.

## 1.3     DATA PROCESSING CYCLE AND INFORMATION CYCLE

Data processing is simply the conversion of raw data to meaningful information through a process. Data is manipulated to produce results that lead to a resolution of a problem or improvement of an existing situation. Similar to a production process, it follows a cycle where inputs (raw data) are fed to a process (computer systems, software, etc.) to produce output (information and insights).

The Data Processing Cycle is a series of steps carried out to extract information from raw data. Although each step must be taken in order, the order is cyclic. The output and storage stage can lead to the repeat of the data collection stage, resulting in another cycle of data processing. The cycle provides a view on how the data travels and transforms from collection to interpretation, and ultimately, used in effective business decisions.

Generally, organizations employ computer systems to carry out a series of operations on the data in order to present, interpret, or obtain information. The process includes activities like data entry, summary, calculation, storage, etc. Useful and informative output is presented in various appropriate forms such as diagrams, repo rts, graphics, etc.
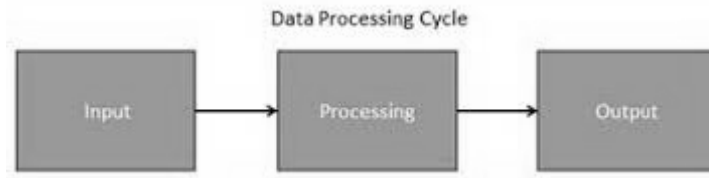
Fig. 1.2: Data Processing

**Stages of the Information Cycle**

**1) Collection** is the first stage of the cycle, and is very crucial, since the quality of data collected will impact heavily on the output. The collection process needs to ensure that the data gathered are both defined and accurate, so that subsequent decisions based on the findings are valid. This stage provides both the baseline from which to measure, and a target on what to improve.

Some types of data collection include census (data collection about everything in a group or statistical population), sample survey (collection method that includes only part of the total population), and administrative by-product (data collection is a byproduct of an organization's day-to-day operations).
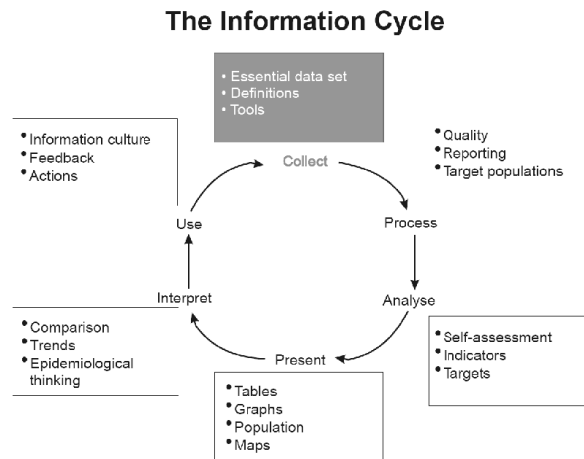


Fig. 1.3: Information Cycle

**2) Preparation** is the manipulation of data into a form suitable for further analysis and processing. Raw data cannot be processed and must be checked for accuracy. Preparation is about constructing a dataset from one or more data sources to be used for further exploration and processing. Analyzing data that has not been carefully screened for problems can produce highly misleading results that are heavily dependent on the quality of data prepared.

**3) Input** is the task where verified data is coded or converted into machine readable form so that it can be processed through a computer. Data entry is done through the use of a keyboard, digitizer, scanner, or data entry from an existing source. This time-consuming process requires speed and accuracy. Most data need to follow a formal and strict syntax since a great deal of processing power is required to breakdown the complex data at this stage. Due to the costs, many businesses are resorting to outsource this stage.

**4) Processing** is when the data is subjected to various means and methods of manipulation, the point where a computer program is being executed, and it contains the program code and its current activity. The process may be made up of multiple threads of execution that simultaneously execute instructions, depending on the operating system. While a computer program is a passive collection of instructions, a process is the actual execution of those instructions. Many software programs are available for processing large volumes of data within very short periods.

**5) Output and interpretation** is the stage where processed information is now transmitted to the user. Output is presented to users in various report formats like printed report, audio, video, or on monitor. Output need to be interpreted so that it can provide meaningful information that will guide future decisions of the company.

**6) Storage** is the last stage in the data processing cycle, where data, instruction and information are held for future use. The importance of this cycle is that it allows quick access and retrieval of the processed information, allowing it to be passed on to the next stage directly, when needed. Every computer uses storage to hold system and application software.

## 1.4     GENERATIONS OF COMPUTERS

The history of computer development is often referred to in reference to the different generations of computing devices. A generation refers to the state of improvement in the product development process. This term is also used in the different advancements of new computer technology. With each new generation, the circuitry has gotten smaller and more advanced than the previous generation before it. As a result of the miniaturization, speed, power, and computer memory has proportionally increased. New discoveries are constantly being developed that affect the way we live, work and play.

Each generation of computers is characterized by major technological development that fundamentally changed the way computers operate, resulting in increasingly smaller, cheaper, and more powerful and more efficient and reliable devices. Read about each generation and the developments that led to the current devices that we use today.

The term generation indicates the type of technology used in the computer construction. As new technology was emerging, it was being used in the making of computer. The new technology improved the speed, accuracy and storage capacity of the computers. Different technologies have been used for computers in different times.

Therefore, computers can be divided into five generations depending upon the technologies used. **These are:**

1. First Generation (1946 – 1959)
2. Second Generation (1959 – 1965)
3. Third Generation (1965 – 1971)
4. Fourth Generation (1971- 1985)
5. Fifth Generation (1985 onwards)

### 1.4.1     First Generation (1946-1959)

All subsequent computers after Mark I were all electronic. The early first-generation computers were powered by

. Magnetic drums were once use as a primary storage device but have since been implemented as auxiliary storage devices.
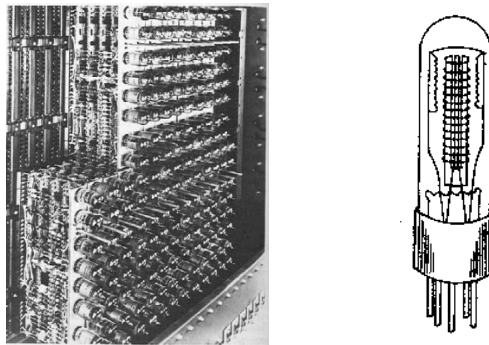


Figure 1.4: Vacuum Tubes

Examples:

- Electronic Numerical Integrator and Calculator (ENIAC),
- Electronic Discrete Variable Automatic Computer (EDVAC)
- Electronic Delay Storage Automatic Computer (EDSAC)
- UNIVAC I

Characteristics of First Generation

- Vacuum tubes
- Magnetic tape and magnetic drum for external storage
- Punched cards for input
- Punched cards and paper for output
- Machine and assembly languages
- Human operators to set switches
- **Examples :** UNIVAC I, UNIVAC II, Datamatic 100, EDSAC, Burrough 2202, etc.

### 1.4.2    Second Generation (1959-1965)

Transistors replaced vacuum tubes and ushered in the second generation computer. Transistor is a device composed of semiconductor material that amplifies a signal or opens or closes a circuit. Invented in 1947 at Bell Labs, transistors have become the key ingredient of all digital circuits, including computers. Today's **latest microprocessor** contains tens of millions of microscopic transistors.
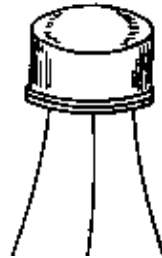


Figure 1.5: Transistor

The first computers of this generation were developed for the atomic energy industry.

Characteristics of Second Generation

- Transistors
- Magnetic-core storage
- Magnetic tape and magnetic disk for external storage
- Punched cards and magnetic tape for input
- Punched cards and paper for output
- High-level languages- FORTRAN, COBOL, PL/I, BASIC and others
- Human operators to handle cards
- **Examples :** Honeywell 200-, 400-, 800-series, IBM 7070/7080, CDC 1604, Burrough B5000 series, etc.

### 1.4.3    Third Generation (1965-1971)

During this time integrated circuits with transistors, resistors, and capacitors were etched onto a piece of silicon. This reduced the price and size of computers, adding to a general trend in the computer industry of miniaturization. The development of the integrated circuit was the hallmark of the third

generation of computers. Transistors were miniaturized and placed on silicon chips, called semiconductors, which drastically increased the speed and efficiency of computers.
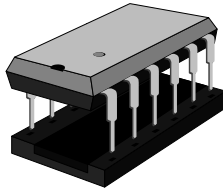
Figure 1.6: Integrated Circuits

Characteristics of Third Generation

- Integrated circuits
- Improved disk storage
- Monitors and keyboards for input and output
- More high-level languages, including RPG and Pascal
- First complete operating system meant less involvement for human operators
- Family of computers introduced allowing compatibility
- Minicomputers used commercially
- Examples: IBM System/360, IBM System/370, Burrough 5700/6700, PDP-8 Series, PDP-11 Series, etc.

### 1.4.4    Fourth Generation (1971-1985)

The microprocessor brought the fourth generation of computers, as thousands of integrated circuits we rebuilt onto a single silicon chip. A silicon chip contained a CPU. In the world of personal computers, the terms microprocessor and CPU are used interchangeably. At the heart of all personal computers and most workstations sits a microprocessor.



Figure 1.7: Microprocessor

Microprocessors also control the logic of almost all digital devices, from clock radios to fuel-injection systems for automobiles.

**Three basic characteristics differentiate microprocessors:**

- **Instruction Set:** The set of instructions that the microprocessor can execute.
- **Bandwidth:** The number of bits processed in a single instruction.
- **Clock Speed:** Given in megahertz (MHz), the clock speed determines how many instructions per second the processor can execute.

Characteristics of Fourth Generation

- LSI and VLSI
- Magnetic disk most common external storage
- Introduction of microcomputers
- Fourth-generation languages (4GLs) emerged and application software for microcomputers became popular
- Microcomputers used - Compaq Deskpro 386
- **Typical examples** : Burroughs B7700 and HP 3000 minicomputers

### 1.4.5    Fifth Generation (Beyond 1985 and Till-Date)

The changes that have occurred since 1985 are plentiful. Computers have got tinier, more reliable, and many times faster. Computers are mostly built using components from many different corporations.

Computers have become more and more online orientated in modern times, especially with the development of the World Wide Web. Popular companies like Google and Yahoo! were started because of the internet.

Fifth generation computing devices, based on artificial intelligence, are still in development, though there are some applications, such as voice recognition, that are being used today. Artificial Intelligence is the branch of computer science concerned with making computers behave like humans. The term was coined in 1956 by John McCarthy at the Massachusetts Institute of Technology.

Characteristics of Fifth Generation

- Development of true artificial intelligence
- Development of Natural Language Processing
- Advancement in Parallel Processing
- Advancement in Superconductor Technology

Fifth generation computers are supposed to be the ideal computers. The scientists are working to design such computers that will have the following features.

1. Having their own thinking power
2. Making decisions themselves
3. Having capabilities of learning
4. Having capabilities of reasoning
5. Having large capacity of internal storage
6. Having extra high processing speed
7. Having capabilities of parallel processing

### 1.5    Digital Computer and its Functioning

Modern computer systems are available in numerous physical shapes and sizes, and truly speaking there is no end to it. In Computer System, different parts of a computer are organized in such a way that, it helps to perform various operations to complete the given specific task. A computer is a sort of electric brain, which capable to solve mathematical problems with in movements or produce desired information or a controlling order.
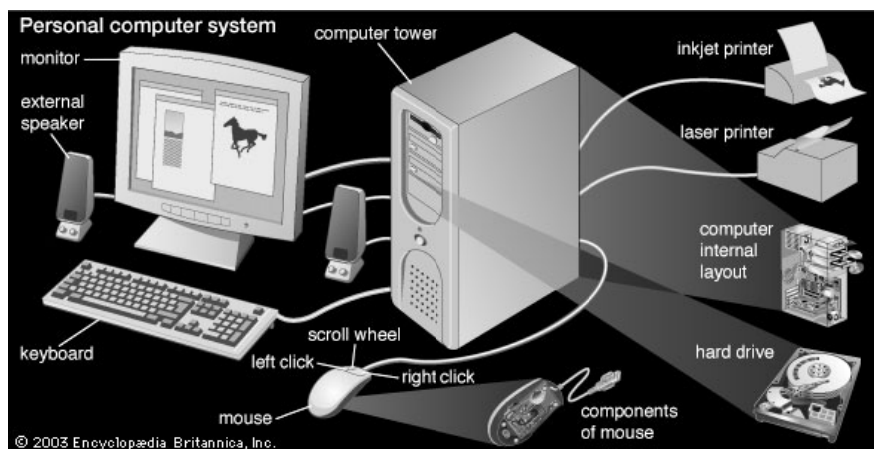


Figure 1.8: Basic Components of a Digital Computer

All modern digital computers consist of three main components. These are indicated in the block diagram **(Fig. 1.9).**
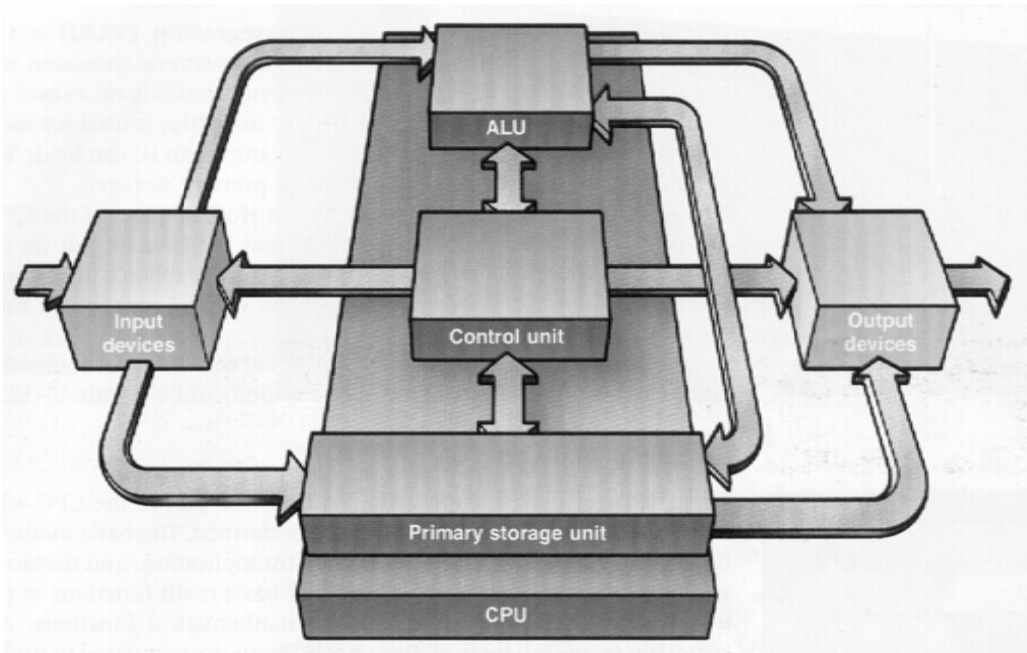
Fig. 1.9: Model of a Digital Computer

Let us now study the organisation and function of each unit in detail.

### I. Input unit

A unit provided to supply data to the computer is called **Input Unit.** This unit is also called Input Devices Unit and uses devices like mouse, lightpen, keyboard etc. to transfer data/information to the computer directly or may collect data on magnetic disks and tapes and later transfer it to the system.

Peripherals is the term applied to all devices that are connected to the CPU but are not part of the CPU. These include the Input/Output (I/O) and mass storage devices and other computer devices such as analog-to-digital converters. The collection of all peripheral equipments is called the computer configuration.

There are two types of peripherals given as under:

    i) Off-line Peripheral and

    ii) On-line Peripheral.

Auxiliary devices that are not directly connected to the CPU, such as keypunches, card sorters, and so on. These are called off-line devices. The term on-line devices refers to equipment that is connected to the CPU.

### II. Central Processing Unit (CPU)

This unit is called the brain or heart and soul of the computer system. It comes in different shapes viz. Vertical CPU, Mid-Tower, Horizontal CPU, etc. Few popular CPU types are shown in **Fig. 1.10.**
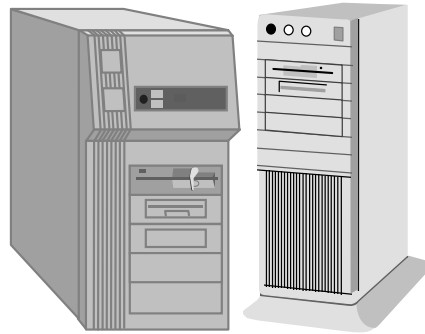
**(a) Mid Tower CPU (b) Vertical CPU**

Fig. 1.10: Few Popular CPU Shapes

It has the following three sub-units:

   i)   Primary Storage Unit (or Memory Unit)
   ii)  Arithmetic & Logic Unit (ALU)
   iii) Control Unit

### a) Primary Storage Unit

We are already aware that the computer is capable of storing data/instruction/information into it. Where does the data get stored? The answer to this question is the memory unit. Memory is a part of the microcomputer that holds data for processing, instructions for processing the data and information i.e. processed data.

As we have different types of data to be stored, this memory unit has four major logical areas, which are not shown in the figure to avoid complexity.

### i) Input Storage Area

The input data does not straight away go to the processor. It is first stored in this area till the processor asks for it.

### ii) Working Storage Area

**'Working storage area'** is like a sheet of scratch paper. When the data is being processed, there are some intermediate results that are not required as output but are required to obtain the output. Such results are stored in **working storage area**.

### iii) Output Storage Area

The final output is not taken by the output devices immediately but is stored in memory till the output device is ready to receive it. Thus an **'output storage area'** holds the finished results of the processing operations until they are released on the output device.

### iv) Program Storage Area

In addition to above, the primary storage also contains a **'program storage area'**. The instructions for data manipulation are stored in this area.

### b) Arithmetic & Logic Unit (ALU)

This unit is capable of performing arithmetic operations and logical operations on the data stored in storage area. The basic arithmetic and logical operations include addition, subtraction, multiplication, division, ORing, ANDing, NOT (complementing), increment, decrement, shifting, clearing operations, etc. The data is transferred to ALU for processing and the intermediate results and final results are transferred to the storage area.

### c) Control Unit

This unit controls the operation of each unit of computer system by issuing control signals on the basis of instructions provided to the computer as a program. So this unit can be called the central nervous system of the computer. This unit generates timing and control signals necessary for execution of instructions. It provides status, control and timing signals necessary for the operation of other parts of the CPU, memory, and I/O devices. It controls the entire operation of the computer. It is actually the control section of the CPU, which acts as the brain of a computer.

### III. Output Unit

The result generated by CPU is either transferred directly or from the output area of the memory to the output devices like visual display units (VDU) or printers, etc.

### Mass Storage Devices

The primary storage area of the computer is limited in size and is expensive. Only, the frequently required instructions are stored in it. To supplement this limited memory, we use auxiliary or secondary storage devices like magnetic tapes and disks. The data can be transferred to/from these devices by the processor at a very fast speed. But as compared to primary storage, secondary storage is slow. But the advantage of secondary storage devices is that apart from being cheap, they are transferable which primary storage is not. There is no limit to secondary storage memory. This can be compared to human beings who use a note-book or pocket-diary to store the notes to supplement the brain.

## 1.6    CHARACTERISTICS OF DIGITAL COMPUTER

Now-a-days computer is playing a main role in everyday life it has become the need of people just like television, telephone or other electronic devices at home. It solves the human problems very quickly as well as accurately. The important characteristics of a computer are described below:

1. Speed
2. Arithmetical & Logical Operations
3. Accuracy
4. Reliability
5. Storage
6. Retrieving data and programs
7. Automation
8. Versatility
9. Communications
10. Diligence
11. No Feelings
12. Consistency
13. Precision

## 1.7    CLASSIFICATION OF COMPUTERS

Though in general we use digital computers, however, present day computers may be classified into three categories:

- Analog
- Digital
- Hybrid

### 1.7.1    Analog Computers

Analog computers are computers which work on the basis of continuous measurement of physical quantities, e.g. pressure, voltage, current, temperature, current, length, etc. We can quote a number of instruments that work on the principles of an analog computer.

### Limitations of Analog Computers

- These don't have logical facilities afforded by programming
- Don't have the ability to store data in large quantities
- Cost of implementation of computation is very high

**Examples :** Thermometer, Speedometer, Wall-clock, Voltmeter, Ammeter, etc.

### 1.7.2    Digital Computers

Digital computers are computers which represent data in terms of discrete number and processes data using the standard arithmetic operations. These computers directly operate on numbers and produce precise results. These are used in a unlimited number of applications. The basic differences between analog and digital computers are listed in **Table No. 1.1.**

We will be concerned with digital computers only because of the following reasons :

- The tasks that can be done on analog computers can also be done on digital computers while the reverse is not true.
- To understand the calculations made by an analog computer, some mathematical background is necessary, whereas digital computer can be used and understood without much mathematical background.
- The digital computer is used extensively in many areas of application.

### 1.7.3    Hybrid Computers

Design features of Analog and Digital computers can be combined to create a Hybrid Computer. Such computers are used for special applications only. Examples of such computers include:

- Chemical Process Control
- Patient Monitoring System
- Electronic Calculating Scale
- Missile Guidance Computer
- Flight Simulators For Training Air-plane Pilots
- Petroleum Distillation Monitoring Systems

### 1.7.4    Difference between Analog and Digital Computers

#### Table 1.1 : Analog Vs. Digital Computer

| S.No | Analog Computers | Digital Computers |
|------|------------------|-------------------|
| 1. | Represent continuous measurement of physical quantities e.g. rotation, voltage, temperature, etc. | Represent numbers by discrete coded patterns |
| 2. | Accuracy is quite limited | Unlimited accuracy |
| 3. | Represent physical or mathematical quantities | Represent numbers, letters and other symbols |
| 4. | Data-storage scattered in various non-interchangeable devices | Data-storage concentrated in space, interchangeable and unlimited in duration |
| 5. | Distinct elements used for each operation | Identical elements used in sequence |
| 6. | Sets up analogy of problem | Breaks down problem into arithmetic operations |
| 7. | Best-suited to represent measurable quantities and simulate response of physical systems by mathematical analogies | Best suited to handle discrete random processes, statistical data, and numerical problems of business and scientific nature |
| 8. | Serves as model and mirrors relations of actual system | Digital computer compounds arithmetic data, unrelated to system it represents |
| 9. | Operations usually carried out in real-time of physical system | Time of operations usually does not correspond to real-time. |
| 10. | Relatively few devices used and easier programming | Many devices needed and difficult programming |
| 11. | Basic operation performed by relatively few 'single-purpose' devices (integrators, multipliers, magnitude-comparators, etc. | Operation performed by relatively many interchangeable arithmetic devices such as adders, registers, accumulators, etc. |

# 1.8    CLASSIFICATION OF DIGITAL COMPUTERS

There is a wide variety of computers in the market today which differ in terms of physical size, price, capacity, and performance. The variety is so wide that it is sometimes difficult to see those elements that are shared by many computers and those elements that tend to differ among computers.

Depending upon their speed and memory size, computers are classified into following four main groups.

1.  Supercomputer
2.  Mainframe computer
3.  Mini computer
4.  Microcomputer

This classification implies differences between classes between in one or more characteristics. In the 1960s, before the microcomputer, there was a clear-cut distinction between minicomputers and mainframes. The most important characteristics that could be used to differentiate the two types of computers were :

- Speed
- Instruction sizes
- Number of CPU registers
- Word Length
- Main Memory Size
- Complexity of I/O modules
- Operating System Complexity

- Physical size
- Cost
- Virtual address space
- Secondary Memory Size
- Degree of Multiprogramming

## 1.8.1    Supercomputer

Supercomputer is the most powerful and fastest, and also very expensive. It was developed in 1980s. It is used to process large amount of data and to solve the complicated scientific problems. It can perform more than one trillions calculations per second. It has large number of processors connected parallel. So parallel processing is done in this computer. In a single supercomputer thousands of users can be connected at the same time and the supercomputer handles the work of each user separately.

Supercomputers are mainly used for:

➢ Weather forecasting.

➢ Nuclear energy research.

➢ Aircraft design.

➢ Automotive design.

➢ To control industrial units.

A supercomputer is shown in **Fig.1.11.**

Fig. 1.11: Super Computer

**Examples :**

- CRAY X-MP/14, X-MP/24, X-MP/48
- CRAY Y-MP, Y-MPC
- CRAY 2
- CRAY 3
- ETA (EDC-ETA 10, ETA 20)
- C-DAC's PARAM

- NEC (NEC SX-3)
- IBM 3090 (with vector)
- Fujitsu (VP Series)
- Hitachi (HITAC S-300)
- PARAM,
  etc.

### 1.8.2   Mainframe Computers

The mainframe remains a distinct class of computers and are very powerful large general purpose computers. Large organisations use mainframe computer. Some of the key differences between the high end of mainframe class and the high end of the minicomputer class are there. One of the most dramatic differences is the speed of the two classes.



Fig. 1.12: Mainframe Computer

**Examples :**

- DEC's VAX-8350, -8650
- HP 9000 Model 870S/400, Model 870S/300
- IBM 4300 Series (small to medium-size models)

- IBM 308X Series (large models)
- Latest model IBM 3090 Series (IBM 3090/600 installed in 1988)
- IBM Enterprise System/9000 Series
- ICL Series
- MEDHA Series
- Sperry Series; etc.

### 1.8.3 Minicomputers

Minicomputers are faster and more powerful than microcomputers. The word-length of these computers is usually 32-bits or more. A minicomputer can support up to 64 or even 100 terminals. Minicomputers can support a greater variety of fast peripheral devices. Minicomputers are extensively used for multi-user and interactive applications in colleges, universities, research organisations, government organisations, industries and so on. These are also used for sophisticated real-time Industrial controls and interactive engineering design work.

Examples :

- Wipro S-68030V and S-68033V built around Motorola 68030 CPU
- HP 9000 series 800 (a Supermini) built around HP's VLSI RISC Processor
- HCL Magnum built around 68030 and 68040 CPUs
- IBM AS/400/B60 (installed in 1988)
- DEC's VAX 8842 (installed in 1988)
- Wipro LandMark 860 (a Supermini) built around Intel's 64-bit RISC processor i860 CPU, and so on.

The capabilities of a minicomputer are between mainframe and personal computer. These computers are also known as midrange computers.

The minicomputers are used in business, education and many other government departments. Although some minicomputers are designed for a single user but most are designed to handle multiple terminals. Minicomputers are commonly used as servers in network environment and hundreds of personal computers can be connected to the network with a minicomputer acting as server like mainframes, minicomputers are used as web servers. Single user minicomputers are used for sophisticated design tasks.

The first minicomputer was introduced in the mid-1960s by Digital Equipment Corporation (DEC). After this IBM Corporation (AS/400 computers) Data General Corporation and Prime Computer also designed the mini computers.

### 1.8.4 Microcomputers and its Types

The microcomputers are also known as personal computers or simply PCs. Microprocessor is used in this type of computer. These are very small in size and cost. The IBM's first microcomputer was designed in 1981 and was named as IBM-PC. After this many computer hardware companies copied the design of IBM-PC. The term "PC-compatible" refers any personal computer based on the original IBM personal computer design.

On the basis of cost and performance, personal computers can be classified as :]

- Personal Computer (PC)
- Personal Computer with Extended Technology (PC/XT)
- Personal Computer with Advanced Technology (PC/AT)
- Super AT or Super Micro

## Personal Computer (PC)

PC is the simplest and cheapest type of personal computer. It uses Intel 8086/8088 as CPU, 640 KB RAM, 8KB ROM and normally two floppy disk drives. One of the drives is normally meant for holding bootable floppy diskette and the second one is used for holding the application package as well as for secondary storage. This type of computer does not contain any hard-disk. It is a single-user system. Its ROM can be extended from 8KB to 64 KB. It uses MS-DOS operation system. It may also employ 8087 math co-processor.

## PC/XT

This type of computer contains hard-disk(s) as well as floppy disk drive i.e. 360 KB/1.2 MB. Its cost is obviously more than the PC due to additional components. It is also a single-user system. Its ROM can also be extended up to 64 KB. It also normally uses MS-DOS operation system. It may also employ 8087 math co-processor.

## PC/AT

It contains 80286 as CPU, 640 KB RAM (can be expanded to 4 MB), 64 KB ROM (can be expanded to 128 KB), hard-disk drive and floppy-disk drive (360 KB/1.2 MB). Microprocessor 80286 is more powerful than the microprocessors of PC and PC/XTs. Up to 4 terminals can be connected to PC/AT to make it multi-user system by using XENIX as an operating system. Hard-disk capacity may lie in the range 20-80 MB. It uses 80287 math co-processor. Processing speed of PC, PC/XT and PC/AT lies in the range 1-5 MIPS.

## Super AT (or Super micros)

These computers use a 32-bit CPU such as Intel 80386 or 80486. The processing speed of 80386 and 80496 may range from 3 to 5 MIPS and 12 MIPS at 25 MHz respectively. RAM size of these lie in the range 2-8 MB. In case of 80386 microprocessor, it can be extended up to 32 MB and in case of 80486 up to 64 MB. Hard-disk capacity of these lies in the range 200 MB-780 MB. Normally, UNIX is used as a multi-user operating system on these systems. 80386 CPU offers the connectivity up to 8-12 terminals whereas 80486 offers the connectivity up to 16-64 terminals.

**Personal computers are available in two models. These are:**
1. Desktop PCs                                                          2. Tower PCs
A desktop personal computer is most popular model of personal computer. The system unit of the desktop personal computer can lie flat on the desk or table. In desktop personal computer, the monitor is usually placed on the system unit.

Another model of the personal computer is known as tower personal computer. The system unit of the tower PC is vertically placed on the desk of table. Usually the system unit of the tower model is placed on the floor to make desk space free and user can place other devices such as printer, scanner etc. on the desktop. Today computer tables are available which are specially designed for this purpose. The tower models are mostly used at homes and offices.

**Microcomputers are further divided into following categories.**

1. Laptop computer         2. Workstation         3. Network computer         4. Handheldcomputer

## Laptop computer

Laptop computer is also known as notebook computer. It is small size (85-by-11 inch notebook computer and can fit inside a briefcase. The laptop computer is operated on a special battery and it does not have to be plugged in like desktop computer. The laptop computer is portable and fully functional microcomputer. It is mostly used during journey. It can be used on your lap in an airplane. It is because it is referred to as laptop computer.

## Workstations

Workstations are special single user computers having the same features as personal computer but have the processing speed equivalent to minicomputer or mainframe computer. A workstation computer can be fitted on a desktop. Scientists, engineers, architects and graphic designers mostly use these computers.

Workstations use sophisticated display screens featuring high-resolution color graphics and operating systems such as UNIX, Windows NT, 95, 98 those permitted multitasking. Workstations also use powerful networking links to other computers.

Most significant feature of workstations is the powerful processor which churns out results much faster than the PCs.

**Examples** : Sun-, Apollo-, Hewlett-Packard-, NeXT- and IBM-workstations.

## Network Computers

Network computers are also version of personal computers having less processing power, memory and storage. These are specially designed as terminals for network environment. Some types of network computers have no storage. The network computers are designed for network, Internet or Intranet for data entry or to access data on the network. The network computers depend upon the network's server for data storage and to use software. These computers also use the network's server to perform some processing tasks.

## Handheld Computer

In the mid 1990s, many new types of small personal computing devices have been introduced and these are referred to as handheld computers. These computers are also referred to as Palmtop Computers. The handheld computers sometimes called Mini-Notebook Computers. The type of computer is named as handheld computer because it can fit in one hand while you can operate it with the other hand. Because of its reduced size, the screen of handheld computer is quite small. Similarly it also has small keyboard. The handheld computers are preferred by business traveler. Some handheld computers have a specialized keyboard. These computers are used by mobile employees, such as meter readers and parcel delivery people, whose jobs require them to move from place to place.

**The examples of handheld computers are:**

1. Personal Digital Assistants          2. Cellular telephones                     3. H/PC Pro devices

### Personal Digital Assistants (PDAs)

The PDA is one of the more popular lightweight mobile devices in use today. A PDA provides special functions such as taking notes, organizing telephone numbers and addresses. Most PDAs also offer a variety of other application software such as word processing, spreadsheet and games etc. Some PDAs include electronic books that enable users to read a book on the PDA's screen.

Many PDAs are web-based and users can send/receive e-mails and access the Internet. Similarly, some PDAs also provide telephone capabilities.

### Cellular phones

A cellular phone is a web-based telephone having features of analog and digital devices. It is also referred to as Smart Phone. In addition to basic phone capabilities, a cellular phone also provides the functions to receive and send e-mails & faxes and to access the Internet.

### H/PC Pro Devices

H/PC Pro dive is new development in handheld technology. These systems are larger than PDAs but they are not quite as large as typical notebook PCs. These devices have features between PDAs and notebook PCs. The H/PC Pro device includes a full-size keyboard but it does not include disk. These systems also have RAM with very low storage capacity and slow speed of processor.

## 1.9    FACTORS THAT INFLUENCE PERSONAL COMPUTERS PERFORMANCE

There are several factors that influence the performance of computer systems. Few of these factors are discussed as under:

### 1. The CPU

High performance, compatibility and upgradability are features that are quite important. The higher the generation of the processor, the better it is. So processor speed is one of the main factors that influence the performance.

### 2. Clock rate

Since any step of processing can happen only on the "tick" of the clock (called clock cycle), the faster the rate the quicker the CPU works. The Pentium processors have the ability to execute multiple instructions per clock cycle due to the fact that the Pentium processor's two pipelines can execute two instructions simultaneously. If other modules of the system require more than one clock pulse, the CPU has to wait for them to keep up. This is called a wait state.

### 3. Random Access Memory (RAM)

It does not make much sense to have a fast processor if you don't have fast RAM. But note that faster RAM is more expensive.

The amount of RAM is also important. The benefits of adding more RAM include letting you open more applications at the same time, and working with large files or documents. More memory may also make your machine run much faster.

### 4. Computer Internal Cache

Internal cache is a storage area for frequently used data and instructions. The processor contains an internal cache controller that integrates the cache with the Central Processing Unit (CPU). The controller stores frequently accessed RAM locations to provide faster execution of data and instructions and therefore a larger cache leads to the perception of a faster CPU

**L1 Cache:** The bigger the on-chip cache size, the better since more instructions and data can be stored on the chip, reducing the number of times the processor has to access slower, off-chip memory areas to get data. For example, Intel has doubled on-chip cache size to 32K on the Intel Pentium processor with MMX technology.

**L2 Cache:** System memories composed of dynamic RAM (DRAM) alone have not been able to keep up with the dramatic increases in CPU speeds over the years. In order to optimize the memory performance in these systems, designers are implementing architectures using cache memory, resulting in speed increases up to 45%.

### 5. Data bus type and size

The data bus is the highway that carries information between the processor and the memory subsystem. The wider the data bus, the more information it can transfer. Because of its external 64-bit data bus, the Pentium processor can transfer data to and from memory at rates up to 528 Mbytes/second.

The PCI local bus greatly improves I/O performance. It can transfer data between the processor and the peripherals at up to 132 MB/second, far faster than the ISA bus rate of 5 MB/second.

### 6. Hard disk capacity and seek time

High-performance hard drives have at least 1.2 G of capacity, provide an average seek time of 12 milliseconds, a 128 to 256 K hard disk buffer cache with both write-caching and read-caching capabilities, and spin about 4,500 rotations per minute.

**7. Videocard**

A full-featured PCI-compliant VGA card, with at least 1 to 2 MB of video RAM, will further accelerate graphics performance.

**8. CD-ROM drive speed**

At the time of writing of these notes the slowest CD-ROM drive available on the market is quad speed. It may be enough, if you are not running applications from CD-ROM, but only installing them. Otherwise look at octal or ten-speed technologies.

**9. MMX processors**

Multimedia extensions processors (MMX) is designed specifically to support media-rich software and communications applications.. The Pentium processor with MMX technology will give a better, smoother and more realistic multimedia experience. These processors have got 57 powerful new instructions specifically designed to manipulate and process video, audio and graphical data efficiently. However, your system will require software designed for MMX technology (old software must be recompiled to take advantage of new MMX features).

### 1.10    PC AS A VIRTUAL OFFICE

Virtual office is a broad term that refers to work environment that is delivered and accessed through Web-based communication and computing technologies.

A virtual office replaces the workspace with cyberspace. Such an office employs Web-based IT services that are used for the initiation, execution and operation of typical office processes.

Virtual office is a business location that exists only in cyberspace. A virtual office setup allows business owners and employees to work from any location by using technology such as laptop computers, cell phones and internet access. A virtual office can provide significant savings and flexibility compared to renting a traditional office space. Meetings can be conducted via teleconferencing and video conferencing, and documents can be transmitted electronically. Some companies even provide virtual office services to give virtual offices the prestige associated with physical offices, such as an important-sounding address, a professional phone-answering service and even occasional rental of office space and conference rooms.

If the business has employees, each employee can work from the location that is most convenient for him or her, and the business is not restricted to hiring employees that live locally. The virtual office arrangement thus expands job options for employees and hiring options for businesses.

Virtual Office Desktop is a comprehensive unified communications client application that integrates a business softphone with visual voicemail, corporate directory, instant messaging, presence, video calling, fax, call recording, web conferencing, and social media.

### 1.11    HUMAN BEINGS VS COMPUTER SYSTEMS

We have already gone through the anatomy of a digital computer and functioning of a computer system using its various components. Besides, we are also well versed and aware with the functioning of human-beings using its various organs.

Processing of data by hand is satisfactory only when the amount of data to be processed is small and also the manual data processing is slow, monotonous and often subject to error. Human-beings utilises past experiences and intuitions for decision making whereas computer follows an algorithmic procedure. Human-beings as a decision maker utilises heuristic. Society will benefit most if complementary strengths of human beings and computers are utilised. Definitely, computers today have more intelligence than in the past and the strides are being made to increase machine capabilities.

The Newell-Simon model suggests that there are limitations on the ability of human as information processors :

* One set of limits concerns the processing of data and is directly related to short-term memory

* Another set of limits is the ability of humans to detect differences

* Humans are also limited in their ability to generate, integrate, and interpret probabilistic data.

Functional similarities of a computer system with human being is in the following **Table 1.2.**

**Table 1.2 :Computer Vs. Human-being (Similarities)**

| S.NO. | Comuter Element | Purpose | Human-Being |
|-------|-----------------|---------|-------------|
| 1. | Input | Used to receive data and instructions in computer-compatible form | Input to the system is through ears, eyes, mouth or nose |
| 2. | Main Storage | Used to hold input data and instructions temporarily before it is processed | Data and instructions are stored in brain and can be recalled whenever needed |
| 3. | Secondary Storage | Used as an extension to main storage and the contents stored in it are retained permanently | Use pocket-diaries, notebooks, etc. to store contents for permanent use. |
| 4. | ALU | Used to carry out arithmetic and logical computations desired in an instruction execution | Portion of our brain is used to carry out comparisons and calculations for helping out in logical judgements |
| 5. | Control Unit | Used to receive stored instructions in serial fashion and one at a time. Interpret each instruction and prompt its execution by one of the units like input, output, storage or ALU. | Our brain controls our mental or body actions on the basis of calculations and comparisons. Before taking any action, the old results stored in brain are also referred to and thus brain acts as a CPU. |
| 6. | Output | Used to give out results via a suitable device e.g. VDU, printer, plotter, etc. | Output is either in the form of a speech using mouth or some action e.g. writing, gesture, body language, etc. |

### 1.12    DIFFERENCE BETWEEN COMPUTER AND CALCULATOR

Every electronic calculating device -- from the humble four-function calculator to the most powerful supercomputer --runs from the same basic computation technique, which are based on Boolean algebra. At their most basic functions, computers and calculators use binary arithmetic, and do translation to decimals at their last step before they're displayed. In spite of sharing the same fundamentals, calculators and computers have a divergent history.

**Table 1.3 :Computer Vs. Calculator**

| S.No. | Computer | Calculator |
|-------|----------|------------|
| 1. | Calculators are single-purpose devices that perform mathematical operations input by the user. | Computers are calculators that have vastly expanded capabilities, and are often called "general purpose computing devices." |
| 2. | A computer is an automatic electronic machine which performs operations at a very high speed and with great accuracy. | A Calculator is an electronic device that calculates accurately and at a very high speed. |
| 3. | A computer can work with numbers and words both. | A calculator can work only with numbers. |
| 4. | A computer can store and execute a set of instructions for performing a series of manipulations on the input data | Calculator usually requires manual input for every operation it performs |
| 5. | A computer can store large volume of data in its memory and reproduce any part of it, as and when needed. | A calculator is not capable of storing data |

### 1.13 Data Communication Media

**Data communication** simply means to exchange of data between a source and a receiver. It occursusing some kind of transmission media.

The source is the device that transmits the data whereas the receiver receives the transmitted data. Main objectives of data communication are the transfer of data and maintenance of the data during the transmitting process.

**Data** (singular- Datum) mean the statistical facts and information exist in various forms such as text, numbers, audio, video, bits, bytes, etc. which are then processed.

The Figure is showing a simple data communication system:



*Simple Data Communication System*

**Components of data communication system:**

A communication system has following components:

**Message**: The actual information or data that is to be communicated is referred as Message.

i.   **Sender**: It is the device that generates a message and then sends that message.

ii.   **Receiver**: The device that receives the message is called as the receiver. Generally the location of receiver is different from that of sender.

iii.   **Medium**: It is the channel or some physical route via which the message is communicated from sender to the receiver. The medium can be wired or wireless.

iv.   Protocol: It is a particular set of rules and regulations that govern the communication. A protocol performs the following functions:

1. **Data sequencing**. It refers to the breaking a long message into smaller packets of a fixed size.

2. **Data routing**. It defines the most efficient path of communication.

3. **Data formatting**. Data formatting rules identify the group of bits/characters within a fixed packet that constitute data, control or other information.

4. **Flow control**. It governs the balance and controls the transmission between a faster sender & slower receiver and vice-versa.

5. **Error control**. These rulesare intended to detect errors in messages. These also ensure the transmission of correct messages.

6. **Precedence and order of transmission**. All the nodes should get a chance to use the communication lines orderly.

7. **Connection establishment and termination**.

8. **Data security**. This prevents access of data by any unauthorized user.

**9. Log information.** This consists of all works and data communications tasks that have taken place.

**The effectiveness of data communications depends on following:**

**1. Delivery**: The data must be delivered in correct order and to correct target.
**2. Accuracy**: Accurate data must be delivered.
**3. Timeliness**: The data must be delivered timely.

**Transmission media or Communication Channel** is a path that transmits the data or information from the sender to the receiver. Generally the data is transmitted through electrical or electromagnetic signals which can be transmitted through copper wires, optical fibres, atmosphere, water, vacuum, etc.

**Types of Transmission Media**

Transmission media is broadly classified into two groups.

**A). Wired or Guided Media or Bound Transmission Media:** Here the tangible cables having the physical existence are used. E.g. Unshielded Twisted Pair (UTP) cable, shielded twisted pair (STP) cable, co-axial cable, fibre optical cable. Each cable has its own

characteristics like transmission speed, appearance, cost, etc. These media are bounded by physical geography. A two-wired transmission line is considered to be the simplest of all transmission media.

**B). Wireless or Unguided Media or Unbound Transmission Media:** Nowadays gaining popularity, unguided transmission media transmit the data without using any cable. These media are not bounded by physical geography. E.g. Wireless LANs. The wireless transmission uses Microwave, Radio wave, Infra-red, Satellite.
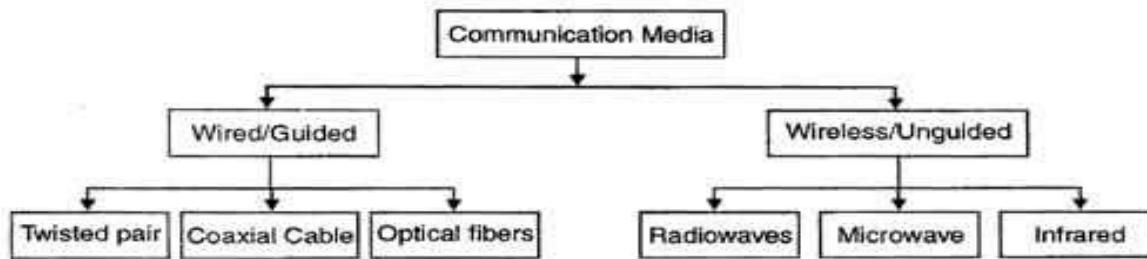


The data transmission depends on following factors are:

1. **Bandwidth**. Communication channels with higher bandwidth maintain higher data transmission rates.

2. **Radiation**. Due to some unwanted electrical disturbances of the medium there may be leakage of signal from the medium.

3. **Noise Absorption**. The exposure of the media to external electrical noise may cause false data signal.

4. **Attenuation**. Radiations and physical characteristics of the media causes the attenuation i.e. loss of energy which depends on frequency.

## SUMMARY OF THE LESSON

You learnt the following in this lesson:

- A computer is an electronic machine that operates under the control of instructions, that accepts the input data, processes or manipulates the given data according to the predefined instructions and stores the result for future use.
- In Dark Age (5000 B.C. - 1890 A.D.), all the computing devices were manual-mechanical in nature and all the earliest data processing equipment were all manual-mechanical devices.
- In Middle Age (1890-1944), all computing devices were electro-mechanical in nature
- In Modern Age (SINCE 1944), computers changed over time; they improved in speed, power and efficiency.
- The computers can be divided into five generations depending upon the technologies used. These generation are:
  o First Generation (1946 – 1959)          o Fourth Generation (1971- 1985)
  o Second Generation (1959 – 1965)         o Fifth Generation (1985 onwards)
  o Third Generation (1965 – 1971)
- Modern computer systems are available in numerous physical shapes and sizes, and truly speaking there is no end to it.

- The important characteristics of a computer are speed, arithmetical and logical operations, accuracy, reliability, storage, retrieving data and programs, automation, versatility, communications, diligence, no feelings, consistency and precision

- Though in general we use digital computers, however, present day computers may be classified into three categories – Analog, Digital and Hybrid.

- Digital computers are computers which represent data in terms of discrete number and processes data using the standard arithmetic operations

- Design features of Analog and Digital computers can be combined to create a Hybrid Computer. Such computers are used for special applications only.

- Depending upon their speed and memory size, computers are classified into four main groups – Supercomputer, Mainframe computer, Mini computer and Microcomputer.

- The examples of handheld computers are Personal Digital Assistants and Cellular telephones.

- Processing of data by hand is satisfactory only when the amount of data to be processed is small and also the manual data processing is slow, monotonous and often subject to error.

- Human-beings utilises past experiences and intuitions for decision making whereas computer follows an algorithmic procedure. Human-beings as a decision maker utilises heuristic.

- There are several factors that influence the performance of computer systems. Few of these factors include CPU, Clock rate, Random Access Memory (RAM), Data bus type and size, Hard disk capacity and seek time, Videocard, CD-ROM drive speed, MMX processors, etc.

- Virtual office is a broad term that refers to work environment that is delivered and accessed through Web-based communication and computing technologies.

## SELF ASSESSMENT QUESTIONS AND EXERCISES

1.  What is a Computer ? What capabilities does a computer possess ?
2.  How do analog computers differ digital computers ?
3.  State the criteria for classification of digital computers.
4.  Is digital computer more accurate than analog computer ? Justify your answer.
5.  Discuss the important features of micro, mini, mainframes and super-computers.
6.  What are the operations that a computer is able to perform ?
7.  How do you compare human beings and computers?
8.  What are the fundamental components of a computer system ? Which component of a computer system executes the program ?
9.  Why are microcomputers so popular in comparison to other computers ?
10. What is a digital computer ? Provide its anatomy and explain the functioning of such a computer through its block diagram.
11. What factors influence the performance of a computer?
12. What do you mean by 'PC as Virtual Office'? Justify your answer.
13. Is a computer more intelligent than human-beings ? Justify your answer.
14. What are supercomputers and where are they used ?
15. What are different types of portable computers ?

# CHAPTER-2

## INPUT/OUTPUT DEVICES AND OTHER HARDWARE

### OBJECTIVES OF THIS LESSON

This lesson is aimed to make you understand the basic concepts of peripheral devices as well as important hardware components as under:

- Input/Output concepts
- Input devices
  - o Commonly used input devices such as Keyboards, Mouse, Joysticks, Trackballs, Touch Screens, Light Pens, Touch Pad, Digitizer, Voice Systems and Scanners
- Output devices
  - o Commonly used output devices such as Monitors, Printers and Plotters
- Other important hardware such as -
  - o Motherboard, RAM, Video Card, Digital storage, Power Supply Unit, Expansion Cards, Sound Card, Network card, etc.
- Communication devices and other hardware
- Configuration of hardware peripherals

### STRUCTURE OF THIS LESSON

2.1     Introduction
2.2     Input Devices
        2.2.1    Keyboards
        2.2.2    Mouse
        2.2.3    Joysticks
        2.2.4    Trackballs
        2.2.5    Touch Screens
        2.2.6    Light Pens
        2.2.7    Touch Pad
        2.2.8    Digitizer
        2.2.9 Voice Systems
        2.2.10   Scanners
2.3.    Output Concepts
2.4     Output Devices
        2.4.1    Monitors
                 2.4.1.1  CRT Monitor
                 2.4.1.2 Flat Panel Displays
                          2.4.1.2.1 LCD (Liquid Crystal Display) Monitors
                          2.4.1.2.2 TFT Monitor
                          2.4.1.2.3 Plasma Display Panel
        2.4.2    Printers
                 2.4.2.1  Categories of Printers
                 2.4.2.2          Character Printers
                 2.4.2.3          Daisy-Wheel Printer
                 2.4.2.4          Dot-Matrix Printer
                 2.2.4.5          Line Printers
                 2.4.2.6          Page Printers
                 2.4.2.7          Laser Printer
                 2.4.2.8          Inkjet Printer

## 2.1     INTRODUCTION

A **computer peripheral** is any external device that provides input and output for the computer. For example, a keyboard and mouse are input peripherals, while a monitor and printer are output peripherals. Computer peripherals, or peripheral devices, are sometimes called "I/O devices" because they provide input and output for the computer. Some peripherals, such as external hard drives, provide both input and output for the computer.

## 2.2     INPUT DEVICES

An **input device** is any hardware device that sends data to the computer, without any input devices, a computer would only be a display device and not allow users to interact with it, much like a TV. Following continuing research in the field of computer hardware, we have a large number of input devices. Recall that before data can be processed by the computer, they must be translated into machine-readable form and entered into the computer by an input device.

Many input devices can be classified according to:

- Modality of input (e.g. mechanical motion, audio, visual, etc.)
- The input is discrete (e.g. key presses) or continuous (e.g. a mouse's position, though digitized into a discrete quantity, is fast enough to be considered continuous)
- The number of degrees of freedom involved (e.g. two-dimensional traditional mice, or three-dimensional navigators designed for CAD applications)

Pointing devices, which are input devices used to specify a position in space, can further be classified according to:

- Whether the input is direct or indirect. With direct input, the input space coincides with the display space, i.e. pointing is done in the space where visual feedback or the cursor appears. Touch Screens and light pens involve direct input. Examples involving indirect input include the mouse and trackball.

- Whether the positional information is absolute (e.g. on a touch screen) or relative (e.g. with a mouse that can be lifted and repositioned)

Note that direct input is almost necessarily absolute, but indirect input may be either absolute or relative. For example, digitizing Graphics tablets that do not have an embedded screen involve indirect input and sense absolute positions and are often run in an absolute input mode, but they may also be setup to simulate a relative input mode where the stylus or puck can be lifted and repositioned.

Here, we list a variety of input devices:

- Punched Cards and Card Readers
- Keyboards
- Joysticks
- Trackballs
- Mouse
- Touch Screens
- Light Pens
- Touch Pad

- Digitizer
- Voice Systems
- Key to Magnetic Media
- Financial Transaction Terminals
- Machine Vision Systems
- Source Data Input
- Magnetic-ink Character Recognition (MICR)
- Magnetic Strips
- Optical Recognition

- Point-of-Sale Terminals
- Barcode reader
- Digital camera
- Microphone
- MIDI keyboard
- Mouse (pointing device)
- Remote
- Scanner
- Webcam

Few popular and commonly used input devices are briefly described below.

### 2.2.1   Keyboards

A keyboard is one of the today's most common and familiar input device. A keyboard's primary function is to act as an **input device.** The computer **keyboard** is used to enter text information into the computer, as when you type the contents of a report.



Figure 2.1: Keyboards

### 2.2.2   Mouse

Mouse is a pointing device and it has been around us for more than 20 years. The mouse usually contains one to three buttons; as the user rolls it on a flat surface, the mouse controls cursor movement on the screen. When the user presses one of the buttons, the mouse either marks a place on the screen or makes selections from data on the screen.

Different types of mouse are shown in **Fig. 2.2.**
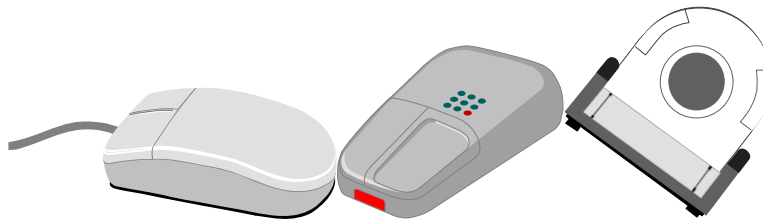


(a) Simple Mouse  (b) Cordless Mouse  (c) Ball-point Mouse
Fig. 2.2: Different Types of Mouse

**Advantages**
- It is simple device and very easy to use.
- It is not that very expensive.
- It moves the cursor faster than the arrow keys of keyboard do.

**Disadvantages**

- The movement of the cursor is not very sensitive to movement of mouse.
- If the contact between wheels and mouse pad is lost, the cursor does not move.

**2.2.3    Joysticks**

A joystick is also a pointing device. It is used to move the cursor position on a CRT screen. Its function is similar to a mouse, except that with a mouse the cursor stops moving as soon as you stop moving the mouse. A joystick is a stick which has spherical ball at its lower end as well as at its upper end. A joystick uses a lever to control the position of the cursor. It internally translates the lever position and speed with which the joystick is moved into digital signals that are sent to the computer to control the cursor movement. Most joysticks include two buttons called triggers.
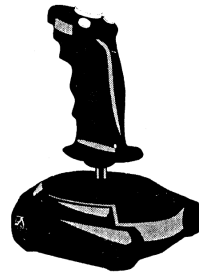


Fig. 2.3: Joystick

Joysticks are used for Computer games but they are also used occasionally for CAD/CAM systems and other applications.

**2.2.4    Trackballs**

Trackball is another pointing device. A trackball is a mouse lying on its back. A trackball uses a hard sphere to control cursor movement. The ball can be rotated by hand in any direction. The associated electronic circuitry detects the direction and speed of spin. The trackball translates the sphere's direction and speed of rotation into digital signal used to control the cursor. The information is sent to the CPU for initiating further necessary action.

Different types of Trackball are shown in **Fig. 2.4.**



**(a)**                                              **(b)**                              **(c)**
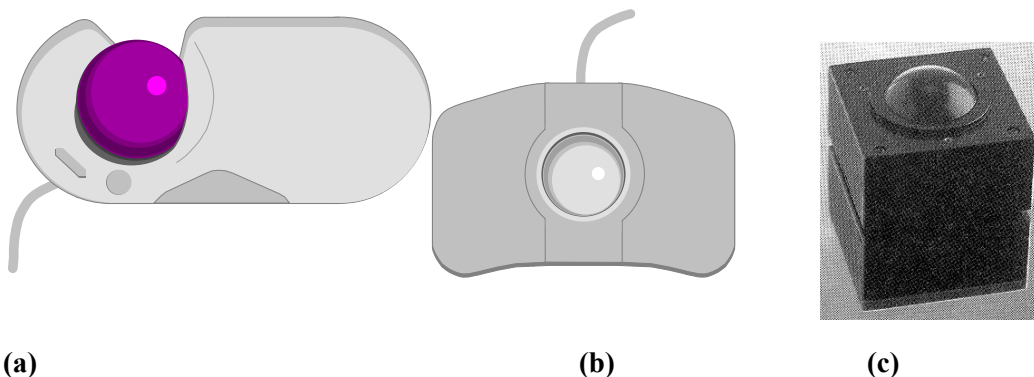
Fig. 2.4: Various Types of Trackballs

**2.2.5    Touch Screens**

A touch screen is basically a display screen which can identify the occurrence and position of a touch inside the display region. The word normally refers to a touch or tap to the display of the gadget by a finger or hand. Touch screens can also identify added inactive objects, such as a stylus. However, if the object identified is active, as with a light pen, the phrase touch screen is normally irrelevant. The facility to interact directly with a display normally specifies the existence of a touch screen.

Figure 2.5: Touch Screen Monitor

Such touch screen displays can be connected to computers, laptops, PDAs, cell phones etc. They also project an important function in the blueprint of digital.

### 2.2.6 Light Pens

A light pen is similar to a mouse, except that with a light pen we can move the pointer and select objects on the display screen by directly pointing to the object with the pen. It is a pen like device which is connected to the machine by a cable.

Light pens are shown in **Fig. 2.6.**
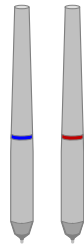


Fig. 2.6: Light Pens

### 2.2.7 Touch Pad

A small, touch-sensitive pad is used as a pointing device on some portable computers. By moving a finger or other object along the pad, we can move the pointer on the display screen. The touch pad is related to the touch screen, but activated by different means. The touch pad uses pressure-sensitive materials to record data at the point where the pad is touched. Many appliances around the home, such as microwave ovens, use touch pads for programming time or temperature.
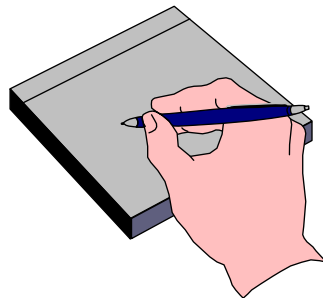


Fig. 2.7: Touch Pad Using a Point-device

### 2.2.8 Digitizer

A digitizer, or graphics tablet, is similar to a light pen; however, instead of drawing on the screen, a separate tablet is used on which a special stylus is moved. Input tablets or digitizer tablets or graphical tablets are typically found in CAD terminals or engineering workstations, etc.

Digitizers are also called Digitizing Tablets, Graphics Tablets, Touch Tablets, or simply Tablets. Top-view of digitizer along with tablet is shown in **Fig. 2.8.**
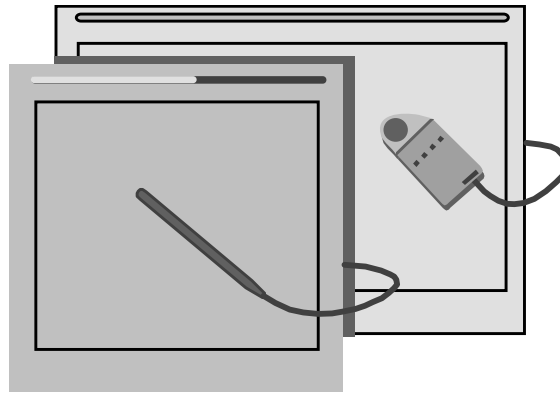
Fig. 2.8: Digitizer With Tablet

### 2.2.9 Voice Systems

Audio input provides direct and "user friendly" means of inputting data and instructions to the computer. Recently, a number of Voice Data Entry (VDE) systems have been developed. Voice recognition is one of the newest, most complex input techniques used to interact with the computer. The user inputs data by speaking into a microphone.

### 2.2.10   Scanners

Scanner is a kind of input device that can read text or printed paper and translates the information in a convenient form to be understood by the computer. All kinds of scanned documents using an optical scanner gets converted in the form of bit-map and thus it does not distinguish between text or graphics. In order to edit text read by an optical scanner, we need an OCR system to translate the image into ASCII format. Almost all optical scanners sold today come along with OCR packages.

There are six distinct types of scanners:

> ➢ handheld                                         ➢ photo drum, and

> ➢ flatbed                                            ➢ slide

> ➢ sheetfed

Each of these styles has its own practical applications and limitations. Theoretically, you could also include digital cameras as a type of scanner.

Flatbed (or simple) and Hand-held scanners are the most popular scanners in maximum use. These are shown                                                       in **Fig. 2.9 (a)** and **(b)** respectively.



**(a)          (b)**

**(c)**                              **(d)**
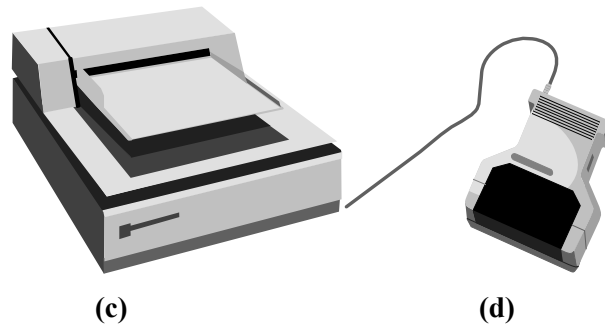
**(a) to (c) Flatbed Scanners (d) Hand-held Scanner**

Fig. 2.9: Types of Scanners

## 2.3.     OUTPUT CONCEPTS

The output device receives results and other information from the computer and provides it to the users. Output is the process of translating data in machine-readable form into a form understandable to humans or readable by other machines.

In today's information society, people require clear, legible and output. Output that can be understood by humans can be categorized as :

- **Hard copy**                                    • **Soft copy**

**Hard copy** is the output, such as paper, that can be read immediately or stored and read later. It is relatively stable and permanent form of output. **Soft copy** is usually a screen-displayed output. It is transient form of output and is lost when the computer is turned off. But if the data needed to create the soft copy have been saved on disk or tapes, the soft copy can be reproduced on the screen anytime.

## 2.4     OUTPUT DEVICES

Any peripheral that receives or displays output from a computer. An inkjet printer is a good example of an **output device** that can make a hard copy of anything on a computer. Below is a listing of all the different computer output devices found on a computer:

- Flat panel
- Monitor
- Printer
- Projector

- Sound card
- Speakers
- Video card

An **output device** is any piece of computer hardware equipment used to communicate the results of data processing carried out by an information processing system (such as a computer) to the outside world.

**Examples of output devices:**

- ➢ Monitors
- ➢ Printers
- ➢ Plotters

- ➢ Speakers
- ➢ Headphones
- ➢ Voice Response Systems

Most of the computer output devices are common to home as well as office environments. At the same time, there are some devices, which are not as commonly available. Having said that, let's take a look at computer output devices list.

### 2.4.1   Monitors

A computer display is also called a display screen or video display terminal (VDT). A monitor is a screen used to display the output. Images are represented on monitors by individual dots called pixels.

A pixel is the smallest unit on the screen that can be turned on and off or made different shades. The density of the dots determines the clarity of the images, the resolution.

**Types of Computer Monitors**

The computer **monitor** (also know as a **VDU** or **V**isual **D**isplay **U**nit) is the most common computer output device. For desktop computers, cathode ray monitors (**CRT**) are gradually being replaced by flat-screen monitors such as the Liquid Crystal Displays (**LCD**) and Thin Film Transistor (**TFT**) displays used with laptop computers because they use less power and take up less space.

**2.4.1.1  Crt Monitor**

The traditional output device of a personal computer has been the **CRT** (Cathode Ray Tube) monitor. Just like a television set (an older one, anyway) the CRT monitor contains a large cathode ray tube that uses an electron beam of varying strength to "paint" a picture onto the color phosphorescent dots on the inside of the screen. CRT monitors are heavy and use more electrical power than flat panel displays, but they are preferred by some graphic artists for their accurate color rendition, and preferred by some gamers for faster response to rapidly changing graphics.



Figure 2.10: CRT monitor

**2.4.1.2 Flat Panel Displays**

Portable computers such as a laptop use flat panel displays, because they are more compact and consume less power than CRTs. Portable computers use several kinds of flat panel screens:

**2.4.1.2.1 LCD (Liquid Crystal Display) Monitors**

Liquid crystal display, also known as liquid crystal diode, is one of the most advanced technologies available at present. Typically, an LCD monitor consists of a layer of color or monochrome pixels arranged schematically between a couple of transparent electrodes and two polarizing filters.



Figure 2.11: Flat panel display (LCD)

Other types of flat panel technology exist (such as **plasma displays**) but LCDs are most commonly used in computers, especially laptops.

Flat panel displays are much lighter and less bulky than CRT monitors, and they consume much less power. They have been more expensive than CRTs in the past, but the price gap is narrowing. You will see many more flat panels in the future.

### 2.4.1.2.2 TFT Monitor

A TFT monitor is a LCD display that uses thin-film transistor technology. Flat panel displays are quickly becoming the dominant display of choice and are replacing cathode ray tubes. These days, nearly all of the LCD monitors that are designed and developed use TFT technology to provide the picture. They were developed because, in the past, there was a reliance on the passive matrix LCD display.

Figure 2.12: TFT monitor

### 2.4.1.2.3 Plasma Display Panel

A **plasma display panel** (PDP) is a type of flat panel display common to large TV displays (80 cm/30 in or larger). They are called "plasma" displays because the technology utilizes small cells containing electrically charged ionized gases, or what are in essence chambers more commonly known as fluorescent lamps.

Figure 2.13: A typical modern plasma screen television

### 2.4.2    Printers A **printer** is a peripheral which produces a text and/or graphics of documents stored in electronic form, usually on physical print media such as paper or transparencies. Many printers are primarily used as local peripherals, and are attached by a printer cable or, in most new printers, a USB cable to a computer which serves as a document source. Some printers, commonly known as **network printers**, have built-in network interfaces, typically wireless and/or Ethernet based, and can serve as a hard copy device for any user on the network. Individual printers are often designed to support both local and network connected users at the same time. There are several printer technologies, the most common of which are:

> ➢ the daisy wheel printer
> ➢ the dot-matrix printer (also called impact matrix printer)
> ➢ the inkjet printer and the bubble jet printer
> ➢ the laser printer

Today, daisy wheel printers and matrix printers are hardly ever used.

### 2.4.2.1  Categories of Printers

A printer is an output device that produces a hard copy of data. The resolution of printer output is expressed as DPI. Printers can be classified into different types in several ways.

**First, the printers can be divided into three categories by the way they print.**

- **Serial Printers:** Also called a character printer. Print a single character at a time. They are usually inexpensive and slow.

- **Line Printers:** Print a line at a time. They are expensive and very fast. Line printers use a band, a chain, etc.

- **Page Printers:** Also called a laser printer. Print a page at a time. They usually use a laser to produce page images. Quality is best. This is a little bit expensive, but the price of the personal laser printer is decreasing. The price range of the personal laser printer is around $400, today.

**Second, printers can be classified into two forms according to the use of a hammer.**

- **Impact Printers:** Hammer hits ribbons, papers or print head. Dot-matrix and daisy-wheel printers are the example. Noisy.

- **Nonimpact Printers:** They do not have the hammer and do not hit. An example is an ink-jet and laser printer.

**So, let's take a closer look at the various types of printers.**

### 2.4.2.2 Character Printers

They are used to print only one character at a time. A typewriter is an example of a character printer. Some of character printers are described below.

### 2.4.2.3 Daisy-Wheel Printer

Daisy-Wheel Printer prints typewriter-like very high quality characters. However, they are slower and less reliable than dot-matrix printers. Microcomputer users seldom use this printer, because the better dot-matrix printers and inexpensive laser printers are available today. The speeds of daisy-wheel printers range from 30 to 60 characters per second (cps).
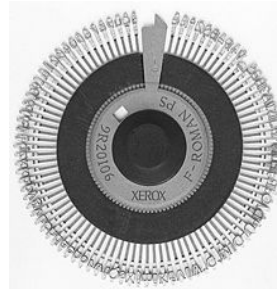


Figure 2.14: A daisy-wheel print wheel

### 2.4.2.4 Dot-Matrix Printer

The **dot-matrix printer** allows you to print documents on paper thanks to the "back and forth" motion of a carriage housing a print head.

Dot-matrix printers are printers that write characters and form graphic images using one or two columns of tiny dots on a print head. The dot hammer moving serially across the paper strikes an inked-ribbon and creates images on paper.

- ➢ The print head travels from side to side across the paper and is made up of numerous pins which are pushed out to form the shape of each character.

- ➢ The pins hit an ink ribbon against the paper so the characters are printed out.

- ➢ The paper is usually continuous with holes down each side and perforations so the pages can be easily separated by tearing.

Because the pins make an impact against the paper the characters can be printed through several layers of self-carbonating paper to produce duplicate copies.



Figure 2.15: Dot Matrix Pins

An animation showing how head of a 21 pin dot-matrix printer moves across the paper, firing the pins that strike the ink against the paper.

➢ **Character Matrix Printer**

**Character matrix printers** are a category of computer printers (typically impact printers) that place characters from a fixed character set anywhere onto a fixed grid of possible locations on the page. Examples of these are daisy wheel printers, golf ball printers, chain printers, and band printers. A character printer prints one character at a time.

### 2.2.4.5 Line Printers

**Line printers**, as the name implies, print an entire line of text at a time. The **line printer** is a form of high speed impact printer in which one line of type is printed at a time. They are mostly associated with the early days of computing, but the technology is still in use. Print speeds of 600 to 1200 lines-per-minute (approximately 10 to 20 pages per minute) were common.



Figure 2.16: IBM 1403 line printer

**Designs**

Four principal designs existed:

➢ Drum printers
➢ Chain (train) printers
➢ Band Printers

### 2.4.2.6 Page Printers

These are the very high speed non impact printers. They can produce documents at speeds of over 20,000 lines per minute. Electronics, xerography, lasers, and other technologies have made these high-volume systems possible. These techniques called electro-photographic techniques have developed from the paper copier technology. Page printers can produce pages of output at a rate equal to a photo copier.

### 2.4.2.7 Laser Printer

Laser printers are page printers that print one page at a time. It is a non-impact printer. A laser printer is a printer that uses the electro-photographic method used in a copy machine. A **laser printer** is a common type of computer printer that rapidly produces high quality text and graphics on plain paper.
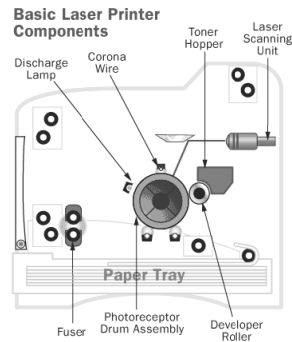
Figure 2.17: The basic components of a laser printer

The **laser printer**s produce quality print-outs inexpensively at a high print speed. However, these printers are mostly used in professional and semi-professional settings because of their high cost.

### 2.4.2.8 Inkjet Printer

Ink-jet is a printer mechanism that sprays one or more color of ink at high speed onto the paper and produces high-quality printing. This printer also produces color printing as well as high-quality image. That is, ink-jet printers can be used for variety of color printing at a relatively low cost. Ink-jet printing has two methods: Continuous stream method and drop-on- demand method.

Inkjet printing, like laser printing, is a non-impact method.
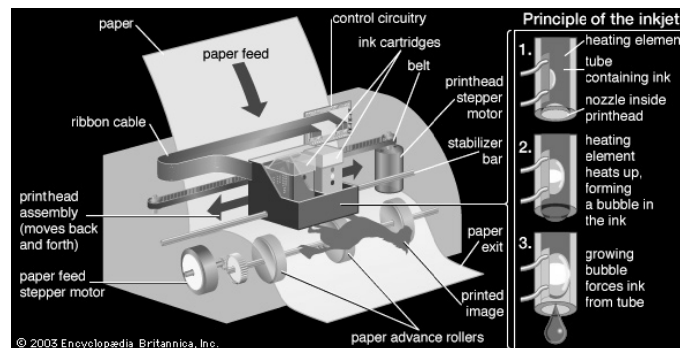


Figure 2.18: Ink Jet Printer

### 2.4.3    Plotter

Plotters were the first type of printer that could print with color and render graphics and full-size engineering drawings. As a rule, plotters are much more expensive than printers. They are most frequently used for CAE (computer-aided engineering) applications, such as CAD (computer-aided design) and CAM (computer-aided manufacturing). Hewlett-Packard is the leading vendor of plotters worldwide.

**Plotters are divided into four types:**

1. Drum plotters                                                          3. Inkjet plotters
2. Flatbed plotters                                                      4. LED plotters

### 2.4.3.1  Drum Plotter

A drum plotter is pen plotter that wraps the paper around a drum with a pin feed attachment. The drum then rotates the paper as pens move across it and draw the image. It was the first output device used to print graphics and large engineering drawings.
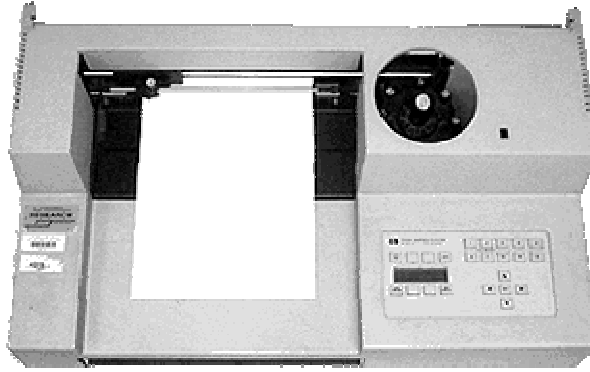
Figure 2.19: A drum plotter

### 2.4.3.2  Flatbed Plotter

A flat-bed plotter is a mechanical drafting device used with many CAD programs for designers. The paper remains stationary on a flat surface while a pen moves across it horizontally and vertically. A flatbed plotter is also known as Table Plotter.



Figure 2.20: Flatbed Plotter

### 2.4.3.3  The Inkjet Plotter

This is the third kind of Plotter which is called as the Inkjet plotter. The inkjet plotter creates an image by spraying small droplets of ink onto a piece of paper. A popular choice for advertising agencies and graphic designers, inkjet plotters are used generally for large outputs, such as banners and billboards and large signs often seen on roadsides.



Figure 2.21: Inkjet plotter

**Remarks**

In Today's world, virtually all inkjets create color. Low-end inkjets make the most of the three ink colors (cyan, magenta and yellow), but finally create a complex black that is often mud-spattered. Four-color inkjets make use of the black ink created for pure black printing alone.

### 2.4.3.4 LED Plotter

LED plotters are also called as Electrostatic plotters. It works similar to Laser Printers except that it uses LED as the heat source instead of Laser.



Figure 2.22: LED plotter

### 2.4.4     Projector

Projectors are display devices that project a computer created image. The computer sends the image data to the video card which then sends the video image to the projector. They are typically used for presentations or for viewing videos.

An output device that can take the display of a computer screen and project a large version of it onto a flat surface. **Projectors** are often used in meetings and presentations so that everyone in the room can view the presentation. In the picture to the right, are a ViewSonic projector and an example of what a projector may look like. Projectors used with computers are small devices that are rarely much larger than a toaster and typically weigh a few pounds.
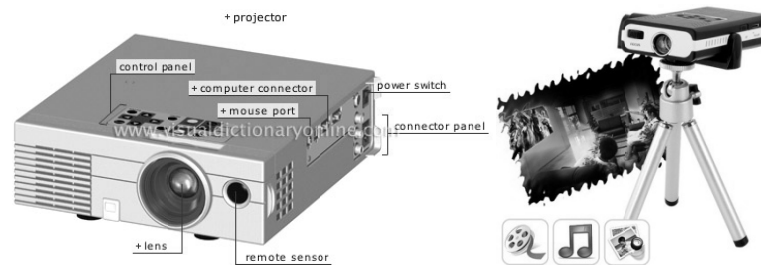


Figure 2.23: Projector

## 2.5      OTHER COMPUTER PERIPHERALS AND HARDWARE

Computer hardware is the collection of physical parts of a computer system. Apart from computer case, monitor, keyboard, mouse, printers, plotters, etc., it also includes all the parts inside the computer case, such as the hard disk drive, motherboard, video card, and many others. Computer hardware is what you can physically touch. Few such computer hardware devices and components are discussed as under.

### Motherboard

The **motherboard** is the main circuit board of a computer. It contains the central processing unit (CPU), the Basic Input/Output System (BIOS), memory, mass storage interfaces, serial and parallel ports, expansion slots, and all the controllers for standard peripheral devices like the keyboard, disk drive and display screen.
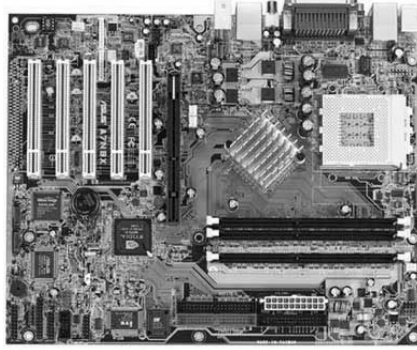
Figure 2.24: Motherboard

The **chipset** and other motherboard circuitry are the "smarts" of the motherboard. Their job is to direct traffic and control the flow of information inside the computer.

The **chipset** is a critical part of any computer, because it plays a big role in determining what sorts of features the computer can support.

**CPU**

The central processing unit (CPU), also called a **processor**, is located inside the **computer case** on the motherboard. It is sometimes called the brain of the computer, and its job is to carry out commands. Whenever you press a key, click the mouse, or start an application, you're sending instructions to the CPU.
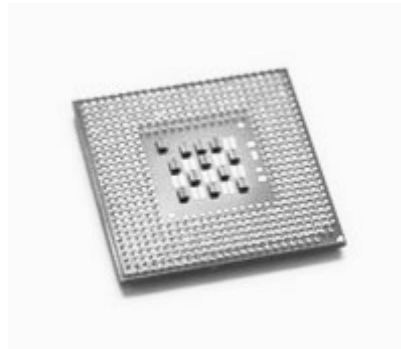


Fig. 2.25: Processor

The CPU is generally a **two-inch ceramic square** with a **silicon chip** located inside. The chip is usually about the size of a thumbnail. The CPU fits into the motherboard's **CPU socket**, which is covered by the **heat sink**, an object that absorbs heat from the CPU.

A processor's **speed** is measured in **megahertz (MHz)**, or millions of instructions per second; and **gigahertz (GHz)**, or billions of instructions per second. A faster processor can execute instructions more quickly. However, the actual speed of the computer depends on the speed of many different components—not just the processor. There are 2 main chip manufacturers, **Intel and AMD**.

**RAM**

Random Access Memory (RAM) is a critical performance component for computers. When a computer boots up, opens a program, and then opens a file, it loads these elements into RAM to do the work.
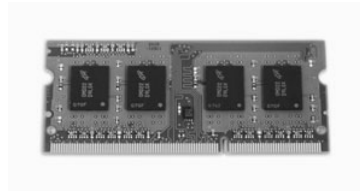
Figure 2.26: RAM

In general, you want to have as much RAM in your computer as you can afford. If you are running a 32 bit operating system, then each program can make use 2GB to 3 GB of RAM. If you have a 64bit OS, then each program can use as much RAM as you have available.

**Video Card**

A video card or Graphics Processing Unit (GPU) is the part of the computer that connects to the monitor. The GPU takes the video image and puts it in a form that can be displayed on the monitor. In most laptops, this is built into the system and cannot be replaced. In most desktop computers, the GPU fits into a slot on the motherboard, and can often be upgraded.

**Digital storage**

Every computer needs a storage device to store the operating system, programs and files. In the vast majority of cases, this is provided by one or more hard drives. Most computers have at least one internal hard drive, and they have the capability to connect to external drives.



Figure 2.27: Hard Disk

Most computers also have the ability to read and write optical disc like CD, DVD or Blu-ray. These are used for loading data and programs on and off the computer.

Digital storage is a critical part of any computer system, and using storage properly can be the difference between keeping your photos and losing them. For more information, take the course on digital storage and backups.

**Power Supply Unit**

The power supply unit in a computer **converts the power** from the wall outlet to the type of power needed by the computer. It sends power through cables to the motherboard and other components.



Figure 2.28: Power Supply Unit

## Expansion cards

Most computers have **expansion slots** on the motherboard that allow you to add various types of **expansion cards**. These are sometimes called **PCI (peripheral component interconnect) cards**. You may never have to add any PCI cards because most motherboards have built-in video, sound, network, and other capabilities. However, if you want to boost the performance of your computer or update the capabilities of an older computer, you can always add one or more cards. Below are some of the most common types of expansion cards.

## Sound Card

The **sound card**, also called an audio card, is responsible for **what you hear** in the speakers or headphones. Most motherboards have integrated sound, but you can upgrade to a dedicated sound card for higher-quality sound.

## Network card

The **network card** allows your computer to communicate over a network and access the Internet. It can either connect with an **Ethernet** cable or through a **wireless** connection (often called **Wi-Fi**). Many motherboards have built-in network connections, and a network card can also be added to an expansion slot.

## Bluetooth card

Bluetooth is a technology for wireless communication over short distances. It's often used in computers to communicate with wireless **keyboards**, **mice**, and **printers**. It's often built into the motherboard or included in a **wireless network card**. For computers that don't have Bluetooth, a USB adapter, called a **dongle**, can be purchased.



Figure 2.29: Dongle

## 2.6    COMMUNICATION DEVICES

Communication devices are the machines that assist in transmission of data. The versatility of a computer gets enhanced considerably when it can communicate with other devices and computers. For a two-way communication, a computer must be equipped with a modulator for outgoing data and a demodulator for the incoming data. This modulating device is referred to as a modem. There are various kinds of communication devices in the present day market.

There are several types of communication devices. Few of these are discussed below:

## Network Interface Card

This is a device which is connected to a users' computer which allows them to connect their computer to a device e.g. a switch or a hub, allowing them to communicate using this device.
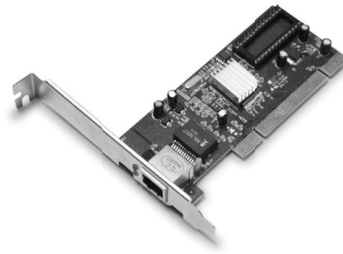
Fig. 2.30: Network Interface Card

### Servers

A server is used in a network to provide the users of a network with different features, for example a client server which allows the nodes on a network to connect on any computer system allowing them to always have the same interface when they log in, another server could be an e-mail server this is used to hold accounts of the users of the e-mail programmes, when the messages are being sent and other various features on the e-mail server.

### Router

A router is an intelligent device which can route subnets together. Routers are also used across the internet to transfer the data across the world. A router uses a routing table which is configured with ip address, so when a user sends data from one network the data on the other network can be received due to the router. Wireless routers are also the same accept transferring the data wirelessly using a normal 2.4 ghz frequency.
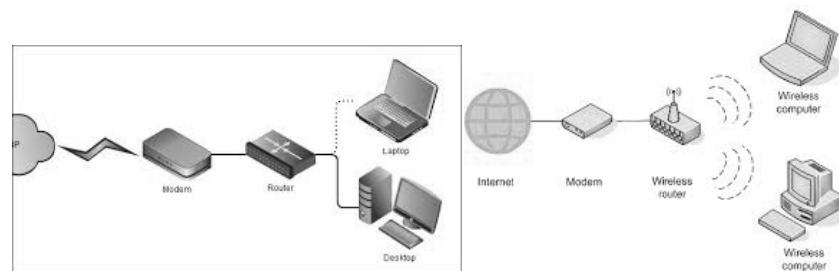


Fig. 2.31: Modem and Router

### Modems

Modem stands for Modulate/demodulate.
A device that transmits and receives data using a modulated carrier wave. Modems are used to establish network and Internetconnections.

### Hub

A hub is a non intelligent device, the reason for this is because when a node on port one for example sends a message to someone on port 4 the message is sent out to all of the ports on the hub, as well as this making the device slower, it also makes the device insecure because it makes it easy for people to sniff packets on a network.
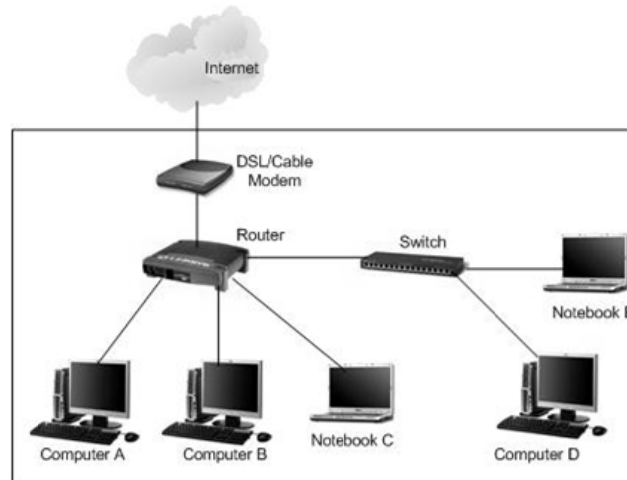
Fig. 2.32: Switch and Router

**Switch**

A switch is an intelligent device, when data is sent from a node for example on port one sending the data to port 4 the switch knows exactly which port to send to making it a faster and more secure device to use.

## 2.7     CONFIGURATION OF HARDWARE DEVICES

Hardware configuration references the details and system resource settings allotted for a specific device. Many computer specialists improve hardware performance by adjusting configurations, which may also include settings for the motherboard and the BIOS, as well as the bus speeds.

With newer technology, most computers have plug-and-play (PnP) allowing the OS to detect and configure external and internal peripherals, as well as most adaptors. PnP has the ability to locate and configure hardware components without needing to reset jumpers and dual in-line package (DIP) switches.

Each device has a hardware configuration setting, which may include the following:

- Interrupt Request (IRQ) Lines: These are hardware interrupt lines, which signal the CPU when a peripheral event has stopped or started.

- Direct Memory Access (DMA) Channels: This is a method for transferring data from the main memory to a device without going through the CPU.

- Input/Output Port: This connects the input and output devices to the computer. There is a memory address for each port.

- Memory Address: There is a unique identifier used for each memory location. The memory address is typically a binary number, which is numbered sequentially.

All hardware devices have configuration settings that can affect performance and system function. Hardware configuration information may include:

- Available memory
- Power management features
- Devices that are connected such as modems, disc drives and serial ports

During power-on-self-test (POST), basic input/output system (BIOS) searches system configurations to determine what devices are present and how they interface with the CPU. After POST, when the computer and system configurations are found, the CPU uses the information to process instructions

and data. Configuration information is stored in several ways using DIP switches, jumpers and complementary metal oxide semiconductors (CMOS).

Today most peripheral devices use PnP, which will auto-configure the DMA, IRQ and I/O address. Older systems that do not have PnP require a new device to be set by using jumpers or DIP switches.

## SUMMARY OF THE LESSON

You learnt the following in this lesson:

- An **input device** is any hardware device that sends data to the computer, without any input devices, a computer would only be a display device and not allow users to interact with it, much like a TV.
- A keyboard is one of the today's most common and familiar input device. A keyboard's primary function is to act as an **input device.**
- Mouse is a pointing device and it has been around us for more than 20 years
- A joystick is also a pointing device. It is used to move the cursor position on a CRT screen. Its function is similar to a mouse, except that with a mouse the cursor stops moving as soon as you stop moving the mouse.
- A touch screen is basically a display screen which can identify the occurrence and position of a touch inside the display region.
- Scanner is a kind of input device that can read text or printed paper and translates the information in a convenient form to be understood by the computer.
- **Hard copy** is the output, such as paper, that can be read immediately or stored and read later. It is relatively stable and permanent form of output. **Soft copy** is usually a screen-displayed output.
- Any peripheral that receives or displays output from a computer. An inkjet printer is a good example of an **output device** that can make a hard copy of anything on a computer.
- The computer **monitor** (also know as a **VDU** or **V**isual **D**isplay **U**nit) is the most common computer output device
- A **printer** is a peripheral which produces a text and/or graphics of documents stored in electronic form, usually on physical print media such as paper or transparencies
- A printer is an output device that produces a hard copy of data. The resolution of printer output is expressed as DPI. Printers can be classified into different types in several ways.
- Plotters were the first type of printer that could print with color and render graphics and full-size engineering drawings.
- Computer hardware is the collection of physical parts of a computer system. Apart from computer case, monitor, keyboard, mouse, printers, plotters, etc., it also includes all the parts inside the computer case, such as the hard disk drive, motherboard, video card, and many others.
- Communication devices are the machines that assist in transmission of data. here are various kinds of communication devices in the present day market.
- **Network Interface Card** is a device which is connected to a users' computer which allows them to connect their computer to a device.
- **Servers** is used in a network to provide the users of a network with different features.
- A router is an intelligent device which can route subnets together. Routers are also used across the internet to transfer the data across the world.
- **A Hub** is a non intelligent device and **Switch** is an intelligent device.
- Hardware configuration references the details and system resource settings allotted for a specific device.

- With newer technology, most computers have plug-and-play (PnP) allowing the OS to detect and configure external and internal peripherals, as well as most adaptors. PnP has the ability to locate and configure hardware components without needing to reset jumpers and dual in-line package (DIP) switches.

## SELF ASSESSMENT QUESTIONS AND EXERCISES

1. What are input devices?

2. What do you mean by keyboard?

3. Explain the concept of mouse?

4. Explain the speech recognition system in detail?

5. What do you mean by digital camera?

6. Explain the working of scanners?

7. What do you mean by output devices?

8. What are printers? Explain the various types of printers in detail?

9. Explain the various types of plotters?

10. What do you mean by monitor?

11. Explain the various types of monitors?

12. What do you mean by projector?

13. State the necessities of Input and Output devices.

14. What are the reasons for the visual display unit to be more popular than punched card reader ?

15. What is a Keyboard ? How does a simple keyboard differ from an ergonomically designed keyboard.

16. What is meant by configuration of hardware? What are the steps involved in this process?

17. What is communication hardware?

18. Differentiate between Hub and Switch?

19. What is Modem? State its role.

20. What is Network Interface Card?

# COMPUTER MEMORY AND SECONDARY STORAGE

## OBJECTIVES OF THIS LESSON

This lesson is aimed to make you understand the basic concept of computer memory and storage devices. Readers will be able to understand the following:

- Characteristics of memory systems and memory hierarchy
- Characteristics of memory unit
- Types of memory - core memory and     semiconductor memory
- Types of semiconductor memories – RAM and ROM
- High speed memory and cache memory
- Secondary storage devices
- Magnetic disks, their characteristics and Classification of magnetic disks
- Magnetic drum, Magnetic cards and strips
- Optical disks and their types
- Zip disk, Jaz disk, Superdisk, Optical disks, Magneto-optical drives
- Magnetic tapes and their comparison with Magnetic disk

## STRUCTURE OF THIS LESSON

## 3.1    INTRODUCTION

Memory is that portion of a computer system that is used for the storage and subsequent retrieval of data and instructions. Memory is a quite essential component of digital computer. Computer memory exhibits perhaps the widest range of type, technology, organization, performance, and cost of any feature of a computer system.

## 3.2    CHARACTERISTICS OF MEMORY SYSTEMS

The complex subject of computer memory is made more manageable if we classify memory systems according to their key characteristics. The most important of these are listed in **Table 3.1**

### Table 3.1 : Key Characteristics of Computer Memory Systems

| | |
|---|---|
| **a) Location** | - Random access |
| - CPU | - Associative access |
| - Internal (main) | **e) Performance** |
| - External (secondary) | - Access time |
| **b) Capacity** | - Cycle time |
| - Word size | - Transfer rate |
| - Number of words | **f) Physical type** |
| **c) Unit of transfer** | - Semiconductor |
| - Word | - Magnetic |
| - Block | **g) Physical Characteristics** |
| **d) Access Method** | - Volatile/Nonvolatile |
| - Sequential access | - Erasable/Non-erasable |
| - Direct access | **h) Organization** |

One of the characteristic of memory is its capacity. For internal memory, this is typically expressed in terms of bytes or words. External memory capacity is typically expressed in terms of bytes or Kbytes (KB) or Mbytes (MB). The storage capacity can be expressed in terms of Bytes. Few higher storage units are given below:

| | | |
|---|---|---|
| 1 KB (Kilo Byte) | = 1024 Bytes | = $2^{10}$ Bytes |
| 1 MB (Mega Byte) | = 1024 KB | = $2^{20}$ Bytes |
| 1 GB (Giga Byte) | = 1024 MB | = $2^{30}$ Bytes |
| 1 TB (Tera Byte) | = 1024 GB | = $2^{40}$ Bytes |
| 1 PB (Peta Byte) | = 1024 TB | = $2^{50}$ Bytes |
| 1 EB (Exa Byte) | = 1024 PB | = $2^{60}$ Bytes |
| 1 ZB (Zetta Byte) | = 1024 EB | = $2^{70}$ Bytes |
| 1 YB (Yetta Byte) | = 1024 ZB | = $2^{80}$ Bytes |

## 3.3    MEMORY HIERARCHY

A typical memory hierarchy is illustrated in **Fig. 3.1.**

As one goes down the hierarchy, the following occur:

**a) Decreasing cost per bit**

**b) Increasing capacity**

**c) Increasing access time**

**d) Decreasing frequency of access of the memory by the CPU**

```
┌─────────────┐
│ CPU         │
│ Registers   │
└─────────────┘
       ↓
┌─────────────────────┐
│   Cache Memory      │           Internal
└─────────────────────┘           Memory
       ↓
┌─────────────────────────┐
│   Main Memory           │
└─────────────────────────┘
       ↓
┌───────────────────────────────┐
│      Magnetic Disk            │
└───────────────────────────────┘
       ↓                           External
                                   Memory
┌───────────────────────────────────┐
│         Magnetic Tape             │
└───────────────────────────────────┘
```
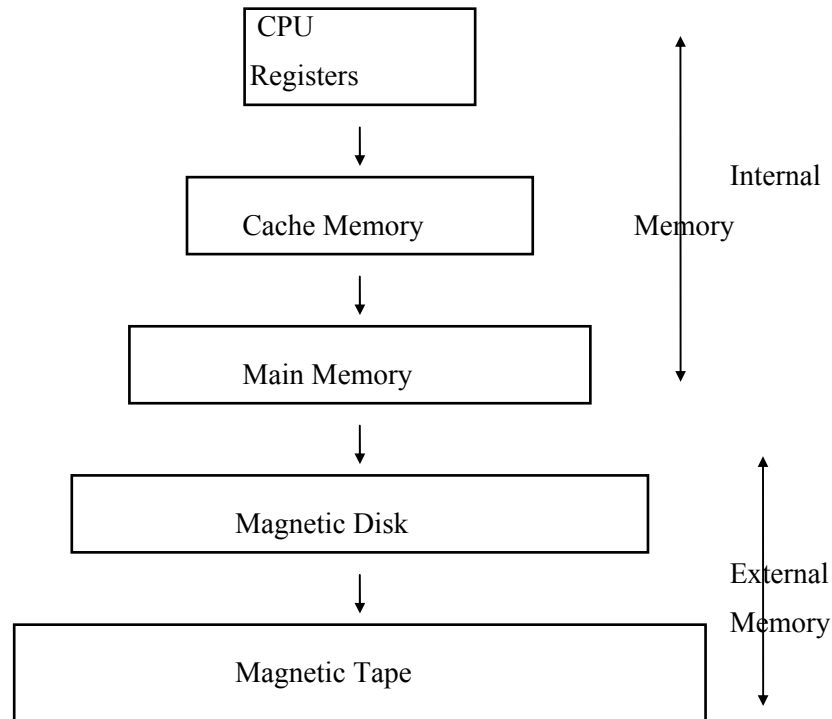
Fig 3.1 : The Memory Hierarchy

### 3.4    DESIRABLE CHARACTERISTICS OF MEMORY UNIT

The structure of the memory unit is perhaps the most important characteristic of a computer system. Some desirable features of the smallest constituent of the memory unit, i.e., binary cell are as:

- It must be very fast.
- It must be very compact in size.
- It must have two stable states.
- It must be capable of switching infinite number of times between these stable states.
- Cost should be very low.
- Time taken for reading and writing onto the binary cell should be very less.
- Power consumption must be as small as possible.

### 3.5    TYPES OF MEMORY

At present the following three kinds of memory are commonly used in modern computers:

a) **Primary Memory**

- Core Memory
- Semiconductor memory

b) **Secondary Memory**

- Magnetic Memory
- Optical Memory

c) **Backup Memory**

**Primary Memory**

All computers except very small systems contain all types of memory, namely, primary, secondary and backup memories. The core memory or semiconductor memory is employed as the primary memory (or main memory) of the computer. It stores programs and data which are currently needed by the CPU.

**Secondary Memory**

The magnetic memory is used as secondary (or auxiliary) memory. The information which is not being currently processed resides in the secondary memory. The information which is needed by the CPU for current processing is transferred from the secondary to main memory. The size of the main memory is comparatively much smaller than that of the secondary memory because of its high cost. The CPU communicates directly with the memory. As the CPU employs semiconductor technology and has very high speed, its matching memory must be very fast. Only semiconductor devices can provide the matching speed. Thus the main memory also must employ semiconductor technology. RAM and ROM ICs are used as the main memory of the computer. RAMs are volatile, i.e., their contents are erased when power goes off.

**Backup Memory**

Backup memory is used to store the copy of the important programs such as operating system, compilers etc. Floppy disks and magnetic tapes can be employed as backup storage. These programs are generally available in the secondary memory but their copies are also kept in the backup memory so that they can be reloaded into the secondary memory in case the programs stored in the secondary memory are lost accidentally or due to any other reason.

### 3.6 CORE MEMORY

This type of memory was introduced in the year 1955. It consists of tiny cores of doughnut-shaped objects called **cores**. The cores are made of ferromagnetic material. The individual cores are strung on wires to form a core plane. Several core planes are stacked one over the other to form a core stack.
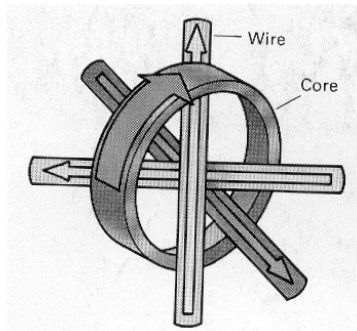


Fig. 3.2: Core Memory (One Core Cell)

### 3.7 SEMICONDUCTOR MEMORY

The complete memory unit may be constructed from either bipolar or field-effect transistors on a single silicon chip, which may be referred to as Semi-conductor Memory. These were introduced by IBM in 1971. The semiconductor storage operates on the principle of a flip-flop in which the switch is set to a 0 and 1 position by a Write command which sets or restores the flip-flop.

The semiconductor memory is:

- Faster
- Compact
- Consumes less power
- Having no rotating part in it
- Lighter
- Static device

### 3.8 CORE MEMORY VS SEMICONDUCTOR MEMORY

The main difference between Core memories and Semiconductor Memories are enumerated in **Table 3.2:**

**Table 3.2 : Difference Between Core and Semiconductor Memories**

| S.NO | CORE MEMORY | SEMICONDUCTOR MEMORY |
|------|-------------|----------------------|
| 1. | Non-volatile | Generally Volatile |
| 2. | Destructive readout | Non-destructive readout |
| 3. | Limited range of read & write cycle times | Wide range of read & write cycle times |
| 4. | Moderately priced | Low to moderately priced |
| 5. | High power consumption | Low power consumption |
| 6. | Best for large memories | Best for small or medium-sized memories |
| 7. | Relatively large access time | Short access time |
| 8. | Available only in large blocks | Available in wide variety of sizes |
| 9. | Relatively large and heavy | Relatively small and light |

## 3.9     TYPES OF SEMICONDUCTOR MEMORIES

Semiconductor memories are of two types :

>    **i) RAM (random access memory) and**

>    **ii) ROM (read only memory)**

### 3.9.1     Random Access Memory (Ram)

It is a type of computer memory that can be accessed randomly; that is, any byte of memory can be accessed without touching the preceding bytes. RAM is the most common type of memory found in computers and other devices, such as printers.

This type of memory is pronounced as **'ramm'** and can be used both for reading as well as writing and that is why RAM is also known as Read/Write memory. It is accessible to users. The user enters his program and data into RAM. It possesses random access property. The access time is same for each memory location. RAM is a volatile memory. The information stored into it is retained in it as long as the power supply is on. As soon as the power supply goes off (or interrupted) its stored information is lost. The programmer has to load his program and data into the RAM when the power is resumed.
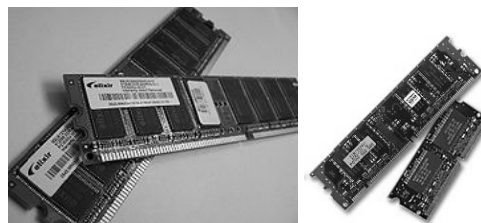


Figure 3.3: Random-Access Memory

It is the same as the main memory of computer system. RAM is not the correct name of R/W memory because both RAM and ROM possess random access property. But R/W memory has been called RAM since long and in practice it has become an established name. Thus R/W memory is commonly called RAM.

There are two basic types of RAM:

>    **a) Static RAM (SRAM) and**

>    **b) Dynamic RAM (DRAM)**

**Static RAM (SRAM) Vs Dynamic RAM (DRAM)**

Static RAMs retain stored information only as long as the power supply is on whereas a dynamic RAM loses its stored information in a very short time (in milli seconds) even though the power supply is on.

In the table below we summarize the main differences between dynamic RAM (DRAM) and static RAM (SRAM).

**Table 3.3: SRAM Vs DRAM**

| Feature | Dynamic RAM (DRAM) | Static RAM (SRAM) |
|---|---|---|
| **Storage circuit** | Capacitor | Flip-flop |
| **Transfer speed** | Slower than CPU | Same as CPU |
| **Latency** | High | Low |
| **Density** | High | Low |
| **Power Consumption** | Low | High |
| **Cost** | Cheap | Expensive |

Even though static RAM is faster than dynamic RAM, its disadvantages prevent it from being used as the main RAM circuit.

**Examples of SRAMs are :**

* Hitachi HM 6116, 2 K x 8                               * NEC µPD43256, 32 k x 8; etc.
* HM 6264, 8 K x 8
* HM 6287, 64 K x 1;

The refreshing and control circuitry for a dynamic RAM may be either on the chip itself or on a separate IC called dynamic RAM controller. If the DRAM and its refresh and control circuitry are on the same IC, it is called iRAM (integrated RAM). In other words the iRAM integrates a dynamic RAM and its control and refreshing circuitry into a single IC. iRAM is also known as quasi-static RAM or pseudo-static RAM.

**Examples of DRAMs are :**

* Toshiba DRAM TC 51100 of 1 M x 1 bits

* TC 514256 of 256 K x 4 bits, etc.

Intel 21019 is a 1 MB x 9 bit DRAM. 4 MB x 9 bit DRAMs are also available. The ninth bit is for parity checking.

**Advantages of RAMs**

* These are available in larger sizes than ROMs
* They serve as temporary data storage
* They can be updated and corrected
* No special programming mechanism like ROMs are required
* These do not require lead time like ROM

**3.9.2    Read Only Memory (Rom)**

Read Only Memory, commonly known as ROM, is a memory which is permanently programmed and can only be read. It also possesses random access property. RAMs are much cheaper compared to RAMs when produced in large volumes to defray the cost of making the mask. The stored

information can only be read from ROMs at the time of operation. Information cannot be written into a ROM by the users. In other words ROMs are not accessible to users. The contents of ROMs are decided by the manufacturers. The contents are permanently stored in a ROM at the time of manufacturer. From programming mode point of view the ROMs are placed in broad categories:

- **Masked-programmed ROMs and**
- **User-programmed ROMs.**

ROMs in which contents are written at the time of IC manufacturing are called mask-programmed RAMs. The following are user-programmable ROMs:

- **PROM (Programmable ROM)**
- **EPROM (or UVPROM)**
- **E$^2$PROM (Electrically Erasable PROM)**
- **Non-volatile Flash memory**

ROMs store information which is not subject to change. They store fixed programs. In microprocessor-based system which are used for industrial controls, ROMs store monitor, assembler, debugging package, function tables such as sine, cosine, square root and code-conversion tables, etc. An example of a ROM is Toshiba Mask ROM, TCS 534000, 512 k x 8 bits.



Figure 3.4: Read Only Memory

**Advantages of ROMs**

- They are non-volatile in nature
- ROMs are easier to interface than RAMs
- ROMs can not be accidentally changed
- ROMs are cheaper than ROMs
- ROMs are easy to test
- These are more reliable than RAMs due to their reduced complexity
- These are static and do not require refreshing
- Its contents are always known and can be verified

### 3.9.3    Non-Volatile Flash Memory

Flash memory is a special type of EEPROM that can be erased and reprogrammed Non-volatile flash memories are also electrically erasable and re-programmable non-volatile memories. They possess the feature of quick-pulse programming, a typical time is 100 μs for byte-program and 4 sec for chip-program.

EEPROM is similar to flash memory i.e. flash EEPROM. The main difference between EEPROM and flash EEPROM is that the first requires data to be written or erased one byte at a time whereas flash EEPROM chip allows data to be written or erased in blocks and the same makes it faster. The chip is flash erasable and programmable. The whole device is erased in one operation. A typical electrical flash erase time for the chip is 1 second. The access time for read-operation is 150-170 ns. It can be used in place of EPROM.

These are suitable for firmware storage whereas conventional E$^2$PROMs are suitable for parameter storage. When codes are to be updated the entire codes are written to avoid errors. For updation of

firmware codes, flash memories are very fast and economical as compared to EPROMs. In case of parameter updation, they need to be rewritten individually byte by byte while system is on-line, in normal operation. Hence, EEPROM are best suited for such applications.

This type of memory is very costly and also they have the limit on the number of times they can be reprogrammed usually 10,000 erase/write operations. But the failure rate is less compared to EEPROMs.

Examples of flash-memories are :

  i) Intel 28F512, 512K (64K x 8) bit CMOS Flash Memory

  ii) Intel 28F020, 2048K (256 x 8) bit CMOS Flash Memory

## 3.10    HIGH SPEED MEMORY

We are aware that the access time of main memories is slower than the speed of the processor. Since each instruction require several memory accesses, therefore, faster memories will be of great help in increasing the overall performance of a computer system. The following may be the four serious possibilities to enhance the speed of memory:

  o  Inserting Cache memory, known as a high speed memory, between the main memory and processor.

  o  Employing associative addressing in place of random access using which information can be retrieved at a very high speed on the basis of the portion of its contents as an address.

  o  Employing a faster but expensive technology for main memory having a very smaller access time and the same become available in the time to come due to technological advancement in memories.

  o  By employing Memory Interleaving using which more words are accessed in a single memory access cycle rather than accessing one word. This is termed as memory interleaving.

## 3.11    CACHE MEMORY

A very high speed small capacity memory introduced as a buffer between the CPU and the main memory is called a Cache Memory. Due to very high cost, small cache memories are intended to provide fast speed of memory retrieval. Only small sizes such as 8KB, 64 K, 128K, 256 KB, 512 KB etc. are normally provided in microcomputers whereas they can have 640 KB to 64 MB RAMs or even more Parts of the current program are copied from the main memory into the high speed cache.

The design of cache memory is such that it is not **"visible"** to a programmer. The CPU cycle time in a computer is normally much faster than the memory cycle time. Thus every time information is to be read from the memory to be used by CPU, this speed mismatch would make the CPU wait. Employing cache is an attempt to minimize this mismatch.

When the CPU refers to an instruction (or data), it is fetched from the cache if it is already there. This is called a hit. If it is not available, then it is called a miss and in this case the same is read from the main memory.

## 3.12    SECONDARY STORAGE DEVICES

A secondary storage device refers to any volatile storage device that is internal or external to the computer. It can be any storage device beyond the primary storage that enables permanent data storage.

A secondary storage device is also known as an **auxiliary storage device** or **external storage**.

Fig. 3.5: Few Secondary Storage Devices

Secondary storage devices are primarily referred to as storage devices that serve as an addition to the computer's primary storage, RAM and cache memory. Typically, secondary storage allows for the storage of data ranging from a few Mega Bytes to Peta Bytes. These devices store virtually all programs and applications stored on a computer, including the operating system, device drivers, applications and general user data. Most of the secondary storage devices are internal to the computer such as the hard disk drive, the tape disk drive and even the compact disk drive and floppy disk drive.

### 3.13    MAGNETIC DISKS

A disk is a circular platter constructed of metal or of plastic coated with a magnetizable material. Data are recorded on and later retrieved from the disk via a conducting coil named the head. During a read or write operation, the head is stationary while the platter rotates beneath it.

The write mechanism is based on the fact that electricity flowing through a coil produces a magnetic field. Pulses are sent to the head, and magnetic patterns are recorded on the surface below, with different patterns for positive and negative currents. The read mechanism is based on the fact that a magnetic field moving relative to a coil produces an electrical current in the coil. When the surface of the disk passes under the head, it generates a current of the same polarity as the one recorded.

### 3.13.1  Characteristics of Magnetic Disk Systems

A magnetic disk system is a mylar or metallic platter on which electronic data can be stored. Although disk resemble phonograph records, they do not have the characteristic spiraling groove, however, data is accessed in much the same was as an individual song is selected on a record. Data files on the disk can be read sequentially or directly.

**Table 3.4** lists the major characteristics that differentiate among the various types of disk systems.

### Table 3.4: Characteristics of Disk Systems

| | |
|---|---|
| **1. Head Motion** | **4. Platters** |
|    - Fixed-Head |    - Single-platter |
|    - Movable-Head |    - Multiple-platter |
| **2. Disk Portability** | **5. Head Mechanism** |
|    - Non-removable Disk |    - Contact (floppy) |
|    - Removable Disk |    - Fixed gap |
| **3. Sides** |    - Aerodynamic gap (Winchester) |
|    - Single-sided | **6. Disk Access Time** |
|    - Double-sided | |

### 3.13.2  Classification of Magnetic Disks

Depending upon the aforesaid characteristics, magnetic disks can be classified in the following manner :

* **Floppy Disk**
    * 8 inch
    * 5.25 inch
    * 3.5 inch
* **Hard Disk**
    * Fixed Disk
    * Removable Cartridge
    * Disk Pack
* **Magnetic Drum**

* Magnetic Cards and Strips
* Zip Disk
* Jaz Disk
* SuperDisk

### Floppy Disks

A floppy diskette, also called simply a diskette or disk, is a small flexible disk. Floppy disks are commonly used as secondary and backup memory in personal computers. These disks are very thin and flexible and hence, they are called floppy. It has been around since the early 1970s.

The different sizes of floppy disk are:

* **8 inch**                    * **5 ¼ inch**                    * **3 ½ inch**

### Hard Disk

A hard disk is just that - hard and inflexible. The hard disk is made from materials such as aluminium instead of mylar. The I/O device used to transfer data to and from a hard disk is called a hard-disk drive. The read/write head of a hard-disk drive floats above the surface of the disk at a height of about 50 millionth of an inch (0.00005 inches). In comparison, a human hair is a hundred times larger in diameter.

### Fixed Disk

A fixed disk is enclosed permanently inside a sealed case for protection from environmental factors. Fixed-disk systems contain one or more hard disks and can be used in all types of computers. Home computer users may be familiar with the 5.25 " fixed-disk systems used with desktops, having typical storage capacities between 10 MB and 2.1 GB. In large computers, the fixed-disk system provides storage capacities in Giga-bytes (GB) or Tera-bytes (TB).
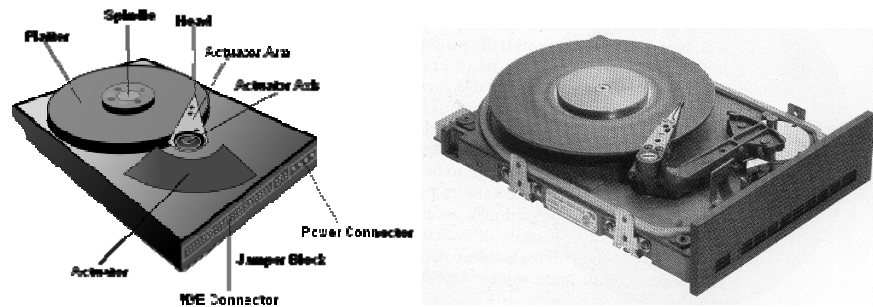
Fig. 3.6: Fixed Hard-disk(s) With Removed Outer Jacket

### Removable Cartridge

A storage system using Removable Cartridges has the same speed and capacity as a hard disk. These cartridges usually contain only one or two disks. Many hard-disk drives used with small computers are designed to use removable cartridges.

The advantage of this type of disk is that it may be removed at any time and a new or different cartridge may be inserted. For example, a user can have a separate cartridge for each application.

### Disk Pack

A disk pack is another removable storage media in which several hard-disks are packed into a single plastic case. The disk-pack drives are designed for large systems that require larger storage capacities. Because a disk pack is susceptible to damage by scratching, the top of the first disk and the bottom of the last disk are generally not used.
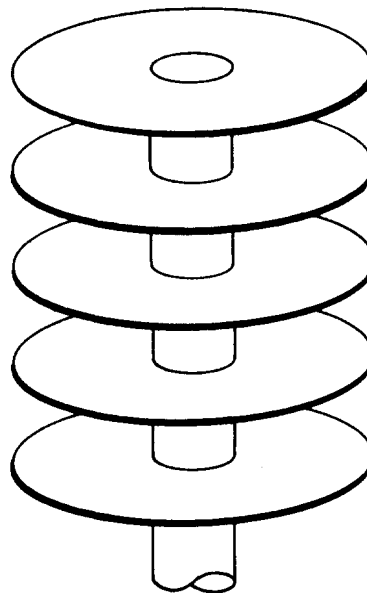


Fig. 3.7: Disk Pack Arranged on a Spindle

Disk packs can be interchanged, giving the computer a virtually unlimited amount of secondary storage.

Fig. 3.8: Disk Pack

**Advantages of Magnetic Disks**

    i)    The data can be accessed sequentially as well as directly.
    ii)   The access time is smaller, which results in efficient storage.
    iii)  When a transaction is made, data can be updated immediately. There is no need to maintain a transaction file.
    iv)  Software allows files to be altered simultaneously.
    v)   Disk storage is much more durable and is less likely to be lost because of mishandling or a poor storage environment.
    vi)  Inquiries can be answered quickly on the spot.

**Disadvantages of Magnetic Disks**

    i)    They are more expensive than magnetic tapes.
    ii)   Requires complex programming to gain access to files.
    iii)  These are heavier (particularly disk packs) and more difficult to replace than a magnetic tape.
    iv)  Easily transported disks may pose security problems.
    v)   Requires backup files to be prevent data from being lost during alterations.
    vi)  When the data in master file is updated in case of a transaction, the old data is lost. Whereas in tapes, a new master-file is formed which has the updated data. The old master file is also retained for the desired time.

## 3.14    MAGNETIC DRUM

A magnetic drum is similar in a concept to a fixed stack magnetic disk, except that the information is stored on the outer surface of a drum, rotating at a high speed as opposed to the surface of a disk. a drum, as the name suggests, is cylindrical in shape, typically about 3 feet in length. The outer surface of the drum is coated in ferro-oxide, enabling the storage of information in coded form as magnetized

or non-magnetized spots. The surface is divided into a number of tracks, each having one or more fixed read and record heads.

As in the case of magnetic disk, data are recorded serially along the tracks, from where any particular item can be directly accesses. Magnetic drums are used in places where very fast access and fast transfer speed are required.

A typical drum can store between 100,000 and 10,000,000 characters of information, transfer more than 1.5 million characters per second (CPS) with an appropriate access time of 6 to 29 ms (million seconds). Unlike a disk pack it cannot be removed from a unit and replaced and is more expensive than disk. Magnetic drums are not used in our present day computers.

### 3.15    MAGNETIC CARDS AND STRIPS

A magnetic strip is a flexible plastic material of size 2 x 12 inches, on which data are magnetically recorded. Ten such strips put together is called as a sub-cell and twenty sub-cells are placed in a data cell drive. Like disk packs they can be removed. Cards and strips have high storage facility and slow access speed. They are much cheaper than disk packs, can accommodate reasonably large amount of data and the data stored are erasable.

### 3.16    ZIP DISK

These are high-capacity floppy disk drives developed by the Iomega Corporation. Zip disks are slightly larger than the conventional floppy disks, and are about twice as thick. These can store 100 MB of data. As they are relatively inexpensive and durable, so they have become a popular media for backing up hard disks and for transporting large files.

### 3.17    JAZ DISK

These are removable disk drives developed by the Iomega Corporation. The Jaz drive has a 12 ms average seek-time and a transfer rate of 5.5 MB per second. The removable cartridges hold 1 GB of data. The fast data rates and large storage capacity make it a viable alternative for backup storage as well as everyday use.

### 3.18    SUPERDISK

This is a new disk storage technology developed by the Imation Corporation that supports very high-density diskettes. SuperDisk diskettes are etched with a servo pattern at the factory. This pattern then read by the SuperDisk drive to precisely align the read/write head. The result is that a SuperDisk diskette can have 2490 tracks, as opposed to the 135 tracks that conventional 3 ½ inch 1.44 MB diskettes use. This higher density translates into 120 MB capacity per diskette.

Unlike the other removable disk storage solutions, such as the Zip Drive, SuperDisk is backward compatible with older diskettes. This means that you can use the SuperDisk drive to read and write to older 1.44 MB diskettes as well as the new 120 MB SuperDisk diskettes. Imation's current SuperDisk drive is called the LS-120.

### 3.19    OPTICAL DISKS

In 1983, one of the most successful consumer products of all time was introduced : the Compact Disk (CD) digital audio system. The CD is a non-erasable disk that can store more than 60 minutes audio information on one side. The huge commercial success of the CD enabled the development of low-cost Optical Storage Technology that now promise to revolutionize data storage.

The greatest drawback of the optical disk system is its slow average seek time of the drive. In case of a hard disk the read/write head is a tiny magnet whereas in optical system the drive has to move on sizable optical assembly across the disk surface. This increases the seek time. In future it is expected that the access time will be reduced using fibre-optic system.

CD-ROM Drive with Optical Disk is shown in **Fig. 3.9.**
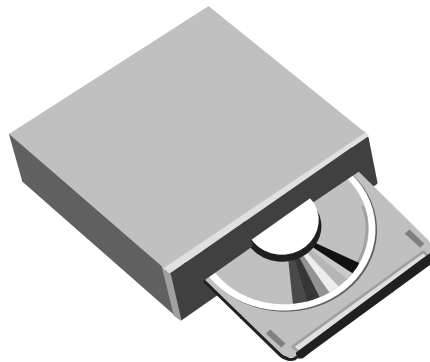


Fig. 3.9: CD-ROM Drive With Optical Disk

Portable CD-ROM Drive is shown in **Fig. 3.10.**
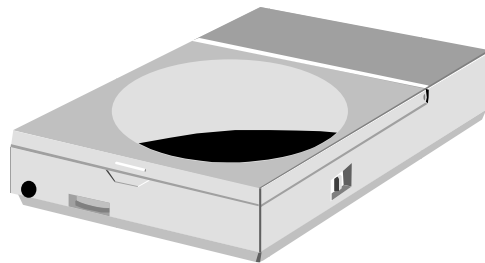


Fig. 3.10: Portable CD-ROM Drive

There are mainly following types of optical disk products :

    I.   Compact Disk (CD)
    II.  CD-ROM (Compact Disk Read-Only-Memory)
    III. Compact Disk Interactive (CD-I)
    IV. Digital Video Interface (DVI)
    V.  WORM (Write-Once-Read-Many)
    VI. CD-R (Compact Disk-Recordable) Drive
    VII.Erasable Optical Disk or CD-RW (ReWritable) Disk
    VIII.Optical Card
    IX. Optical Tape

Optical disk(s) are shown in **Fig. 3.11 (a),Fig. 3.11 (b) and Fig. 3.11(c).**

**(a) A CD-ROM Drive    (b) A CD-ROM Drive (without case)**



**(c)The optical lens of a CD Drive**

Figure 3.11

### Compact Disk (CD)

Compact Disk (CD) is a non-erasable disk that stores digitized audio information. The standard system uses 12 cm disks and can record more than 60 minutes of uninterrupted playing time.

### CD-ROM

CD-ROM is an optical Compact Disk ROM. Pre-recorded data can be read out. The manufacturer writes data on CD-ROMs. The disk is made up of resin, such as poly-carbonate. It is coated with a material which will change when a high intensity laser beam is focused on it. The coating material is highly reflective, usually aluminium. The high intensity laser beam forms a tiny pit along a trace to represent 1. For reading the data laser beam of less intensity is employed.

CD-ROM is appropriate for the distribution of large amounts of data to a large number of users. Because of the expense of the initial writing process, it is not appropriate for individualized applications.

### Advantages of CD-ROM

- The information-storage capacity is much greater on the optical disk.
- Mass replication of CD-ROMs is inexpensive and very fast.
- These are removable and thus may be used suitably for archival storage.

### Disadvantages of CD-ROM

- It is read-only and can not be updated.
- It has an access time much longer than that of a magnetic disk drive.

### Compact Disk Interactive (CD-I)

Compact Disk Interactive (CDI) optical disk is a specification based on the use of CD-ROM. It describes methods for providing audio, video, graphics, text, and machine-executable code on CD-ROM.

### Digital Video Interface (DVI)

Digital Video Interface (DVI) optical disk is a technology for producing digitized, compressed, representation of video information. The representation can be stored on CD or disk media. Current systems use CDs and can store about 20 minutes of video on one disk.

### WORM (Write Once Read Many)

To accommodate applications in which only one or small number of copies of a set of data is needed, the write-once read many (WORM) type optical disk has been developed.

The WORM optical disk is attractive for archival storage of documents and files. It provides a permanent record of large volumes of user data.

**Advantages**

      i) High capacity

      ii) Better reliability

      iii) Longer life

**Disadvantages**

      i) Greater access time as compared to that of hard disk.

**CD-R Drive**

It is a special type of disk-drive that can create CD-ROMs and audio CDs. This allows the users to master a CD-ROM or audio CD for publishing. Until recently, CD-R drives were quite expensive, but prices have tremendously come down.
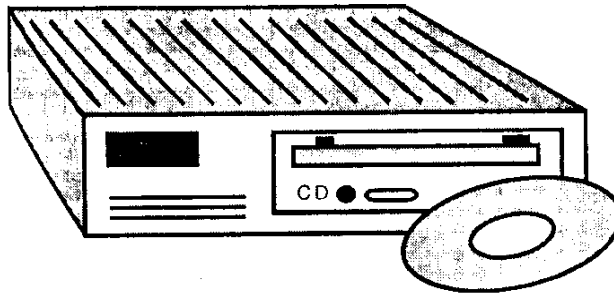
Fig. 3.12: CD-R Drive

**Erasable Optical Disk or CD-RW Disk**

The most recent development in computer optical disks is the erasable optical disk. This disk can be repeatedly written and overwritten, as with any magnetic disk. Although a number of approaches have been tried, the only technology that has proved commercially feasible is the magneto-optical system.

The erasable optical disk has the obvious advantages over CD-ROM and WORM that it can rewritten and thus used as true secondary storage. As such, it competes with magnetic disks.

**Optical Card**

The optical or laser card is the of the size as a credit card and has an optical laser-encoded strip that can store approximately 2 MB of data. These cards have many potential uses, most notably for storing credit records or medical histories. Some people predict that these cards may one day lead to a cash-less and cheque-less.

Optical cards have the potential to store an individual's entire financial history, adding to or subtracting from appropriate accounts as a person makes, saves, or spends money. These cards may also supply a hospital with the holder's complete medical history. If emergency treatment is required, this information could expedite care.

**Optical Tape**

Continuing developments and refinements in optical technology include Optical Tape. Optical Tape is similar in appearance to magnetic tape, but data are stored by optical-laser techniques. Optical tapes which are in cassette form can store over 8 GB each, and the tape drives can hold 128 cassettes,

providing a total storage of about 1 TB (1024 GB). Like other optical methods of data storage, optical is read-only. As optical technology develops, higher densities and expanded uses will result.

### 3.20    MAGNETO-OPTICAL DRIVES

This is a type of disk drive that combines magnetic disk technologies with CD-ROM technologies. Like magnetic disks, these can be read as well written to and like floppy disks, they are also removable. These are faster than floppy and CD-ROM drives but not comparable to hard-disk drives. However, their storage capacity can be more than 200 MBs which is an enormous storage capacity in comparison to floppy disks.

### 3.21    MAGNETIC TAPES

A magnetic tape is usually a 0.5 inch wide plastic tape with a coating of magnetic material on one side. The length is generally 2400 feet. Records are stored on the tape one after the other in the order of the key field.

Every tape has a header and trailer label. The header label is at the beginning of the tape and stores the name of file, date of last updation and any other relevant information. The trailer label has the same information as header label. It may be possible that a number of files are stored in a tape.
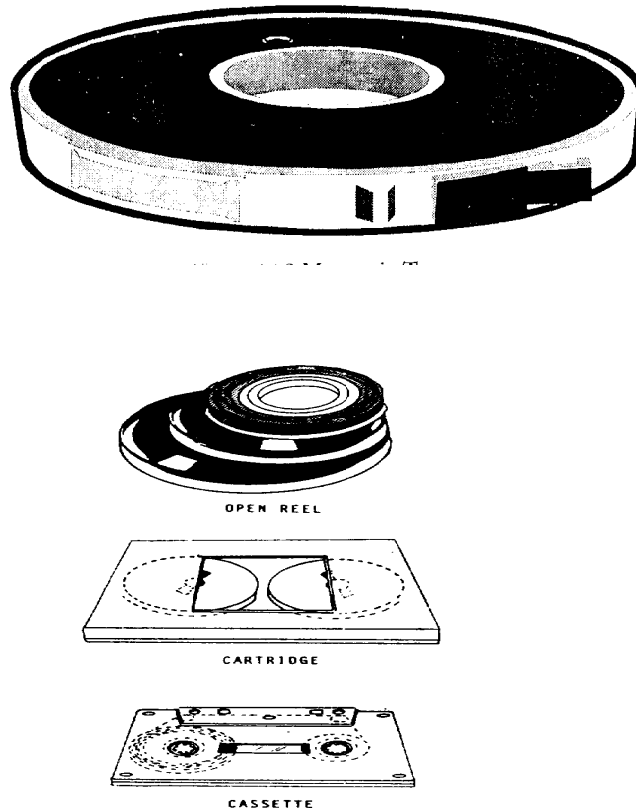


Fig. 3.13: Various Types of Magnetic Tapes

**Main Characteristics of Magnetic Tapes**

Some major characteristics of magnetic tapes are given as under

* **Tape Density**
* **Character Set Used**
* **Parity Check**
* **Blocks : Fixed Length or Variable Length**

* **Block Size**
* **Labels**
* **Mechanical Interlock**
* **Headers and trailers**
* **Length of tape**
* **Drive mechanism**
* **IRG and IBG**
* **Blocking/Unblocking Storage**

## Magnetic Tape Drive And Its Types

A tape drive performs the operation of writing onto the tape and also reading information from the tape. The tape is loaded onto the tape drive in the same way that a movie projector is threaded.



Fig. 3.14: Mounting of Magnetic Tape on Drive

There are two types of magnetic tape drive mechanisms. These are:

* **ArmsUsing Vacuum Columns**
* **Using Tension**

## Types of Magnetic Tapes

There are three forms of magnetic tape :

a) **Reel-to-reel Tape**

b) **Cassette Tape**

c) **Cartridge Tape**

## Advantages of Magnetic Tapes

1. It is the cheapest storage medium for sequential access.

2. The storage capacity is very high.

3. A tape is erasable and reusable.

4. It is a low-cost backup

5. They require less space to be stored as compared to other storage devices.

6. Magnetic tapes are less prone to errors

7. Stores large amounts of data in a small space in comparison to punched cards.

8. It is the most suitable backup media for voluminous storage.

9. Transfers data between tape and the CPU rapidly.

**Disadvantages of Magnetic Tapes**

1. It is not a very reliable and durable media for storage as when a tape tears, some data is certainly lost.
2. Magnetic tapes require proper labels for content verification.
3. Only sequential access is possible and time required to access depends upon the location of the record on the tape.
4. Tapes are not easily distinguishable superficially.
5. Data can not be inserted in a tape. Each time an updation is to be made, a new copy of tape is made.
6. Environmental factors can distort data stored on magnetic tapes.
7. A tape can be read only by a machine, whereas punched cards can be read visually by an operator.

### 3.22    MAGNETIC TAPE VS MAGNETIC DISK

Magnetic tape and disk have evolved together since the 1950s, filling different data storage needs for computer users. Tape drives store and archive large amounts of data economically. Disk drives access the data with great speed.

**1. Random Access**

Any data on a disk can be accessed in a few thousandths of a second. This is called random access---you don't need to search every file to find something.

**2. Serial Access**

A magnetic tape drive must search through all the files leading up to the one you want. This is serial access, reading one file after another.

**3. Speed**

For everyday file access, magnetic disk is faster because of its random access feature. For archiving files, tape and disk are about the same speed.

**4. Archiving**

Magnetic tape is less expensive to store large amounts of data for archiving. Data centers also use disks for archiving, though to a lesser extent.

**5. Size**

The smallest magnetic disks are the size of a matchbox. The smallest tape drives are about the size of a small book.

### SUMMARY OF THE LESSON

You learnt the following in this lesson:

- Memory is that portion of a computer system that is used for the storage and subsequent retrieval of data and instructions. Memory is a quite essential component of digital computer.
- Memory systems may be classified according to their key characteristics.
- The structure of the memory unit is one of the most important characteristic of a computer system.

- At present three kinds of memory are commonly used in modern computers - Primary Memory, Secondary and Backup.

- There are several types of primary memories - Core Memory, Semiconductor memory, etc.

- The semiconductor memory is faster, compact, lighter, consumes less power, static device and having no rotating part in it

- ROMs in which contents are written at the time of IC manufacturing are called mask-programmed RAMs.

- There are user-programmable ROMs such as PROM (Programmable ROM), EPROM (or UVPROM), $E^2$PROM (Electrically Erasable PROM) and Non-volatile Flash memory

- A very high speed small capacity memory introduced as a buffer between the CPU and the main memory is called a Cache Memory. Due to very high cost, small cache memories are intended to provide fast speed of memory retrieval.

- There are several types of secondary storages also such as Magnetic Disks, Magnetic Tapes, Magnetic Drums, etc.

- All computers except very small systems contain all types of memory, namely, primary, secondary and backup memories.

- The magnetic memory is used as secondary (or auxiliary) memory

- Backup memory is used to store the copy of the important programs such as operating system, compilers etc.

- There are several types of optical disk such as Compact Disk (CD), CD-ROM (Compact Disk Read-Only-Memory), Compact Disk Interactive (CD-I), Digital Video Interface (DVI), WORM (Write-Once-Read-Many), CD-R (Compact Disk-Recordable) Drive, Erasable Optical Disk or CD-RW (ReWritable) Disk, Optical Card and Optical Tape.

## SELF ASSESSMENT QUESTIONS AND EXERCISES

1. What are disk systems ? Outline their typical characteristics.
2. What is meant by Memory Hierarchy ? State its importance.
3. State the function of memory in a computer ?
4. What is a hard-disk and how does it work ?
5. Differentiate between Core and Semi-conductor memory.
6. What are high speed memories ? Explain their usage.
7. What are the advantages and disadvantages of magnetic tapes ?
8. What are the different types of memory ? Explain their merits and demerits.
9. Describe the physical characteristics of magnetic tape.
10. What is magnetic strip ? Explain its working.
11. How does a random access device differ from a sequential access device ?
12. What are the major secondary storage devices ?
13. When is magnetic tape storage used ?
14. What is a magnetic drum ? State its applications.
15. Why do we need secondary storage devices ? What are the characteristics of secondary storage ?
16. What is a magnetic tape ? State its major characteristics.
17. What are optical disks and how do they work ?
18. Why a floppy diskette is named so ? How is it different from a hard-disk ?
19. Explain the difference between Zip-Disk, Jaz-Disk and SuperDisk.
20. State the applications of ROM and RAM.

## COMPUTER NETWORKS AND INTERNET

### OBJECTIVES OF THIS LESSON

This lesson is aimed to make you understand the basic concepts of software and operating systems. Readers will be able to understand the following:

- Basics of Information Technology (IT) and its role in society
- Essence of computer network and types of computer network
- About Local Area Network (LAN), Wide Area Network (WAN) and types of WAN
- Concept of Internet and its importance
- About World Wide Web and Web Browser
- Applications of the Internet such as information retrieval services, communication services and data transfer services
- Overview of E-mail, internet browsing and search engines
- Internet access devices, domain name system (DNS) and types of internet connections
- About multimedia applications of multimedia

### STRUCTURE OF THIS LESSON

### 4.1     INTRODUCTION TO INFORMATION TECHNOLOGY

Information technology (IT) in simple words can be defined as a marriage of two technologies i.e. Computer Technology and Communication Technology that helps in all walks of life.

IT (information technology) is a term that encompasses all forms of technology used to create, store, exchange, and use information in its various forms (business data, voice conversations, still images, motion pictures, multimedia presentations, and other forms, including those not yet conceived). It's a convenient term for including both telephony and computer technology in the same word. It is the technology that is driving what has often been called "the information revolution."

## 4.2    MODERN INFORMATION TECHNOLOGY

IT has become a vital and integral part of every business plan. From multi-national corporations who maintain mainframe systems and databases to small businesses that own a single computer, IT plays a role. The reasons for the omnipresent use of computer technology in business can best be determined by looking at how it is being used across the business world.

Following are certain areas where IT plays a very important role:

### 1. Communication

For several organisations, email is the principal means of communication between employees, suppliers and customers. Email was one of the early drivers of the Internet, providing a simple and inexpensive means to communicate.

Over the years, a number of other communications tools have also evolved, allowing staff to communicate using live chat systems, online meeting tools and video-conferencing systems. Voice over internet protocol (VOIP) telephones and smart-phones offer even more high-tech ways for employees to communicate.

### 2. Inventory Management

When it comes to managing inventory, organizations need to maintain enough stock to meet demand without investing in more than they require. Inventory management systems track the quantity of each item a company maintains, triggering an order of additional stock when the quantities fall below a pre-determined amount. These systems are best used when the inventory management system is connected to the point-of-sale (POS) system. The POS system ensures that each time an item is sold, one of those items is removed from the inventory count, creating a closed information loop between all departments.

### 3. Customer Relationship Management

Companies are using IT to improve the way they design and manage customer relationships. Customer Relationship Management (CRM) systems capture every interaction a company has with a customer, so that a more enriching experience is possible. If a customer calls a call center with an issue, the customer support representative will be able to see what the customer has purchased, view shipping information, call up the training manual for that item and effectively respond to the issue. The entire interaction is stored in the CRM system, ready to be recalled if the customer calls again. The customer has a better, more focused experience and the company benefits from improved productivity.

### 4. Data Management

Today, most companies store digital versions of documents on servers and storage devices. These documents become instantly available to everyone in the company, regardless of their geographical location. Companies are able to store and maintain a tremendous amount of historical data economically, and employees benefit from immediate access to the documents they need.

### 5. Management Information Systems

Storing data is only a benefit if that data can be used effectively. Progressive companies use that data as part of their strategic planning process as well as the tactical execution of that strategy. Management Information Systems (MIS) enable companies to track sales data, expenses and

productivity levels. The information can be used to track profitability over time, maximize return on investment and identify areas of improvement. Managers can track sales on a daily basis, allowing them to immediately react to lower-than-expected numbers by boosting employee productivity or reducing the cost of an item.

### 4.3      COMPUTER NETWORK

A computer network is an interconnection of various computer systems located at different places. In computer network two or more computers are linked together with a medium and data communication devices for the purpose of communicating data and sharing resources. The computer that provides resources to other computers on a network is known as server. In the network the individual computers, which access shared network resources, are known as workstations or nodes.



Fig. 4.1: Computer Network

**Need of Computer Network**

The need of a computer network arose due to:

     *    **Limited resources**   *    * **Desire to share the resources**          *   **Cost Reduction**
Today, that's a limiting view, because the most important resource is information. Network lets us share information and the same is achieved by **Resource Sharing**.

The purpose of many computer networks is to permit a far-flung community of users to share computer resources. The resource sharing will automatically result in **Cost Reduction**.

### 4.4      TYPES OF COMPUTER NETWORK

The following are different types of networks:

1.   Local Area Network (LAN)
2.   Wireless Local Area Network (WLAN)
3.   Wide Area Network (WAN)
4.   Metropolitan Area Network (MAN)
5.   Storage Area Network (SAN)
6.   Campus Area Network (CAN)
7.   Personal Area Network (PAN)
8.   Desk Area Network (DAN)

Local Area Network and Wide Area Network are the popular computer networks, and the same are being discussed here.

### 4.4.1    Local Area Network(LAN)

A local area network (LAN) is two or more computers directly linked within a small well-defined area such as a room, building, or group of closely placed buildings. A LAN may be made up of only microcomputers or any combination of microcomputers and large systems.

LANs is shown in **Fig. 4.2.**



(a)          (b)
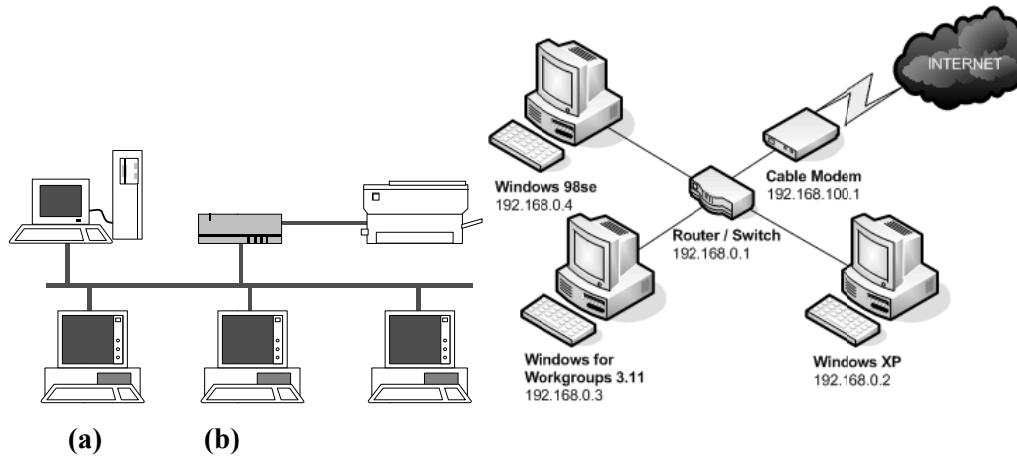
Fig. 4.2: Local Area Network(s)

The computer network which connects the computers in the different parts of the same big city like metropolitan city may be referred to as Metropolitan Area Network (MAN).

Interest in local area networks is constantly growing due to following two developments:

*    Development of powerful and user-friendly micro-computers
*    Developments in communication technology

### 4.4.2    Wide Area Networks (WAN)

A wide area network (WAN) is two or more computers that are geographically dispersed, linked by communication means such as telephone system, microwave, satellites, etc. This type of network is usually limited to use by large corporations and government agencies because of the high costs involved in building and maintaining them.

A WAN is a network that links separate geographical locations and this network can be a public system or any of the various packet switched services provided by the public telecommunication agencies.

The main difference between a WAN and LAN is that, the LAN is under the complete control of the owner, whereas the WAN needs the involvement of another authority like telecom department. LANs are successful and capable of handling very high data transfer rates at low cost because of the small area covered. Besides LANs have a lower error rate than WANs.
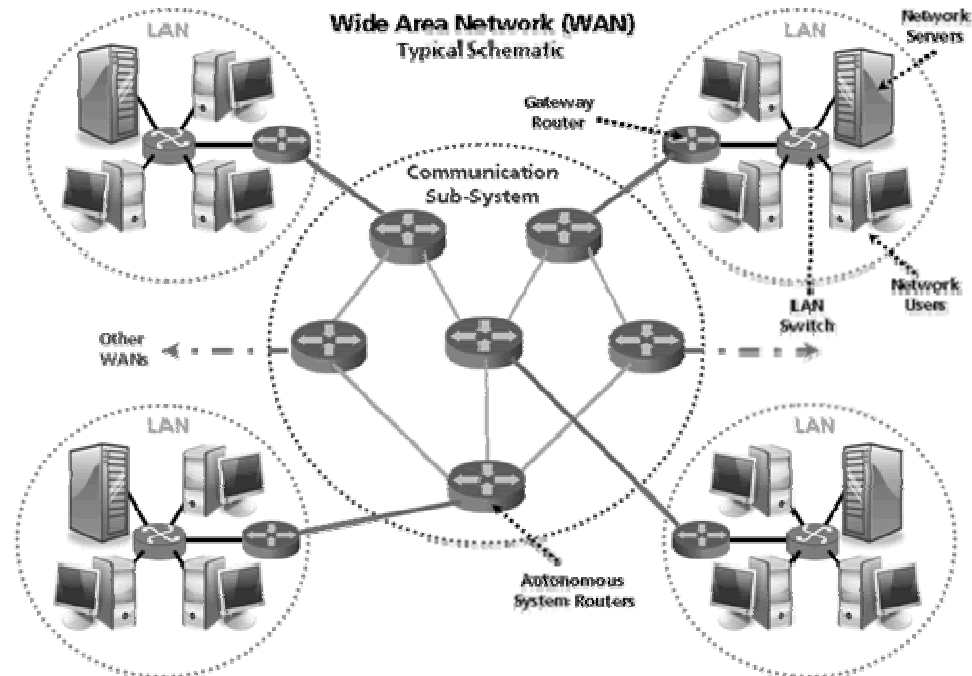
Fig. 4.3: Wide Area Network (WAN)

### 4.4.3    Types Of Wide Area Networks

There are mainly two types of WAN:
         *         Public Networks                                    *          Private Networks

### 4.3.1    Public Networks

Public networks are those networks which are installed and run by the telecommunication authorities and are made available to any organisation or individual who go for their subscription.

### 4.3.2    Private Networks

The basic technique used in all forms of private WAN is to use private circuits to link the locations to be served by the network. Between these fixed points the owner of the network has complete freedom to use the circuits in any way they want. They can use the circuits to carry large quantities of data or for high speed transmissions. Private wide area networks can be built using whatever standard technology is available.

## 4.5      INTERNET

The word Internet is derived from two words 'Interconnection' and 'Network'. 'Network' is a set of two or more computers that are connected through a set of hardware devices to share data/information. When a large number of such 'Networks' are 'Interconnected' together to exchange information, using same set of rules and regulations, they constitute the Internet. Internet is also known as mother of computer networks i.e. network of networks.

**There are several ways to describe the Internet:**

➢   **From a social point of view.**
     The Internet is a platform where people can communicate with others no matter where they are, their status, or their expertise. People communicate on the internet in a variety of ways: E-mail, Usenet, etc.

➢   **From commercial point of view.**

The Internet is a vast collection of information that can be searched and retrieved electronically. One can access the information or communicate with others on the Internet by using a collection of tools and services that give access to people, information, and resources. There are three basic services: Telnet, FTP, WWW, etc.

➢ **From technical point of view.**

As discussed earlier, the Internet is a Network of Networks. Every network and every computer on these networks exchange information according to some set rules and regulations which are called protocols. Two most commonly used protocols for working with the Internet are Internet Protocol (IP) or Transmission Control Protocol (TCP).

## 4.6      WORLD WIDE WEB

The term WWW refers to the World Wide Webor simply the Web. The World Wide Web consists of all the public web-sites connected to the Internet worldwide, including the client devices (such as computers and cell phones) that access Web content. The WWW is just one of many applications of the Internet and computer networks. The World Web is based on these technologies:

- HTML - Hypertext Markup Language
- HTTP - Hypertext Transfer Protocol
- Web servers and Web browsers

Researcher Tim Berners-Lee led the development of the original World Wide Web in the late 1980s and early 1990s. He helped build prototypes of the above Web technologies and coined the term "WWW." Web sites and Web browsing exploded in popularity during the mid-1990s.

**HTML**

HTML stands for **H**yper **T**ext **M**arkup **L**anguage. HTML is a **markup** language for **describing** web documents (web pages).A markup language is a set of **markup tags** and HTML documents are described by **HTML tags.** Each HTML tag **describes** different document content

**HTTP**

The Hypertext Transfer Protocol (**HTTP**) is an application protocol for distributed, collaborative, hypermedia information systems. **HTTP** is the foundation of data communication for the World Wide Web. Hypertext is structured text that uses logical links (hyperlinks) between nodes containing text.

In order to fetch a web page for you, your **web browser** must "talk" to a web server somewhere else. When web browsers talk to web servers, they speak a language known as HTTP, which stands for HyperText Transfer Protocol. This language is actually very simple and understandable and is not difficult for the human eye to follow.

## 4.7      WEB BROWSER

A **web browser** (commonly referred to as a **browser**) is a software application for retrieving, presenting and traversing information resources on the World Wide **Web**. An information resource is identified by a Uniform Resource Identifier/Locator (URI/URL) and may be a **web** page, image, video or other piece of content.

The two most popular browsers are Microsoft Internet Explorer and Mozila Firefox. Other major browsers include Netscape Navigator,Google Chrome, Apple Safari and Opera. While most commonly use to access information on the web, a browser can also be used to access information hosted on Web servers in private networks.

## 4.8      APPLICATIONS OF THE INTERNET

The wide variety of applications provided by Internet can be categorized into following categories according to their behavior:

### 4.8.1 Information Retrieval Services

The Internet has enabled individuals and organizations to publish ideas and information to a large audience online at minimal charges and no time delay. Those ideas can be published in one of the following forms:

**a) Web pages**

Internet provides a pool of information through the web pages available on almost every topic. These websites can be referenced with Uniform Resource Locators (URL's) which allow providers to symbolically identify services and clients to locate websites and access them using Hypertext Transfer Protocol (HTTP).

Web pages are designed using Hypertext Markup Language (HTML) which is a special formatting language that defines the placement and format of text and other objects on the webpage.

**b) Blogs**

Web logs or blogs are used as updateable online diaries as journals. Readers can post comments on each journal entry. The blogs are usually arranged in chronological order from the most recent post or entry at the top of main page to the older entries towards the bottom of the page.

**c) Advertisements**

The companies and organizations advertise their products via banners on popular websites. Banners are advertisements in the form of graphical images that runs across a webpage.

### 4.8.2 Communication Services

Internet provides its users one of the most attractive services to communicate over long distances. This communication can be carried out in one of the many forms mentioned here:

**a) Email**

Email is a basic communication service provided by the Internet. This is a way of sending electronic text messages between sender and receiver. Images, documents and other files can also be sent as mail attachments.

**b) Voice-over-Internet Protocol(VoIP)**

VoIP is a method of transmitting audio over the Internet by encoding analog audio in a digital form, transmitting it over the Internet, and decoding it back to analog form for listening. It carries the voice traffic over the Internet. VoIP can be free of cost or much less cost than a telephone, especially over long distances.

**c) Internet Relay Chat (IRC)**

IRC enables people all over the world to talk over the Internet in real-time sessions. One can connect to an IRC Server across the Internet through an IRC client application and join a network to participate in world-wide conversations.

### 4.8.3 Data Transfer Services

Retrieving the information is only a first step in the overall transfer of information. Actual data is transferred using specific protocols used in transferring files over Internet. Various protocols used in data transfer are listed below:

    **a)  File Transfer**

File Transfer Protocol (FTP) is the protocol used for exchanging files over the Internet. It is commonly used to download a file from a FTP server using the Internet or to upload a file to a FTP server.

    **b)  Gopher**

Gopher is a menu based document delivery system. An individual uses Gopher to access various types of information such as files, documents, and images. Gopher also allows access to ftp, telnet, and searchable databases. All of this is done by selecting items from menus.

<div align="center">

### 4.9      E-MAIL

</div>

E-mail stands for electronic mail. It is the most popular service or facility provided by the Internet through which we can electronically send and receive messages anywhere in the world. E-mail is a fast and efficient method of communication. It is almost free of cost. The e-mail reaches to the destination in a few seconds. You can also send documents, pictures, audio and video files via e-mail by attaching the file with e-mail. It is also possible to send or receive e-mail messages through a mobile phone.

E-mail is a fast and efficient method of communication. You can also send your important data files or information to your own mail account and download these when required.

**E-mail Address**

The general format of an e-mail address is:        **username@domain_name**

where **username** specifies the name of user or organization and **domain_name s**pecifies the name of server or ISP (internet Service Provider) of which the user is member.

For example**, "nasib.gill@mdurohtak.ac.in"** is e-mail address in which, "nasib.gill" is the name of user and "mdurohtak.ac.in" is the name of server.

**E-Mail Attachment**

Attachment is a powerful feature of e-mail, which enables you to send additional files with your e-mail message. In this way, you can send and receive messages as well as document or program files. You can send documents, pictures or images, and audio & video files via e-mail, anywhere over the network. Attachment size varies from one e-mail service provider to the other.

**Advantages of E-Mail**

There are several advantages of the e-mail facility available on the Internet. The main advantages of e-mail are:

1.  It is extremely fast and reaches to the destination in a few minutes or even in few seconds. Typically, it takes 1 to 5 minutes to reach a destination in Europe (USA, England etc.) from Pakistan.
2.  Its cost is either very low or almost free.
3.  One message can be sent to many persons with a single e-mail.
4.  It is available round the clock and round the globe.
5.  You can send and receive e-mail from anywhere in the world.
6.  You can attach and send any type of files.
7.  It is also possible to send or receive e-mail messages through a mobile phone.

**Limitations of E-Mail**

Although e-mail, provides the fast and efficient way to send and messages. It also has some limitations. These are described below.

1.  Email is not necessarily private. Your confidential message read by someone such as network administrator.
2.  Some email systems can send or receive text files only.
3.  It is difficult to express emotions using email.
4.  You can receive too much or unwanted emails.
5.  You may not know about the person with whom you are communicating.

**Free E-Mail Account**

Although you are provided with the e-mail account when you join any local ISP company there are also some websites that provide facility to Internet users to create their own e-mail account, free of cost. The most popular websites are:

*   http://www.gmail.com
*   http://www.yahoo.com
*   http: //www.hotmail.com
*   http: //www.rediffmail.com

After creation of your e-mail account, you are allotted username and password. You can check 'your e-mail account by entering the correct username and password. You can also compose and send the e-mail from your free e-mail account as well as you can manage your mails.

## 4.10    INTERNET BROWSING AND SEARCH ENGINES

Internet is a large source of information and contains almost millions of Web Pages related to almost every topic that can be thought of. Initially to search for any relevant item of information, user needs to browse from an initial starting address of a known website, and then begin searching for links from one webpage to another, hoping to reach to the required information. This technique is called **browsing.** Many searching tools are developed for the searchers to get the relevant information in minimum time possible with accurate results.

**Search Engines** are programs that search documents for specified keywords and return a list of the documents where the keywords were found. A **search engine** is really a general class of programs, however, the term is often used to specifically describe systems like Google, Bing and Yahoo! that enable users to search for documents on the World Wide Web.

## 4.11    INTERNET ACCESS DEVICES

**Internet access** connects individual computer terminals, computers, mobile devices, and computer networks to the Internet, enabling users to access Internet services, such as email and the World Wide Web.

Internet service providers (ISPs) offer Internet access through various technologies that offer a wide range of data signaling rates (speeds).

## 4.12    DOMAIN NAME SYSTEM

The Domain Name System (DNS) is a global database that translates domain names (such as www.mdurohtak.ac.in) to Internet addresses that are used by computers to talk to each other.

DNS also provides other information about domain names, such as mail services.

Domain names are fundamental to the Internet. Every Internet-connected device, whether a personal computer, smart phone, or gaming console, looks up each name in the global DNS, and uses the resulting Internet address to connect to the web server, send the e-mail or use the World Wide Web.

The Domain name system comprises of **Domain Names, Domain Name Space, Name Server** that have been described below:

**Domain Names**

Domain Name is a symbolic string associated with an IP address. There are several domain names available; some of them are generic such as **com, edu, gov, net** etc, while some country level domain names such as **in, au, uk, us** etc.

**Domain Name Space**

The domain name space refers a hierarchy in the internet naming structure. This hierarchy has multiple levels (from 0 to 127), with a root at the top. The following diagram shows the domain name space hierarchy.

### 4.13    TYPES OF INTERNET CONNECTIONS

In today's age, there are numerous ways to connect laptops, desktops, mobile phones, gaming consoles, e-readers and tablets to the Internet. Some of the most widely used Internet connections are described below.

**Wireless**

Radio frequency bands are used in place of telephone or cable networks. One of the greatest advantages of wireless Internet connections is the "always-on" connection that can be accessed from any location that falls within network coverage. Wireless connections are made possible through the use of a modem, which picks up Internet signals and sends them to other devices.

**Mobile**

Many cell phone and smartphone providers offer voice plans with Internet access. Mobile Internet connections provide good speeds and allow you to access the Internet on the go.

**Hotspots**

Hotspots are sites that offer Internet access over a wireless local area network (WLAN) by way of a router that then connects to an Internet service provider. Hotspots utilize Wi-Fi technology, which allows electronic devices to connect to the Internet or exchange data wirelessly through radio waves. Hotspots can be phone-based or free-standing, commercial or free to the public.

**Dial-Up**

Dial-up connections require users to link their phone line to a computer in order to access the Internet. This particular type of connection—also referred to as analog—does not permit users to make or receive phone calls through their home phone service while using the Internet.

**Broadband**

This high-speed Internet connection is provided through either cable or telephone companies. One of the fastest options available, broadband Internet uses multiple data channels to send large quantities of information. The term broadband is shorthand for broad bandwidth. Broadband Internet connections such as DSL and cable are considered high-bandwidth connections. Although many DSL connections can be considered broadband, not all broadband connections are DSL.

**DSL**

DSL, which stands for Digital Subscriber Line, uses existing 2-wire copper telephone line connected to one's home so service is delivered at the same time as landline telephone service. Customers can still place calls while surfing the Internet.

**Cable**

Cable Internet connection is a form of broadband access. Through use of a cable modem, users can access the Internet over cable TV lines. Cable modems can provide extremely fast access to the Internet.

**Satellite**

In certain areas where broadband connection is not yet offered, a satellite Internet option may be available. Similar to wireless access, satellite connection utilizes a modem.

**ISDN**

ISDN (Integrated Services Digital Network) allows users to send data, voice and video content over digital telephone lines or standard telephone wires. The installation of an ISDN adapter is required at both ends of the transmission—on the part of the user as well as the Internet access provider.

There are quite a few other Internet connection options available, including T-1 lines, T-3 lines, OC (Optical Carrier) and other DSL technologies.

## 4.14    MULTIMEDIA

A good general definition of multimedia is:

**Multimedia** is the field concerned with the computer-controlled integration of text, graphics, drawings, still and moving images (Video), animation, audio, and any other media where every type of information can be represented, stored, transmitted and processed digitally.

Multimedia means integration of multiple mediums such as audio, video, and animation in addition to traditional media (i.e., text, graphics drawings, images, etc).

Multimedia uses computers to present text, audio, video, animation, interactive features, and still images in various ways and combinations made possible through the advancement of technology. This is an exciting new field for those interested in computers, technology, and creative career options. Multimedia can be accessed through computers or electronic devices and integrates the various forms together. One example of multimedia would be combining a website with video, audio, or text images.

## 4.15    APPLICATIONS OF MULTIMEDIA

Applications of multimedia are limitless. However, following are main Application Areas of Multimedia:

- **Education & Training**
  - In Education, multimedia applications are used in educational games as well as for training purposes in various fields.
- **Entertainment**
  - Multimedia power is to use computers as a medium for entertainment. With the addition of computer games to the multimedia revolution, entertainment has reached new heights. Multimedia is also great for artistic expression.

- **Presentations**

  - PowerPoint can be very effective means of presentation in increasing viewers' enthusiasm and interest in the delivered contents. Most often, you will use only graphics, sound, video and hyperlinks.

- **Virtual Reality**

  o The goal of virtual reality is to create a three-dimentional world which feels real. the high level of interactivity is desired and is achieved by simulating world. virtual reality uses headsets and data gloves. the headset covers the eyes and ears and projects sights and sounds generated by the computer. the glove transmits orientation of hand, enabling the computer to tell where you are looking, reaching or pointing. this technology will enhance multimedia by supporting real time, interactive, three dimensional graphics.

- **Kiosk Displays**

  o Kiosk Displays are usually stand alone applications, frequently used in Museum displays, trade show exhibits, automated information centers in company lobbies and store promotional devices.

## SUMMARY OF THE LESSON

You learnt the following in this lesson:

- Information technology (IT) in simple words can be defined as a marriage of two technologies i.e. Computer Technology and Communication Technology that helps in all walks of life.

- IT is a term that encompasses all forms of technology used to create, store, exchange, and use information in its various forms (business data, voice conversations, still images, motion pictures, multimedia presentations, and other forms).

- A computer network is an interconnection of various computer systems located at different places. In computer network two or more computers are linked together with a medium and data communication devices for the purpose of communicating data and sharing resources.

- The need of a computer network arose due to limited resources, desire to share the resources and cost reduction.

- There are several types of networks but Local Area Network (LAN) and Wide Area Network (WAN) are the main ones.

- A local area network (LAN) is two or more computers directly linked within a small well-defined area such as a room, building, or group of closely placed buildings. A LAN may be made up of only microcomputers or any combination of microcomputers and large systems.

- A wide area network (WAN) is two or more computers that are geographically dispersed, linked by communication means such as telephone system, microwave, satellites, etc.

- The word Internet is derived from two words 'Interconnection' and 'Network'. 'Network' is a set of two or more computers that are connected through a set of hardware devices to share data/information. When a large number of such 'Networks' are 'Interconnected' together to exchange information, using same set of rules and regulations, they constitute the Internet.

- The World Wide Web consists of all the public web-sites connected to the Internet worldwide, including the client devices (such as computers and cell phones) that access Web content.

- A web browser (commonly referred to as a browser) is a software application for retrieving, presenting and traversing information resources on the World Wide Web.

- The wide variety of applications provided by Internet can be categorized into three main categories according to their behavior: Information Retrieval Services, Communication Services and Data Transfer Services.

- E-mail stands for electronic mail. It is the most popular service or facility provided by the Internet through which we can electronically send and receive messages anywhere in the world.
- Search Engines are programs that search documents for specified keywords and return a list of the documents where the keywords were found.
- Internet service providers (ISPs) offer Internet access through various technologies that offer a wide range of data signaling rates (speeds).
- The Domain Name System (DNS) is a global database that translates domain names (such as www.mdurohtak.ac.in) to Internet addresses that are used by computers to talk to each other.
- DNS also provides other information about domain names, such as mail services.
- In today's age, there are numerous ways to connect laptops, desktops, mobile phones, gaming consoles, e-readers and tablets to the Internet.
- ISDN (Integrated Services Digital Network) allows users to send data, voice and video content over digital telephone lines or standard telephone wires
- Multimedia means integration of multiple mediums such as audio, video, and animation in addition to traditional media (i.e., text, graphics drawings, images, etc).
- Applications of multimedia are limitless. However, main application areas of multimedia include Education & Training, Entertainment, Presentations, Virtual Reality and Kiosk Displays.

## SELF ASSESSMENT QUESTIONS AND EXERCISES

1. What is Information Technology (IT)?
2. How IT is important in the present scenario?
3. What are IT tools?
4. In which areas IT may play an important role?
5. What is a computer network? What are its benefits?
6. Differentiate between LAN and WAN.
7. What are different types of WAN?
8. What is ISDN? Discuss its importance.
9. What are different types of services of Internet?
10. What are the benefits and limitations of E-Mail ?
11. What is computer conferencing ? What are its benefits ?
12. What do you mean by internet?
13. Explain the evolution of internet?
14. Explain the various application of internet?
15. Explain the various ways to connect the internet?
16. What do you mean by e-mail?
17. What are the advantages and disadvantages of email?
18. What do you mean by search engine?
19. What do you means by Information Retrieval Systems ? State their importance.
20. What are the advantages and disadvantages of email?
21. What do you mean by search engine?
22. Explain the components of Search engine?
23. What is an Internet Service Providers? Give few examples.
24. What is DNS? Outline its significance.
25. What are different elements of multimedia technology?
26. What are applications of multimedia?

# CHAPTER-5

## OPERATING SYSTEMS

### OBJECTIVES OF THIS LESSON

This lesson is aimed to make you understand the basic concepts of software and operating systems. Readers will be able to understand the following:

- Software and its different types such as programming software, system software, application software and other software types
- Application software and its various types such as general-purpose application packages, application-specific packages and customised application packages
- Operating system and its characteristics, desirable features of operating system
- Classification of operating systems and their families
- Functions of operating system, main functions, basic roles of operating system, OS as an extended machine and as a Resource Manager
- Programming languages and its different types
- Generation of programming languages
- Operating system choices – DOS, UNIX and LINUX.
- Windows operating system, its common features, Windows Explorer, Control Panel, Print Manager and other elements of Windows
- UNIX operating system, its overview and few important commands.
- Outline of LINUX operating system
- User interface and its types. GUI, its features and important elements.

### STRUCTURE OF THIS LESSON

## 5.1      INTRODUCTION

The hardware alone can not perform any particular calculation, computation or manipulation without being instructed exactly what to do, when to do and how to do it. These instructions are very important and are called software.

The software acts as an interface between the user and the computer or a software can be defined as a complete set of instructions written by the programmer which enables the computer to obtain the solution to a problem.

Software may be viewed as a general term that is used to describe any single program or a group of programs.

In its most general form, software is a term used in contrast to hardware to refer to all programs which can be used on a particular computer system i.e. the term software is used to describe program sets needed to operate an information processing system.

## 5.2      SOFTWARE TYPES

Software is the means by which computer systems speak with computer users. Software forms the heart of computer systems.
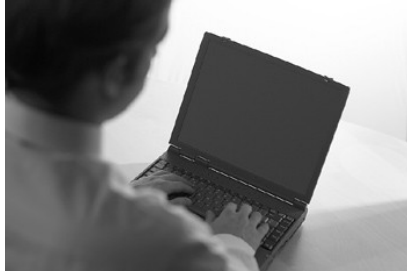
Figure 5.1

Software, by definition, is the collection of computer programs, procedures and documentation that performs different tasks on a computer system. The term 'software' was first used by John Tukey in 1958. Briefly, computer software is the language in which a computer speaks. There are different types of computer software.

### 5.2.1    Programming Software

This is one of the most commonly known and popularly used forms of computer software. These software come in forms of tools that assist a programmer in writing computer programs. Computer programs are sets of logical instructions that make a computer system perform certain tasks. The tools that help the programmers in instructing a computer system include text editors, compilers and interpreters.

### 5.2.2    System Software

It helps in running the computer hardware and the computer system. System software is a collection of system programs; device drivers, servers, windowing systems and utilities. System software helps an application programmer in abstracting away from hardware, memory and other internal complexities of a computer.

### 5.2.3    Application Software

It enables the end users to accomplish certain specific tasks. Business software, databases and educational software are some forms of application software. Different word processors, which are dedicated for specialized tasks to be performed by the user, are other examples of application software.

### 5.2.4    Other Software Types

Apart from these three basic types of software, there are some other well-known forms of computer software like inventory management software, ERP, utility software, accounting software and others.

## 5.4    APPLICATION SOFTWARE

An application package or application program is the software that has been written to process or perform specific job. The term application indicates that the software is applied to the job at hand. application packages are available for all types of tasks. These programs are called Application Packages because they accomplish the processing required for a particular application. They may be for business applications, engineering designs, home applications, teaching aids etc.

An end-user wishing to use an application package has to define his own requirements by means of parameters, which are employed by the programs in the system to produce the specific results required. These are usually written in high-level languages. Of course, the application packages run under the control of the operating system.

Application software is developed to aid in any task that benefits from computation. It is a broad category, and encompasses software of many kinds, including the internet browser being used to display this page. This category includes:

- Business software
- Computer-aided design
- Databases
- Decision making software
- Educational software
- Quantum chemistry & solid state physics software
- Simulation software
- Telecommunications (i.e., the Internet and everything that flows on it)
- Video editing software
- Video games

- Image editing
- Industrial automation
- Mathematical software
- Medical software
- Molecular modeling software

- Spreadsheets

- Word processing
  and so on.

Application packages can be classified as:

- General-purpose Application Packages
- Application-specific Packages
- Customised Application Packages

### 5.4.1   General-purpose Application Packages

It is that class of application packages that perform quite commonly used day-to-day tasks and also increase the productivity very significantly and that's why these are also known as productivity packages.

Some important examples of this category include:

- Word processing packages for processing and manipulating text
- Spreadsheet packages for calculating finances and data analysis
- CAD for designing or drafting
- Database packages for management of files, database, storage and retrieval of information
- Engineering design packages
- Communication packages
- Integrated packages, etc.

Some integrated packages have been developed which combine the functions of word processing, spreadsheets, graphics, database management and communication into a single software. MS-Office, Framework and Symphony are good examples of Integrated Packages.

### 5.4.2   Application-specific Packages

It is the type of application packages specifically meant for accomplishing a uncommon application. Few important examples include :

* **General Application Packages**
  * Payroll
  * Personnel Management

  * Attendance Management
    and so on.

* **Business Application Packages**
  * Inventory Control
  * Marketing Analysis
  * MRP (Material Requirements Planning)
  * Human-resource Managementand so on

  * Finance and Accounting

* **Scientific Application Packages**
  * Computer-Aided Designing and Drafting (CADD)
  * SPSS (Statistical Package For Social Sciences)
  * Computer-Aided Manufacturing (CAM)
  * Statistical Analysis Software (SAS)and so on.

* **Miscellaneous Application Packages**
  * Computer-Based Learning (CBL)
  * MIDI (Musical Instrument Digital Interface) Package
  * Computer-Based Training (CBT)and so on

### 5.4.3  Customised Application Packages

It is a kind of application packages developed by the professional programmers. It has become the trend of the present day Software Industry to develop such kind of packages. Natural Language Processing (NLP) is getting world-wide attention because these are non-procedural and are more closer to human conversation. This is trend has been geared up probably due to the development of the non-procedural 4GLs (4$^{th}$ Generation Languages). This trend will continue to grow as the development in multimedia, graphics, artificial intelligence, networking solutions enhance.

### 5.5     OPERATING SYSTEM

"Operating System (OS) is a collection of software written to provide the fundamental instructions that a computer needs to manage resources, such as memory, the file system, and processes".

In other words, OS is a master program that controls a computer's basic functions and allows other programs to access the computer's resources such as disk drive, printer, keyboard, and screen.

There are several definitions of operating system. Few of these are:

"Operating system is a set of system programs which controls all the computer's resources and provides the base upon which application programs can be written".

OR

"An operating system may be viewed as an organised collection of software extensions of hardware, consisting of control routines for operating a computer and for providing an environment for execution of programs".

OR

"An operating system is a set of procedures (manual and/or automatic) that enables people or group of people to share a computer installation efficiently".

OR

"An operating system is a program that act as an intermediary between a user of a computer and the computer hardware. The primary goals of an operating system are:

- To make the computer system convenient to use and

- To use the computer hardware in an efficient manner"                  OR

"An operating system is an integrated collection of subsystems and further each subsystem consists of programs that perform specific duties. Just as the processor is the nucleus of the computer system, the operating system is the nucleus of all types software activities".

**Examples of operating systems:** Linux, MS Windows 95, MS Windows NT, Windows XP, UNIX, DOS and OS/2.
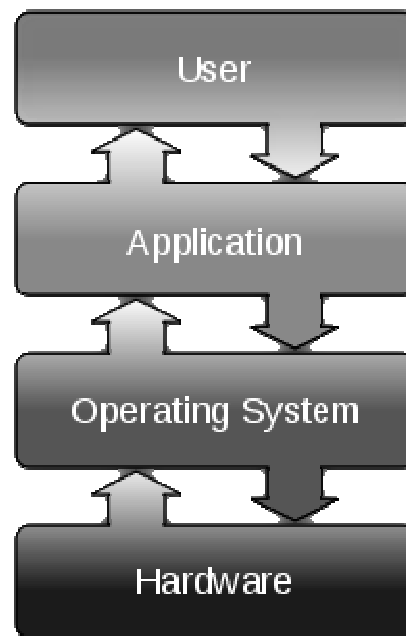
Fig. 5.2: Layers of Computer System

It co-ordinates all the hardware and software components of a computer
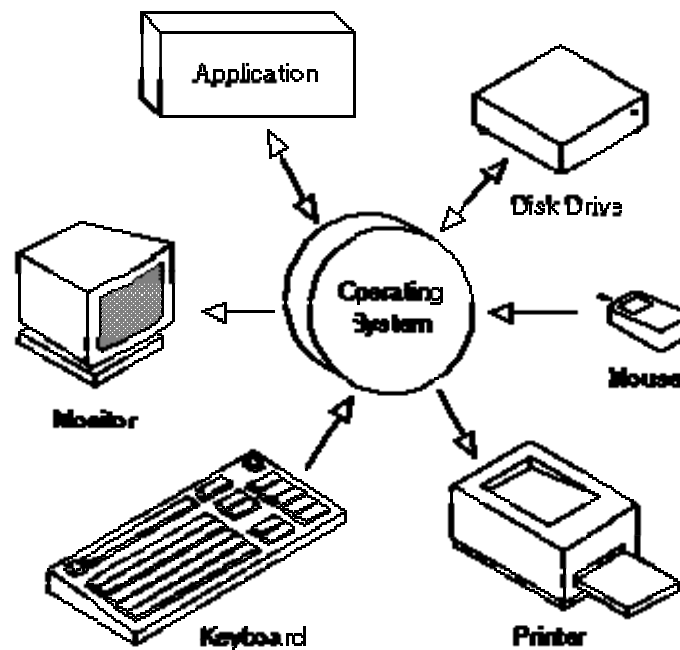


Fig. 5.3: OS as Co-ordinator

The following two types of programs make up the operating system:

    i)    Control programs and

    ii)   Processing programs

### 5.5.1    Control Programs

These programs oversee system operations and performs tasks such as input/output, scheduling, handling interrupts, and communication with computer operator or programmer. The control programs consist of the following :

a) Supervisor Programs
b) Job Control Programs
c) Input/Output Management Program

### 5.5.2    Processing Programs

These are executed under the supervision of control programs and are used by the programmer to simplify program operation for the computer system. They include language translator programs, link editors, library programs and a set of utility programs. These programs collectively automate the management of all the computing resources available in a computer system including CPU, all peripherals, and software. This integrated collection of programs provides more efficient computer operation. Improved operating convenience is another benefit of an operating system.

Typically, operating systems (OSs) are used in microcomputer systems. They require mass storage media such as magnetic tape or floppy disk. most microcomputers systems use operating systems only with floppy disk mass storage. For this reason, these operating systems are referred to as disk operating systems (DOS). The most commonly used operating systems on personal computers are MS-DOS and PC-DOS.

## 5.6    CHARACTERISTICS OF OPERATING SYSTEM

- Sharing
- Concurrency
- Long-term Storage
- Non-determinacy

## 5.7    DESIRABLE FEATURES OF OPERATING SYSTEM

- Efficiency
- Reliability
- Small-Size
- Maintainability

Thus the operating system is responsible for directing a given computer into a batch mono-programming system, a multi-programmed system, a time-sharing system or a real-time system. Many operating systems can handle both batch and real-time applications simultaneously.

## 5.8    BOOTING (OR BOOTSTRAPPING)

The process of loading the operating system into memory is known as booting. When a computer is turned on the operating system must be brought into the memory of computer from the hard-disk storage. The process is normally started by a small program called bootstrap loader. This program resides in a ROM as a firmware. A computer is designed to fetch its very first instruction from the ROM when power is turned on. The first instruction is bootstrap loader. It is very simple program sufficient only to direct the CPU to look for specific file on the disk memory, and executes the instructions stored in the file. The file contains machine codes to direct the CPU to continue loading the rest of the operating system into the memory. When the operating system is fully loaded into the memory, the computer is ready to accept user's commands.

## 5.9    FAMILY OF OPERATING SYSTEMS

The family of operating systems have evolved over the years:

a) Windows family of OS:
   Windows 1.0                                              Windows 2.0
   Windows 3.0 (the first version to make substantial commercial impact)

Windows 3.1x
Windows 95 (aka Windows 4.0)
Windows 98 (aka Windows 4.1)
Windows Me (aka Windows 4.2)
OS/2 (developed jointly with IBM)
**Windows NT**
Windows 2000 (aka Windows NT 5.0)
Windows XP (aka Windows NT 5.1)
Windows Server 2003 (aka Windows NT 5.2)
Windows Vista (to be released August 2006)
Windows Longhorn Server (to be released shortly after Windows Vista)
Microsoft Codename Blackcomb (to follow Vista)

b)  Apple/Macintosh                                    Lisa OS
    Apple DOS                                          A/UX
    ProDOS                                             Mac OS
    GS/OS                                              System 6
    System 7 (code-named "Big Bang")
    Mac OS 8                                           Mac OS 9
    Mac OS X
    Mac OS X v10.0 (aka Mac OS X 10.0 "Cheetah")
    Mac OS X v10.1 (aka Mac OS X 10.1 "Puma")
    Mac OS X v10.2 (aka Mac OS X 10.2 "Jaguar")
    Mac OS X v10.3 (aka Mac OS X 10.3 "Panther")
    Mac OS X v10.4 (aka Mac OS X 10.4 "Tiger")
    Mac OS X v10.5 (aka Mac OS X 10.5 "Leopard")
    Mac OS X Server                                    Darwin

c)  Unix                     d)  Linux                     e)  Solaris.

## 5.10    FUNCTIONS OF OPERATING SYSTEM

The main functions of OS are:

1.   It manages the hardware and software resources of the system. In a desktop computer, these resources include such things as the processor, memory, disk, etc.

2.   It provides a stable, consistent way for applications to deal with the hardware without having to know all the details of the hardware.

### 5.10.1  Main Functions

OS acts as an interface between hardware and users. It controls overall operations of computers. It is mainly used for job management, data management, virtual memory management, input/output management, process management, security etc.

a)  Job Management: OS manages the job waiting to be processed. It recognizes the jobs, identifies their priorities, allocates the memory for the job, schedules and finally runs each job at the appropriate moment.

b)  Data Management: Data management keeps track of the data on disk, tape and optical storage devices. The operating system's file system knows where that data are physically stored.

c)  Virtual Storage Management: OS is used for virtual memory management. OS makes possible to increase the capacity of main memory with out actually increasing its size.

d)  Input/output Management: OS manages the input and output operation of computer. This applies to the flow of data among the different devices of computer and application programs.

e) Process Management: The main activities of process management are job queuing, job scheduling, keeping track of the status of each process etc.

f) Protection and Security: OS job is to secure data inside the memory of computer. Operating systems provide password protection to keep unauthorized users out of the system.

g) User Interface: OS acts as an interface between a user of a computer and the computer hardware.

### 5.10.2 Basic Roles of Operating System

a) Easy interaction between human and computer.
b) Starting computer operation automatically.
c) Loading and scheduling users' programs/processes.
d) Controlling I/O devices
e) Managing various types of memories such as primary, secondary, cache etc.
f) Providing security to users' jobs and files.
g) Accounting hardware resources and handling network communication.
h) Allowing users to share data and software among themselves.
i) Preventing the system from unauthorized user, programs etc.

### 5.10.3 OS as an Extended Machine

The OS effectively isolates the hardware from the user. The user communicates only with the OS and it links the various languages and the systems and applications programs available. The OS fields all requests for services and totally eliminates the need for the user to deal with the hardware or related problems. Thus the operating system allows the user to concentrate on his application and prevents him for having to spend a lot of time determining how things are to be specifically accomplished by the hardware.

In this view, the function of an operating system is to prevent the user with the equivalent of an Extended Machine or Virtual Machine that is easier to program than the underlying hardware.

### 5.10.4 OS a Resource Manager

An operating system's major function is to manage the resources of the computer system. It allocates the resources on the basis of the user need and system capability. The four major functions of an operating system are:

        i) File and Software Management
       ii) Input/Output and Peripheral Management
    iii) Memory Management
    iv) Processor (or CPU) Management

As a Resource Manager, the operating system must perform the following functions for each resource viz. processor, memory, I/O, files :

a) Keep track of status of each resource

b) Decide which job should get the resource and for how much time, according to some policy

c) Allocate the resource to the job decided

d) After the resource is used by the job for the allocated time, make the resource free

## 5.11    CLASSIFICATION OF OPERATING SYSTEMS

Within the broad family of operating systems, these may be categorized based on the types of computers they control and the sort of applications they support. These may be classified in the following categories:

- Single-user, Single-task Operating System
- Single-user, Multi-task Operating System
- Multi-user Operating System
- Multi-access Operating System
- Multi-processing Operating System
- Multi-tasking and Multi-threading Operating System
- Real-time Operating System
- Distributed Operating System

- Embedded Operating System

### Single-user, single task Operating System

As the name implies, this operating system is designed to manage the computer so that one user can effectively do one thing at a time. The Palm OS for Palm handheld computers is a good example of a modern single-user, single-task operating system. Other examples of such operating systems include MS-DOS, PC-DOS, etc.

### Single-user, multi tasking Operating System

This operating system allows a computer to perform more than one task at a time. Microsoft's Windows and Apple's Mac OS (Leopard) platforms are both examples of operating systems that will let a single user have several programs in operation at the same time.

### Multi-user Operating System

A multi-user operating system allows many different users to take advantage of the computer's resources simultaneously. UNIX, VMS and mainframe operating systems, such as MVS, are examples of multi-user operating systems.

These operating systems allow two or more users to run their respective programs at the same time by making all these programs resident in the memory of computer. Such operating systems are normally made to work on minicomputers and mainframe computers.

**Examples** : **VMS (on DEC Mainframes), UNIX, XENIX, MVS, etc.**

### Multi-access Operating System

In a multi-access operating system, a user may submit a job by typing on a terminal and may use the terminal to monitor and control the job as it runs. These operating systems allow simultaneous access of a single application onto a computer system through two or more terminals.

The operating system shares the computing resources among the different jobs so that it appears to each user that he has entire machine to himself.

An example is provided by some dedicated transaction-processing systems, such as Airline Ticket Reservation Systems, that supports hundreds of active terminals under control of a single program.

### Multiprocessing Operating System

It is that class of operating systems that have the ability to support more than one process at the same time i.e. allowing more than one programs to run concurrently on the multiple CPUs in a single computer system. These operating systems differ from the time-sharing (or multi-user) operating systems in the manner that these refer to utilisation of multiple CPUs.

In such operating system, the resources are allocated comfortably to the competing processes in a reasonable manner which results in a high throughput.

**Examples : OS/2 for high-end PCs, UNIX, MVS, etc.**

**Multitasking and Multithreading Operating System**

These operating systems have the capability to execute more than one task concurrently on a computer system having a single CPU. In these operating systems, CPU switches from one task to another so quickly that it gives the illusion to the user of executing all the programs (or tasks) at the same time.

Multithreading permits different portions of a single program to run concurrently and this it is having the ability of an operating system to execute different parts of a program (called threads) simultaneously. It requires the programmer to design the program so carefully that all the threads can run at the same time without interfering with each other.

**Examples : Windows 95/98, Windows NT, OS/2, etc.**

**Real-time Operating Systems (RTOS)**

Real-time operating systems are used to control machinery, scientific instruments and industrial systems.

These operating systems have the following peculiar characteristics:

- Fast response time
- Feedback mechanism
- Reliability

A primary objective of real-time operating systems is to provide quick response-times, and thus meet the scheduling deadlines. In the design of these operating systems, user-convenience and resource utilisation are of secondary concern.

These operating systems must be designed in such a manner that response-time to the external-stimulus is very immediate as the same are designed for the purpose of controlling and monitoring of external activities with timing constraints.

Such applications include :

- Industrial Control
- Telephone Switching Equipments
- Flight-Control
- Real-time Simulators
- Few Military Applications etc.

**Examples:**

Some examples of real time operating systems are:

- BLMX (Board-Level Multitasking eXecutive)

- BSO/RTOS (Boston Systems Office/ Real-time Operating System)

- CCP (Communication Control Program) Operating System for IBM System/3

- iRMX (Intel's 8086 family Real-time Multitasking Executive) Operating System

- DMERT (Duplex Multiple Environment Real-time) Operating System

  etc.

**Distributed Operating Systems**

A distributed operating system governs the operation of a distributed computer system and provides a virtual machine abstraction to its users. The key objective of a distributed operating system is transparency. Ideally, component and resource distribution should be hidden from users and application programs unless they explicitly demand otherwise.

The added services necessary for pooling of shared system resources include:

- Global naming
- Distributed file system, and
- Facilities for distribution of computations, such as inter-node process communication and remote procedure calls.

**Embedded Operating System**

Embedded operating systems are mainly executed on computers that control devices. These devices are mobile phones, TV sets etc. These systems consist of circuits and 32-bit microprocessors that control the functioning of various operations.

Apart from the above main criterion for classification of operating systems, there will be other criterion as well, like basing on whether it is open code or not and whether it is available for free and similar.

Fig. 5.4 shows widely used operating systems in the market.
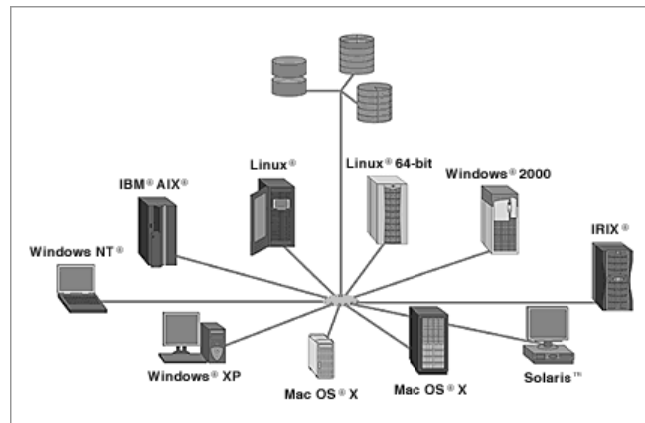


Fig. 5.4: Widely used OS

### 5.12    PROGRAMMING LANGUAGES

A language is a vehicle for communication. In order to communicate with each other, humans need languages like English, Hindi, etc. In the same manner, for communicating with the computer, we use computer language called programming language. A programming language consists of all the symbols, characters and usage rules that permit people to communicate with computers. Learning to program requires learning all these symbols and rules.

Programming language is a systematic notation by which we describe computational process. Computational process means steps for solving a problem. Programming language consists of symbols, characters and certain rules. There are various programming languages each with a specific purpose. Every language has its own instruction set that permits the operation to be performed.

If we want to make our computer to do something for us, we have to tell the computer what to do in a language that a computer understands called a machine language (language of 0 and 1). Communication with the computer is possible only if we develop a third language that can be understood by both us and the computer. Such a language is called a Programming Language.

### 5.13    GENERATION OF PROGRAMMING LANGUAGES

Another categorisation on the basis of the introduction of the programming languages is as follows:

- **First Generation Language    : Machine Language**
- **Second Generation Language  : Assembly Language**
- **Third Generation Language    : High Level Languages**

- **Fourth Generation Language  : 4 GLs (4ᵗʰ Generation Languages) or
                                 Very High Level Language**
- **Fifth Generation Language     : Natural Language**

### 5.13.1  Machine Language

This is a sequence of instructions written in the form of binary numbers consisting of 1s and 0s to which the computer responds directly. A machine language would have two parts.

The first part is the command or an operation that tells the computer what functions are to be performed. The second part of the instruction is the operand that tells the computer where to find or store the data on which the desired operation is to be performed. The machine language is the only one that computer can understand directly. In the earlier computers programmers had to translate instructions directly into machine language from the computers understood. This task was very difficult and very few programmers could do this job. So, this language was very difficult to understand. But the main advantage of this language is that it is faster in execution as the computer directly starts executing it.

### 5.13.2  Assembly Language

To ease the burden of the programmer, mnemonic operation codes and symbolic addresses were developed during the early 1950s. The mnemonic refers to a memory aid. One of the first steps for improving the program preparation process was to substitute letter, symbols and mnemonics for the mnemonic machine-language operation codes. Today every computer has a mnemonic code, though the actual symbols vary among makes and models.

Machine language is still used by the computer as it process data but assembly language software first translates the specified operation code symbol into its machine language equivalent. Symbolic addressing is the practice of expressing an address not in terms of its absolute numeric location but in terms of symbols that are convenient for the programmers. Programmers no longer assign actual address numbers to symbolic data items. Now, they merely specify where they want the first location in the program to be and an assembly language program takes it from there, allocating locations for instructions and data.

A program written by a programmer in an assembly language is called a Source Program. After this source program has been converted into machine code by an assembler, it is referred to as an Object Program. The main advantage of assembly language is that the programs written in it are easy to understand as compared to the programs of machine language. And a big drawback is that they are machine-oriented, depending upon the model of processor being used.

### 5.13.3  High Level Language (Hll)

The development of mnemonic technique and macro-instruction led, to the development of high level languages that are often oriented towards a particular class of problem. Unlike assembly programs, HLL programs may be used with different makes of computers with the little modifications. Thus, re-programming expense may be greatly reduced when new equipment is acquired.

The main advantages of HLL are as follows:

| | |
|---|---|
| Readability | Programs written in these languages are more easily readable than those in assembly language and machine language. |
| Portability | Programs could be run on different machines with little or no changes. |
| Easy debugging | Errors are easy to find and remove. |
| Easy software development | Software could easily be developed using the HLL. |

The time and cost of creating machine and assembly languages was quite high. And this was the prime motivation for the development of high level languages.

High level languages may further be classified into following classes according their areas of application:

**a) Scientific Programming Languages**

**Examples**

    i)   FORTRAN (FORmula TRANslation)
    ii)  ALGOL (ALOGOrithmic Language)
    iii) IAL (International Algebraic Language) [Later named as ALGOL]
    iv) PL/I (Programming Language I)
    v)  COGO (COordinate GeOmetry Language)
    vi) APL (A Programming Language)
    vii) Pascal (Named after a great scientist Blaise Pascal)etc.

**b) Business Programming Languages**
**Examples :**
    i)  COBOL (COmmon Business Oriented Language)
    ii) PL/I (Programming Language I)etc.

**c) General or Multipurpose Languages**
**Examples :**
    i)   PL/I (Programming Language I)
    ii)  Pascal
    iii) BASIC (Beginner's All-purpose Symbolic Instruction Code)
    iv)  C
    v)   JOVIAL (Jules' own version if International Language)
    vi) Adaetc.

**d) Specialized Programming Languages**
**Examples :**
    i)  LISP (LISt Processing)
    ii) PROLOG (PROgramming in LOGic)
    iii) Ada (Named after a first lady programmer Augusta Ada)
    iv) LOGO (for teaching geometry, mathematics and programming to children)
    v)  RPG (Report Program Generator)
    vi) Modula-2
    vii) APT (Automatic Programming Tool)
    viii) NELIAC (Navy Electronics Laboratory International Algol Compilers)
    ix) CORAL (For Real-time Applications)
    x)  FORTH (Originally developed to be used by astronomers & later used for process control applications)
    xi) SIMULA/ SIMULA 67 (Simulation Language)
    xii) GPSS (General Purpose Simulation System) Language
    xiii) SNOBOL (StriNg-Oriented symBOlic Language)
    xiv) SIMSCRIPT (Simulation Script) Languageetc.

**e) Interactive Programming Languages**
**Example:**
    i)  BASIC (Beginner's All-purpose Symbolic Instruction Code)
    ii) APL (A Programming Language)
    iii) Interactive FORTRAN
    iv) QUICKTRAN (Subset of FORTRAN and designed for use with multi-access systems)etc.

**f) Object-Oriented Languages**
**Examples :**

| | | |
|---|---|---|
| i)  C++ | iv) Simula | vii) CLOS, etc. |
| ii)  Smalltalk | v)  Object Pascal | |
| iii) Eiffel | vi) Object C | |

### 5.13.4 Fourth Generation Languages (4GLs): Very High Level Languages (VHLLs)

The syntax used in 4GL is very close to human language, an improvement from the previous generation of languages. 4GL languages are typically used to access databases and include SQL and ColdFusion, among others.

Looking analytically into the wide-perspective of 4GLs, these can be classified mainly into three categories:

- **Application Generators**
- **Production-Oriented 4GLs**
- **End-User-Oriented 4GLs**

### 5.13.5 Fifth Generation Languages (5GLs): Natural Languages

These are known as $5^{th}$ generation language and are often called Natural Languages because of their resemblance to the natural spoken English Language. These languages are still in the development stages. Application of these languages will be quite beneficial in the area of Artificial Intelligence (AI) and Expert Systems (ES).

5GLs are currently being used for neural networks. A neural network is a form of artificial intelligence that attempts to imitate how the human mind works.

## 5.14    OPERATING SYSTEM CHOICES

There are more than a dozen of operating systems commonly used by users. Few of these are discussed below:

### 5.14.1  DOS

DOS is an acronym for "Disk Operating System". DOS is a 16-bit, single-user operating system that does not support multi-tasking. It is far easier to administer than UNIX, but less powerful. Compared to graphical interfaces such as Windows and Mac OS X, it's also not particularly user-friendly.

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

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

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

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

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

### 5.14.2   Windows Operating System

**Microsoft     Windows** (or      simply **Windows**)     is     a     metafamily     of graphical operating systems developed, marketed, and sold by Microsoft. It consists of several families of operating systems, each of which cater to a certain sector of the computing industry.

The Windows operating system is developed and maintained by Microsoft, the company founded by Bill Gates. The first version was released in 1985. Since then, it has grown significantly, and it now dominates the market. Windows uses a graphical user interface to make it easier for people to use their computers. The primary ways that people navigate are through icons on the desktop and the Start menu.

As of April 2014, the most recent versions of Windows for personal computers, smartphones, server computers and  embedded  devices are  respectively Windows  8.1, Windows  Phone  8.1, Windows Server 2012 R2 and Windows Embedded 8. A specialized version of Windows runs on the Xbox One game console.

The next version of Windows is Windows 10 and is currently available as a technical preview; it is set for release for phones, tablets, laptops, and PCs in late 2015.

#### 5.14.2.1Windows Explorer

Windows Explorer displays the hierarchical structure of files, folders, and drives on your computer. It also shows any network drives that have been mapped to drive letters on your computer.

**Windows Explorer** is automatically launched any time you open a folder in **Windows** XP.

Using Windows Explorer, you can copy, move, rename, and search for files and folders. For example, you can open a folder that contains a file you want to copy or move, and then drag the file to another folder or drive.

There are other places in Windows where you can view and work with files and folders. My Documents is a convenient place to store documents, graphics, or other files you want to access quickly.

You can also view My Network Places, which lists other computers that are connected to your local area network (LAN). When you delete files or folders from your hard disk, Windows places them in the Recycle Bin, where you can retrieve them, until you empty the Recycle Bin. Files or folders deleted from a floppy disk or a network drive are permanently deleted and are not sent to the Recycle Bin.

To open Windows Explorer, click **Start**, point to **All Programs**, point to **Accessories**, and then click **Windows Explorer**.

#### 5.14.2.2Print Manager

Both in Windows 7 and Windows 8, the Print Management console is part of Administrative Tools. However, it is not available in all editions of Windows. Only users of Windows 7 Professional, Ultimate and Enterprise will be able to use it. In Windows 8 it is available in Windows 8 Pro and Enterprise.

While a search for the term Print Management in Windows 7's Start Menu will return the appropriate result, doing the same in Windows 8's Start screen will not. That's why, to make sure you find it, it is best to open the Control Panel and go to System and Security -> Administrative Tools.

Fig. 5.5: Administrative Tools Menu
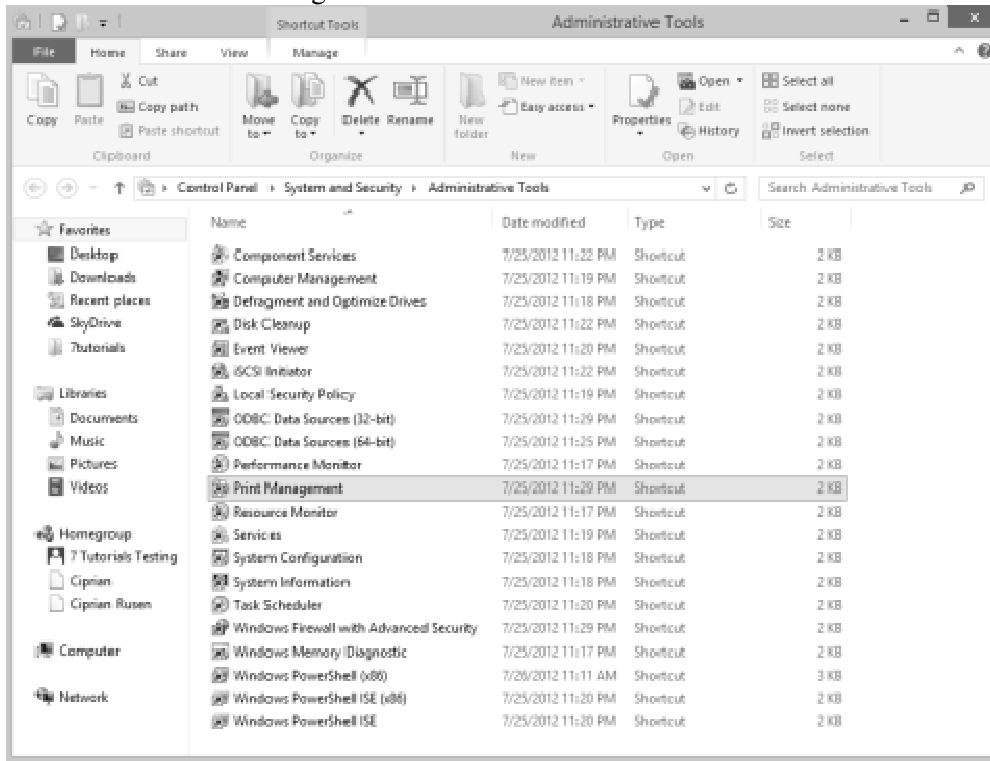


This will work both in Windows 7 and Windows 8.

When you first launch Print Management, its window will look similar to the screenshot below.
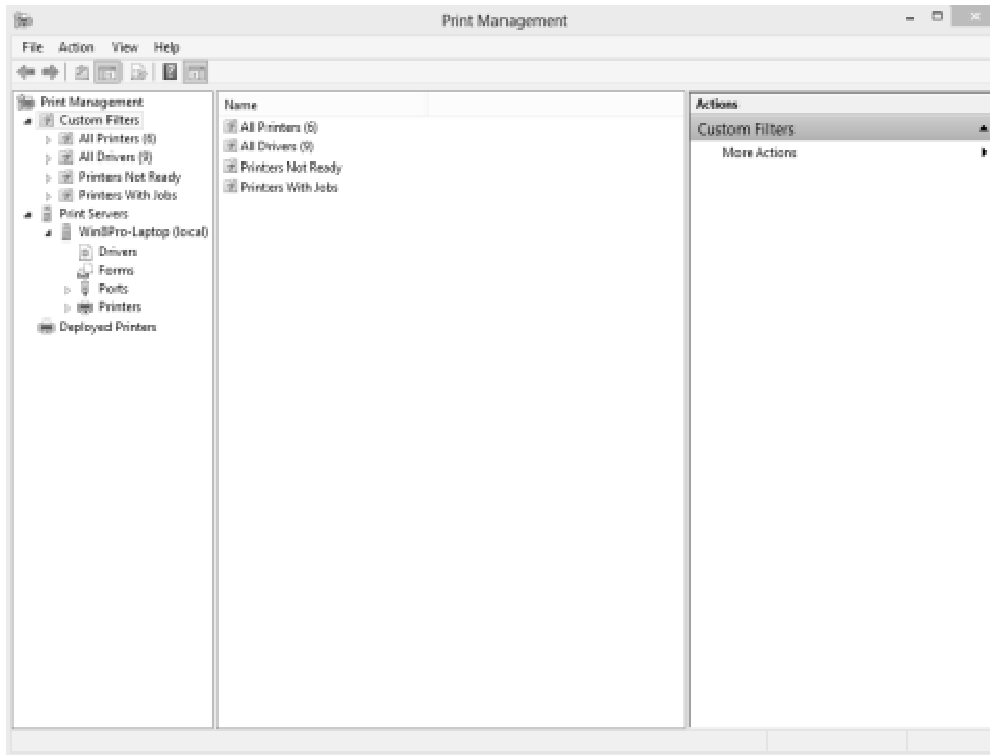


Fig. 5.6: Print Management Menu

**5.14.2.3 Control Panel**

The Control Panel is a part of the Microsoft Windows graphical user interface which allows users to view and manipulate basic system **settings** and controls via applets, such as adding hardware, adding and removing software, controlling user accounts, and changing accessibility options.

To open the Control Panel, click the Start button on the taskbar and then click Control Panel on the Start menu. Windows 7 gives you three different views for looking at your computer's Control Panel: To switch views, click the View By drop-down button (labelled Category by default) in the upper-right corner of the Control Panel and then choose one of the views from the button's drop-down



menu.

**Fig. 5.7: Control Panel Menu**

By default, the Control Panel is displayed in Category view, which is separated into eight categories, ranging from System and Security to Ease of Access. To open a window with the Control Panel options for any one of these categories, simply click the category's hyperlink.



Fig. 5.8: Control Panel Menu

**5.14.2.4 Paint Brush**

Paint formerly known as Paintbrush for Windows is a simple graphics painting program that has been included with almost all versions of Microsoft Windows since its first release. It is often referred to as MS Paint or Microsoft Paint.

The program opens and saves files as Windows bitmap (24-bit, 256 color, 16 color, and monochrome, all with the .bmp extension), JPEG, GIF, PNG, and TIFF. The program can be in color mode or two-color black-and-white, but there is no gray scale mode. For its simplicity, it rapidly became one of the most used applications in the early versions of Windows—introducing many to painting on a computer for the first time—and still has strong associations with the immediate usability of the old Windows workspace.

**Steps to Start the Paint Brush**

1).Click on the Start Button.

2).Click Programs.

3).Click Accessories.

4).Click on Paint.

Then you will screen as shown below:
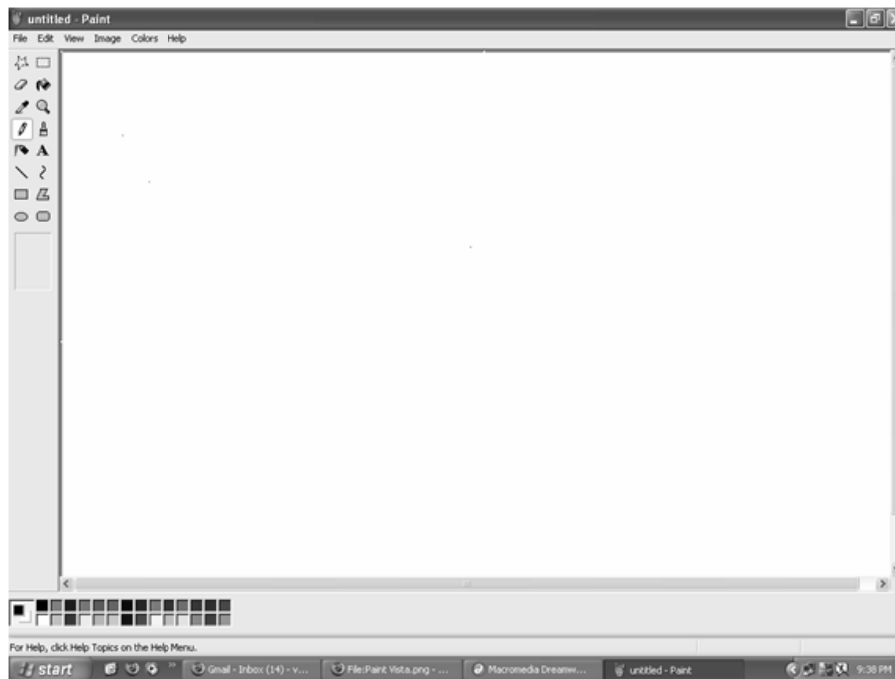


Fig. 5.9: Paint Screen

**Menus**

Four of the Paint menus—File, Edit, View and Help—are common to almost all Windows programs. Menus that are special to Windows Paint are Image and Colors. The menu of greatest interest is the Image Menu.
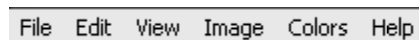


Fig. 5.10: Paint Menu

| **Toolbox**

All the little grey boxes down the left are called the tools and together they make the toolbox. The individual tools will each be explained separately further down. Under the toolbox is a small area where you see different options according to which tool you're using.



Fig. 5.11: Paint Toolbox

**Paste Options**

In this picture, with the selection tool active, you have a choice between paste opaque and paste transparent (selected, as you can tell by the dark background).



Fig. 5.12: Paint Paste Options

**The Colour Palette**

Under the main window is the colour palette. The two squares set apart from the rest at the left end of the palette show the active colours; the colours presently in use. When you click on a colour in the palette with the left mouse button, that colour will be the primary or foreground colour, here shown as pink. The colour you click on with the right mouse button will be the secondary or background colour, here shown as white.

**5.14.2.5 Calculator**

You can use Calculator to perform simple calculations such as addition, subtraction, multiplication, and division. Calculator also offers the advanced capabilities of a programming, scientific, and statistical calculator.

You can perform calculations by clicking the calculator buttons, or you can type calculations by using your keyboard. You can also use the numeric keypad to type numbers and operators by pressing Num Lock. For more information about using the keyboard with Calculator, see **Keyboard shortcuts**.

Fig. 5.13: Calculator

**Calculator window**

1. Open Calculator by clicking the **Start** button 🔘. In the search box, type **Calculator**, and then, in the list of results, click **Calculator**.
2. Click the **View** menu, and then click the mode that you want. When you switch modes, the current calculation is cleared. Calculation history and numbers stored by the memory keys are retained.
3. Click the calculator keys to perform the calculation you want.

**5.14.2.6 Desktop**

Desktop is a common term used to describe a **desktop computer**. When referring to an operating system or GUI, the **Desktop** is a system of organization of icons on a screen. The Microsoft Windows Desktop was first introduced with Microsoft Windows 95 and has been included with all versions of Windows since then. Below is a basic example of the Microsoft Windows Desktop.



Fig. 5.14: Windows 7 Desktop

In the above picture, is an example of the Microsoft Windows 7 Desktop. In this picture, there are no icons on the Desktop and at the bottom of the window is the Taskbar.

Press the shortcut key **Windows key + D** at any time to get to the Windows Desktop. Press the same keys again to restore Windows back to how they were before they were minimized.

Some of the most common icons on the Desktop include the **My Computer** icon, **Recycle Bin**, your Internet browser icon (e.g. **Internet Explorer**), and **My Documents**. On the Windows Desktop, you can also have access to the Windows **Start Menu** through the Start button on the **Taskbar** and the **Windows Notification Area.**

### 5.14.2.7 My Computer

The 'My Computer' icon gives us easy access to our hard drives, removable flash drives and other network-related locations. But if you're one who enjoys a **clutter-free desktop**, then maybe you can use this tweak to remove the many program and folder shortcuts on your desktop.
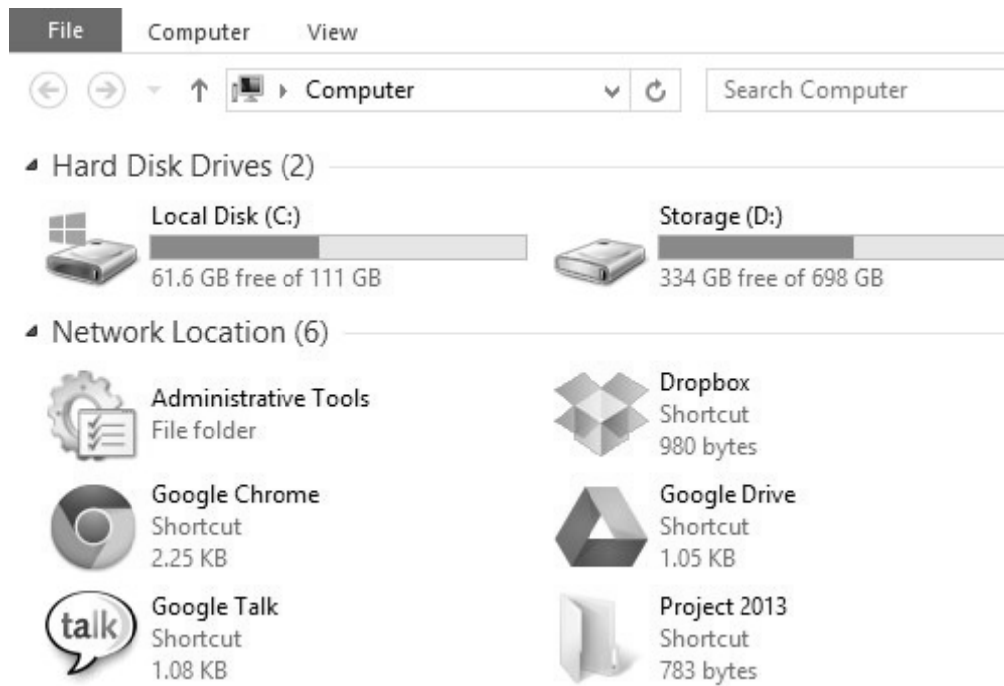


Fig. 5.15: My Computer

Here's a way to get more usefulness out of "My Computer" by adding the shortcuts that you need to it. This also gives you **quick access** to the program or folder and works very well with Windows Explorer tabs tweak like Clover.

### 5.14.2.8 Find and Run

Find is another great command line tool that every Windows user should know about because it can be used to search content of files for specific strings of text.

As with every command prompt based tool in Windows, there are certain switches and parameters you will need to know in order to use the tools effectively. These are listed and explained below.

1. /v – This switch will show any lines that don't contain the string of words you specified.
2. /c – This switch tells the find tool to count how many lines contain your search terms.
3. /n – This switch shows the numbers that correspond with the lines.
4. /i – This switch tells find to ignore the case of text you are searching for.

Like every tool in windows, you will need to know how to enter your commands. The syntax below is the perfect model.

> FIND [SWITCH] "String" [Pathname/s]

Depending on your command, you will receive one of three %errorlevel% responses.

1. 0 – The string you were searching for was found.

2.  1 – The string you were searching for was not found.
3.  2 – This means you had a bad switch or your parameters were incorrect.

There are several ways to launch or run commands in Windows and few of these are as under:

## 1. Launch the Command Prompt Using Search (Windows 7 & Windows 8)

Search is very helpful, both in Windows 7 and Windows 8. In Windows 7, open the Start Menu and type command or cmd.
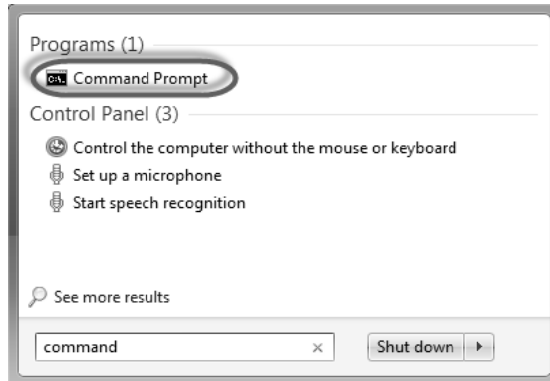


Fig. 5.16: Launching command

Then, click the Command Prompt search result.

In Windows 8, go to the Start screen and type command or cmd.

Then, click or tap the Command Prompt search result.

## 2. Launch the Command Prompt from the Run Window (Windows 7 & Windows 8)

One of the quickest ways to launch the Command Prompt is to use the Run window (pressWin+R on your keyboard to open it).

Then, type cmd or cmd.exe and press Enter or click/tap OK.
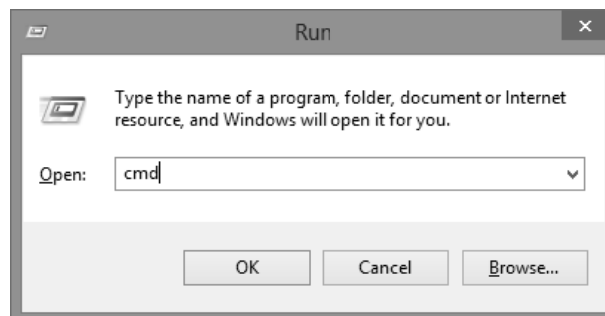


Fig. 5.16: Run Window

## 3. Launch it from the Start Menu/Screen (Windows 7 & Windows 8)

If you like clicking on stuff and you are using Windows 7, open the Start Menu. Then, go to All Programs -> Accessories.
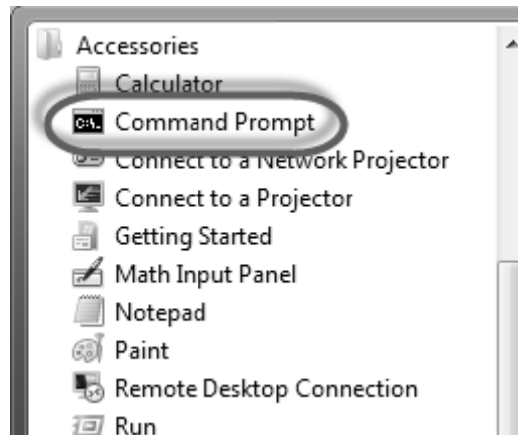
Fig. 5.17: Running command from Start Menu

There you will find the Command Prompt shortcut.

### 5.14.3   UNIX

**Unix** (pronounced as YOO-niks) is a family of multitasking, multiuser and time-sharing **operating system** that is derived from the original AT&T **Unix**, developed in the 1970s at the Bell Labs research center by Ken Thompson, Dennis Ritchie, and others. UNIX is the trademark.

UNIX is a **multi-user** operating system. This means that multiple users can use the system at the same time. Concretely, this means that, for instance, dozens of users can log in from a certain location on the same server.

When logging in, you need to **identify** by means of your login and password - an evident consequence of the multi-user nature of UNIX.
login: **your_loginname**
passwd: **your_password**

After your login, you're positioned in your personal **home directory**. This consists of the different groups of users you belong to, followed by your login name.
/root/usersgroup/login$ forinstance
/staff/arc/fdgroot$

After the **prompt** (a $-sign) commands can be given in.

Keep in mind, the UNIX operating system is **case-sensitive**, in other words, a difference is made between upper- and lower case. Always count this in when entering commands.

The information your home directory contains is built hierarchically. **Files** and **directories** belong to this hierarchy. A file created by you is placed in a directory of your choice. Under your home directory you can find several subdirectories and files. These subdirectories at their turn contain other subdirectories and files.

Below, it is briefly explained which commands can be used to navigate through this structure.

### 5.14.3.1Few Common Unix Commands

 1)   **Query the content of the present directory**

To see the **content of the present directory**, enter the command **ls** (list files):

$ **ls**

The output of this is the names of all files and directories under the current directory.

If you want more info than only the name of the files and directories which are under the current directory, then you can use the command **ls -al**:

$ **ls -al**

With this command, you'll get info like **permissions, the owner, the numer of links, the size, the creation- or modification date and the name** of the files and directories

**2) Moving through directories**

With the command **cd** (change directory) you navigate through **directories**.

$ **cd**                                                                                                                          **..**
moves you to the directory which is one level higher than the current one

$ **cd**
moves you to your home directory

$ **cd directory_name**
moves you to the given directory

If you want to go to a directory two levels deeper then you could e.g. use the command

$ **cd directory_name/directory_name**.

The most important thing is to know in which directory you're positioned when entering the commands. This can be displayed with the command **pwd** - print working directory:

$ **pwd**

**3) Copying files and directories**

**Files** can be **copied** with the copy-command **cp**. If the source is the name of a file then an identical file with a new name is created.

If the target is an existing directory, then an identical file with the same name is created in this directory. A few examples:

$**cp file1 file2**
Creates an identical file with a different name.

$ **cp file1 directory**
Copies this file to another directory in which it will be found under the same name

$ **cp file1 directory/file2**
Copies the file to another directory where it will be found under the name file2.

A **directory** (together with its subdirectories and files) can be copied using the command **cp -R**:

$ **cp -R dir1 dir2**

**4) Move files and change filenames**

To **move a file** or to **change a filename**, the **move-command mv** is used.

$ **mv file1 file2**
This changes the name of a file.

$ **mv file1 directory**
This moves the file to another directory.

$ **mv file1 directory/file2**
This moves the file to another directory and gives it another name at the same time.

**5) Removing files and directories**

**Files** can be deleted with the **removal command rm**.

$ **rm filename**

With the command **rmdir** you can **remove directories** The directory can not contain any files or directories at that moment.

$ **rmdir directory_name**

Directories can be removed while containing their files and subdirectories using the command **rm - R**.

$ **rm -R directory_name**

Pay attention using this command and check the content of the directory first. This prevents the loss of needed information.

Use the command

$ **rm -i**

then, before removing, a confirmation wil be asked.

**Removing files starting with -**

To    remove    files    starting    with    -    (hyphen)    enter    the    command: rm -- -filename

**6) Creating new directories**
To **create a new directory** the command **mkdir**.
$ **mkdir directory_name**

### 5.14.4   LINUX

Linux is a generic term that commonly refers to Unix-like computer operating systems that use the Linux kernel. Linux is one of the most prominent examples of free software and open source development; typically all the underlying source code can be used, freely modified, and redistributed by anyone.
    Ubuntu, NepaLinux, UserLinux etc are few examples of Linux distributions.

### 5.15     USER INTERFACE

Interface is a common boundary between the user and the computer system. OS provides two types of User interface.

### 5.15.1   CUI (Command User Interface)

A CUI (command user interface) is a user interface to a computer's operating system or an application in which the user responds to a visual prompt by typing in a command on a specified line, receives a response back from the system, and then enters another command, and so forth. MS-DOS and UNIX are CUI operating systems.

### 5.15.2   GUI (Graphical User Interface)

GUI is graphical user interface. It is user friendly and easy to understand and use. A GUI uses windows, icons, and menus to carry out commands such as opening files, deleting files, moving files, etc. and although many GUI Operating Systems are operated by using a mouse, the keyboard can also be used by using keyboard shortcuts or arrow keys.

    A few examples of a GUI Operating Systems: Microsoft Windows 95, Apple Mac OS etc.

    A few examples of a GUI interfaces are: GNOME, KDE etc.

Desktop view of GUI of Windows 7 Home Premium is shown in **Fig. 5.18.**

Fig. 5.18: Desktop View of Windows 7 Home Premium

**5.15.2.1 Common Features of GUI**

A present day GUI has the following common features:

a) **Pointing device(s)**: These allow users to point at different parts of the screen as well as can be used to initiate a command. Besides, these can also be used to manipulate objects on the screen by:

- selecting objects on the screen
- moving objects around the screen, or
- merging several objects into another object

   Examples: Mouse, light pen, joystick, touch sensitive screen, touch pad and so on.

b) **Windows :** It graphically display the progress of the action initiated. When a screen is divided into several independent regions, each one of these is called a window. Each window can highlight results related to the action fired in the respective window.

c) **Switching capability :** Windows system offers the switching capability from one application to another or for sharing of data among various applications.

d) **Resizing and Movement :** Windows system also support resizing as well as moving around feature of windows.

e) **Graphical Bit-mapped Displays :** Bit-mapped display are made up of small pixels and offer a very high resolution. Bit-mapped displays have almost replaced character-based displays. Bit-mapped displays wonderful support graphic manipulation. This feature of these displays is also called WYSIWYG i.e. What You See Is What You Get.

f) Functionality to support graphics along with height-parameters, color attributes, video-attributes, etc.

g) **Icon :** Icons provide a symbolic representation of any system-entity or user-defined object, etc. such as file, folder, address, table, book, applications and so on. A folder icon consists a group of files or other folder icons. Double clicking on the folder icon causes a window to be opened displaying a list of icons and folder icons representing the folder's contents.

h) **Dialog box :** Dialog box is used to capture user information or to present information to the user. Normally, a dialog box is displayed to get additional information. Dialog boxes are also used to indicate error messages in the form of alert boxes. Dialog boxes also use a wide range of screen control elements to communicate with the user.

**i)** **Check box :** Such a box is used to capture the information intending confirmation pertaining to any kind of actions desired by the end-user.

**j)** **Sliders :** These are used to show the relative position of the contents or to move to a different position.

**k)** **Desktop Metaphors :** In desktop graphical metaphor, users are not aware of applications and they deal with files, folder, drawers, clipboard and an out-box. For example, merely clicking the mouse on an icon representing the Report cause word processor to get started and to load the report file automatically.

**l)** **Menus :** The functionality on a GUI system must be arranged in the form of structured menus such as horizontal menus, pull-down menus, etc. From the menu, the end-user can select any operation of his choice such as File, Edit, Search, Tool and so on. Rather than remembering commands at each stage, a menu can be used to provide a list of items. Each menu element can be either a word or an icon representing a command or a function. Menu item can be invoked by moving the cursor on the menu item and selecting the item by clicking the mouse.

### 5.15.2.2 Components of GUI

GUIs consists of four major components :

**a)** **Windowing System :** It allows to display multiple applications at the same time and it includes programming tools for designing movable and resizable windows, menus, dialog boxes, check boxes, and other items on the display.

Example : Macintosh, X Window, etc.

**b)** **Imaging Model :** It describes how fonts and graphics are designed on the screen and such a model is capable of handling typeface, color, shading, dimension and size of graphical primitives such as simple or complex lines, curves, etc. Some GUIs support more than one imaging model.

**c)** **API (Application Program Interface) :** API is a set of programming language functions that allow the programmer to specify how the actual application will control the menus, scroll bars and icons that appear on the screen.

**d)** **Set of Interface Development Tools :** GUI development environments may incorporate toolkits and frameworks. Most of these toolkits are based on object-oriented approach**.**

### 5.15.2.3 CUI Vs GUI Operating Systems

**Table 5.1: CUI Vs GUI OS**

| GUI | CUI |
|---|---|
| It is based on graphical user interface mode. | It is based on command user interface mode. |
| It is graphical and user friendly. | It is more textual and less user friendly. |
| It is very common. | It is less common. |
| It uses keyboard and mouse. | It uses only keyboard. |
| It consists of different components such as text box, icon, desktop, pointing device etc. | It does not consist such components. |
| E.g. MS-Windows OS | E.g. MS-DOS OS |

# SUMMARY OF THE LESSON

You learnt the following in this lesson:

- The software acts as an interface between the user and the computer or a software can be defined as a complete set of instructions written by the programmer which enables the computer to obtain the solution to a problem.
- There are different types of computer software such as Programming Software, System Software and Application Software
- An application package or application program is the software that has been written to process or perform specific job.
- Operating System (OS) is a collection of software written to provide the fundamental instructions that a computer needs to manage resources, such as memory, the file system, and processes.
- The control programs consist of Supervisor Programs, Job Control Programs and Input/Output Management Program
- Windows Explorer displays the hierarchical structure of files, folders, and drives on your computer. It also shows any network drives that have been mapped to drive letters on your computer.
- Both in Windows 7 and Windows 8, the Print Management console is part of Administrative Tools.
- The Control Panel is a part of the Microsoft Windows graphical user interface which allows users to view and manipulate basic system **settings** and controls via applets, such as adding hardware, adding and removing software, controlling user accounts, and changing accessibility options.
- Paint formerly known as Paintbrush for Windows is a simple graphics painting program that has been included with almost all versions of Microsoft Windows since its first release. It is often referred to as MS Paint or Microsoft Paint.
- In Windows and other operating systems, the Clipboard is a short-term storage area for all kinds of information that you have copied from one place and you plan to use in another place.
- The 'My Computer' icon gives us easy access to our hard drives, removable flash drives and other network-related locations.
- A programming language consists of all the symbols, characters and usage rules that permit people to communicate with computers.
- Programming language is a systematic notation by which we describe computational process. Computational process means steps for solving a problem. Programming language consists of symbols, characters and certain rules.
- Another categorisation on the basis of the introduction of the programming languages is as follows:

  - First Generation Language        : Machine Language
  - Second Generation Language        : Assembly Language
  - Third Generation Language        : High Level Languages
  - Fourth Generation Language        : 4 GLs (4th Generation Languages) or
                                                                Very High Level Language
  - Fifth Generation Language        : Natural Language

- Unix (pronounced as YOO-niks) is a family of multitasking, multiuser and time-sharing operating system that is derived from the original AT&T Unix, developed in the 1970s at the Bell Labs research center by Ken Thompson, Dennis Ritchie, and others. UNIX is the trademark.

- UNIX is a multi-user operating system. This means that multiple users can use the system at the same time. Concretely, this means that, for instance, dozens of users can log in from a certain location on the same server.
- Linux is a generic term that commonly refers to Unix-like computer operating systems that use the Linux kernel. Ubuntu, NepaLinux, UserLinux etc are few examples of Linux distributions.
- GUls consists of four major components - Windowing System, Imaging Model, API (Application Program Interface) and Set of Interface Development Tools.

## SELF ASSESSMENT QUESTIONS AND EXERCISES

1.  What is software? What are its different types?

2.  What is a programming language?

3.  What are different generations of programming languages?

4.  Differentiate between application and system software.

5.  What is meant by GUI ? What are the important features of GUI ? Explain.

6.  What are various components of GUI ? Explain.

7.  What is an operating system ?

8.  Discuss the important functions of an operating system.

9.  What is a bootstrap program ?

10. What is a File Manager ? Outline its responsibilities.

11. Is word-processing package a system software ? Justify your answer.

12. Discuss the features of an integrated package.

13. What are advantages of Windows environment ?

14. Enumerate functions of a monitor program.

15. Chart the family of operating system.

16. What is Windows operating system? List its important versions.

17. What is the purpose of a clipboard?

18. What is Print Manager?

19. What is 'My Computer'?

20. What is Paint program/Paint Brush?

21. What are main features of Windows operating system?

22. What is Control Panel? How is it useful?

23. What is UNIX operating system? How did it evolve?

24. What are important UNIX commands?

25. What is LINUX? What are its flavours?

26. What are different types of user interaces?

27. What are components of GUI

# CHAPTER-6

**E-Commerce**

## E-Commerce

## 1. Meaning of E- Commerce

E-commerce is defined as the online buying and selling of goods and services or the transfer of funds or even transmission of the data/information electronically. It is primarily done using the internet and regarded as a modern method for business. The use of platforms such as Amazon, Flipkart, etc. has grown the online retail market. E-commerce has grown from 5.1 per cent in 2007 to 16 per cent of total sales in 2019.

- **How does E-Commerce work?**

Using the internet on mobile, laptops or computers, the customers can access and browse any online store and then can place orders for various products or services. Data pertaining to the order reach to the server hosting the website for the online store from the customer's web browser and then conveyed to the central computer of the order manager.

After that the information is forwarded to various channels for processing:

A. To the databases for managing the inventory levels.
B. To the merchant system for managing payment information
C. To a bank computer for successfully processing the order.

Then the information circles back to the order manager. After the validation of the order, the order manager notifies the server of the store by displaying a message which in turn will notify the customer about the order status. After this, the order manager sends order data to the warehouse (for tangible or digital product) or to the fulfilment department (for service) to be successfully dispatched to the customer. Then the products may be dispatched to the customer, or access to ordered service by the customer may be allowed to the customer.

**E-Commerce Includes:**

- Electronic Data Interchange
- e-mail
- Electronic Fund Transfer
- Electronic Bulletin Boards
- Other online modes
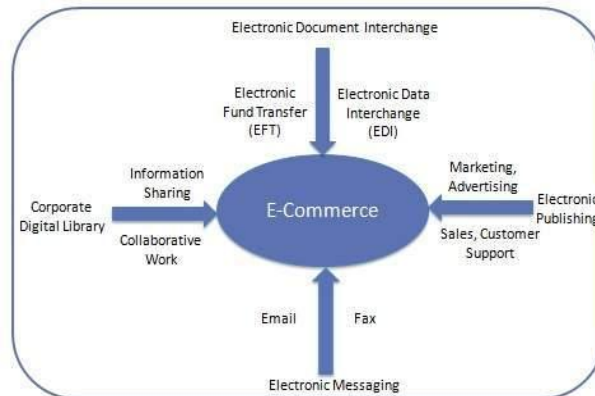


## 2. E-Commerce has following features

- **Cashless Payment**: For the payment of the orders the use of cashless channels like credit cards, debit cards, e-wallets, electronic fund transfer through net banking, etc.is made.

- **Availability:** E-commerce service is available 24x7 anytime and anywhere.

- **Advertising**: The advertising and marketing of has increased manifolds using this platform.

- **Better Sales**: E-commerce boosts the overall sales.

- **Support**: -commerce provides assistance to provide better services to customers before, during and after placing the orders.

- **Inventory Management**: Due to automation, the product inventory management has become very easy.

- **Communication improvement**: E-commerce provides for easy, faster and efficient communication with customers.

## 3. Types of E-Commerce

### i.   **Business to Business E-Commerce**

In B2B type, the products are first wholesaled to an intermediate. Then the wholesaler sells these products through its retail outlets to the end user or final customer.
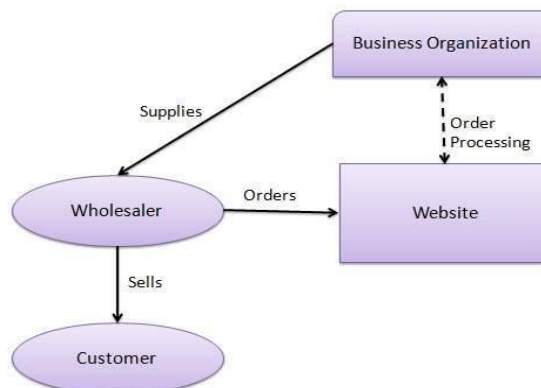
**ii.   Business to Consumer E-Commerce**

When the website trades directly with the customers, it comes under purview of B2C model of e-commerce. The customer can view, choose and order a product then and there.
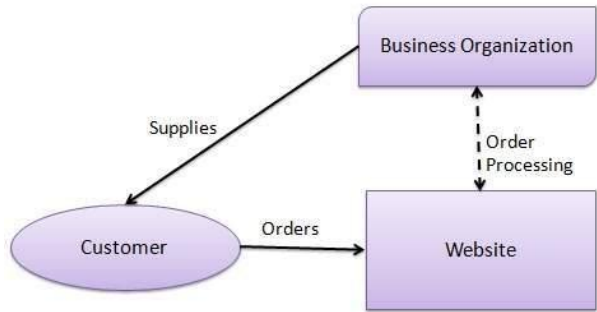


**iii.   Consumer to Consumer E-Commerce**

When a website helps the consumers to sell their own assets like property, motorcars, bikes, electronic items, etc. or to rent a room by advertising. Other consumers have the option to buy the product on that website.
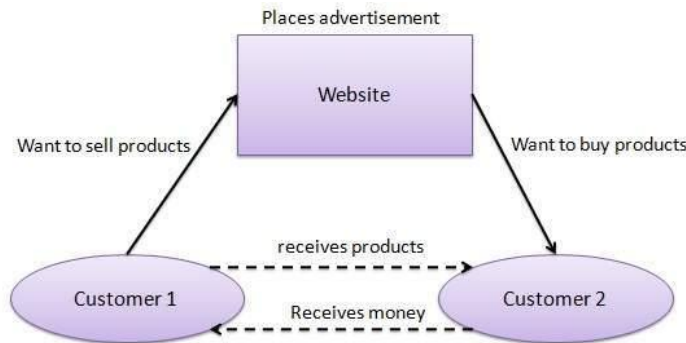


**iv.   Consumer to Business E-Commerce**

A website under C2B model shows various business organizations or companies for a particular service. The consumer may visit the website and offer his budget for a particular service. For example, interest rates of a particular loan are advertises by various banks. The bank meeting the consumer requirement with this budget may approach him/her back for offering its services.
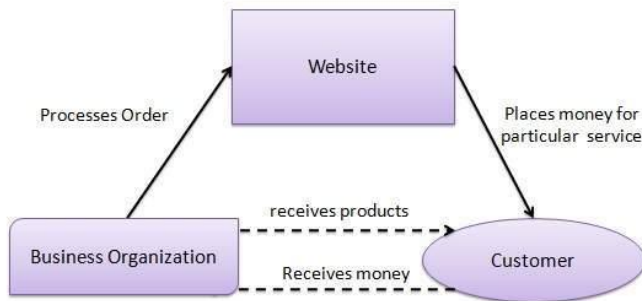
v.    **Business to Government E-Commerce**

The government makes use of some websites to trade and to disseminate information about its services to business organizations. The business organization may apply on these websites for any trade/service with the concerned department of the government.
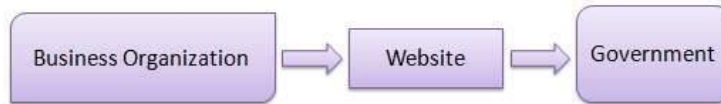


vi.   **Government to Business E-Commerce**

Websites under G2B model are used by government to reach various business organizations for auctions, tenders, etc.
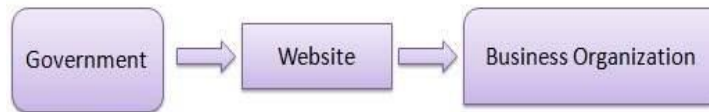


vii.  **Government to Citizen E-Commerce**

The websites under G2C type of e-commerce are used by the government to approach citizens for delivering many of governmental services. Activities like auctions of motor vehicles, machines, etc. and services like registration of marriage, birth/death registration and application of various welfare schemes.. It greatly reduces the time for the service to reach the citizens.



**Mobile E-Commerce** (M-Commerce) is very popular now a days that features mobile shopping, mobile banking and mobile payments.

4. **Benefits of E-Commerce**

i.    **Availability:** Most of the websites associated with e-commerce are available 24x7**.**

ii.   **Speed of access:** E-Commerce sites run quickly on basis of bandwidth of both consumer device and e-commerce site.

iii.  **Wide availability.** E-Commerce sites cover a vast area even all over the world where internet facilities are available

iv.   **Easy accessibility:** Almost all the e-commerce websites are very easy and fast to use.

v.    **Lower cost:** E-commerce businesses lessen that cost which would occur in offline mode. However shipping and warehouse costs are associated with the e-commerce

- **Disadvantages of E-Commerce**

i.    Narrow customer service as some places are not approached by E-commerce websites.
ii.   Not being able to touch or see
iii.  Long Wait time
iv.   Security risk

5.  **E-commerce Technologies**

To compete, earn more and maintain customer satisfaction and safety, various technologies are used in the e-commerce market.

i. **Artificial intelligence (AI)**

AI reveals the valuable insights of what the customers prefer which are very useful in marketing campaigns and communication automation. Mostly it is believed that the user experience is an important tool for improving sales which is facilitated by AI. As AI can predict customer behaviour and preferential patterns, websites can recommend relevant and useful information and suggestions to the customers on various products and services.

ii. **The Cloud**

The cloud is very essential for the instant access of data/information and to manage it. The cloud ERP in e-commerce improves the delivery speeds and hence the stability and growth.

iii. **Chatbots**

Chatbots nowadays are replacing on-call solution scenarios. For customer satisfaction, Chatbots are wide-spread in e-commerce applications which are very helpful in providing a variety of services and solutions. Chatbots are available 24x7 (day and night) and provide answers after responding to the queries.

iv. **Voice assistants**

This feature/technology may be called Voice commerce. It allows the customers to use voice commands for e-commerce. Various voice assistants like Siri, the Echo, and Google Home are very popular for their easy use.

v. **Audio brand signatures**

Any specific auditory tone is considered an audio brand signature for a specific e-commerce application. It provides recognition to the brand and helps customers to remember the same.

vi. **Assistive technology**

In the e-commerce world, assistive technologies are very helpful to reach and approach those customers who could not have this experience before. E.g. the visually impaired persons can also experience e-commerce using speech-to-text technology.

vii. **Image search**

Using this technology, customers can photograph the products of their interest and find alike products on other websites offering better deals.

## Electronic Funds Transfer

Now a days this technology is very popular which is used for transferring the funds/moneyfrom one bank account which is debited to another bank account which is credited with the same amount electronically and this transaction is referred to as a paperless monetary transaction. POS terminals in retail stores are connected to EFT systems of banks via WANs for instant payment.

Following are some of the types of electronic payments:

i. **Credit Card**

The most common type of electronic payment is payment using an active credit card which is a small plastic card having a distinctive number which is linked with an account. Card reader reads the card no. using the magnetic strip embedded on this card. The issuer bank makes payment to the acquirer bank for the customer when the customer purchases something from a merchant. After a certain time period the customer will have to pay the credit card bill.

### ii.    Debit Card

Debit card is a plastic card having a unique 16 digits number that is linked with the customer's bank account. It is also having name of the customer and expiry date of the card. On the back side of debit card there is a 3 to 4 digit CCV number. When some payment is done using the debit card, the amount gets debited from the linked bank account instantly if the transaction is successful. There is no such compulsion of maintenance of account balance when the payment is done using the credit card.

### iii.   Smart Card

Smart card has a little microprocessor chip fixed in it. This chip can store the required encrypted information. Smart cards carry cash and when used for some payment the amount gets deducted. This type of card can only be accessed using customer self-given PIN. These cards are very safe and secure because these store information in coded format. E.g. Mondex and Visa Cash cards.

### iv.    E-Money

When payment of some purchase is made over the network. The transaction occurs very quickly from one financial entity to another with no middleman. E.g. Paytm Wallet, Amazon Pay, etc.

### v.     Electronically Fund Transfer

For transferring the funds or money electronically from one account of a bank to another account of same or different bank. Transfer can be done using Net banking or even ATM. Customer's bank itself makes the payment if the recipient is having an account with the same bank, otherwise the request for transferring the funds is forwarded to an ACH (Automated Clearing House).

### vi.    Security Schemes of an Electronic Payment System

Security in e-commerce is an important and challenging issue especially for electronic payment. There are some requirements for secure electronic payment which are as follows:

- **Confidentiality**: All the information of a customer must be confidential.

- **Integrity**: Integrity of the information must be maintained.

- **Authenticity**: Authentication of the user must be verified systematically.

- **Non-Reputability**: It simply means that the sender cannot deny sending of a message and the recipient of a message cannot deny the receipt regarding an electronic payment

- **Encryption**: Personal information must be encrypted which must be decrypted only by a genuine customer.

- **Auditability**: The recorded data which is used for the transaction should be auditable so that if there is some kind of fraud, it can be traced.

Data during electronic payment is encrypted to decrease its vulnerability to fraudsters. On the internet platform, Secure Sockets Layer (SSL) and Secure Electronic Transaction (SET) are two important standards used for secure transactions.

### 6.    Security System of Electronic Payment System

There are some important measures which ensure security and safety of the online payments

- **Encryption**: It is a very effective and efficient way to secure the information. The encrypted data can only be decrypted by a specified user.

- **Digital Signature** or e-signature is authenticated, valid and encrypted tool which ensures the authenticity of the information.

- **Security Certificate:** It is a specifically provided distinctive digital Id used to verify the authenticity of any website/user.

- ### Security Protocols for Internet

The following security protocols are used over the internet to ensure the secure online transactions.

### i. Secure Socket Layer (SSL)

The most commonly used protocol which provides security and safety in terms of authentication, encryption, integrity and non-reputability.

"https://" before the web address of any website is used with SSL instead of "http:/". An additional 's' stands for secure.

### ii. Secure Hypertext Transfer Protocol (https)

This protocol supports multiple security mechanisms. The basis of this security protocol is encryption which provides the security to the end-users.

### iii. Secure Electronic Transaction (SET)

MasterCard and Visa developed this security protocol which is having following components:

- **Digital Wallet Software**: Digital Wallet are the e-wallets associated with various e-commerce websites. These wallets assist protected purchases online because payment occurs through point and click interface then and there.

- **Merchant Software**; Such software help merchants in communicating and trading with the customers in a secure and protected way.

- **Payment Gateway Server Software** provides a good feature for automatic, standard and uninterrupted payment processes.

- **Certificate Authority Software**: The customers as well as the merchants enter into an agreement and get their accounts registered for secure electronic payments.

### 7. Electronic Data Interchange (EDI)

**Basics of EDI:** It is an electronic and online way of sharing the soft copies of documents regarding a business in an organisation internally (between its various departments) or externally (with suppliers or customers). E.g. Word documents, Excel sheets, etc.

Electronic Fund Transfer facility like NEFT, RTGS in banking sector is a good example of EDI.

- ### EDI Documents

The important documents that are shared using EDI are following:

- Bills and Invoices
- Purchase orders
- Acknowledgement
- Shipping/dispatch Requests
- Correspondence/communication letters
- Letters with Financial information like that of related to bank accounts

### 8. Steps in an EDI System

The steps used in an EDI System are as follows:

I. A file containing the processed document is generated by a program.

II. Then the conversion of that document into a file with some standard format occurs.

III.    This file containing the document is sent electronically either internally or externally on the network.

IV.    The trading partner on the other side receives the file delivered electronically.

V.    At last an acknowledgement is generated which is shared electronically.

**9.   Components of Electronic Data Interchange (EDI)**

1.   **Standard Document Format:** A standard format which is agreed upon by both parties is used for communication.

2.   **Translator and Mapper:** A translator converts the raw data into meaningful information. For this a mapper creates some conversion specifications.

3.   **Modem**: It is a device which is used to transmit data from one computer to another.

4.   **Communication Software**: It is used to transmit the data and convert various documents into a specific standard format.

5.   **Communication Network**: It provides a direct link between the two partners.

6.   **Point to Point link:** It is a direct communication link between two computers only.

7.   **VAN:** It is a type of network that connects the computer system of two or more organisations.

**10. Applications of Electronic Data Interchange (EDI)**
**Retail Sector**: Here in this sector usually the profit margins depend upon efficient inventory management.



**EDI in Retail Sector**

EDI in the retail sector helps in the maintenance and replenishment of goods that are stocked at any of the retail outlets. The position of point of sale stock is updated continuously online. This data is fed through EDI enabled SCM network (supply chain management network). The EDI also helps in monitoring the logistics and updating of the original stock.

1.   **Manufacturing Sector**: EDI in the manufacturing sector ensures the efficient management of the materials that are required for the production of a commodity timely.



**EDI in Manufacturing Sector**

The Inventory position is constantly updated using EDI and thus the supplier is informed about this which help in further planning

2. **Automobile Sector:** Here the EDI is used to keep the customers updated with the current products and their prices. EDI also ensures proper receipt of the product and facilitates payment for speeding up the process.

3. **Financial Sector:** In this sector EDI efficiently replaces the labour intensive activities. These include collection and dispersing of monetary payments. It facilitates the flow of money without any human intervention. One account is debited and the other account is credited electronically.

### 11. Advantages of an EDI System

i.   Data entry errors are minimised.

ii.  Faster response time

iii. Easy transfer of electronic form of data

iv.  Reduction in paperwork

v.   Cost Effective

vi.  Standard and clearer means of communication

## Self Assessment Questions

### Short Answer Type Questions

1. What do you mean by E-Commerce?
2. Define E-Mail.
3. What is meant by cashless payments?
4. Explain C2C E-Commerce.
5. What is M-Commerce?
6. What do you understand by artificial intelligence?
7. What do you meant by chatbots?
8. What is meant by EFT?
9. What are the types of EFT?
10. Define EDI documents.

### Short Answer Type Questions

1. What is E- Commerce? Discuss its working and features in detail.
2. What are various types of E-Commerce?
3. Define E-Commerce technologies.
4. What is meant by electronic fund transfer? Define various types of electronic payments.
5. What are the important measures to insure the safety and security of the online payment?
6. What is electronic data interchange? Discuss the steps and components of electronic data interchange.
7. Define EDI. What are the various applications of electronic data interchange?

**Remarks**

# INTRODUCTION TO MS-WORD

## OBJECTIVES OF THIS LESSON

This lesson is aimed to make you understand the concepts of word processing and MS-Word. Readers will be able to understand the following:

- Concept and features of word processing
- Basic concepts of MS-Word
- Different components of Word document window
- Different types of Menu and their various options
- Various types of Toolbars with their different options
- Different ways for text and document formatting
- To check the spelling and grammar mistakes of text of document
- Creation and formatting of table
- Working with graphics i.e. various ways to insert the pictures in Word document
- Concept of Mail Merge

## STRUCTURE OF THIS LESSON

6.1 Introduction
6.2 Word Processing
6.3 Features of Ms-Word
6.4 Starting Ms-Word
6.5 Components of Word Document Window
6.6 Basic Commands of Ms-Word
6.7 Documents and Text Formatting
6.8 Tables and Setting
6.9 Working with Graphics
6.10 Introduction to Mailmerge

SUMMARY OF THE LESSON
SELF ASSESSMENT QUESTIONS OR EXERCISES

## 7.1 INTRODUCTION

There are many ways of conveying information. Writing is one of them. Earlier we were using manual typewriters to prepare documents, then electronic typewriters and now we are using computers to prepare any type of document. Many applications programs have been developed that helps us to quickly create documents with a professional look. One such most popular program is word processor. A word processor provides general tools for creating, editing, saving, formatting and printing the documents. We can create all types of documents that are used in our daily lives with the help of word processor. In fact word processor provides a great role in every field for creating different types of documents. Therefore, it is suggested generally that every person must be aware of word processing and its features.

## 7.2  WORD PROCESSING

Word processing specifies the use of hardware and software to create, edit, view, format, store, retrieve and print documents. Word processor is a computer program that is used to type text, align text, provide variety of font styles and sizes etc. With the help of this, users can make their document more effective by combining text, graphics and images. There are number of word processors such as MS-Word, Word Star, Write, Word Perfect, Chi Writer etc. MS-Word is the mostly used word processing system.

MS-Word is used to do simple as well as complex task. MS-Word facilitates for entering, editing, formatting and printing text. It helps to type the text, correct spelling mistakes and grammatical errors align text. It also offers different font styles and font sizes. This is used to create different types of documents such as letter, calendar etc.

### 7.3 FEATURES OF MS-WORD

MS-Word is the most famous processing software package. MS-Word is composed of various features and can help to edit, format or many other types of formatting with document so that it will appear more attractive and effective. MS-Word is used:

- To enter text
- To edit text or to make changes in existing document.
- To define different page layout for a document.
- To format text in a document to enhance its appearance and readability.
- To display documents in different layout such as normal, web layout, print layout, and outline etc.
- To save, retrieve and delete documents.
- To print documents and to see the preview of that document.
- To import text, graphics and images.
- To search and replace text strings.
- To check spelling and grammatical mistakes and to correct use of improper writing styles in a document.
- To write text in different sizes of fonts.
- To link with other documents.
- To define page number on different documents.

### 7.4  STARTING MS-WORD

To start MS-Word:

- Click on Start button
- Then click on All Programs
- Click on Microsoft Office
- Select Microsoft Word.
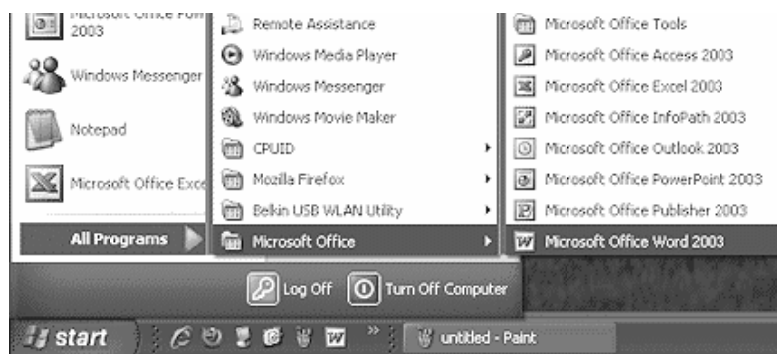


### 7.5 COMPONENTS OF WORD DOCUMENT WINDOW

The parts of Word Window are shown in Fig…… and they are described below.

Title Bar | Formating Toolbar
Menu Bar
Standard Toolbar
Insertion Point | Ruler | Scroll Bar
End-of-Document Marker
Office Assistant
Scroll Bar | Status Bar
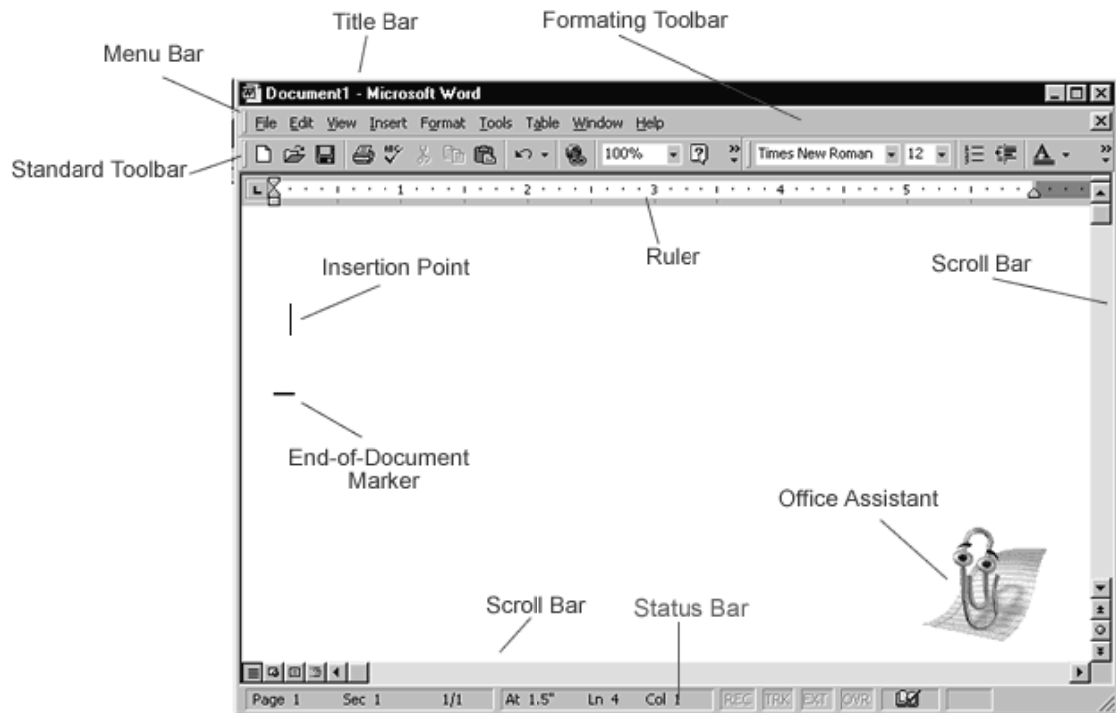
### Title Bar

This bar tells which application package and document are currently running. It also displays the program and document name.

### Menu Bar

This bar is just below the Title Bar. When you point to any menu title and click once with the mouse, the menu will open displaying all the commands available under this menu title. Clicking the desired command will tell word to execute that command. Some commands have ellipses (……..) in front of them. These commands have further sub-commands, or options. Commands appearing dimmed cannot be used.

### Standard Toolbar

The standard tool bar contains buttons, drop-down menus and other controls that help you quickly alter the appearance and arrangement of document. Toolbars are very helpful and convenient in quickly executing commands without having to go through menus. The Standard toolbar contains icons for basic functions like opening files, saving files, printing files, cut, copy, Paste etc.

### Formatting Toolbar

This toolbar contains icons styles, font for changing the appearance of text for example; there are icons for changing fonts, font styles, font sizes, text alignment etc.

### Ruler

The ruler helps to make changes in margins and indents, and also create document as per the dimensions required.

### Scroll Tools

Through this bar, you can travel within your document. You can go anywhere, up and down, and right and left in your document using following-

| | | |
|---|---|---|
| Scroll Arrows | Scroll Bar | Next Page |
| Scroll Box | Previous page | Arrow Key |

**Status Bar**

Status bar is also known as Status Area. Basically it is the last line on screen. This gives the following information about the work-

| Section Number | Current Page | Record Macro |
|---|---|---|
| Line Number | Total Pages | |
| Column Number | Cursor point | |

**Cursor**

Insertion Point is its other name. This denotes the place where text, graphics or any other item will be placed when you type, overwrite or insert them.

**Mouse Pointer**

When mouse pointer looks like an I beam, you should be able to move it freely about the screen. This is used for either placing the cursor at the desired place or choosing any command either from menu or from toolbars.

**Mouse Operations**

1. **Pointing:-** Move the mouse pointer until the pointer is on the desired item.
2. **Clicking:-** Move the mouse pointer to the desired position and then press the mouse button once.
3. **Double Clicking:-** Move the desired pointer to the desired position and then press the mouse button twice in rapid succession.
4. **Dragging:-** Move the mouse pointer to the right place, press the left mouse button, keep it pressed and move the mouse simultaneously.

<div align="center">

**7.6 BASIC COMMANDS OF MS-WORD**

</div>

**FILE MENU**
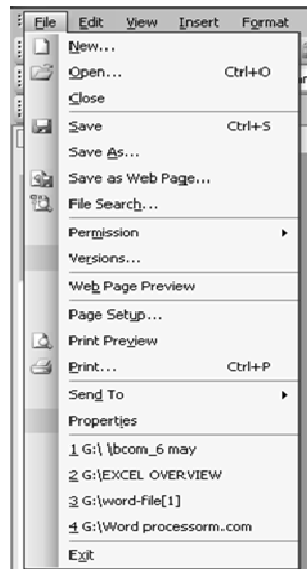


The File menu contains a number of options, which are following:-

- NEW- This creates a new document. It can be from scratch or from a template.

**Remarks**
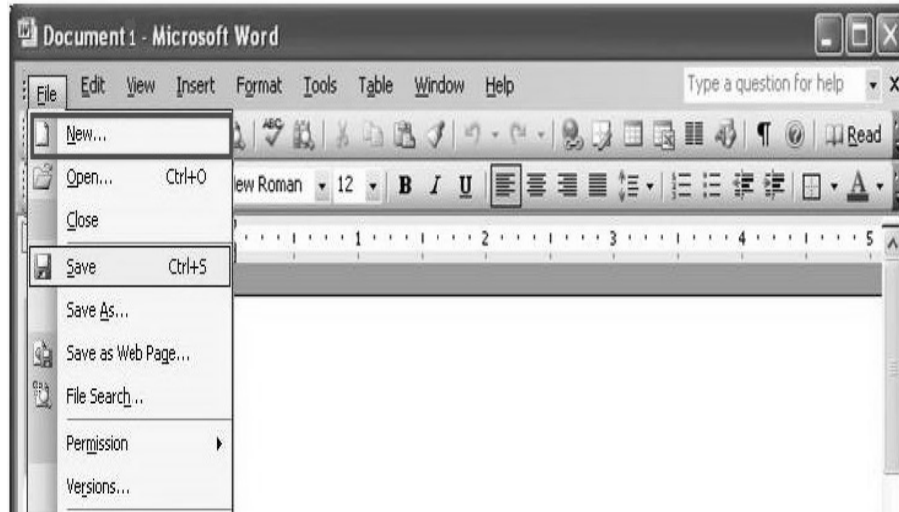


- OPEN- Already prepared document is opened through this command. To open file following steps are used:
- Click on Open in file menu.
- Specify the name of folder in which file is saved.
- Select the file by clicking on it.
- Then click open for opening the file.
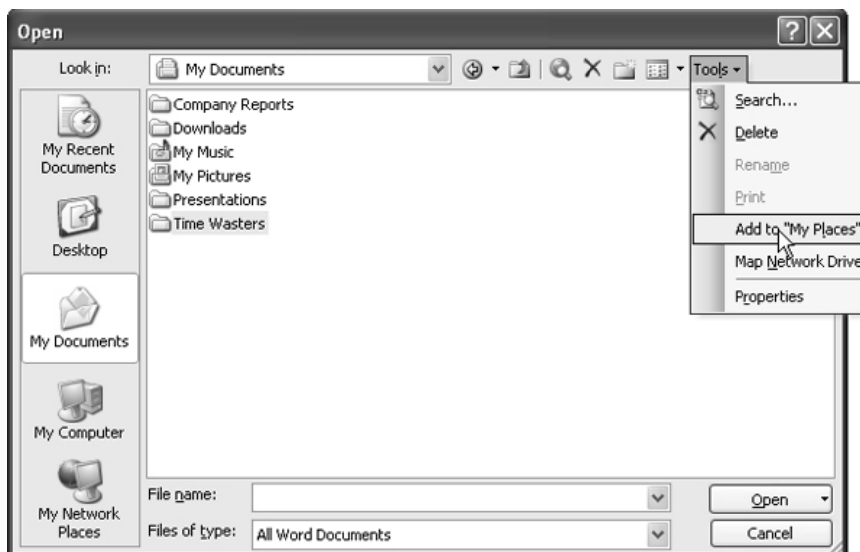


- CLOSE- currently working document is closed.

- SAVE- It saves document either on H:/ drive or on C:/ drive or on disc or on CD ROM. This can be done by clicking on Save option in File menu
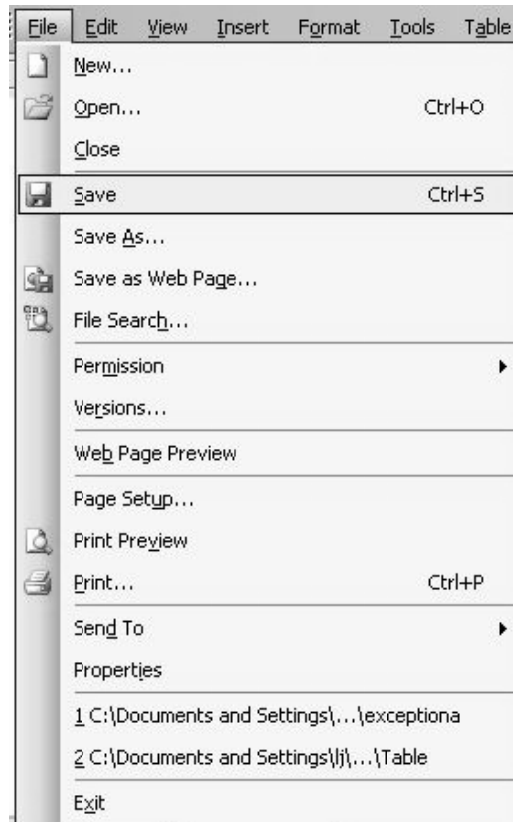
- SAVE AS- This command allows to save the current document again with different location and/or under a different name. Steps are:
- Click on Save As in File menu
- Type the name of file in box
- Click on Save to make the changes safe.



- SAVE AS WEB PAGE- Saves the document as a web page and can be linked to web.
- SEARCH – The Word files containing the key words type in the box will be searched by this command.

- VERSION – used to save different version of document, by date.
- WEB PAGE PREVIEW – to preview how document would look like as a web page.

- PAGE SET UP- to set the margins selects page orientation, selects paper source and size, add line numbers and borders and view the page in preview mode.

- 



**To change the Page Margin**
- Select the Margin tab on Page Setup Screen in File menu
- Enter the value for set the margin in box.

**To set the Gutter Margin**
- Select the Margin tab on Page Setup Screen in File menu
- Enter the value for set the margin in box.
- Click on right or upper in Gutter Position Box to give the space.

- PRINT PREVIEW- This view shows how a document will appear on paper without actually printing it. This is helpful to make the appropriate document if there is any mistake in that document.
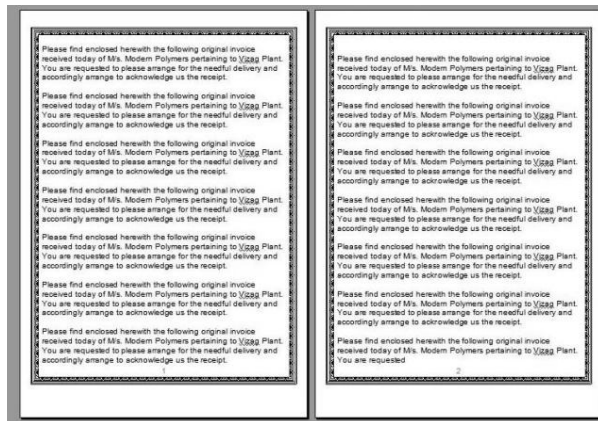


- PRINT- Print all pages in the active document or the currently selected page or a range of pages.
  Steps are:
- Select Print option from File menu.
- Select Printer or default printer for printing.
- Select **All** (If all the pages of document are to be printed) or write the **number of pages** in Page option to print the specific pages.
- Click OK.
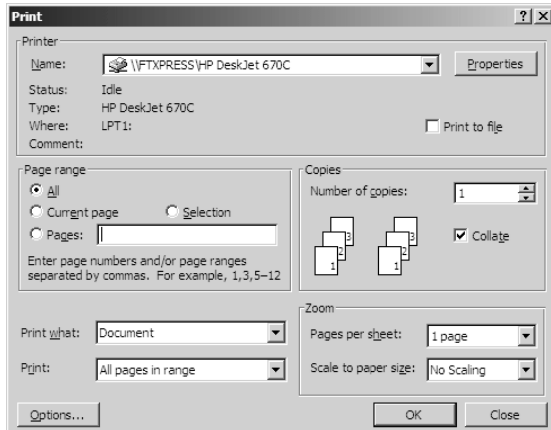
**To Print More than one copy at same time**
- Select Print from File menu
- Write the number of copies in box for printing.
- Click OK.

**To Print Even/ Odd numbered Pages**
- Select Print from File menu
- Write the Even or Odd pages from drop down list in Print box.
- Click OK.
- SEND TO – used to send document to a variety of places.
- PROPERTIES - to show the details of current document.
- EXIT- used to exit from both the document and M.S. Word.

## EDIT MENU
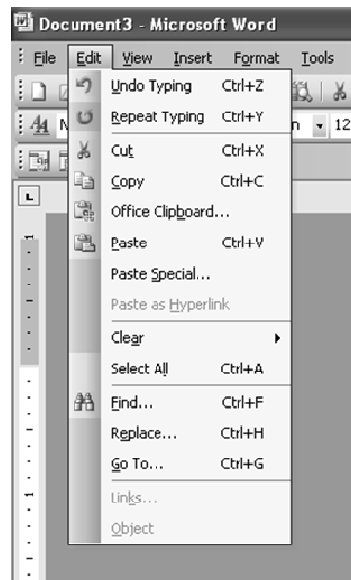
This menu involves a number of editing options, which are following:-

- UNDO & REPEAT – This command undo or repeat the action that has performed.
- CUT- It takes out the highlighted text.
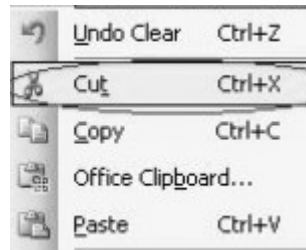


- COPY- used to copy the highlighted text.
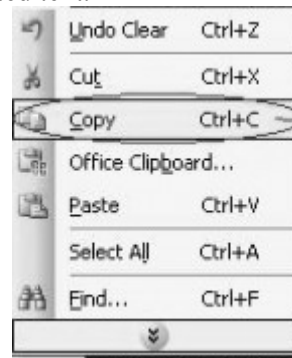


- OFFICE CLIPBOARD – used to collect text and graphics from different documents or other program and then paste them into any office document.
- PASTE – used to paste copied text or graphics.
- PASTE SPECIAL – used to paste text in HTML or unformatted text.
- PASTE AS HYPERLINK – used to paste material as hyperlink into document.
- CLEAR- it is the other way of delete as it clears all formats or contents.
- SELECT ALL- It selects the whole text for formatting or deleting.
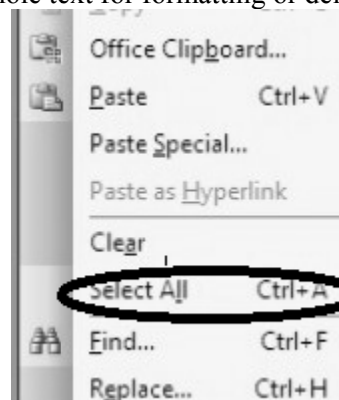


- FIND- It looks for a word or phrase within your document.
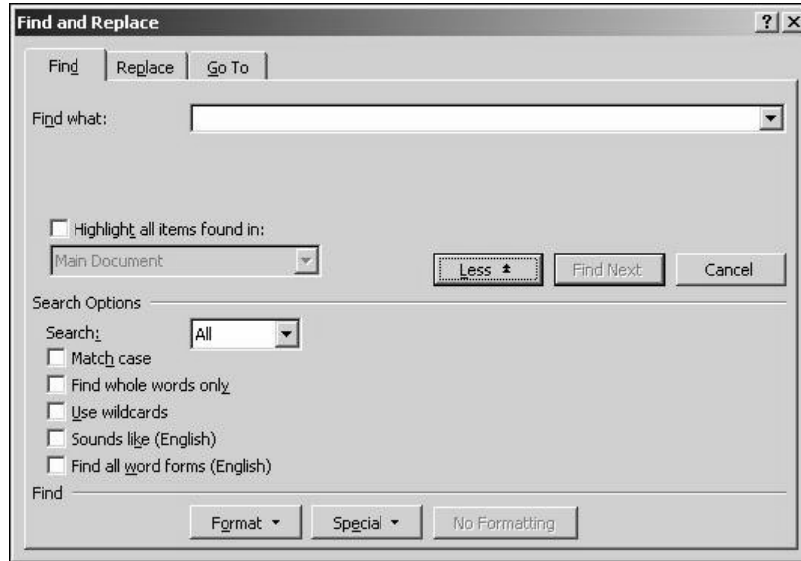
- REPLACE- It replaces a word or phrase in your document with any other word or phrase.
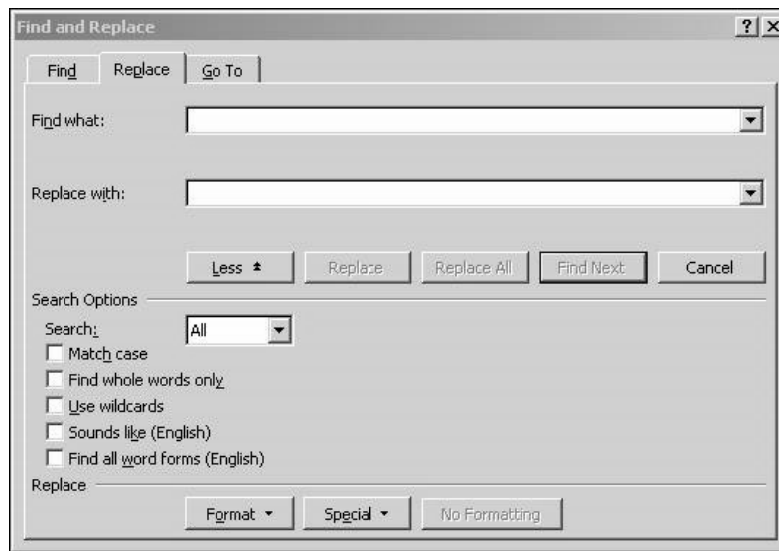


- GO TO- This command will take you to the place in your document where it finds the text you type in the box.
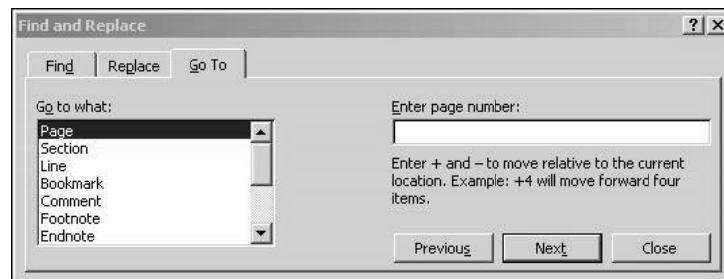
- LINKS – used to display or change information for each link in current file. (It is unavailable if no links are present in document)
- OBJECTS – used to edit the objects placed in document.

## View Menu

The view Menu involves a number of viewing options, which are following:-

- NORMAL: This view lets the user to see the document using the whole screen including any formatting.
- WEB LAYOUT- Through this view, user can see the document as it would appear on a webpage.
- PRINT LAYOUT-Through this view, user can see ruler and can adjust margins or tabs. It also allows seeing the edge of document as it would appear when it is printed.
- OUTLINE- User can see the document as in Normal view but without any formatting.
- TASK PANE – used to show the options like templates for new documents from other documents, the clipboard, ClipArt & Styles and Formatting.
- TOOLBARS- You can see all the different toolbar options and to invoke and customize them.
- RULER- For adjusting margins, this command activates the ruler in PRINT LAYOUT view.
- DOCUMENT MAP – used to see different styles that have been applied to document.
- HEADER and FOOTER- It allow creating Header and Footer for document. In this we can add time, date, page number etc.
- FOOTNOTES- This command allows to go to the footnotes, which already prepared in document.
- MARKUP – used to display or hide comments or track changes such as insertion, deletions and formatting changes.
- FULL SCREEN – it allows using the entire screen to view the document without any Menu or Toolbar.
- ZOOM- used to zoom in or out of document.
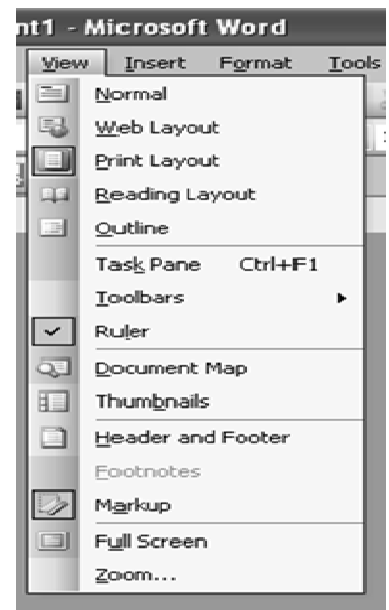
## Insert Menu

Insert menu has many commands which are very useful for inserting different things into document. These are following:

- BREAK - used to insert Page break, Column break or text Wrapping Break into document.
- PAGE NUMBERS- used to insert page numbers into document.
- DATE AND TIME- used to insert date and time into document.
- AUTO TEXT – used to insert automatic text into document selected from a list of options.
- FIELD – used to set a field within document such as user name, address block etc.
- SYMBOL – used to insert a symbol into document either picture or alphabetical symbol.
- COMMENT – used to insert a comment into document.
- REFERENCE – used to insert a caption, footnote, cross-reference or an index and table into documents.
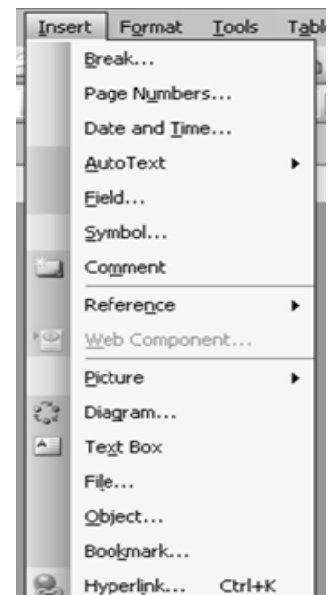
- WEB COMPONENT – used to insert web pages components as link bars for navigation.
- PICTURE- allows inserting picture from Clipart or from file.
- DIAGRAM – used to insert an organizational chart from different choices.
- TEXT BOX – used to insert text anywhere within the document and move the whole box around.
- FILE – used to insert another file directly into document.
- OBJECT – used to insert an object into document such as Adobe Photoshop Image, Acrobat file or Bitmap image.
- BOOKMARK – used to identify a location or text selection that user name and identify for future reference.
- HYPERLINK- adds a hyperlink when the address of a webpage is typed.

**Format Menu**

These are different options:

- FONT- It changes the style of font, size, color and formatting applied to fonts.
- PARAGRAPH- used to change alignment, indentation and spacing.
- BULLET AND NUMBERING – used to change bullets, their indentation and the indentation of bulleted text.
- BORDER AND SHADING – used to apply border to document, to apply shading to paragraph(s) or document.
- COLUMNS – used to insert and edit columns into document.
- TABS- It sets the tabs for document.
- DROP CAP – allows taking first letter of word and capitalizing it and pulling it away from text.
- TEXT DIRECTION – used to rotate selected text in table cells that the user can read it from top to bottom or from bottom to top.
- CHANGE CASE – used to change words to upper case, lower case, toggle case, title case or sentence case.
- BACKGROUND – used to change the color of document, add pictures, watermarks, pattern etc.
- THEME – used to apply formatting theme ( heading, fonts, background colors and bullet point) to document
- FRAMES – used to make information easier to access or to display the content of web sites that has multiple pages.
- AUTOFORMAT – allows choosing settings that will automatically apply those changes to every document written by user.
- STYLE AND FORMATTING – used to apply heading styles and formatting to text.
- REVEAL FORMATTING – shows all different formatting options have been applied to document.
- OBJECT – used to edit object inserted from INSERT Menu.
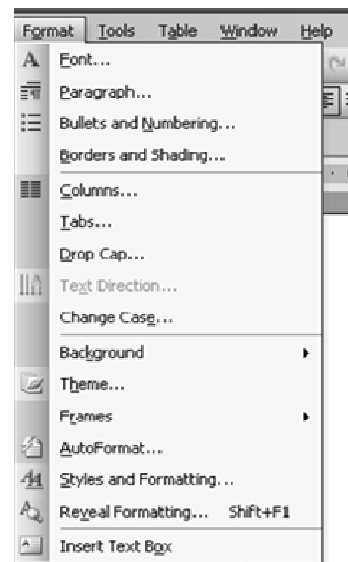
**Tools Menu**

Various options are:

- SPELLING AND GRAMMER- This command checks the spelling and grammar in the document.
- LANGUAGE – used to set the language and look words up in thesaurus.
- WORD COUNT- It allows you to count how many words you have in your document like paragraph, pages and lines.
- AUTOSUMMARIZE – used to create summary as main points and then allows placing that in different parts of document.
- TRACK CHANGES – it allows specifying changes in current document and keeps track of changes by reviewer's name.
- MERGE DOCUMENTS – used to merge the document and to display the merge result in current document, target document or in a new document.
- ONLINE COLLABORATION- used to schedule meeting and web discussion related to document.
- LETTERS AND MAILING – This option consist Mail merge, envelopes and letters, and letter wizard etc. it is used to create an address for printing on envelope, create letter from template or merge address created into a label format that is ready for printing.
- MACRO- used to automate the task, if a task performed repeatedly. Basically, a macro is a series of word commands and instructions that can be group together as a single command.
- TEMPLATE AND ADD-INS – used to attach a different template to active document, modify document styles or to load add-in programs
- AUTOCORRECT – used to correct common mistakes that the user make personally and want to correct them.
- CUSTOMIZE – used to customize toolbar settings and to show description for all toolbar/menubar options.
- OPTIONS – used to set the parameters for printing, saving, editing, spelling and grammar etc.
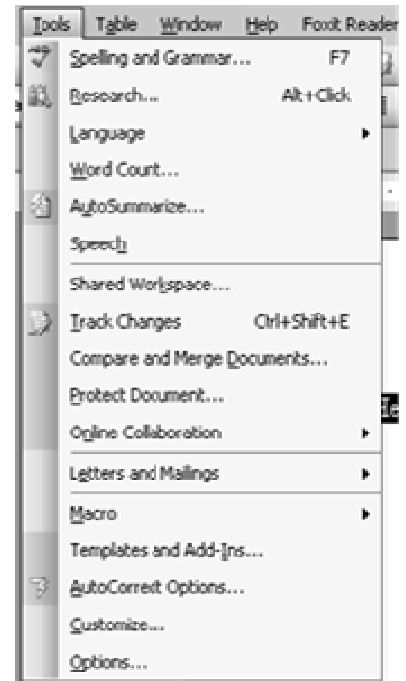
**Table Menu**

This menu allows inserting and then modifying the table within document. It consists following options:

- DRAW TABLE – used to draw a table into document.
- INSERT – used to insert a table into document.
- DELETE – used to delete the table, cells, columns and/or rows.
- SELECT – table, cells, columns and/or rows can be selected by using this.
- MERGE CELLS – used to merge two or more cells into one.
- SPLIT CELLS – used to split one cell into two or more cells.
- SPLIT TABLE – this is used to split the table.
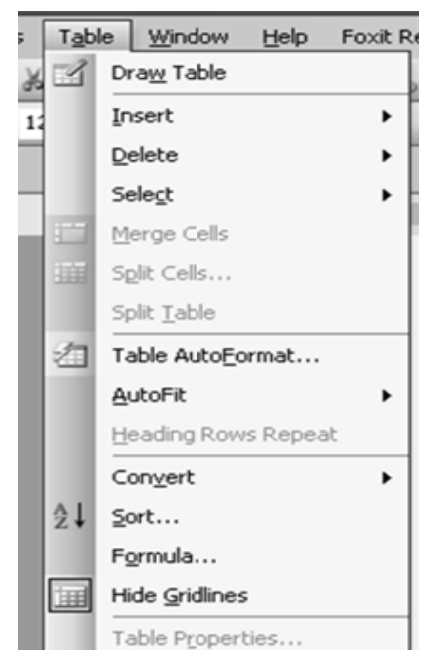
- TABLE AUTOFORMAT – used to apply a specific format to table.
- AUTOFIT – used to automatically set the area where the text will fit and rows and columns are also evenly distributed.
- HEADING AND ROWS REPEAT – it allows the user to keep the heading and row in place at the top of each page as table spans in many pages.
- CONVERT – used to change the text to a table, and a table to text format.
- SORT – used to sort the text alphabetically forwards or backwards.
- FORMULA – used to input formula.
- HIDE GRIDLINES – used to hides the table's gridlines.
- TABLE PROPERTIES – used to edit the properties of table such as: alignment of table and text wrapping, row, column and cell alignment.

## Window Menu

The Window menu provides different options to move between documents, and these are following:

- NEW WINDOW – used to open new window with same content as the active document consists. So different parts of document can be viewed at the same time.

- ARRANGE ALL – used to show all open files in separate windows on the screen that makes easy dragging between files.

- SPLIT – used to define a split into two panes or removes the split

- DOCUMENT 1 – It shows all currently open active documents.
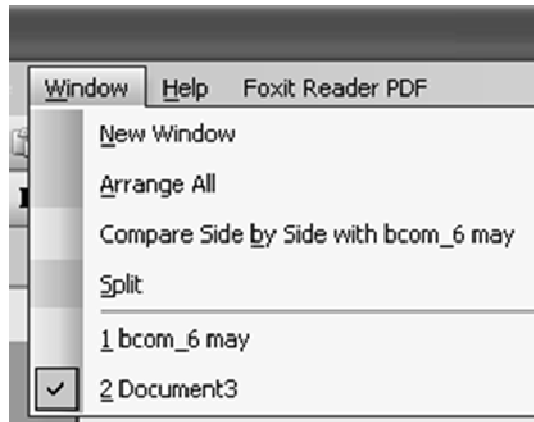
## Help Menu

The Help menu gives the idea to do something in Word or how something works. This menu has following options:

- MICROSOFT WORD HELP –used to provide the possible topics related to answer of query typed in subject of question.

- SHOW OFFICE ASSISTANT – it shows an animated paperclip that gives suggestions about what the computer thinks related to the work performed by user on document.

- WHAT'S THIS – used to reveal the formatting where cursor clicked?

- OFFICE ON THE WEB – used to take the user to website with tips on MS Office software.

- WORDPERFECT HELP – used to provide a help menu related to WordPerfect document if user is working on that.

- DETECT AND REPAIR – used to find and fix errors in all Office files.

- ABOUT MICROSOFT WORD – it specifies information about Word i.e license information etc.
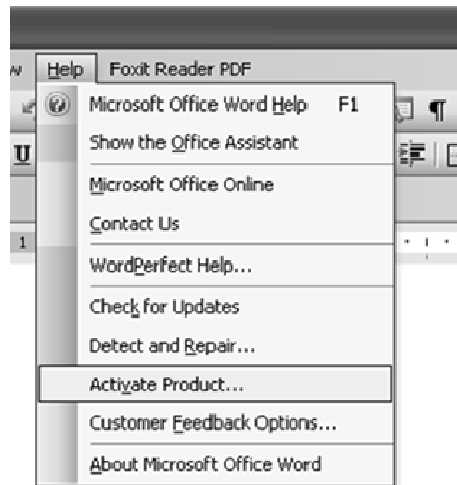
## 7.7 DOCUMENTS AND TEXT FORMATTING

Formatting is helpful to assign the numbers on pages. For this following steps are used:

### (A) To Insert Page Number

- Click on **Page number** in **Insert** menu.
- In Page number dialog box, Set the position, alignment and show number on first page with default setting
- Click OK.

In it, Preview is used to specify the changes done in document.
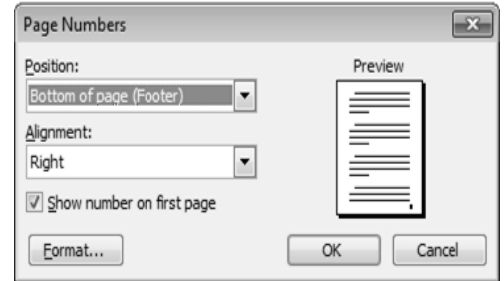
### (B) To Insert Date and Time

To insert Date and Time, Select **Date and Time** option from **Insert** menu. It inserts date and time on each page of document. But H**eader and Footer** will also used for this.
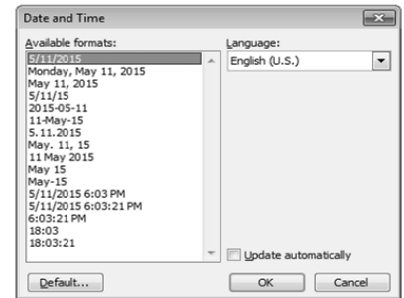
### (c) AUTO TEXT

This command is used to insert the Auto text. For this, select **Auto Text** from **Insert** menu. Select the name of Auto Text from list. The text is appeared at that position where clicking is done in document.

### (D) FONT

Document can be formatted by changing the font. There are different options for changing the font
- **FONT OF TEXT-**
- Select the text you want to change
- Click a font name in the Font box on the Formatting toolbar.
- **SIZE OF TEXT -**
- Select the text you want to change.
- Click a point size in the Font Size box on the Formatting toolbar.
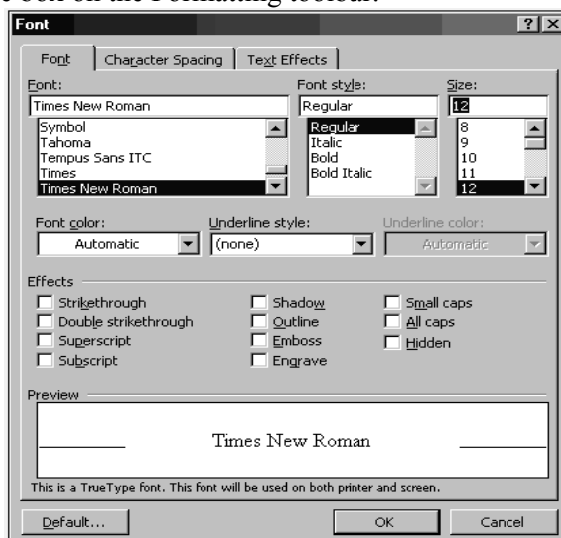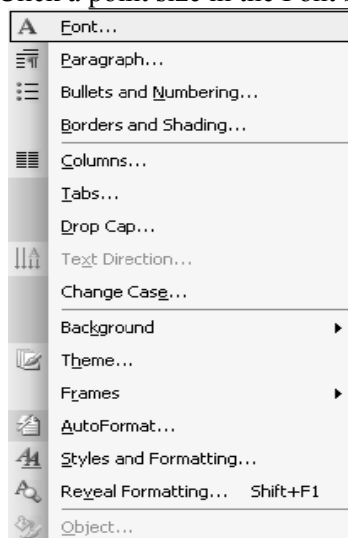
- **BOLD TEXT-**
- Select the text you want to change.
- Click Bold on the formatting toolbar.
- **ITALIC TEXT-**
- Select the text you want to change.
- Click Italic on the formatting toolbar.
- **UNDERLINE TEXT-**
- Select the text you want to change.
- Click underline on Formatting toolbar.

**(E) Add Bullets or Numbering**
- Select the items you want to apply bullets or numbering to
- To add bullets, click Bullets on Formatting toolbar.
- To add numbering, click Numbering on Formatting toolbar
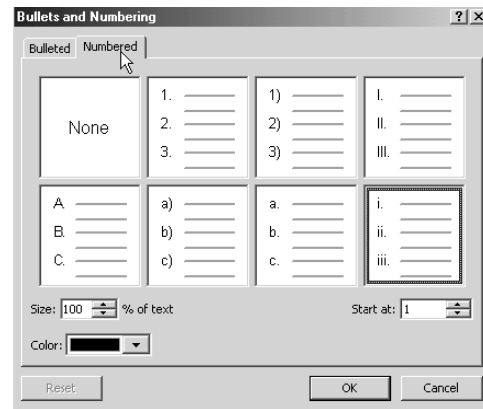


**(F) Change The Color of Text-**
- Select the text you want to change the color.
- Click the Font Color on the Formatting toolbar.
- For applying different color, click the arrow next to the Font Color button
- 

**(G) Horizontal Alignment of Text-**
- **Align Text With The Left Margin**
  - Select the text you want to align left.
  - Click Align Left (Ctrl+L) on the formatting toolbar.
- **Align Text With Right Margin**
  - Select the text you want to align right.
  - Click Align right (Ctrl+R) on the formatting toolbar.
- **Center Text**
  - Select the text you want to center.
  - Click Center (Ctrl+E) on the Formatting toolbar.
- **Justify Text**
  - Select the text you want to justify.
  - Click justify (Ctrl+J) on the Formatting toolbar.
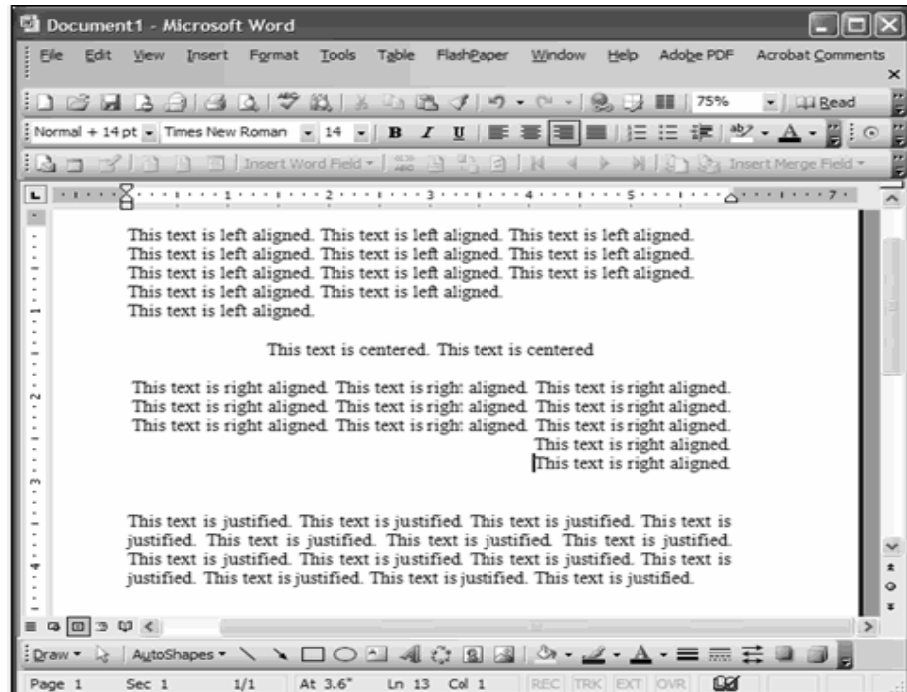
## (H) Spelling Check-

Spelling is one of the best features of Word since it frees you from bothering about the spelling of your text.

- Select Spelling from the Tools menu.
- A spell check dialog box appears. The spell check program starts picking up each word in your document and searching that word in its dictionary. If the word is found in the dictionary, the program moves on to the new word.
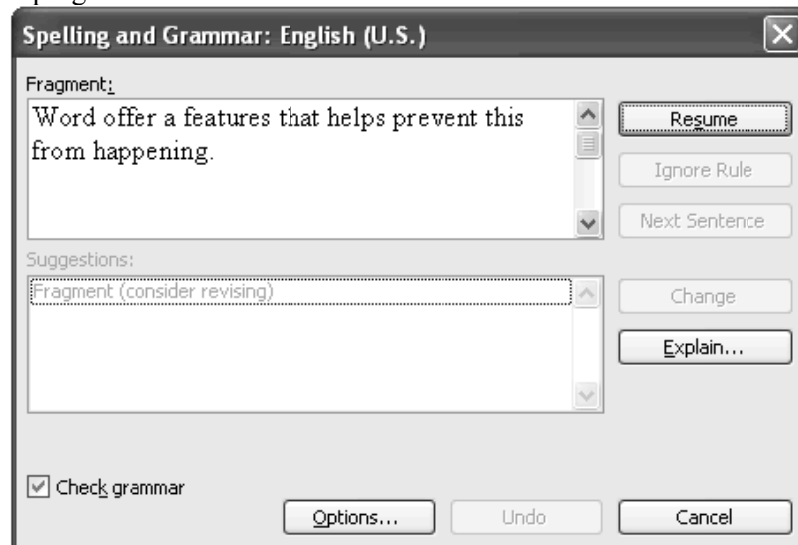


## (I) CHANGE THE CASE OF TEXT –

Sometimes, it is required to change the case of text. The case could be upper case, lower case or title case.

- To change case choose format menu, then click change case.
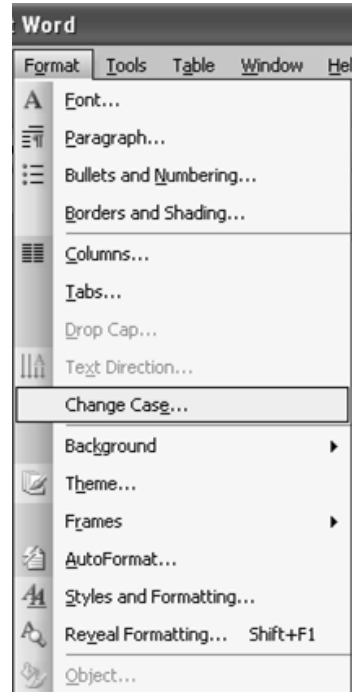
- A dialog box will appear with following options:
    - Upper case
    - Lower case
    - Title case
    - Sentence case
    - Toggle case
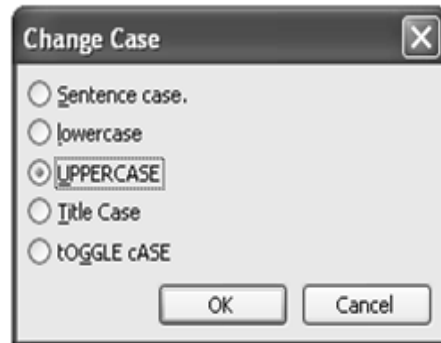
- Select the text you want to change.
- Click on Change Case on Format menu.

**(J) Add Or Change The Background Color Or Texture –**
- Select BACKGROUND from FORMAT menu, and then click color (required for background) or click MORE COLORS to see additional color choices. Click on FILL EFFECTS for special effects, such as texture.
- Select the option according to choice.

**(K) Remove Background –**
- Select BACKGROUND from FORMAT menu.
- Click on No Fill.

<div align="center">

**7.8 TABLES AND SETTING**

</div>

In MS-Word, There are two ways to specify table in a document i.e. to draw table and to insert table.

**(A) Create A Table**

- Click on the Table menu.

- A drop down menu appears.
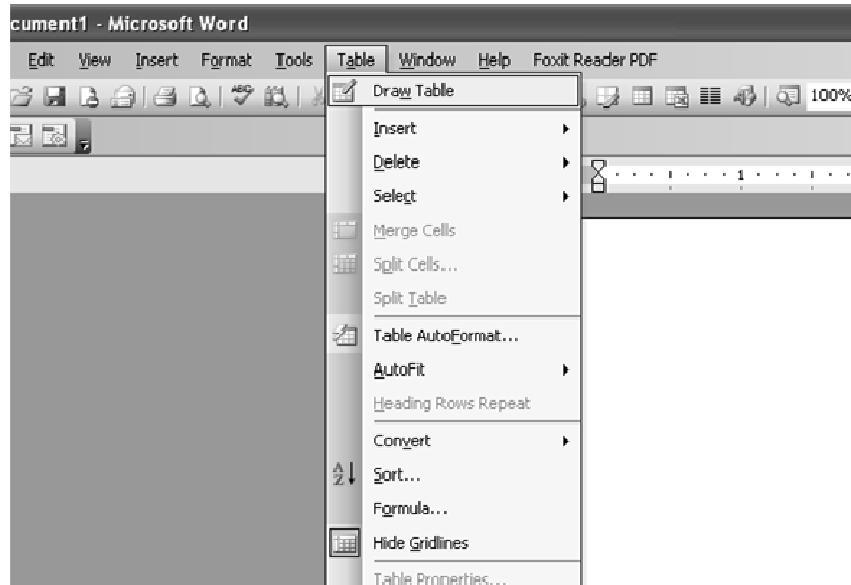


- The Insert Table window appears after clicking Insert Table.

- Enter the Number of Rows and Number of columns.

- Click OK.
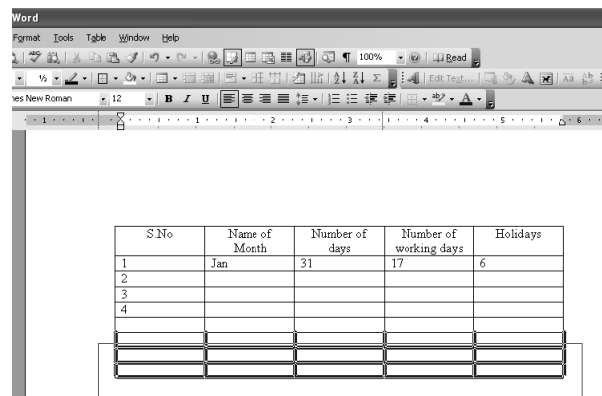


**(B) Inserting Row and Column in Existing Table**

To insert rows and column in existing table, steps are following:

- Place the cursor in table, where row is to be inserted.
- Click on **table** menu option.
- Click on **insert.** A submenu will appear.
- Click on **Rows above** or **Rows below** depending on choice.

In the same way, column can be inserted also.

New row added above

| | | | | |
|---|---|---|---|---|
| a | b | c | d | E |
| f | g | h | i | J |
| k | l | m | n | O |
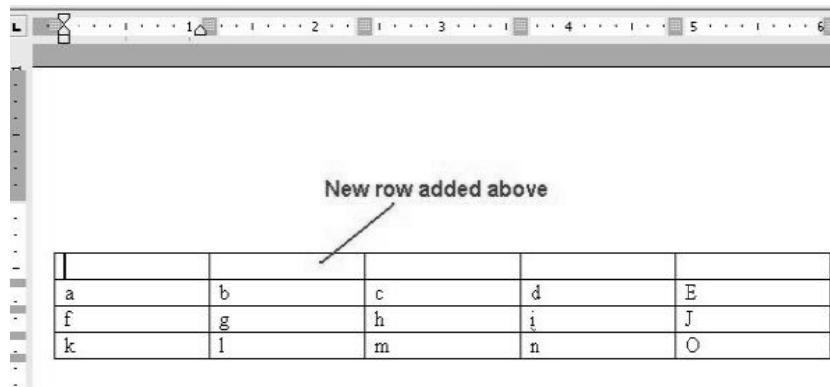
## (C) Delete A Table

- Click the table.

- Pointing to Delete on the Table menu, click Table.
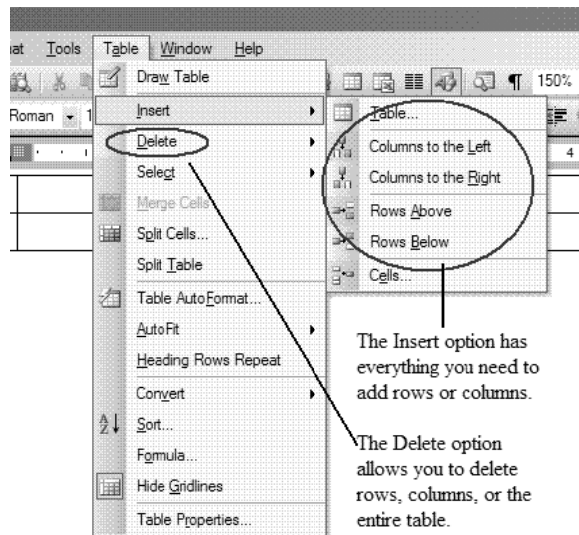


## (D) Delete Row or Column

- Take the mouse pointer in the row or column that you want to delete.
- Click the Table menu option.
- A submenu will appear as soon as, you click on Delete.
- Click on the option Rows or Column, depending on your requirement.

## (E) Change The Column Width in A Table

- Place the pointer on the column boundary you want to do wide until it becomes and then drag the boundary until your column gets the desired width.

- If you want to change the column width to a specific measurement, click a cell in the column, on the Table menu, click Table Properties and then click the Column tab.

- Select the options you want.
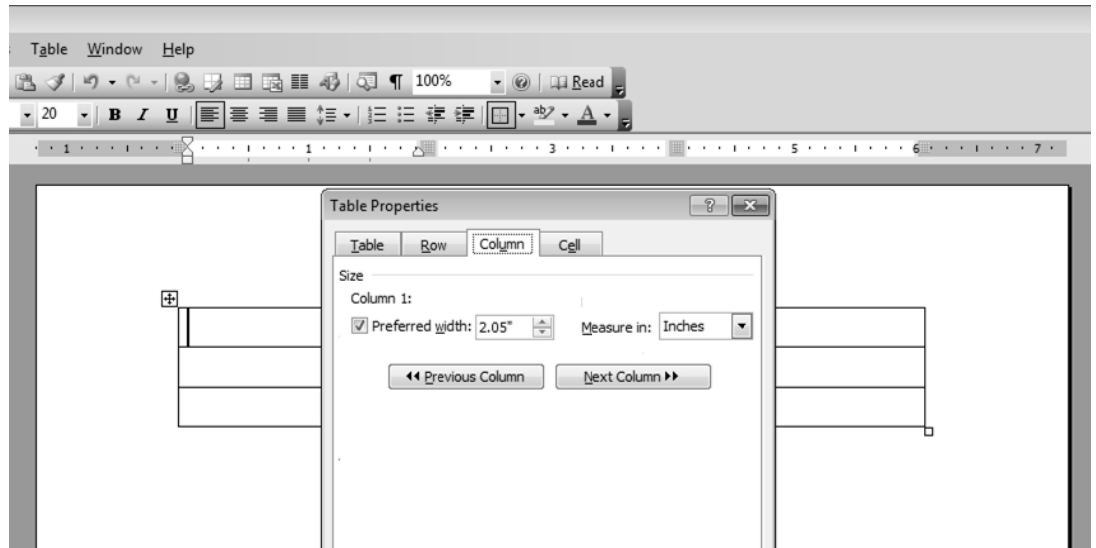
## (F) Change The Row Height in A Table

- Place the pointer on the row boundary you want to move until it becomes and then drag the boundary.

- If you want to change a row height to a specific measurement, click a cell in the row, on the Table menu, click Table Properties, and then click the Row tab.
- Select the options you want.
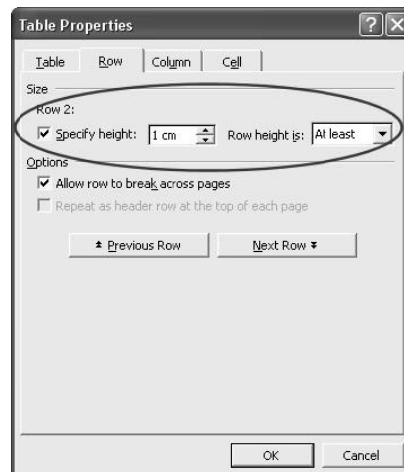


## (G) Autofit

Auto fit is a great feature in word. This feature automatically tries to adjust text in cells so as to keep consistent look of the data in table. For using autofit, perform following steps:

- Click on Table menu.
- Select Auto fit. A submenu will appear.
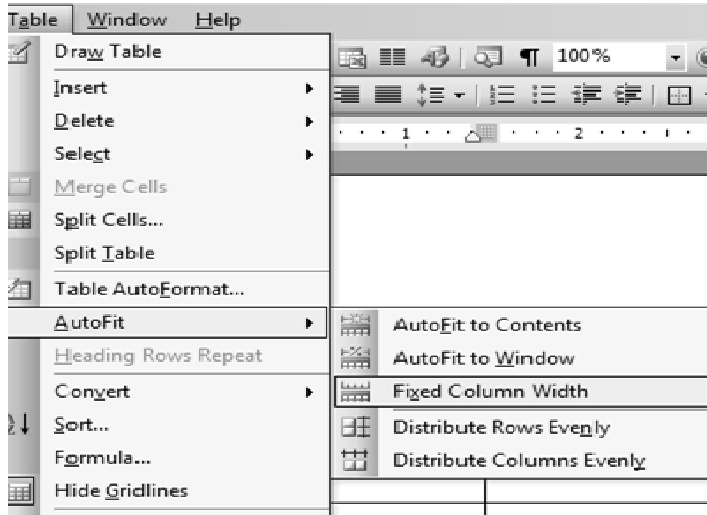
- Select one of the following:-
1. Auto fit to contents: Automatically adjust the width of columns in the table.
2. Auto fit to Window: Automatically resizes the table to make it fit into window.
3. Fixed column width: This option will make width of all columns same as current column width.
4. Distribute rows evenly: This will make all rows of same height.
5. **Distribute columns evenly: This will make all columns of same height.**

**(H) Sorting Text in Table**

Microsoft word allows us to sort data in a table. For sorting ascending and descending are the two options. It is also possible to sort data from two or more columns. To perform sorting, steps are:

- Select column which we want to sort.
- Click on table menu→select sort option.
- A dialog box will appear.
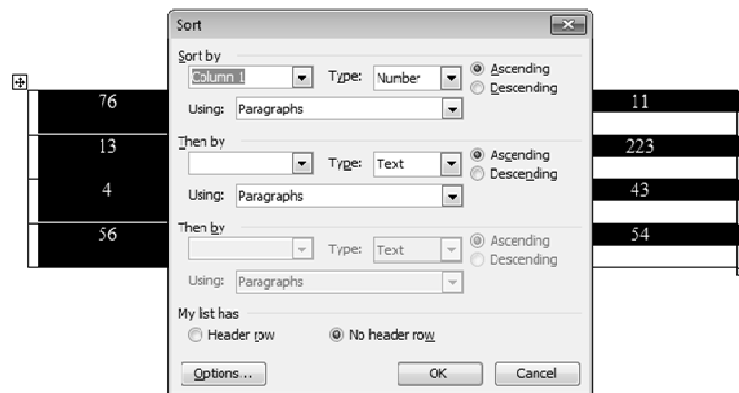


- Specify column name, its type and sort order. Press ok.

**(I) Formatting Text in Table**

Once a table is created, we can easily enter text in the table. The table data could require formatting. The formatting can be done on individual cells of the table or whole table data can be formatted in one time.

- Click on cell or select table to format.
- Apply formatting as normal text using formatting toolbar.

| **(J) Formatting of Table**

Like table text, the whole table can be formatted also. We can add and remove borders, change the border type, border colors, and cell fill color. The text of table can be formatted like normal text. We can also change the direction of text in table cells.

There are two ways to format a table:
- Click on table menu→ choose Table AutoFormat.
- A dialog box will appear. Choose required formatting.
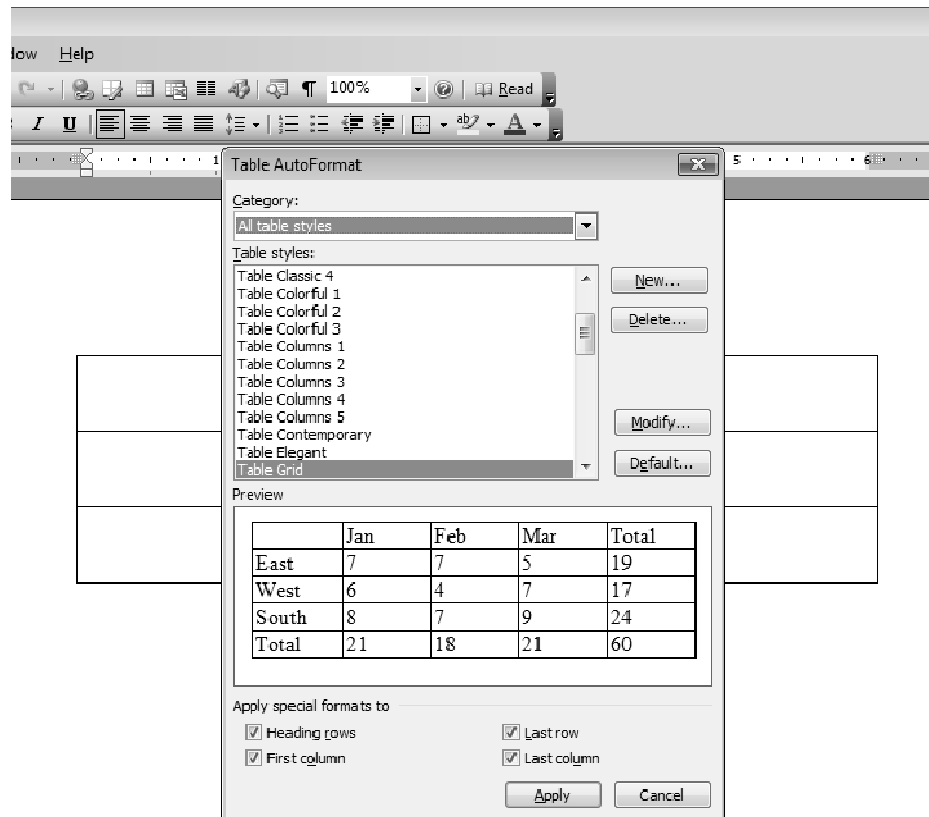


- o Select tables and borders toolbar from view menu→ toolbars→tables and borders.
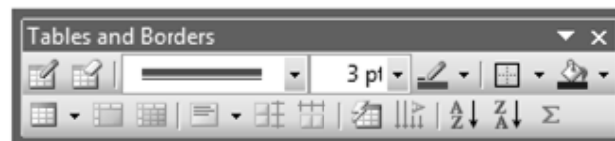


## 7.9 WORKING WITH GRAPHICS

In MS-Word, mainly two types of graphics are used. These are drawing objects and pictures. Drawing objects include Autoshapes, curves, lines, and WordArt drawing objects. Pictures are graphics that were created from another files. Pictures include bitmaps, photographs, scanned pictures and clip art etc.
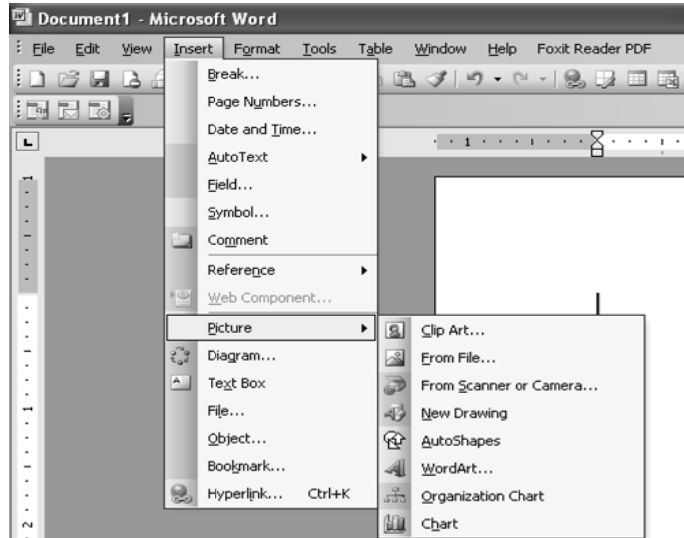
### ➢ Inserting A Picture Using Clip-Art

MS - Word provides many options to insert a picture and for this we can use clip art, we can insert a picture from file, scanner or camera, in our document. The picture option shows drawing option and word art option. The new picture could be in the form of charts. We can also use clip art in ms-excel and power point also.

Steps to insert clip art:-
1. Click on insert menu ➔ picture➔ clip art.
2. Select an image from clip art.
3. A dialog box will appear on screen from which image can be searched.
4. Select the image that you want to insert in your document.
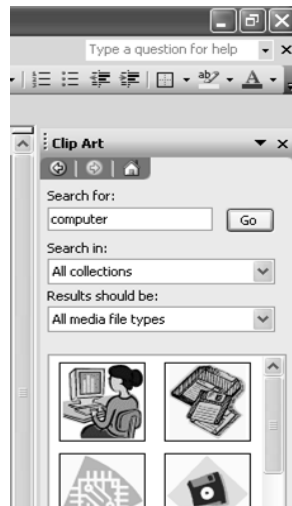
### ➢ Inserting A Picture From File

Steps to insert a picture from file :
- Click on Insert menu➔ picture ➔From File.
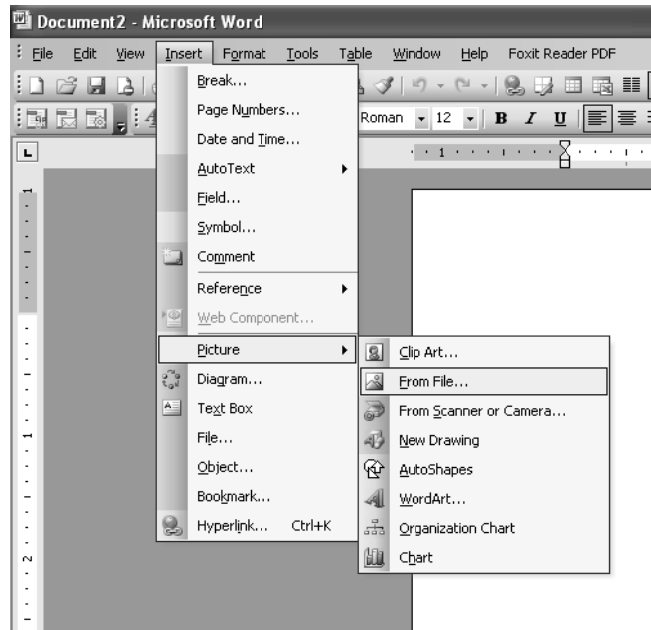
- A dialog box will appear that will ask for name and location for picture to be inserted.
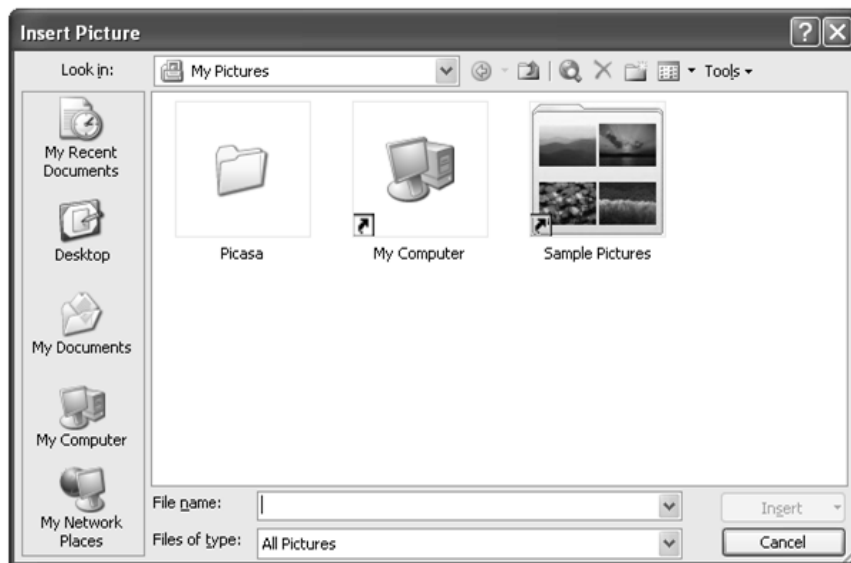


- Give picture name and location to insert the picture.

➢ **Inserting A Picture From Scanner or Camera**
- On the Insert menu in Microsoft word, click on picture, and then click on From Scanner or Camera.
- If camera is selected, a picture needs to be clicked first, then it will be inserted.
- If scanner is chosen, firstly we have to set image settings. Then image will be displayed on screen.

➢ **Drawing Objects in a Document**

For drawing graphics objects in a word document, we can use drawing toolbar. While clicking on Insert menu, then picture, then new drawing, A drawing canvas will appear on word document. By using drawing toolbar, we can draw any kind of picture.
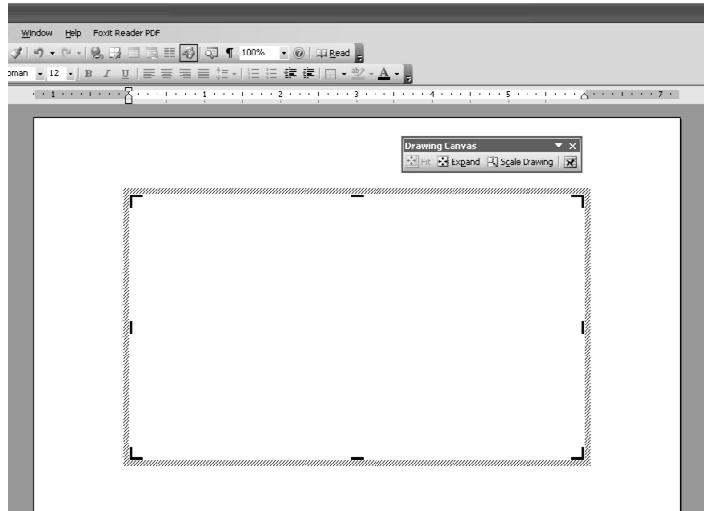
## ➢ **Inserting Autoshapes**

We can insert pre-defined shapes in our word document.

- Click on insert menu➔ picture➔ autoshapes.
- A AutoShapes toolbar will appear.
- Choose the desired shape from that and draw it.



## ➢ **Inserting a Picture Using Word Art**

- Click on insert menu➔ picture➔ word art.
- A dialog box will appear.
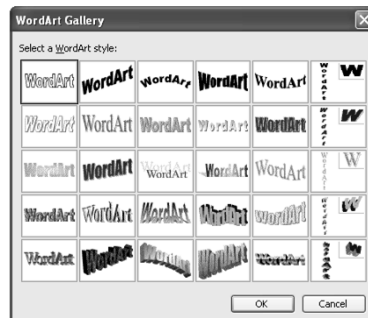


- Choose a word art style, press ok.

- Type the text in next dialog box and press ok.

• For editing the word art object, either double click on object or choose word art toolbar from view menu→toolbars→WordArt.

➢ **Inserting A Chart**

It is a feature in MS Word which enables the user to see chart in document.

In main menu we can select insert →picture →chart to see any chart in a document.

Chart is used in different word documents mainly in business documents which has numerical values.

Chart enables the correct and better view of numerical values.

As we choose chart option, a chart is appeared with datasheet in document. Modify the data sheet as per requirements and click outside the chart and datasheet. The chart will appear in document.
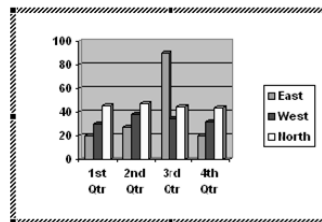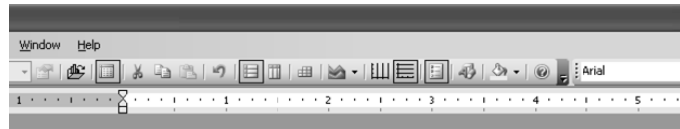


➢ **Symbols:**

These are special characters and can be inserted by INSERT→SYMBOLS in document. Steps are following:

-   Select the place to insert the symbol in document.
-   Choose the symbol from SYMBOL WINDOW.
-   Double click on symbol to specify that in document.
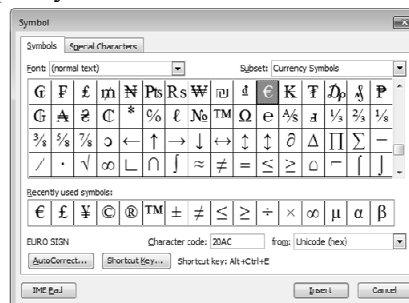


## 7.10    INTRODUCTION TO MAILMERGE

Mail Merge does what it says-----merges mail. When you want to send the same document to different persons with different addresses, Mail Merge is the best option. Through this facility you

can create a database of your contacts and automatically merge the main body of letter and this database in such a manner that many personalized letters would be generated. Each of these letters would be addressed individually to different people and every recipient would feel as if you have personally written the letter to him or her.

The file that contains the 'form-letter' is called the main document and the file containing the database is called the data source. Each entry in the database file (data source) containing details about one person is called a record and each item of detail in this record(like name, phone number, subscription number ) is called field.

Steps for Mail Merge:-
- First type the document which is to be sent to different people.
- Click Tools menu.
- Click letters and Mailings.
- Click Mail Merge
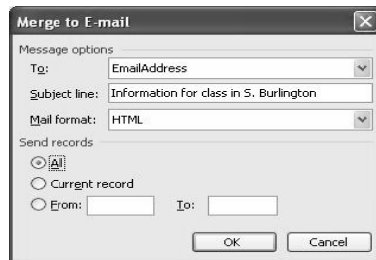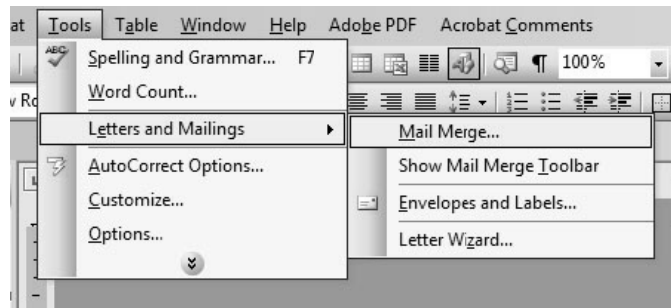




## SUMMARY OF THE LESSON

You learnt the following in this lesson:

- Word processor is a computer program that is used to create, edit, view, format, store, retrieve and print documents.
- MS-Word is one of the popular word processing software that consist various tools and functions to format the document.
- MS-Word consist different menu options used to give direction to software.
- Data can be exported and imported in MS-Word.
- In MS-Word, pictures can be inserted by various ways such as using AutoShapes, ClipArt, From Files, from scanner and Camera etc.
- Multi-Column facility makes more than one column in single document.
- With the help of spell check option, we can make error free document.
- MS-Word also provides the facility of table.
- Mail merge option is used to send letters to many people at the same time.

**SELF ASSESSMENT QUESTIONS AND EXERCISES**

1.  What do you mean by Word Processor?

2.  Discuss the components of Word Document Window.

3.  What is the use of title bar?

4.  What is the purpose of standard toolbar?

5.  What is the purpose of formatting toolbar?

6.  Write down the steps to create a document.

7.  Discuss various ways and steps to save a document.

8.  Discuss the steps to close document.

9.  What is editing? Explain various commands used for editing.

10. Write the steps to find and replace text from the document

11. What is the purpose of undo and redo?

12. State the steps to cut and copy the text.

13. How can you find out the text available in document?

14. Explain various option of help menu.

15. State the steps to align text.

16. Explain the steps to change the font and font size by giving example.

17. Discuss the use of Clip-Art Gallery.

18. What is the procedure to print a document?

19. How many types of text alignment are present in MS-Word? Discuss all of them.

20. What is the procedure to print a document?

21. What is the use of Frame? How a frame can be created?

22. Discuss Table- handling in MS-Word.

23. How multi-column document can be created?

24. What are the steps for recording and running of a macro?

25. What are the steps to insert Bullets and Numbers?

26. Discuss various ways to insert picture in a document.

27. How a table can be created?

28. What are the steps to insert row and column in a table?

29. How a document can be corrected from Misspell?

30. Discuss the purpose of red and green underline in a document.

31. What is Mail Merge? Write down the steps for creating Mail Merg

# CHAPTER-8

## INTRODUCTION TO MS-EXCEL

### OBJECTIVES OF THIS LESSON

MS-Excel is a spreadsheet package which organizes various types of data. It offers enormous features. This lesson is aimed to make you understand the following:

- Basic concepts of MS- Excel i.e. Rows, Columns, Cell etc.
- Various Menu and Toolbar options
- Creating, opening and saving of worksheet
- Formatting and printing of worksheet
- Linking of different worksheets
- Creation and printing of charts or graphs
- Use of Macros and built-in functions

### STRUCTURE OF THIS LESSON

### 8.1     INTRODUCTION

MS-Excel is a spreadsheet package that is offered by Microsoft as a part of their suite. A Spreadsheet is a tool that helps you organize, analyze and evaluate data. It allows you to creating a computerized ledger. With the help of this, arithmetic calculations can be performed very easily and it also make easy to change different numerical values.MS-Excel also provides graphical user interface and user friendly environment. In MS-Excel, charts or graphs are used to show the graphical representation of data. In brief, working in spreadsheets saves a lot of time by its different functionalities.

### 8.2     MS-EXCEL

Microsoft Excel is a spreadsheet package, which organizes all types of data especially numerical data. It is a tool for not only storing or managing data but also analyzing and querying data. A spreadsheet offers considerable ease of performing such tasks by automating all arithmetic calculations and making it easier to change certain numerical values. Spreadsheet is a primary document which consists of cells that are organized into columns and rows. Excel not only does accounts related work but it is cool graphical user interface and user friendliness, even while doing some very sophisticated tasks. Working in spreadsheets saves a lot of time.

## 8.3      FEATURES OF MS-EXCEL

Some of the features of MS-Excel are:

1. Data can be manipulated in tabular form.
2. Excel contains workbooks, in which worksheets are present. Each worksheet consists of 256 columns and 65536 rows.
3. Data from excel can be exported to other compatible softwares.
4. Excel supports charts and graphs for pictorial representation of data.
5. Excel provides built-in functions to perform calculations.
6. This spreadsheet package offers many features that helps to handle complex data like goal seek, what-if analysis.

## 8.4      STARTING MS-EXCEL

- **Click on Start button.**
- **Select the option Programs**
- **Click on Microsoft Excel**
  **MS-Excel window will appear**
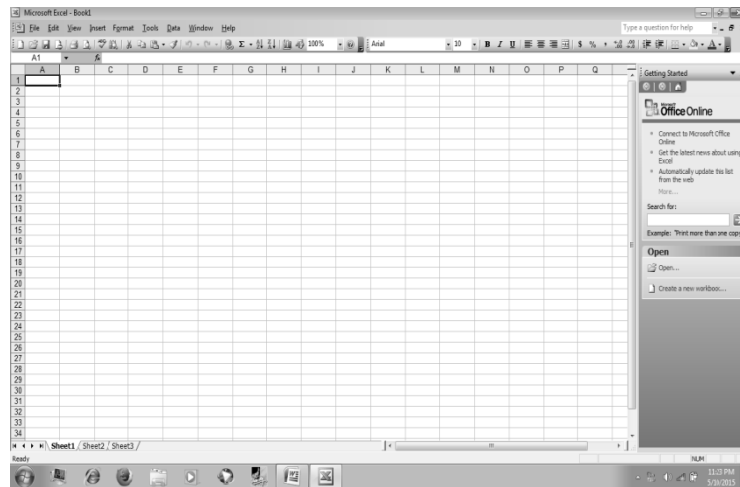


## 8.5      BASIC TERMS IN EXCEL

- **ROWS:-**

    All the rows are numbered numerically i.e. 1, 2, 3…. and so on. There are 16384 rows in each spreadsheet. We can insert a new row also by clicking insert menu. We can also do formatting on rows.

- **COLUMNS:-**

    All the Columns are labeled alphabetically i.e. A, B, C….. and so on. There are 256 columns in each worksheet. We can also change the width of column. We can also do formatting on columns.

- **CELL:-**

    Intersection of a row and a column is called cell. It contains Text or Numbers. We can apply formatting on cells. We can also insert or delete cells. The active cell has a dark outline. When a cell is active, data can be typed into it.
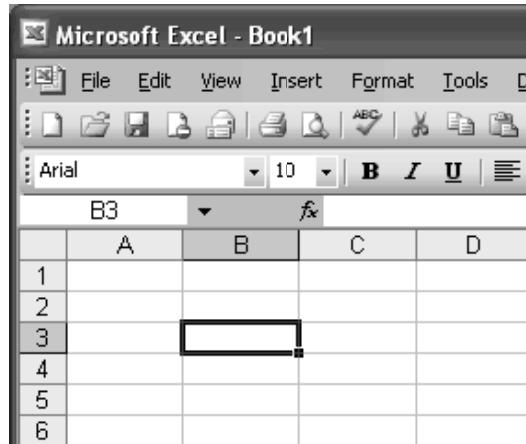
- **Range of Cells:-**

Many spreadsheet operations consists a range of cells instead of a single cell. A range of cells may involve many cells and entering every individual cell address for performing an operation on them may be time taking. To resolve this problem, the concept of cell ranges is used. These are of following types:

1. **Row Range:** It includes a set of adjacent cells in the same row. For example, the range B5…D5 refers to the cells B5, C5 and D5.
2. **Column Range:** It includes a set of adjacent cells in same column. For example, the range C5..C9 refers to the cells C5, C6, C7, C8, and C9.
3. **Block Range:** It includes a set of adjacent cells in a rectangular group of cells. For example, the range B5.. D9 refers to the cells B5, B6, B7, B8, B9, C5, C6, C7, C8, C9,D5, D6, D7, D8, and D9.

- **Cell Contents:-**

In spreadsheets, different types of data can be entered in a cell. The four commonly used types of cell data are:

1. **Label**: A label is any string of alphanumeric text. Label can be used to enter either alphanumeric values in cells, or descriptive data or titles to make the contents easier to understand.
2. **Numeric value**: A numeric value is a number on which spreadsheet can perform calculations.
3. **Formula**: A formula may include numbers, mathematical operators, mathematical functions supported by spreadsheet and cell addresses.
4. **Date and time**: Date and/or time contents type in a spreadsheet are used to display the actual date and time.

- **Cell Referencing:-**

Reference to a cell can be done in three ways:

1. **Relative referencing**:

   The copied formula presents the positional relationship among the cells and this type of referencing is called Relative referencing. For example, suppose the cell E5 contain the formula = B5+ C5 + D5. Excel provides the facility to copy the content of a cell or group of cells. If the formula in E5 is copied to E10, Excel copies it as B5 +C5 +D5.

2. **Absolute referencing**:

   Referring to the value in a cell rather than the position of the cell is called Absolute referencing. For example, suppose D5 contain the formula = C3*12. We wish to copy the formula to cell D6, such that it appears as =C3*12 in this cell. If C3 is taken as a relative address then the copy of the formula to the cell D6 will be C4*12.

MS-Excel uses $ (dollar) symbol to distinguish absolute and relative referencing. To make the relative reference "C3" as absolute "$C$4" will have to be typed in formula in D5. So we type the formula in D5 as = $C$3*12. Absolute reference remains unchanged when that is copied.

**3. Mixed referencing:**

In the example of absolute referencing, "$C$4" makes both the row and column absolute. On the other hand "C$4" or "$C4" are treated as half relative and half absolute and this type of referencing is known as Mixed referencing.

- **COLUMN HEADINGS:-**

| A | B | C | D | E | F |
|---|---|---|---|---|---|

Each Excel spreadsheet contains 256 columns. Each column is named by a letter or combination of letters.

- **ROW HEADINGS:-**

| 1 |
|---|
| 2 |
| 3 |
| 4 |
| 5 |

Each spreadsheet contains 65,536 rows. Each row is named by a number.

- **NAME BOX:-**

B4 ▼

This shows the address of the current selection or active cell.

**Workbooks And Worksheets**

A **workbook** automatically shows in the workspace when you open Microsoft Excel 2003. Each workbook contains three **worksheets**. A worksheet is a grid of cells consisting of 65,536 rows by 256 columns. Spreadsheet information—text, numbers, or mathematical formulas—is entered in the different cells.

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |

**Navigation Buttons And Sheet Tabs**

|◄ ◄ ► ►|\ **Sheet1** / Sheet2 / Sheet3 /

Navigation buttons allow you to move to another worksheet in an Excel workbook. They are used to display the first, previous, next, or last worksheets in a workbook.

Sheet tabs separate a workbook into specific worksheets. A workbook defaults to three worksheets. Each workbook must contain at least one worksheet.

## 8.6    MS-EXCEL WINDOW ELEMENTS
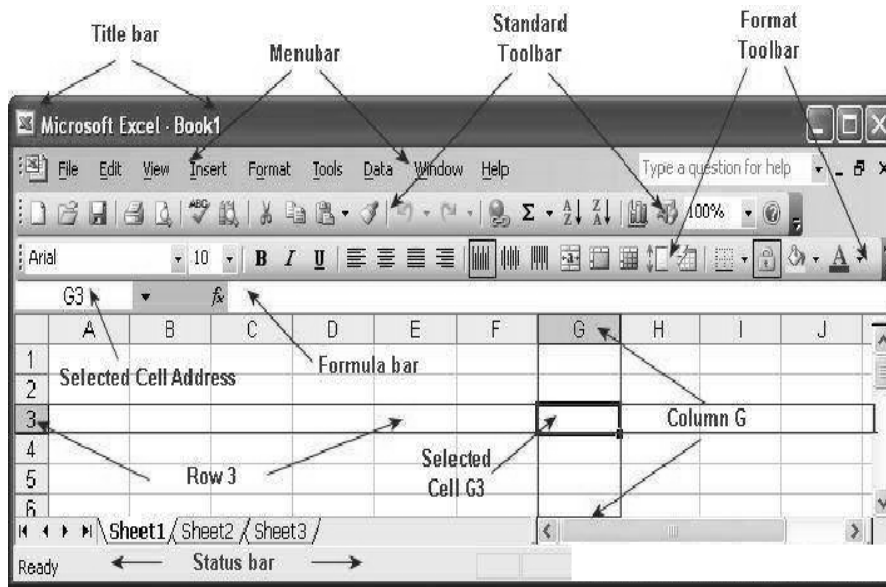
**Excel Screen Elements**

- **Title bar**



**Excel Title bar**

Title bar is located on the top of the Excel Screen. Excel displays the name of the workbook (i.e. file) being used currently.

- **Menu bar**



**Excel Menu bar**

Menu bar is located directly below the 'Title bar'. Menu bar contains Menu tabs File, Edit, View, Insert, Format, Tool, Data, Window and Help. The first letter of menu tabs is underlined. Typing 'Alt + the underlined letter' or a click on the 'Menu tab' will open the drop-down menu associated with the tab. Menus are used to give commands to the software.

- **Standard Toolbar**
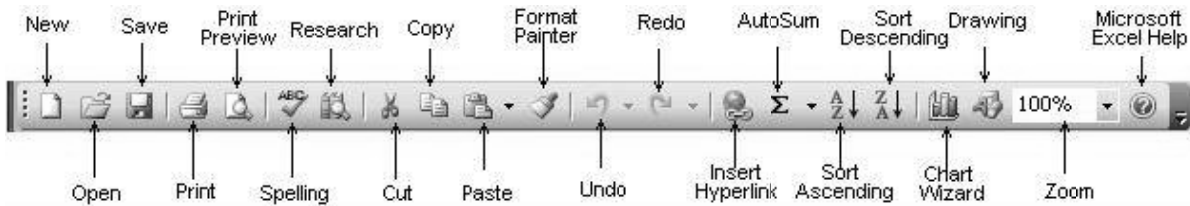


**Excel Standard toolbar**

The Standard Toolbar provides shortcuts to various 'commands' being used frequently by the user like opening or a creating workbook (file), opening, Saving, printing a workbook, Print preview, Cut, Copy, Paste, Undo, Redo, Sum, Sort Ascending, Sort Descending the contents of selected cells, Zoom etc. On moving the mouse over the icons on the tool bar, the command associated with the icon is displayed in a pop up.
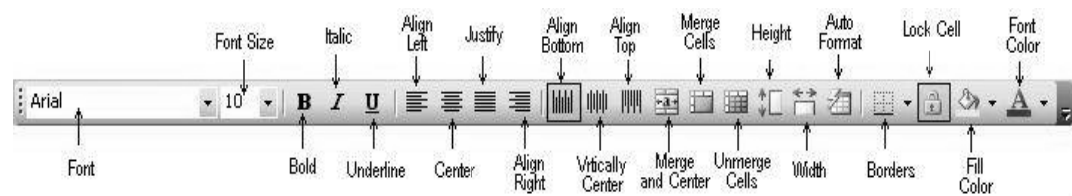
-    **Format Toolbar**



**Excel Format toolbar**

Format toolbar provides commands for formatting the cells and its contents, merging / de merging cells, increasing or decreasing height of rows and width of columns, horizontal and vertical aligning of cell contents etc. A user can add or remove icons (commands) to the toolbar as per requirements.

-    **Formula bar**



**Excel Formula bar**

Formula bar has Name box on the left to display the address of the selected cell. The other box on the formula bar displays number, text, formula or other contents of the selected cell. You can enable or disable display of the **Formula bar** by clicking on **View** followed adding or removing check mark against **Formula bar**.

-    **Status bar**



**Excel Status bar**

The Status bar is located at the bottom of the Excel screen. The bar displays status of the window on the left. The word 'Ready' indicates that Excel is in the Ready mode and is awaiting your next command. Other indicators appear on the Status bar in the lower right corner of the screen are:

- The letters "NUM" on the Status bar in the lower right corner of the screen indicate that the **Num Lock** is on.

- The letters "CAPS" on the Status bar in the lower right corner of the screen indicate that the **Caps Lock** is on.

- The letters "SCRL" on the Status bar in the lower right corner of the screen indicate that the **Scroll Lock** is on.

- The letters "END" on the Status bar in the lower right corner of the screen indicate that the **End** key is on.

- The letters "EXT" on the Status bar in the lower right corner of the screen indicate that the **Extension** of selected cell / range is on. Pressing F8 key anchors a cell / range for extension by pressing arrow keys and repressing F8 key removes the anchor.

A right click on the **Status bar** displays Sum, Average, Count, Maximum or Minimum of the selected cells. You can enable or disable display of the **Status bar** by clicking on **View** followed adding or removing check mark against **Status bar**.

### 8.7      CREATING, OPENING AND SAVING WORKBOOK/WORKSHEET

- **Creating A New Workbook:-**

By default, excel document is called a workbook. Workbooks are named as Book1, Book2 and so on. Every workbook contains 3 worksheets. New worksheets can be added anytime in a workbook.

- To create a new workbook, click New button [icon] on standard toolbar

- You can also select New from File menu.
  You can also press Ctrl+ N.
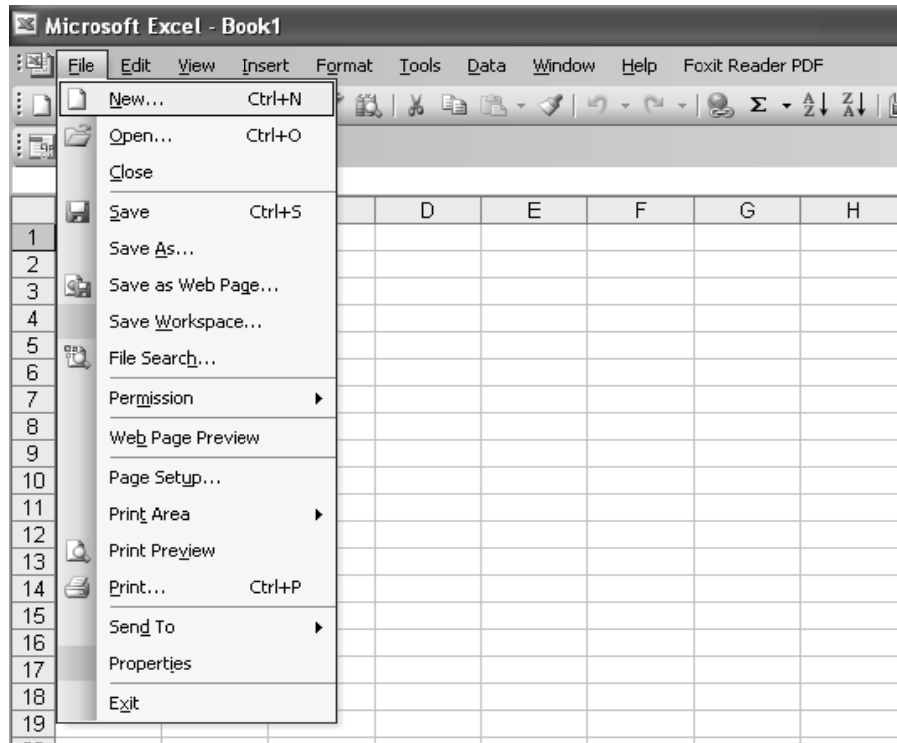


- **Opening A Workbook**

  - To Open an existing workbook, click Open button [icon] on standard tool bar.
  - 
  - You can also select Open from File menu.
    You can also press Ctrl+ O.

- **Saving A Workbook**

  - To save the document, click Save button [icon] on standard tool bar.
  - 
  - You can also click Save from File menu.
  - You can also press Ctrl+S.
    A dialog box will appear.
- 
Save the document with name and extension.
Following are the extensions for excel document saving:
  1. .xls: saving a workbook.
  2. .xlw: saving workspace.
  3. .xlt: template.
  4. .xlk: backup file.
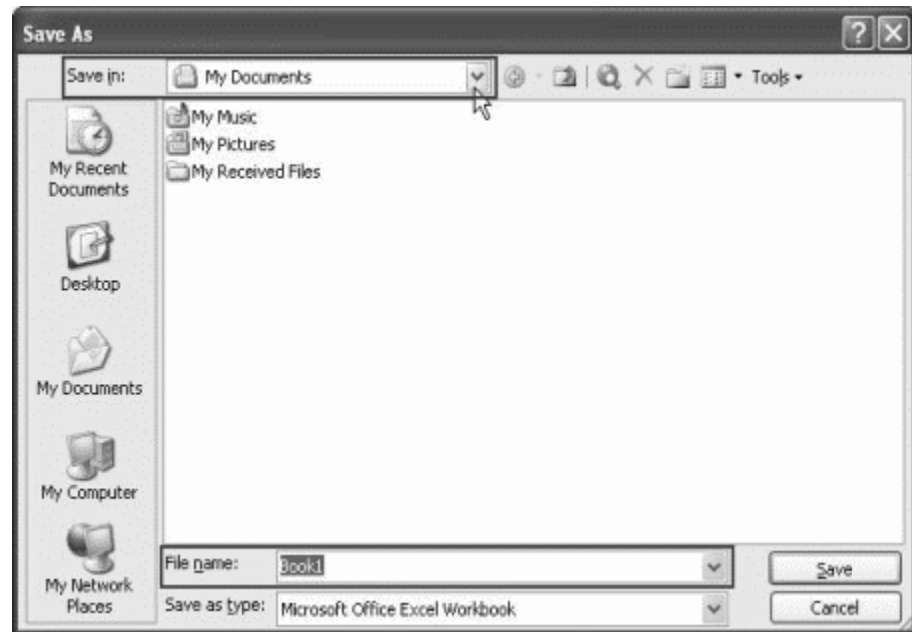
- **Closing A Workbook:-**

Steps to close a workbook are:
- Choose close from File menu to close active workbook.
- We can also press close on right side of menu bar.
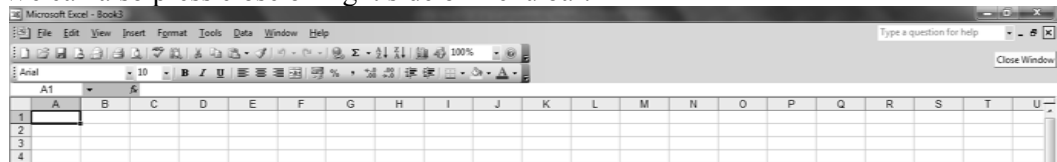


Steps to close excel are:
- To quit excel, choose Exit from File menu.
- We can also click on close button on right side of title bar.
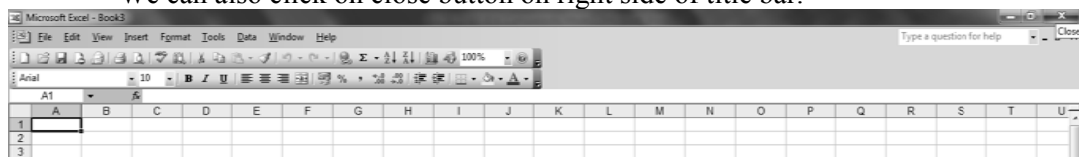


## 8.8      WORKING WITH EXCEL

- **Navigation**:

In MS-Excel, to move around the spreadsheets, keyboard arrow keys are used for going up(↑), for going down(↓), for going left(←), for going right(→), Page up for going one screen up and Page down for going or use the mouse to traverse the different parts of worksheet.

- **Selection of cells:**

A cell is to be selected before it is to be used. Single cell can be selected using mouse or keyboard.

A group of cells selected is called a range. A range is a rectangular group of cells is referred to by its diagonal corners (top-left cell address and bottom-right cell address separated by a colon). Example A1:C3 implies a rectangle covering all the 9 cells from A1 to C3, i.e. A1, B1, C1, A2, B2, C2, A3, B3 and C3.
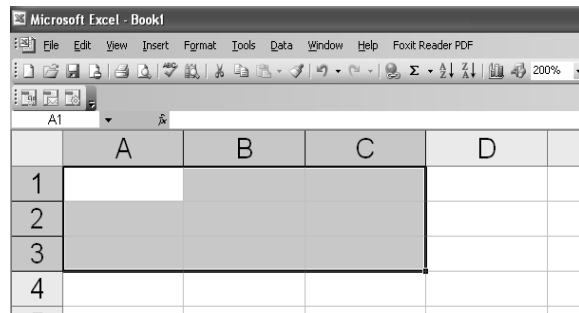
- **Selection of cell with mouse:**

The mouse is helpful to select the specific cells.

- To select a single cell, simply point and click on it to make it active.
- To select entire row, click on a row number.
-  To select entire column, click on column alphabet.
- Click and drag to select a range of cells.
- Click on empty button at the intersection of the column and row numbers to select the entire worksheet.

## Working in Workbook and Worksheet

### To insert worksheet:

To add new worksheet in workbook, select WORKSHEET from INSERT menu. A new worksheet will open in the left side of active sheet.

### To delete worksheet:

 Select the worksheet to be deleted and choose DELETE SHEET from EDIT menu. Then click on OK to delete the worksheet.

### To change the name of worksheet:

Select FORMAT→SHEET→RENAME or double click on desired worksheet to change the name of worksheet.

### To copy/move worksheet:

 For this purpose, select MOVE or COPY command from EDIT menu.
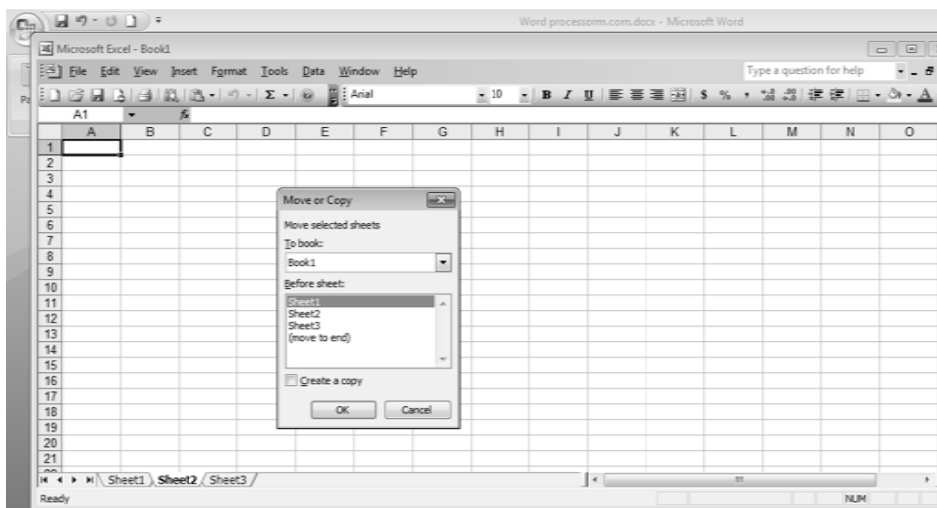
**To hide the workbook/worksheet:**

Hiding of workbook or worksheet saves the data from deletion and there is less number of worksheet on screen. This is the best way to secure the data from undesired changes.
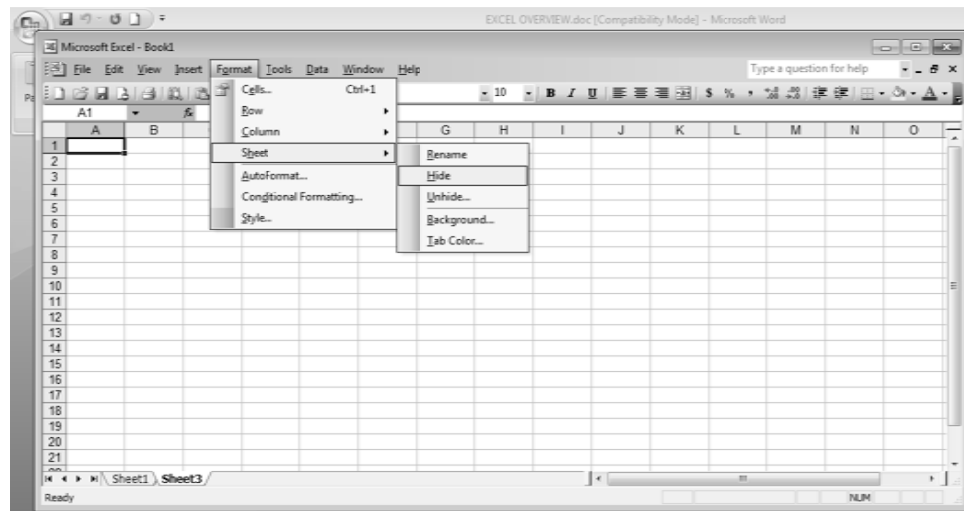


**Entering Formula:**

The Excel worksheet is helpful to modify the data table and to calculate the specific cells. For this purpose, the unique characteristic of Excel named formula and function is used. Formulas are entered in worksheet cell and must start with an equal sign '='. The formula includes the cell addresses whose values have to be manipulated using correct operands. The formula calculates the cell range automatically specified in it.

## 8.9    FORMATTING

- **Conditional Formatting:**

This feature helps to copy the formatting style from a selected cell to another. To do this, simply copy the cell and paste its format to another cell. We can also copy format to a range of cells. Following are the steps:

- Select the range of cells in the worksheet to which conditional format is to be copied. The cell is to be copied must be the part of the range.
- Select Format menu→ Conditional Formatting.
- A dialog box will appear.
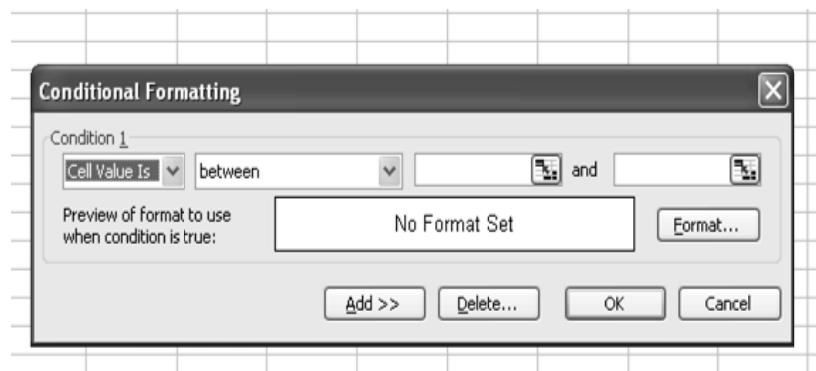


- Fill the required details.

- **Moving Through Cells**

While working in the worksheet we can use mouse to select a specific cell or row. We can also use keyboard to move through cells in a worksheet.

- To move to the next cell, press the Arrow Keys.
- To move to the next cell to the right, press TAB.
- To move to the next cell to the left, press SHIFT + TAB.
- To move to the edge of a data region, press CONTROL + Arrow Keys.
- To move to the first cell in the row, press HOME.
- To move to the first cell, press CONTROL + HOME.
- To move to the last cell, press CONTROL + END.
- To scroll down, press PAGE DOWN.
- To scroll up, press PAGE UP.
- To scroll to the right, press ALT + PAGE DOWN.
- To scroll to the left, press ALT + PAGE UP.
- To move to the next worksheet, press CONTROL + PAGE DOWN.
- To move to the previous worksheet, press CONTROL + PAGE UP.
- To go to a cell using the "Go To" dialog box, press F5 to open the "Go To" dialog box, type the cell co-ordinates in the Reference box and press ENTER.

- **Adding rows:**
  - Select the cell.
  - Click on Insert menu➔ Row
  - A new row will be inserted above the selected cell.
- **Adding Columns:**
  - Select the cell.
  - Click on Insert menu➔ Column
  - A new column will be inserted before the selected cell.
- **Resizing Rows:**
  - Select the row.
  - Click on Format menu➔ Row
  - A sub menu will appear with following options:
    - Height
- **Resizing Columns:**
  - Select the column.
  - Click on Format menu➔ Column
  - A sub menu will appear with following options:
    - Width

- **Selecting Cells:**

A cell is to be selected before it is to be used. Single cell can be selected using mouse or keyboard.

A group of cells selected is called a range. A range is a rectangular group of cells is referred to by its diagonal corners(top-left cell address and bottom-right cell address separated by a colon). Example A1:C3 implies a rectangle covering all the 9 cells from A1 to C3, i.e. A1, B1, C1, A2, B2, C2, A3, B3 and C3.
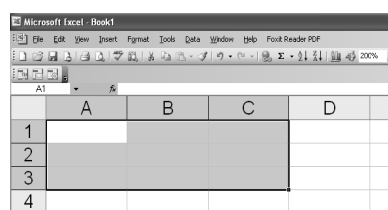
-   **Moving Cell Contents:**

The contents of a cell can be moved using cut and paste. For this, following are the steps:

- Choose the cell to be moved.
- Click on Edit menu→ Cut.
- Now, go to that position where data is to be moved.
- Click on Edit menu→ Paste.

-   **Copying Cell Contents:**

The contents of a cell can be moved using copied and paste. For this, following are the steps:

- Choose the cell to be copied.
- Click on Edit menu→ Copy.
- Now, go to that position where data is to be copied.
- Click on Edit menu→ Paste.

-   **Drag And Drop Option:**

   This option can be used to move the cell contents to a short distance. To perform Drag and Drop, simply drag the highlighted border of the selected cell to the destination cell using mouse.

-   **Freeze Panes:**

To make the heading visible at all times in big worksheet, where the heading will disappear as the worksheet is scrolled, freeze panes feature is used. It can be performed by following steps:

- Click the label of the row below the row that should remain frozen at the top of the worksheet.
- For adding Frozen panes, select Window→Freeze Panes from menu bar
- To remove the Frozen Panes, select Window→Unfreeze Panes from menu bar
  The freeze panes will remain stationary while the remaining rows and column will move when worksheet is scrolled.
- **To Change The Font Used in A Cell or Range of Cells:**
- Select the cell or range of cells you wish to change.
- On the Excel **Formatting toolbar** choose a font from the **Font** drop down list.

-   **To Change Other Font Characteristics**
- Select the cell or range you wish to change.
- From the **Format** menu, click **Cells**.
- From the **Format Cells** dialog box displayed, select the Font tab to change the **Font, font style**, or **size**.
- Select the **Underline:** drop down list box to select a style of underline or None to remove the underlining.
- Select the **Color:** drop down list box to choose a font color.
- In the **Effects** section, you can tick **Strikethrough, Superscript**, or **Subscript**.
- To change all the settings in the dialog box back to the Normal style which is set in the **Style** dialog box, tick the **Normal font** check box.
- Select **OK** to close the **Format Cells** dialog box.

-   **To Align Data between the Left and Right Sides of a Cell**
- Select the cell, or cells, you wish to align.
- On the Excel **Formatting toolbar**, click on the **Align Left** icon to align data with the left edge of the cell.
- Click on the **Align Right** icon to align data with the right edge of the cell.
- Click on the **Center** icon to center data in the cell.

- **To Align Data Between The Top and Bottom of A Cell**
- Select the cell, or cells, you wish to align.
- From the **Format** menu, click **Cells**.
- From the **Format Cells** dialog box displayed, click on the **Alignment** tab.
- In the **Text alignment** section, choose the Top, Center, or Bottom option in the **Vertical** area to align the data in the cell.
- To make the lines of data fit evenly within the height of a cell, tick the **Justify distributed** option and click on **OK**.
- **To Change The Orientation of Data Cells**
- Select the cell, or cells, you wish to change.
- From the **Format** menu, click **Cells**.
- From the **Format Cells** dialog box displayed, click on the **Alignment** tab.
- In the **Orientation** section, you can change the **Degrees** of the text or use the mouse to drag the 'red small diamond' up or down. When satisfied, click on **OK**.
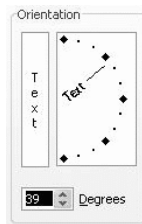


- **To Wrap Multiple Lines of Data in A Cell**
- Type the data you require into the cell and press **Enter**. The entry will appear as one long line and select the cell, or cells, you wish to format.
- From the **Format** menu, click **Cells**.
- From the **Format Cells** dialog box displayed, click on the **Alignment** tab.
- In the **Text control** section, tick the **Wrap text** check box and click on **OK**.

- **To Shrink The Text Into One Cell**
- Type the data you require into the cell and press **Enter**.
- From the **Format** menu, click **Cells**.
- From the **Format Cells** dialog box displayed, click on the **Alignment** tab.
- In the **Text control** section, tick the **Shrink to fit** check box and click on OK.

- **To Merge Several Cells**
- Select the cells that you wish to merge to become one cell.
- Right-click on the selected cells, click **Format Cells**.
- From the **Format Cells** dialog box displayed, click on the **Alignment** tab.
- In the **Text control** section, tick the **Merge cells** check box and click on **OK**. **Note:** You also can use the **Merge and Center** icon on the Excel **Formatting** toolbar.
- **To Change the Color of Text**
- Select the cells containing the data you want to change the color.
- On the Excel **Formatting** toolbar, click the down arrow next to the **Font Color** icon.
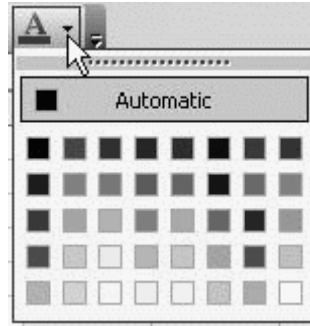
- Choose a color from the **Font Color** palette.

- The color you selected from the **Font Color** palette will be displayed on the new icon face. Click on the icon face to apply the new color to the cell.

- **To apply colors to cell(s)**

- Select the cell or range of cells you wish to color.

- On the Excel **Formatting** toolbar, click the down arrow next to the **Fill Color** icon.

- Choose a color from the **Fill Color** palette.
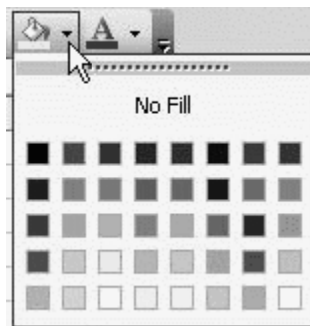


- **To turn off the cell(s) color**

- Select the cell or range of cells you wish to color.
- On the Excel **Formatting** toolbar, click the down arrow next to the **Fill Color** icon.
- Choose **No fill**.

- **To Change Number Formatting Using The Formatting Icons**

- We can quickly change the formatting of a cell or selected range by using the following icons on the **Formatting** toolbar.



| | |
|---|---|
| **Currency** | 12345 will become $12,345.00 |
| **Percent** | .25 will become 25% |
| **Comma** | 98765 will become 98,765.00 |
| **Increase Decimal** | 12,345.00 will become 12,345.000 |
| **Decrease Decimal** | 98,765.00 will become 98,765.0 |

- **To Format A Number As A Currency**

- Select the cell or range of cells you want to format.

- From the **Format** menu, click **Cells**.

- From the **Format Cells** dialog box displayed, select the **Number** tab.

- In the **Category:** section, select **Currency**.
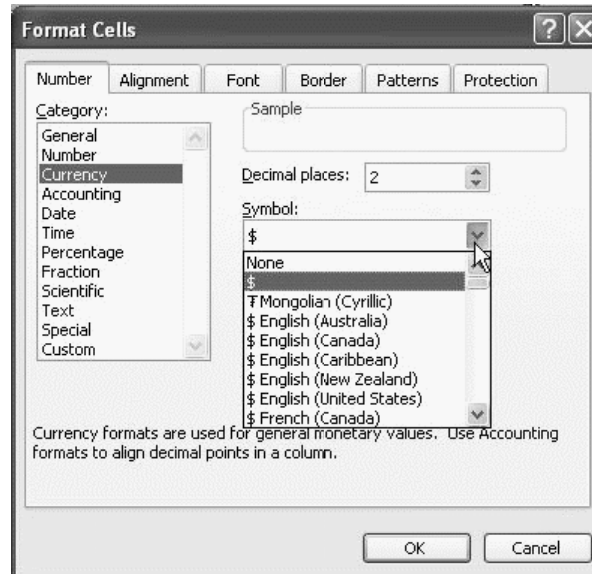


- Select the number of decimal places you require by using the **Decimal places:** spin box arrows.

- In the **Symbol:** section drop down list, select the type of currency.

- Click **OK**.

- **To Format A Number As A Percentage**

- Select the cell or range of cells you wish to format.

- From the **Format** menu, click **Cells**.

- From the **Format Cells** dialog box displayed, select the **Number** tab.

- In the **Category:** section, select **Percentage**.

- Select the number of decimal places you require by using the **Decimal places:** spin box arrows.

- Click **OK**

- **Format Painter:**

This is a useful feature for formatting the text. If the cells have already formatted using specific font style, date format, and other formatting option, then another cell or group of cells can be formatted using the same style. To do this, place the cursor within the cell containing the format that is to be copied. Then, click the FORMAT PAINTER button on standard toolbar. Now the pointer has paintbrush as FORMAT PAINTER is initialized. Highlight the cell to which same selected formatting is added.

### Auto Formatting

This feature is helpful to obtain professional-quality format for data. Auto formats are combinations of formats, such as lines and fills, that Excel applies to the indicated range of cells. Steps for Auto formatting are :

- Select cell(s) in table.
- Click **Format** menu, then click **AutoFormat**.
- Click Premade format in **Table Formats** list, to select the appropriate format.
- Click Ok when done.
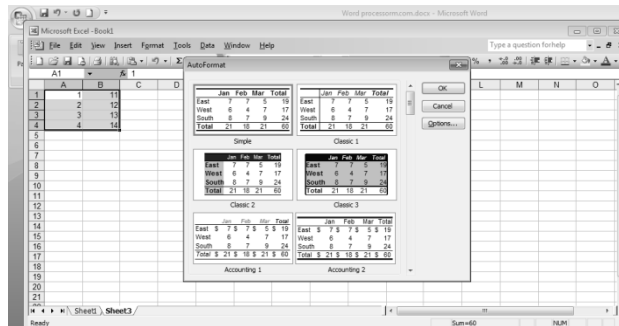


## 8.10    PRINTING A WORKSHEET

- To Print an active document, click Print button  on standard toolbar
- 
- You can also click Print on File menu.
- You can also press Ctrl+P.
- A dialog box will appear.
  Fill the necessary information.
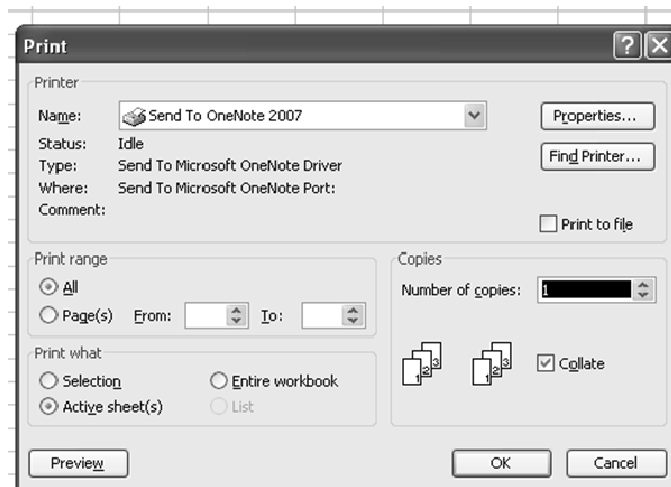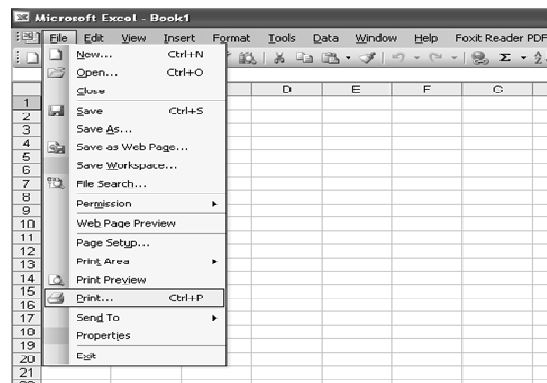
# 8.11    MACRO

A macro is a set of instructions that tells Microsoft Excel to perform one or more actions as per user requirements. Macros are like computer programs, but they run completely within Excel. We can use them to automate tedious or frequently repeated tasks.

Macros can carry out sequences of actions much more quickly. For example, we can create a macro that enters a series of dates across one row of a worksheet, centers the date in each cell, and then applies border format to the row. Or we can create a macro that defines special print settings in the Page Setup dialog box and then prints the document.

Macros can be simple or extremely complex. They can also be interactive; that is, we can write macros that request information from the user and then act on that information.

There are two ways to create a macro: we can record it, or we can build it by entering instructions in a module. Either way, the instructions are encoded in the programming language Microsoft Visual Basic for Applications (VBA).

- **Recording A Macro**

- On the Tools menu, point to Macro, and then select Record New Macro.
- In the Macro name box, enter the name of the macro. Click Ok.
- A Stop Recording toolbar will appear. Drag it to a new position if it is in the way.
- Perform actions we want to record.
- Press stop recording on toolbar. A macro will be saved.



- **Running A Macro**

- Click on Tools menu, select Macro.
- A list of macros, earlier saved will appear. Choose macro we want to run.
- Click Run.

## 8.12    FUNCTIONS

Functions are power tools which help to perform calculations on data. FUNCTIONS are predefined formulas that will calculate selected data. The user has to simply provide the values based upon which calculations are to be done. All Excel functions consist of three (3) parts: The = sign, the function name, and an argument or range enclosed in parentheses.

A FUNCTION is always identified by the =SIGN preceding the function name. The FUNCTION NAME indicates which function is being used. The ARGUMENT or RANGE is enclosed in parentheses and specifies the range of cells on which the function will act. The ARGUMENT can be a real number, a reference to a cell, a reference to a group of cells, a formula, or another function. A function can be added to the worksheet by two methods:

1.   Place the cursor where you want the function result to appear and select Function from Insert menu.
2.   Manually type the function at desired place.

| Total | =SUM( |
|-------|-------|
|       | SUM(**number1**, [number2], ...) |

Functions are characterized by purpose. There are 9 function categories.

### 1.   Mathematical Functions:

With math and trigonometry functions, we can perform simple and complex mathematical calculations
-   **SUM (Range)**- Sum of a group of numbers
-   **SQRT(X)** - Displays the square root of a number (X)
-   **PRODUCT (range)** – multiplication of given values
-   **MODE (argument 1, argument 2)** – will give remainder after dividing argument 1 by argument 2

### 2.   Statistical Functions:

Statistical worksheet functions perform statistical analysis on ranges of data. This includes average, highest and lowest values, standard deviation, median, and other statistics.

-   **AVERAGE (Range)**      - Gives the average of a group of numbers
-   **COUNT (Range)**        - Counts the items in a list
-   **MIN (Range)**          - Displays the smallest number in the range
-   **MAX (Range)**          - Displays the largest number in the range

### 3.   Financial Functions:

Financial functions perform common business calculations, such as determining the payment for a loan, the future value or net present value of an investment, the principle and interest etc.

-   **FV**               – To calculate future value of investment
-   **IPMT**             – to find interest payment

### 4.   Logical Functions:

Logical functions are used to see whether a condition is true or false or to check for multiple conditions. Like,

-   **AND**                    -   **OR**                    -   **NOT**                    -   **IF**

**5. Lookup Functions:**

When we need to find values in lists or tables or when you need to find the reference of a cell, we can use the lookup and reference worksheet functions.

- **ADDRESS** - returns a cell reference as text

- **COLUMN** – returns the column number of reference

- **COLUMNS** – returns number of columns in a array of reference

**6. Text Functions**:

With text functions, we can manipulate text strings in formulas. For example, we can change the case or determine the length of a text string. We can also join, or concatenate, a date to a text string. To manipulate the text, excel provides many functions like

- **CHAR**           - **LEFT**           - **REPLACE**

- **CODE**           - **LEN**            - **RIGHT**

- **FIND**           - **LOWER**          - **SEARCH**

**7. Date & Time Functions**:

With date and time functions, we can analyze and work with date and time values in formulas. For example, if we need to use the current date in a formula, use the TODAY worksheet function, which returns the current date based on computer's system clock. There are other main function like

- **DATE**           - **NOW**

- **DAY**            - **TIME**

- **MONTH**          - **YEAR**

**8. ENGINEERING FUNCTIONS:** The engineering worksheet functions perform engineering analysis.

**9. DATABASE FUNCTIONS:** A set of functions that allows calculations on database. Following are the functions:

**DAVERAGE** – returns the average of values in a list or database.

**DCOUNT** – counts the cells in a record that matches a specified condition

**DMAX** – returns the maximum value from the list or database

**DMIN** – returns the minimum value from the list or database
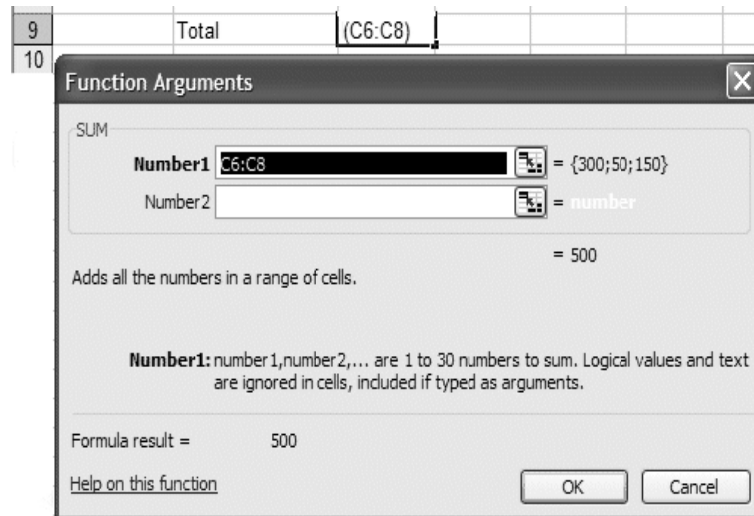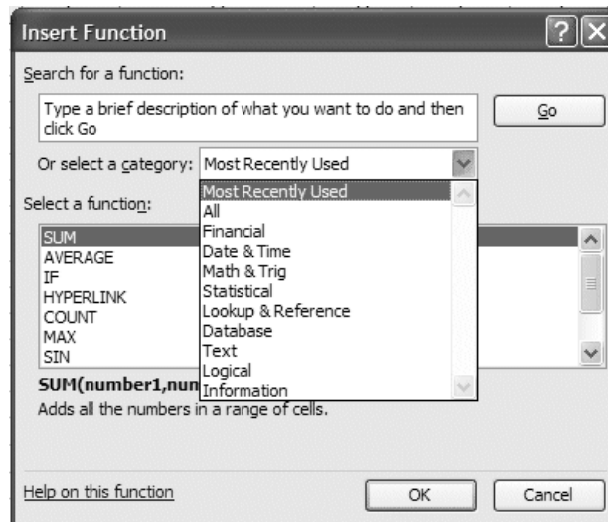
### 8.13    CHARTS (GRAPHS) IN EXCEL

A chart is a graphical representation of the data in your worksheet. You can create an embedded chart, which appears on the worksheet beside the data, or, you can create a chart sheet as a separate sheet in the workbook so that it can be displayed apart from its associated data. Whichever method you choose your chart data is automatically linked to the worksheet from which it was created. If you change the data on the worksheet, the chart will change accordingly.

Excel offers many different chart types, each of which has several subtypes or variations:

- Column
- Bar
- Line
- Pie
- XY (scatter)
-  Area
- Doughnut
-  Pyramid
  Standard Chart Types

- Radar
- Surface
- Bubble
- Stock
- Cone
- Cylinder

The main chart types are as follows (arranged in alphabetical order):

- **Area chart**

  An area chart shows the relative importance of values over a period of time. It is similar to a line chart but emphasizes the amount of change (Magnitude of values) rather than time and the rate of change.

- **Bar chart**

  Bar charts illustrate comparisons between items. Although they are similar to column charts, the categories on a bar chart are displayed vertically and the values are organized horizontally. This concentrates on comparing values and places less emphasis on time. A stacked bar chart shows the relationship of individual items to the whole.

- **Bubble chart**

  A bubble chart is a variation on an xy scatter plot. The size of the bubble (data marker) indicates the value of a third variable. Arrange the data with x values in one column (or row) and the corresponding y values and bubble size in the adjacent columns (rows).

- **Column chart**

  Column charts can be used to illustrate how data changes over a period of time, and to compare various items. Categories are displayed horizontally, values vertically.

- **Doughnut chart**

  Doughnut charts are similar to pie charts but, unlike pie charts, can show more than one data series. Each ring represents one data series. These charts are widely used in the Far East.

- **Line chart**

  This shows trends or changes in data over a period of time, at even intervals. A line chart emphasizes time flow and rate of change rather than the amount of change. If you need to show trends or changes in data at uneven or clustered intervals, an xy (scatter) chart is more appropriate.

- **Pie chart**

  A pie chart can only show one data series. It compares the size of individual items with the sum of them all.

- **Creating A Chart**

  - Choose a range of data for which we want to make a chart.
  - Either Click on the Chart Wizard button on the toolbar
    Or
    Select Chart from the Insert menu.

The first Chart Wizard dialog box will appear. The Chart Wizard –

**Step 1 of 4** – Chart Type dialog box that appears has two tabs. The popular built-in chart types can be found on the Standard Types tab. Chart types designed by us, the user, and combination charts designed by Excel, can be found on the Custom Types tab.
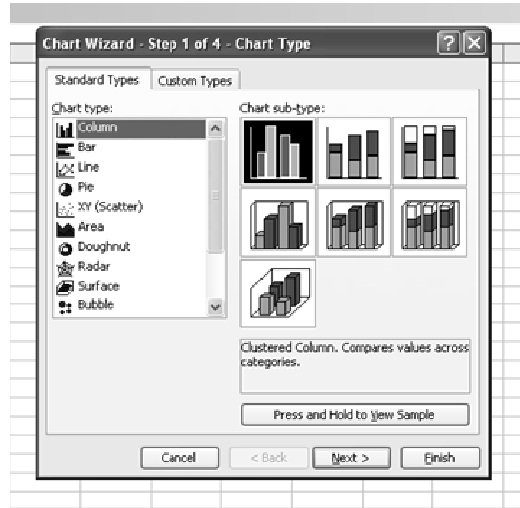
**Step 2 of 4** – Specify the data to be plotted i.e. the source of data for which chart is to be created.
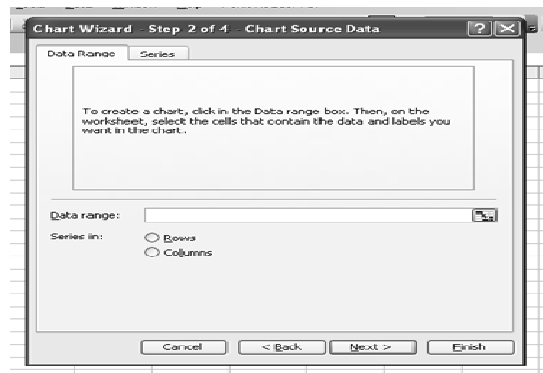


**Step 3 of 4** – The number of tabs displayed in the Step 3 – Chart Options window varies, depending on the chart type. Here we have three — Titles, Legend and Data Labels.
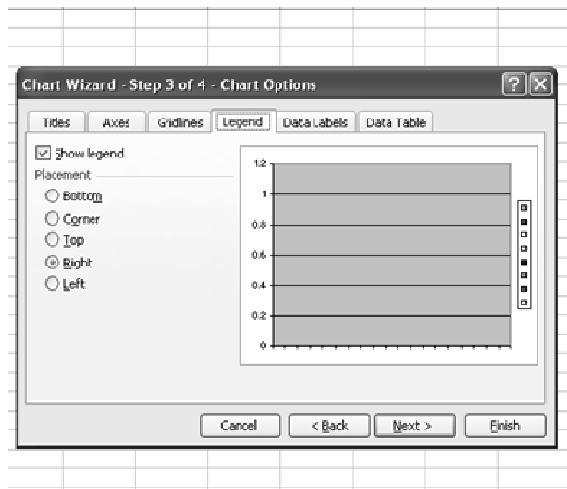
**Step 4 of 4** – Specify chart location in window, we can specify where this new chart is to go. You can choose to place the chart.
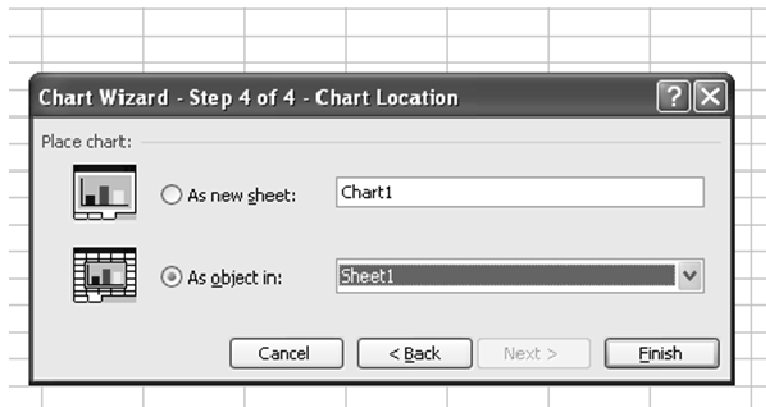


• As new sheet in which case a chart sheet containing just the chart will be entered in workbook — type a name for the sheet in the adjacent box.
• As object in so that the chart will be placed in an existing worksheet
— the current one where our data is, or a different one (click on the down-arrow to select one).

## 8.14    ADDING GRAPHICS

Graphics can easily be added to charts and are a useful way to draw attention to a particular feature or to provide an explanation. We may decide to add an arrow and some text to chart. Whatever we are doing, you should first make sure that the Drawing toolbar is visible:

Select View | Toolbars | Drawing.
There are two possible scenarios:
• The graphics are confined to the area of the chart
• The graphics are partly/completely outside the chart area
**Adding Graphics:**
- Click on the chart to select it.
- Click on the Arrow button on the Drawing toolbar.
- Draw an arrow on your chart.

If the graphics are confined to the area of the chart, we can move the chart and the arrow will move with it. If the graphics are partly outside the chart area, the arrow will not move with the chart unless we also:

- Select the chart, arrow and text box (using Shift+click).
- Right-click on this selection.
- Select Grouping | Group.
- Click away from the selection.

**Adding Trendlines:**

Trendlines are used to show the trends of data in graphical form. As the name suggests, trendlines show the up and down of data. In Excel, trendlines are of six types. These are:

-   Linear          - Logarithmic
-   Polynomial       - Power
-   Exponential       - Moving Average

To add trendlines following steps are required:

- Select the range of data
- Select Add Trendlines from Chart menu (present in menu bar as chart is created)
- Specify the type of Trendline in dialog box.
- To apply the changes, Click OK.
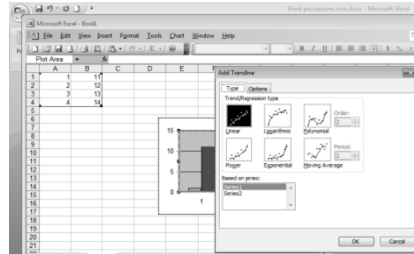


## 8.15    USES OF WORKSHEET IN DIFFERENT AREAS

Worksheet can be used for different purposes. Some of them are:

### Used as Database in Accounting:

Spreadsheet is the combination of rows and columns in worksheet. Database is also like a worksheet consists rows and columns to represents different types of data. So, spreadsheet is used for database**.** Spreadsheet is used to create and save the accounting database. It also provides the facility of database charts, different types of data and pivot tables. Database is created for the validity and security of data and Excel provides these facilities. Sorting of data is also available in spreadsheet.

### Marketing:

Spreadsheet is used in marketing to make the detailed marketing plan. These plans are helpful to get the target, to make the advertisement effective, safety from mistakes and for training to employees etc.

It is also necessary to update the marketing plan routinely.

### Financial and personal sector:

Now days, financial data kept in database. It provides the information that can be used for different

purposes. For example, customer database that consists their name, address, phone number etc. and employee database consists name of employees, designation, department etc. each value is defined in field such as name, salary etc. Collection of field is called record and record collection is known as database.

## SUMMARY OF THE LESSON

You learnt the following in this lesson:

- MS-Excel is spreadsheet package used to organize data and to perform calculations.
- MS-Excel is used to create the simple database as well as prepare the document for WWW.
- In MS-Excel, a workbook, by default contains three worksheets.
- MS-Excel worksheet has a grid of cells arranged in rows which are numbered and columns which are named with letters for organizing data and performing mathematical operations.
- The content of cell can be activated by double clicking on the cell or by clicking once in the cell and then pressing function key F2.

- Different types of Menu, toolbar and their options are used to format the worksheet.
- Excel toolbars help to use various options such as opening, creating, renaming, merging, moving, formatting, analyzing, saving and printing a worksheet.
- Macro facility is also available in MS-Excel. These are called to speed up any general editing sequence that a user executes in Excel spreadsheet.
- Data can be represented in graphical format using chart or graph option.
- Worksheets can be linked using hyperlink command.
- MS-Excel provides various built-in functions for different purposes such as mathematical functions, statistical functions, logical functions etc.
- Spreadsheet can be used in different areas such as in accounting as database, in marketing etc.

## SELF ASSESSMENT QUESTIONS AND EXERCISES

1. Discuss the features of MS-Excel.
2. How a worksheet can be created?
3. How rows and columns can be added in Excel worksheet?
4. Differentiate absolute, reference and mixed referencing in Excel using examples.
5. Explain the steps to create, save, open and close workbook.
6. State the steps for opening and saving of worksheet.
7. What is the use of formatting toolbar in MS-Excel?
8. How can the content of a cell in MS-Excel be activated?
9. State the steps to Move Cells content.
10. State the steps to Copy Cells content.
11. Write the steps to fill color in a cell.
12. Write the steps to insert row and column.
13. State the steps to change the height of a row and size of column.
14. How different worksheets can be linked with each other?
15. How worksheet functions can be categorized?
16. Write the structure of the Function.
17. Discuss various logical and statistical functions.
18. State the purpose of different mathematical functions.
19. How charts or graphs can be created in MS-Excel?
20. Write the steps to print a graph or chart.
21. What is the use of 'Macros' in MS-Excel?
22. Explain the steps to Record and Run a Macro.
23. Explain various References to a cell.
24. What is the advantage of using keyboard shortcuts?
25. Discuss the use of spreadsheet in different area.

## INTRODUCTION TO POWERPOINT

### OBJECTIVES OF THIS LESSON

This lesson is aimed to make you understand the concepts of PowerPoint. Readers will be able to understand the following:

- Basic concept of PowerPoint
- Creation of presentation
- Insertion of slides
- Insertion of effect and animation

- Working with graphics
- Formatting of presentation
- Concept of animation
- Presentation view

### STRUCTURE OF THIS LESSON

### 9.1 INTRODUCTION

PowerPoint is a graphics package which allows to create drawings, charts etc. and then used for presentation purpose. It makes the presentation very effective. There are two basic features which are used for simplifying the task in PowerPoint and these are Presentation Design and Auto Layouts. PowerPoint consist the tools for arrangement of word processing, outlining, drawing, graphics and presentation. These tools are very easy to use and make the presentation attractive.

**Basic terms in PowerPoint**

- **Presentation:** The primary type of file, PowerPoint is used to create. Presentations typically have the file extension .ppt; however, we can also save PowerPoint presentations as Adobe Acrobat documents with the file extension .pdf. Finally, we can save your presentation as a web page, with the file extension .html or .htm.

- **Slides:** Individual parts of a presentation. Slides are similar to the individual pages in a print document, and can contain text, graphics, and animation.

- **Layout:** The specific arrangement of text and images on a slide. Layouts can be very simple, consisting of simple titles and text, or they can be more complex and include elaborate colors and images. We can also include animation, sounds, and other multimedia objects in layout.

- **View:** Microsoft PowerPoint has three main views: normal view, slide sorter view, and slide show view. Normal view is the main editing view. Slide sorter view is an exclusive view of slides in thumbnail form, helpful for rearranging the order of slides. Slide show view takes up

the full computer screen, like an actual slide show presentation. In this full-screen view, we see your presentation the way audience will.

- **Design Template:** The specific "look" of a slide or group of slides. A design template can be very basic - with black text on a white background - or it can be very colorful and complex.

- **Slide Show:** The way a presentation appears when you are presenting it. When you display your slides in a slide show, the slides typically take up the whole screen, and they appear in sequence.

## 9.2 STARTING POWERPOINT

To start PowerPoint, go to the Start menu and select Programs ->Microsoft Office ->Power Point.
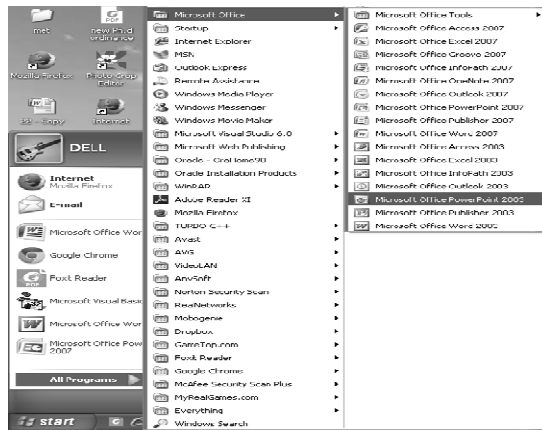


### 9.2.1 Powerpoint Screen Elements

The very first screen that appears when we first open power-point consists of following elements:
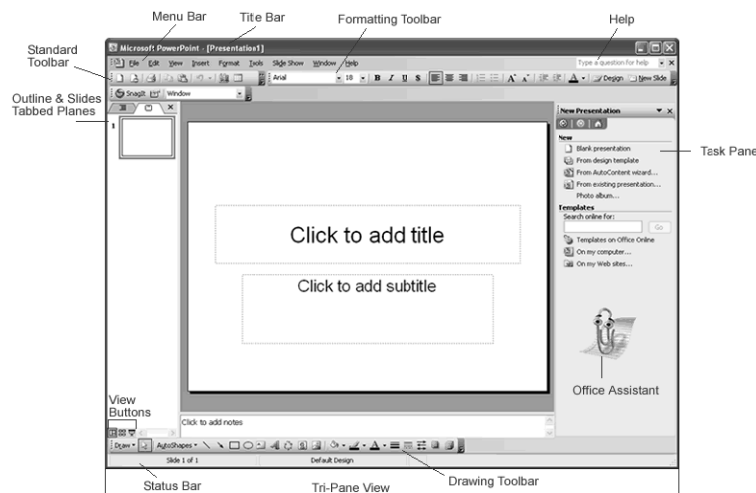


The **PowerPoint window** has toolbars and panes to help you quickly create presentations. Most of the toolbars are common in Office applications but may feature options unique to PowerPoint:

- **Title Bar**: Displays the document name followed by a program name
- **Menu Bar**: Contains a list of options to manage and customize documents
- **Standard Toolbar**: Contains shortcut buttons for the most popular commands
- **Formatting Toolbar**: Contains buttons used for formatting

- **Status Bar**: Displays slide position and the type of design in PowerPoint
- **Drawing Toolbar**: Contains tools for drawing lines, shapes, and objects
- **Task Pane**: Allows you to select tasks in different categories and quickly enhance your slides in a few steps; provides quick access to the most common actions and features in PowerPoint
- **Outline and Slides Tabbed Pane**: Lets you easily view a presentation in outline format (text), as well as a list of all the slides in the presentation (with visuals)
- **Help**: Provides quick access to Help topics

The **Outline and Slides tabbed panes** are located on the left side of the screen. Click the tabs to view an outline or slide of your presentation. The tabs render differently based on the size of the pane.

### 9.2.2 Views In Powerpoint

Microsoft power point offers three views: **Normal View**, **Slide Sorter View**, and **Slide Show View**.

- **Normal View** contains the **Outline and Slides tabbed panes** on the left, the **Slide pane** in the center, and the **Task pane** on the right.

  - The **Outline View** shows the text of your presentation for easy editing, while the **Slides View** shows text and graphics of the slide you're working on. Click the tabs to switch between the two views. Under the center slide area is a place for notes.

- **Slide Sorter View** lets you see small versions of all the slides you have created. You can delete, copy, and move slides in this view.

- **Slide Show View** lets you see your presentation electronically as it will appear to an audience.

  **The views can be seen using View menu or at lower left corner in powerpoint screen.**

### 9.2.3 Powerpoint Slide Master

PowerPoint offers a slide master feature that gives your presentation a consistent, professional look. A slide master is helpful if you want every slide in your show to be the same color, to have the same header or footer, or to carry a particular logo. The background color, title, and images on the slide master appear on every slide of presentation. Universal style changes can be made to every slide in presentation by formatting the master slide, leaving the content of each slide unchanged.

**To create a Slide Master:**
- Start a new presentation or open an existing one.
- Click **View** → **Master** → **Slide Master**.
- A slide with placeholders appears.
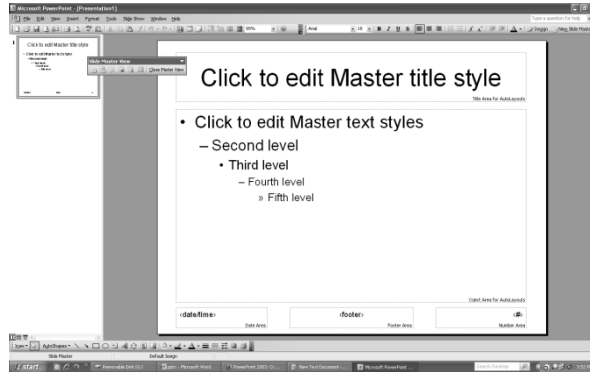
- Perform desired editing.
- After editing click View menu→ Normal to see applied changes.
- Or choose Close master View in slide master view toolbar.

### 9.2.4 Creating And Saving of Powerpoint Presentation

In Micro-soft power-point, there are many ways to create a new presentation.

**Creation of New Power-Point Presentation**

- Click on file menu→ then click on new.
- A task pane will open in right side of power-point.
- Choose blank presentation.
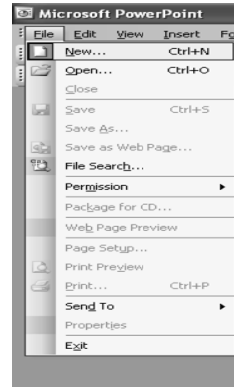
**Option 2:** Click on new button [icon] on standard toolbar

**Option 3**: Press Ctrl+N from keyboard.
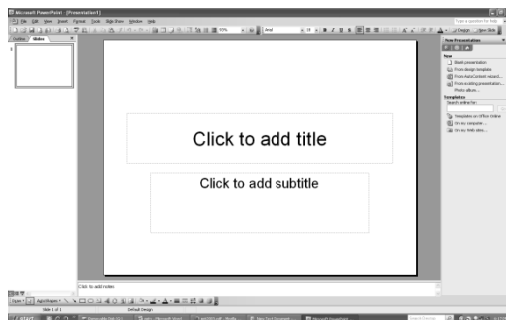


**Opening an Existing Presentation**

- Click on file menu → open.

    Or

- Press Ctrl+O to open presentation.

    Or
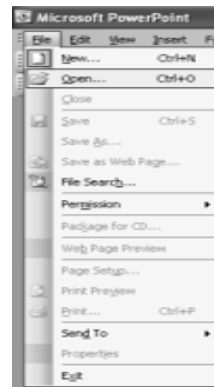
- Choose open button  from standard toolbar.

- A dialog box will appear.
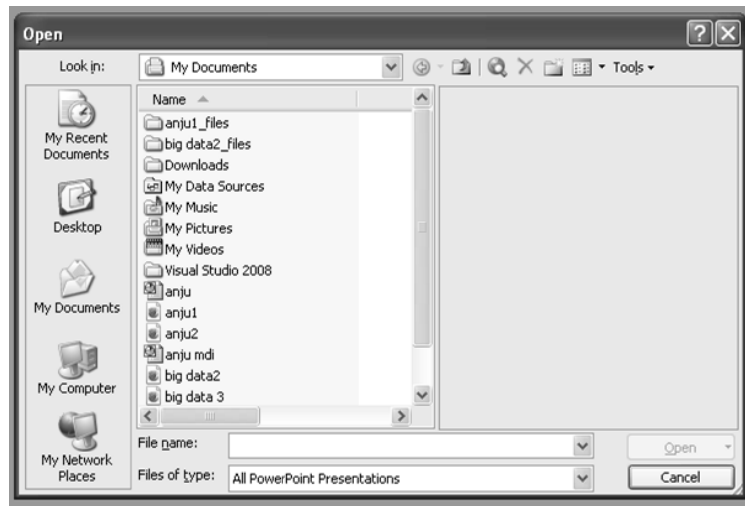


- Type file name and location to open existing presentation.

### Saving A Presentation

- Click on file menu→ save.
  Or
- Press Ctrl + S.
  Or
- Choose save button on standard toolbar.

When we first time save the presentation, it will ask for name and location of file to be saved.
Power point will save the file with .ppt extension.

### Closing Presentation

- Choose close from file menu to close current presentation.
  Or
- Press close button on right side of menu bar.



### Closing Powerpoint

- Choose exit from file menu to close power point.
  Or
- Press close button on right side of title bar.



### Running Powerpoint Slide Show

Once created slides, we can run your Slide Show:
Do one of the following:

- Press F5.

- Choose Slide Show > View Show from the menu.
- Click the Slide Show icon , which is located in the bottom left corner of your screen.

The slideshow will appear on screen.

**Page Setup**

- Click on file menu→ choose page setup.
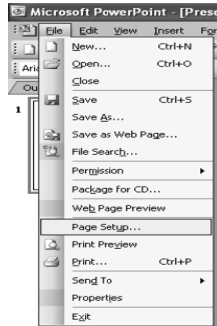
- A dialog box will appear.
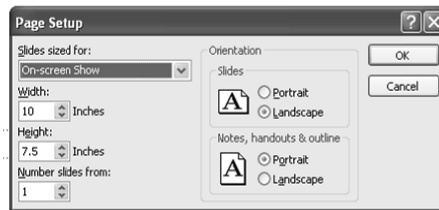
- Set the values like width, height and slide orientation of slides and notes, handouts & outline.

**Editing of Presentation**

**Edit menu**

This menu involves a number of editing options, which are following:-

- UNDO & REPEAT – This command undo or repeat the action that has performed.

- CUT- It takes out the highlighted text or graphics.

- COPY- used to copy the highlighted text or graphics.

- OFFICE CLIPBOARD – used to collect text and graphics from different documents or other program and then paste them into any office document.

- PASTE – used to paste copied text or graphics.

- PASTE SPECIAL – This command connect the content of clipboard with present or working file.

- PASTE HYPERLINK – This command is used to connect to files or link the files with each other.

- CLEAR- it is the other way of delete as it clears all formats or contents such as text or graphics.

- SELECT ALL- It selects the whole text for formatting or deleting.
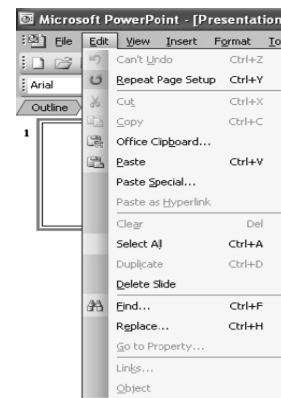
### 9.2.5 Inserting Function

**- SLIDE COPYING:** For slide copying, select Duplicate slide from Insert menu. This will create the same copy of slide.
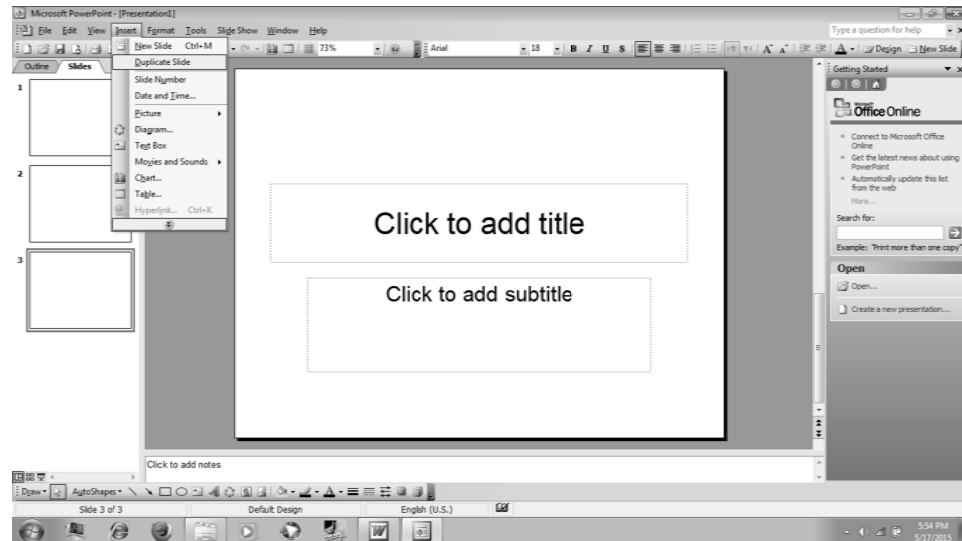


### SLIDE NUMBERING

- Select Header and Footer from View Menu.

- Click on Slide number checkbox.

- Click on Apply to all button. It will assign the number on all present slides.
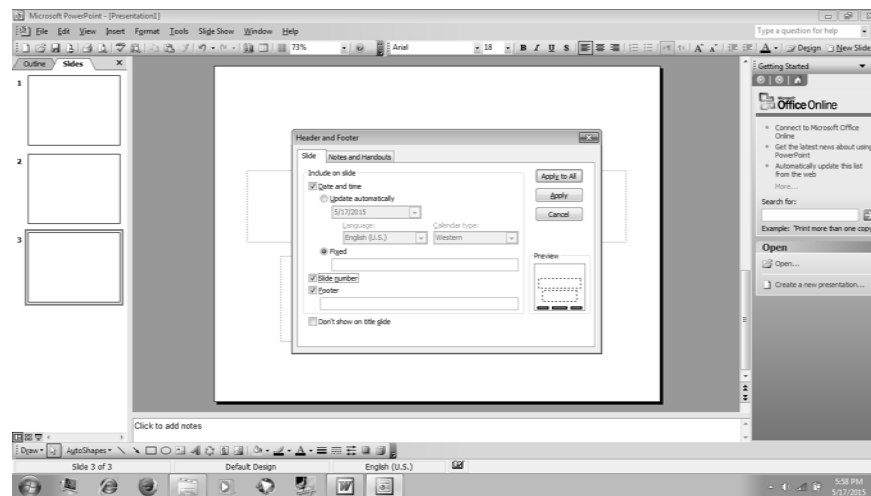


### Printing of Presentation

- Select Print from File Menu and select the printer.

- Click on Properties

- Click on Ok.
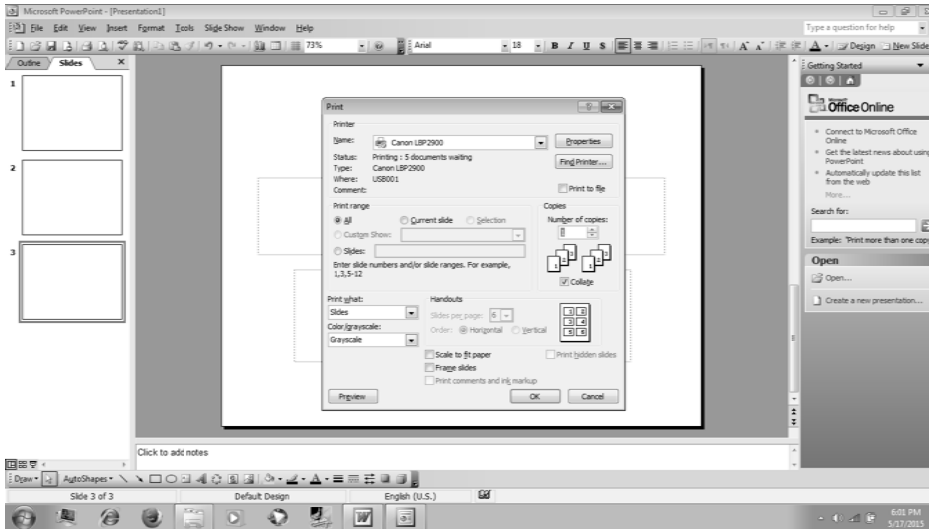
## 9.2.6 Insert Slide

### From Insert Menu

The first way to insert a new slide is to Click the **Insert Menu** and then **New Slide**. PowerPoint will insert one new slide into the presentation and display in the Slide Pane.

Holding down the **Control Key** and pressing **M (Ctrl+M)** will also inset a new slide.
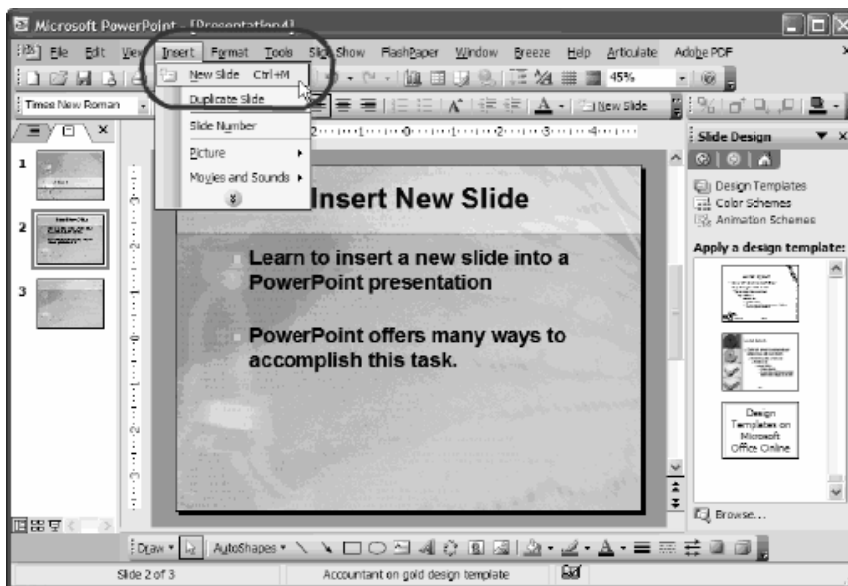


PowerPoint does several things when you create a new slide. First it automatically opens the **Task Pane** on the right side and sets it to display the **Slide Layout Task Pane**. Second it creates a new content slide that includes a title and text and displays it for editing in the Slide Pane. Finally, it crates a new thumbnail image and displays it in the Outline/Slides pane on the left.

**Remarks**
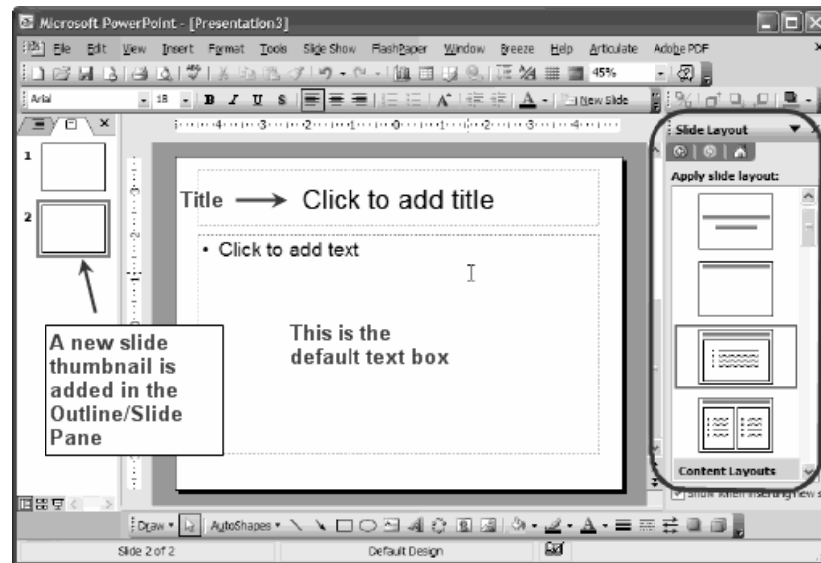


**Insert a New Slide from the Formatting Tool Bar**

Another way to insert a new slide into a presentation is to Click **New Slide** from the **Formatting Toolbar**. When clicked, the new slide button also creates a new content slide that includes a title and a text box.
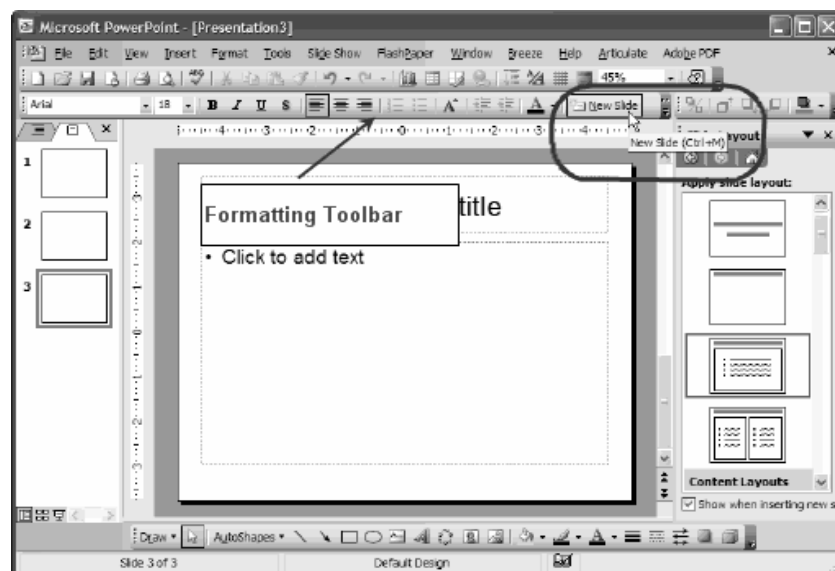


Insert A New Slide From The Outline/Slides Pane

Another way to create a new slide is to **Right Click** the mouse on a thumbnail in the **Outline/Slides Pane**. This will bring up a context sensitive menu. From the menu, Click **New Slide**. PowerPoint will insert a blank content slide that includes a title and text box.

You can also highlight a thumbnail image and then Hit the **Return** or **Enter Key** to inset new slides into the presentation.
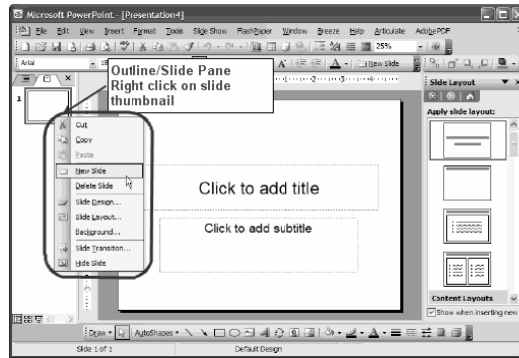
### Insert A New Slide From The Outline View

You can insert new slides from the **Outline/Slides Pane** by clicking on a slide and hitting the **Return** or **Enter Key**. You can also Right Click in the Outline view bringing up a context sensitive menu. From the menu, you can choose **New Slide**.
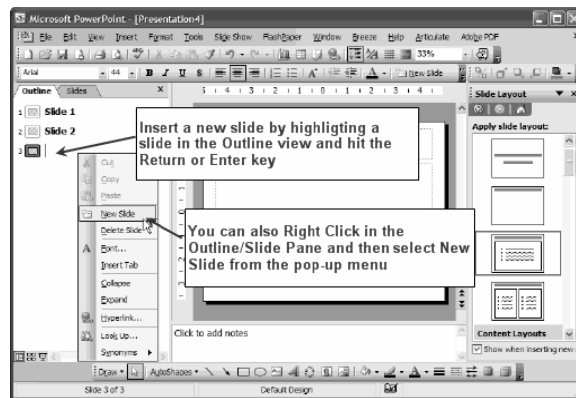


### Inserting A New Slide From The Slide Sorter View

You can also insert a new slide from the Slide Sort View by Right Clicking in any area in the view. A context sensitive menu will pop-up. Click on New Slide from the menu, and PowerPoint will insert the new slide into the Slide Sorter View.
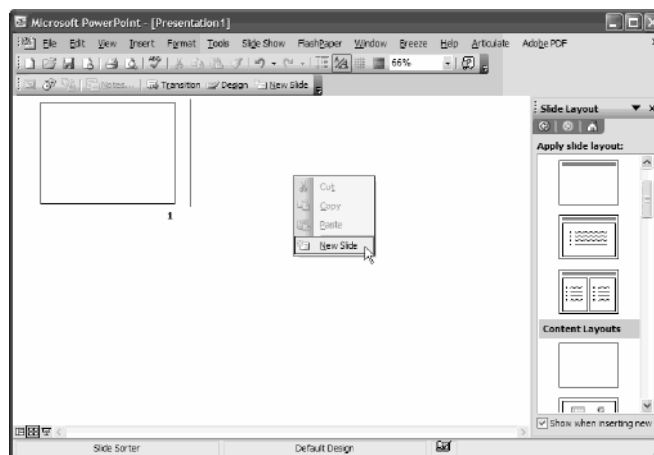


## 9.3 WORKING WITH GRAPHICS IN POWERPOINT

Graphical elements can help to create attractive slides for presentation. PowerPoint provides the option of adding AutoShapes, WordArt, Flowcharts symbols, and ClipArt etc.

| **Autoshapes**

In PowerPoint, with some AutoShapes text can be added and with others, flowcharts can be created.

1) Add an AutoShape to presentation:
   - From Insert menu, click Picture and then click AutoShapes
   - Click the AutoShapes inserted on slide.
   - Click the upper-right corner of the slide and then drag the object down diagonally about one inch.
   - To delete an AutoShape, right-click the AutoShape to be deleted and then click cut.
2) Add an AutoShape with text to a presentation:
   - On the AutoShapes toolbar, click Callouts.
   - Click Rounded Rectangular Callout.
   - Click the upper-right corner of the slide and then drag the object down diagonally about one inch.
   - Type the text of choice.
   - Select the text jst typed.
   - Right click the Callout box, click font, change the font size and then click OK.
   - Click and drag the upper-right corner of Callout box until all the text fits within it.
   - Close the AutoShapes toolbar.

**Clipart**

There are different ways to add the ClipArt on the slide. It can be added from Insert menu option or Drawing toolbar.

- On the Drawing toolbar, click insert ClipArt.
- Select a category such as bird
- Click keep looking to view additional graphics.
- To insert the graphics, click the graphics and then click insert clip.
- Move the graphics by dragging it to the desired location.
- Resize the graphics by selecting the graphics and moving the handles until the graphic is the desired size.

**Adding Textbox**

Text box can be added by selecting Text box from Insert menu. In the text box, text can be typed and graphics can be added.

**Add The Picture From Scanner or Camera**

In presentation, picture can be added from scanner or camera. For this

- Select insert from main menu
- Select picture and then select From Scanner or Camera.

**Add The Picture From File**

To insert the picture from file, place the cursor in the document where picture is to be inserted and then click. After that, select Picture from Insert menu. A dialog box is to be opened to ask the name of file where picture is to be stored. Select the file and then click insert.

**Add Organizational Chart/ Diagram**

To insert the Organization chart, following steps are used:

- Select INSERT > PICTURE > ORGANIZATION CHART
- Click on Diagram from Organization Chart.
- Click on Ok.
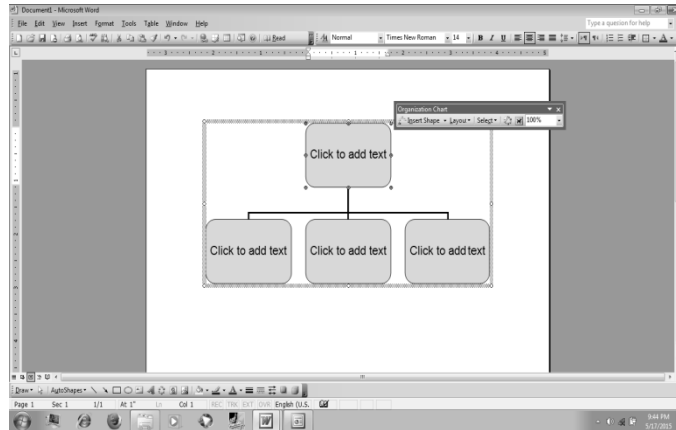
## 9.4 FORMATTING OF PRESENTATION

Formatting is used to define different formats of specific aspect related to slides such as the process of changing the appearance of the text, deleting a portion of the text or moving a part of the text. It is necessary to select the text before move, format, delete or changing text.

- tab on dialog box.

Change the color of slide by selecting the color swatch beside **FONT OF TEXT**

- Select the text you want to change
- Click a font name in the Font box on the Formatting toolbar

**SIZE OF TEXT**

- Select the text you want to change.
- Click a point size in the Font Size box on the Formatting toolbar.

**BOLD TEXT**

- Select the text you want to change.
- Click Bold on the formatting toolbar.

**ITALIC TEXT**

- Select the text you want to change.
- Click Italic on the formatting toolbar.

**UNDERLINE TEXT**

- Select the text you want to change.
- Click underline on Formatting toolbar.

**ADD BULLETS OR NUMBERING**

- Select the text you want to apply bullets or numbering to
- To add bullets, click Bullets on Formatting toolbar.
- To add numbering, click Numbering on Formatting toolbar.
- Click on Ok.

**ALIGNMENT OF TEXT**

**Align text with the left margin**

- Select the text you want to align left.
- Click Align Left(Ctrl+L) on the formatting toolbar..

**Align text with right margin**

- Select the text you want to align right.
- Click Align right(Ctrl+R) on the formatting toolbar.

**Center text**

- Select the text you want to center.
- Click Center(Ctrl+E) on the Formatting toolbar.

**Justify text**

- Select the text you want to justify.
- Click justify(Ctrl+J) on the Formatting toolbar.

**Line Spacing**

This is used to set the space between selected lines. For this, select Line Spacing from Format menu for setting.

**Slide Layout**

Each page of presentation is specifying as slide layout. The layout of slide can be changed by selecting the slide. For this, select Slide layout. Then select the desired layout.

**Color Schemes**

The color scheme of designed slide template can be modified and a new color scheme can be added to blank presentation. The steps are following:

- Select Format > Slide Color Scheme from Menu bar.
- Click one of the preset color scheme in Color Schemes box.
- Click Preview button to view how the scheme will appear on the slide.
- To make changes to color scheme, click Custom name of element and click change color button.
- After finishing all color formatting, click Apply to All to apply the color scheme to all the slides in presentation.

**Background Fill**

Background can be modified or added to a new slide. Following steps are used for this:

- Select Format > Background from menu.
- Select a color from drop-down menu below the Background Fill preview or choose More Colors…. for larger selection.
- Select Fill Effects from drop-down menu to add gradient, texture, pattern or picture to background.
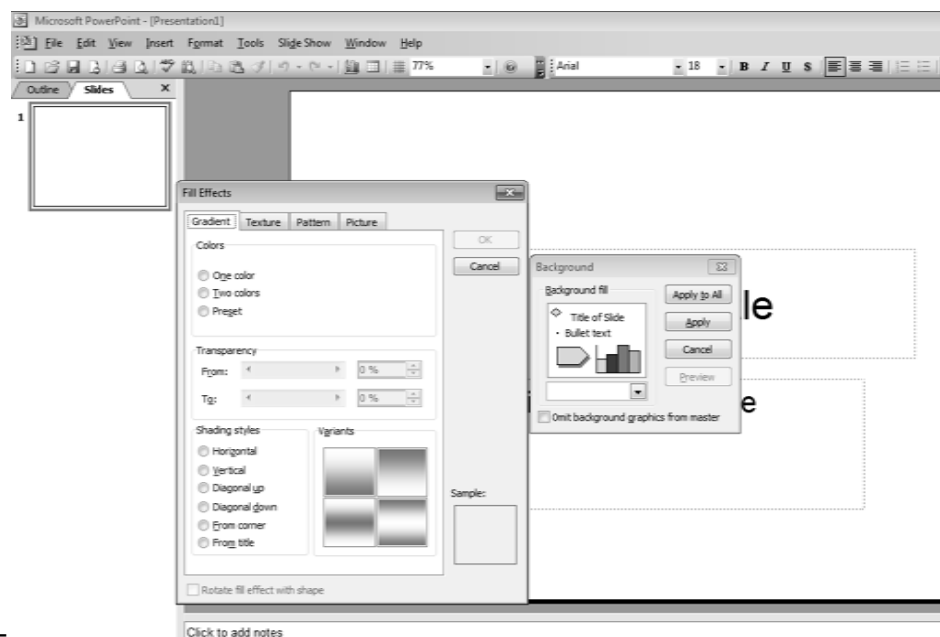
**Spell Check**

The spell check feature provides helps to check and correct spelling in the presentation. To start correction of spelling in presentation, select Tools > Spelling from menu bar or press F7 on keyboard. The steps are following:

- The spell check prompt to make correction in first word that is spelled wrong.

- If the word spelled correctly or not to be changed then click Ignore or Ignore All if the same word appear several times in presentation.

- If the word spelled wrong, highlight any one of the displayed Suggestions or type own spelling in Change to box. Click Change to correct the occurrence of word.

- Click Close to abort spelling check early.
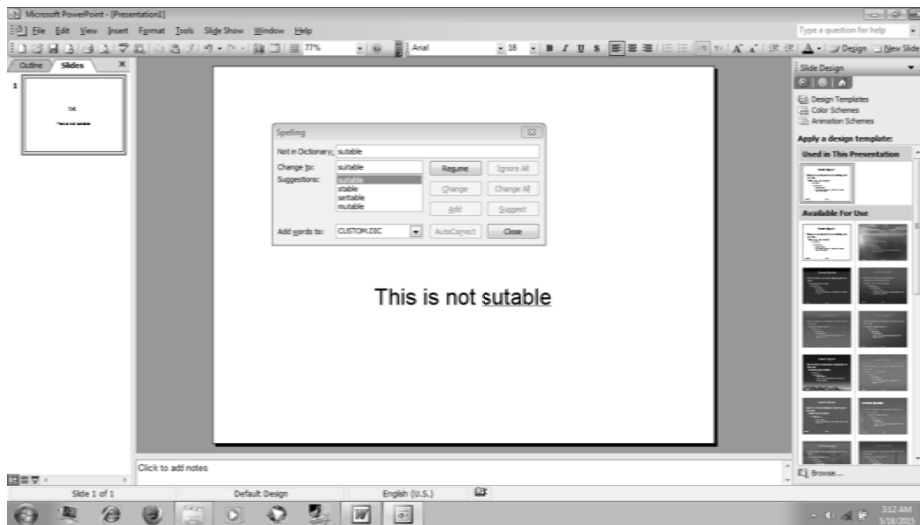


**Macro**

Macro can be created, edited and deleted in PowerPoint. Macro can be recorded by Tools > Macro > Record New Macro.

**9.5 Presentation View**

To make effective presentation, animation effects can be inserted in slides. Audio video clips can also be inserted in slides to make the presentation attractive

**To Insert Transition Effect**

The time specified for opening of slides can be defined by transition effect. It can be done by following way:

- Select Slide Show > Slide Transition from main menu.
- Click effect from drop-down menu.
- Select the speed for effect i.e. Slow, Medium or Fast.
- Click Apply to All to make the slides effective.

**Adding Sounds**

One way to incorporate sound into presentation without creating problems with disk space is to play a portion of a CD from the computer's CD drive. (You can do this only if you are running your presentation from the hard drive or the floppy disk drive, rather than from the CD drive.)

- Click the **Insert** button on the menu bar at the top of your screen.

- Select **Movies and Sounds** from the drop-down menu, followed by **Play CD Audio Track**. This will display the Movie and Sound Options dialog box shown in Figure.

- Enter the track of the CD you want to play.

- Also note where in the track you wish to begin and end; enter this information in minutes and seconds.
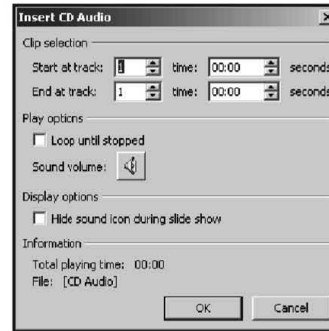


- When you click **OK**, another dialog box will ask if you want the sound to play automatically when the slide appears on screen or when you click the sound icon. In most cases, you should choose the second option, so you can control exactly when the CD will play.

- After you make your selection, the dialog box closes and a sound icon appears on the screen. You can place the icon anywhere on the slide by dragging it to your desired location.

Another way to incorporate sounds into a PowerPoint presentation is to download sound clips from the Internet. You can use a clip that you have downloaded previously, or you can download one specifically for your speech. In either case, the procedure is the same for inserting the clip onto a PowerPoint slide:

- Click **Insert** on the menu bar, followed by **Movies and Sounds** from the drop-down menu.
- Select **Sound from File** to display the Insert Sound dialog box (Figure).
- Find the file that contains the clip you want and click OK to add it to your slide.



**Adding Animation**

In PowerPoint, "animation" refers to the way objects enter or exit a slide. Without animation, all the items on a slide appear at the same time when the slide is displayed. With animation, you can control when words, pictures, and even parts of graphs show up on the screen.

## Preset Animation

One way to generate animation is by using PowerPoint's preset animation effects. To add preset animation to an individual slide, display the slide in Normal view and follow these steps:

- Click **Slide Show** on the menu bar at the top of your screen, followed by **Animation Schemes** from the drop-down list. The left column on your screen will show thumbnails of all the slides in your presentation. The right column will present a list of animation effects arranged by category: No Animation, Subtle, Moderate, and Exciting.
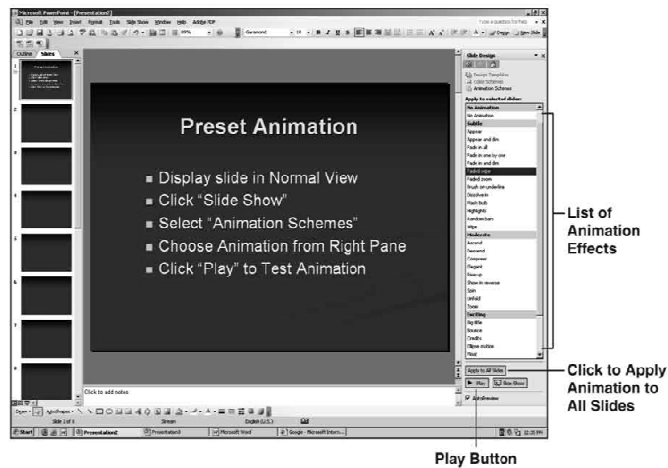


- Click the effect you want and it will be added to the slide that is currently on screen.
- To test the animation, click **Play** at the bottom of the right column.
- If you want to apply the animation to all the slides in your presentation, click **Apply to All Slides**.

## Custom Animation

Custom animation gives full control of all your animation effects. There are six steps in adding custom animation:

- Make sure the slide to which you want to add animation is displayed in Normal view.
- Click **Slide Show** on the menu bar at the top of the screen.
- Choose **Custom Animation** on the drop-down menu to display the Custom Animation task pane at the right of your screen—as seen in Figure.
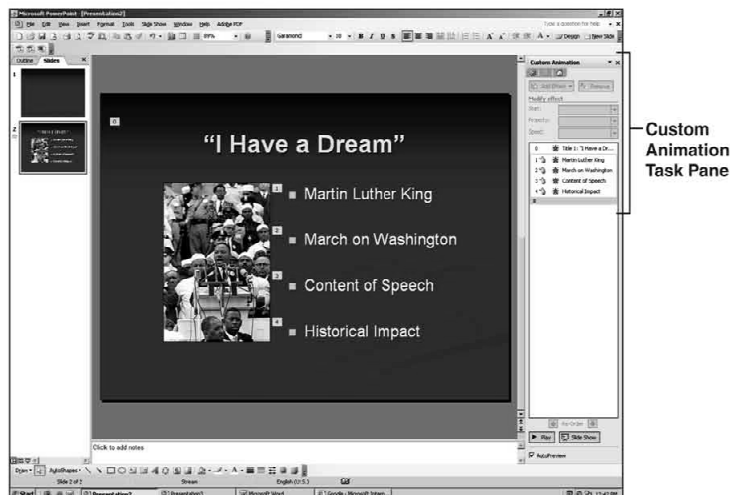
- Click on the object or text you want to animate.

- Click **Add Effect** in the Custom Animation task pane, followed by **Entrance** and **More Effects** from the resulting shortcut menus shown in Figure.
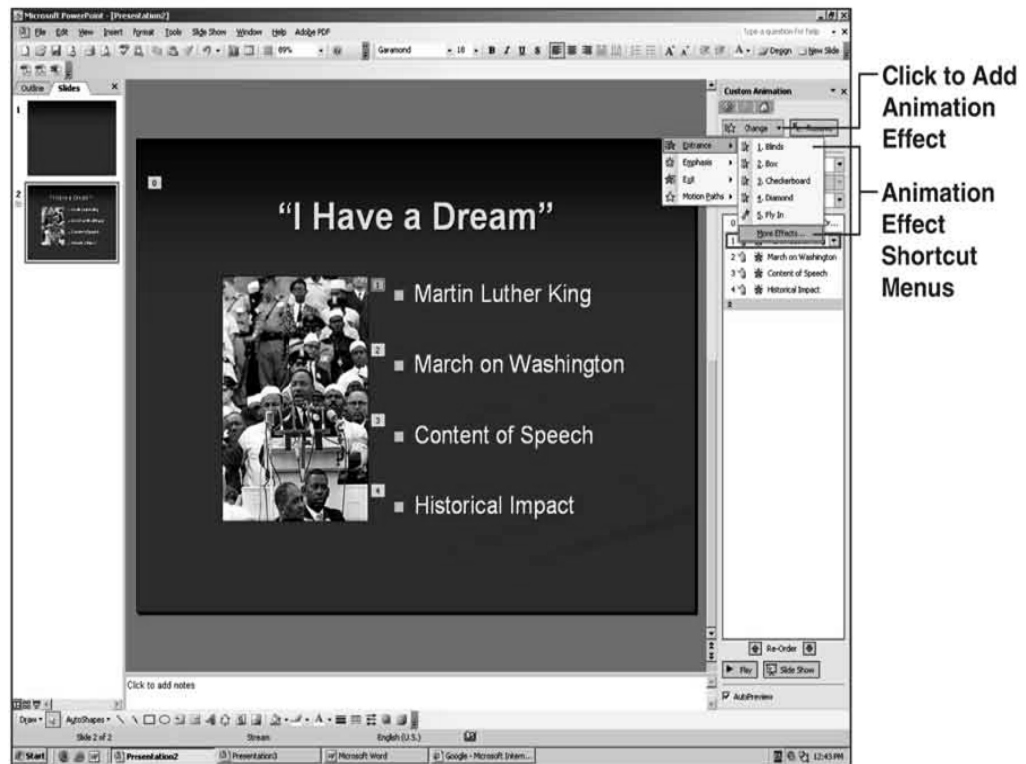


- The Add Entrance Effect dialog box will now be displayed on screen (Figure). Click on any effect to preview it. Once you have decided which effect to use, click **OK** to apply it to your slide.
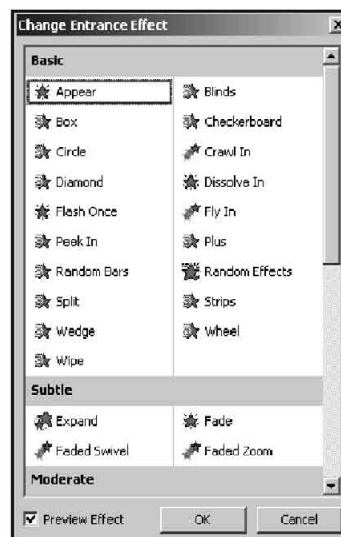
When choosing an animation effect, stick with those in the Basic, Subtle, and Moderate categories—such as Appear, Dissolve In, Strips, and Stretch. Those in the Exciting category are fun to experiment with, but are too distracting for most speeches. Also, stick with a limited number of animation effects and use them consistently from slide to slide.

**Timing, Direction, and Speed of Animation Elements**

Depending on the animation effect you pick, you may need to choose its timing, direction, and speed. You can adjust all of these with the boxes under Modify in the Custom Animation task pane.

- To open the pane, make sure the slide to which you want to add animation is displayed in Normal view.

- Click **Slide Show** on the menu bar at the top of the screen.

- Choose **Custom Animation** on the drop-down menu to display the Custom Animation task pane at the right of the screen.
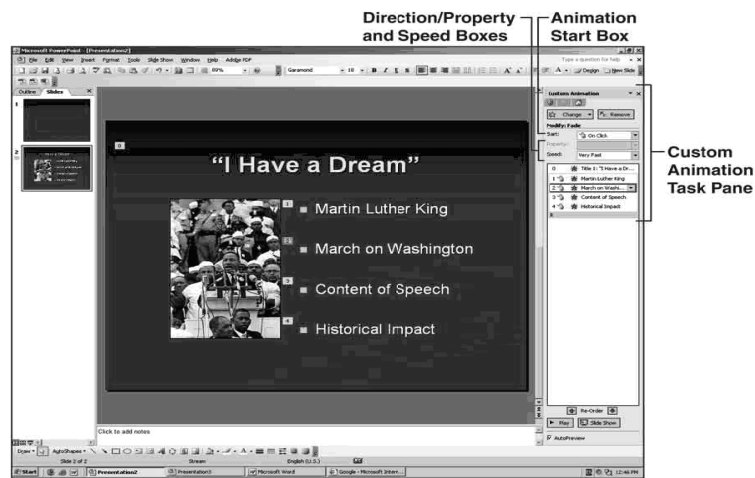


- The default option for starting animation effects is On Click, which prevents objects from showing up on screen before you're ready. If you want items to appear automatically, click the arrow at the right of the Start box to expose a drop-down menu and select another option.

- To control the direction and speed of animated items, highlight the desired item and click the down arrows in the Direction and Speed boxes in the Custom Animation task pane. This will expose drop-down menus with a number of options. Click the desired option to apply it to your slide.

As with other aspects of animation, choose direction and speed options that are not going to distract your audience. For example, if you're using Fly In, it's usually best to choose From Left for text that is located on the left of the slide and From Right for text that is on the right of the slide.

Although the best speed will depend on the exact animation effect you select, Fast and Very Fast are usually preferable because they get the text or object on screen quickly without drawing undue attention to the animation effect.

**Hiding of Slide**

In PowerPoint presentation, slides can be hiding. These are not visible at the time of slide show. To hide the slide, Select Slide Show > Hide slide from main menu.

**To Show the Invisible Slide in Slide Show:**

This can be done by selecting the hiding slide in Normal view and right click on it.

## SUMMARY OF THE LESSON

You learnt the following in this lesson:

- Microsoft power-point is an effective component of Microsoft office package to make attractive presentations in very small amount of time.

- A presentation mainly is composed of slides. A slide is like a page that can have any type of data over it. The data could be text, images, audio or a video file.

- Data can be inserted in a slide by many ways.

- There are three types of views in power-point: Normal view, slide sorter view and slide show view.

- A slide master is a master slide which can be configured to give a consistent look to complete presentation. All the formatting to be applied over all slides can be incorporated on slide master.

- A new slide can be inserted by many ways: Pressing CTRL+M from keyboard, choosing New Slide from Insert Menu or clicking on new slide button on formatting toolbar.

- The major benefit of power-point is to create any type of presentation. It could be for students, employees for common people.

- The AutoShapes toolbar allows drawing a number of geometrical shape, arrows, callout and other graphics on a slide.

- Several predefined animation are available in PowerPoint which can be used through drop-down menu.

**SELF ASSESSMENT QUESTIONS AND EXERCISES**

1.    What do you mean by PowerPoint presentation?

2.    What are main screen elements of PowerPoint screen?

3.    Explain the types of views available in PowerPoint.

4.    What is slide master?

5.    What are the different ways of inserting a new slide in presentation?

6.    What are the steps to insert sound on a slide?

7.    Explain the concept of clip-art.

8.    How charts can be created on a PowerPoint slide?

9.    What do you understand by animation? What types of animation can be applied over a presentation?

10.   When we use paste as hyperlink command?

11.   How custom animation is different from pre-set animation?

12.   What are the page margins? Why page setup is required.

# INTRODUCTION TO LOTUS SMARTSUITE

## OBJECTIVES OF THIS LESSON

This lesson is aimed to make you understand the concepts of Lotus SmartSuite. Readers will be able to understand the following:

- Basic concepts of Lotus SmartSuite
- To make effective worksheet in Lotus
- Concept of Cell Referencing
- Use of in-built functions
- Goal seek and Backsolver tool
- Working with graphics in worksheet
- Sharing of data with other desktop application
- Making of error-free worksheet

## STRUCTURE OF THE LESSON

9.1     Introduction
9.2     Structure of Spreadsheet and use in Accounting
9.3     Opening Lotus 1-2-3
9.4     Components of Lotus Window
9.5     Basic Terms and Definitions
9.6     Structure of Lotus 1-2-3 Window
9.7     Built in Functions
9.8     Using Graphics
9.9     Sharing Data with other Desktop Applications
9.10    Strategies of Creating Error Free Worksheet
        Summary of the Lesson
        Self Assessment Questions and Exercises

## 10.1 INTRODUCTION

SmartSuite is an office suite from Lotus Software. The office suite has two versions: one for windows and other for OS/2.SmartSuite is not officially supported by IBM on versions of windows after XP, but it does work well on both the 32 bit and 64 bit versions of windows vista and windows 7.

**Components of Lotus SmartSuite**

The following applications are included in SmartSuitee for Microsoft windows:

1. Lotus word pro – word processor
2. Lotus 1-2-3 – spread sheet
3. Lotus freelance Graphics – presentation software
4. Lotus approach – relational database
5. Lotus organizer – personal information manager
6. Lotus Smart center – a toolbar to quickly access programs
7. Lotus Fast Site – web design software
8. Lotus ScreenCam – screen recording software

| Package Components | Working of component | Min. space required (in MB) | Max. space required (in MB) | Remarks |
|---|---|---|---|---|
| Word Pro | Word processor | 16 | 38 | |
| 1-2-3 | Spreadsheet | 12 | 22 | |
| Approach | Relational Database | 8 | 19 | |
| Freelance Graphics | Presentation software | 9 | 19 | |
| Organizer | Personal Organizer | 7 | 11 | |
| Screen Cam | Screen Capture | 3 | 3 | |
| Smart Centre | One click icons | 1.5 | 1.5 | |
| Total Space Required | | 56.5 | 118 | |

**System Requirements**

- ➢ IBM Compatible System.
- ➢ VGA Monitor
- ➢ Min. 8 MB RAM

- ➢ DOS 3.1 and DOS 4.x
- ➢ Min. space required: 56.5 MB
- ➢ Max. space required: 118 MB

**WordPro**

Earlier known as AmiPro, WordPro is word processing software. "Take a tour" is a feature, which allows getting complete knowledge about software. "Take a tour" option is available in toolbar. It shows following options:

Starting WordPro, Frames, Graphics, Tables, Help, Text Formatting, Share Document, Spell Check & Format Check, Arrange document, Review & Comment Tool, and printing.

**Lotus 1-2-3**

Spread sheet software is used to save information to be processed. Spreadsheet allows users to work with numbers and apply formulae on that numeric data. Spreadsheet allows users to arrange and organize data as per requirements.

Lotus 1-2-3 is a member of spread sheet family of software. It is integrated with Lotus SmartSuite which is an office suite. It is capable of doing three specific functions:

1. Electronic spreadsheet/worksheet: allows analysis of numeric data.
2. Database management : allows to handle great amount of data and querying on that data
3. Graphics/Charting: allows the user to represent data in pictorial form.

## 10.2 STRUCTURE OF SPREADSHEET AND USE IN ACCOUNTING

Spreadsheet is a datasheet that contain cells which are used to specify the rows and columns. Each cell consist different types of data such as alphanumeric, numeric and formula etc. Formula shows how calculations are done in cells. In financial matters, spreadsheet is mostly used due to change in whole spreadsheet on the basis of change in one cell.

**Financial and Marketing based Function:**

It consists mainly three parts.

1.  Customer Oriented:

    In any business, one thing is kept in mind that what are the customer requirement and what he/she wants. After analysis of all these, things can be launched in market.

2.  Matter of Profit:

    In business, there should be some profit for businessman when they provide services to their customers. It is necessary to run the business smoothly. Without profit, one cannot think about the requirement or need of customers.

3.  Unity :

    According to this, if there is no unity in different departments then marketing is not successful.

For each business, some more things are required also known as financial tools:

-   Balance sheet:

    This is the most important document in accounting. The main purpose of the balance sheet is to provide the information regarding total assets and liabilities of the business organization.

-   Profit and loss statement:

    The role of profit and loss account in any business organization is to give information about the income of the organization in terms of profit and also the total outflow in terms of losses.

-   Cash flow statement:

    Any business organization may be interested in the cash flow. How much cash inflows and how much of that goes out, can be determined from a special type of document called cash flow statement.

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**10.3 OPENING LOTUS 1-2-3**

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Double click on application icon of Lotus 1-2-3 to open or launch the application.
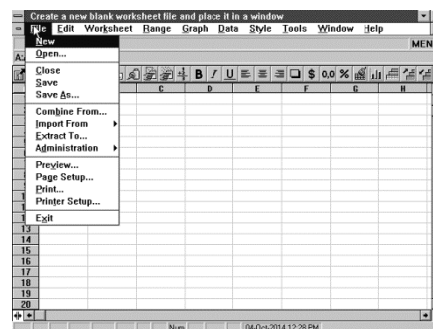


**Closing Lotus 1-2-3**

To quit Lotus 1-2-3, click on file menu, and then choose exit.

## 10.4 COMPONENTS OF LOTUS WINDOW
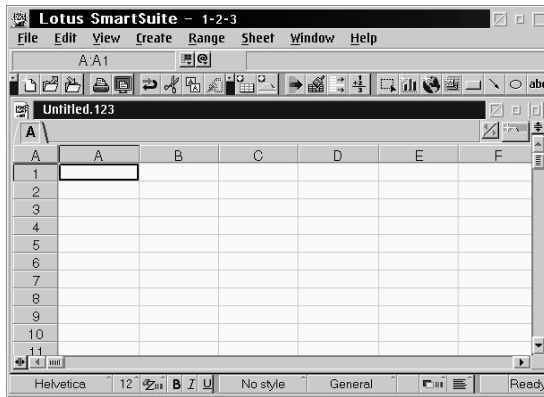
When we launch Lotus 1-2-3, the main window is visible which include control panel at the top of screen, a document window called work area at bottom and status line below that work area. The control panel consists of 3 rows: title bar followed by menu bar and the edit line.

**Title bar**



Displays the name of application "Lotus 1-2-3", the control menu box on the far left and minimize, maximize and close button on far right.

**Menu bar**



**Displays main commands**

 The commands can be clicked by mouse left button or by pressing keyboard shortcuts.

**Edit Line**



This row contains four parts, which are:

a)      Selection indicator: displays current cell address
b)      Navigator: allows moving around worksheet
c)      Function selector: lets you choose functions
d)      Content box: displays text you enter in a cell

**Status bar**
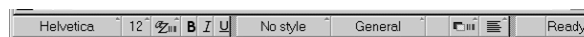


This bar is located at very bottom of document window. It displays the information about the current state of the program. It displays the properties of selected object, the current file, current mode and status of lotus. The status line also contains button controls that let you change the following:

a)      Number format
b)      Font face of current selection
c)      Point size of current selection
d)      Smart icon bar

        When you point to these items and click the left mouse button, additional menu items appears.

## 10.5 BASIC TERMS AND DEFINITIONS

### Cell

It is the basic unit of any spread sheet. It is the place where information is actually stated. Cell is defined by its row and column. For example, C6 means a cell in third column and 6th row.

### Active cell

Active or selected cell is the cell that which has highlighted outline box around it. This is the cell ready for inserting or editing the data.

### Range

Range is referred to a cell or a group of adjacent cells forming a rectangle. A range is defined by the addresses of two cells that are in opposite corners of the rectangle area. A range can be selected to work upon a group of data values.

### Worksheet

In Lotus 1-2-3, a file may have one or many worksheets. Each worksheet may have different type of information contained in it. Worksheets are used for data management and numerical calculations.

### Workbook

Lotus for windows allows you to work with a collection of worksheets/ spreadsheets at a time. This collection of worksheets are called workbook. Workbook allows you to keep related spreadsheets together and make global changes.

### Applications of worksheet/Spreadsheet

1.  Worksheets can be used for accounting purpose. Data can be represented using rows and columns. User can create database using worksheets. Database charts and Pivot tables can be created within the spreadsheet also.
2.  Worksheets can be used for creating marketing plans.

### Type of data in Lotus 1-2-3

a)      Label: text information is referred as label
b)      Value: this can be number, cell reference, formula or function.

## 10.6 STRUCTURE OF LOTUS 1-2-3 WINDOW

### Info Box

This is the place where we can change and modify the properties of any object. Properties of object include name, color, size and security features. Select an object and click on Range menu → Range Properties. It will open info box for the object. Here, we can change the properties of the object.
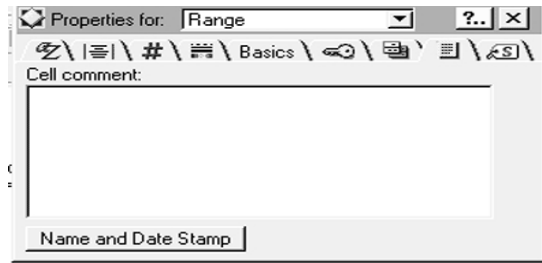
## Tabs in INFO BOX

Info box contains a series of tabs. Every tab has a set of specific properties.

Use of smart icons:

These are the shortcut icons of commands in LOTUS 1-2-3 which are frequently used by the user. These icons are above the workspace. When we mouse over these icons, LOTUS 1-2-3 shows their workings.
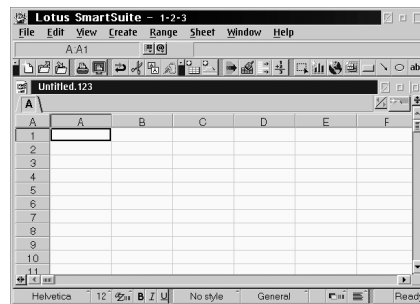
## Cell Referencing in Worksheets

Each cell has a unique address formed by combination of its row and column address. When a cell address is referred to in a formula, its writing style determines how that cell will be referenced during calculations. There are three referencing styles in a worksheet:

a)      Relative referencing      b)      Absolute referencing      c)      Mixed referencing

### Relative referencing

In a formula copied from one column to another, a reference to a range in the first column becomes a reference to a adjacent range in the second column. For example, when copying a formula from column C to column D, a reference to range C1..C3 becomes a reference to adjacent range D1..D3. The range address in this copy operation is relative reference. A similar adjustment occurs when we copy a formula from one row to another.

### Absolute referencing

When we want all or part of cell address not to get adjust as it is copied, we need absolute referencing. This means that cell address is referencing a fixed location and does not adjust as it is copied. To make a formula absolute put a dollar sign ($) in front of row/column reference that should not change as the formula is copied.

### Mixed referencing

A cell address contains two parts – column letter and row number. If we put a $ sign before both parts, the cell address becomes absolute. If we do not put $ sign before any, it is relative address. And if we put $ sign before any one part, it is mixed reference.

## 10.7 BUILT IN FUNCTIONS

A function is a shortcut for formula. A formula is that which is seen on one side of equation. For example,

=3+ (7-4)

=B4+G7

A formula works well for small range of data. But say we have a list of 50 values, that would be one long formula. Here the concept of function is used.

@SUM(B1..B50)

A function consists of @ sign, then the name of function (e.g. SUM) followed by arguments within the parentheses (e.g. B1..B50).
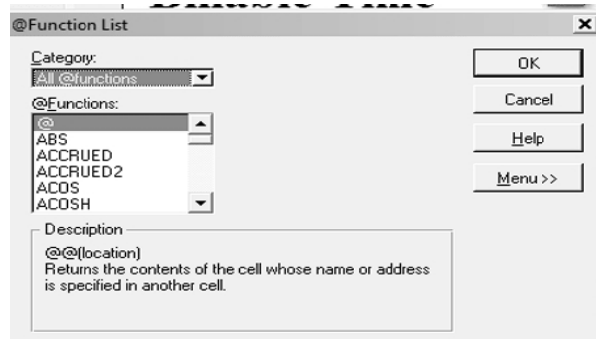


### Type of Functions

Various functions available in Lotus can be categorized as:

1.    **Financial Functions**. They analyze investments, annuities and securities; determine depreciation; and calculate cash flows and loans.

2.    **Logical.** They Calculate the results of logical formulas

3.    **Mathematical.** They, simplify various Mathematical operations such as calculating square roots and replace complex trigonometric calculations.

4.    **Statistical.** They, performs calculations on lists of values.

5.    **String**. They, provides information about text in cells and perform other operations on text.

### Financial Functions

| S.No. | Function Name | Syntax |
|-------|---------------|--------|
| 1 | @FV (Future Value) | @FV(payment amount, periodic interest rate, no. of items) |
| 2 | @PMT (Payment) | @PMT(principal, periodic interest rate, no. of terms) |
| 3 | @PV (Present value) | @PV(payment, periodic interest rate, no. of terms) |

### Mathematical Functions

| S.No. | Function Name | Syntax |
|-------|---------------|--------|
| 1 | @ABS (Absolute Value) | @ABS(Value) |
| 2 | @EXP (Exponent Value) | @EXP(Value) |
| 3 | @INT (Integer Value) | @INT(Value) |
| 4 | @LN (Natural Logarithm) | @LN(Value) |
| 5 | @LOG (Base 10 Logarithm) | @LOG(Value) |
| 6 | @MOD (Reminder from division of two integers) | @MOD (Numerator, Denominator) |
| 7 | @ROUND (Rounded Value) | @ROUND (Value) |
| 8 | @SQRT (Square Root) | @SQRT(Value) |

**Statistical Functions**

| S.No. | Function Name | Usage |
|---|---|---|
| 1 | @AVG | To find the average of a range |
| 2 | @COUNT | To count number of cells in a range |
| 3 | @MAX | To find the largest value of a range |
| 4 | @MIN | To find the smallest value of a range |
| 5 | @SUM | To find the sum of values of a range |

**String Functions**

| S.No. | Function Name | Syntax |
|---|---|---|
| 1 | @LEFT | @LEFT(String, n) |
| 2 | @LENGTH | @LENGTH(String) |
| 3 | @LOWER | @LOWER(String) |
| 4 | @MID | @MID(String;pos;n) |
| 5 | @RIGHT | @RIGHT(String, n) |
| 6 | @UPPER | @UPPER(String) |

**Logical Functions**

| S.No. | Function Name | Usage |
|---|---|---|
| 1 | @FALSE | Reurns the logical value 0 (false) |
| 2 | @TRUE | Returns the logical value 1 (true) |
| 3 | @IF | To evaluate condition and returns true or false |

e.g, @IF(A4>500;@TRUE;@FALSE)=0

**Goal Seek**

It is also a part of Lotus 1-2-3 commands. It is also called what-if analysis tool. Goal seek allows the user to use the desired result of a formula to find the possible input value necessary to achieve that result. The goal seek command is a process of calculating an output by performing various what-if analysis on a given sets of input. E.g., we know the total profit to be gained and number of units to be sold and we want to know what should be the cost of per unit so that desired profit can be gained.

**Backsolver Tool**

Backsolver tool is selected from Range → Analyze → Backsolver. When we click on Backsolver, a dialog box appears. This tool is used when we know the result of the formula, but we do not know how to get it.

What-If Solver : What-If solver can be used to solve linear and non-linear both types of problems. This feature is added to Lotus 1-2-3 in 1990.

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**10.8 USING GRAPHICS**

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One of the important features of Lotus 1-2-3 is that it represents tabular data in pictorial form which is easily understandable. This pictorial form could be in form of charts or graphs.
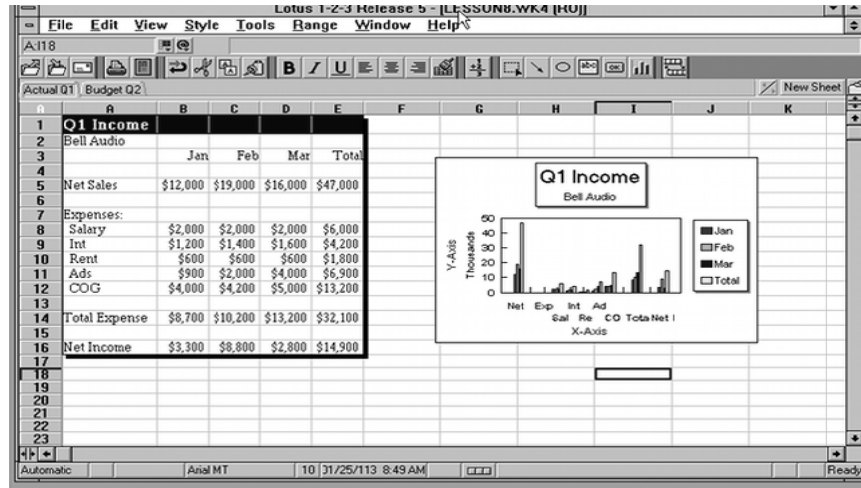
## 10.9 SHARING DATA WITH OTHER DESKTOP APPLICATIONS

One of the important features of Lotus 1-2-3 is Lotus notes which is client in client server architecture. This feature allows other applications to link data with other applications. The Text field is used to make OLE object. Linked data is directly associated with real data of other application. Therefore we can see changes are reflected at both places. By double clicking on OLE object the link is opened up with original application.

## 10.10 STRATEGIES OF CREATING ERROR FREE WORKSHEET

A Worksheet is used for numerical calculation which must be error free for every business organisation it is important to have accurate output. A small error can affect many business decisions. While creating a worksheet user must be careful about following errors:

1. **Syntax Error:**
   This kind of error means we have written formula by wrong way.
2. **Run Time Error:**
   This kind of errors are difficult to find e.g. a value is divided by zero.
3. **User Error:**
   Errors created by user e.g. wrong entry in a cell. It is not necessary that user make errors, errors are performed by mistake also. Therefore, such kinds of errors are very difficult to find. For example, a wrong entry in cell may change entire output.

   Therefore, it becomes important for us that we must try to make error free worksheet. If errors are there, they should be found and rectified. One method of creating error free worksheet is to lock those cells where critical data or formulae are saved.

**Using LOOKUP for data entry and avoiding errors**
In LOTUS 1-2-3, we can use lookup functions to minimize the chances of errors. Following are the lookup functions:

1. HLOOKUP:
   By using @HLOOKUP(X; range; row-offset) we can see the value of a special cell in a row. The output will be a horizontal table.
   X: X could be any value but it should be equal to or greater than values of range. Otherwise output would be the last value of range.
   Range: The range could be any specific row or the first row labels.
2. VLOOKUP:
   By using @VLOOKUP(X; range; row-offset) we can see the value of a special cell in a row. The output will be a vertical table.

**SUMMARY OF THE LESSON**

You learnt the following in this lesson:

- LOTUS Smart suit is a professional package for office automation. It consists of many components like word pro, LOTUS 1-2-3 etc.

- Spreadsheet is a data sheet which looks like a normal sheet like on paper. It contains rows and columns which makes cells. A cell is a place where data can be entered.

- LOTUS 1-2-3 is a kind of spreadsheet. This component is a part of LOTUS SmartSuite which is an office suite.

- LOTUS 1-2-3 is an electronic spreadsheet used to process data, analyze it and perform calculations over it.

- Info Box is a place where object properties can be modified according to user requirements.

- Goal seek feature is used when we know the final value but we do not know what would be the input to get that final output.

- Errors are the mistakes in a worksheet which could be of any type and can cause the unexpected output.


**SELF ASSESSMENT QUESTIONS AND EXERCISES**


1. What do you mean by LOTUS SmartSuite? Describe the components of SmartSuite.

2. What is LOTUS 1-2-3?

3. Discuss the system requirements of LOTUS 1-2-3.

4. How LOTUS 1-2-3 is helpful in accounting and marketing?

5. What are the types of data in LOTUS 1-2-3?

6. Explain the concept of referencing. What are the types of referencing?

7. What do you understand by functions? What are the types of functions available in LOTUS 1-2-3?

8. How backsolver tool is useful and how is it different from what-if solver?

9. Write the steps to create a workbook.

10. What is goal seek feature?

11. Explain the strategies of creating an error free worksheet.

12. How data is shared from LOTUS 1-2-3 to other applications

# INTRODUCTION TO TALLY

## OBJECTIVES OF THE LESSON

This lesson is aimed to make you understand the concepts of Tally.ERP9 software. Readers will be able to understand the following:

- Basic concepts of Tally.ERP9
- Use of TallyERP9
- Creation of Accounting Voucher and Invoice
- Creation of payroll statement
- Maintenance of inventory records
- Final account and maintenance of accounting books

## STRUCTURE OF THE LESSON

11.1    Introduction
11.2    Accounting
    11.2.1   Types of Accounting
    11.2.2   Major Reports in Financial Accounting System
    11.2.3   Types of Accounts
    11.2.4   Debit and Credit
    11.2.5   Accounting Principles
    11.2.6   Accounting Terminology
11.3    Woking in Tally.Erp9
11.4    Creation of Voucher and Invoice
11.5    Creation of Payroll Statement
11.6    Maintenance Of Inventory Records
11.7    Maintenance of Accounting Books and Final Accounts
    11.7.1   Modification in Report:
    11.7.2   Day Book
    11.7.3   Accounts Book
    11.7.4   Preparation of Financial Reports
    11.7.5   Stock Summary
    Summary of the lesson
    Self Assessment Questions and Exercises

## 11.1 INTRODUCTION

Tally is powerful accounting software which is easy to use and designed to simply complex day to day activities associated in an enterprise. Tally, accounting software, provides a solution around inventory management, stock management, invoicing, purchase order management, discount, stock valuation methodology etc.

The technology used by Tally makes data reliable and secure. In Tally, data can be seen by only application and this increase the security of data.

Tally ERP 9 is an advanced and simple to use accounting software. It is software with the help of which accounting process is carried out mechanically through instructions given by user with the selection of graphical represented information of computer screen.

**Features of Tally ERP 9**

- It is user friendly. Users can create their own names for their accounting data in their own language.

- It is easy to install and easy to use.
- It provides complete business solutions. Accounts can be managed either with inventory or without inventory.
- It enables to work with multiple company accounts simultaneously.
- It provides the facility to automate the management of employee records i.e. payroll system.
- It provides powerful audit capabilities.
- It gives varieties of management reports.
- It provides the facility of invoicing.

## 11.2 ACCOUNTING

**Meaning of Accounting**

Accounting is defined as the process of identifying, measuring and communicating the economic information of an organization to its users where the information is needed for decision making.

### 11.2.1 Types of Accounting

Accounting can be classified into three categories which are following:

      i) Financial accounting;

      ii) Cost accounting; and

      iii) Management accounting.

Now, let us understand these terms.

**Financial Accounting**

Financial accounting concerned with the financial state of affairs and financial results of operations. It is the process of generating information in the form of financial statements for external use i.e. preparation of financial statements for the use of outsiders like creditors, debenture holders, investors and financial institutions. The financial statements i.e., the profit and loss account and the balance sheet, specifies the manner in which operations of the business have been conducted during a specified period.

**Cost Accounting**

Cost accounting concerned with the accumulation and assignment of historical costs to units of product and department, mainly for the purpose of valuation of stock and measurement of profits. It includes the application of different techniques to evaluate and control costs. Its application is suitable for manufacturing concerns. It generally relates to the future and consists an estimation of future costs to be incurred.

**Management Accounting**

It is an accounting for the management i.e., accounting which provides necessary information to the management for discharging its functions. Information may be in the form of budgets and forecasts, that enable an enterprise to plan effectively for its future or may include an assessment based on its past performance and results.

Management accounting is not only restricted to the area of cost accounting but also covers other areas (such as capital expenditure decisions, capital structure decisions, and dividend decisions) as well.

### 11.2.2 Major Reports in Financial Accounting System

The documents used in financial accounting system are following:

- **Voucher:** entries are defined in voucher at the first time.
- **Journal:** This is the primary book of accounts in which business transactions are recorded in chronological and systematic order, with the help of voucher. In journal, accounts to be debited and credited are specified together with explanation for the entry.
- **Ledger:** A ledger is summary statement of all transactions related to a person, assets, expense or income taken place during a period of time and shows their net effect. In ledger, entries are defined on the basis of group and after that calculation are performed.

On the basis of above defined documents, different types of reports are generated which are following:

- **Trial Balance:** This is the statement containing the balance of all ledger accounts, at any given date, arranged in the format of debit and credit column to check the arithmetic accuracy of ledger.
- **Profit and Loss report:** This is prepared to know the net profit and loss of the business. When debit side is excess that means there is loss and if the credit side is excess it means profit is there.
- **Balance Sheet:** This is the statement of assets and liabilities of a business. This is prepared to know the exact financial position of business

### 11.2.3 Types of Accounts

The accounts can be classified into two categories: Personal and Impersonal.

**Personal Accounts:** Accounts which represents person or group of Persons and organizations are known as personal accounts. These accounts are necessary, in particular, to record credit transactions. Personal accounts are of the following types:

   **(a) Natural persons:** An account that consist transactions with an individual human being is termed as a natural persons' personal account. eg., Mary's account, Ram's accounts etc. Males and females both are included within this type of account.

   **(b) Artificial or legal persons:** An account that consist financial transactions with an artificial person created by law or otherwise is termed as an artificial person, personal account, e.g. Firms' accounts, limited companies' accounts, educational institutions' accounts, Co-operative society account.

   **(c) Groups/Representative personal Accounts:** An account indirectly representing a person or persons is known as representative personal account. When accounts are of a similar nature and their number is large, it is better to group them under one head and open representative personal accounts. e.g., prepaid insurance, upstanding salaries, rent, wages etc. When a person starts a business, he is known as proprietor. This proprietor is represented by capital account for that entire he invests in business and by drawings accounts for all that which he withdraws from business. So, capital accounts and drawings account are also personal accounts.

   The rule for personal accounts is: **Debit the receiver, Credit the giver**

**Impersonal Accounts:** All other accounts which are not personal accounts are called Impersonal Account. These are not related to persons. Impersonal accounts are of different types:

   **(a) Real Accounts**

Accounts relating to properties or assets are known as 'Real Accounts'. A separate account is maintained for each asset e.g., Cash Machinery, Building, etc., Real accounts can be further classified into tangible and intangible.

- **Tangible Real Accounts:** These accounts represent assets and properties which can be seen, touched, felt, measured, purchased and sold. e.g. Machinery account Cash account, Furniture account, stock account etc.
- **Intangible Real Accounts:** These accounts represent assets and properties which cannot be seen, touched or felt but they can be measured in terms of money. e.g., Goodwill accounts, patents account, Trademarks account, Copyrights account, etc.

   The rule for Real accounts is: **Debit what comes in Credit what goes out**

   **(b) Nominal Accounts**

Accounts relating to income, revenue, gain expenses and losses are termed as nominal accounts. These accounts are also known as fictitious accounts as they do not represent any tangible asset. A separate account is maintained for each head or expense or loss and gain or income. Wages account, Rent account Commission account, Interest received account are some examples of nominal account.

The rule for Nominal accounts is: **Debit all expenses and losses Credit all incomes and gains.**

## 11.2.4 Debit And Credit

Whether a debit increases or decreases an account depends on what kind of account it is. In summary: an increase to an asset account is a debit. An increase to a liability or to an equity account is a credit. Conversely, a decrease to an asset account is a credit. A decrease to a liability or equity account is a debit.

|                    | **Debit** | **Credit** |
|--------------------|-----------|------------|
| **Asset**          | Increase  | Decrease   |
| **Liability**      | Decrease  | Increase   |
| **Income/Revenue** | Decrease  | Increase   |
| **Expense**        | Increase  | Decrease   |
| **Equity/Capital** | Decrease  | Increase   |

## 11.2.5 Accounting Principles

Accounting principles means those rules of action or conduct which are adopted in recording accounting transaction. These principles can be categorized into two categories:

- Accounting concepts
- Accounting conventions

**Accounting Concepts:**

These refer to the accounting assumptions upon which accounting is based and accepted and obeyed by all. Some of these concepts are as follows:

i) **Business entity concept:** According to this, a business is separate and distinct from the person or persons who own it. The business and the businessman are considered two separate things.

ii) **Money measurement concept:** According to this, all business transaction are recorded in the books of business in terms of money and transaction or events which cannot be expressed in terms of money are not recorded in the books of account.

iii) **Going concern concept:** According to this, it is assumed that business will continue to operate for an indefinitely long period in the future. So the long term assets of business are shown at their book value.

iv) **Accounting period concept:** The life of business is supposed to be indefinite and the owner of business cannot wait for a long period for the determination of its income.

v) **Cost concept:** According to this, a long term asset is recorded in the books at the price paid to acquire it i.e. its actual cost and this cost is the basis of all subsequent accounting for that asset.

vi) **Matching concept:** According to this, to ascertain the profit made during a period, the expenses incurred in the accounting period should be matched with the revenues realized in that period.

**Accounting Conventions:**

These are used to signify customs and traditions that guides in the preparation of accounting statements. These are following:

i) **Convention of consistency:** According to this, same methods of accounting should be used to record the business transactions every year, so that the result of the business can be comparable of various years.

ii) **Convention of conservatism:** According to this, all prospective losses should be taken into consideration and leave all prospective profits. This convention compels the accountant to safeguard the business against possible losses and uncertainties.

iii) **Convention of materiality:** As per this, accountant should attach importance to material details and ignore insignificant details there is almost unlimited amount of financial information which can be provided for any business.

iv) **Convention of full disclosure:** According to this, all the information must be honestly disclosed in the books of accounts and in the financial statements.

### 11.2.6 Accounting Terminology

It is necessary to understand some basic accounting terms which are daily used in business world. These terms are called accounting terminology.

**Transaction**

"An event, the recognition of which gives rise to an entry in accounting records. It is an event which results in change in the balance sheet equation. That is, this changes the value of assets and equity. In a simple statement, transaction means the exchange of money or money's worth from one account to another account. Events like purchase and sale of goods, receipt and payment of cash for services or onpersonal accounts, loss or profit in dealings etc., are the transactions". Transactions are of two types:

    i)      Cash transaction: is one where cash receipt or payment is involved in the exchange.

    **ii)**     Credit transaction: will not have 'cash' either received or paid, for something given or receive respectively. It gives rise to debtor and creditor relationship.

**Debtor**

A person who owes money to the firm mostly on account of credit sales of goods is called a debtor.

**Creditor**

These are the persons from whom goods are purchased on credit or a person to whom money is owing by the firm is called creditor.

**Capital**

It means the amount (in terms of money or assets having money value) which the proprietor has invested in the firm or can claim from the firm. It is also known as owner's equity or net worth. Owner's equity means owner's claim against the assets.

It will always be equal to assets less liabilities, say:

Capital = Assets – Liabilities.

**Liability**

It means the amount which the firm owes to outsiders that is, accepting the proprietors. In simple terms, debts repayable to outsiders by the business are known as liabilities.

**Asset**

Any physical thing or right owned that has a money value is an asset. In other words, an asset is that expenditure which results in acquiring of some property or benefits of a lasting nature. Assets are of five types: Fixed, Current, Fictitious, Intangible and Wasting assets.

**Goods**

It is a general term used for the articles in which the business deals; that is, only those articles which are bought for resale for profit are known as Goods.

**Revenue**

It means the amount which, as a result of operations, is added to the capital. It is defined as the inflow of assets which result in an increase in the owner's equity. It includes all incomes like sales receipts, interest, commission, brokerage etc.,

**Expense**

The terms 'expense' refers to the amount incurred in the process of earning revenue. If the benefit of an expenditure is limited to one year, it is treated as an expense (also know is as revenue expenditure) such as payment of salaries and rent.

**Expenditure**

Expenditure takes place when an asset or service is acquired. The purchase of goods is expenditure, where as cost of goods sold is an expense. Similarly, if an asset is acquired during the year, it is expenditure, if it is consumed during the same year, it is also an expense of the year.

**Purchases**

Buying of goods by the trader for selling them to his customers is known as purchases. As the trade is buying and selling of commodities purchase is the main function of a trade. Purchases can be of two types i.e. cash purchases and credit purchases. If cash is paid immediately for the purchase, it is cash purchases, If the payment is postponed, it is credit purchases.

**Sales**

When the goods purchased are sold out, it is known as sales. It can be of two types: cash sales and credit sales. If the sale is for immediate cash payment, it is cash sales. If payment for sales is postponed, it is credit sales.

**Stock**

The goods purchased are for selling, if the goods are not sold out fully, a part of the total goods purchased is kept with the trader unlit it is sold out, it is said to be a stock. If there is stock at the end of the accounting year, it is said to be a closing stock. This closing stock at the yearend will be the opening stock for the subsequent year.

**Drawings**

It is the amount of money or the value of goods which the proprietor takes for his domestic or personal use. It is usually subtracted from capital.

**Losses**

Loss really means something against which the firm receives no benefit. It represents money given up without any return. It may be noted that expense leads to revenue but losses do not.

**Account**

It is a statement of the various dealings which occur between a customer and the firm. It can also be expressed as a clear and concise record of the transaction relating to a person or a firm or a property (or assets) or a liability or an expense or an income.

**Invoice**

While making a sale, the seller prepares a statement giving the particulars such as the quantity, price per unit, the total amount payable, any deductions made and shows the net amount payable by the buyer. Such a statement is called an invoice.

**Voucher**

A voucher is a written document in support of a transaction. It is a proof that a particular transaction has taken place for the value stated in the voucher. Voucher is necessary to audit the accounts.

**Proprietor**

The person who makes the investment and bears all the risks connected with the business is known as proprietor.

**Discount**

When customers are allowed for any type of deduction in the prices of goods then that is called discount. When some discount is allowed in prices of goods on the basis of sales of the items, that is termed as trade discount, but when debtors are allowed some discount in prices of the goods for quick payment, that is termed as cash discount.

**Solvent**

A person who is capable to pay his liability in full is called solvent.

**Insolvent**

A person whose liabilities are more than the realizable values of his assets is called an insolvent.

**Bad Debts**

The amount of debtors, which is irrecoverable, is called Bad debts. It is a loss which is incurred by the business when debtor fails to pay or all the chances of recovery of debts are lost.

## 11.3 WOKING IN TALLY.ERP9

There are different ways for data processing in Tally. These are following:

**Starting and Closing of TALLY.ERP9:**

To start Tally: Click on START→PROGRAMS→TALLY.ERP9. Tally can be opened or started by double clicking on the icon of Tally if that is on desktop. When Tally is loaded, then Simplicity screen is appeared. As the Start –up screen is available, working on Tally can be started. Screen of Tally is as like:
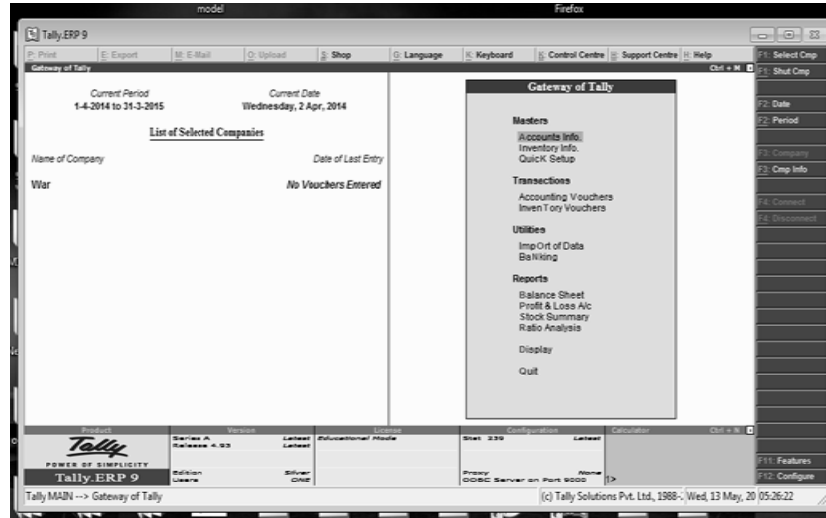
## Elements of Tally Screen:

- **Title bar:** It consists version number, system date and time, and Tally version.
- **Gateway of Tally:** It consists menu, screen and reports and it accepts those options which are responsible for availability of data and to see that data.
- **Calculator ODBC Server:** It is used for calculation work.
- **Button Toolbar:** It consists various buttons to do work in Tally. These buttons provide quick interaction with Tally.
- **Minimize Button:** It is used to minimize Tally screen to switch over another application.

## Switching in Screen Area:

As Tally started, Gateway of Tally screen is appeared. To work in that Gateway of Tally screen and Calculator ODBC server Ctrl+N and Ctrl+M are used. These are used to switch over from one area to another area. The active area of the screen is highlighted by green bar.

## Exit From Tally:

For exit from Tally, press ESCAPE key until QUIT? YES or NO message is appeared on screen. Then press ENTER or YES to exit. This can be done by pressing Ctrl+Q in Gateway of Tally.

## 11.4 CREATION OF VOUCHER AND INVOICE

A voucher is a document that contains the details of a financial transaction. For example, a purchase invoice, a sales receipt, a cheque, a bank interest statement etc.

Groups, ledgers, types of vouchers and quit options are present in 'Accounts Info' menu. F11 key is used to configure these options and after configuration 'Accounts Info' is shown like:
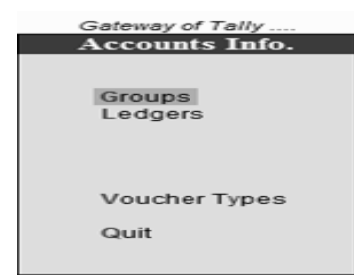


### 11.4.1 Accounting Voucher:

Tally is pre-programmed with a variety of accounting and each used to perform a different job. There are number of vouchers in Tally, which can be created, displayed, altered or deleted. These vouchers are of following types:

### 1.Contra Voucher:

Contra Voucher is used to record below transaction: -

- Cash transfer from one cash account to another (Cash a/c to petty cash a/c)

- Cash deposit in the bank account
- Cash withdraw from the bank account
- Fund transfer from one bank account to another bank account

Contra voucher is created by:

Gateway of Tally. ERP9 Accounting Vouchers > F4: Contra

Contra Voucher Creation screen will appear as shown below:



### 2.Payment Voucher:

Payment Voucher is used to record all cash & bank payments. In payment vouchers, entries related to payment are defined. For examples 1. cash payment for conveyance. 2. Bank payment to supplier settle purchase bills.

Payment voucher is created as follows:

Gateway of Tally.ERP9 Accounting Vouchers → F5: Payment

Payment Voucher Creation screen will appear as shown below:

### 3.Receipt Voucher:

Receipt Voucher is used to record all cash & bank receipts. For examples 1. Cash/bank received from customer against sales.

It can be created by:

Gateway of Tally.ERP9 Accounting Vouchers → F6: Receipt

**Ways of Adjustment:** A number of ways are used for adjustment such as

- Advance:
- Against Reference:
- New Reference:
- On Account:
- Transaction:

### 4. Journal Voucher:

Journal Voucher is used to make adjustments in accounts. It does not involve any cash or bank accounts. For example depreciation charged to the fixed assets, Rent payable entry etc.
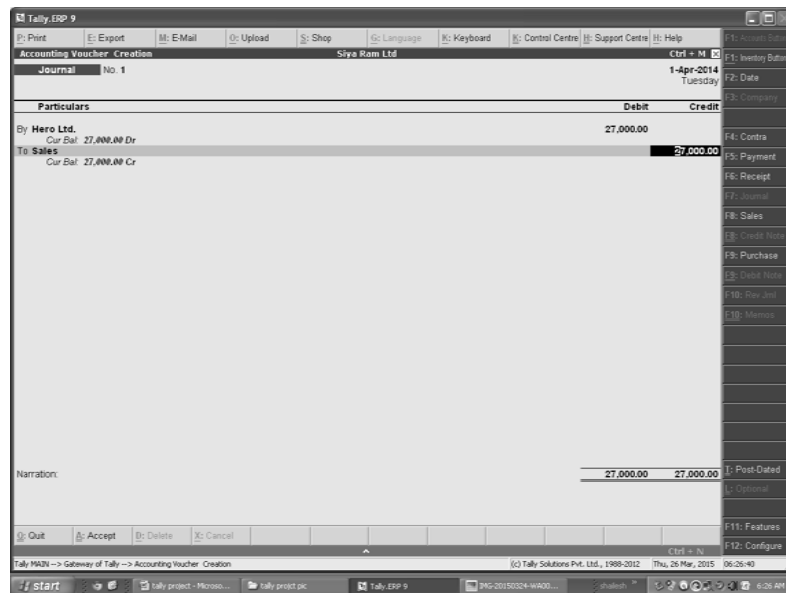


### 5. Sales Vouchers:

Sales Voucher is used to record sales transaction whether it is Cash or Credit. Sales voucher can be enter mainly in two modes.

**Sales Voucher in Voucher Mode:**

Voucher mode is used for simple sales entry with less detail. It is good for professionals because there is no need to maintain inventory.

**Sales Voucher in Invoice Mode**

For enter Sales Voucher in Invoice Mode go to **Gateway ot Tally > Accounting Voucher > Press F8 or click on Sales Button from Right Side Button Menu.**

**Sales Voucher also has two modes:**

**Sales Invoice As Account Invoice**

Sales invoice as account invoice is used to record sales transaction without Inventory. It is generally used by professionals such as doctors, advocates, chartered accountants etc for their service charges. They don't use inventory features.

**Sales Invoice As Item Invoice**

Sales invoice as Item Invoice is used to record sales transaction with Inventory. It is generally used for Trading, Manufacturing companies.

**6. Purchase Voucher:**

Purchase Voucher is used to record Purchase Transaction whether its Cash or Credit.

Purchase Voucher also has two modes:

**Purchase Invoice as Account Invoice**

Purchase Invoice as account invoice is used to record Purchase transactions without Inventory. It is generally used in service industries or by professionals such as doctors, advocates, chartered accountants etc for their service charges. They don't use inventory features.

**Purchase Invoice as Item Invoice**

Purchase invoice as Item Invoice is used to record Purchase transaction with Inventory. It is generally used for Trading, Manufacturing companies.

**7. Debit Note (CTRL + F9)**

Debit Note is used to Debit the ledger / account of party for purchase return or escalation / de-escalation in price or any other reason but mainly it is used for purchase return only.

**8. Credit Note (CTRL + F8)**

Credit Note is used to Credit the ledger / account of party for Sales return or escalation / de-escalation in price or any other reason but mainly it is used for Sales Return only.

**9. Memo Voucher:**

These are non-accounting vouchers and do not affect the account at any cost. The enteries are not specified in ledger. It can be created by configration of option of F11

**11.4.2 Invoices:**

An **invoice**, **bill** or **tab** is a commercial document issued by a seller to a buyer, relating to a sale transaction and indicating the product, quantities, and agreed prices for products or services provided by seller to the buyer.

Payment terms are stated on the invoice. These may specify that the buyer has a maximum number of days in which to pay, and is sometimes offered a discount if paid before the due date. The buyer could have already paid for the products or services listed on the invoice.

In the rental industry, an invoice must include a specific reference to the duration of the time being billed, so in addition to quantity, price and discount the invoicing amount is also based on duration. Generally each line of a rental invoice will refer to the actual hours, days, weeks, months, etc, being billed.

**A Typical Invoice Contains:**

- The word invoice (or Tax Invoice).
- A unique reference number (in case of correspondence about the invoice)
- Date of the invoice.
- Credit terms.
- Tax payments if relevant (e.g. GST or VAT)
- Name and contact details of the seller
- Tax or company registration details of seller
- Name and contact details of the buyer
- Date that the goods or service was sent or delivered

- Purchase order number (or similar tracking numbers requested by the buyer to be mentioned on the invoice)
- Description of the product(s)
- Unit price(s) of the product(s) (if relevant)
- Total amount charged (optionally with breakdown of taxes, if relevant)
- Payment terms (including method of payment, date of payment, and details about charges for late payment)

There are different types of invoices:

**1. Proforma invoice:**

Proforma invoice is a document that states a commitment from the seller to provide specified goods to the buyer at specific prices. It is often used to declare value for customs. It is not an actual invoice, and thus the seller does not record a pro forma invoice as an account receivable and the buyer does not record a pro forma invoice as an account payable. A pro forma invoice is not issued by the seller until the seller and buyer have agreed to the terms of the order. In some cases, a pro forma invoice is issued to request advance payments from the buyer, either to allow production to start or for security of the goods produced.

**2. Credit Memo:**

When buyer returns the goods, the seller usually issues a credit memo for the same or lower amount than the invoice, and then refunds the money to the buyer, or the buyer can apply that credit memo to another invoice.

**3. Commercial invoice:**

This invoice is a custom declaration form used in international trade that describes the parties involved in the shipping transaction, the goods being transported, and the value of the goods. It is the primary document used by customs, and must meet specific customs requirements, such as the Harmonized System number and the country of manufacture. It is used to calculate tariffs.

**4. Debit memo:**

When a company fails to pay or short-pays an invoice, then it is common practice to issue a debit memo for the balance and any late fees owed. Debit memos are identical to invoices in function.

**5. Self-billing invoice**:

A self billing invoice is when the buyer issues the invoice to himself (e.g. according to the consumption levels he is taking out of a vendor-managed inventory stock). The buyer (i.e. the issuer) should treat the invoice as an account payable, and the seller should treat it as an account receivable. If there is tax on the sale, e.g. VAT or GST, then buyer and seller may need to adjust their tax accounts in accordance with tax legislation.

**6. Evaluated receipt settlement (ERS):**

ERS is a process of paying for goods and services from a packing slip rather than from a separate invoice document. The payee uses data in the packing slip to apply the payments. "In an ERS transaction, the supplier ships goods based upon an Advance Shipping Notice (ASN), and the purchaser, upon receipt, confirms the existence of a corresponding purchase order or contract, verifies the identity and quantity of the goods, and then pays the supplier.

**7. Timesheet:**

Invoices for hourly services issued by businesses such as lawyers often pull data from a timesheet. A timesheet invoice may also be generated by Operated equipment rental companies where the invoice will be a combination of timesheet based charges and equipment rental charges.

**8. Statement:**

A periodic customer statement includes opening balance, invoices, payments, credit memos, debit memos, and ending balance for the customer's account during a specified period. A monthly statement can be used as a summary invoice to request a single payment for accrued monthly charges.

**9. Progress billing:**

It is used to obtain partial payment on extended contracts, particularly in the construction industry.

## 11.5 CREATION OF PAYROLL STATEMENT

Tally ERP9 performs all those functions which are necessary for any salary department. In Tally, error free salary statement can be created without any special effort. A Salary slip can be created by following steps:

**Creation of Employee master:** It consists all necessary information about the employee such as department, date of joining, date of leaving, identity card number, place of joining, details of bank account, passport details etc.

**Creation of Payroll Master:** This is based on payroll unit. And payroll unit consists information related to calculation of pay head i.e. where the pay head calculation have been done.

**Creation of Pay head:** It consist the details about earning and deductions of employees. Some example of pay head are basic pay, Dearness Allowance, uniform allowance etc. and deductions are like ESI, TDS etc. Tally consists following details on Pay head:

- Earning by Employees
- Deductions from Employees
- Employee's Statutory Deduction
- Employee's Statutory Contribution
- Employee's other Charges
- Bonus
- Gratuity
- Loans and Advances
- Reimbursement to Employees

**Creation of Salary Statement:** It consists of various information in salary details master such as department of employee, salary of employee, earning and deduction etc.

**Process of Payroll:** It consists various vouchers for proper functioning as payroll voucher, payment voucher etc. all the entries related to payroll are specified in these vouchers. These vouchers act as input in the process of preparation of payroll.

**PAY-SLIP:**

Pay slip specifies the detail of salary of employee given to them from employer side. It consists the details about earning and deductions of employees.

Pay-slip is created as:

Gateway of Tally > Display > Payroll reports > Statement of Payroll > Pay slip > Single Pay Slip

Then click the name of employee.

## 11.6 MAINTENANCE OF INVENTORY RECORDS

Any Business activity is specified by accepting and giving of items. In these items, different kinds of things are included such as raw material, prepared and non prepared things etc.

Inventory Info menu consists following options:
- Stock Group: This is the group of things such as raw material.
- Stock Items: It consists the preparation of stock items such as TV, music system etc.
- Voucher Types: creation of vouchers is specified.
- Measurement of Units: It consist the information about measurement units as litre, meter, box etc.
- Quit: This is the option for quitting the menu.

It is necessary to get the information about stock group, stock items and measurement units before creation of Inventory Info menu

➢ **MEASUREMENT UNIT:**

These are of two types: Single and Mixed unit

- Single Unit: When a single unit is used for stock item, then that is single unit.
- Mixed Unit: When two different units are used for stock item, then that is mixed unit.

➢ **CREATION OF SINGLE STOCK GROUP:**

Gateway of Tally.ERP9 > Inventory Info > Single Stock Group > Create

- Enter the name of Group.
- Select the name of categorized group

**Alteration of Single Group:**

Gateway of Tally.ERP9 > Inventory Info > Single Stock Group > Alter

**Display of Stock Group:**

Gateway of Tally.ERP9 > Inventory Info > Single Stock Group > Display

**Deletion of Single Group:**

Gateway of Tally.ERP9 > Inventory Info > Single Stock Group > Alter

- Press Alt+D on keyboard
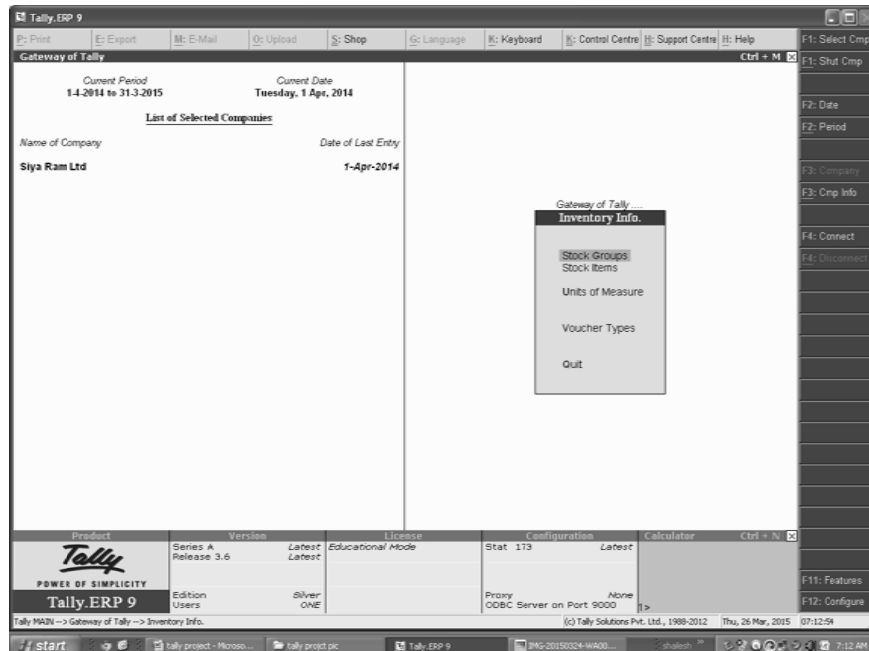


**Creation of Multiple Stock group:**

Gateway of Tally.ERP9 > Inventory Info > Single Stock Group > Create

- Select the Group, press Alt+c
- Enter the name of Groups.

**Creation of Stock Unit:**

Gateway of Tally.ERP9 > Inventory Info > Units of Measure > Create

**Modify the Stock Unit:**

Gateway of Tally.ERP9 > Inventory Info > Single Stock Group > Alter

This can be done also by pressing Alt+D

> **STOCK ITEMS:**
> These can be created as follows:

Gateway of Tally.ERP9 > Inventory Info > Stock items > Create

A new group or unit can be added by pressing Alt+C at that place where cursor is present.
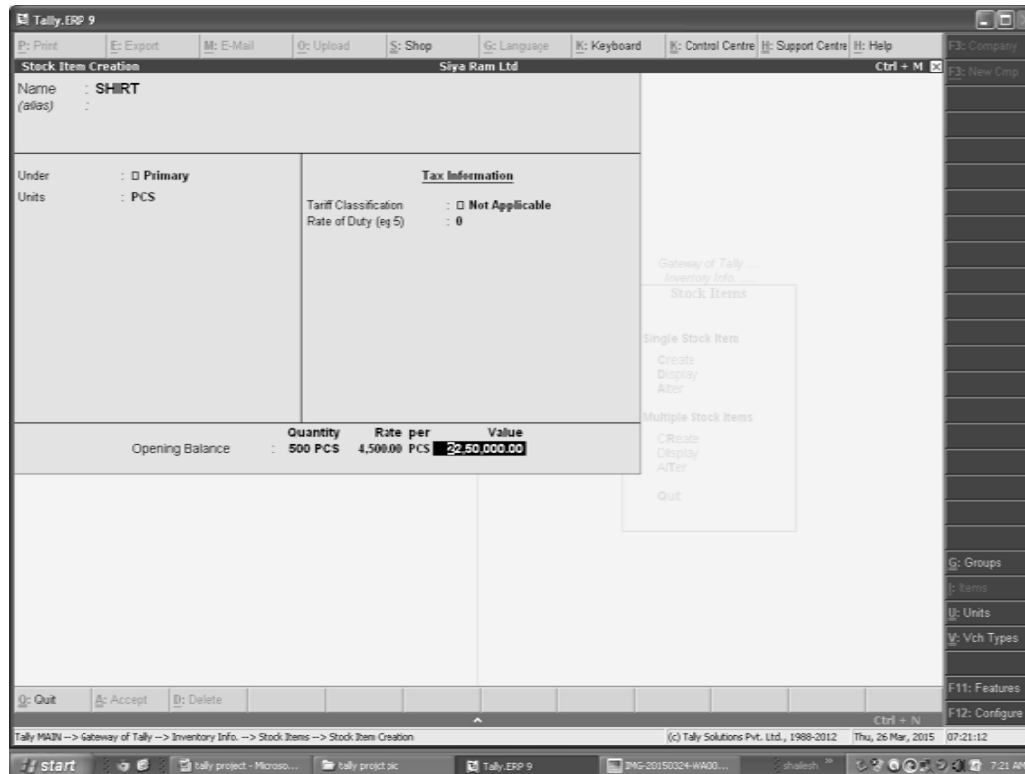
## Alteration Of Stock Item

Gateway of Tally.ERP9 > Inventory Info > Stock items > Single Alter or Press Alt+D

### 11.7 MAINTENANCE OF ACCOUNTING BOOKS AND FINAL ACCOUNTS

Final accounts are created to calculate the profit and loss in a specific time period.

### 11.7.1 Modification in Report:

When report is displayed on screen after selection then modifications can be done on that report. It can be done by pressing Alt+F1: Detailed/ Condensed. This is used to make the changes in reports.

**F2: Period:** This is used to modify the time period.

**F3: Company:** Used to select more than one company and to show the content of present selected company.

**F4-F10:** functioning can be changed according to reports.

**F11:** Company Features: Used to select the option for voucher entries.

**F12:** Configure: Used to configure the report.

**Alt+12: Range:** Used to filter the information of data.

**Ctrl+F12: Value:** Used to select the type of voucher for calculation.

**New Column:** New Column can be added to compare the data of any company.

**Delete Column:** used to delete the column.

### 11.7.2 Day Book

It consist the entries of whole day. It is set for current date by default. All types of vouchers are included for day book's entries. Day book is created as follows:

Gateway of Tally.ERP9 > Display > Day Book

### 10.7.3  Accounts Book

There are number of account books in Tally which are used in daily working. These are following:

- Cash book
- Petty Cash book
- Bank book
- Ledger
- Group register

- Journal
- Sale register
- Purchase register
- Stock summary
- Stock item

- Balance Sheet
- Trial Balance
- Profit and Loss account
- Day book

### 10.7.4  Preparation of Financial Reports

There are various financial reports in Tally which are as follows:

- **Trial balance:** It is a list of all the general ledger account contained in the ledger of business. It defines the closing balance of ledger account on a specific date it is prepared at the end of accounting period to prepare the drafting of financial statement. It is created as follows:

Gateway of Tally.ERP9 > Display > Trial Balance



- **Balance Sheet:** Balance sheet is a final financial statement that reveals the state of affair of the company as on the data of report. Asset side list what the company owns and liabilities side lists what the company owes.

Balance sheet is specified as:

Gateway of Tally.ERP9 > Balance Sheet > F12: Configure



-   **Profit and Loss account:** The profit and loss a/c displays the figure of all nominal accounts and the net profit/loss.



## 10.7.5  Stock Summary

It specifies the available stock on a specific date. It does not have date with entries. So the user can see it any time.

**11.8 Value Added Tax (VAT) in** Tally.ERP9
   **1.** Introduction
   **2.** VAT calculation
   **3.** Salient Features of VAT in Tally.ERP9
   **4.** VAT in Tally.ERP9:
      4.1 Create a Company
      4.2 Enable VAT in Tally.ERP9
      4.3 Create a Stock Item
      4.4 Create a Supplier Ledger
      4.5 Create a Customer Ledger
      4.6 Create a Purchase Ledger
      4.7 Create a sales Ledger
      4.8 Create a VAT Ledger
5   Transaction for VAT calculation
6   VAT Reports
7   Payment

### Value Added Tax (VAT)

### 1. Introduction

Value Added Tax (VAT) is defined as the tax that is levied at every stage of value addition to the stock item. In India value added tax (VAT) was made implemented from 01-04-2005. The introduction of VAT replaced existing general sales tax. Input Tax Credit is actually the sum paid as tax for acquiring the items. When this item is sold, the VAT payable got adjusted against the input tax credit and the remaining balance is paid as the VAT.

### 2. VAT Calculation

Input Tax: The tax paid which is paid on purchases.

Output Tax: The tax which is payable on sales.

Then the VAT Payable = Output Tax – Input Tax

**Example:**

Mr. Ravi, a registered dealer, purchased a stock item at ₹500 by paying 5% tax on it, that is, ₹25. Then he did a value addition of ₹250 on it & sold it. The total VAT liability became ₹37.5 (5% on ₹750).

Thus, net VAT liability of Mr. Ravi for this stock item = 37.5 – 25 = 12.5

There may be situation where the Input Tax paid for purchases is more than the Output Tax, then the dealer will have two options. Either he can carry forward the excess amount or can claim it as refund.

### 3. Salient Features of VAT in Tally.ERP9

   i.    A very simple and easy to use process.

ii.    Facility of flexibility to create and change tax rates with dates.

iii.   Facility to define tax rates in VAT at various levels like that of company level, group Level, ledger level, etc.

iv.    We can calculate tax in both the cases when MRP is either inclusive or exclusive.

v.     We can view all the tax payments with the challan details.

vi.    From the VAT returns, payment voucher can be made.

vii.   Tax invoice can be printed.

viii.  All the transactions can be tracked and categorized as Included, Excluded and Uncertain.

ix.    VAT return can be generated at any time.

x.     We can view the return summary.

xi.    Various required annexures can be generated.

Tally ERP9 has been updated for state specific VAT taxation with some added modules like tax rates at Company Level, Group Level and Ledger or Item Level.

4.  **VAT in Tally.ERP9:**

4.1 **How to Create a Company?**

Go to **Tally ---------->F3: Company Information --- ------>Create a Company**

i.    Write the desired name in the **Company Name**
ii.   Fill the **Address** details
iii.  **In Statutory Compliance** select **India**
iv.   Select **State**
v.    Enter the **Pin code, Contact details** and **E-Mail** details
vi.   **Enable Auto Backup**
vii.  Select **Accounts with Inventory** (**Maintain** field)
viii. After entering all the details, the **Company Creation** screen
ix.   Press **Y** or **Enter** to accept and save.

We will understand the concept with defining tax rate at ledger or item level.
The information of an already created company can be altered as follow:
     Gateway of Tally →**Alt+F3**→ Co. info →**Alter**

**Remarks**

Mailing Name       : Shisana Technology
Address            : Kunnil House,Bakkalam,PO Kanul,Kannur

Country            : India
State              : Karnataka
Pincode            : 670562

### 4.2 How to enable VAT in Tally.ERP9?

      **Gateway of Tally ------> F11 ------> Statutory & Taxation**

 i. Enable Value Added Tax (VAT)

Company:  Shisana Technology

Statutory and Taxation

Enable Value Added Tax (VAT)  ? Yes  Enable Tax Collected at S
 Set/alter VAT details     ? Yes   Set/alter TCS details

 ii. Set Set/alter VAT details to yes.

**VAT Details**

State             : Karnataka

TIN              : 321210425355

Inter-state Sales Tax Number     :

Set/alter tax/rate details      ? No

Define VAT commodity and tax details as masters ? No

 iii. Save main screen and sub screens.

### 4.3 How to create a Stock Item?

Create STOCK ITEM e.g. 'Computer' where VAT @4%

  **Gateway of Tally ----->Inventory Information ------> Stock Items ------> Create**

i.    Enter the details like name, etc. in the respective fields.

ii.   Set VAT applicable to applicable.

iii.  Set Set/Alter Vat Details to Yes

iv.   In the next screen, Tax/rate details Enter VAT Rate as 4%.

v.    Tax Type will be seen as 'Taxable' automatically, and will be displayed as 'exempt' if there is no tax rate.



vi.   Click on enter and save the screen.

**4.4 How to create a Supplier Ledger** whose name is 'Computer Solution'?

   **Gateway of Tally ------>Accounts Info. -- --->Ledgers ------> Create**

i.    Submit all the details of creditor (Shown in image).

**Remarks**



ii.      **Set Set/Alter VAT Details to Yes**

iii.     Submit the VAT details of supplier.

iv.     Enter **Type of Dealer** as **Regular.**

v.      Enter the valid TIN number of the dealer.



vi.     Press enter key and save the created Supplier Ledger with name of "computer Solutions".

**4.5 How to create a Customer Ledger** with the name of "Computer Point"?

**Gateway of Tally -----> Accounts Information ------> Ledger ------> Create**

i.      Enter all the required details of the customer.

The State name appeared automatically in case of creating customer ledger.

ii.     Set Set/Alter VAT details to Yes.

iii.    Then submit the required VAT details of the customer.



iv.     Press Enter key and save the customer ledger with the name of 'Computer Point'.

**4.6 How to create a Purchase Ledger?**

**Gateway of Tally ------> Accounts Information ------> Ledgers ------> Create**

i.      Enter all the details of purchase in this screen for purchase ledger creation.

**Remarks**



ii. Set the Set/Alter VAT Details to No here.

iii. Press enter key and save the purchase ledger.

**4.7 How to create a sales Ledger?**

**Gateway of Tally ------> Accounts Info. ------> Ledgers ------> Create**

i. A separate ledger for Sales @4% needs to be created.

ii.    Set the Set/**Alter Vat Details** to Yes

iii.    Set the Tax rate 4% in the new window

iv.    It is to be noted that Tax type will automatically be appeared as "Taxable".



6. Then enter the correct tax rate (with displaying applicable date)

7. Press the Enter key and save the screen. And at last save the newly created Sales Ledger.

### 4.8 How to create a VAT Ledger?

**Gateway of Tally → Accounts Information → Ledgers →Create**

i.    Select Duties & Taxes in 'Under"

ii.    Enter VAT in Type of duty/tax

iii.    Enter Percentage of calculation: 0 %

iv.    Enter all other required details.

v.     Press the enter key and save the newly created VAT ledger.

**5   Transaction for VAT calculation**

There may be described two types of transaction required for VAT calculation:

A.  **Purchase Transaction**

B.  **Sales Transaction**

　　A.  **Purchase Transaction for VAT Calculation**

　　　　E.g. 10 computers were purchased from "computer solutions" at the rate of Rs. 25000 per computer.To create this purchase transaction, follow as:

<div align="center">

**Gateway of Tally ----> Accounting Vouchers ------> F9: Purchases**

</div>

i.    Then enter the details like Transaction date, Supplier Invoice Number & Name, Product Name, Quantity or Number, Price Rate, etc.

ii.   After this when Enter in VAT ledger, Total Amount and Tax Amount will be calculated automatically.

iii.  Set the provided VAT Details to Yes in the bottom

iv.   Thereafter a new form will appear for submitting the required additional details of the purchase tax (Input Tax)

v.    e-Sugam Number: When the e-Sugam-XML file generated from Tally.ERP9 is submitted to the Department website, a unique acknowledgement number which is called e-Sugam number is generated which has to be entered here.

vi.   Invoice Delivery Date is displayed here.

vii.  Dispatch and delivery place have to be entered.

viii. VAT Category Types enlisted for e-Sugam is displayed as a list from which one has to be selected on the basis of the nature of transaction.

ix.   Document Type: The required document has to be selected here on the basis of nature of transaction.

<div align="center">

**Additional Details : Purchase Taxable**

</div>

| Invoice no. | : CS 75689 | Date | : | 1-Apr-2015 |

<div align="center">

**e-Sugam Details**

</div>

| e-Sugam Number | : KA154565 | | |
| Invoice Delivery Date | : 1-Apr-2015 | | |
| From Place | : Bommasandra | To Place(Destination) | : Bangalore City |
| Category of Transaction | : V-A  After Sale | | |
| Document Type | : INV Invoice | | |
| Transporter Name(Carrier Name/Agent) | : KRS | Vehicle Number(Despatch through) | : KA-05-2564 |
| Bill of lading/LR-RR No. | : 456 | Date | : 1-Apr-2015 |
| Quantity with Units | : 10.00 Nos | | |

x.    Save this.

　　B.  **Sales transaction**

　　　　E.g. 5 computers were sold at the rate of Rs. 27000 per computer with 4% VAT which are purchased by the 'Computer Point'.

　　　　To create this sales transaction follow the below given path:

**Gateway of Tally -----> Accounting Vouchers ------> F8: Sales**

1. Set VAT details to Yes
2. Enter the required VAT details.
3. Enter the quantity and other required details.



e-Sugam Details

| | | | |
|---|---|---|---|
| e-Sugam Number | : KA46556 | | |
| Invoice Delivery Date | : 1-Apr-2015 | | |
| From Place | : Bangalore City | To Place(Destination) | : Mangalore |
| Category of Transaction | : V-C To His Shop/Godown/Storage | | |
| Document Type | : STM Stock Transfer Memo | | |
| Transporter Name(Carrier Name/Agent) : VRL | | Vehicle Number(Despatch through) : KA 18 B 4565 | |
| Bill of lading/LR-RR No. | LR 265544 | Date | : 1-Apr-2015 |
| Quantity with Units | : 5.00 Nos | | |

4. Press Enter key and save this newly created Sales Transaction.

## 6 VAT Reports

To view the VAT reports, follow the below given path:

**Gateway of Tally ----> Display ----> Statutory Reports ----> Form VAT 100**

i. The information like Assessable Value, total Tax amount, net tax payable amount, etc. will be displayed in this report.



ii. Payable VAT amount should be paid in the subsequent month.
iii. By pressing ALT+P, VAT computation report can be obtained (sample is given below).

**Remarks**



## 7   Payment

For payment, VAT returns in prescribed formats (according to states) are to be submitted.

**Gateway of Tally ---> Accounting Vouchers---> F5: Payment**



After the successful payment, VAT liability becomes nil. The VAT Ledger also becomes Zero.

**SUMMARY OF THE LESSON**

You learnt the following in this lesson:

- Tally.ERP9 is accounting software that is easy to use.
- Tally is used to create different types of vouchers and invoices.
- Tally is used to check the profit and loss in any business.
- Management accounting performs the functioning of data collection, arrangement and analysis.
- Trial balance, Balance sheet and profit and loss statements are the part of financial accounting.
- Debit and Credit are the basic terminology used in accounting.
- Tally consist Startup and Quit activities for the processing.
- Entry, capital, assets, debtor, and liabilities etc. are the keywords used in accounting.
- To specify the credit of any party, credit note is used.
- To define the debit of any company, debit note is used.
- Purchase Voucher is used to record Purchase Transaction whether its Cash or Credit.
- Sales Voucher is used to record sales transaction whether its Cash or Credit. Sales voucher can be enter
- Inventory menu consist different options such as stock group, stock item, types of vouchers, measurement units and quit etc.
- Trial balance is a list of all the general ledger account contained in the ledger of business. It defines the closing balance of ledger account on a specific date
- Balance sheet is a final financial statement that reveals the state of affair of the company as on the data of report.
- Stock summary specifies the available stock on a specific date. It does not have date with entries.

## SELF ASSESSMENT QUESTIONS AND EXERCISES
1. Discuss the categories of accounting.
2. Name the documents used in financial accounting.
3. How personal account is categorized?
4. Discuss the features of Tally.ERP9.
5. What is the use of title bar in TallyERP9?
6. Differentiate payment and journal voucher.
7. What are the schemes of adjustment in receipt voucher?
8. Why sales voucher is used?
9. What is stock summary?
10. How single unit ledgers are created?
11. Differentiate stock item and stock group.
12. What are components of Tally.ERP window?
13. Discuss the way of creation of single stock group.
14. Discuss the concept of financial reports with its different types.
15. Outline the process of creation of payroll statement

## INTRODUCTION TO STATISTICAL PACKAGES

### OBJECTIVES OF THIS LESSON

This lesson is aimed to make you understand the concepts of statistical packages. Readers will be able to understand the following:

- Concept and features of SPSS as Statistical package and its uses.

- Concept of SYSTAT as powerful and statistical graphical software.

- Use of SYSTAT for analysis of complex statistical calculations.

### STRUCTURE OF THIS LESSON

### 12.1 INTRODUCTION

Statistical package is a computer program that has the capability to perform statistical analysis. This package specifies the results of statistical techniques. There are a number of statistical packages available in market such as ADMB, DAP, JAGS, SOFA statistics, SYSTAT, SPSS etc.

SPSS is window based program that is used to explain statistical data. It is also used for making tables and graphs. SYSTAT is also used for statistical work and it consist presentations of desktop statistics package.

### 12.2 SPSS (STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES)

SPSS, (the Statistical Package for the Social Sciences) has been developed by three students at the University of Stanford ( Norman H. Nie, C. Hadlai (Tex) Hull and Dale H. Bent). Initially not meant for distribution outside their home university, the publication of the first manual made SPSS widely known and used. Initially developed for IBM mainframe computers, versions for most other important mainframe brands (Univac, CDC, Honeywell...,) and later for so-called minicomputers

(like DEC, PR1ME) were available. SPSS Inc. was the founded in 1975. In 2009 IBM acquired SPSS; it is now fully integrated into the IBM Corporation Business Analytics Software portfolio.

The software name originally stood for Statistical Package for the Social Sciences (SPSS), reflecting the original market, although the software is now popular in other fields as well, including the health sciences and marketing.

SPSS is a Windows based program that can be used to perform data entry and analysis and to create tables and graphs. SPSS is capable of handling large amounts of data and can perform all of the analyses. SPSS is commonly used in the Social Sciences and in the business world.

SPSS is a widely used program for statistical analysis in social science. It is also used by market researchers, health researchers, survey companies, government, education researchers, marketing organizations, data miners, and others. In addition to statistical analysis, data management (case selection, file reshaping, creating derived data) and data documentation (a metadata dictionary was stored in the datafile) are features of the base software.

Statistics included in the base software:

- Descriptive statistics: Cross tabulation, Frequencies, Descriptives, Explore, Descriptive Ratio Statistics
- Bivariate statistics: Means, t-test, ANOVA, Correlation (bivariate, partial, distances), Nonparametric tests
- Prediction for numerical outcomes: Linear regression
- Prediction for identifying groups: Factor analysis, cluster analysis (two-step, K-means, hierarchical), Discriminant

The many features of SPSS Statistics are accessible via pull-down menus or can be programmed with a proprietary 4GL command syntax language. Command syntax programming has the benefits of reproducibility, simplifying repetitive tasks, and handling complex data manipulations and analyses. Additionally, some complex applications can only be programmed in syntax and are not accessible through the menu structure. The pull-down menu interface also generates command syntax: this can be displayed in the output, although the default settings have to be changed to make the syntax visible to the user. They can also be pasted into a syntax file using the "paste" button present in each menu. Programs can be run interactively or unattended, using the supplied Production Job Facility.

Additionally a "macro" language can be used to write command language subroutines. A Python programmability extension can access the information in the data dictionary and data and dynamically build command syntax programs. SPSS Statistics places constraints on internal file structure, data types, data processing, and matching files, which together considerably simplify programming. SPSS datasets have a two-dimensional table structure, where the rows typically represent cases (such as individuals or households) and the columns represent measurements (such as age, sex, or household income). Only two data types are defined: numeric and text (or "string"). All data processing occurs sequentially case-by-case through the file. Files can be matched one-to-one and one-to-many, but not many-to-many.

The graphical user interface has two views which can be toggled by clicking on one of the two tabs in the bottom left of the SPSS Statistics window. The 'Data View' shows a spreadsheet view of the cases (rows) and variables (columns). Unlike spreadsheets, the data cells can only contain numbers or text, and formulas cannot be stored in these cells. The 'Variable View' displays the metadata dictionary where each row represents a variable and shows the variable name, variable label, value label(s), print width, measurement type, and a variety of other characteristics. Cells in both views can be manually edited, defining the file structure and allowing data entry without using command syntax. This may be sufficient for small datasets. Larger datasets such as statistical surveys are more often created in

data entry software, or entered during computer-assisted personal interviewing, by scanning and using optical character recognition and optical mark recognition software, or by direct capture from online questionnaires. These datasets are then read into SPSS.

SPSS Statistics can read and write data from ASCII text files (including hierarchical files), other statistics packages, spreadsheets and databases. SPSS Statistics can read and write to external relational database tables via ODBC and SQL.

Statistical output is to a proprietary file format (*.spv file, supporting pivot tables) for which, in addition to the in-package viewer, a stand-alone reader can be downloaded. The proprietary output can be exported to text or Microsoft Word, PDF, Excel, and other formats. Alternatively, output can be captured as data (using the OMS command), as text, tab-delimited text, PDF, XLS, HTML, XML, SPSS dataset or a variety of graphic image formats (JPEG, PNG, BMP and EMF).

SPSS Statistics Server is a version of SPSS Statistics with a client/server architecture. It had some features not available in the desktop version, such as scoring functions. (Scoring functions are included in the desktop version from version 19.)

## 12.3 VERSION HISTORY

- SPSS 6 (1968), 7, 8, 9

- $SPSS^X$ (1983) (the X standing for version 10) was a major revision, $SPSS^X$ 2 and 3 followed, then the $^X$ was dropped and numbering of new versions continued SPSS 4,5,6

- SPSS 7, 8, .... 15: Version 7, at least on some computers, had an interactive user interface

- SPSS Statistics (2008) 16, 17.0: major revision, user interface rewritten in Java (solved the problem of having different versions on different platforms, now the Windows, Mac and Linux versions are published at the same time. SPSS also added "Statistics" to the name of the product formerly simply called SPSS.

- PASW Statistics (2009) 17.02 and version 18:: name change to Predictive Analytics Software Statistics [note that on the SPSS Website PASW and SPSS Statistics are used interchangeably]

- IBM SPSS Statistics (2010): After SPSS Inc has been acquired by IBM, the new official name is IBM SPSS Statistics
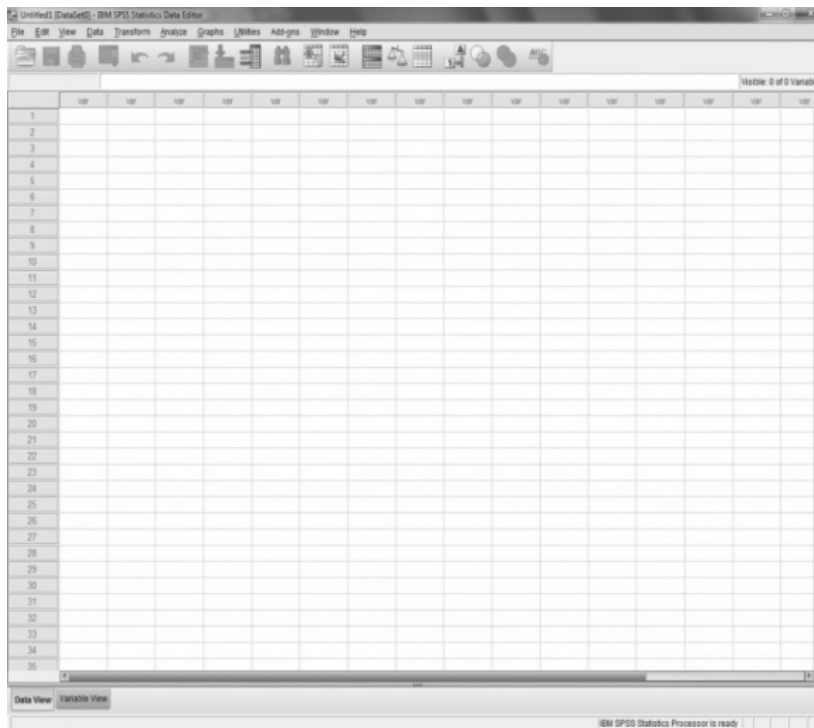
## 12.4 OPENING SPSS

We can open SPSS in one of two ways.

1. If there is an SPSS shortcut icon on the desktop, simply put the cursor on it and double click the left mouse button.

2. Click on the start button, then All Programs. Select SPSS for Windows.

**File:** includes all of the options we typically use in other programs, such as open, save, exit.

Utilities: allows you to list file information which is a list of all variables, there labels, values, locations in the data file, and type.

**Edit:** includes the typical cut, copy, and paste commands, and allows to specify various options for displaying data and output.

**View:** allows you to select which toolbars you want to show, select font size, add or remove the gridlines that separate each piece of data, and to select whether or not to display your raw data or the data labels.

**Data:** allows you to select several options ranging from displaying data that is sorted by a specific variable to selecting certain cases for subsequent analyses.

**Transform:** includes several options to change current variables.

**Analyze:** includes all of the commands to carry out statistical analyses and to calculate descriptive statistics.

**Graphs:** includes the commands to create various types of graphs including box plots, histograms, line graphs, and bar charts.

**Add-ons:** are programs that can be added to the base SPSS package.

**Window:** can be used to select which window you want to view (i.e., Data Editor, Output Viewer, or Syntax).

| **Help:** has many useful options including a link to the SPSS homepage, a statistics coach, and a syntax guide.

## 12.5 LAYOUT OF SPSS

The Data Editor window has two views that can be selected from the lower left hand side of the screen. Data View is where you see the data you are using. Variable View is where you can specify the format of your data when you are creating a file or where you can check the format of a pre-existing file. The data in the Data Editor is saved in a file with the extension .sav. The other most commonly used SPSS window is the SPSS Viewer window which displays the output from any analyses that have been run and any error messages. Information from the Output Viewer is saved in a file with the extension .spo.

One of the primary ways of looking at data file is in Data View, so that you can see each row as a source of data and each column as a variable (e.g., characteristic or property of each data source).

We click on the Data View tab so that we can enter and edit the data points themselves. Typically, we enter the data (and certainly edit the data) after establishing the names and other properties of the variables in a data set explained below under Variable View.
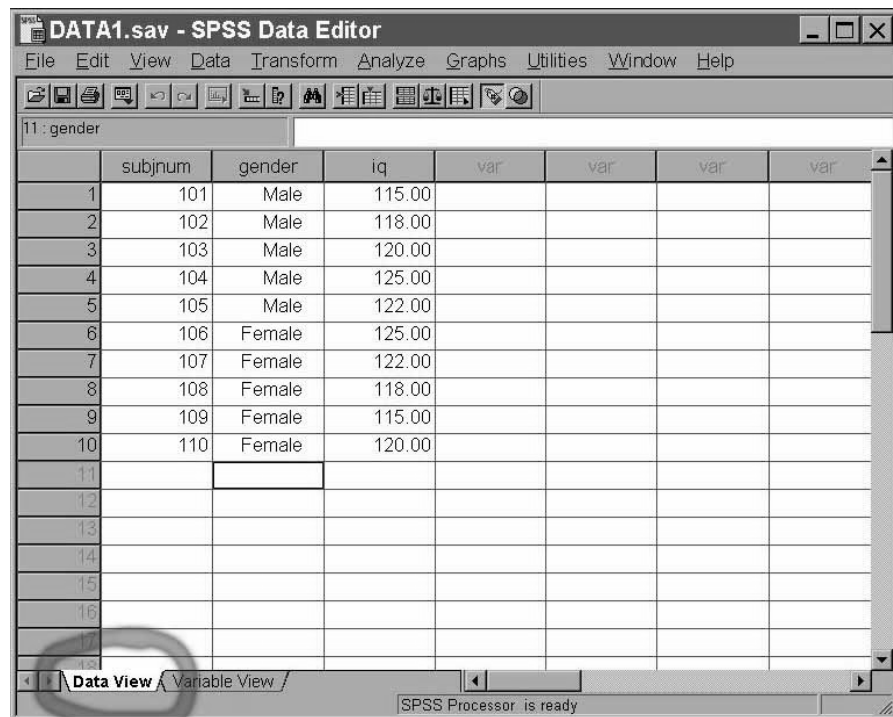


SPSS Data in Variable View

We click on the Variable View tab to define or change the names and other properties of each variable in the data set:

In this view, each variable is represented as a row, and various properties of the variable are represented as columns, allowing us to change the properties of existing variables or establish properties for new variables.

The variable properties and their functions are:

- Name -- the unique variable name

- Type -- the kind of data to be recorded (e.g., strings of characters, numeric values, or special numbers like dates)

- Width -- the number of characters used to display the data

- Decimals -- the number of decimal places displayed

- Label -- a text entry to describe the data provided by the variable, which can be much longer than the variable name and may include spaces. With questionnaires, for example, the label is usually the text of the question.

- Values -- if specific numeric values have a non-intuitive meaning, these values can be labeled (e.g., 1 = male and 2 = female)

- Columns -- determines how wide the variable column should be in Data View mode

- Align -- determines whether the data should be left-justified, right-justified, or centered

- Measure -- describes the level of measurement (e.g., nominal, ordinal, or scale)

**Navigating SPSS Output**

The SPSS output window is split into two frames. There is a navigation frame on the left and the output itself in a frame on the right.
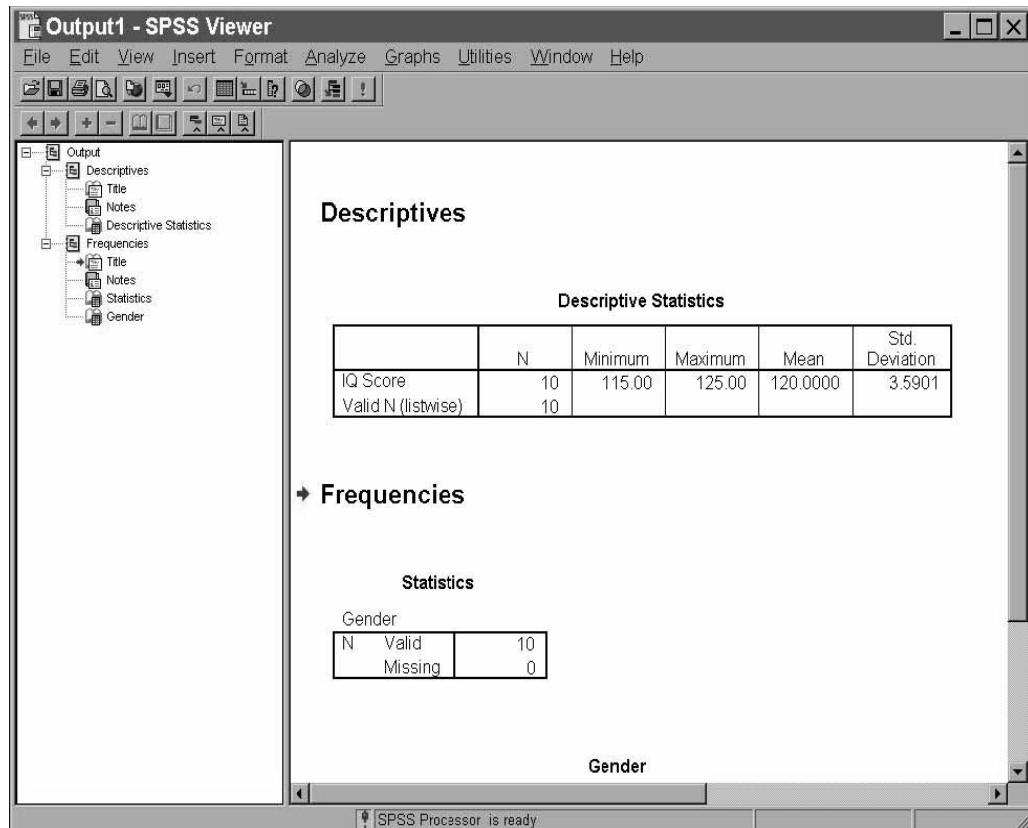
**12.6 EXITING SPSS**

To close SPSS, we can either left click on the close button located on the upper right hand corner of the screen or select Exit from the File menu.

**12.7 SYSTAT**

**SYSTAT** is a statistics and statistical graphics software package, developed by Leland Wilkinson in the late 1970s, who was at the time an assistant professor of psychology at the University of Illinois at Chicago. SYSTAT was incorporated in 1983 and grew to over 50 employees.

In 1995 SYSTAT was sold to SPSS Inc., who marketed the product to a scientific audience under the SPSS Science division. By 2002, SPSS had changed its focus to business analytics and decided to sell SYSTAT to Cranes Software in Bangalore, India. Cranes formed Systat Software, Inc. to market and distribute SYSTAT in the US, and a number of other divisions for global distribution. The headquarters are in Chicago, Illinois.

By 2005, SYSTAT was in its eleventh version having a revamped codebase completely changed from Fortran into C++. Version 13 came out in 2009, with improvements in the user interface and several new features.

**System requirements**

• Windows 32 bit (Vista, XP, 2000)            • Pentium-level 32 bit processor

• 128 MB RAM (512 recommended)            • 220 MB free disk space (inclusive of manual

                                                   PDFs, 85 MB)

• CD-ROM drive                              • Internet Explorer 6

• SVGA adapter and monitor

## 12.8 STARTING SYSTAT

To start SYSTAT for Windows NT4, 98, 2000, ME and XP:
Choose: Start →All Programs→SYSTAT 12
**Creating Data/Importing/Saving Data**
 To create data, click File->New->Data, and enter the dataset. You can also import data by using File->Open->Data. The supported file formats for import include Excel, SPSS, SAS, MINITAB, and JMP. Once inputted, data can be saved in the SYSTAT file format.

**The SYSTAT user interface**

The organization of the user interface is somewhat complicated. The command window is a .syc file that appears at the bottom of the screen. SYSTAT outputs the results of commands in a .syo file,
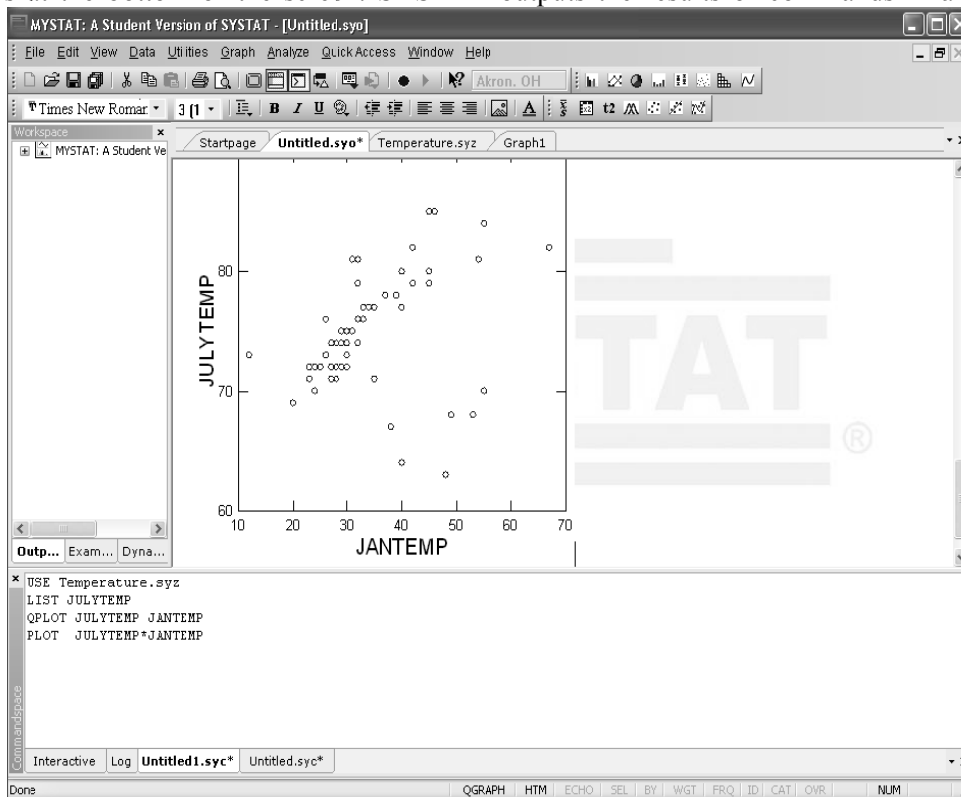


which is accessible by clicking on a tab toward the top of the screen. Any graphics are also outputted to a separate tab. SYSTAT stores the results of user commands in the Workspace window on the left of the screen.
The user has two options for analysis with SYSTAT: using the GUI, or using the command line.
To run a command, right click in the .syc file. You then can choose to run the current line or to run the commands from the current line to the end. To specify a specific data set to use, type "USE FileName.extension".
Here's an example of running commands on the SYTAT user interface.

**The SYSTAT user interface**
The user interface of SYSTAT is organized into three spaces:
I. Viewspace

II. Workspace

III. Commandspace


**Viewspace has the following tabs**

**Output Editor:** Graphs and statistical results appear in the Output Editor. You can edit, print and save the output displayed in the Output Editor.

Data Editor: The Data Editor displays the data in a row-by-column format. Each row is acase and each column is a variable. You can enter, edit, view, and save data in the DataEditor.

Graph Editor: You can edit and save graphs in the Graph Editor.

Startpage: Startpage window appears in Viewspace as you open SYSTAT. It has five sub-windows.

i.Recent Files                                                        iv. Manuals

ii. Tips                                                               v. Scratchpad

iii. Themes

**Workspace has the following tabs**

Output Organizer: The Output Organizer tab helps primarily to navigate through the results of your statistical analysis. You can quickly navigate to specific portions of output without having to use the Output Editor scrollbars.

Dynamic Explorer: The Dynamic Explorer can be used to rotate 3-D graphs, apply power transformations to values on one or more axes, and change the confidence intervals, ellipses, and kernels in scatter plots.

**Command space has the following tabs**

Interactive: In the Interactive tab, you can enter commands at the command prompt (>) and issue them by pressing the Enter key.

Untitled: The Untitled tab enables you to run the commands in the batch mode. You can open, edit, submit and save SYSTAT command file (.syc or .cmd)

Log: In the Log tab, you can view the record of the commands issued during the SYSTAT session (through Dialog or in the Interactive mode).

**SYSTAT Data, Command and Output files**

**Data files:**

You can save data files with (.SYZ) extension.

**Command files:**

A command file is a text file that contains SYSTAT commands. Saving your analyses in a command file allows you to repeat them at a later date. These files are saved with (.SYC) extension.

**Output files:**

SYSTAT displays statistical and graphical output in the output Editor. You can save the output in (.SYO), Rich Text format (.RTF) and HyperText Markup Language format (*.HTM).

**The Data Editor**

The Data Editor is used for entering, editing, and saving data. Entering data is a straightforward process. Editing data includes changing variable names or attributes, adding and deleting cases or variables, moving variables or cases, and correcting data errors.

SYSTAT imports and exports data in all popular formats, including Excel, ASCII Text, Lotus, BMDP Data, SPSS, SAS, StatView, Stata, Statistica, JMP, Minitab and S-Plus as well as from any ODBC compliant application.

## 12.9 USING GUI IN SYSTAT

Basic statistics can be found under the Analyze tab. To analyze column variables, click Analyze->Basic Statistics. To analyze row variables, click Analyze->Row Statistics. You can also use the Analyze bar to get contingency tables, scatter plot matrices and correlation matrices, and stem-and-leaf plots. To get basic graphs, use the Graph tab. Options include histograms
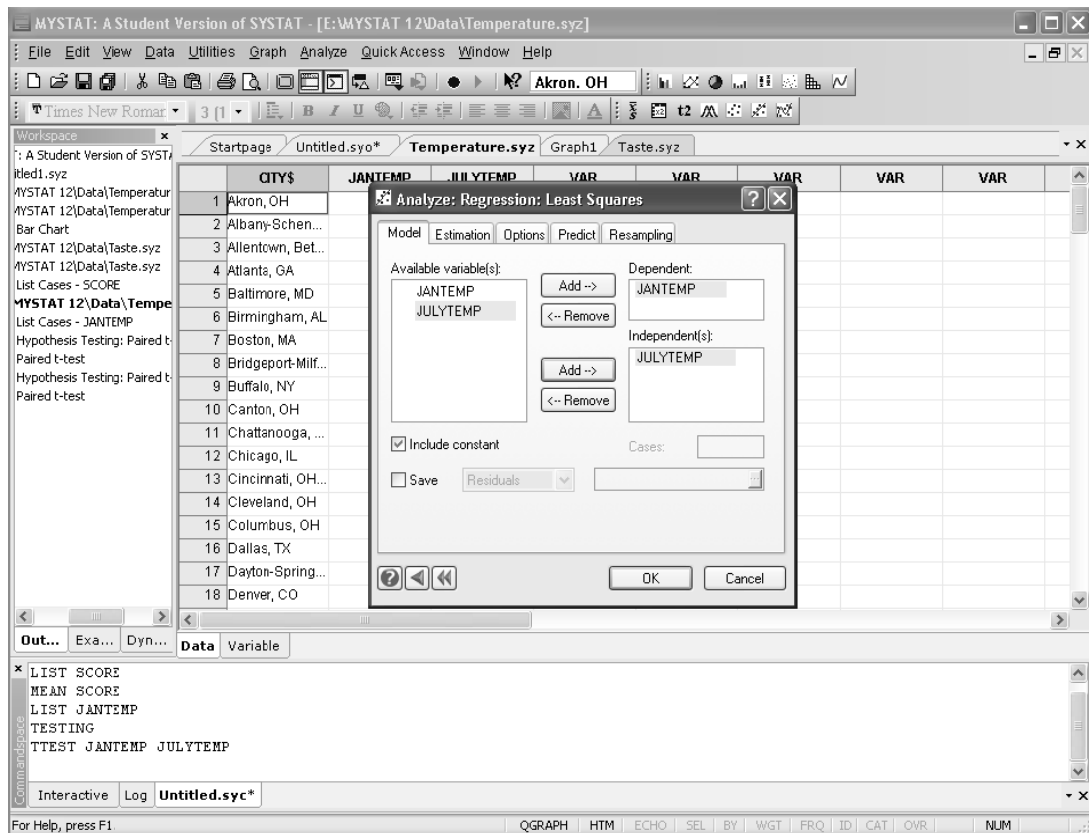


We can also do a regression analysis using the GUI. Click Analyze->Regression and choose what type of regression you want to do. Options include least squares and logit regression. SYSTAT will output summary information, including residual plots. Some of the regression output will show up on in the Workspace window toward the left of the screen. Other options include bootstrapping and normality tests.

**Using the GUI for Least Squares regression**

We can also do ANOVA using the GUI. Click Analyze->Analysis of Variance.

**Basic command lines in SYSTAT**

| Construct a qqplot | **QPLOT varname** |
|---|---|
| Plot Y*X | **PLOT VarY*VarX** |
| Sort by a variable | **SORT varname** |
| Normality test | **CSTATISTICS varname/ ADTEST SWTEST** |
| Ttest | **TESTING**<br>**TTEST var1 var2** |
| Bootstrap from a dataset | **USE Filename.extension**<br>**SAMPLE BOOT(nsamples,sample_size)/MEAN MEDIAN**<br>**CSTATISTICS variable1 variable2** |
| Summary statistics | **CSTATISTICS varname** |

**Features of SYSTAT**

- **Unmatched Graphics Made Easier to Use**

SYSTAT provides a large variety of scientific and technical graphing types, which helps to produce the right type of graph for every need. Its Interactive Graphics Dialog can be used to change multiple aspects of your graphics using a single integrated dialog. We can compare subgroups, overlay charts, transform coordinates, add geographic projections, change colors, symbols, and more, to create insightful presentations. You can change graph locations, point- and- click to alter axis labels, scales, colors and symbols.

- **Powerful New Data Manipulation Features**

SYSTAT provides innumerable data manipulation features to get data in the right form for the intended analysis. With a simple menu - dialog we can transform, sort, trim, center, standardize, select, rank, label, group, reshape, or weight your data.Tha data file's value can be enhanced with additional information such as study details, variable information, variable labels, value labels, processing conditions, etc. We can save effort using undo and redo in the Data Editor up to 32 steps in the same session. We can increase data accuracy with widened data field of (23, 15). We can name your variables, including string variables, using up to 256 characters. We can obtain basic variable statistics and histogram from the Variable Properties dialog.

- **Analyze Larger Data Sets with Greater Speed**

When we use SYSTAT, we are allowed to work on very large amount of data. The software does very fast processing of that data in very small amount of time. This saves user time.

- **Less efforts and more results**

SYSTAT software saves efforts of user in terms of defining the data and kind of processing to be done. There are many options for statistical processing.

<div align="center">

**SUMMARY OF THE LESSON**

</div>

You learnt the following in this lesson:

- SPSS, (the Statistical Package for the Social Sciences) has been developed by three students at the University of Stanford ( Norman H. Nie, C. Hadlai (Tex) Hull and Dale H. Bent).

- SPSS base software includes Descriptive statistics, bivariate statistics, Prediction for numerical outcomes and Prediction for identifying groups.

- SPSS Statistics can read and write data from ASCII text files (including hierarchical files), other statistics packages, spreadsheets and databases.

- SPSS Statistics can read and write to external relational database tables via ODBC and SQL.

- The data in the Data Editor is saved in a file with the extension .sav.

- SPSS supports many statistical features for data processing.

- SYSTAT is computer software used for statistical processing of data.

- SYSTAT base software includes features for data processing, power analysis, creating many types of charts and graphs etc.

- This software component was basically designed for statistical processing, but now a days it is extended to be used in multiple application areas.

- User interface of SYSTAT is defined in 3 spaces:

  a. View space

  b. Work space

  c. Command space

- SYSTAT data file is a file which contains data. This file can be created, edited and saved for future reference. The extension of data file in SYSTAT is .syz.

- The very important feature of SYSTAT is that it includes very high graphics capabilities which allows a user to analyze and process data in any format.

## SELF ASSESSMENT QUESTIONS AND EXERCISES

1. What are the statistics included in SPSS base software?

2. What are the views available in Graphical User Interface (GUI) of SPSS?

3. Explain different ways to open SPSS.

4. Differentiate between Data View and Variable view.

5. What is the functionality of variable view?

6. Describe the history of SPSS.

7. What do you mean by SYSTAT software?

8. Explain the version history of SYSTAT.

9. What are the software requirements of using SYSTAT?

10. How the user interface is designed in SYSTAT?

11. What are data files? Explain the role of data files in SYSTAT.

12. Describe the main features of SYSTAT that makes it different from other statistical softwares.