BACHELOR OF COMPUTER APPLICATIONS

PC Software

BCA-2

MADHYA PRADESH BHOJ (OPEN) UNIVERSITY, BHOPAL

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Message from the Vice Chancellor

To meet the ever growing needs of our knowledge society and global economy, The M.P. Bhoj (Open) University is running about 50 courses in diverse academic and professional fields.The University is equipped to provide teaching and training to the students of open and distance learning (ODL) through print media, on-line, print and on-line, and audio-video-radio. The University is making sincere efforts with the support from IGNOU and ISRO to provide education to ODL students through satellite and teleconferencing using the disc antenna for remote, rural and tribal population. The university is in the process of creating a placement cell to assist the students for employment.

Our distance education system aims to reduce inequalities and respond to social, cultural and economic contexts of the needs of learners and encourage an academic vibrancy in the educational syste[illegible]em can also overcome the limitations of age, geographical area and provide a system flexible enough to be accessed at the convenience and requirement of the learner. It also makes a suitable provision for gifted and fast learners as well as for slow learn[illegible]rs at assorted levels like rural learners, learners of disadvantaged societies, gifted learne[illegible]s from rural and urban schools and female learners/women. Thus, higher education is re[illegible]ching to un[illegible]eached through this open University in the state.

In our mission,w[illegible] have received valuable support and guidance received from H.E. the Governor and Chancellor, Honourable Chief Minister and Honourable Education Minister. I am also thankful to the Distance Education Council and its Chairman and other officials for generous financial grant. The support from the officials of the Higher Education and Finance Departments of M.P. and Chhattisgarh is highly appreciated.

Also, a word of appreciation for all my colleagues and experts at state and national level institutions, who provide their expertise in the preparation of the study materials, impart teaching during contacts classes and conducting evaluation.

I extend hearty welcome to the students, joining us, and offer my best wishes for success in their career and efforts to usher the knowledge society and meet the challenges, posed by global economy.

PROF. R. K. SINGH
Vice-Chancellor

Preface

The Bachelor of Computer Applications program seeks to educate graduates to be productive and creative in modern business and industry environments. The curriculum ranges from theory through experimental techniques to engineering methodology. The program exposes students to the subject areas that define the discipline as well as the interrelationships that exist among them: computer fundamentals, programming fundamentals, multimedia systems, digital electronics, visual basic, oracle, software engineering etc. The program focuses on the associated technical , managerial, and policy issues with building computer –based information systems so that students develop strong analytical and problem solving skills and implement solutions professionally. The students are made familiar with recent technological and theoretical developments general professional standards as also the strengths and limitations of the discipline itself.

An important aim of the course is to prepare students for life – long learning because, in a rapidly changing environment, they will need the ability to quickly learn new programming languages and approaches to software development.The program being developed in consultation with professionals from academia and the software industry,is designed to provide graduates with comprehensive and portable skills to seek employment in areas such as database administration, management and engineering; database application programming; systems analysis and design; information engineering; knowledge engineering; network design and administration; systems integration; management information systems and the like after due completion of the course.

It has been an earnest effort to produce a compact and yet comprehensive study material. This project, though humble, has been launched with the confidence to meet the needs of the students of this fast emerging discipline. Excellence, being the motto, a rigorous procedure has been adopted in the selection of authors, reviewers and production team. A project of this nature, however, iterates through continuous improvement cycle. We shall highly appreciate any suggestion or advice to carry out the necessary improvement.

DR. R.P. MISHRA
Director
Regional Services and Student Support

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INTRODUCTION

The life of a manager has become very challenging and busy these days. Gone are the days when you would find a manager relaxing on his chair. A manager of today has to be very active and attentive through out the day. He has to be on his toes in order to meet the challenges and competition of the world around. Every day the manager is required to take many quick actions and decisions based on which his overall performance is assessed. During the earlier days when computer was not available, all the data like accounts receivables, accounts payables, inventory, payroll, personnel and the billing of customers were maintained by book keepers and clerks. Record-keeping systems were very much prone to human errors. They were very bulky and took larger amounts of time in maintaining them. Therefore, this led to delay in making decisions. Now, with the advent of computers, life of a manager has become a bit more easy. The computer can achieve the same task in a matter of few minutes. It provides all the data with great accuracy and speed. These days the computer has taken over the old labour intensive methods of data keeping. Instead of going through the voluminous data a manager can concentrate only on the data that is required by him. This is possible through the process of creating reports. Reports save the precious time of a manager. Now, he is not required to look at a hundred page report when his requirement can be solved through a ten page report if prepared judiciously by the use of computers.

Computers play a major role in a manager's life specially in development and implementation of management information systems. The computerised information systems have become a necessity for modern managers. Before discussing the importance of personal computers (PCs) for managers, let us first understand the meaning of some important terms.

IMPORTANT TERMINOLOGY

In order to understand the role of PC for managers, you must be aware of the following basic terminology:

Personal Computer

Today, computers have become an essential part of everybody's life. Computers are being used in almost every field and everyday new areas of activities are being discovered. There is hardly any area in our society, where computers are not being used. In a layman's language, a computer is a fast calculating device that can perform arithmetical operations. Although, the computer was originally invented mainly for doing high speed and accurate calculations, it is not just a calculating device. The computer can perform any kind of work involving arithmetic and logical operations on data. It gets the data through an input device, processes it as per the instructions given and gives the information as an output. In simple words, a computer can be defined as–a fast electronic device that processes the input data according to the instructions given by the programmer/ user and provides the desired information as an output. According to the size and memory, there are four main types of computers– Supercomputer, Mainframe computer, Minicomputer and Microcomputer. Microcomputer is the smallest among all these computers and is most popularly known as *Personal Computer* or simply PC.

Management

Conceptually, management comprises processes or activities viz. planning, organising, controlling, directing and initiating operations of an organisation for its smooth functioning and attainment of it's pre-determined goals through optimal utilization of its resources viz. men, money, materials and machines. Decision making is a fundamental prerequisite to initiate

management processes necessary for planning, organising and controlling the functions of the business.

Manager

Manager is a crucial individual in a management system of an organisation who is responsible for its management. In this age of information technology and systems, the basic requirements to be a manager are:

- To be skilled in a functional speciality such as engineering, marketing, sales, information technology, legal or human resource;
- To be adept in traditional functions of planning, organising, controlling and initiating;
- To be able to participate in design and utilization of computerised information systems.

System

A system is a set of interrelated elements that collectively work together to achieve some goal. For instance, accounting is a system with elements viz. journals, ledgers, people etc. and its basic goal is maintaining of account books along with preparation of financial and MIS statements. Computer is also a system with elements CPU (Central Processing Unit), the input device, the output device and users; and its basic goal is to process the data and provide information. There are hundreds of definitions of the word 'System', but we define here it as follows:

A system is a set of interrelated elements that form an activity or a processing procedure in order to achieve a common goal or goals by operating on data to yield information.

Subsystem

Most systems are part of a larger system. For instance, Financial Accounting System, Marketing System and HRD (Human Resource Development) System are parts of a larger system, called MIS (Management Information System) and are called subsystems. A system can be made up of many subsystems. A subsystem is defined as follows:

A subsystem is a part of a system that carries one part of the system function.

The information systems (such as MIS) are designed on the basis of synergy of subsystems (such as Production, Inventory, Sales and Marketing systems) in order to achieve a net unified cohesive system.

Data and Information

Data and information are the two basic components of any information system. Data is defined as a set of basic facts and entities which itself has no meaning or value. For example, 5000, 6000, 4500, 8000, 9500.... is a data of employees salaries which itself has no meaning. On the other hand, information is defined as that data which has some meaning or value. For example, the personal data of employees' names and their basic salaries represented as "Komal Sachdeva - 5000", "Rajesh Pathak - 6000", "Sarika Arora - 4500", "Preeti Nigam - 8000", "Pawan Gupta - 9500", etc. is an information because it has some meaning.

Data is considered the raw material of an information system. An information system transforms data into meaningful management information. Business processes, which are the essence of the business, are always associated with a huge amount of data. The objective

of an information system is to provide the required information to the organisation, so that the business processes can be managed effectively. The database is the main source of information. It is essential for an organisation to develop an effective database system.

Information System

All organizations need systems for processing of their routine transactions. An information system is a system that provides information to management and other people in an organisation. As computers are becoming part of every activity in most of the organisations, many information systems now use computer systems for manipulating information.

System Analysis

System analysis is the application of the systems approach to develop Computer-based Information Systems (CBIS) or a Computer-based MIS (Management Information System).

INFORMATION SYSTEM AS A SYSTEM

An information system is a subsystem of the business. It receives input data and instructions, processes them and gives the output. It is a system that interacts human and computer to support the operational and managerial decision making information needs of an organisation.

An information system may be defined as a set of tools, procedures and technology that generate information and communicate it to the user.

There are three major classes of information system:

(a) *Formal Information Systems*: These systems are designed to achieve company goals. They are based on the management and information levels in an organisation. Decision Support System (DSS), Management Information System (MIS) and Data Processing System (DPS) are the typical formal information systems for use of upper, middle and lower level management respectively.

(b) *Informal Information Systems*: These systems are designed to provide information to the employees of an organisation for solving their work-related problems.

(c) *Computer-based Information Systems (CBIS)*: Computer is the central element of most of the present day formal and informal information systems. So, almost all DSS, MIS and DPS applications are computer-based. Systems analysis and design involves the analysis, design and implementation of CBIS.

MANAGEMENT INFORMATION SYSTEM

Having insight into the management, information and system as segregated units we are capable of understanding the concept of MIS and shall provide a formal definition of MIS as follows:

Management information system is a refined orientation of available sources of information which enables managers to tie planning and control procedures to operational systems of implementation.

This system of information raises the management perceptions from the level of piecemeal spotty decision making and intuitive guesswork to the level of a professional approach of decision making and planning accoutred with deep insight into the complexity of system processes.

Components of MIS

We identify the components of MIS by describing the system as a processor. Any system is a processor. We would define the system process by identification of our inputs and transformation of our inputs to outputs. The typical example of a system as a processor, is data processing system. Here the raw data is processed. The processes include classification, sorting, calculating and summarising of data. These processes lead to generation of useful information. A computerised MIS processes information. In this case, the processes consist of computation and skilful stylisation of management reports. These processes yield paramount decisions for all levels of management for operational, tactical and strategic control as well as planning. The functional relationship between input and output of a process is used to design and evaluate feedback systems. (Ref. Figure 1.1(a), 1.1(b)).

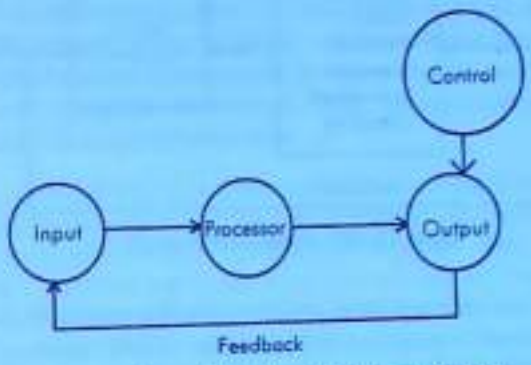
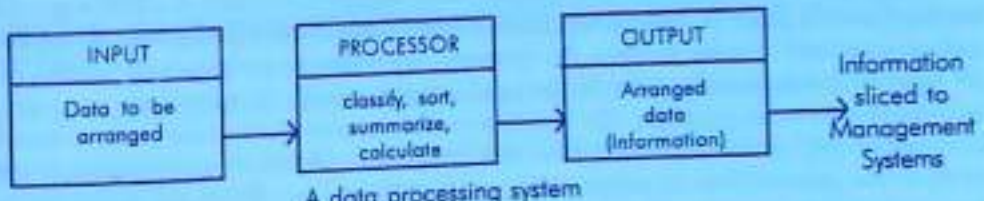


Figure 1.1(a): A model of Information System



A data processing system

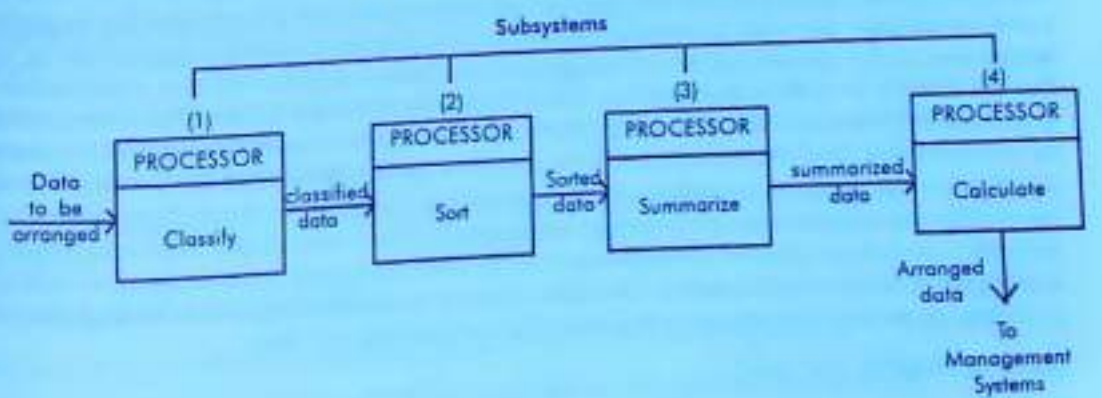


Figure 1.1(b): Subsystems of a data Processing System

MIS as a communication process.

MIS is a communication process which enables flow of information to be recorded, stored and retrieved for decisions on planning, operating and controlling. The flow of information is the input. The processed information that assist in decision making is the output (Ref. Figure 1.2)

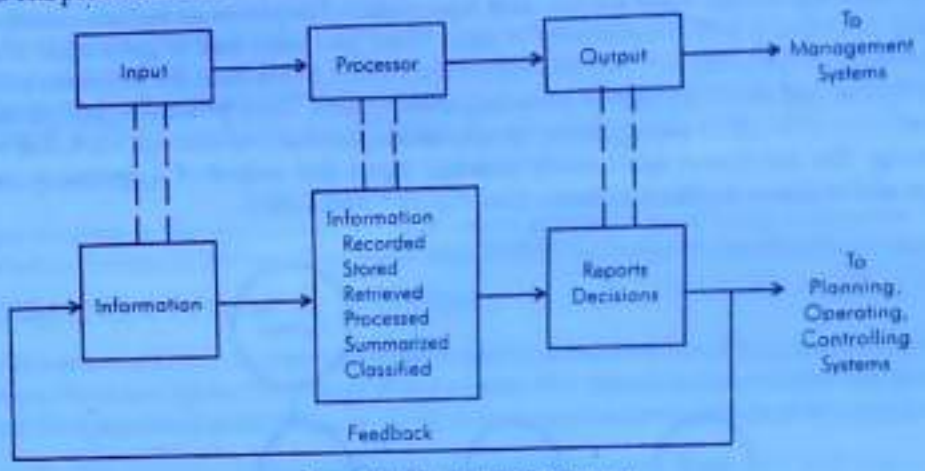


Figure 1.2: MIS - Communication process

While describing MIS as a communication process, it is imperative to dwell upon three key elements of MIS namely timeliness, accuracy and volume of information. The other factor that needs attention is the distinction in the identity of data and information at different levels of management. Delayed information is generally less appropriate for a management decision. It may be contrived or obsolete. The significance of degree of accuracy in a MIS is governed by the purpose of a piece of information. Most management decisions may require approximate and summarized data for analysis. For example, top management generally prefers rounded off figures in mega-units (like Rs. in lacs/crores, quantity in metric ton, etc.) to peruse information for strategic plans. The substance of information in the most summarized form is much more appropriate for a MIS rather than the bulk of not too necessary detailed data. If we analyze the general flow of information amongst the various levels and functional area of management, we observe an interesting symbiosis between data and information. For example, a sundry debtors' list with outstanding details is definitely an important information for an accountant or the operational level management of a finance department in an organisation. For the middle or tactical management this information is merely a data. This data may be processed to generate a report on ageing debt analysis or receivables above a specific amount or recoverable/ non-recoverable dues, etc. to serve as an information for a middle level management of a finance department in an organisation. It is pertinent to note that information for middle management is a data for top management of an organization. Top management may need an information on divisionwise data in working capital in outstanding as well as a synopsis of current fixed assets to formulate strategy for business expansion, diversification or laying up policies for streamlining operations of business processes.

IMPORTANCE OF MIS

The major purpose of MIS is to make decisions at all levels of operations based on flow of information. The objectives of MIS are twofold. The operations of an enterprise are needed to be automated through MIS design. Most structured problems in the operations are programmable. The structured problems can be solved by automated solutions because of the

repetitive and procedure oriented tendencies in their solutions. Typical examples of such structured problems in any enterprise are payment or accounts receivables, purchase orders, credit cheques, payrolls, cost production schedules and all other problems where decisions that are governed by certain regulations. The automation incorporated in such problems lead to decisions which are known as programmed decisions. Such decisions are characterized by the relevant data and a few decision rules or algorithms. These algorithms generally aim at optimal solutions to similar types of problems. The advantage of these algorithms is that they provide specific solutions to the problems. The automation can be incorporated in the structured problems with the aid of programming techniques and computers. Thus, manager is benefited by the exact and optimal solutions for routine structured problems in lesser time. He can save his energy and time for strategic decision making in solving un-structured problems which are difficult to be automated. It is imperative to understand that all problems in any enterprise are not structured. These un-structured problems are strategy oriented and relatively complex. Typical un-structured problems are advertising budgets, new product launch, diversification plans, merger and acquisition considerations, recruiting, training, automation plans etc. These problems are characterized by non-programmed decisions because these lack support of optimal algorithm or decision rules. Information support for non-programmed decision is based on un-structured data.

The second important a[illegible] design is to devise techniques to handle such un-structured problems. This is established by incorporating the mix of internal and external data in MIS design to establish a communication channel of decision support. Aim of such decision support is to assist manager's intuition and guide him heuristically to choose from various estimates under various hypothetical constraints. Decision support systems are higher level MIS designs appropriate for tactical and strategic decision making. These are characterized by natural language support, knowledge based systems, artificial intelligence and what-if analysis.

Role, characteristics and goal of an efficient MIS in an organisation can be summarized in the following statements:

- Information primarily geared to assist managerial decisional process and control
- Information communication based on relevancy with respect to diverse needs of management at different levels
- Timeliness of information (delayed information may be contrived or obsolete and therefore useless for decision making process)
- Information flow based on system approach linking diverse activities of diverse departments within an organisation to exchange information. This approach obliterates data redundancy and inculcates efficient and cost effective usage of data storage
- Flexibility in information system to incorporate future requirements of management on need basis.

NEED FOR COMPUTERISED MIS

The need for computerised MIS assumes significance due to the following factors:

- In the absence of a computerised MIS, an organisation fails to meet its commitments persistently because of inappropriate and delayed information that results in inappropriate decisions.
- Manual information systems are difficult to be maintained and result in tedious paper

work, non productive overtime costs in respect of clerical staff, backlogs and disjointedness in information flows.

- Manual information deter the organisation to accoutre itself for the current/future competition, diversification and/or expansion strategic plans because the management is engrossed in finding solutions to ever increasing operational problems.
- Major advantage of MIS in an organisation is improvement in management process with decisions based on facts rather than subjective approach or bureaucratic procedures. Benefits of MIS may not be quantified in terms of monetary gains but be explored radically An efficient MIS obliterates the over dependency or indispensability of expertise of any particular executive in an organisation. The unfair emphasis on procedures resulting in delayed and not always appropriate decisiens is overridden by ready and mostly appropriate decisions. MIS supplants management by activity with management by results. The result orientation of management process results in swift accomplishment of management goals. Major impact of an efficient MIS is being felt on traditional pyramidical structure of an organisation. This structure is flattening into a two tier system of analytical and operational levels.

ROLE OF COMPUTERS IN MIS

Conceptually, computer is not a part of a management information system. However, it is considered as a central element of MIS due to its major role in assisting the managers in designing, development and implementation of management information systems. Computers have become an essential part of organizational data processing. They are used as a management tool in operations research and decision making process. In operations research, certain scientific techniques like critical path analysis and linear programming are used for decision making process. Critical Path Method (CPM) is a management technique for analysis and determination of critical steps required for project completion. Linear programming is the mathematical technique used to obtain an optimum solution in resource allocation problems in designing an MIS.

MIS has become a generic term of information systems for management. It is most intriguing to peep through the stages of emergence in information systems and highlighting some of the emerging trends.The phenomenon of MIS recognition as a generic term began in 1970s when the MIS supplanted the data processing systems. The stage of data processing systems was set in 1960s with the advent of computers. The revolutionary upsurge in computing and communication technologies in 1980s led to further development and upgradation of MIS The most significant development marking the computer based information system is the evolution of Decision Support Systems (DSS). The highlights of DSS may be realized by distinguishing it from the traditional view of MIS. Decision support systems ought to be necessarily and entirely computer based whereas, as discussed earlier, the MIS need not necessarily be so. The decision support system provides an interactive environment and seeks the help of computer for each specific area involving decision making at any point of time. This is due to the fact that the decision support systems aim at instantaneous on-line and interactive information within an organisation. The traditional MIS aims at a management reporting system based on deriving information from the available data from various sources and subsystems. In our opinion it is logical to extend the traditional view of MIS to encapsulate all the information systems assisting the management process within the purview of MIS Modern view of MIS should encompass transaction processing systems, management reporting systems, decision support systems, office systems, knowledge based systems, expert systems, artificial intelligence based systems and communication systems.

Other trend in the computer based information systems is development of techniques in the field of system analysis and design. The object oriented systems are continuing to gain

importance primarily due to the popularity of graphical user interfaces and windows in the computer applications. Window based computer applications enable the sharing of resources from the multiple application sources thus simulating a multitasking environment conducive to sharing and exchange of information. Graphical user interfaces in a computer application makes it user friendly as the user does not have to type in details to access information. The user may just click the graphical icon on the computer screen to retrieve the desired information. The object oriented systems aim at usage of reusable codes to develop the application of similar types. As the technology is evolving, the business processes are improving, the competitiveness in the business world is becoming intense, the need for incorporating the principles of total quality management and business process re-engineering in the information systems is gaining momentum. The focus of the business is shifting to the customers' needs and perspectives.

We can conclude that the immediate benefit of computers in MIS is that critical decisions can be made in advance before any possible crisis that might happen in organisation due to delayed decisions.

SUMMARY

Computers play a major role in a manager's life specially in development and implementation of management information systems. Management information system (MIS) is a refined organisation of available sources of information which enables managers to fix planning and control procedures to operational systems of implementation. The major purpose of MIS is to make decisions at all levels of operations based on flow of information. Major advantage of MIS in an organisation is improvement in management process with decisions based on facts rather than subjective approach or bureaucratic procedures. A Personal Computer (PC) is considered as a central element of MIS due to its major role in assisting the managers in designing, development and implementation of management information systems. MIS has become a generic term of information systems for management. The immediate benefit of computers to managers is that critical decisions can be made in advance before any possible crisis that might happen in organisation due to delayed decisions.

REVIEW QUESTIONS

1. Fill in the blanks:

   (a) Computers play a major role in a manager's life specially in development and implementation of _____.

   (b) The major purpose of MIS is to make _____ at all levels of operations based on flow of _____.

   (c) _____ is a management technique for analysis and determination of critical steps required for project completion.

   (d) The most significant development marking the computer based information system is the evolution _____.

   (e) An information system is a _____ of business.

2. State True or False:

   (a) Manager is a crucial individual in a management system of an organisation.

   (b) A computerised MIS processes information.

   (c) Decision Support Systems need not to be computer-based.

   (d) The functional relationship between input and output of a process is used to evaluate feedback systems.

   (e) Most management decisions does not require summarized data for analysis.

3. Define the following terms:

   (a) Management (b) System (c) Data (d) Information System (e) Systems Analysis

4. Define a MIS. Describe the basic components of MIS.

5. 'MIS is a communication process'. Discuss.

6. Describe the importance of MIS for organisations.

7. Why a computerised MIS is needed? How does it help managers in making decisions?

8. Describe the role of computers in MIS.

CHAPTER 2

Generations of Computers and Evolution of PC

LEARNING OBJECTIVES

- Introduction
- Zeroth Generation Computers
- First Generation Computers
- Second Generation Computers
- Third Generation Computers
- Fourth Generation Computers
- Fifth Generation Computers
- Evolution of PC

INTRODUCTION

The computer evolved as a result of man's search for a fast and accurate calculating device. **Abacus** was the first manual calculating device, which was invented in Asia many centuries ago. In 1617, John Napier, a Scottish mathematician invented a mechanical calculator called the '**Napier's bones**'. Thereafter, many kinds of computers have been designed and built during the evolution of the modern digital computer. In order to provide a framework for the growth of computer industry, the computer era has been referred in terms of generations. Computers are classified into following six types, based on their historical advancement and electronic components used.

ZEROTH GENERATION COMPUTERS

The zeroth generation of computers (1642-1946) was marked by the invention of mainly mechanical computers. *Pascaline* was the first mechanical device, invented by Blaise Pascal, a French mathematician in 1642. In 1822, Charles Babbage, an English mathematician, designed a machine called *Difference Engine* to compute tables of numbers for naval navigation. Later on, in the year 1834, Babbage attempted to build a digital computer, called *Analytical Engine*. The analytical engine had all the parts of modern computer, i.e. it had four components– the store (memory unit), the mill (computation unit), the punched card reader (input unit) and the punched/printed output (output unit). As all basic parts of modern computers were thought out by Charles Babbage, he is known as *Father of Computers*. In later years, Herman Hollerith invented a machine for doing counting for 1880 US census, which was called the *Tabulating Machine*. In 1944, Howard A. Eiken invented first American general purpose electro-mechanical computer, called *Mark I* and later on, its successor, *Mark II*. The Zeroth generation of computers or the era of mechanical computers ended in 1946 when vacuum tubes were invented.

FIRST GENERATION COMPUTERS

The first generation of computers (1946-1954) was marked by the use of vacuum tubes or valves for their basic electronic component. Although these computers were faster than earlier mechanical devices, they had many disadvantages. First of all, they were very large in size. They consumed too much power and generated too much heat, when used for even short duration of time. They were very unreliable and broke down frequently. They required regular maintenance and their components had also to be assembled manually. The first generation of computers became out-dated, when in 1954, the Philco Corporation developed transistors that can be used in place of vacuum tubes.

Examples:

- **ENIAC** (Electronic Numerical Integrator and Calculator) - 1946
  It was the first electronic computer using vacuum tubes.
- **EDSAC** (Electronic Delay Storage Automatic Calculator) - 1949
  It was the first stored-program computer
- **EDVAC** (Electronic Discrete Variable Automatic Computer) - 1951
  It was successor of EDSAC
- **IAS machine** (Princeton's Institute of Advanced Studies) - 1952
  It was a new version of the EDVAC, built by von Neumann.

The basic design of IAS machine is now known as *von Neumann machine*, which had five basic parts–the memory, the arithmetic logic unit, the program control unit, the input and the output unit.

SECOND GENERATION COMPUTERS

The second generation of computers (1954-64) was marked by the use of transistors in place of vacuum tubes. Transistors had a number of advantages over the vacuum tubes. As transistors were made from pieces of silicon, they were more compact than vacuum tubes. The second generation computers, therefore, were smaller in size and less heat generated than first generation computers. Although they were slightly faster and more reliable than earlier computers, they also had many disadvantages. They had limited storage capacity, consumed more power and were also relatively slow in performance. Like first generation computers, they also required regular maintenance and their components had also to be assembled manually. Manual assembly of components was very expensive and later many attempts were made to reduce such manual assembly. It was in 1964, when it was discovered that a number of transistors could be sealed up into a tiny package, called an *Integrated Circuit*(IC) or a *Chip*. Second generation computers became out-dated after the invention of ICs.

Examples:

- **PDP-1**, developed by DEC was the first minicomputer.
- **NCR 304** (National Cash Register) was first all-transistorized computer.

THIRD GENERATION COMPUTERS

The third generation of computers (1964-1980) was marked by the use of Integrated Circuits (ICs) in place of transistors. ICs were more compact than transistors, as hundreds of transistors could be put on a single small circuit. These computers removed many drawbacks of second generation computers. The third generation computers were even smaller in size which generated less heat and required very less power as compared to earlier two generations of computers. These computers required less human labour at the assembly stage. Although, third generation computers were faster and more reliable, they also had a few disadvantages. They still had less storage capacity, relatively slower performance and thus could not fulfil the requirements of the users and programmers. The third generation computers became out-dated around the year 1978 when it was found that thousands of ICs could be integrated onto a single chip, called LSI (Large Scale Integration).

Examples:

- **IBM 360**, developed by IBM in 1964 was the first product line designed as a family.
- **PDP-8**, developed by DEC in 1965 was the first mass-market minicomputer.
- **PDP-11**, developed by DEC in 1970 was the first highly successful minicomputer.
- **CRAY-1**, developed by Cray in 1974 was the first supercomputer.
- **VAX**, developed by DEC in 1978 was the first super minicomputer.

FOURTH GENERATION COMPUTERS

The fourth generation of computers (1978- till date) was marked by use of Large Scale Integrated (LSI) circuits in place of ICs. As thousands of ICs could be put onto a single circuit, so LSI

circuits are still more compact than ICs. In 1978, it was found that millions of components could be packed onto a single circuit known as Very Large Scale Integration (VLSI). VLSI is the latest technology of computer that led to the development of the popular Personal Computers (PCs), also called as Microcomputers. All present day computers belong to the fourth generation of computers. These computers are very powerful having a high memory and a fast processing speed. Today's PCs are even more powerful than mainframe computers. Although fourth generation computers offer too many advantages to users, the major drawback of these computers is that they have no intelligence on their own. Scientists are now trying to remove this drawback by making computers which would have artificial intelligence.

Examples:

- **IBM PC**, developed in 1981 was the first industry standard personal computer, having Intel 8088 memory chip.
- **IBM PC/AT**, developed in 1982 was the first advanced technology PC, having Intel 80286 memory chip.
- **386**, developed in 1985, had Intel 80386 memory chip.
- **CRAY-2**, developed in 1985, was the fourth generation supercomputer.
- **486**, developed in 1989, had Intel 80486 memory chip.
- **Pentium**, developed in 1995, has pentium (80586) memory chip.

FIFTH GENERATION COMPUTERS

The fifth generation computers (Tomorrow's computers) are still under research and development stage. These computers would have artificial intelligence. They will use ULSI (Ultra Large Scale Integration) chips in place of VLSI chips. One ULSI chip contains millions of components on a single IC. The most important feature of fifth generation computers is that they will use an intelligent software. This software will enable the user to tell computer 'What to do' and not 'How to do' by using intelligent programming and knowledge-based problem solving techniques. So, the programmers or users would not be required to give each and every instruction to the computer for solving a problem. These computers will also have user interface in form of speech in natural languages.

Example:

- Yet to develop but **ROBOTS** have few features of fifth generation computers.

EVOLUTION OF PC

IBM PC is the first personal computer, introduced in 1981 by the world's largest computer company–IBM (International Business Machines Corp., New York). This computer was based on Intel's 8088 microprocessor or chip. It became a success almost overnight. In later years, IBM manufactured 80286, 80386, 80486 and recently the Pentium PCs. Although, IBM is still the largest supplier of PCs, the majority of PCs are manufactured by other companies as per the standards set by IBM. This whole family of PCs is known as *IBM-compatible PCs*. So, whenever we talk about a PC, it usually means one of the IBM-compatible PCs. PS/2 and PS/1 (PS stands for Personal System) are IBM computer series introduced in 1987 and 1990 respectively.

Apple Macintosh PC (popularly called as Mac) is another series of 32-bit personal computers, introduced in 1984 by one of the first microcomputer manufacturing company– Apple (Apple Computer, Inc.). Apple is the largest independent manufacturer of non-IBM-compatible PCs. Apple Mac PC uses the Motorola (a leading manufacturer of semiconductor devices) 68000 processor family and a proprietory operating system. As this PC comes with its own operating system, there is no need of DOS (Disk Operating System) or other operating systems for operating it. The method of operating a Mac PC is known as Macintosh user interface. All Mac PCs have graphic displays, as their operating systems provide graphical user interface (GUI). The Mac PC always displays a row of menu titles at the top of the screen, from which options are selected.

Although the first Mac PC was praised by many users due to its ease of use and low-cost system, it was not exciting for most corporate buyers due to its slow speed, small screen and closed architecture (a system whose technical specifications are not made public). IBM-compatible PCs are used as stand-alone machines or as workstations/ file servers in a local area network. These PCs are very popular as stand-alone systems, which run under DOS. IBM-compatible PCs (80486 and above) are also popular as client/server systems. On the other hand, Apple Macintosh PCs are rarely used as the primary client computers in client/ server systems. Macintosh PCs are useful mainly for desktop publishing systems, due to graphical user interface. IBM-compatible PCs, on the other hand, are useful for any kind of business applications.

SUMMARY

The computer evolved as a result of man's search for a fast and accurate calculating device. Computers are classified into six types - Zeroth, First, Second, Third, Fourth and Fifth generation computers based on their basic electronic components used. The Zeroth generation computers were actually the mechanical computers.

The first generation computers used Vacuum tubes for their basic electronic component. The second generation computers used Transistors in place of Vacuum tubes. The third generation of computers was marshed by use of Integrated Circuits (IC) in place of transistors. All present day computers are fourth generation of computers. They use Very Large Scale Integrated Circuits in place of IC. The fifth generation computers would have artificial intelligence and are still under development. The most popular IBM-compatible PC and the least popular Apple Mac PC are two series of personal computers.

REVIEW QUESTIONS

1. Fill in the blanks:
   (a) Computer processes the input data and provides the _____ as an output.
   (b) _____ is the main component or "brain" of a computer.
   (c) _____ are the small high speed circuits which are used to store data, instructions and memory addresses.
   (d) The connection between two components to transmit signal between them is known as _____.
   (e) The hardware devices through which electronic signals are generated are commonly known as _____ Circuits.
2. State True or False:
   (a) The analytical engine had all the four parts of modern computer.
   (b) Apple Mac PCs are widely used as the primary client computer in client/ server systems.
   (c) Control unit manages and coordinates all other units of a PC.

(d) The information stored in EEPROM can be erased by ultra violet rays.

(e) The information stored in SRAM may be refreshed after every few seconds.

3. Match the following:

(a)	Zeroth Generation Computers	(i)	Vacuum Tubes
(b)	First Generation Computers	(ii)	ULSI
(c)	Second Generation Computers	(iii)	Mechanical Computers
(d)	Third Generation Computers	(iv)	VLSI
(e)	Fourth Generation Computers	(v)	Integrated Circuits
(f)	Fifth Generation Computers	(vi)	Transistors

4. Classify the following computers in different generations:

(i) IBM 360 (ii) NCR 304 (iii) PDP-1 (iv) CRAY-2

(v) PDP-11 (vi) DEC Micro VAX (vii) Pentium (viii) ENIAC

5. Name the following computers:

(i) First Supercomputer (ii) First Supermini Computer

(iii) First highly successful minicomputer (iv) First industry standard PC

6. Write the full form of following abbreviations:

(i) ENIAC (ii) EDSAC (iii) EDVAC (iv) IBM (v) IAS

(vi) CPU (vii) ALU

7. Write a short note on Zeroth Generation of Computers.

8. Why did the First Generation Computers fail? Did the Second Generation Computers become successful? Discuss with examples.

9. Write the differences between Third and Fourth generation of computers.

10. What are the Fifth Generation Computers? Do you think these computers would replace Fourth Generation Computers? Discuss.

11. Why are IBM Compatible PCs more popular than Apple Mac PCs? Discuss.

CHAPTER 3

Common PC Architecture and Types of PCs

LEARNING OBJECTIVES

- Computer PC Architecture
- Bits and Bytes
- Number Systems for Data Representation
- Types of Computers
- Types of PCs

COMMON PC ARCHITECTURE

The internal architectural design of a computer differs from one model to another. However, the basic components of a PC or any other computer remains the same. The diagram of a generalised architecture of a PC is shown in Figure 3.1.

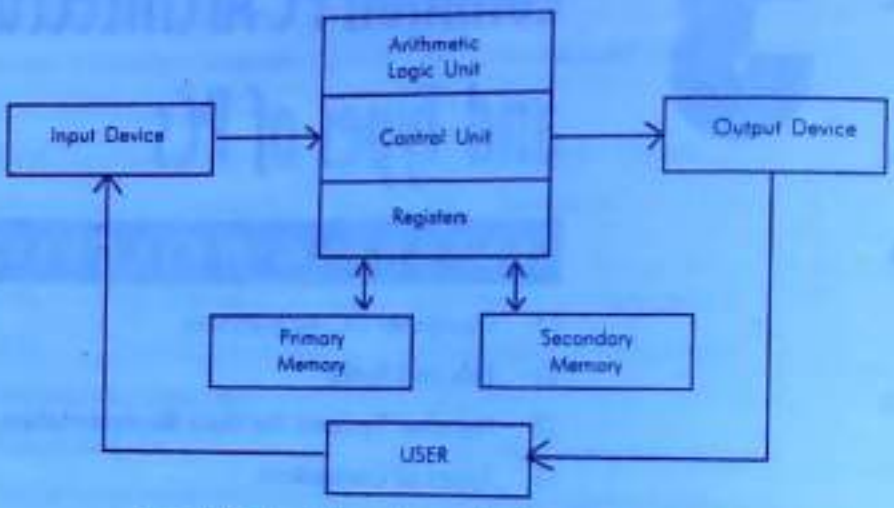


Figure 3.1: Functional diagram of a generalised architecture of a PC

A PC has following main components:

- Input/Output Unit
- Central Processing Unit
- Memory Unit
- Logic Gates/Circuits

Input/ Output Unit (I/O Unit)

The unit used for getting the data and instructions into the computer and displaying or printing output is known as an *Input/Output Unit*. There are many peripheral devices which are used as input/ output units for the computer. The input device is used to enter data and instructions into a computer. The most common form of input device is known as a terminal. A terminal has an electronic typewriter like device, called *keyboard* along with a display screen, called *Visual Display Unit* (VDU) or monitor. Keyboard is the main input device of a computer. The output device is used to display or print output. Although, the monitor is the main output device, it may be considered both as an input as well as an output unit. There are some other common input devices like mouse, punch card, tape, joystick, scanner, modem etc., which are explained in the later part of this block. Printer and plotter are the other peripheral devices used as output units for a computer.

Central Processing Unit (CPU)

Central Processing Unit is the main component or "brain" of a computer, which performs all the processing of input data. Its function is to fetch, examine and then execute the instructions

stored in main memory of a computer. In microcomputers, the CPU is built on a single chip or Integrated Circuit (IC) and is called a *Microprocessor*. The CPU consists of the following distinct parts:

1. Arithmetic Logic Unit (ALU)
2. Control Unit (CU)
3. Registers
4. Buses
5. Clock

1. ***Arithmetic Logic Unit:*** The arithmetic and logic unit of CPU is responsible for all arithmetic operations like addition, subtraction, multiplication and division as well as logical operations such as less than, equal to and greater than. All calculations and comparisons are performed in the arithmetic logic unit.

2. ***Control Unit:*** The control unit is responsible for controlling the transfer of data and instructions among other units of computer. It is considered as the "Central Nervous System" of a computer, as it manages and coordinates all the units of computer. It obtains the instructions from the memory, interprets them and directs the operation of the computer. It also performs the physical data transfer between memory and the peripheral device.

3. ***Registers:*** Registers are the small high speed circuits (memory locations) which are used to store data, instructions and memory addresses (memory location numbers), when ALU performs arithmetic and logical operations. A register can store one 'word' of data (Word is a unit of memory where 1 word = 2 bytes and 1 byte = 8 bits. Details of BITS and BYTES are discussed in later part of this block) until it is overwritten by another 'word'. Depending on the processor's capability, the number and type of registers vary from one CPU to another. Registers can be divided into six categories, viz. General Purpose Registers, Pointer Registers, Segment Registers, Index Registers, Flag Registers and Instruction Pointer Registers depending upon their functions.

4. ***Buses:*** Data is stored as a unit of eight bits (BIT stands for Binary Digit, i.e. 0 or 1) in a register. Each bit is transferred from one register to another by means of a separate wire. This group of eight wires, which is used as a common way to transfer data between registers is known as a *bus*. In general terms, bus is a connection between two components to transmit signal between them. Bus can be of three major types, viz. Data Bus, Control Bus and Address Bus. The data bus is used to move data, address bus to move address or memory location and control bus to send control signals between various components of a computer.

5. ***Clock:*** Clock is another important component of CPU which measures and allocates a fixed time slot for processing each and every micro-operation (smallest functional operation). In simple terms, CPU is allocated one or more clock cycles to complete a micro-operation. CPU executes the instructions in synchronization with the clock pulse.

   The clock speed of CPU is measured in terms of Mega Hertz (MHz) or Millions of Cycles per second. The clock speed of CPU varies from one model to another in the range 4.77 MHz (in 8088 processor) to 350 MHz (in Pentium). CPU speed is also specified in terms of Millions of Instructions Per Second (MIPS) or Millions of Floating Point Operations Per Second (MFLOPS).

Memory Unit

Memory Unit is that component of a computer system, which is used to store the data, instructions and information before, during and after it is processed by ALU. It is actually a work area (physically a collection of integrated circuits) within the computer, where the CPU stores the data and instructions. It is also known as a Main/Primary/Internal Memory. It is of following three types:

1. Read Only Memory (ROM pronounced as "Ra-om")
2. Random Access Memory (RAM pronounced as "R-aem")
3. Complementary Metal Oxide Semiconductor Memory (CMOS)

1. ***Read Only Memory:*** Read Only Memory is an essential component of the memory unit. We know that the computer, being a machine, itself has no intelligence or memory and requires the instructions which are given by man. Whenever the computer is switched on, it searches for the required instructions. The memory, which has these essential instructions is known as *Read Only Memory* (ROM). This memory is permanent and is not erased when system is switched off. As evident from its name, this memory can only be read and cannot be written by user/ programmer. The memory capacity of ROM varies from 64 KB to 256 KB (1 Kilobyte = 1024 bytes) depending on the model of computer.

   ROM contains a number of programs (set of instructions). The most important program of ROM is the *Basic Input Output System* (BIOS, pronounced as "bye-os") which activates the hardware (physical components of computer) such as keyboard, monitor, floppy disk, etc. in communicating with the system and application software (set of instructions or programs).

   Types of ROM: There are many types of ROM available for microcomputers like Mask ROM, PROM, EPROM, EEPROM and EAPROM.

   (i) *Mask ROM:* Mask ROM is the basic ROM chip. In this type of ROM the information is stored at the time of its manufacturing. Hence, it cannot be altered or erased later.

   (ii) *PROM:* PROM stands for *Programmable Read Only Memory*. In this type of ROM, the information is stored by programmers after its manufacturing. It also cannot be altered or erased later.

   (iii) *EPROM :* EPROM stands for *Erasable Programmable Read Only Memory*. It is similar to PROM, but its information can be erased later on by ultra violet rays and it can be reprogrammed.

   (iv) *EEPROM :* EEPROM stands for *Electrically Erasable Programmable Read Only Memory*. It is similar to EPROM, but its information can be erased by using a high voltage current.

   (v) *EAPROM :* EAPROM stands for *Electrically Alterable Read Only Memory*. As compared to EPROM and EEPROM, the information stored in EAPROM can be altered later.

2. ***Random Access Memory:*** Random Access Memory (RAM) is another important component of Memory Unit. It is used to store the data and instructions during the

execution of programs. Contrary to ROM, RAM is temporary and is erased when computer is switched off. RAM is a read/ write type of memory and, thus, can be read and written by user/ programmer. As it is possible to randomly use any location of this memory, this memory is known as random access memory. The memory capacity of RAM varies from 640 KB to several megabytes (1 Megabyte = 1024 KB) with different models of PC.

Types of RAM: There are two types of RAM used in PCs–Dynamic and Static RAM.

(i) *Dynamic RAM (DRAM)* : The information stored in Dynamic RAM has to be refreshed after every few milliseconds, otherwise it is erased. DRAM has higher storage capacity and is cheaper than Static RAM.

(ii) *Static RAM (SRAM)* : The information stored in Static RAM need not be refreshed, but it remains stable as long as power supply is provided. SRAM is costlier but has higher speed than DRAM.

3. *Complementary Metal Oxide Semiconductor Memory:* Complementary Metal Oxide Semiconductor (CMOS) memory is used to store the system configuration, date, time and other important data. When computer is switched on, BIOS matches the information of CMOS with the peripheral devices and displays error in case of mismatching.

Logic Gates/Circuits

All the computer operations are performed by passing signals in 0s and 1s. Computer has a block of built-in-devices through which these signals are generated and passed. These hardware devices are basically electronic digital circuits and are known as *Logic Gates* or *Logic Circuits*. There are two more names for these devices–*Switching Circuits and Digital Circuits*.

BITS AND BYTES

BIT stands for *Binary Digit*. It is single digit in a binary number which can either be 0 or 1. Within computer, a single bit can be stored in many ways, generally by using transistor, multivibrator (flip-flops - circuits made of Logic Gates) or a capacitor as on/off switch. If a bit is OFF then its value is considered as 0 and if it is ON, its value is 1. BIT is the smallest unit of data in a computer. A single bit alone does not provide much information, but a combination of 8 bits is enough to store all alphabets, numbers and other characters used by the computer. The group of 8 BITS is known as a *BYTE*. For example, when the user type A (1 byte) on the keyboard, the system delivers a signal which sets the input location to the bit value 01000000. In memory, each byte occupies unique address (storage location). Byte is considered as the smallest unit of memory. There are higher units of memory such as Word, Kilobyte, Megabyte, Gigabyte and Terabyte. Different units of memory along with their equivalents are shown in Table 3.1.

Table 3.1: Different units of memory alongwith their equivalents

Unit of Memory	Equivalent Units	Unit of Memory	Equivalent Units
Byte	8 BITS	Kilobyte (K)	1024 Bytes
Word	2 Bytes	Megabyte (MB)	1024K
Doubleword	4 Bytes	Gigabyte	1024 MB
Quadword	8 Bytes	Terabyte	1024 GB
Paragraph	16 Bytes		

NUMBER SYSTEMS FOR DATA REPRESENTATION

The number system that is commonly used for calculations is the *Decimal Number System*. It has 10 symbols or digits, i.e. 0,1,2,3...9 which are known as Arabian numerals. It has a base or radix (number of different digits which can occur in each position) of 10. Although this number system provides a great advantage to man as compared to earlier used binary numbers, it is not considered suitable for data representation in computers. The memory cells used in computers are bistable in operation. They are capable of storing only one bit (either 0 or 1). Therefore, the Binary Number System is used to store and represent numbers in computers. The binary number system has only two digits or symbols (0 and 1) and base of 2. Each decimal number can be represented in its equivalent binary number. Two other number systems which are used in computers are Octal (base of 8) and Hexadecimal (base of 16) Number Systems. These number systems are useful in representing binary numbers in a compact form. The octal number has 8 digits i.e. 0,1,2,3...7 and the hexadecimal number has 10 digits, i.e. 0,1,2,3...9 and 6 alphabets, i.e. A,B,C,D,E and F. Some examples of equivalent decimal, binary, hexadecimal and octal numbers are shown in Table 3.2.

Table 3.2: Some examples of equivalent decimal, binary, hexadecimal and octal numbers

Decimal	Binary	Hexa	Octal	Decimal	Binary	Hexa	Octal
0	0000	0	0	8	1000	8	10
1	0001	1	1	9	1001	9	11
2	0010	2	2	10	1010	A	12
3	0011	3	3	11	1011	B	13
4	0100	4	4	12	1100	C	14
5	0101	5	5	13	1101	D	15
6	0110	6	6	14	1110	E	16
7	0111	7	7	15	1111	F	17

TYPES OF COMPUTERS

Before knowing about various types of PCs, let us first see what are different types of computers. According to the size and memory / storage capacity, computers are of the following four types:

Supercomputer

Supercomputer is the biggest and fastest computer, which is mainly designed for complex scientific applications. It has many CPUs (Central Processing Units –main part of computer) which operate in parallel to make it a fastest computer. It is typically used for the following applications:

- Weather information
- Petroleum exploration and production
- Energy management
- Defence
- Nuclear Energy Research

- Structural Analysis
- Electronic Design
- Real-time animation
- Medicine

Some of the examples of supercomputers are **CRAY3, CRAY-XMP-14, NEC-500** and **PARAM.**

Mainframe Computer

Mainframe computers are very large and fast computers but smaller and slower than supercomputers. They are used in a centralized location where many terminals (input/output devices) are connected with one CPU and, thus, allow different users to share the single CPU. They have a very high memory (several hundred megabytes) and can support thousands of users. They are mainly used for the following applications:

- Railway and Airline reservations
- Banking applications
- Commercial applications of large industries/ companies

Some of the examples of mainframe computers are **IBM 3090, IBM 4381, IBM 4300** and **IBM ES-9000.**

Minicomputers

Minicomputers are medium-scale, smaller and generally slower than mainframe computers. Like mainframes, they have many terminals which are connected with one CPU and can support many users. The cost of minicomputer is very less as compared to mainframe. Therefore, it is mainly used in applications where processing can be distributed among several minicomputers rather than using a mainframe computer.

Some of the examples of minicomputers are **PDP-1, DEC Micro VAX** and **IBM AS/400.** IBM AS/400, which is actually a midicomputer (computer with performance ranging between a mainframe and a minicomputer) is becoming very popular among minicomputers.

Microcomputers

A microcomputer is the smallest digital computer, which uses a microprocessor as its CPU. Microprocessor is a single chip (integrated circuit) CPU. A microcomputer is popularly called as *Personal Computer* (PC). It can be used both as a stand-alone machine and a terminal in a multi-user environment. Microcomputers are becoming very popular now-a-days due to very high processing power and memory. Today, a powerful microcomputer may be used as a substitute for mini or mainframe computer.

TYPES OF PCs

PCs are either of *desktop* or *portable* model. Portable computers can be carried from one place to another. Some of the models are called as *laptops* while others as *notebook* computers. Notebook computers are smaller, lighter and costlier than laptops. Desktop computers fit on a desktop and are used widely in offices and homes. The pictures of some of the desktop and portable computers are shown in Figure 3.2. There are many types and models of microcomputers, which are summarized in Table 3.3.

Figure 3.2: Some desktop and portable computers

Table 3.3: Different types of microcomputers alongwith the technical specifications of CPU

CPU Model	Clock (MHz)	Data Bus	Register (BIT)	Max. Memory (RAM)	Comments
8088	8	8	16	1 MB	First 8 bit microprocessor (Original PC)
8086	8	16	16	1 MB	First 16 bit CPU on a chip (PC/XT)*
80286	20	16	16	16 MB	5 times faster than PC/XT (PC/AT)*
80386 SX	33	16	32	16 MB	80386 with an 80286 bus
80386 DX	40	32	32	4 GB	True 32 bit CPU on a chip
80486 SX	40	32	32	4 GB	Math co-processor disabled
80486 DX2	66	32	32	4 GB	More speed with Math co-processor enabled
80486 DX4	100	32	32	4 GB	More speed than 486 DX2
Pentium Pro (P5)	166	64	32	4 GB	Superscope architecture Able to execute 2 instructions simultaneously
Pentium II (P6)	350	64	32	64 GB	Fastest PC

* XT stands for Extended Technology and AT for Advanced Technology

SUMMARY

A computer system has four main components – Input/ Output Unit, Central Processing Unit, Memory Unit and Logic Gates/ Circuits. The input unit is used to enter data and instructions into a computer. The output unit is used to display or print the information. Central Processing Unit, the main component of a computer consists of Arithmetic Logic Unit, Control Unit, Registers, Buses and Clock. The arithmetic and logic unit is responsible for all arithmetic and logical operations. The control unit controls the transfer of data and instructions among other units of a computer. Registers are the memory locations which store data, instructions and memory addresses. Bus is a connection between two components to transfer data between them. Clock measures and allocates a fixed time for processing each and every micro-operation. Memory unit stores the data, instructions and information. It is of three types ROM, RAM and CMOS. ROM (Read Only Memory) contains those essential programs, which are not erased when the system is switched off. RAM(Random Access Memory) stores the data and instructions during execution of programs and is erased when the computer is switched off. Logic Gates or Circuits are electronic digital circuits through which data signals are generated and passed. The group of 8 bits is called a Byte. In computers, data is represented in various number systems viz. binary, octal and hexadecimal number systems. Besides these representations, BCD (Binary Coded Decimal), ASCII (American Standard Code for Information Interchange) and EBCDIC (Extended Binary Coded Decimal Interchange) are various coding schemes used to represent characters in computers. According to size/ memory capacity, there are four types of computers - (i) Supercomputer, (ii) Mainframe Computers, (iii) Minicomputers and (iv) Microcomputers (Personal Computers).

REVIEW QUESTIONS

1. Fill in the blanks:
   (a) _____ has many CPUs which operate in parallel.
   (b) _____ are medium scale, smaller and generally slower than mainframe computers.
   (c) Microcomputer is popularly called as _____.
   (d) Notebook computers are smaller and costlier than _____.
   (e) _____ is the fastest PC.
2. State True or False:
   (a) Mainframe computers are typically used for Weather information.
   (b) Supercomputer is mainly designed for complex scientific applications.
   (c) IBM AS/400 is the most popular microcomputer.
   (d) PCs can be used as substitutes for mini and mainframe computers.
   (e) All portable computers are laptops.
3. Classify the following computers into Supercomputer, Mainframe or Minicomputer:
   (a) DEC Micro VAX (b) PARAM (c) IBM 4300 (d) CRAY3 (e) PDP-1
4. What is a computer system? Describe in brief the architecture of a computer system.
5. Which component of a computer is generally called 'brain' of computer and Why? Describe the functions of the distinct parts of this component.
6. What is ROM? How does it differ from RAM and CMOS?
7. Name various types of ROM and describe their main characteristics.
8. How does a Static ROM differs from a Dynamic ROM. Which RAM would you prefer in your computer and Why?
9. What are Logic Gates? Draw the diagrams of 3 basic logic gates.

10. Define the following memory units:

    (a) BIT (b) BYTE (c) Kilobyte (d) Megabyte (e) Gigabyte

    (f) Terabyte (g) MIPS (h) MFLOPS

11. Name various number systems and coding schemes used for data representations in computers.

12. What is a Supercomputer? List various uses of supercomputers.

13. Write the differences between mainframe computer and minicomputer.

14. What is a Microcomputer? Explain the differences among various models of microcomputers.

CHAPTER 4

Common I/O Devices for PC

LEARNING OBJECTIVES

- Introduction
- Keyboard
- Mouse
- Trackball
- Joystick
- Light Pen
- Touch Screen
- Digitizer
- Scanner
- Optical Mark Reader (OMR)
- Optical Character Reader (OCR)
- Bar Code Reader
- Magnetic Ink Character Recognition (MICR)
- Voice-Input Devices
- Monitor
- Printer
- Plotter
- Computer Output Microfilm
- Hardware and Software

INTRODUCTION

Input Devices are used to input data, information and instructions into the RAM. Output devices are hardware components which are used to display or print the processed information. We are discussing below the structure, working and uses of the common input and output devices.

KEYBOARD

Keyboard (similar to a typewriter) is the main input device of a computer. It contains three types of keys–alphanumeric keys, special keys and function keys. *Alphanumeric keys* are used to type all alphabets, numbers and special symbols like $,%,@,^, etc. *Special keys* such as <Shift>,<Ctrl>,<Alt>,<Home>, <Scroll Lock>, etc. are used for special functions. *Function keys* such as <F1>,<F2>,<F3> etc. used to give special commands depending upon the software used. You can understand the function of each and every key actually by working on a PC. When any key is pressed, an electronic signal is produced. This signal is detected by a keyboard encoder that sends a binary code corresponding to the key pressed to the CPU. There are many types of keyboards but 101 Keys Keyboard, as shown in Figure 4.1, is the most popular one.

Figure 4.1: A 101 keys keyboard

MOUSE

Mouse (similar to a mouse) is another important input device. It is a pointing device used to move cursor, draw sketches/ diagrams, selecting a text/object/menu item, etc. on monitor screen while working on windows (graphics based operating environment of computer). Mouse is a small, palm size box containing three buttons and a ball underneath as shown in Figure 4.2, which senses the movement of the mouse and sends the corresponding signals to CPU on pressing the buttons.

Figure 4.2: A Mouse

TRACKBALL

A trackball looks like a mouse, as the roller is on the top with selection buttons on the side as shown in Figure 4.3. It is also a pointing device used to move the cursor and works like a mouse. For moving the cursor in a particular direction, the user spins the ball in that direction. It is sometimes considered better than mouse, because it requires little arm movement and less desktop space. It is generally used with portable computers.

Figure 4.3: A Trackball

JOYSTICK

Joystick is also a pointing device which is used to move cursor position on a monitor screen. Joystick is a stick having a spherical ball at its both lower and upper ends as shown in Figure 4.4. The lower spherical ball moves in a socket. The joystick can be moved in all four directions. The function of joystick is similar to that of a mouse. It is mainly used in Computer Aided Designing (CAD) and playing computer games.

Figure 4.4: A Joystick

LIGHT PEN

Light pen (similar to a pen) is a pointing device which is used to select a displayed menu item or draw pictures on the monitor screen as shown in Figure 4.5. It consists of a photocell and an optical system placed in a small tube. When its tip is moved over the monitor screen and pen button is pressed, its photocell sensing element detects the screen location and sends the corresponding signal to the CPU.

Figure 4.5: Demonstration of a light pen

TOUCH SCREEN

Some special VDU devices have touch sensitive screens. These screens are sensitive to human fingers and act as tactile input devices. Using the touch screen, a user can point to a selection on the screen instead of pressing keys as shown in Figure 4.6. Touch screen helps the user in getting the information quickly. It is mainly used in hotels or airports to convey information to visitors.

Figure 4.6: Demonstration of touch screen

DIGITIZER

Digitizer is used to create drawings and pictures using a digitizer tablet by a process called digitizing. Digitizing is a process by which graphic representations are converted into digital data. The digitizer consists of 3 main parts - a flat surface called tablet, a small hand held mouse-like device called puck and a special pen like device called stylus as shown in Figure 4.7. The puck is used to input existing drawings into the computer. The stylus is used to trace existing drawings placed on the tablet. It is also used to draw new drawings on a piece of paper placed on tablet. The user makes contact to the tablet with stylus. As the stylus is connected to the tablet by a wire, the traced image is stored in RAM and displayed on monitor.

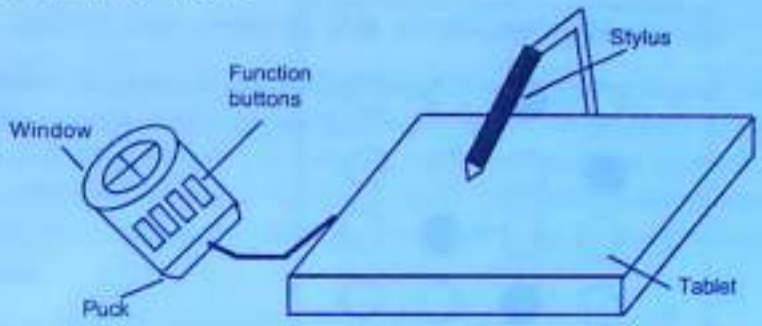


Figure 4.7: A digitizer

SCANNER

Scanner is widely used in Desktop Publishing (DTP) applications. It is used for digitizing images such as photographs, forms, documents, etc. into computer memory. There are many types of scanners as illustrated in Figure 4.8. Some scanners can also read text by converting them to digital code. The scanners are very useful for converting the typed pages into word-processing files. Graphics scanners convert a printed image into video image without converting it to digital code.

Figure 4.8: Various types of scanners

OPTICAL MARK READER (OMR)

Optical Mark Reader is a special type of optical scanner used to recognize the type of mark made by pen or pencil. It is used where one out of a few alternatives is to be selected and marked. It is especially used for checking the answer sheets of examination having multiple choice questions. The answer sheet contains special marks such as squares or bubbles. The student fills in these squares with soft pencil or ink to indicate the correct choice as illustrated in Figure 4.9 The OMR detects these marks and sends corresponding signals to the processor. If a mark is present, the amount of reflected light is reduced and, thus, OMR detects the presence of mark for each and every answer. Optical Mark Readers are widely used for almost all competitive examinations having objective type questions.

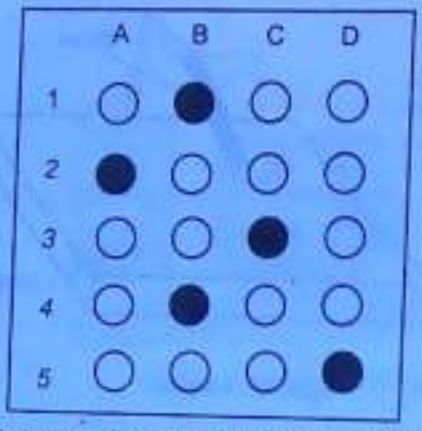


Figure 4.9: A sample of answer sheet that is checked by Optical Mark Reader (OMR)

OPTICAL CHARACTER READER (OCR)

Optical Character Reader is an optical scanner, which is capable of detecting alphanumeric characters typed or printed on paper using an OCR font. The text, which is to be scanned is illuminated by a low-frequency light source. The dark areas on the text absorb the light while light areas reflect it. The photocells of OCR device receive this reflected light and provide binary data corresponding to dark and light areas. OCR devices are used for large volume applications like reading of passenger tickets, computer printed bills of credit card companies and reading of ZIP codes in postal services.

BAR CODE READER

Bar Code Reader is an optical scanner used for reading bar-coded data (data in form of light and dark lines) as illustrated in Figure 4.10. The bar-coded data consists of a number of bars of varying thickness and spacing between them. The bar code reader reads the bar coded data and converts it into electrical pulses, which are then processed by computer. Bar-coded data is generally used in labelling goods, numbering the books or encoding ID or A/c numbers.

Figure 4.10: A bar code reader

MAGNETIC INK CHARACTER RECOGNITION (MICR)

Magnetic Ink Character Recognition is used to recognize the magnetically-charged characters, mainly found on bank cheques. The magnetically-charged characters are written by a special ink called magnetic ink. MICR device reads the patterns of these characters and compares them with special patterns stored in memory. Using MICR device, a large volume of cheques can be processed in a day. MICR is widely used by the banking industry for the processing of cheques.

VOICE-INPUT DEVICES

Voice-Input Devices are the latest input devices that can recognize the human voice. They seem to be very useful but are not popular due to storage of limited vocabularies and variations in way of pronouncing words by different persons.

MONITOR

Visual Display Unit (VDU), commonly called as *monitor* is the main output device of a computer. It consists of a Cathode Ray Tube (CRT), which displays characters as an output. It forms images from tiny dots, called pixels, that are arranged in a rectangular form. The sharpness of the image (screen resolution) depends upon the number of the pixels.

Types of Monitors

There are different kinds of monitors depending upon the number of pixels. Depending upon the resolution, monitors can be classified as follows :

1. CGA (Color Graphics Adapter)
2. MDA (Monochrome Display Adapter)
3. HGA (Hercules Graphics Adapter)
4. EGA (Enhanced Graphics Adapter)
5. VGA (Video Graphics Adapter)
6. SVGA (Super VGA)

The differences between these monitors are outlined in Table 4.1. Depending upon color of display, monitors can be classified as Monochrome (with single color black/white display) and Color (with all colors display) Monitors. The pictures of two different models of color monitors are shown in Figure 4.12.

Table 4.1: Comparison among different types of monitors

Type of Monitor	Display Type	Text Resolution	Graphics Resolution (Pixels)
CGA	Text & Graphics	Fair quality	320 × 200
MDA	Text only	Good quality	-
HGA	Text & Mono Graphics	Fair quality	320 × 200
EGA	Text & Enhanced Graphics	Good quality	640 × 350
VGA	Text & Video Graphics	Much better than all above	640 × 480
SVGA	Text & Video Graphics	Best quality	1600 ×1280

20" Color Monitor

15" Multimedia Color Monitor

Figure 4.12: Two models of Color Monitors

PRINTER

Printer is the most important output device which is used to print information on papers. Printers are essential for getting output of any computer based application.

Types of Printers

There are many types of printers which are classified on various criteria as illustrated in Figure 4.13.

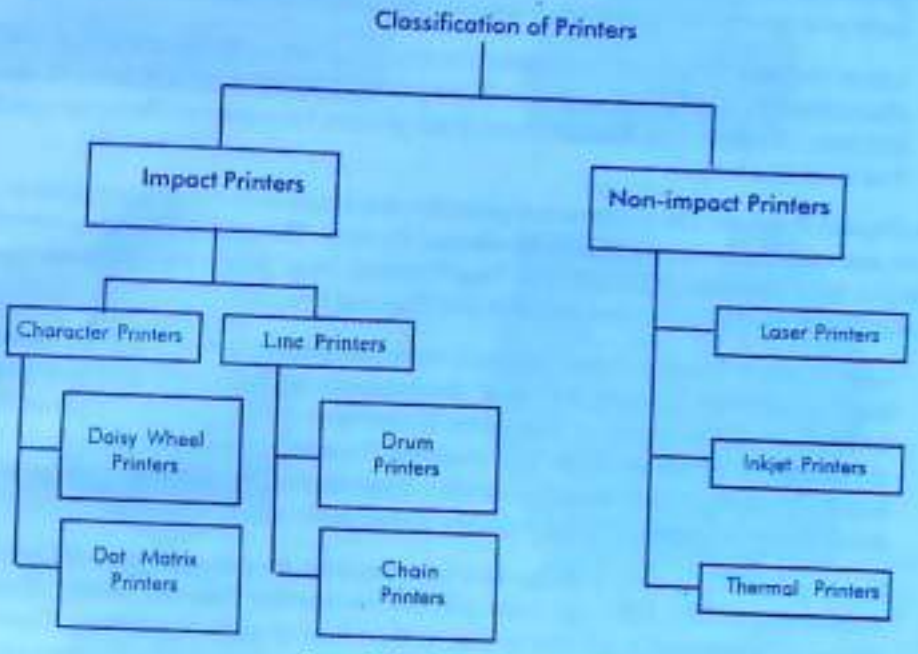


Figure 4.13: Classification of Printers

As clear from the above figure, printers are broadly categorized into following two types:

1. *Impact Printers:* The printers that print the characters by striking against the ribbon and onto the paper, are called Impact Printers. These printers are of two types–(i) Character; and (ii) Line printers.

   (i) *Character Printers:* These printers print one character at a time. These printers can be further classified into two types–Daisy Wheel and Dot Matrix Printers.

   Daisy Wheel Printers: These printers print the characters by a mechanism that uses a plastic or metal hub with spokes, called *daisy wheel*. The characters are embossed on the radiating spokes and printed by striking these spokes against the ribbon and paper. Daisy Wheel printers give a good quality but they are expensive than Dot Matrix printers.

   Dot Matrix Printers: These printers print the characters by putting dots onto the paper. They do not give better printing quality than daisy wheel printers, but are faster in speed. The printing speed of a dot matrix printer can be upto 360 cps (characters per second). They are widely used with microcomputers in most of the offices.

   (ii) *Line Printers:* These printers print one line at a time. Their printing speed is much more than character printers. They are also of two types–Drum Printers and Chain Printers.

Drum Printers: These printers print the line by a rotating drum having a ring of characters for each print position. The hammer strikes each character of the drum simultaneously so that entire line is printed for one full rotation of the drum. These printers are also called as *Barrel Printers*. The printouts obtained from these printers have even character spacing but uneven line height.

Chain Printers: These printers print the line by a rotating chain having ring of characters for each print position. Their printing mechanism is similar to drum printers. The printouts obtained from these printers have uneven character spacing but even line height.

Non-Impact Printers: The printers that print the characters without striking against the ribbon and onto the paper are called Non-Impact Printers. These printers print a complete page at a time, therefore, also called as Page Printers. Page printers are of three types– (i) Laser Printers, (ii) Ink Jet Printers, and (iii) Thermal Printers.

(i) *Laser Printers:* These printers look and work like photocopiers. They are based on laser technology, which is the latest development in high speed and best quality printing. In these printers, a laser beam is used to write the image on a paper. First, the image is formed by electrically charging thousands of dots on a paper by laser beam. Then, the paper is sprayed with a toner having the opposite charge and is passed over a heated roller to make the image permanent.

Laser printers are very popular and have become an essential part of Desk Top Publishing (DTP). Although laser printers are costlier than dot matrix, they are generally preferred in all offices due to their best quality of printing. There are many models of laser printers depending upon the speed and number of dots printed. The latest model of laser printer is 1200 DPI (Dots Per Inch), which can print 10 pages/minute. Some high speed laser printers give a speed of upto 100 pages/minute.

(ii) *Inkjet Printers:* These printers print the characters by spraying the paper with electrically charged ink. These printers give better quality than character printers but not better than laser printers. They are cheaper than laser printers, hence, used widely in many offices. They also offer an option of using colour cartridges for multi-color printing.

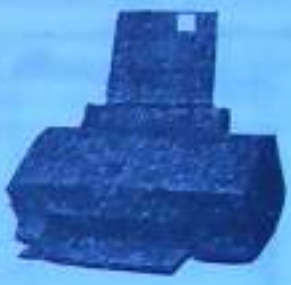
(iii) *Thermal Printers:* These printers print the characters by melting a wax-based ink off a ribbon onto a special heat sensitive paper. They give Letter-quality printing but are relatively expensive in maintenance than other printers.

The pictures of some of the printers are shown in Figure 4.14.

PLOTTER

Plotter is an important output device, used to print high quality graphics and drawings. Although the graphics can be printed on printers, the resolution of such printing is limited on printers. Plotters are generally used for printing/ drawing graphical images such as charts, drawings, maps, etc. of engineering and scientific applications. Some important types of

Dot Matrix Printer



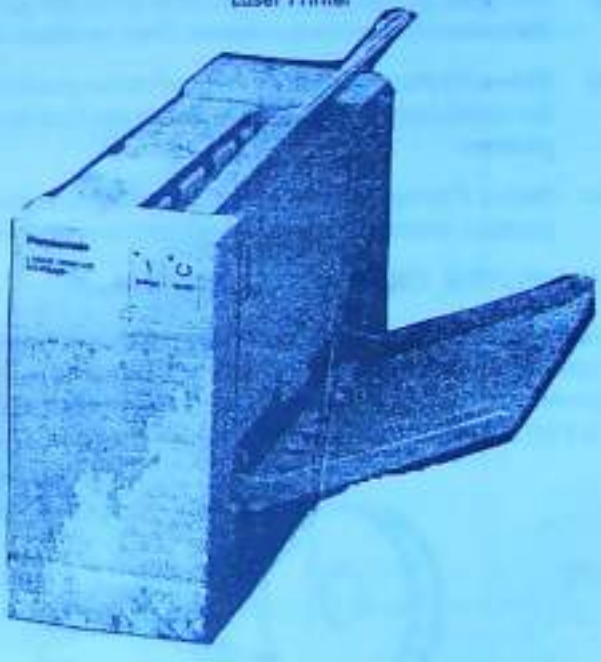
Inkjet Printer

Line Printer

Laser Printer

Line Printer

Line Printer



Laser Printer

figure 4.14: Various Types of Printers

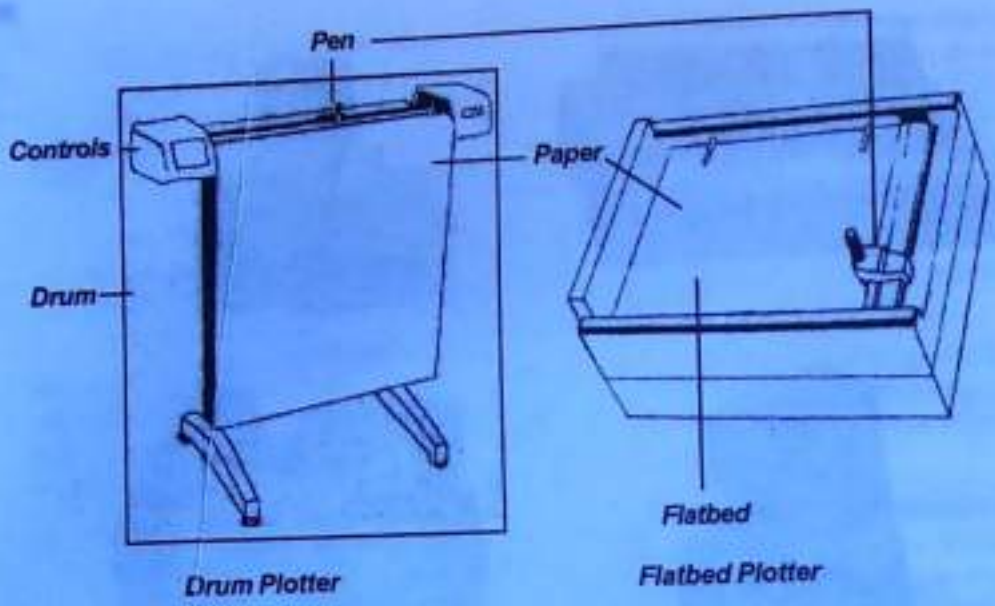


Figure 4.15: Various types of plotters

plotters are shown in Figure 4.15 and are discussed below:

(i) *Flat Bed Plotters:* These plotters print the graphical images by moving the pen on stationary flat surface material. They produce very accurate drawings.

(ii) *Drum Plotters :* These plotters print the graphical images by moving both the pen and the drum having paper. They do not produce as accurate drawings as printed by flat bed plotters.

(iii) *Inkjet Plotters :* These plotters use inkjets in place of pens. They are faster than flat bed plotters and can print multi-colored large drawings.

COMPUTER OUTPUT MICROFILM

Computer Output Microfilm (COM) is a technique to produce output on a microfilm media (microfilm reel or microfiche card) as illustrated in Figure 4.16. A microfilm is a continuous film strip that can store several thousands miniaturized document pages. A microfiche card is a 4 by 6 inch film sheet, which can store several hundred pages.

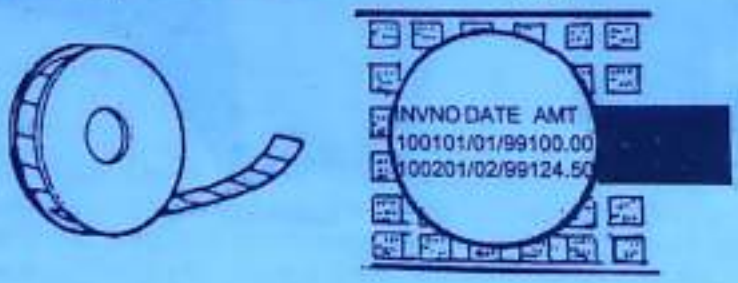


Figure 4.16: Computer Output Microfilm

The process of producing microfilm or microfiche takes place on a special COM unit. The information recorded on the microfilm is read with the help of a microfilm viewing system. It is generally easier to read a microfiche than microfilm. Computer Output Microfilm is particularly useful for organizations which need to store and manipulate large amount of data. It helps them in tremendous savings in paper and document handling costs.

HARDWARE AND SOFTWARE

Computer components can be broadly divided into two categories–Hardware and Software. Hardware refers to any physical component of a computer, for example, CPU, Monitor, Keyboard, Hard Disk, Floppy Disk, etc. Software refers to the programs which are required to operate the computer. For example, DOS (Disk Operating System), BASIC, COBOL, dBASE, an accounting software, etc. are all software. An analogy of hardware can be the book which you are reading and then software would be the text written on this book. Another analogy could be–'brain' is a hardware but 'memory stored in brain' is a software.

Both hardware and software are dependent on each other. CPU, Memory Unit, Hard Disk, etc. are useless unless they are provided with instructions and data for storage and processing. Similarly, BASIC or COBOL language has no importance unless they are used alongwith various hardware components of a computer.

SUMMARY

Keyboard and Mouse are the basic input devices of today's PC. Trackball, Lightpen, Touch Screen, Joystick, Digitizer, Scanner, Optical mark reader (OMR), Optical Character Reader (OCR), Bar Code Reader, MICR and voice input devices are the other input devices that are used for various special purposes. Monitor and Printer are the main output devices of a PC. There are many types of monitors primarily based either on the quality of output. Printers are also of many types depending upon their printing quality and speed. Plotter, another output device, is used to print high quality graphics and drawings. Computer Output Microfilm (COM) is also an output device which is used to produce output on a microfilm media. Hardware and Software are two broad categories of computer components. Hardware refers to the physical component while Software to the programs required to operate computers.

REVIEW QUESTIONS

1. Fill in the blanks:

   (a) _____ is a pointing device used to move cursor while working on windows.

   (b) Using the input device _____, the user can point to a selection on the screen instead of pressing keys.

   (c) _____ is an input device that is mainly used in CAD.

   (d) _____ is an output device that is used to print high quality graphics.

   (e) _____ is used to recognize the magnetically charged characters.

2. State True or False:

   (a) Optical character reader is used to recognize the type of mark made by pen or pencil while checking the answer sheets of an examination.

   (b) Mouse is considered better than trackball because it requires little arm movement.

   (c) A digitizer consists of tablet, puck and stylus.

   (d) Inkjet printers give better printing quality than daisy wheel printers.

   (e) The printouts obtained from drum printers have even character spacing but uneven line height.

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3. Classify the following devices into an Input (I) or Output (O) Device:

(a) Touch Screen (b) Printer (c) Light Pen (d) Plotter

(e) Monitor (f) COM (g) OMR (h) MICR

4. Classify the following category of printers as Impact (I) or Non-impact (N) printer:

(a) Laser Printers (b) Thermal Printers (c) Drum Printers

(d) Inkjet Printers (e) Chain Printers (f) Daisy Wheel Printers

(g) Dot Matrix Printers

5. Classify the following components into Hardware (H) or Software (S):

(a) CPU (b) ROM (c) DOS (d) BASIC (e) Floppy (f) Bus

6. Name any five input devices of a PC and explain their functions in brief.

7. What is a trackball ? How does it differ from mouse and joystick?

8. Name the input device used -

(a) to create drawings and pictures

(b) to digitizing photographs and documents

9. How does an OMR differ from an OCR? Which of these devices is used for checking the answer sheets of examinations having multiple choice questions?

10. Explain the differences between CGA, EGA and SVGA monitors. Which of these monitors has the best quality display?

11. What is the difference between Impact and Non-impact printers? Name any two impact and two non-impact printers and also write their functions.

12. Explain the difference between Character, Line and Page printers. Give examples.

13. Explain the difference between Hardware and Software.

CHAPTER 5

Operating Systems for PC

LEARNING OBJECTIVES

- Operating Systems
- Disk Operating System
- Windows 95

OPERATING SYSTEMS

An Operating System is the most essential system software, that manages the operation of a computer. Without an operating system, it is not possible to use the computer. We know that the computer is a hardware and is useless unless it is provided an essential software, that makes it ready to use. An operating system is that software which makes the computer ready to use by a process called booting. Before discussing the types of operating system, let us first see what exactly is meant by booting.

When we switch on the computer, the instructions stored in ROM are automatically executed. These instructions help the computer to load the operating system from external storage device (disk) to internal storage (RAM). This process of loading of operating system from disk to RAM is called booting.

The term 'booting' comes from the word–'bootstrap'. As bootstrap helps us to get our boots on, similarly booting helps the computer to get ready. The process of booting is illustrated in Figure 5.1.

Types of Operating Systems

Many types of operating systems are available for computers. These are divided into following two types:

- Single-user operating systems
- Multi-user operating systems

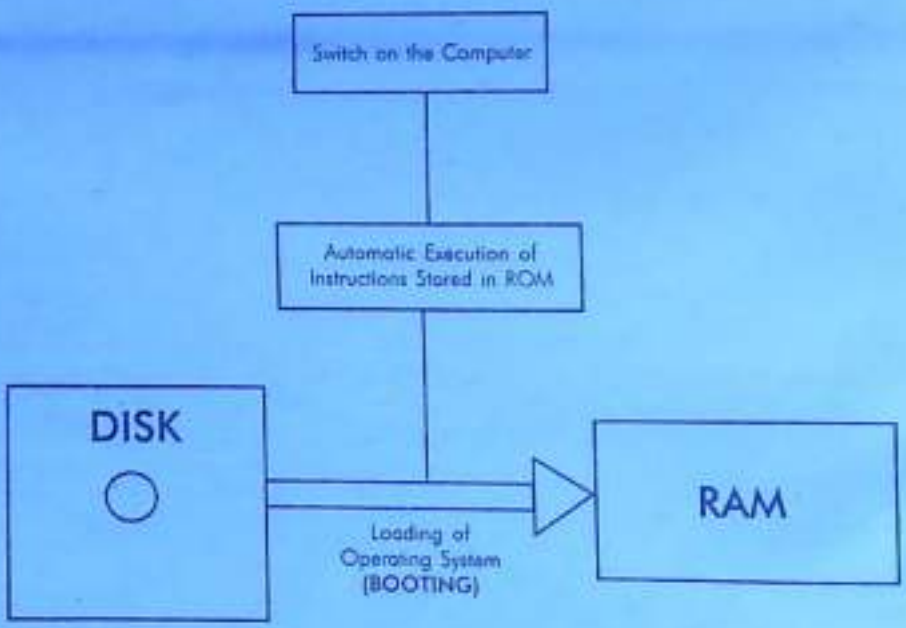


Figure 5.1: Process of Booting

1. *Single-user operating systems:* These operating systems are used for those computers (mainly microcomputers) which have only one terminal (stand-alone PC). MS DOS (Microsoft Disk Operating System) and PC DOS (Personal Computer Disk Operating System) are the two important single-user operating systems. Both systems are almost identical and are simply called DOS.

2. *Multi-user operating systems:* These operating systems are used for those computers (micro to mainframe) which have many terminals (multi-user systems). The popular operating systems used for multi-user systems are UNIX, NETWARE, MVS, OS/400, VMS, LINUX, OS/2 and Windows NT.

We are going to discuss two major operating systems in detail:

- DOS
- Windows 95

DISK OPERATING SYSTEM

DOS is the most commonly used operating system. The full form of DOS is Disk Operating System. It is a single user operating system which means that only one application can be made to run at one time. DOS provides a 'Platform' or an 'Environment' which lets the application program to interact with CPU and I/O devices. Many application software requires DOS for running. The common among these are word processors like Wordstar, Professional write; spreadsheet programs like Lotus 123, VP Planner Plus; accounting software like Tally, EX, etc. Each software package has a specific command to get itself running on DOS. For example, in order to run the spreadsheet program, Lotus 123, you will have to enter 123 at the DOS prompt. DOS will run Lotus 123 for you. One any application software shuts down, the control again has to come back to DOS and the DOS prompt can be seen again on the screen. Now, DOS is ready to accept more commands from you.

MS DOS (Microsoft Disk Operating System), a product of Microsoft Corporation of USA, is the most popular operating system for PCs. Another operating system available in the market is the PC DOS, a product of IBM, which is almost similar to MS DOS. Whether you use MS DOS or PC DOS, the basic commands of DOS remains the same.

Loading DOS

The booting happens automatically when the computer is switched on, provided DOS is available to it. DOS can be present on both hard disk as well as the floppy disk. So, when the system is turned on, a search for DOS is done on floppy drive first. If it is not present on the floppy drive, the DOS is searched for on the hard disk. Thus, for booting to happen, the DOS must be present either on the floppy or on the hard disk. So, if DOS is not present on the hard disk, insert the floppy carrying DOS software in the A drive before switching on the system. If the system boots from floppy, the following prompt comes on the screen:

```
A:\>_
```

where underscore character '_' indicates the cursor (blinking mark) of the screen. However, if booting has been done from the hard disk, then the following prompt will come:

C:\>_

C:\> or A:\> is the DOS Prompt. Looking at DOS Prompt, you can easily make out the currently active drive. If you want to switch yourself over to the another drive, then simply type its drive letter after the prompt and hit the <Enter> key as shown below:

C:\>A: <Enter>

A:\>_

Now again if you want to go back to the C drive, then type in C: and hit the <Enter> key.

Files and Directories in DOS

File is a collection of related information. Any kind of text, data or program that is entered is stored in a file. Now, it is very essential to organize your files in an ordered manner. This makes file search easier otherwise, it can really be a difficult and time consuming job to search for a particular file out of the whole lot of files stored on the disk. An example of library can make the explanation of the concept more clear. As you must have already observed, the books in a library are put in big cabinets. Each cabinet is divided into many shelves and sub-shelves. Each shelve or sub-shelve contains books on a particular subject. So, the required book on a particular subject can be found out very easily without wasting much time and effort.

On similar grounds, all the files that are related to each other are clubbed at one place. This is known as a Directory Structure or simply a Directory. A directory structure resembles an inverted tree. The main directory becomes the Root directory. The directories and files become the branches of this directory tree. Any number of files and directories can be added to it thus, making the tree grow big downwards. Let us take an example.

Suppose we wish to store two kinds of files on our disk: ACCOUNT and EXPENSE. Further, we wish to keep two more kinds of files (say CASHSALE and CREDSALE) under ACCOUNT sub-directory. DOS can very much help you in organizing your files through directory structure which is shown in Figure 5.2.

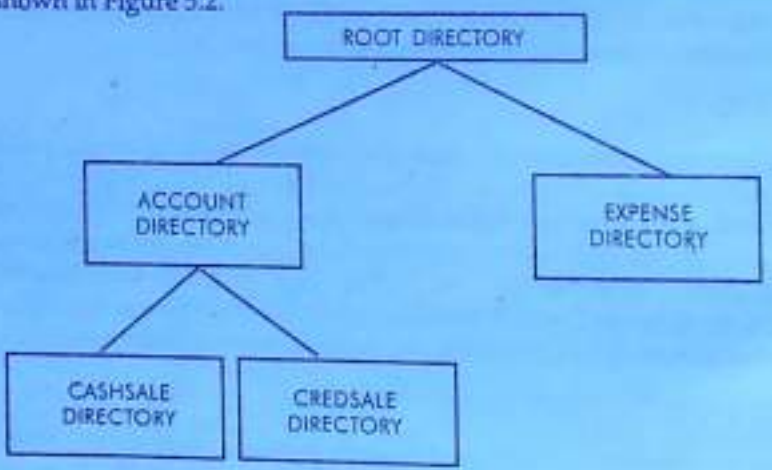


Figure 5.2: Example of Directory Structure

It is clear from the figure that:

1. On the top of the directory structure, there is a Root directory. This directory is always present and is shown by \(backslash) for referencing. Any file or directory that is created is always under the Root directory.
2. EXPENSE is the sub-directory of the Root Directory.
3. ACCOUNT is the parent directory of the directories CASHSALE and CREDSALE. It can also be said that the CASHSALE and CREDSALE are the sub-directories of the ACCOUNT directory. Thus, a directory under a directory is called a sub-directory.

It can be clearly seen that the files relating to a particular subject can be put under a directory. For example, all the files relating to expenses can be put under EXPENSE sub-directory whereas all the files relating to cash sales can be stored under the sub-directory CASHSALE.

Referencing Files

It's time to learn as to how to locate a file. The directory structure shown in Figure 5.3 has two sub-directories under the Root directory. The sub-directory EXPENSE has two files under it.

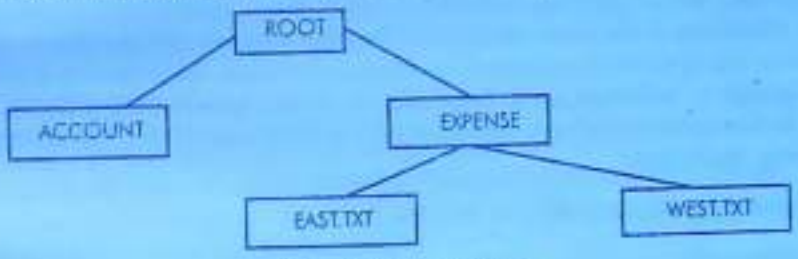


Figure 5.3: Referencing Files

DOS allows you to go from one directory to another by following a certain path. In the beginning, the user is always resident in the Root directory. While travelling from one directory to another certain rules have to be followed. A user cannot go directly from ACCOUNT sub-directory to EXPENSE sub-directory. To go from one sub-directory to another, you have to first go to its parent directory or the Root directory. Thus, for going from ACCOUNT sub-directory to EXPENSE sub-directory, you first have to go to Root directory. Similarly, for going from the file EAST.TXT to WEST.TXT, you have to go to the EXPENSE sub-directory first. Thus, in other words, while moving from one directory to another, you have to go to its parent directory first.

Now, in order to reach out to the file WEST.TXT the following path has to be followed:

C:\>Expense\West.txt

1 3 4 5

2

Here, 1 is the drive name where the file is resident in;

2 is the path which DOS takes to reach for a file;

3 is the directory under the Root;

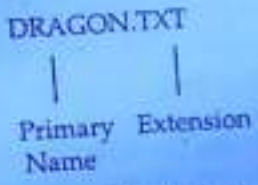
4 is the primary name of the file that is to be accessed; and

5 is the extension name of the same file.

The \ (backslash) has to be used for tracing out the path. The first backslash takes you to the Root directory. The subsequent backslashes separate the directories, sub-directories and the filename that are given in the whole path.

File Naming Conventions

There are certain rules that have to be followed while giving names to your files. A file name has two parts– Primary Name and Extension (Secondary Name). A dot(.) separates a primary name from an extension. Let as see the two parts of the file named DRAGON.TXT.



A primary name cannot have more than eight characters and an extension cannot have more than three characters. A file name having only the primary name and no extension is absolutely valid because it is optional to give an extension to a filename. An extension is generally given by the language or software used. For example, if you are entering a BASIC or PASCAL program, its filename would have extension BAS or PAS respectively. A filename can contain the following characters:

1. An Alphabet (A-Z) or (a-z)
2. A number (0-9)
3. Special characters such as $, #, &, @, !, %, (,), -, {, }, ', ^, etc.

   except *, ?, fullstop (.) and space ( ).

It is a good practice to give meaningful names to your files. However, no two files can have exactly the same name on the disk. Thus, a name given to a file on a disk has to be unique.

A look at a few valid and invalid filenames:

VALID	INVALID
MYHUNT	MY BOOK.DOC
Dragon.Txt	B.R.ARORA
Uphill.up	S?JAIN.BAS
VIJAYA	EXCELBOOKS
Employee.Emp	ANURAG*.*
157.IN	VICKY.MEHTA

The rules for naming a directory are the same as that of naming files.

DOS Commands

DOS offers a variety of commands to perform various functions. With the help of DOS commands, you can display the list of files and directories that are present on the disk, create new files and directories, remove unwanted files and directories and much more. DOS commands can be entered either in uppercase or lowercase letters. The format of a DOS command is called syntax. All DOS commands begin with command name. When DOS carries out the instructions given by you, it is called the execution of DOS command. Let us discuss some of the DOS commands in detail. (The commands which you should issue are written as bold letters throughout this unit)

Directory Commands of DOS

The directory commands help you to create new directories and remove existing ones. They also allow you to travel from one directory to another. You can also view the listing of files and directories that are present on the disk.

1. Displaying a list of files on the disk: DIR command

This particular DOS command helps you in displaying a list of files or directories that are present on hard disk as well as floppy disk. Thus, to see the contents of your hard disk, issue the following command:

C:\>**DIR** <Enter>

The above command displays the primary name, extension and size of files in bytes. It also displays the date and time when the file was created or modified last. If you wish to view the contents of the floppy drive, then you first switch yourself to the floppy drive and then issue the DIR command as shown below:

C:\>**A:** <Enter>

A:\>**DIR** <Enter>

Figure 5.2 shows two sub-directories ACCOUNT and EXPENSE. If you wish to view the contents of the sub-directory EXPENSE, then issue the following command:

C:\>**DIR \EXPENSE** <Enter>

Let us assume that there is one more sub-directory by the name BUSINESS existing under EXPENSE. To view the contents of this sub-directory, issue the following command:

C:\>**DIR \EXPENSE\BUSINESS** <Enter>

If you have a large number of files on the disk, then on issuing DIR command, the screen scrolls up and only a few filenames are shown. In such a case, issue the following command:

C:\>**DIR/P** <Enter>

The above command will show the contents of the disk pagewise or screenwise. Now, if you are interested only in seeing the filenames, then issue the following command:

C:\>**DIR/W** <Enter>

The above command shows the names of files and directories widthwise. So, in one line only five names of files and directories are shown. The other details like the size of file, the date and time of each file creation are not shown. The directories are shown in square ([]) brackets.

2. *Making a Directory: MD command*

In the earlier part of this chapter, we discussed that all the related files should be clubbed at one place, called a directory or sub-directory. So, to club all the related files under one head, new directories and sub-directories have to be created. Let us create a new sub-directory by the name INCOME under the Root directory. The following command can achieve this:

C:\>**MD INCOME** <Enter>

where MD stands for Make Directory. Further, let us create another sub-directory by the name HOSPITAL under the sub-directory Income.

C:\>**MD INCOME\HOSPITAL** <Enter>

3. *Removing a Directory: RD command*

With time, certain directories grow old and are no more needed. It is better to delete such directories because they can save us many precious bytes on the disk. So, let us delete the sub-directory HOSPITAL with the following command:

C:\>**RD INCOME\HOSPITAL** <Enter>

where RD stands for Remove Directory

A directory or a sub-directory has to be essentially empty before removing it. For example, in order to remove the sub-directory HOSPITAL, there should not be any directories and files under it. So, you must first delete all the files and remove all the sub-directories present under the sub-directory HOSPITAL before removing it. We will discuss the method for deleting files in subsequent part of this unit.

4. *Changing Directories: CD command*

Let us again refer to the Figure 2.2. Suppose you are under the EXPENSE sub-directory and you want to access the files or directories in the ACCOUNT sub-directory. This would involve the changing of directory from EXPENSE to ACCOUNT. This will make the ACCOUNT directory active. The task of changing directories can be accomplished with the help of CD command. Look at the following example:

C:\>**CD ACCOUNT** <Enter>

where CD stands for Change Directory

The above command will take you to the sub-directory ACCOUNT as shown by the following prompt:

C:\ACCOUNT>_

If you want to go to the sub-directory CASHSALE straight from the sub-directory EXPENSE, issue the following command:

C:\>**CD ACCOUNT\CASHSALE** <Enter>

After the above command, the following prompt will come:

C:\ACCOUNT\CASHSALE>_

The command for going to the root directory from the above prompt is:

C:\ACCOUNT\CASHSALE>CD\ <Enter>

But, the command for going to the parent or previous directory (whether it is root or sub-directory) is:

C:\ACCOUNT\CASHSALE>CD.. <Enter>

If you are in the sub-directory CASHSALE, the above command will take you to ACCOUNT sub-directory as shown below:

C:\ACCOUNT>_

File Commands of DOS

DOS offers a number of file commands for performing various operations on your file like copying, deleting and renaming the files.

1. *Copying Files: The COPY Command*

At times, you may have to work on some other machine. So, this involves copying files from one disk to another. Copying of files can happen from hard disk to floppy or vice-versa. Files can also be copied onto the same disk with a different name. The COPY command helps us to accomplish all these tasks.

The syntax of the copy command is:

COPY <Source drive>: (File spec 1) <Target drive>: (File spec 2)

where

Source drive refers to the drive from where the file has to be copied. It can be A, B or C.

'File Spec 1' refers to the path from where the file that has to be copied.

'Target drive' refers to the drive where the file is going to be copied.

'File Spec 2' refers to the destination where the file is going to be copied.

(i) *Copying a file to another drive under the same name*: A file can have the same name if it is stored on different disks. Thus, to copy a file by the name SCENE from hard disk to floppy disk, issue the following command:

C:\> COPY C:SCENE A:SCENE <Enter>

As the file is copied from the active drive, then there is no need to specify the source drive in the above command. On similar grounds, if the filename remains unchanged then there is no need to specify it after the target drive. Thus, the above command can also be given in the following way:

C:\>COPY SCENE A: <Enter>

(ii) *Copying a file to another disk under a different name*: The name of the file can be changed very easily while copying. The following command copies the file SCENE from the hard disk onto floppy disk by the name SERENE.

C:\>COPY SCENE A:SERENE <Enter>

(iii) *Copying a file with a new name on the same disk:* The file can be copied with a different name and stored on the same disk. Proceeding with the above example let us save the file SCENE with a new name, SERENE and copy it onto the same disk.

C:\>**COPY SCENE SERENE** <Enter>

Once this command is executed, we have the same file under two different names, stored on the same disk.

(iv) *Copying files from one directory to another :* Suppose you have placed all your files under the root directory. Now, at later point of time, you wish to club all the related files at one place. This can be easily done. Create a directory and copy the required files from the root directory to this newly created directory. DOS allows you to copy files from one directory to another.

Let us assume that you have a file by the name NORTH.TXT in the root directory and you wish to copy this file in the newly created Area sub-directory. The following command will do this:

C:\>**COPY NORTH.TXT \AREA** <Enter>

Similarly, you can copy files from any directory to any other directory. DOS only needs the specification of full path from you. Let us copy a file OLD.TXT which exists under the sub-directory DATA to the sub-directory INFO which is resident in the floppy disk.

C:\>**COPY DATA\OLD.TXT A:\INFO** <Enter>

2. *Deleting files: DEL Command*

With time, certain files grow old which are no longer required. So, it is desirable to delete such files because unwanted files occupy precious space on the disk. Suppose there is a file on the hard disk by the name TRY.PRG which is no longer required. The following command deletes this file:

C:\>**DEL TRY.PRG** <Enter>

If the file SALE.PRG exists on the floppy disk, first you go to the A: prompt and then delete the file as shown below:

C:\>A: <Enter>

A:\>**DEL TRY.PRG** <Enter>

While deleting any file of a sub-directory, its full path should be given as illustrated in the following example. Let us assume that the TRY.PRG file exists under a sub-directory MANAGE on the hard disk. To delete this file, issue one of the following commands:

C:\>**DEL C:\MANAGE\TRY.PRG** <Enter>

OR

C:\>**DEL MANAGE\TRY.PRG** <Enter>

You can also delete the IMT.PRG file by first changing to that sub-directory and then issuing the DEL command as given below:

C:\>**CD\MANAGE** <Enter>

C:\MANAGE>**DEL TRY.PRG** <Enter>

3. *Renaming Files: REN Command*

DOS allows you to give new names to your files. Assume that there is a file by the name OLD.TXT and now you wish to give a new name NEW.TXT to it. Carry out one of the following commands to get your work done.

C:\>**REN OLD.TXT NEW.TXT** <Enter>

OR

C:\>**REN DATA\OLD.TXT NEW.TXT** <Enter>

The file OLD.TXT which resides under the sub-directory DATA now has a new name NEW.TXT.

Wildcards

Often you may need to do a similar kind of job on a number of files. If these files have something in common, then we can save the effort of performing repetitive job. So, these files can be referred collectively by using the wildcard facility provided by DOS. The use of wildcards in a DOS command gives greater flexibility when using similar type of filenames. DOS offers two wildcards ? and *. Each ? can be replaced by exactly one character or none, if it is given at the end of the filename. As and when the ? wildcard is specified in the middle of a filename, it has to necessarily match one character. The * wildcard can match eight or less characters in the primary name and three or less characters in the extension part.

Let us take an example to make the concept of wildcards clear. Suppose the following files are present onto your disk:

Old.Txt	INCOME.pro	Alpha	Page.in
Go.Exe	OLD1	Dragon.Exe	KOMAL
Expense.prg	OLD20.bas	Over.prg	Annual.doc
New.doc	Zee.com	Old.doc	Paper.com

The following commands illustrate the concept of wildcards:

(i) If you wish to see all the files that start with the letter O and any extension, then give the following command:

C:\>**DIR O*.*** <Enter>

The above command will list the files OLD.TXT, OLD1, OVER.PRG, OLD20 and OLD.DOC

(ii) Now, let us copy all the files with any number of characters in the primary name and the extension EXE with the following command

C:\>**COPY *.EXE A:** <Enter>

The above command will copy the files GO.EXE and DRAGON.EXE onto the floppy disk.

(iii) To delete all the files beginning with OL, having two more characters in the primary name and any extension, issue the following command.

C:\>**DEL OL??.*** <Enter>

With this command, the files OLD.TXT, OLD.DOC and OLD1 are going to be deleted because these are the only files present on the disk which match the given wildcard pattern. The above command will not delete the files OVER.PRG and OLD20, because the former does not start with OL and the latter has 5 characters primary name.

(iv) Similarly, to copy all files starting with P and an extension comprising of two characters ending with N issue the following command:

C:\>**DEL P*.?N** <Enter>

This will delete the file PAGE.IN because this is the only file matching the given wildcard pattern.

(v) For copying all the files having primary name OLD and any extension from floppy to EXPENSE sub-directory of hard disk, issue the following command:

A:\>**COPY OLD.* C:\EXPENSE** <Enter>

The above command will copy only two files–OLD.DOC and OLD.TXT.

(vi) To copy all the files with primary name anything and no extension from EXPENSE sub-directory of hard disk to floppy, issue the following command:

C:\>**COPY \EXPENSE*. A:** <Enter>

The above command will copy the files ALPHA, OLD1 and KOMAL.

(vii) To delete all the files of floppy, issue the following command:

A:\>**DEL *.*** <Enter>

After giving the above command, the following message will come on the screen:

Are you Sure (Y/N)?_

Press 'Y' if you really want to delete all files otherwise press any key. Never try the above command on root directory of hard disk, otherwise your most important DOS file COMMAND.COM will also be deleted and thereafter you will not be able to boot the system from the hard disk. Therefore, wildcards with DEL command should be used with great caution.

Some More DOS Commands

You have already been introduced to the directory and file commands of DOS. Now, let us make ourselves familiar with other commonly used commands.

(A) Displaying and/or changing the current date: The DATE Command

DOS allows you to show as well as change the current date once you are on the DOS prompt. Issue the following command to see or change the today's date:

C:\>**DATE** <Enter>

After issuing the above command the following screen appears:

Current date is Thu 11-12-98
Enter new date (mm-dd-yy):_

So, key in the new date in 'month-date-year' format. However if you do not want to change this date simply hit the <Enter> key. The current date will be taken as new date.

(B) Displaying and/or changing the current time: The TIME Command

The TIME command is used to display and change the current time.

C:\>**TIME** <Enter>

On issuing this command, the following screen appears:

Current time is 11:05:10:01
Enter new time:_

Enter the new time in hours: minutes: seconds format. Hit the <Enter> key if you do not want to change the time. The new time can also be specified along with TIME command.

(C) Clearing Screen: The CLS Command

In order to clear the cluttered and clumsy screen, issue the CLS command. This will remove the contents shown on your screen thus making it look neater and cleaner. The CLS command is given in the following manner.

C:\>**CLS** <Enter>

(D) Creation of a new file: The COPY CON Command

Text Files can be created by COPY CON command. Look at the following example:

C:\>**COPY CON HELLO.TXT** <Enter>

This command tells DOS to copy the information from the keyboard or Console and put it in the file HELLO.TXT. On issuing the command the following screen appears:

C:\>**COPY CON HELLO.TXT**
_

You will find a blinking cursor in the second line. Enter the text and terminate each line by pressing <Enter> key as illustrated below:

My first DOS file. The name given to this file is Hello.Txt. <Enter>

It is very easy to create files in DOS. <Enter>

Once all the required text is entered, hit the <Ctrl+Z> keys together to mark the end of Text. <Ctrl+Z> keys tell DOS that no more text is going to be entered now. Again hit the <Enter> key.

(E) Displaying contents of files: The TYPE Command

The contents of any file can be viewed very easily by giving the TYPE command followed by the filename. Let us see the contents of file HELLO.TXT that we have just created by issuing the following command.

C:\>**TYPE HELLO.TXT** <Enter>

You can also send the output of a file to the printer. The following command starts the printing job provided the printer is on.

C:\>**TYPE HELLO.TXT >PRN** <Enter>

(F) Displaying a message on the screen: The ECHO Command

At times, you may require to display a text on the screen while executing a set of commands. The ECHO command helps you to display a meaningful message on the screen. This command is issued as illustrated below:

C:\>**ECHO Please insert floppy in drive A:** <Enter>

The ECHO command is a special DOS command used exclusively in batch files (the files containing a set of DOS commands). There is one more form of ECHO command i.e. ECHO OFF as shown below:

C:\>**ECHO OFF** <Enter>

The above command tells DOS not to display other commands in the batch file.

(G) Displaying the currently logged sub-directory: The PROMPT Command

Users always prefer to see the prompt for currently logged sub-directory. The PROMPT command tells DOS to include the sub-directory, greater than (>) sign or any text as a part of the prompt. The various forms of PROMPT command are discussed below:

(i) To display the path designation (e.g. \ACCOUNT\EXPENSE) and the greater than sign as a DOS prompt, issue the following command:

C:\>**PROMPT pg** <Enter>

After giving the above command, if you are logged to EXPENSE sub-directory of ACCOUNT sub-directory in the root directory, then the following prompt will come on the screen:

C:\ACCOUNT\EXPENSE>_

(ii) To display a text 'I Love India' along with path designation and greater than prompt, issue the following command:

C:\>**PROMPT I Love India pg** <Enter>

The above command will display the following prompt:

I Love India C:\>_

(iii) To display just greater than sign without path designation, you can give the following command:

C:\>**PROMPT** <Enter>

The command will display the following prompt:

C>_

(H) Specifying a sub-directory PATH: The PATH Command

By this time, you must be familiar with the directory structure of DOS. Suppose your program (say PRINCE.COM file) lies on the GAME sub-directory of the root directory and you want to execute it from any other sub-directory (say WINDOWS). To execute PRINCE.COM file, first you will have to make GAME as the currently active sub-directory and then issue the following command:

C:\GAME>**PRINCE** <Enter>

DOS provides a shortcut way to locate and run the above program from any other sub-directory by specifying the path as illustrated below:

C:\WINDOWS>**PATH C:\GAME** <Enter>

The above command tells DOS that GAME sub-directory is in the current search path of DOS. DOS will first search the required program file in the currently logged drive and then GAME sub-directory. Thus, the PRINCE.COM file can be executed directly from WINDOWS or any sub-directory as shown below:

C:\WINDOWS>**PRINCE** <Enter>

The PATH command is generally used in batch files.

Internal and External Commands

All DOS commands can be classified into two categories: Internal Commands and External Commands.

Internal Commands

The commands which are a part of the main files of DOS (i.e. COMMAND.COM and two hidden files) are known as Internal Commands. They are loaded in the RAM as soon as the computer is switched on. The important internal commands are DIR, COPY, DEL, REN, MD, CD, RD, TYPE, COPY CON, DATE, TIME, CLS, ECHO, PROMPT and PATH. We have already discussed all these commands quite in detail. These commands are very frequently used.

External Commands

External commands are those commands which are stored on disks as separate program files. These files have the same primary name as the command name. The extension of these files is either COM or EXE. So, at the time of execution of these commands, the corresponding program file should be present in the DOS sub-directory of the harddisk and DOS sub-directory should also be in the path search. The commonly used external commands are: FORMAT, DISKCOPY, CHKDSK, XCOPY and LABEL. Let us learn about these commands.

1. *Making the disk usable: FORMAT Command*

Before discussing the format command in detail, let us first see what is meant by the term 'Formatting'. Generally when you purchase a diskette from the market, it is unformatted. It can be compared with a notebook which has blank pages without any ruler lines. You would prefer to put lines, write page numbers and categorise the pages into equal parts so that an index can be made and the required topic can be searched very easily. Similarly, DOS organises the disk into concentric circles which are called tracks. Tracks are further divided into triangular regions. Each such region is called a sector. The organisation of disk into tracks and sectors is called Formatting. The Figure 5.4 makes the formatting concept more clear.

FORMAT command is used for formatting a hard disk or floppy disk. As FORMAT is an external command, a file by the name FORMAT.COM should be present on your disk. In order to format the floppy disk, issue the following command:

C:\> **FORMAT A:** <Enter>

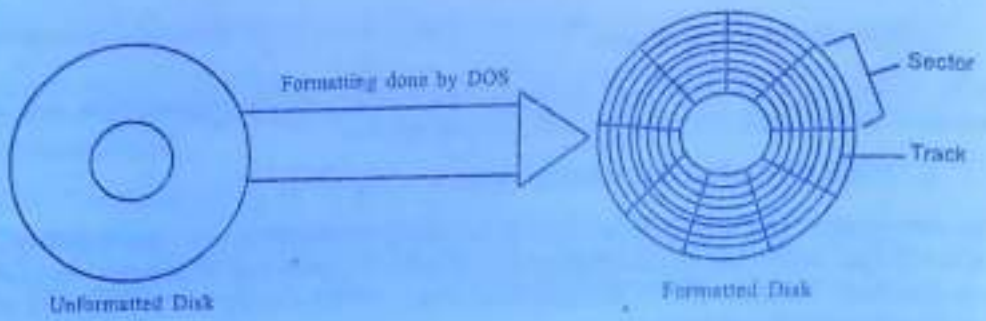


Figure 5.4: Process of Formatting

Once the above command is executed, the following message appears:

Insert new diskette in drive A:
and strike ENTER when ready

Insert a floppy disk in drive A and hit the <Enter> key. When the formatting of the disk is done, the following message appears on the screen.

Enter Volume Label (upto 11 characters):_

Here, you can give a name to the disk for its easy identification. A label upto 11 characters can be given to the disk after it is formatted. If you don't want that your disk should carry any label, simply press <Enter> key. Now, the following message will come:

Format Another (Y/N)?_

Now, if you want to format another disk, then hit 'Y' (for Yes) and insert that disk in the drive otherwise type in 'N' (for No) or press any key to end the format program.

New disks should always be formatted for using them. But old disks can also be formatted. Formatting will make the disk blank by erasing all its data. You may require to format an old disk if it has bad sectors and is needed again for usage. However, the FORMAT command should be used with extreme caution. Any disk whether hard disk or floppy disk will lose all data stored on it once the formatting operation is done. Therefore, you should not try the FORMAT command for formatting the hard disk. If you format the hard disk, all the contents stored on it are going to be removed permanently and new tracks and sectors will be created.

FORMAT command also provides a method for making your disk bootable. The following command is used for this purpose:

C:\>FORMAT A:/S <Enter>

With the help of above command, all the operating system files (COMMAND.COM and two hidden files) are copied from the hard disk to the floppy disk. This floppy can now be used to load DOS in the computer's memory if you are unable to boot the system from the hard disk. The COPY command cannot serve the above purpose because it can not copy the two hidden files of DOS in the boot sector.

2. *Checking a disk: The CHKDSK Command*

The command CHKDSK helps to check the status of the disk. After checking the disk, CHKDSK displays several items of information. However to get executed, this command needs the program file CHKDSK.COM. Let's check the status of the disk in drive A through the following command:

C:\>**CHKDSK A:** <Enter>

On successfully checking the disk, the following status is shown on the screen:

If no drive letter is specified with CHKDSK command, then the currently active drive is checked for.

3. *Giving volume label to disk: The LABEL Command*

Although, you have seen that a volume label to the disk is given at the time of formatting the disk, DOS also provides LABEL command to change, delete or give new label. This command needs a program file LABEL.COM. Let us give a label to the floppy disk by the following command:

C:\>**LABEL A:** <Enter>

Once the above command is executed the following screen appears:

Volume label in drive A has no label
Volume label (11 characters, ENTER for none) _

So hit the <Enter> key if you want to delete the volume label without typing in anything. You can also provide volume label directly with the following command.

C:\>**LABEL A:MANOJ** <Enter>

4. *Copying the contents of one floppy disk to another: The DISKCOPY Command*

The DISKCOPY command helps you to copy all the contents of one disk onto the other in such a way that both disks become identical. It copies the contents of the floppy disk present in source drive onto the disk present in the destination drive. If you have a single drive on your computer, then the same drive can act as source as well as the destination drive. The command to copy the contents of one floppy onto the other is given here:

C:\>DISKCOPY A: A: <Enter>

When you issue the above command a screen like the one shown below appears:

Insert SOURCE diskette in Drive A
Press any key to continue

At this point, insert the diskette whose contents are to be copied and then hit any key. Anothe message appears on the screen as shown below:

Insert TARGET diskette in drive A
Press any key to continue

So, after this message appears, insert the diskette into which the files are to be copied. Thereafte press any key to continue the process. Once the process of copying is completed, the followin screen appears:

Copy Complete
Copy Another (Y/N)?_

Press the 'Y' (for Yes) key if you want to copy the contents of some other diskette. DOS wi again prompt you to enter the source diskette. However, if you want to stop the DISKCOP process, press 'N' (for No). DISKCOPY command first formats the target diskette if it unformatted and then copies files onto it. So, if any contents exist on the target diskette, the are all going to be removed. The DISKCOPY command needs the program file DISKCOPY.CO for execution.

5. *Copying files and directories: XCOPY Command*

The XCOPY command is used to copy the files present in sub-directories. The comman 'COPY *.*' copies the files of the currently working directory and DISKCOPY comman copies the entire contents from one floppy to another. So, they are not helpful in copying fil selectively. The XCOPY command offers three special advantages:

a) It prompts you to specify the files that you want to copy.

b) It can also copy directories and other lower level directories.

c) It can be used to copy files from the hard disk to the floppy disk.

Now, let us explore the XCOPY command. If you wish that DOS should ask for yo confirmation for copying a file, then use the /P option along with the XCOPY comman Consider the following example:

C:\>XCOPY C:ACCOUNT A:ACCOUNT /P <Enter>

If you want to copy the directories and lower level directories, then use the /S option alongw the XCOPY command. Look at the following example:

C:\>XCOPY C: ACCOUNT A:ACCOUNT /S <Enter>

This command will copy the directory and all the sub-directories onto the A disk. Howeve the /S option is not specified, then the XCOPY command works within the single directo You can also use /P and /S option simultaneously with the XCOPY command as sho below:

C:\>XCOPY C:ACCOUNT A:ACCOUNT /P/S <Enter>

The whole path can be specified with the XCOPY command. This command again needs the program file XCOPY.EXE in order to get executed.

BATCH files

Very often, you keep keying in the same sequence of commands to do a repetitive job. For example, everyday, when you start your work on the computer, you first see the listing of files present on the hard disk. Then, you copy all the files with extension EXE and TXT from the floppy disk to hard disk. Thus, for achieving your task, you have to issue the following commands everyday.

```
C:\>DIR/P <Enter>
C:\>COPY A:*.EXE C: <Enter>
C:\>COPY A:*.TXT C: <Enter>
```

DOS can really simplify your task. All the sequence of commands can be put in a file which is called a batch file. This file offers a great advantage. Any number of commands given in a batch file can be executed by just giving a single command at the DOS prompt. DOS executes all these commands one by one. All the batch files can have any primary name but the extension given to these kinds of files is BAT. The method of creating a batch file is exactly similar to that of creating any other file on DOS. Let us see it through an example.

```
C:\>COPY CON MY.BAT <Enter>
DIR/P <Enter>
COPY A:*.EXE C: <Enter>
COPY A:*.TXT C: <Enter>
<CTRL+Z> <Enter>
```

In the above example, a batch file by the name MY.BAT has been created. If you want to execute this file, simplify type in the name of the file at the DOS prompt as shown below:

```
C:\>MY.BAT <Enter>
or C:\>MY <Enter>
```

The commands given in this batch file are going to be executed one by one in the sequence specified.

The AUTOEXEC. BAT file

The AUTOEXEC.BAT is an autoexecutable batch file. It is a special kind of a batch file. This file is executed as soon as the operating system is loaded in the computer's memory. The AUTOEXEC.BAT file is needed when you want it to be executed automatically each time the system is switched on. Now, as soon as the computer is switched on, DOS searches for the AUTOEXEC.BAT file in the Root directory of the bootable disk. If the system finds this file, then all the commands given in it are executed one by one instantly without even asking for date and time. The AUTOEXEC.BAT file is created like any other batch file. Look at the following example:

```
A:\>COPY CON AUTOEXEC.BAT <Enter>
ECHO OFF <Enter>
CLS <Enter>
ECHO My first Autoexec.bat file successfully executed <Enter>
PROMPT $P$G <Enter>
PATH C:\DOS;C:\WINDOWS <Enter>
<CTRL+Z> <Enter>
```

Enter the above commands on the root directory of bootable floppy disk. Reset your system. You will notice the above created batch file being executed automatically.

WINDOWS 95

Windows 95, a product of Microsoft is the latest upgrade of its earlier versions (Windows 3.0, 3.1 and 3.11). It is a graphical user interface (GUI) which has been designed to make your work more intuitive and easy. There is no more need of remembering the exact syntax of commands to get your work done. Everything is provided in the form of pictures and graphics. Windows 95 is a full fledged operating system. The program files and other resources are generally accessed with the help of mouse. The Windows 95 desktop acts as the primary media for organising your programs, files and resources.

Hardware requirements

The minimum hardware configuration required to run Windows 95 is given below :

- 486 or Pentium CPU
- At least 4 MB of RAM
- 10 MB to 40 MB of free disk space
- SVGA monitor
- Mouse
- Keyboard

Features of Windows 95

We will briefly discuss some of the features of Windows 95:

1. It provides a graphical operating environment. All the programs and other resources are provided in the form of Icons.
2. It is a full fledged operating system with an in-built copy of DOS. DOS programs can be safely run on Windows 95.
3. It is a multi-threaded and preemptive multi-tasking operating system which means that more than one application can be made to run simultaneously and more smoothly.
4. It supports long file names upto 255 characters, thus, breaking the DOS naming convention where you can give primary file name upto 8 characters.
5. The plug and play feature of Windows 95 automatically adapts itself to the hardware it is running on. It can detect hardware and then install all the proper drivers without taking any help from you.
6. It gets you organise all your work on the desktop or in folders. You can safely click at any folder to open it up.
7. It is more effective in cleaning up after crash of a faulty application. At any time, if a program crashes you can remove it safely from the tasklist without disturbing other running application. The memory and other resources that the application was using are altogether freed.
8. It contains a disk compression program which can essentially double your hard disk space, thus, preventing you from buying a new hard disk.

The Windows 95 Desktop

So, as and when you switch on your computer, Windows 95 is loaded in the RAM and a desktop appears on the screen as shown in Figure 5.5. This desktop contains folders, files, applications, taskbar and shortcuts.

Figure 5.5: The Windows Desktop

The objects labelled 'My Computer', 'My Briefcase' and 'Network Neighbourhood' are examples of folders. A folder is similar to a directory in DOS. A folder can contain other folders and individual files under it. Thus, to open a folder just double-click it. All the files and folders are shown graphically. Looking at the filename icon, you can easily make out the application to which it is associated. In order to open a file within a folder, simply double-click it. It will open the file with the correct application. Multiple objects can be selected by clicking at the object and then holding down the <Ctrl> key on the keyboard and clicking on another object. You can select as many files and folders as you want.

Now, to open the folder 'My Computer' just double-click it. All the resources on your computer are shown in it as can be seen in Figure 5.6. Now, if you want to see the files and folders present on your floppy disk, click the object '3 1/2 Floppy (A:)' icon.

Figure 5.6: The 'My Computer' window

The Taskbar

Taskbar is located at the bottom of the Windows 95 desktop. It contains a start button on the left side. On the extreme right side, the taskbar shows the current time. The taskbar also shows all the applications that are currently opened. You can switch between applications using the taskbar. The Figure 5.7 shows that Paint and Aldus Pagemaker 5.0 are the applications that are currently running. The button of the application that is running in the foreground appears depressed. The button that appears raised tells us that the application is running in the background. However, if you want to run any particular application in the foreground, then simply click at that button appearing on the taskbar.

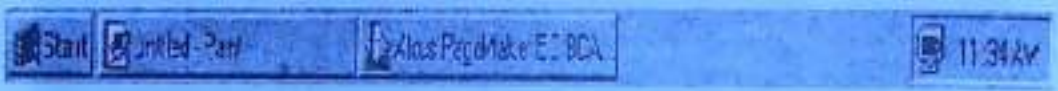


Figure 5.7 The Taskbar

The Start Button

The Start Button is a new and much useful feature of Windows 95. Click on it once to display the start menu. From the start menu many other menus can be seen. You can select any of the menu option by taking your mouse pointer on that particular menu can be seen in Figure 5.8.

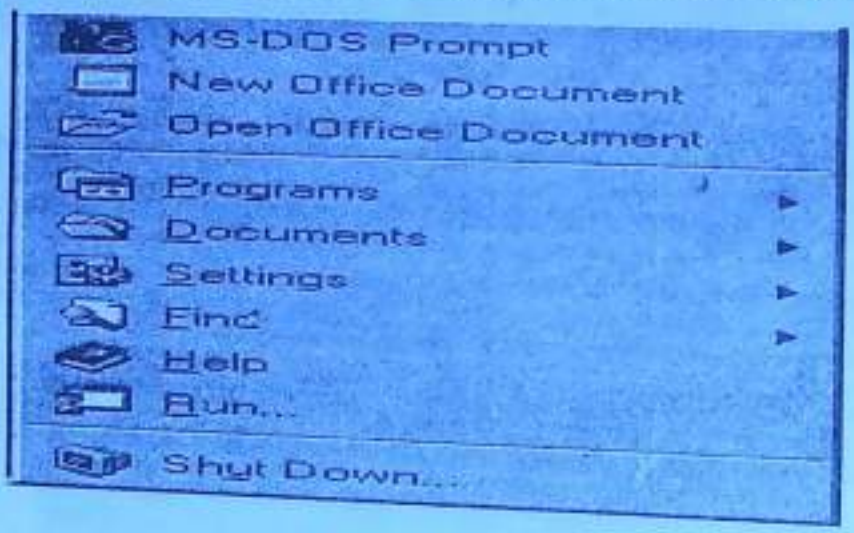


Figure 5.8: The Start Menu

1. The Program Menu

The program menu of Windows 95 as shown in Figure 5.9 is exactly similar to the program group found in Windows 3.1. It contains program groups and individual programs. Thus, to launch any program, simply take your mouse pointer at that particular program and click it. In order to open 'Accessories' program group, move the mouse pointer to that group and a cascading menu will appear on the screen. It contains Windows 95 accessory programs such as WordPad, Paint, Notepad, etc.

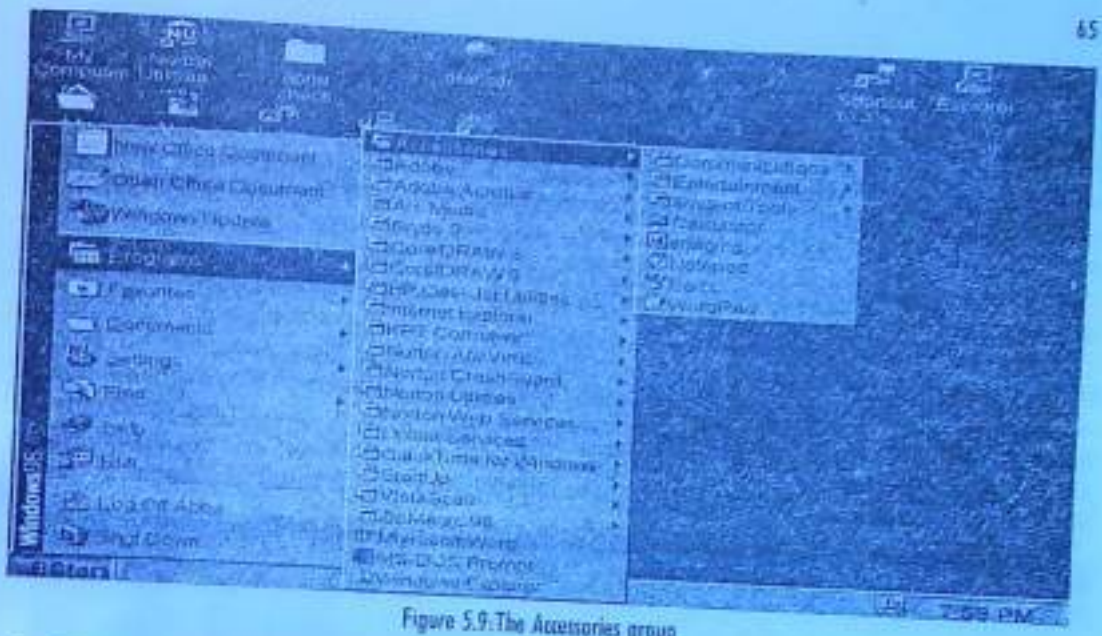


Figure 5.9: The Accessories group

2. The Document Menu

This menu shows you the document that you recently opened or worked upon. This offers a short way of opening a document. It launches the application in which the document was created. The document menu keeps tracks of the latest fifteen documents that you have used and it puts them in an alphabetical order.

3. The Settings Menu

This menu is used for changing the default system setting. You can fiddle with the control panel, printer folder and taskbar setting from here.

4. The Find Command

The Find option of the start menu helps in locating a particular file or a folder. It offers a quick way of finding a file. In the 'Named' box type in the file name you want to search. Accordingly, Windows 95 will return you the full details about the file.

5. The Help Command

Windows 95 has got very smart help to offer. In case you find yourself stuck on any issue simply select the Help option from the Start Menu. Above all, you can type in your query in your own words. Windows 95 will display you the related information.

6. The Run Command

The Run option of the Start Menu helps you to run your file or application straightway. Simply type in the full path and the filename in the 'Open' box and click at 'OK' button. You can also make use of the 'Browse' button in order to locate appropriate files.

7. The Shutdown Command

This command is used for shutting down the system. It offers three options. You can shut down your system, restart your system in windows mode itself or you can switch yourself to DOS mode temporarily. Select appropriate option depending upon your requirement.

Windows explorer

The File Manager of Windows 3.x is replaced with Windows 95 explorer. It helps you to manage and organise your files and folders. In order to start explorer click at the start menu. Select Programs and then the Windows Explorer option. The 'Windows Explorer' windows comes up on the screen as shown in Figure 5.10. This screen lets you to explore anything on your desktop. The left part of the explorer screen shows the desktop at the highest level. All the components of the desktop like 'My Computer', 'Network Neighbourhood', 'Recycle Bin', etc. are shown under it. You must have observed that some components of the desktop have a plus sign (+) before them. It shows that there are deeper level of components under it. On clicking at the plus sign, the next level of the hierarchy is shown. This layering of components continues as long as there is deeper level of folders or components underneath. The right side of the Explorer Screen shows the contents of the folder or the components that are selected in the left part of the explorer window. In the right part of window only, the major actions are performed. Now, we will learn some of the important functions that are performed frequently.

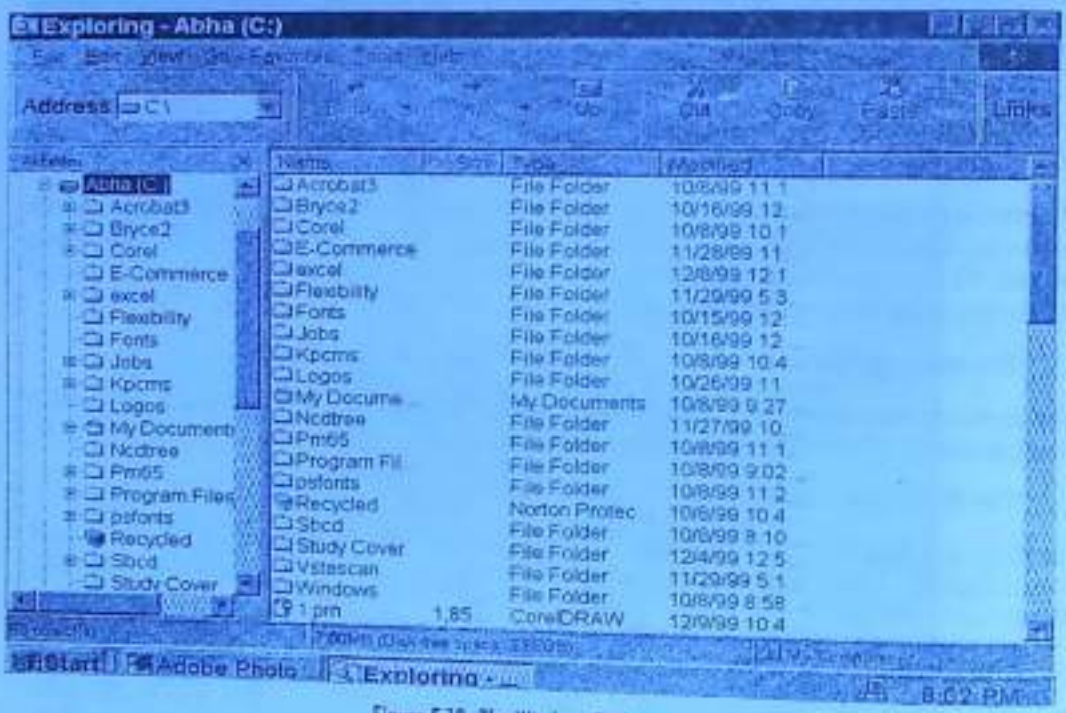


Figure 5.10: The Windows Explorer

(A) Renaming a file or a folder

In order to rename a file or a folder follow the steps given below:

1. Select the file or the folder that has to be renamed.
2. Right click the mouse button and select the Rename option.
3. Type in the new name that you wish to give to the file.

(B) Deleting a file or folder

A file or a folder can be safely deleted by following the steps given below:

1. Select the file or folder that has to be deleted.
2. Hit the <Del> key or from the File menu, select the Delete option.
3. Windows 95 will confirm before deleting the file.

(C) Moving a file

Windows 95 allows you to move files from one place to another. A file can be moved from one folder to another by simply performing the following drag and drop procedure:

1. Select the file that you want to move from the right pane.
2. Click the file or the folder on the left pane and drag it in the new destination.

(D) Copying a file to a floppy

In order to copy a file to the floppy disk, follow the steps mentioned below:

1. Select the file that has to be copied to the floppy disk.
2. Right click the mouse button and select the Send To option.
3. Select the floppy disk to which the file has to be copied.

(E) Creating a new folder

A new folder can be created by following the steps given below:

1. Select the parent folder that will contain the new folder.
2. From the File menu, select the New option. From the cascading menu, select the Folder option.
3. Windows 95 will ask you the name that has to be given to the new folder.

(F) Restoring from the Recycle Bin

In Windows 95, deleting a file is a two step process. Once the file is deleted, it is put in the 'Recycle Bin'. The 'Recycle Bin' appears on the desktop. It is of immense use if you have accidently deleted your files. The files once deleted can be restored from the 'Recycle Bin'. However, if the file is deleted from the 'Recycle Bin' also, then you cannot in any case recover your file. So, the Recycle Bin helps you to retrieve deleted files. In order to restore a file from the 'Recycle Bin', follow the steps given below :

1. Double Click the 'Recycle Bin' icon available on the desktop. A dialog box opens up as shown in Figure 5.11.
2. This window shows all the files that have been deleted. Select the file that you wish to restore.
3. From the File menu, select Restore option.

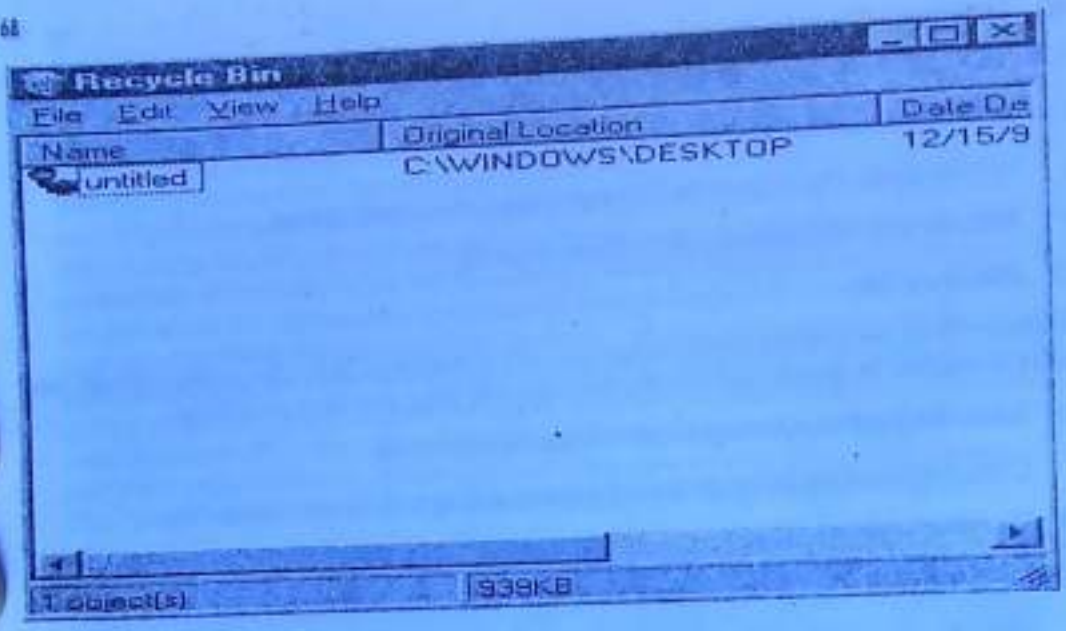


Figure 5.11: The Recycle Bin

(G) Emptying the Recycle Bin

If you wish to delete all the files from the Recycle Bin also, then follow the steps given below:

1. Double-click the 'Recycle Bin' icon on the desktop.
2. From the File menu, select the Empty Recycle Bin option.
3. Windows 95 will ask you to confirm before deleting all the files.

Windows 95 accessories

Windows 95, like its predecessors, contains several built-in accessories which make your computer easier and more convenient to use. In order to access Windows 95 accessories, click on the Start button, move the mouse cursor to programs and then click at the Accessories option of the cascading menu. We will learn a few of the commonly used built-in accessories of Windows 95.

(A) WordPad

Microsoft Wordpad for Windows 95 is a very simple word processing program which allows you to create, read and modify simple documents. It is more or less similar to Windows 3.x Notepad program but contains more features and is capable of opening a wider variety of documents. It contains basic file manipulation, editing, viewing and formatting tools that are essential for creating simple documents. It contains standard menu items. The Wordpad can be seen in Figure 5.12.

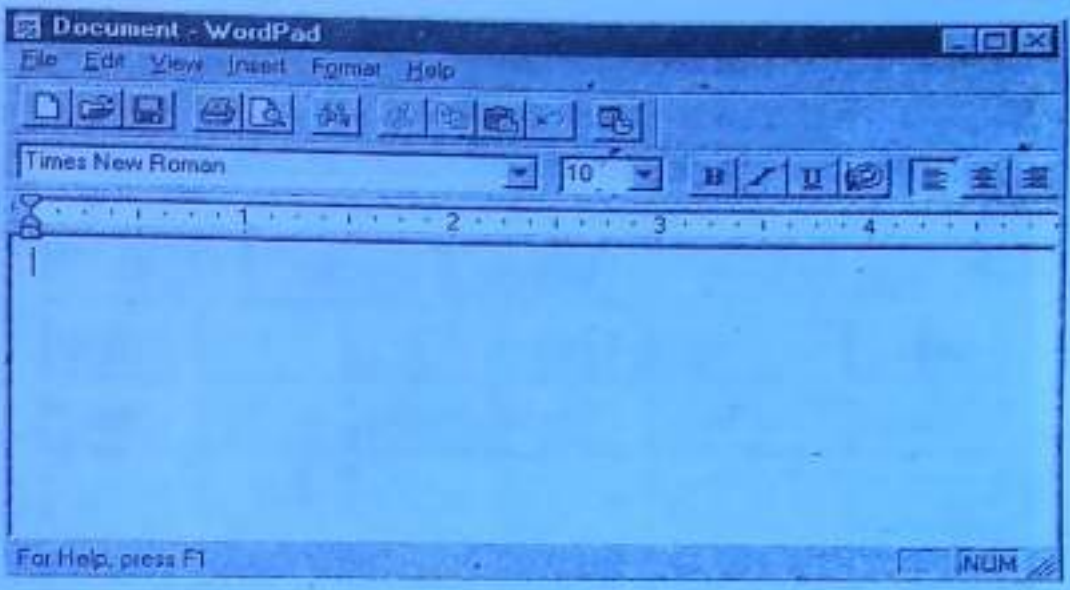


Figure 5.12: The WordPad Application window

(B) Microsoft Fax

The Microsoft Fax program of Windows 95 helps you to send and receive faxes. It can help you to send the documents that have been created on your computer. You can also send documents directly from compatible applications without ever leaving the application e.g. using Word for Windows, you can use the File menu's Send command to direct the output of that application directly to a fax telephone number rather than a printer.

(C) System Tools

Windows 95 contains a number of useful system tools to help you see and configure your system. Let us briefly discuss a few system tools.

Backup : This program helps you to perform backups of your computer system.

Disk Defragmenter : This system tool reconfigures files on your hard disk so as to speed up disk access times.

Scan disk : This utility is more or less similar to the old DOS checkdisk utility. It scans your disk and gives you the disk status by finding out the used, unused and bad sectors.

Drive Space : This utility is a disk compression program that can double up the space on a disk drive. If you need some extra space on your disk you can use this facility.

(D) Multimedia

Windows 95 contains utilities that can control your CD-ROM player and multimedia abilities. You can use it to control various aspects of your multimedia system.

(E) Calculator

Windows 95 has a desktop calculator that can perform simple calculations. It contains both the standard as well as the scientific calculator. The calculator has been shown in Figure 5.13.

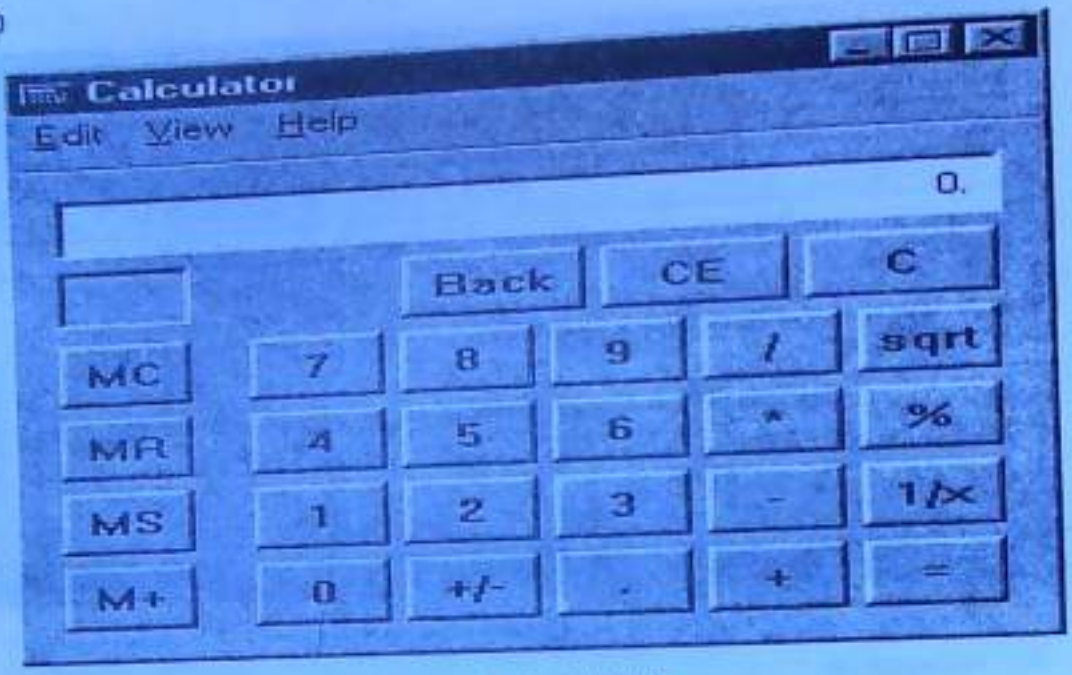


Figure 5.13. The Standard Calculator

(F) Paint

If you are a graphics lover, Windows 95 can fulfil your desire. It contains 'Paint' utility which can create simple graphics. You can create, open, view and edit graphics files such as bitmaps, PC Paintbrush files, etc. A typical Paint can be seen in Figure 5.14.

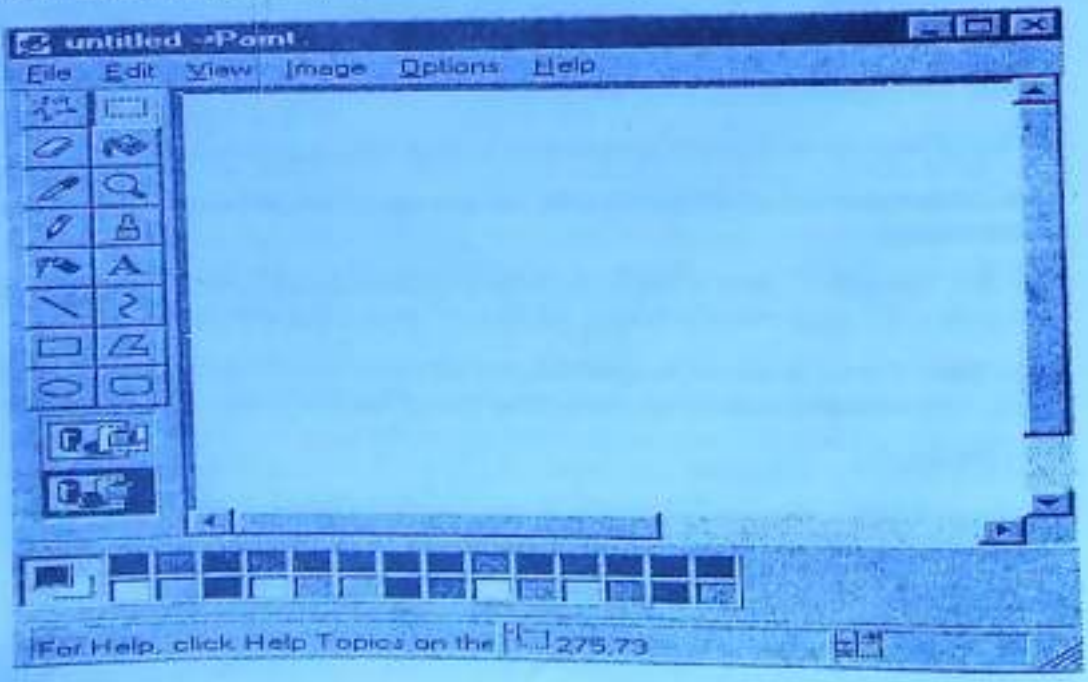


Figure 5.14. The Paint Application window

SUMMARY

An Operating System is the most essential system software, that manages the operation of a computer. There are two types of operating systems - single user and multi-user operating systems. DOS is the most commonly used single user operating system. It offers a platform on which different application programs can be run. DOS basically acts as a translator and helps you to communicate with the hardware and vice-versa. DOS offers a very powerful way of organising your files through the directory structure. The directory structure makes the search of a particular file easy. Each file has two parts – the primary name and extension, which are separated by dot. The primary name can have a maximum of eight characters whereas the extension cannot have more than three characters. Before working on the computer system, DOS must be loaded in the computer's memory. When a computer is switched on, DOS is first searched for on the floppy disk. If it is not present on the floppy disk, then DOS is searched for on the hard disk and loaded in the memory. Once DOS is loaded in the computer's memory, a DOS prompt appears on the screen. DOS offers a large number of directory and file commands. The two wildcards offered by DOS are – ? and *. The ? wildcard can replace exactly one character or none. The * wildcard can replace eight characters or less in the primary name and three or less characters in the extension. A combination of ? and * wildcards can be safely used. DOS also offers the concept of batch processing. DOS commands can be classified as internal and external. Internal commands are the commands which are an inherent copy of DOS itself eg. DIR, COPY, DEL etc. External commands are the commands which need special program files for their execution. A batch file contains a series of commands. All these commands are executed in the same sequence as specified in the batch file. All the batch files have an extension BAT. These files are executed simply by typing in the name of the batch file at the DOS prompt. The AUTOEXEC.BAT file gets executed as soon as the computer system is switched on.

Windows 95 is a product of Microsoft. It is a GUI in which everything is given in the form of pictures and icons. Now, there is no more need of remembering the exact syntax of commands to get your work done. Windows 95 is a full fledged operating system. The Windows desktop helps in organising programs, files and other resources. It is a multi-threaded and pre-emptive multi-tasking operating system. The plug and play of Windows 95 automatically adapts to the hardware it is running on. The Windows 95 desktop contains folders, files, applications, taskbar and shortcuts. The taskbar is located at the bottom of Windows 95 desktop. It contains a start button on the left side. On the extreme right, the taskbar shows the current time. The Windows explorer helps to manage and organise your files and folders. Windows 95 contains several built-in accessories which make your computer easier and more convenient to use.

Some DOS commands and their purposes:

DIR	To see file listing continuously (i.e. without pagewise)
DIR/P	To see file listing pagewise
DIR/W	To see file listing widthwise
MD	To make a sub-directory
RD	To remove a sub-directory
CD\	To go to the root directory from any directory
CD..	To change to the parent or previous sub-directory
CD\Directory name	To change to a particular directory that is under the root
CD	To see the name of the currently active directory
COPY	To copy file(s)
REN	To give a new name to a file
DEL	To delete file(s)
DATE	To show or change the current date
TIME	To show or change the current time
CLS	To clear the screen
COPYCON	To create a new text file
TYPE	To see the contents of a file

ECHO	To display a message on the screen
PATH	To specify the DOS search path
PROMPT	To change the DOS prompt
FORMAT	To create tracks and sectors onto the disk
CHKDSK	To check the status of the disk
LABEL	To give a label to a disk
DISKCOPY	To copy the contents of one floppy disk onto the other
XCOPY	To copy the files and directories that are at lower levels

REVIEW QUESTIONS

1. Fill in the blanks:
   (a) The _____ name of DOS can have a maximum of 8 characters.
   (b) _____ commands of DOS do not require separate program files for their execution.
   (c) The formatted disk contains _____ and _____.
   (d) The command _____ deletes all the files under the current working directory.
   (e) The command _____ shows the listing of files pagewise.
   (f) Windows 95 is a full fledged _____.
   (g) The filenames in Windows 95 can have a maximum of _____ characters.
   (h) You can make use of the _____ command if you find yourself stuck somewhere.
   (i) Windows Explorer helps you to _____ your files.
   (j) The Accessories group is present in _____.
2. State True or False:
   (a) No two files on the disk can have the same filename.
   (b) The COPY command cannot copy files from hard disk to floppy disk.
   (c) The Internal commands of DOS require separate program files for their execution.
   (d) The disk has to be formatted before using it.
   (e) The old diskettes cannot be formatted.
   (f) Files once deleted cannot be recovered.
   (g) The folder can contain other folders and individual files under it.
   (h) Windows 95 can open up multiple applications at one time.
   (i) You need a separate copy of DOS for running Windows 95.
   (j) The scandisk utility of Windows 95 is different from CHKDSK of DOS.
3. What is an operating system? Why is DOS important for a computer system?
4. What is meant by the term *Booting*? Explain the whole booting procedure.

5. Explain the directory structure of DOS with examples.
6. What is the difference between a file and a directory?
7. Explain the naming conventions used by DOS.
8. What are Wildcards? Explain by giving appropriate examples.
9. Differentiate between the internal and external commands of DOS by giving suitable examples.
10. What is a batch file? What is the difference between a simple batch file and an Autoexec.bat file?
11. Differentiate between the COPY, XCOPY and DISKCOPY commands.
12. Write down the steps to create a batch file.
13. Which of the following are valid file names:
    a) % # $. ABC
    b) Letters.doc
    c) COMPREHEN
    d) LYRICS.PATH
    e) 999.53
14. Give a command to create a directory LETTERS on the hard disk.
15. Create another directory by the name ZONE on the floppy disk.
16. Give a command to go to the root directory.
17. Give a command to display the name of the currently active directory.
18. Give a command to show the listing of files under the root directory (both pagewise as well as widthwise).
19. Create a batch file that copies all the files from the floppy disk to hard disk. Then, it gives a listing of all the files present on hard disk. Finally, delete all the files present on the floppy disk.
20. Give the command to remove all the files with any primary name and extension CAT.
21. Create a directory PLANNER and copy all the files from the root directory to this directory.
22. What command will you give to show all the files having an extension EXE?
23. Create a file by the name Myfile and enter contents in it.
24. Rename the file Myfile as Wonder.
25. Copy the file Wonder from the root directory to the directory PLANNER.
26. Go to A drive and create a directory by your own name.
27. Show the listing of all the files present on your floppy drive.
28. Issue the CHKDSK command both on the floppy disk and hard disk to see the status.
29. Use the DISKCOPY command for taking a backup of the whole floppy.
30. Give a label to your floppy. Specify your own name as the label name.
31. Issue the FORMAT command to format the disk present in A:.

32. Remove all the files and directories that you have so far created by issuing appropriate commands.
33. What is Windows 95?
34. Discuss some of the features of Windows 95?
35. Discuss the menu options present in the Start button.
36. Discuss the steps to create a new folder.
37. How can you restore files from the Recycle Bin?
38. Discuss some of the Windows 95 Accessories.

BLOCK 2

APPLICATION SOFTWARE FOR PC

CHAPTER 6

Application Software Available for PC

LEARNING OBJECTIVES

- Introduction
- Classification of Software
- General Purpose Application Software
- Special Purpose Application Software

INTRODUCTION

In the last chapter, we discussed the basic hardware concepts. A computer is a hardware and it is useless unless it is provided with the necessary software. Therefore, all computer users must be aware of the basic software concepts besides hardware. A software is a program or set of instructions, which is required to use the computer. Many types of software are available for various applications. The software development field is so advanced that day by day existing software are becoming outdated and new software are coming in the market. So, we must get aware of the latest developments in the software industry.

In this chapter, we are discussing all the important software concepts and providing you the latest knowledge of all the software available in the market. Though we are also providing you the current information about the latest version of a software, we are sure that it will be outdated soon.

CLASSIFICATION OF SOFTWARE

Software are broadly classified into following two types :

- System Software
- Application Software

System Software

Software that are required to control the working of hardware and aid in effective execution of a general user's applications are called *System Software*. These software perform a variety of functions like file editing, storage management, resource accounting, I/O management, database management, etc. Some of the examples of system software are DOS (Disk Operating System), Windows, BASIC, COBOL and PC TOOLS. These software are developed by System Programmers.

Types of System Software

System software can be further categorised into following three types:

(i) System Management Software
(Operating Systems, DBMSs, Operating Environments)

(ii) System Development Software
(Language Translators, Application Generators, CASE Tools)

(iii) System Software Utilities

Application Software

Software that are required for general and special purpose applications like database management, word processing, accounting etc. are called *Application Software*. Some of the examples of application software are dBASE, Word Star, Tally etc. Application software are developed using system software by Application Programmers.

Types of Application Software

Application software can be further classified into following two types:

(i) General Purpose Application Software
(Database Management Packages, Word Processors, Spreadsheets, etc.)

(ii) Special Purpose Application Software
(Accounting, Inventory, Production Management, etc.)

GENERAL PURPOSE APPLICATION SOFTWARE

Whenever an organisation purchases computers, besides an operating system certain application software are also required to be purchased. These software are needed for general purposes like word processing, database management, spreadsheets etc. and are known as General Purposes Application Software. We are discussing below the importance of different general purposes application software along with their major products.

Word Processor Packages

Word processors are application software which are used for word processing. Word processing is the most widely used technique for typing, editing, storing, formatting, manipulating and printing documents with the assistance of computer and printer. It is the most efficient means of generating documents electronically.

Advantages of Word Processing

Word processing offers several advantages over typewriting. Using the word processing technique, the user can -

- edit the text as and when required
- move or copy any part of the text from one location/ file to another location/ file
- insert or delete the spaces/ text
- wrap words to the next line (Word Wrapping) and justify text to the right margin (Justification)
- select different types of fonts and size of characters
- adjust the margins and page lengths for the desired output
- find the required word/ group of words and replace with another word/ group of words
- check the spelling of any word of the document
- store (save) the document on disk and print single or multiple copies
- print letters with same text and different names and addresses (mail-merging).

Besides the above main features, there are many more benefits of word processing depending upon the word processor used.

Examples of Common Word Processors

There is a wide range of word processors available for both DOS and Windows environment. Word Star, Softword, Akshar, MS Word, Word Perfect and Amipro are some of the common examples of word processors.

Word Star the most common and popular DOS-based word processor is developed by the MicroPro International Corporation, Inc. U.S.A.. There are different versions of Word Star like 1.x, 2.x, 3.x, 4.0, 5.0, 6.0 and 7.0 but the releases 4.0 (also known as Word Star Professional) and 7.0 (the latest one) are the most popular among users. Softword and Akshar are also DOS-based English and Hindi word processors respectively developed by an Indian Company, Softech.

Among the windows-based word processors, MS Word, Word Perfect and AmiPro are the leaders in the markets (DOS based versions of these packages are also available). MS Word, developed by Microsoft Inc. is a part of MS Office professional package. Word 6 for Windows 3.1 and Word 7 for Windows 95 are the most popular versions of Word. Word Perfect (latest version 6.0), developed by Word Perfect Corporation, which provides almost same features as MS Word is also very popular among users. Ami Pro (latest version 3.0)/ Word Pro, developed by Lotus Corporation, is another full-fledged, multi-featured word processor for windows. The important word processors are listed in Table 6.1.

Table 6.1: Common Word Processors

Word Processor	Description
Word Star	Simplest DOS-based word processor
Softword	Similar to Word Star developed by an Indian company
Akshar	Popular Hindi/English word processor developed by an Indian company
Word	Popular Windows-based word processor
Word Perfect	Most widely used Windows-based word processor
Amipro	Full-fledged, multi-featured Windows-based word processor with DTP features

Database Management Packages

Business processes are always associated with a huge amount of data. To store, manipulate and process such data, some software packages are needed, which are collectively known as Database Management Packages/ Software/ Systems (DBMS). *Data Base Management System* is defined as a software that organises and maintains the data in a database for providing the information. Before discussing about these packages, let us see what is meant by the terms - data, information, file and database.

Data and Information

Data and information are the two basic components of any information system. Data is defined as a set of basic facts and entities which itself has no meaning or value. For example, 5000, 4000, 4500, 4800, 8900.... is a data of employees salaries which itself has no meaning. On the other hand, information is defined as that data which has some meaning or value. For example, the personal data of employees names and their basic salaries represented as "Komal – 5000", "Rajesh – 4000", "Sarika – 4500", "Suchitra – 4800", "Pawan – 8900", etc. is an information because it has some meaning.

File and Database

File is a group of related records in a database. For example, a group of personal records of all the employees of a company is a file. However, database is a collection of related files that is created and managed by a database management system. The most important point to remember

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File and Database

File is a group of related records in a database. For example, a group of personal records of all the employees of a company is a file. However, database is a collection of related files that is created and managed by a database management system. The most important point to remember

about database is that it contains data and not necessarily information. Some of the examples of the database are as follows :

(i) The vouchers, bills receipt and other financial data of an organisation.

(ii) The details of students and their marks obtained for preparing their result in a school.

In the above examples, the data can have some meaning or no meaning in itself until it is processed to get useful information.

Examples of Database Management Packages

Many database management packages are available in the market. Managers must be aware of the benefits and limitations of these packages before purchasing and using them. dBASE, Foxbase, Foxpro, MS Access, Paradox, Oracle, Ingres, Sybase, Informix etc. are the major products of database management systems.

dBASE is the most popular and simplest to learn database management system which is developed by Ashton-Tale, U.S.A.. dBASE II was the first product developed for database applications and later on Ashton-Tale developed new versions viz. dBASE III plus, dBASE IV and dBASE V. dBASE III plus and dBASE IV are exclusively DOS based versions while dBASE V is windows-based. FoxBASE+ is a dBASE III plus compatible DBMS, which is originally developed by Fox Software and later on by Microsoft. It is faster and multi-user as compared with dBASE III plus which is slow and single-user. Microsoft developed another dBASE IV compatible DBMS, called FoxPro which has now become very popular among users. FoxPro 1.0, 2.0, 2.5, 2.6 and Visual FoxPro 3.0/5.0 are the different versions of FoxPro. FoxPro offers several advantages over both dBASE and FoxBASE. The difference between dBASE, FoxBASE and FoxPro are given in Table 6.2.

Table 6.2: Comparison among three popular DBMS

Criteria	dBase	Foxbase	Foxpro
Operating Environment	DOS/Windows	DOS	DOS/Windows
Users	Single-user	Multi-user	Multi-user
Execution Speed	Slow	Medium	Fast
Disk Storage	Less	Average	More
Features	Less	Average	Many
Program Generators	Less	Less	Many
Compiler	Not available	Available	Available

MS Access, developed by Microsoft Inc., is also a part of MS Office professional package. It is a relational database management system (RDBMS), which is windows based and is quite similar to Visual FoxPro. Paradox, a part of Corel Office Pro software, is a network RDBMS and is known for its Querry By Example (QBE) method for asking questions. Oracle, Sybase, Ingres and Informix are the leaders among RDBMSs. The list of major DBMS products are illustrated in Table 6.3.

Table 6.3: Common DBMS Packages

DBMS package	Description
dBase	Most popular DOS/Windows based database management system
Foxbase	Faster, multi-user dBase-compatible DBMS
Foxpro/ Visual Foxpro	DOS/Windows-based DBMS with advanced features
Access	Windows-based DBMS similar to Visual Foxpro
Paradox	Network RDBMS with QBE (Query By Example) features
Oracle	Most popular RDBMS for microcomputers
Sybase	Distributed RDBMS that runs on most servers
Ingres	Popular RDBMS that runs on many operating systems
Informix	Popular RDBMS server mainly for UNIX operating system

Spreadsheet Packages

Business applications require a lot of calculation work. In manual system, it is done on a sheet of paper with rows and columns, which is called a 'spreadsheet'. Spreadsheet packages use the concept of an electronic spreadsheet. An electronic spreadsheet (or worksheet) is a very big sheet consisting of thousands of rows and columns, which is used to store information in the memory of a computer. Like databases, electronic spreadsheets have now become an essential tool in developing a computerised management information system. Income statements, annual reports, balance sheet, cost analysis and budgets are some of the applications where worksheets are typically used.

Advantages of Electronic Spreadsheets

The electronic worksheet offers several advantages over manual and other computer application software. These are described as follows :

- The user can perform any type of calculations involving mathematical, financial, statistical and other functions.
- All recalculations are performed automatically, if any figure is changed.
- As worksheet is very big in size, so a large volume of data can be stored on a single worksheet. For example, it is possible to store entire data of accounts of a big organisation on a single worksheet.
- The user can view / print the data in any desired format.
- Most of the word processing features like spell checking, find / replace words can also be performed on a worksheet.
- The data of worksheet can be viewed in many types of graphs / charts.
- The worksheet can be saved, retrieved, combined to another worksheet and transferred to files of different database and word processing packages.

Besides the above main features, there are many more benefits of spreadsheets depending upon the spreadsheet package used.

Examples of Common Spreadsheet Packages

There are many products of spreadsheet packages– some of them are exclusively windows based like MS Excel and others both as DOS and Windows based like Lotus 1-2-3. Lotus 1-2-3, developed by Lotus Development Corporation, is the most popular spreadsheet package among DOS users. The different versions of Lotus 1-2-3 are release 1.x, 2.x & 3.x (DOS based) and 4 & 5 (both DOS & Windows based). Lotus 1-2-3 is also available as a part of Lotus Smartsuite office automation package in the market. MS Excel, a part of MS Office, is the most popular Windows based spreadsheet package. The latest and popular versions of Excel are Excel 5.0 (for Windows 3.1) and Excel 7.0 (for Windows 95). Quattro Pro (latest version 5.0), developed by Borland International is another spreadsheet package that provides advanced graphics and presentation features. Javelin Plus (from Information Resources, Inc.), Multiplan (Microsoft Corp.), Supercalc (Computer Associates International, Inc.) and PlanPerfect (Word Perfect Corp.) are some other examples of spreadsheet packages. The list of major spreadsheet packages are given in Table 6.4.

Table 6.4: Common Spreadsheet Packages

Spreadsheet Package	Description
Lotus 1-2-3	Most popular DOS/Windows based spreadsheet package
Excel	Most popular Windows based spreadsheet package
Quattro Pro	Spreadsheet package with advanced presentation features
Javeline Plus	Spreadsheet package that uses names to identify cells
Multiplan	Spreadsheet package from Microsoft Corp.
Supercalc	Spreadsheet package from Computer Associates
PlanPerfect	Spreadsheet package from Word Perfect Corp.

Office Automation Packages (Office Suites)

Word processors, Spreadsheets and Database Management packages are also available as integerated packages generally called Office Automation Packages/ Software Tools or Office Suites. MS Office and Lotus Smartsuite are two most popular examples of office automation packages.

Microsoft Office (MS Office) Professional is a package that contains five powerful general purpose application packages. It includes Word, Excel, Powerpoint, Access and Mail. We have already discussed about Word, Excel and Access in previous sub-section. Powerpoint is used to create professional presentations in the form of slides. The user can write text, draw figures and organisation charts on these slides. Powerpoint is the most popular and commonly used desktop presentation program for Macintosh and PCs. Powerpoint 4.0 and Powerpoint 7.0 are the currently used versions for Windows 3.1 and Windows 95 respectively. MS Office 4.3 and MS Office 97 are two currently used versions for Windows 3.1 and Windows 95 respectively.

Graphics, Multimedia and Animation Software

For last few years, Graphics, Multimedia and Animation Software are becoming very popular for high quality presentation of business and other applications. CorelDRAW, Adobe Photoshop, AutoCAD Map and Harvard Graphics are some of the commonly used graphic software. We have already discussed about CorelDRAW in the previous sub-section. Adobe Photoshop is an image editing software with multiple layers, interactive GUI and powerful object-based editing tools. AutoCAD Map is a software for mapping and graphic applications. Harward Graphics, developed by Software Publishing Corp., is a business presentation software. It allows the user to create professional looking presentations in just few minutes.

Multimedia, a latest computer technology, displays information using a combination of full-motion video, text, graphics, animations and sound. A wide range of multimedia and animation software are available in the market. Macromedia Director, 3D Studio Max, AnimatorPro and Animator Studio are some of the commonly used multimedia / animation software. Macromedia Director is a multimdeia authoring software for creating tutorials and CBT (Computer Based Training) software. 3D Studio Max software allows the user to create 3D modelling and animations on a PC. AnimatorPro is an 8-bit, 256 color, 2D Paint and animation software with in-built C based programming, 3D Studio and customised GUI. Animator Studio is a digital sound studio designer for animation with true color features.

Business Application Software

Every business consists of many functions which are organised into different departments like Finance, Marketing, Invetory, Production, Research and Development (R & D) and Human Resources Development (HRD). For computerising these departments, special kind of application software are needed, which are collectively called as Business Application Software. These software are available either general requirements of the users (Standard Software) or can be developed as per the requirement of a specific organisation/ user (Customised Software).

Accord, EX and and Tally are some of the examples of popular standard financial accounting software packages among Indian users. Accord (latest version 4.1), developed by EDP Corporation, is the comprehensive accounting software for preparing MIS and other reports. EX (latest version 3.0), developed by Tata Consultancy Services, provides business accounting capabilities along with inventory and invoicing features. Tally (latest version 5.0), developed by Peuronics Pvt. Ltd, is the accounting and book keeping software along with capabilities of invoicing / inventory accounting.

SUMMARY

Software are the programs required to operate a computer. They are broadly classified into System and Application software. System software include mainly operating systems, operating environments, DBMS (Data Base Management Systems), language translators (Assemblers, Interpreters and Compilers), applications generators, CASE tools and various software utilities. Application software are further classified into General Purpose (Word Processors, Spreadsheets, Database Management Software, etc.) and Special Purpose (Accounting, Inventory, DeskTop Publishing software, etc.) application software.

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REVIEW QUESTIONS

1. Fill in the blanks:
   (a) The two types of Application software are _____ and _____.
   (b) The frequent uses of a wordprocessor are _____, _____, _____, _____ and _____ documents.
   (c) A spreadsheet is very big sheet consisting of _____ and _____.
   (d) _____ is defined as a system software that organises and maintains the data in a database for providing the information.
   (e) _____, _____ and _____ are some of the examples of popular financial accounting software.

2. Write True or False:
   (a) Access is a Windows based DBMS similar to Visual Foxpro.
   (b) CorelDRAW and Harvard Graphics are some of the commonly used graphic softwares.
   (c) Standard software is developed as per the requirement of a specific organisation/user.
   (d) Word is a good example of a general purpose application software.
   (e) Database Management System is defined as a system software that organises and maintains the data in a database for providing the information.

3. Differentiate between system and application software. Give 4 examples of each.
4. Discuss the importance of word processors in generating documents. Give some examples of DOS-based and Windows-based word processing packages.
5. Discuss the major features of commonly used Database Management packages.
6. What is an electronic spreadsheet? Describe its major advantages. Name some commonly used spreadsheet packages.
7. What are Office Suites? Why are they so popular among computer users? Discuss with examples.
8. What is DTP? Describe the importance of various DTP software currently available in the market.
9. What is multimedia? Name any 4 multimedia software which are popular among users.
10. Discuss the role of various business application software in computerising the different departments of a company.

CHAPTER 7

Word Processing

LEARNING OBJECTIVES

- Introduction
- What is Word Processor
- How to Start Word 97
- Enhancements in WORD 97
- Working with Documents
- Exiting WORD 97
- Editing Documents in WORD 97
- Formatting Documents
- Find and Replace Commands
- Numbering Pages
- Clip Gallery
- Page Setting
- Application of a Word Processor in Corporate Sector

INTRODUCTION

Over the centuries, we as human beings have always felt the need to communicate and share our ideas and thoughts. The written word has always remained the best and the most effective way of interaction irrespective of the place and nature of job of the person. Sometimes, writing a note comes more easily to us than conveying it verbally. We often prefer to talk to our distant friends and relatives by way of writing only. At times, it is far more easier to express our feelings by setting them down on paper rather than saying them orally. Any kind of formal or informal message can be best sent across by penning it down.

Once the whole work of writing is done, you would be very anxious to read it through to check for any grammatical errors or spelling mistakes. If there are any, then imagine the disappointment you will have to face because then it will demand the pains of writing the whole document again. Similar kind of problems are faced with our old conventional typewriter also. A small change in the typewritten text would involve retyping the entire text again. Now, as and when the work of writing the whole document is over, we must concentrate our attention at the final look of the document. The document has to be made attractive with text, neatly and properly organised within margins. Paragraphs are required to be indented with reasonable spacing between lines. Finally, the document should be free from all kinds of spelling mistakes and grammatical errors. This is a universal truth that a neatly organised and well formatted document is definitely more appealing to the reader's eye.

The following things are to be kept in mind while giving a neat and formal look to your document:

- A long document should be broken down into small paragraphs.
- Proper line spacing should be given.
- The words at the end of the line should not be incomplete.
- The important words and headings should be highlighted either by way of underlining them or by putting them in different font and size.
- There should not be any grammatical and spelling mistakes.
- The text should be placed properly between margins.

Inspite of taking all the efforts and precautions, we cannot keep track of all the above mentioned requirements. Now, for easing our job, a software called '*Word Processor*' has come to our rescue. A Word Processor can do all of these things without any hastle.

WHAT IS WORD PROCESSOR

Word processing includes typing in text and manipulating it so as to give a very systematic and organised look to your document which enables easy reading. The application software or program which helps us in processing the text is called a '*Word Processing Software*' or simply a '*Word Processor*'. So, you can say that a word processor is nothing but a computer program that helps you to:

- type your text
- correct spelling mistakes and grammatical errors
- align text within margins
- offer a variety of font styles and font sizes
- see a preview of the text that you have typed in.

Popular Word Processing Packages

The commonly used word processing packages are:

- MS-WORD
- Word Star
- Word Perfect
- Professional Write

Uses of Word Processing

Normally, a word processor can accomplish the following tasks:

- Brochures
- Newsletters
- Reports
- Advertisements
- Resumes and Cover letters
- Books
- Directories
- World Wide Web Pages

There is absolutely no end to what a word processor can do. By now you must have realised that the word processing applications have become much more sophisticated than before.

HOW TO START WORD 97

To startup WORD in Windows 95 or Windows 98, do the following steps:

1. Click at the Start button which lies at the bottom left corner of the screen.
2. Click at the 'Programs' option. A cascading menu appears on the screen.
3. Click at 'Office 97' option. Again, a cascading menu appears. Select 'Microsoft Word' option of the cascading menu. WORD will be loaded in the computer's memory.

You will find that the above menu options are more or less similar to Figure 7.1.

The menu options shown in Figure 7.1 might not exactly resemble with those seen on your computer. So, in that case you might need to search where actually MS-Word is installed on your computer.

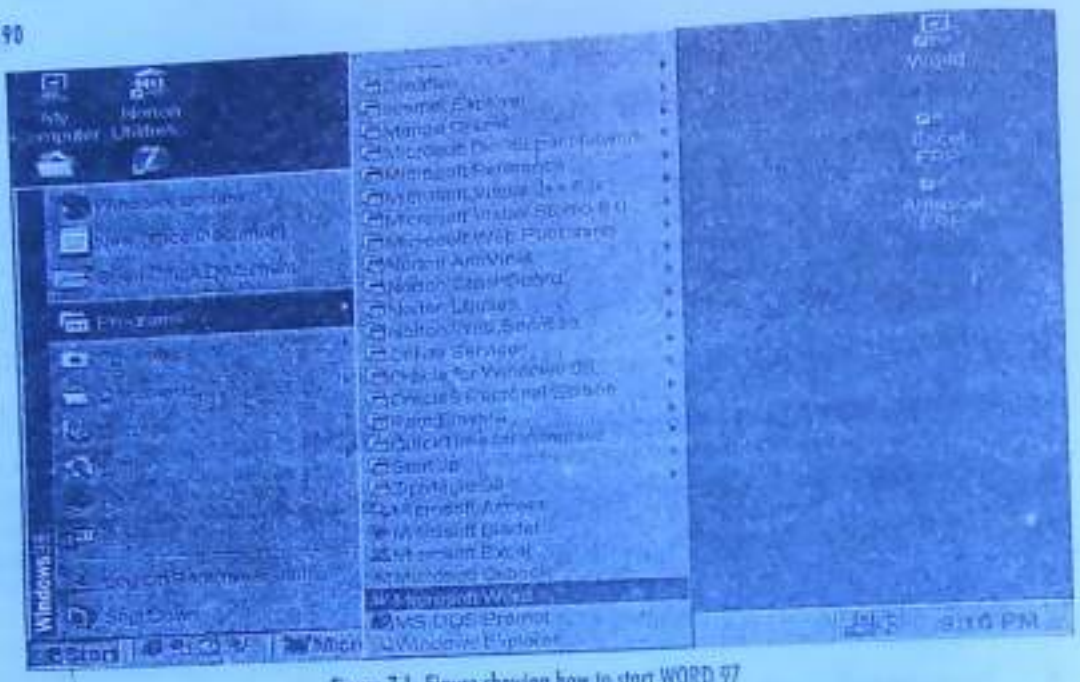


Figure 7.1: Figure showing how to start WORD 97

Alternatively, you can start MS-WORD in the steps given below:

1. Click at the START button.
2. Select 'New Office Document' as shown in Figure7.2.

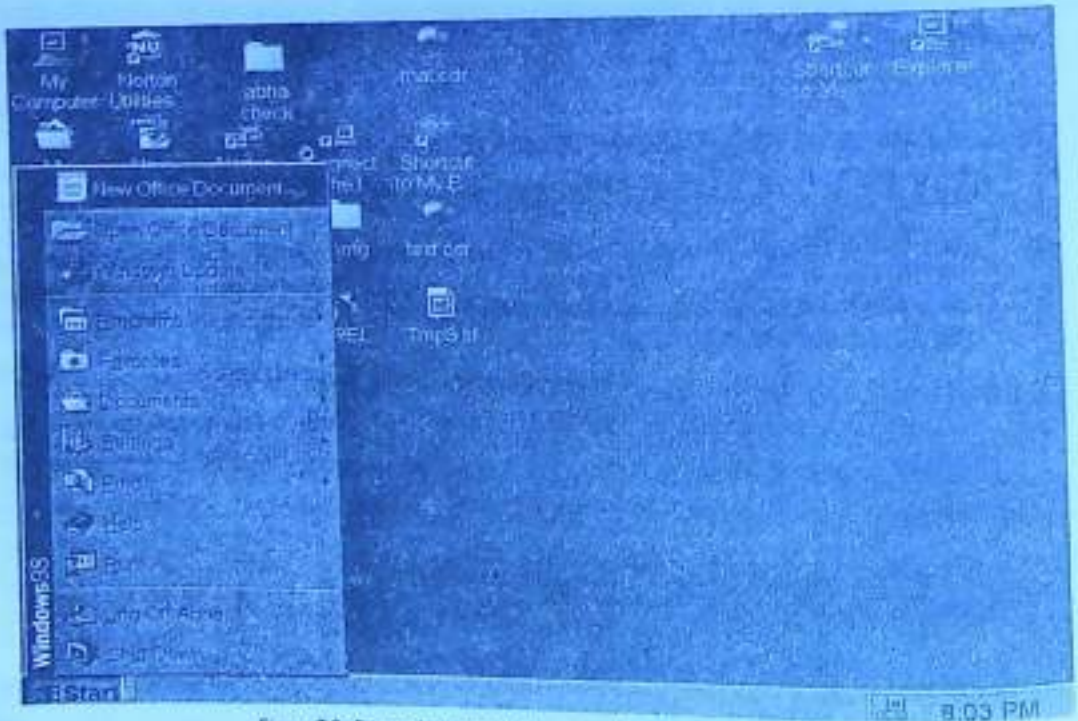


Figure 7.2 Figure showing and Alternative Method to Start WORD 97

This would bring up WORD with a new document opened up for you. Your computer screen will match closely to the Figure 7.3. This blank page is nothing but an empty file created automatically by WORD. This file by default gets the name - Document1. The extension given to a WORD document is 'doc'.

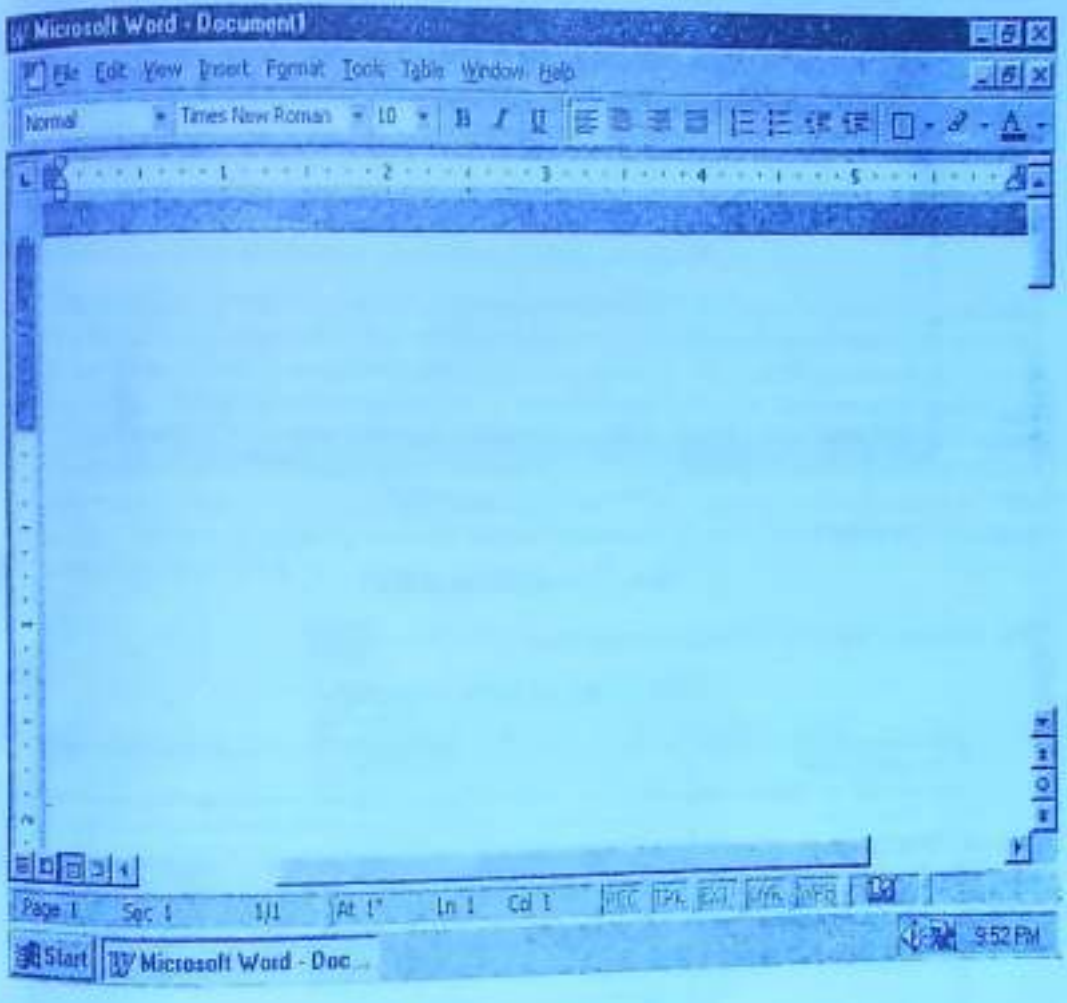


Figure 7.3: WORD's startup screen

Screen Elements

When WORD opens up, you will notice two windows on the screen, one nested closely within the other. The larger among these is called the Application Window, which frames the entire screen. The smaller window is called the Document Window, which fits in the application window. Both these windows serve a different purpose. The application window helps the user to communicate with the WORD program, whereas the document window is used for creating as well as modifying the WORD documents. So, as you keep typing, the words displayed on the monitor or screen, are actually shown in the document window. The different elements of the screen are shown in Figure 7.4

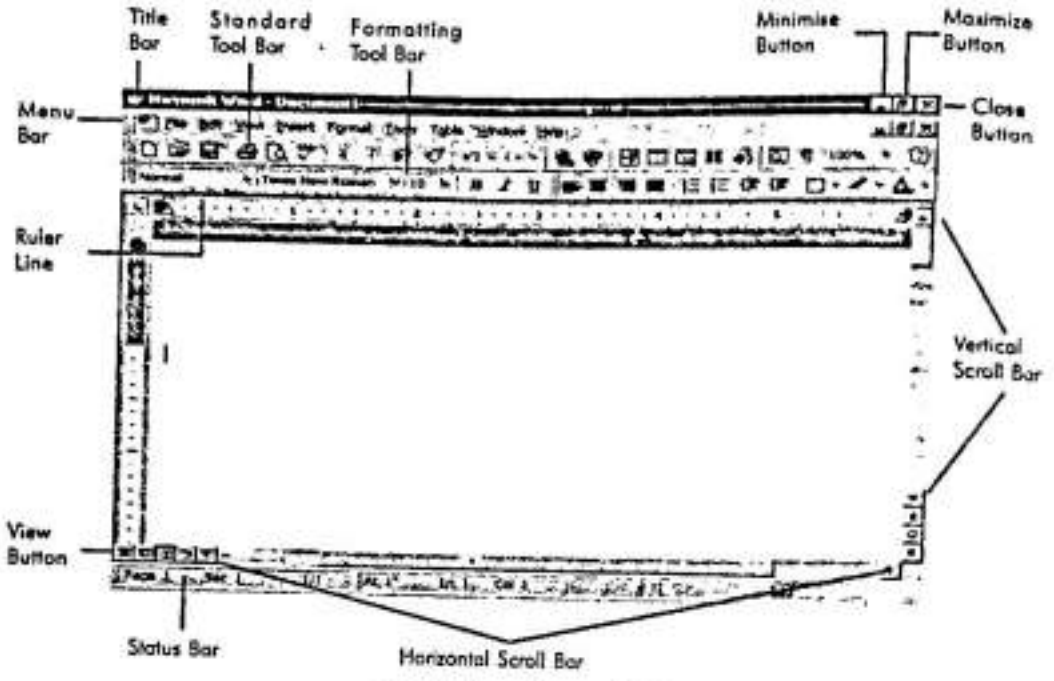


Figure 7.4: Screen Elements of WORD

The different elements of this screen are outlined in Table 7.1:

Table 7.1: Description of Screen Elements

Screen Element	Description
Title Bar	Located at the top of the screen; it displays the name of the application (here 'Microsoft Word') and the active document name (here 'Document1').
Menu Bar	It shows menu options of WORD and is located under title bar.
Standard Toolbar	Located exactly below the menu bar and gives access to WORD's most frequently used commands and utilities.
Formatting Toolbar	Lies below the standard toolbar; it offers commonly used formatting commands.
Ruler Line	Located below the formatting toolbar and provides ongoing page measurement and quick access to margins, tabs and indents.
Status bar	Located at the bottom of the screen; it displays important and varied information about the currently opened document like page number, column number, line number, etc.
View Buttons	Located towards the left side of the horizontal scroll bars(above status bar); they show the documents in different views like normal view, page layout view, outline view etc.
Horizontal Scroll Bars	Help the user to move in the left or right side of the document
Vertical Scroll Bars	Help the user to go up or down in the same document.
Maximise Button	Located in the upper right corner of the screen; it controls the size of the application window.
Minimise Button	Located in the upper right corner of the screen, towards left of maximise button; it helps to minimise the whole application and show it in the reduced form on the taskbar.
Close Button	Located in the upper right corner of the screen, towards right of maximise button; it helps to shut down the opened application; it also allows the user to save the opened files before quitting WORD

Contents of Menu Bar

All the menu pads located on the menu bar can be pulled down by clicking at them or by pressing <Alt + key> where 'key' is the underlined character of the menu name. At one time only one menu pad can be activated and pulled down. From the pull down list, any entry can be selected with the help of mouse. In all the pull down menus, you would find that a few entries are shown in light colour. These entries are called 'ghosted' entries and are inaccessible. These '*ghosted*' entries become solid only when the features they support become accessible. For example, the cut, copy, paste entries become active from the 'Edit' menu only when some text is selected and is made available on the clipboard. When the text is no more selected, these entries again become inactive.

Now, we will explore the contents of different menu pads briefly.

1. *File:* Pull down the 'File' menu by pressing either <Alt + F> keys together or by clicking it with the help of mouse. This menu is used for performing file operations like creating a new file, opening an existing file and then closing it. The 'Save' options help to save the files. The 'Properties' option gives information about the current document. The 'Page Setup' option allows to set page size, margins and paper orientation etc. Document can be previewed with the 'Print Preview' option. The printing operations can be carried out using 'Print'. 'Exit' option closes the WORD application. At the bottom of 'File' menu, the names of all the recently saved files are displayed. The 'File' menu has been shown in Figure 7.5

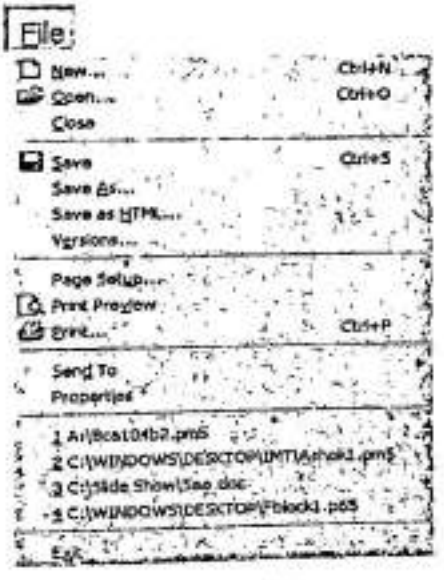


Figure 7.5: The File Menu

2. *Edit:* The 'Edit' menu helps you to delete, copy and move chunks of text. The 'Paste Special' option helps you to link your text with other applications. 'Find' option tries to help you by searching a particular word or phrase. In case you want to replace the selected word with some other word or phrase, then use the 'Replace' option. The 'Edit' menu can be seen in Figure 7.6.

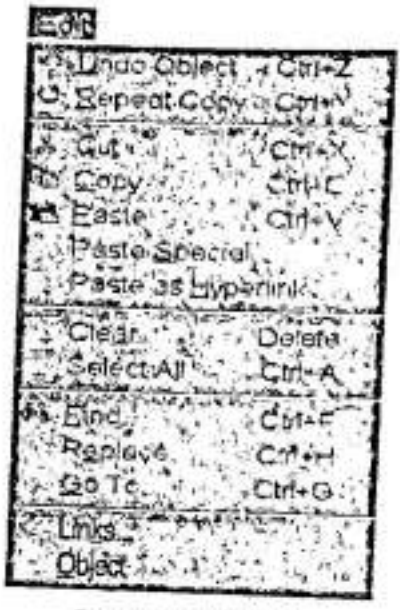


Figure 7.6: The Edit Menu

3. *View:* The 'View' menu can be used to show your document in a variety of ways like Normal, Outline, Page Layout, Master Document and Full Screen. Through the 'Toolbars' option, you can also decide the toolbars that you want to see on your screen. 'Ruler' option turns on or off the ruler line. Headers and footers are added to the document through 'Header and Footer' option. You can see the 'View' menu in Figure 7.7.

Figure 7.7: The View Menu

4. *Insert:* The 'Insert' menu helps to insert page numbers, the current date and time, symbols, footnotes, cross-references, tables, section-breaks, files, bookmarks, pictures, objects including equations, databases and different varieties of captions. The 'Insert' menu has been shown in Figure 7.8.

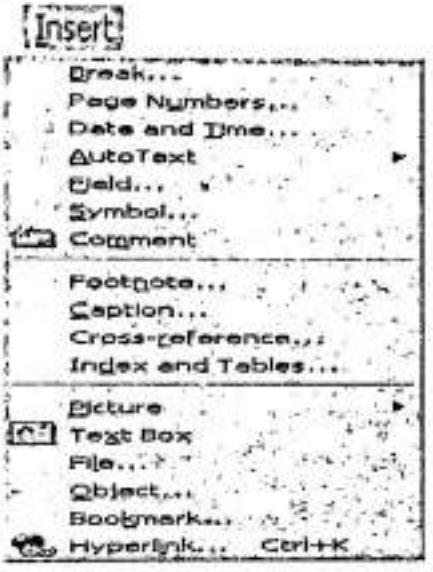


Figure 7.8: The Insert Menu

5. *Format:* The 'Format' menu is basically used for enhancing the look of the document. It can make your document look beautiful by adding a variety of font types and sizes, paragraph formats, tabs, borders and columns, drop caps, bulleted and numbered lists and style settings. The 'Format' menu can be seen in Figure 7.9.

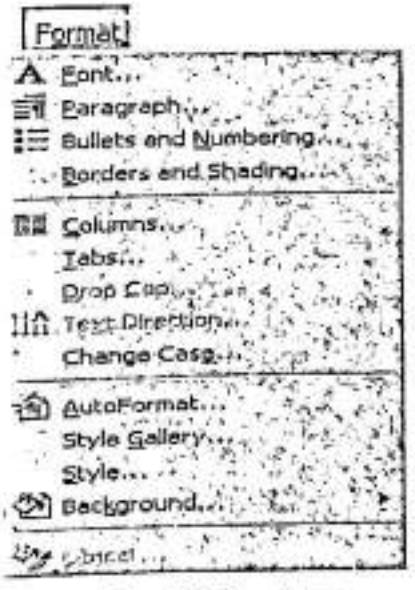


Figure 7.9: The Format Menu

6. *Tools:* The 'Tools' menu can be used to check for spelling and grammatical errors through the 'Spelling and Grammar' option. The 'Word count' option tells you the number of words, characters, lines, etc.in the whole document. Envelopes and labels can be prepared using 'Envelopes and Labels' option. 'Macros' option is used to create and run macros. The 'Tools' menu can be seen in Figure 7.10.

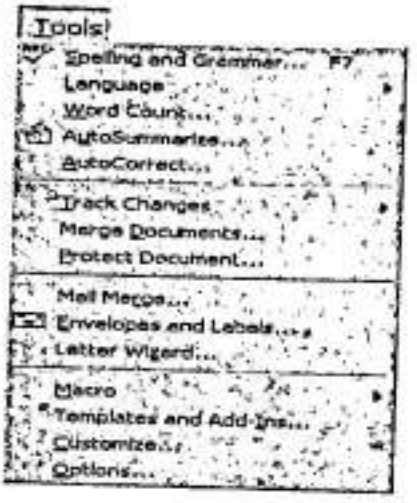


Figure 7.10: The Tools Menu

7. *Table:* The 'Table' menu adds and edits the tables in your document. A row and a column can be safely selected using the 'Select Row' and 'Select Column' options respectively. 'Select Table' option selects the whole table. The table entries can be sorted using the 'Sort' option. 'Gridlines' option turns on or off the gridlines of the table. The 'Table' menu can be seen in Figure 7.11.

Figure 7.11: The Table Menu

8. *Window:* The 'Window' menu allows you to add, arrange and select document windows in a case where more than one document is open. The 'Window 'menu can be seen in Figure 7.12.

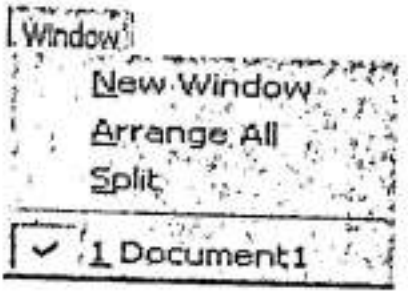


Figure 7.12: The Window Menu

9. *Help:* The 'Help' menu can be used to look for specific information. It also gives some knowledge about Microsoft Word itself. If you find yourself in a difficult situation anytime, then do not hesitate taking help from WORD through this particular menu. The 'Help " menu has been shown in Figure 7.13.

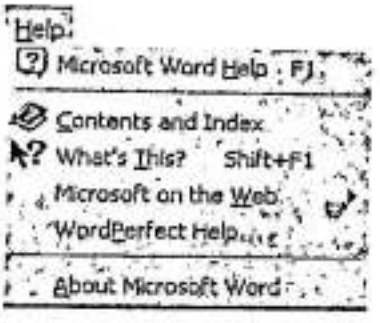


Figure 7.13: The Help Menu

ENHANCEMENTS IN WORD 97

WORD 97 has come up in a new look before us. It has got many new tools and features with which it is fastly gaining popularity among users. Each kind of user can get some new spice of his taste added to the new WORD 97. Let us make ourselves acquainted with some of the new in-things of WORD 97.

1. The animated paperclip on the screen always keeps smiling at you as shown in Figure 7.14. Clippit is a new office assistant, which is there on the screen the first time you start WORD 97. It tries to help you in every way whenever and wherever you are stuck. It can also be customised according to your special needs and requirements

Figure 7.14: Paperclip

2. Some new dimensions are added to the intelligent features of WORD 97. When you are working in WORD, it tries to figure out what it can do more easily and efficiently than you. Many of the intellisense options start with the word 'Auto' like Autocomplete, Autocorrect, Autoformat, Autotext and Autosummary.

3. WORD 97 offers the facility of 'Document Map' with the help of which you can move easily from one place to another in your document. On clicking at the 'Document Map' icon on the standard toolbar, a sidebar to the left of the screen is seen. It shows major headers in the document. Click at any of headers and WORD will take you there instantly.

4. WORD 97 has also made a mark in offering shortcuts to Web Browser such as Microsoft Internet Explorer or Netscape Navigator. With the help of Web Browser, connectivity to the world wide web has been made possible. You can also create your own documents that can be seen on Web. Regular WORD documents have to be converted into a format called HTML which is done automatically by WORD 97.

5. The new WORD 97 can be seen with expanded graphic capabilities. It has the ability to act as a full fledged desktop publishing program. Advancements like text rotation tool, special photoshop-type effects, 3D objects etc. have been made to it. Tables can be very easily made with the 'Draw Table' option of WORD 97.

This is not end of the road. The enhancements done to WORD 97 as discussed above are just a small chunk.

WORKING WITH DOCUMENTS

It's time to familiarise ourselves with the various important concepts like creation of new files, opening existing files, saving and finally closing them.

Creation of a new document

At times, you might need to create a new document from scratch. So, for creating a new document, click at the 'File' menu and then select the 'New' option as shown in Figure 7.15 Now, WORD is ready to accept text as well as other related commands from you.

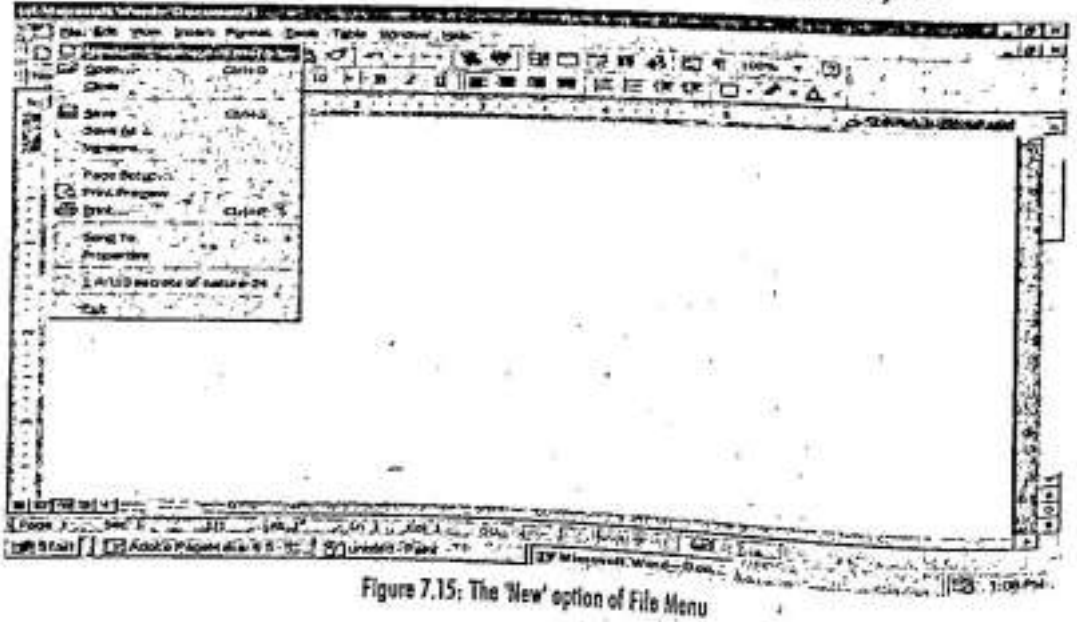


Figure 7.15: The 'New' option of File Menu

You can also open a new document by clicking at the 'New' button available on the standard toolbar. Look for the 'New' icon in Figure 7.16 shown on the next page. Remember to save your document before quitting. ('Saving a Document' is being discussed in the subsequent part)

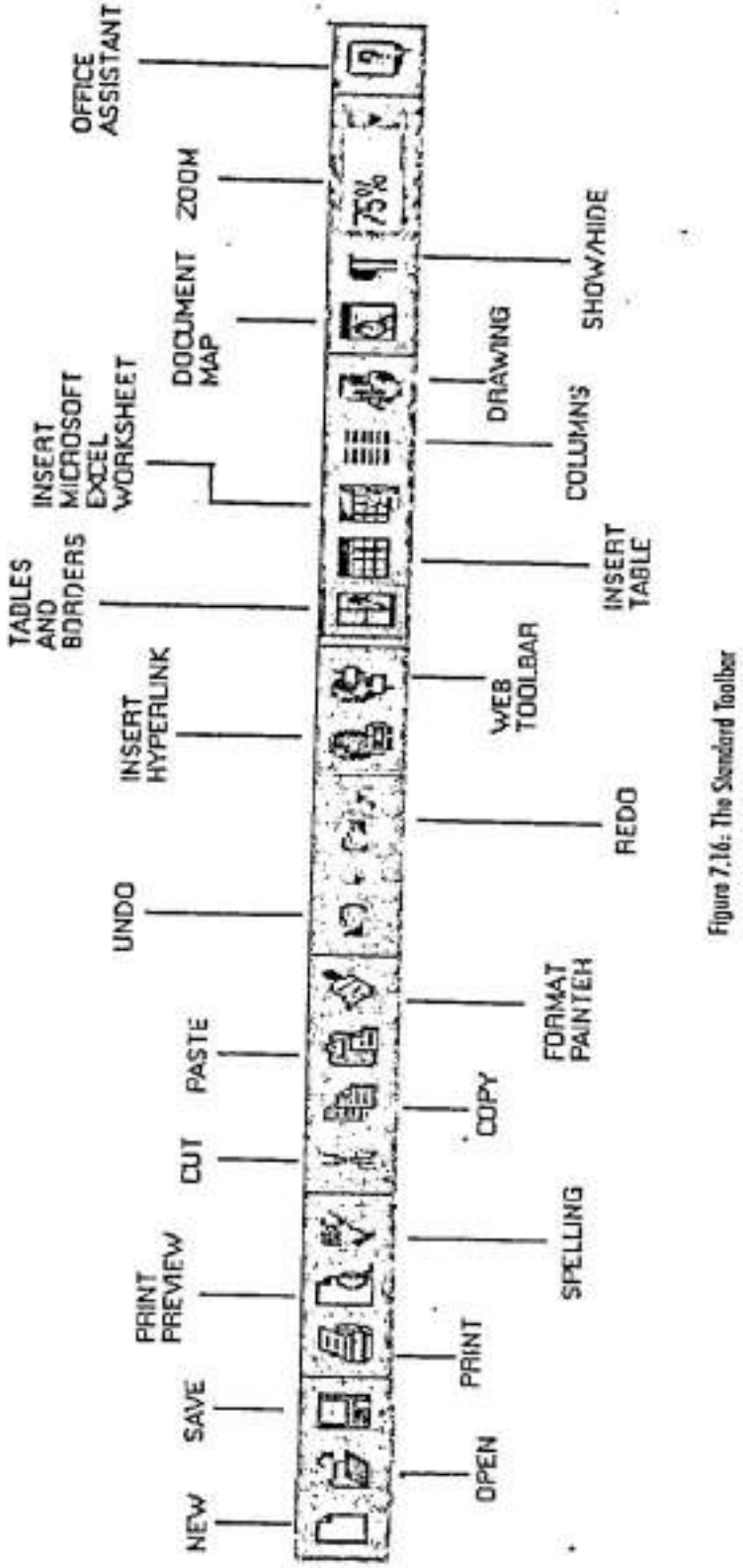


Figure 7.16: The Standard Toolbar

Opening a document

If your document is stored on any of the storage devices like hard disk or floppy disk, then it becomes possible to retrieve that document and the user can manipulate it the way he/ she wants. WORD offers a variety of ways to open your document which are discussed below:

Method 1: Opening a document from desktop

Click at the Start button. Point at 'Open Office Document' and click it as can be seen in Figure 7.17. Alternatively, click at the option 'Open Office Document' of the Office shortcut bar available on the desktop.

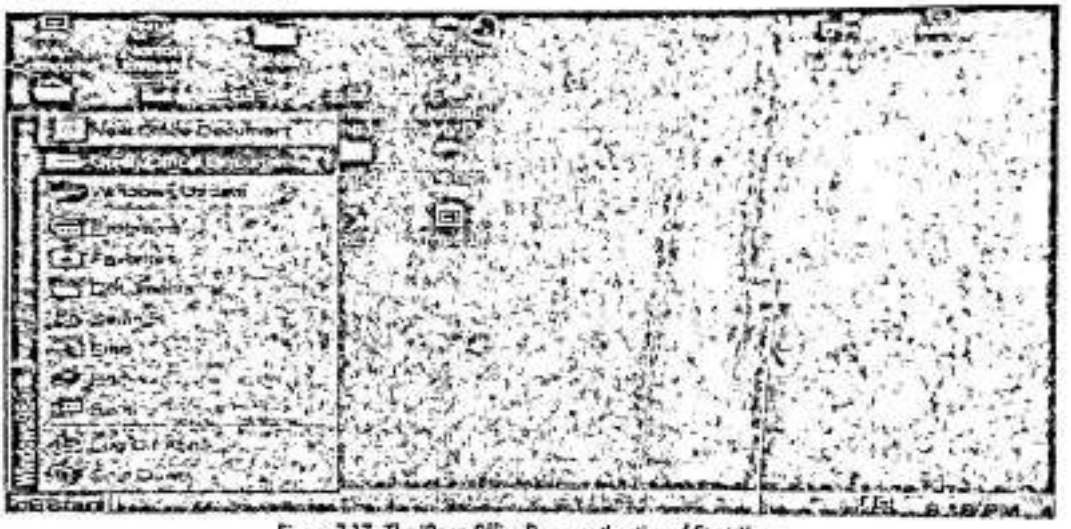


Figure 7.17: The 'Open Office Document' option of Start Menu

Method 2: Opening a document from WORD's startup screen

Click at the 'File' menu and select the option 'Open' as can be seen in Figure 7.18.

Figure 7.18: The 'Open' option of the File Menu

Alternatively, for opening a document, just doubleclick at the 'Open' button from the standard toolbar. This icon looks exactly similar to a file folder and has been shown in Figure 7.16.

One very important thing to observe here is that - an 'Open' dialog box appears on the screen after employing any of the above mentioned methods of opening a document. The 'Open' dialog box has been shown in Figure 7.19. In this 'Open' dialog box you would notice a 'look in' box which is used for selecting the drive as well as the folder where your required document is resident in. Then, there is 'Files of Type' box which helps you to select the kind of file that you want to open. Suppose you want that only the WORD documents should be shown in the file list, then click at the pull down arrow and from the drop down list, select 'Word Documents' option. In case you want to see all the files in the selected drive, then select 'All Files' option from the drop down list. Finally click the filename in the file list and click at the <Open> button or double click the filename to open up the file.

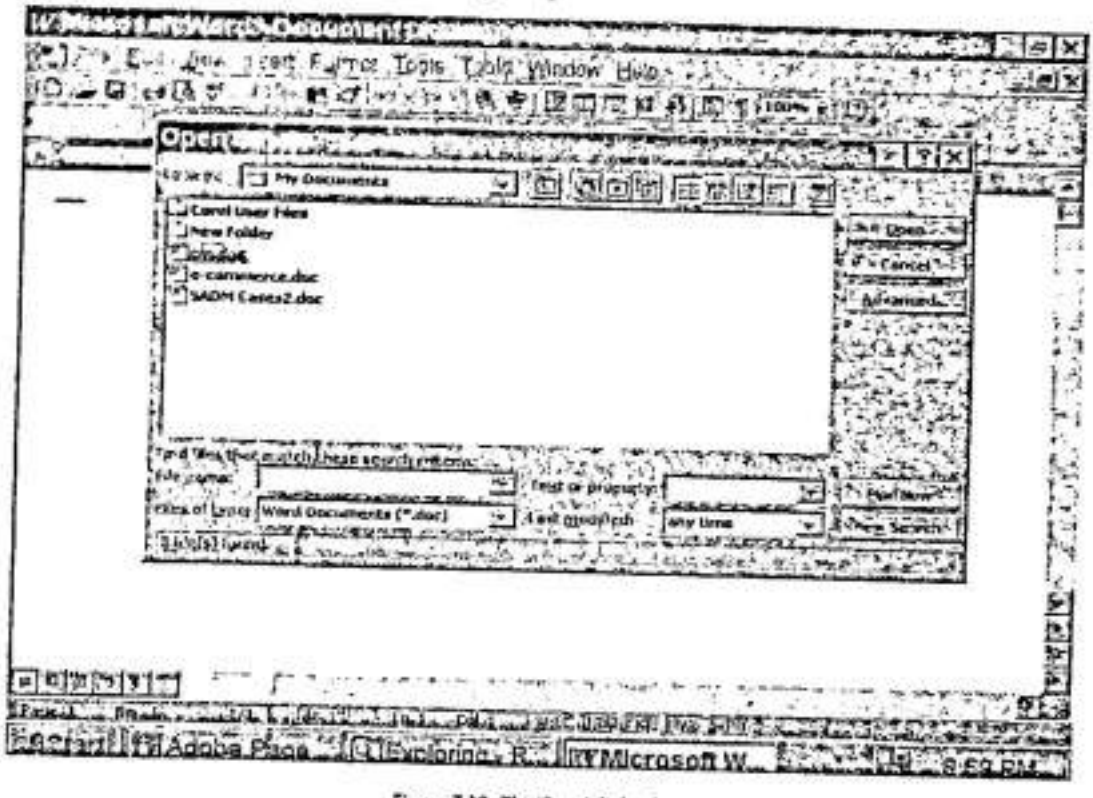


Figure 7.19: The 'Open' dialog box

Saving a document

For future retrieval of the document, it needs to be saved on hard disk or floppy disk. Once all the text is entered, save the document with any of the following methods:

Method 1:

Click at the 'File' menu and then select 'Save' option. You would notice a screen that looks like the Figure 7.20. When the file is being saved for the very first time, the 'Save as' dialog box comes up because WORD needs some additional information from you.

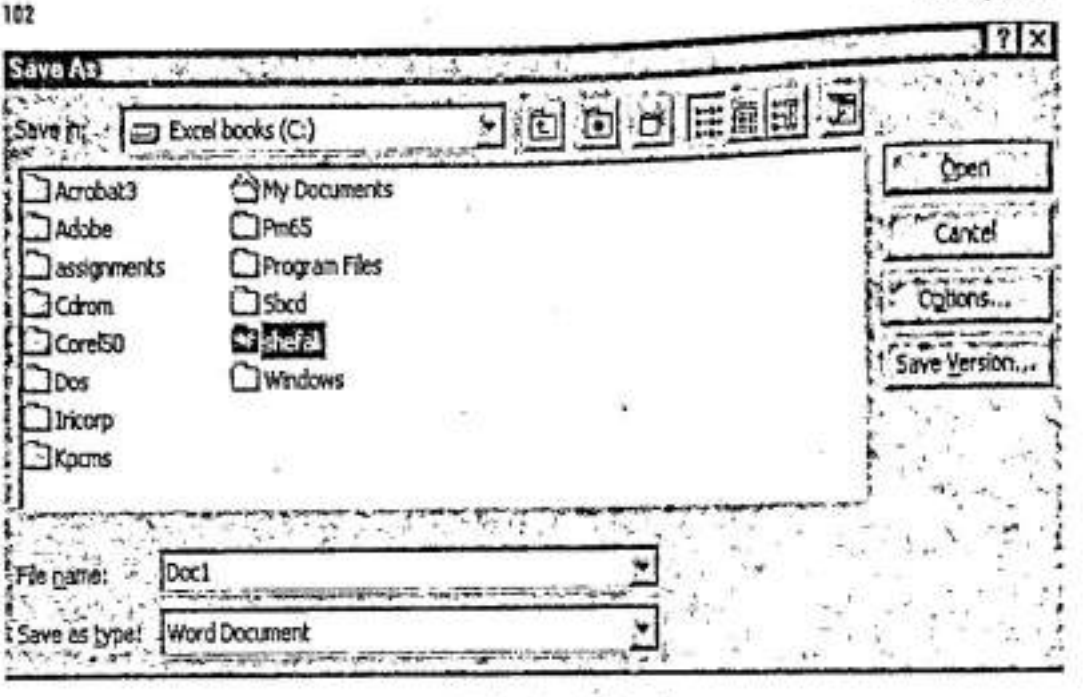


Figure 7.20: The 'Save As' dialog box

First, WORD wants you to give a name to your file. This has to be given in the 'Filename 'box. Secondly, the kind of file you are trying to save, should be given in the 'Save as type' box. Thirdly, the place where you want to save your document should be given in the 'Save in' box. After giving all this information, click at the <Save> button. Your file is finally saved onto the disk.

The 'Save as' dialog box is displayed only once till the time you don't give a name to your document. Once the document has a name, next time if you try to save your file after making a few changes in it, then the 'Save as' dialog box will not appear on the screen.

Method 2:

The other way of saving your files is by clicking at the 'Save' button available on the standard toolbar. You can see the 'Save' button in Figure 7.16.

It's a good idea to keep saving your documents after every few minutes. The reason is if the computer goes down or a power failure occurs, then the chances of recovering some contents in the document are high. Unsaved new documents are the most vulnerable.

Closing a document

WORD offers a very handy method of closing documents. Like, you would prefer to close and remove the office files that are no more required on your table, in the similar manner you may want to close WORD documents too. So, for closing a file, click at the 'File' menu and select the 'Close' option as shown in Figure 7.21. This will close the file that is recently opened. As many documents are opened in WORD, you are required to issue 'File - Close' commands for those many times to close all the files one by one.

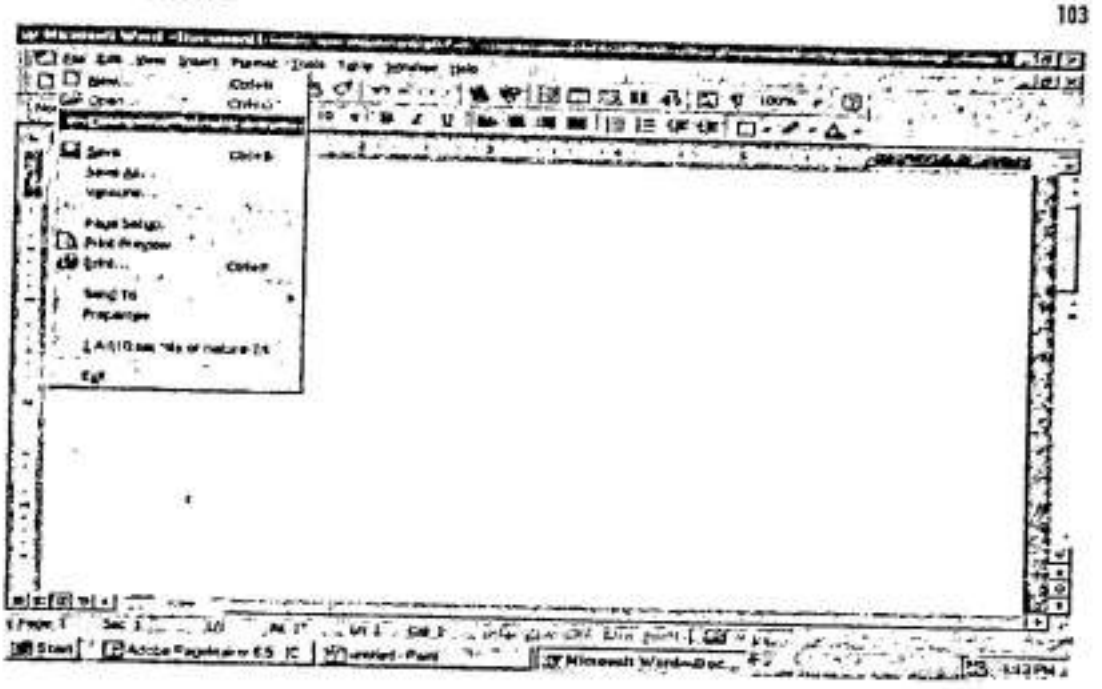


Figure 7.21: The 'Close' option of File Menu

WORD will also prompt you to save your files before closing them as shown in Figure 7.22. If you want that your file should be saved before it is closed, then click at <Yes> button otherwise hit the <No> button. A case may arise when you want to continue working in the same document after issuing 'File Close' command. Select the <Cancel> button. It will allow you to work again in your document thus cancelling the issued command.

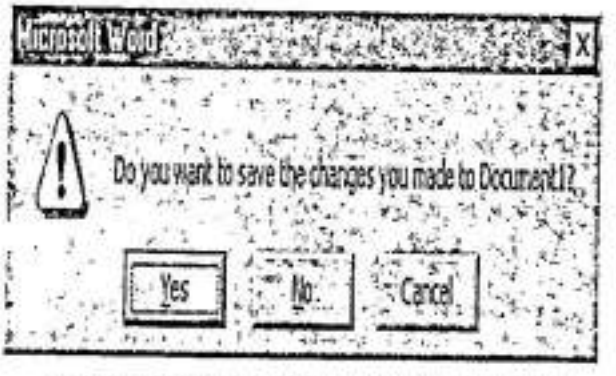


Figure 7.22: WORD prompts to save files before closing them

EXITING WORD 97

To quit WORD or to close the WORD application program, click at 'File\Exit' options as shown in Figure 7.23. With this command, all the currently opened documents are also closed automatically. WORD will again prompt you to save your files before quitting.

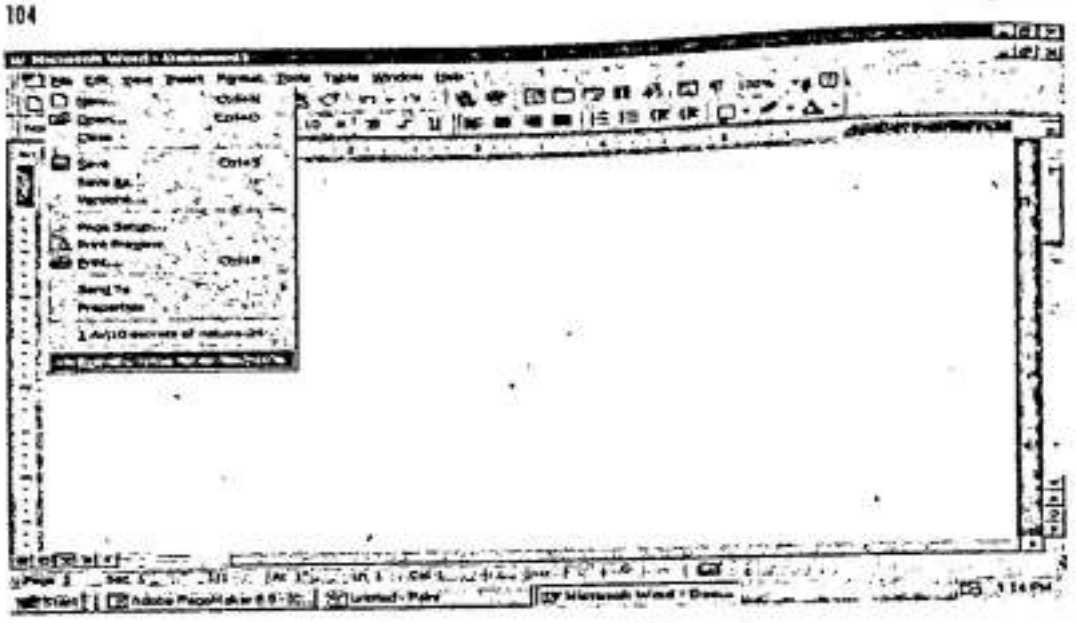


Figure 7.23: The 'Exit' option of File Menu

EDITING DOCUMENTS IN WORD 97

Editing means modifying or making changes in your document. It would involve.

- Inserting new text
- Copying text from one part of the document to another part
- Moving text from one part of the document to another part
- Deleting unwanted text.

Before exploring all these editing features of WORD 97 in detail let us discuss the word-wrapping feature first. Incomplete words or the words that exceed right margin look very clumsy. With the help of word wrap feature, WORD automatically wraps around the word in next line, when the cursor reaches the right margin. So, everytime when you reach at the end of line, you don't need to take care of hitting the <Enter> key. The only time, you need to press the <Enter> key is when you want to end a paragraph or insert a blank line.

Selecting Text

Text needs to be selected for performing various block operations (like Copying/ Moving/ Deleting) on it and for easing our work. Selection of text can be done both by mouse as well as by keyboard.

Selecting text by Mouse:

First of all, let's learn how to select text using a mouse. The various methods of selecting text by mouse are discussed below:

1. Hold your mouse button from where you want your selection to start and drag the mouse either rightways or downwards. Release the mouse button at the place where you want your selection to end up.

2. If you want to select a single word, then take your mouse pointer at that word and double-click it.

3. Paragraphs can be very easily selected by triple clicking anywhere within the paragraph.

Selecting text by Keyboard:

Keyboard can also be used to select text. The method of selecting text by keyboard is discussed below:

1. Take the cursor at a place where you want your selection to start.

2. Hold down the <Shift> key and move the cursor with arrow keys in the direction required. Release the keys at a place where you want your selection to end up. In this way, your text would be highlighted.

Inserting Text

Generally, when you startup WORD, it is in the Insert Mode, which means as text is typed in, the following text is pushed towards the right side. So, wherever you need to put in new text in your document, take the cursor at that particular location and start typing in. The method is exactly the same for inserting either a single character, word, line or a couple of lines.

At times, you also might need to overwrite the pre-written text. For that matter, press the <INS> key from the keyboard once. This would put WORD in overwrite mode and the word 'OVR' will be displayed on the status bar at the bottom of the screen. Now, when the new text is typed in, the existing contents at the current cursor location are going to be overwritten by the new text. If you want to put yourself back in the insert mode, press the <INS> key once again.

Copying Text

Copying means duplicating the contents of the document at some other desired place. The procedure for copying text is almost the same as that of moving text with a little difference which is being discussed in the following steps:

1. Select the text that has to be copied.

2. Press <Ctrl + C> keys.Alternatively, select the 'Copy' option from the 'Edit 'menu.

3. Take the cursor wherever you want the text to be pasted.

4. Hit <Ctrl + V> keys. Alternatively select the 'Paste' option from the 'Edit' menu.

You can also use the 'Copy' and 'Paste' button (shown in Figure 7.16) available on the standard toolbar for copying and pasting text. With the above procedure, you would notice the same text appearing at two places in the same document.

Moving Text

Moving text means removing text from one portion of the document and placing it at some other location. For moving text, do the following steps:

1. First, select the text that you want to move.

2. Then, click at the 'Edit' menu and select the 'Cut' option. Alternatively you can also cut the selected text by pressing <Ctrl + X> keys.Once the text is cut, you will

notice that the marked text disappears from the screen. Don't feel worried, your text is put on the windows clipboard (temporary portion of memory) from where it can be pasted anywhere

3. Look for the place, where you want your text to be placed. Take the cursor at that location and hit the <Ctrl + V> keys or alternatively select the 'Paste' option from the Edit menu.

You can also make use of the 'Cut' and 'Paste' button (shown in Figure 7.16) from the standard toolbar for cutting and pasting the selected text respectively.

Deleting Text

A passage of text can be very easily erased off by selecting it and pressing <Del> key on the keyboard. A single character can also be deleted very easily by positioning the cursor at that particular character and hitting the <Del> key.

If you want to scrap off only a single word from your document, select the word by double clicking it and hit the <DEL> key. You can also delete words by following commands:

- Press <Ctrl + Del> keys to delete next word
- Press <Ctrl + Backspace> keys to delete previous word

FORMATTING DOCUMENTS

Each one of us have a hidden desire that the reader should feel interested in whatever we are trying to convey. So, for achieving this, a special effort on our front is required. We must give a refined look to the document. The formatting features like fonts, bullets and numbering, font type etc. can be used very intelligently to create the whole impact. Now, let us proceed further learning about these special features smartly.

Defining Font Type and Size of Text

A font can be defined as a set of letters that have a common or the same typeface. Different font types and sizes can be applied using the formatting toolbar or the Format menu. Let's discuss them one by one.

Using Formatting Toolbar

The formatting toolbar is designed very artistically as shown in Figure 7.24. It contains most of the tools that need to be used to give a complete and wholesome look to your document. The toolbar also shows you the font type and size as applied to your text. It also displays the effects (Bold, Italic or Underline) as given to the text. For applying a font type and size to your text, use the formatting toolbar in following steps:

1. Select the text.
2. Click at the arrow beside the font type box and select a font type of your choice from the drop down list.
3. Again, click at the arrow beside the font size box and select an appropriate font size from the drop down list.

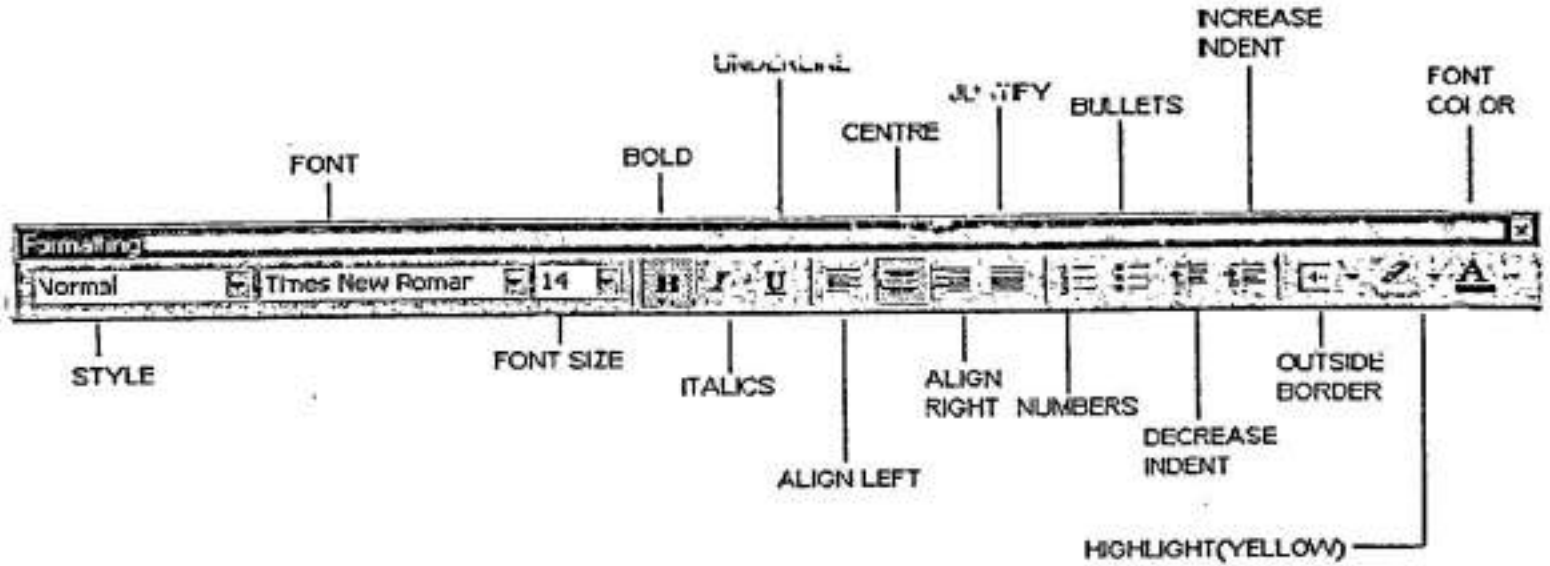


Figure 7.24: The Formatting Toolbar

Using Format Menu

The required font type and size can also be applied to the text by using '*Format* menu as described in following steps:

1. Select the text.
2. From the 'Format' menu, select the 'Font' option. The 'Font' dialog box appears on the screen as shown in Figure 7.25.
3. Choose appropriate font type from the 'font' box. You can move up or down in the 'Font box with the help of up and down arrow keys.
4. Similarly, choose the required font style and size for your text from the 'Font style' and 'Size' boxes respectively.
5. The preview of the selected text can be seen in the 'Preview' window with the applied formatting features.
6. Click <OK> button.

You will find the look of your text changing with the application of new font type, style and size.

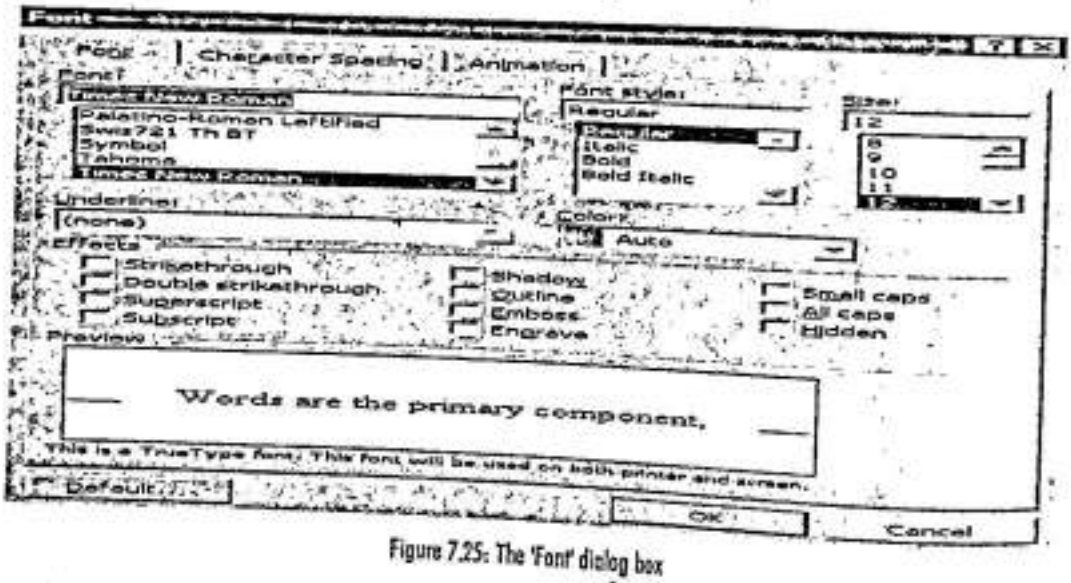


Figure 7.25: The 'Font' dialog box

Making Text Bold, Italic and Underlined

Using Formatting Toolbar

If you have given a keen look at the formatting toolbar, then you must have observed three buttons showing the letters B, I and U. The letter 'B' stands for Bold, 'I' for Italic and 'U' for Underline (Refer Figure 7.24). In order to make your text look a bit darker then the rest of the document, concentrate on the following steps:

1. Select the text.
2. Click at the 'B' button.

On carrying out these steps, the 'B' button becomes depressed or lightened. If you do not want the text to be bold, select the text again and click at the 'B' button. This button on the toolbar again becomes prominent and your text is not bold anymore.

At times you would like to see your text in italics or would like to underline it. To do this, do the following steps:

1. Select the text.
2. Click at 'U' button to underline and 'I' button to italicise it.

Using Format Menu

Alternatively, the same work can also be done using the 'Format' menu by following steps:

1. Select the text.
2. Click at the 'Font' option of the 'Format' menu.
3. In the 'Font' dialog box, activate the 'Bold' option or 'Italic' option from the 'Font style' box to show your text in bold or italics. (Refer Figure 7.25)
4. In order to underline the text, select the required option from the 'Underline' box drop down list.

If you are a keyboard person, you can also use one or more of the following key sequences to achieve the same, after selecting the text:

- Press <Ctrl + B> keys to bold the text
- Press <Ctrl + I> keys to italics the text
- Press <Ctrl + U> keys to underline the text

Changing Case of Text

WORD offers a quick and handy way to change the case of your text. Lowercase charcters can easily be changed to uppercase by hitting <Shift + F3> keys. To achieve the contrary effect, press the <Shift + F3> keys again. This would convert uppercase characters to lowercase.

Alignment of Text

Text alignment means placement of text between the margins. Your text can be left, right, centre aligned or it can be justified within the margins. Left alignment of text would mean the arrangement of text evenly in a straight line at the left side of the document but with uneven edges on the right side. Right aligned text is just the opposite of left aligned text with text evenly arranged at the right edge of the document but uneven from the left side. Justified text would involve even edges of text along both margins. Centre aligned text means that the text is placed exactly in the centre of the page. Centre aligned text is most suitable for giving titles, headings etc. Generally and most frequently the text is left aligned because then the text becomes easily readable and understandable. Now, let us find out how text can be aligned using the formatting toolbar.

1. Select the text (it could be a single line or a paragraph or the whole document).
2. Click at any of the alignment buttons from the formatting toolbar to get the desired result. (Refer Figure 7.24)

If you are more in the habit of using keyboard, then give the following keyboard shortcuts after selecting the text:

- Press <Ctrl + L> keys to left align the text
- Press <Ctrl + R> keys to right align the text
- Press <Ctrl + J> keys to justify the text
- Press <Ctrl + E> keys to show the text in the centre

Formatting Paragraphs

Formatting means deciding alignment of the paragraph. It also includes the spacing that is to be put in between the lines. In order to carry out formatting on paragraph, it needs to be selected first. Then go to the 'Format' menu and do the following steps:

1. From the 'Format' menu, select 'Paragraph' option. A 'Paragraph' dialog box shoots up on the screen as shown in Figure 7.26.

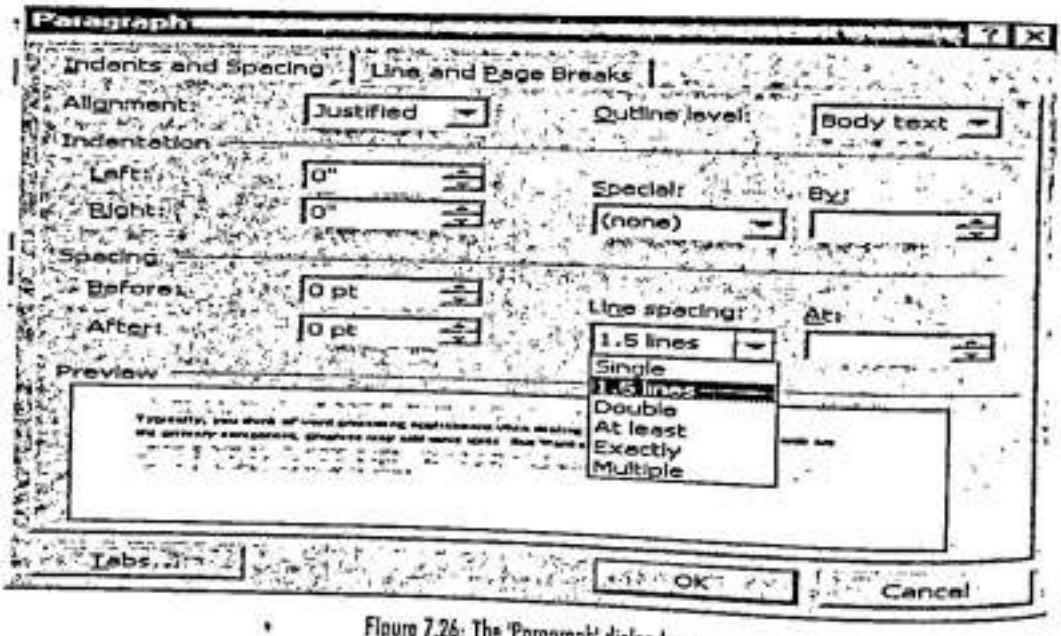


Figure 7.26: The 'Paragraph' dialog box

2. You can set the alignment i.e. decide the placement of text on the screen by clicking on the dropdown arrow of the 'Alignment' box. Your whole of the paragraph can be left, right or centre aligned.

3. Go to the 'Line Spacing' box and click at the drop down arrow to make a choice. Finally click at the <OK> button. In the 'Line Spacing' box there are many options that need a bit of elaboration. Let us find them. For the options 'At least', 'Exactly' and 'Multiple', a number has to be given in the 'At' box. In these cases, the space is measured (between the lines) in terms of print size. The 'At least' option uses the space as given in point size but it can also use some extra space in a case where it needs to accomodate some text. 'Exactly' option gives exactly the same space as defined in the 'At' box. If word needs

extra space to adjust some more text, then it cannot get it. 'Multiple' option allows you to specify the line spacing of your own choice. If you want the lines to be triple spaced then type '3' in the 'At' box.

Bullets and Numbering

It is always advisable to put the text entries which are separated by commas in the bulleted or the numbered form. Adding bullets to the text makes it easy to read and understand. Major points can be very well emphasized through this technique. Points put in the order of preference are long remembered by the reader. Moreover, in our day to day life, we prefer to make our daily list in the numbered manner rather than putting it in a paragraph. The only idea is that the chances of forgetting are turned low and visibility of important points is clearer. You can put bullets or numbers in an existing list by using either the formatting toolbar or the 'Format' menu.

Using Formatting Toolbar

1. Select the text.
2. Click at either the 'Bullets' button or the 'Numbers' button on the formatting toolbar. (Refer Figure 7.24)

In case you decide that you don't require 'numbers' or 'bullets', you can very easily put them off by repeating the above steps.

Using Format Menu

This method perhaps offers a wider choice of symbols other than the typical black circle. Let us discuss this method:

1. Select the text
2. Select the 'Format – Bullets and Numbering' option.

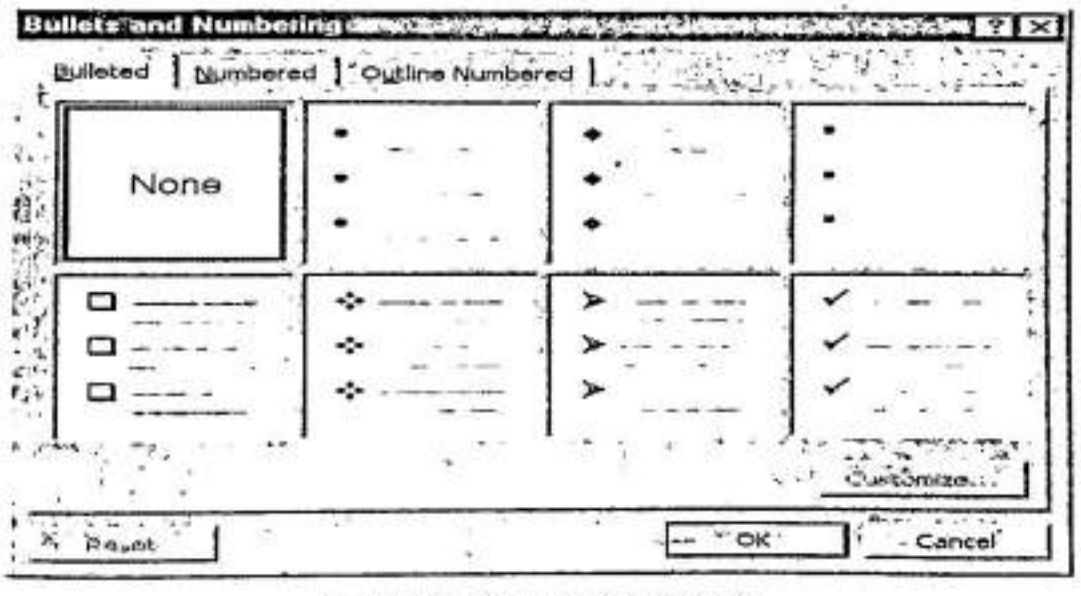


Figure 7.27: The 'Bullets and Numbering' dialog box

A 'Bullets and Numbering' dialog box appears on the screen as shown in Figure 7.27. Select the 'Bulleted' tab in case you want bullets in your document. If you wish to put numbers then select the 'Numbered' tab. Choose any of the bullets or numbers and apply it onto your document by clicking <OK> button. You see how easy it is to place bullets and numbers in your document.

FIND AND REPLACE COMMANDS

'Find' and 'Replace' commands have been presented in a new and different look in WORD 97. 'Find' and 'Replace' do not have their own separate dialog boxes. Instead they have been presented in the tab form in the same window. On finding a word, you can replace it with some other word using 'Replace' straightaway. Carry out the following steps for finding a word or group of words:

1. From the 'Edit' menu, select the 'Find' option. A 'Find and Replace' dialog box appears on the screen as shown in Figure 7.28.
2. Enter the word or phrase you want to search for in the 'Find what' box.
3. Click at 'Find Next' button. It will show you the first appearance of word or phrase. Keep hitting the 'Find Next' button until you find the required word or phrase in your document.

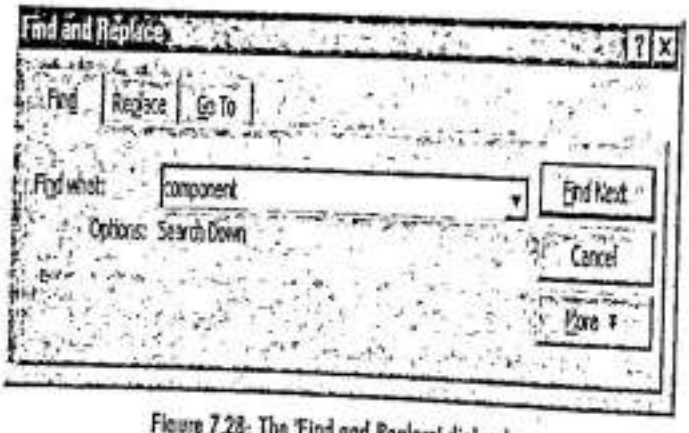


Figure 7.28: The 'Find and Replace' dialog box

Once your word is located, you may want to replace it with some other suitable word At times, global replacements of a word in the whole document has to be carried out. For example, you have entered a word 'component' many a times in your document. Now at later point of time, you may want to change it to 'part'. Replace can help you in making the required changes by carrying out the following steps:

1. Select 'Edit - Replace' option. A 'Find and Replace' dialog box comes on the screen as shown in Figure 7.29.
2. Enter the word 'component' in the 'Find what' box.
3. Enter 'part' in the 'Replace with' box.
4. Click 'Find Next' if you want to see the first occurrence of the word. Click the 'Replace' button if you want to change it. In case you do not want to make the change, then click 'Find Next' again to locate for the next appearance of the word.

5. The 'Replace All' button will change all the occurences of the word 'component' to 'part' in the whole document in a single command.

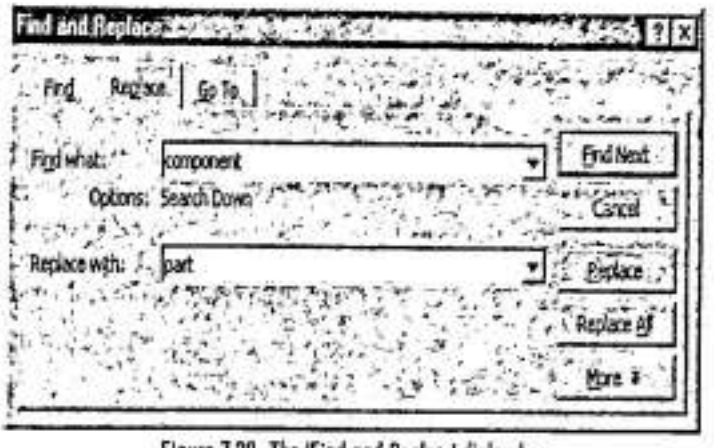


Figure 7.29: The 'Find and Replace' dialog box

NUMBERING PAGES

A long document certainly needs proper page numbering done for easy and quick reference. Adding numbers to each and every page manually cannot only become tedious but also confusing and time consuming work. WORD can really automate your task. To add numbers to your document, follow the steps given below :

1. Click at the 'Page Numbers' option of the 'Insert' menu. A 'Page Numbers' dialog box appears on the screen. This dialog box resembles Figure 7.30.

2. In the 'Position' box, click at down arrow and select the desired position where you want your page number to appear. It can come either at the top or bottom of the page.

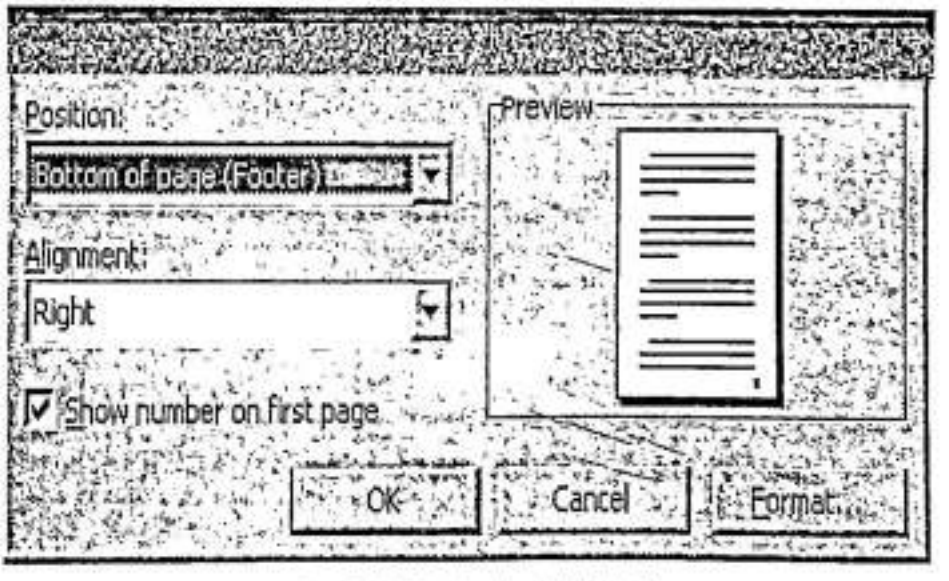


Figure 7.30: The 'Page Numbers' dialog box

3. From the 'Alignment' box, decide the alignment of the page number. You can place your page number either on the left, right or in the centre of the page.

4. If you want that the page number should be shown on the first page also then check the box on. In case you check the box off, then the page number is only going to be hidden but is certainly counted as 1.

5. Click at the 'Format' buttton. A 'Page Number Format' dialog box appears on the screen as shown in Figure 7.31. Select the style of page numbers that you want for your document from the 'Number Format' drop down list.

6. If you want to start your page number from some digit other than 1,2,3..., then you can very well specify it in the 'Start at' button, Click at the 'Start at' radio button and type in the desired number in the following box from where you want your numbering to start.

7. Click <OK> button to apply the desired format. Again click at <OK> button to save the changes and come out of the 'Page Number' dialog box.

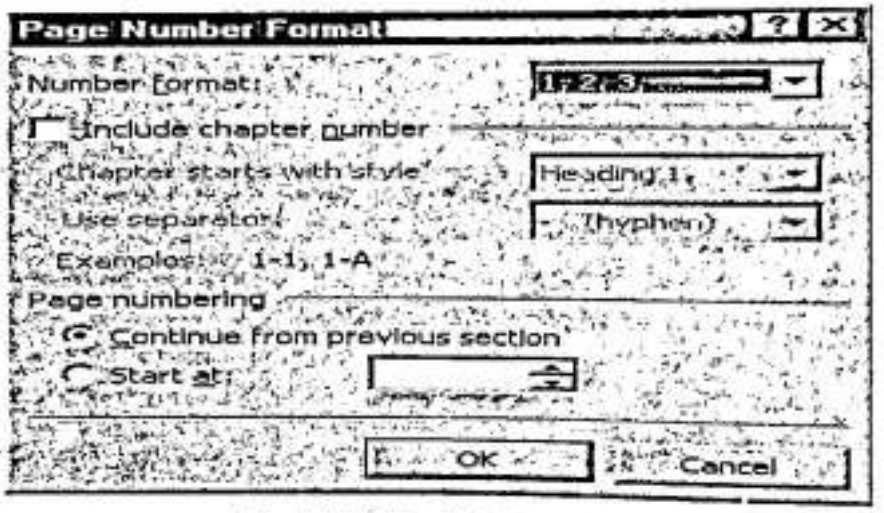


Figure 7.31: The 'Page Number Format' dialog box

CLIP GALLERY

WORD 97 has come up before us with enhanced graphic capabilities. There are many new clips put in this latest version of WORD. Moreover, added multimedia effects such as sound and videos in WORD 97 are getting a very friendly welcome from the users. Our old clipart gallery has also got a new name in WORD 97. Now, it is called Clip Gallery.

Inserting Clips

To place clips in your document, go about performing the following steps:

1. Select Insert/Picture/Clipart'. A dialog box by the name 'Microsoft Clipart Gallery' is shown on the screen as shown in Figure 7.32. Now, from this dialog box, select the 'Clipart' tab. You will notice that your clipart gallery is indexed on major keywords If you scroll down in the window under the head 'All categories', you would find a fairly long list of clips. So, in order to make our search easier, select any particular category in

the category list. In the adjoining window, you would find all the clips relating to that category together.

2. Search through the clips and decide an appropriate clip for your document. Select any one desired clip and click at the <Insert> button. You will find that particular picture placed in your document at the current cursor position.

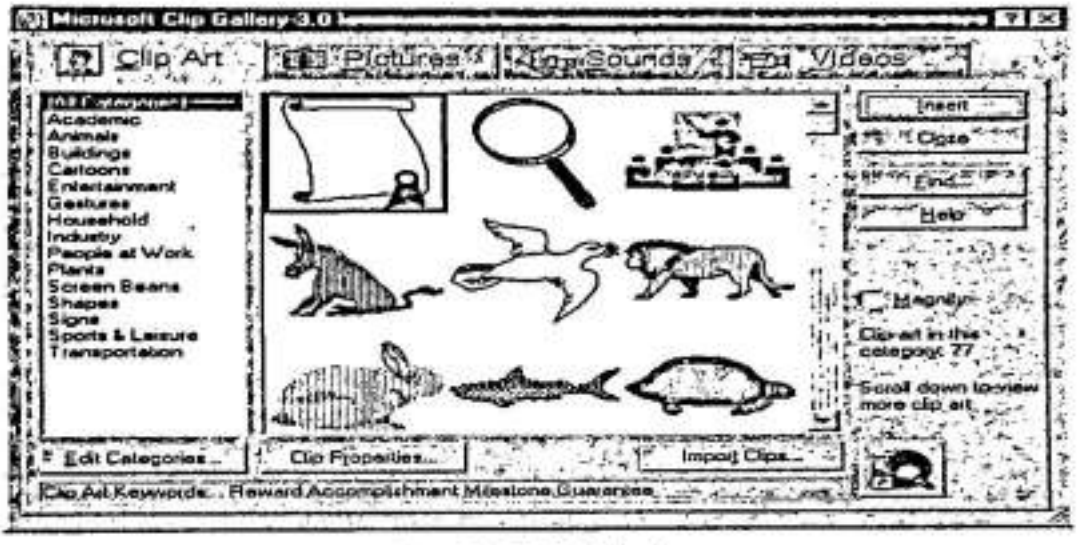


Figure 7.32: The 'Clip' dialog box

Resizing Clips

The clip that you have successfully placed in your document might not be of the exact size that you want. It can either be too small or too big. So, to resize it:

1. Select the clip by clicking anywhere on it. Eight sizing handles appear on the boundary of the clip as shown in Figure 7.33.

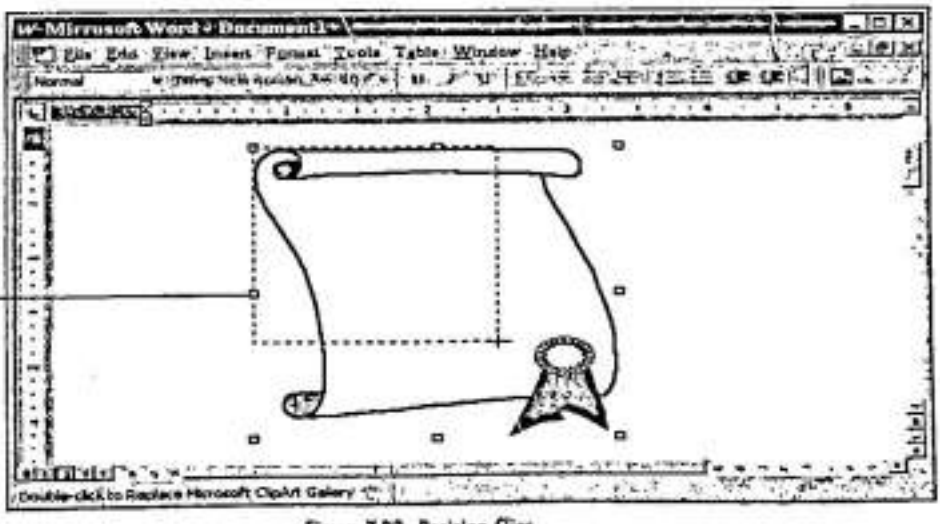


Figure 7.33: Resizing Clips

2. Take your pointer at any of these handles. The pointer will change into a double headed arrow.

3. Click and drag the handle in the direction desired to make your clip big or small.

4. Release the mouse pointer when the required size of your clip is achieved.

PAGE SETTING

Page setting includes putting your text neatly between margins. Margins are nothing but an invisible frame within which the whole text appears. When a blank new docment is opened, a default margin is always there. This margin is laid for sides,top and bottom of the page. You can always fiddle with the default settings of WORD according to your demand and requirements. We will learn to set margins by two methods:

Margin Setting through File / Page Setup

The default setting of the top and bottom margin is 1 inch and in the sides, it is 1.25 inches. To modify the default margin setting, follow the steps given below:

1. Select 'Page setup' option of 'File' menu. A 'Page Setup' dialog box appears on the screen as shown in Figure 7.34.

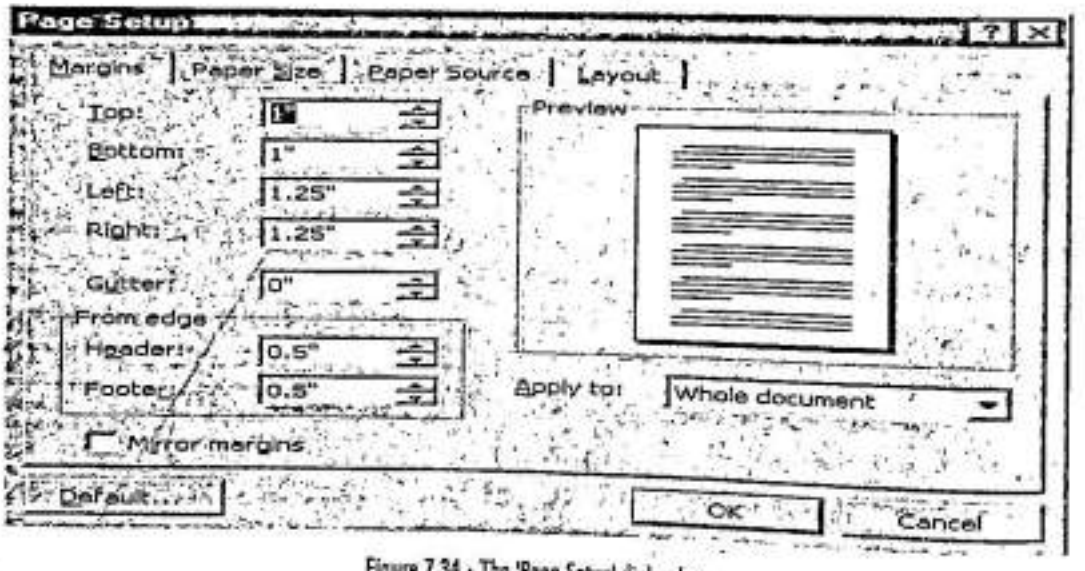


Figure 7.34 : The 'Page Setup' dialog box

2. Click in the 'Top' box and erase off the current setting by using either the <Del> key or the <Backspace> key from the keyboard. Type in the desired number. Alternatively, you can use the top arrow to increase the margin and down arrow to decrease it.

3. Similarly, change the settings in the Bottom, Left and Right boxes as well.

At times, you might want that the changes that have been made recently should apply to the current document only, then click at <OK> button. But in case, you want that the current document as well as any other new document that you open should have these page settings, then click at the <Default> button. The next step would be to click at the <Yes> button in

which case WORD is trying to seek your permission in changing the default settings for page setup.

Setting Margins using Ruler Line

Ruler line is very frequently used to change margins. It is a quick and easy way to set margins but needs some amount of practice also. To set margin using the ruler line, carry out the steps discussed below:

1. Place your mouse pointer on the left side of the horizontal ruler line. Slowly, move the mouse pointer towards your right side till the place where your mouse pointer acquires the shape of a double-headed arrow. A 'Left Margin' tool tip appears on the screen as can be clearly seen in Figure 7.35.

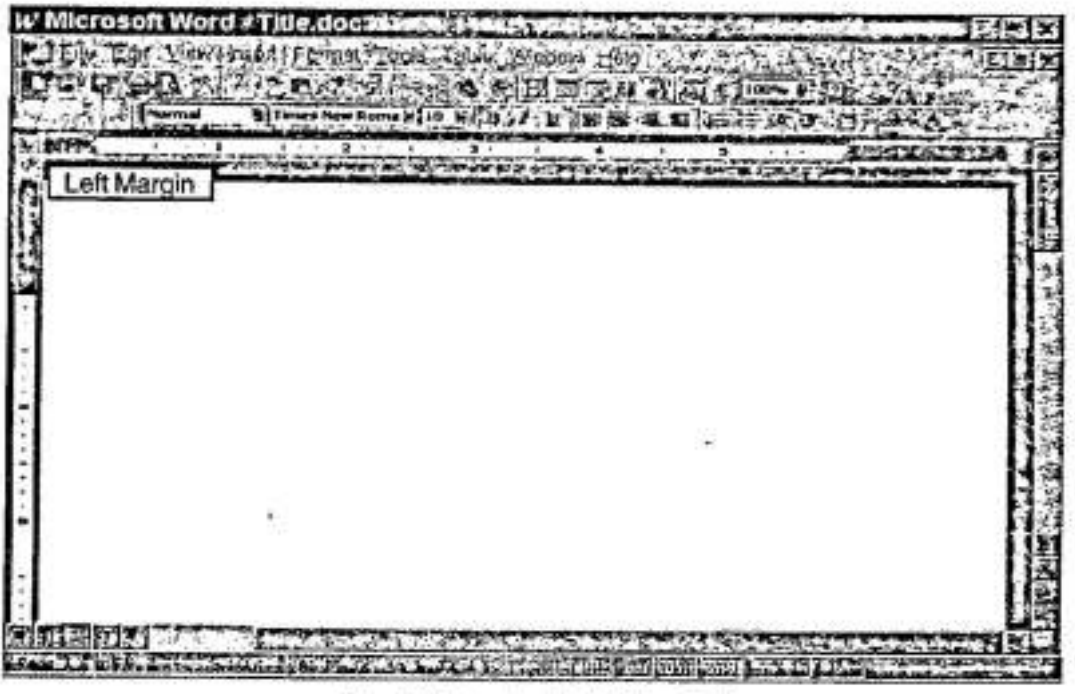


Figure 7.35: Figure showing 'Left Margin Tool'

2. Click at that location and drag the mouse towards right side to increase the margin or on the left side to reduce it.

3. Release the mouse button when suitable margin is attained.

In order to set right margin, the method is just the same as discussed in the above three steps. If you observe closely, you will find a thin gray line above the 'Right Indent' button which is in the extreme right of the Ruler Line. This is the Right Margin Line. Place the mouse pointer at this line and click on it. Drag the pointer in either direction to increase or decrease the right margin. Finally, release your mouse button.

Now, let us learn how to set the top and bottom margins using the vertical ruler line. This vertical ruler line appears only in the Page Layout view. So, in a case if your vertical ruler line is not apparent on the screen, then first switch yourself to Page Layout view by selecting 'Page Layout' option from the 'View 'menu. To set the top margin:

1. Take your mouse pointer on the thin gray line that appears between the darkened and white areas on the top side of the vertical ruler line.
2. As soon as your mouse pointer takes the shape of a double headed arrow, click and drag it either upwards or downwards to attain the desired top margin.
3. Release the mouse button.

When you are trying to play with the margins, a line is shown across the page which keeps moving up or down according to the movement of your mouse pointer. This gives you the exact location of your margin on the page.

APPLICATION OF A WORD PROCESSOR IN CORPORATE SECTOR

A word processor finds inmense usage in the corporate sector. This is a software that is specially designed to help the managers to design and prepare typed documents. It offers very handy tools for managers to work upon. For instance, MS-WORD offers many pre-designed professional letters which can be used with little or no modification at all. Moreover, the overall impact of the document can be enhanced by using the advanced features provided by MS-WORD.

SUMMARY

This unit has introduced you to the basic features of a word-processing software and what it can do for individuals and other business houses. WORD 97's new features make the investment of both money and time worthwhile. We have learnt how to create our own documents, open existing documents and finally save them before closing. The standard toolbar and the formatting toolbar offer a variety of buttons which offer a quick service to the user. With the help of word wrapping feature of WORD 97, the user is saved the effort of hitting the <Enter> key each time he or she reaches the end of line. The text which exceeds the right margin is automatically shifted to the new line. WORD 97 also allows the user to insert new text, delete unwanted text, copy and move text from one portion to other. Moreover, the look of the document can be made impressive and eye-catching by applying different font types, styles and sizes. You can emphasise or highlight your text by making it bold, italicised and under lined. Lowercase characters can be changed to uppercase and vice-versa by pressing <Shift + F3> keys together. Text placed neatly between the margins again looks very attractive and beautiful. So, text can be left, right or centre aligned. Text can also be justified between the margins. Proper line spacing can be given in between the printed lines. Text entries separated by commas can be put in the bulleted or numbered form. This makes the major heads clearly readable and long remembered. The 'Find and Replace' feature of WORD 97 helps us in finding a particular word and can be replaced with some other desired word. This makes searching of the words easier and global replacements happen without fail in no time. WORD 97 can also give numbers to your page which make referencing easier. The looks of the document can be enhanced by adding clips to it from the Clip Gallery. The word processor is specially designed to help the managers to prepare typed documents.

REVIEW QUESTIONS

1. Fill in the blanks:
   (a) The application software that helps us in processing the text is called _____.
   (b) The _____ toolbar offers commonly used formatting commands.
   (c) For creating a new file click at the _____ option of the File menu.
   (d) The text can be copied using the _____ keys.
   (e) The case of the text can be changed using the _____ keys.
2. Write true or false:
   (a) The keys <Ctrl +V> helps in cutting text.
   (b) The 'Save as' dialog box appears every time you try to save your file.
   (c) The Menu Bar lies at the top of the screen.

(d) To come out of the Word application, click at the *File – Exit* options.

(e) The text cannot be selected using keyboard.

3. Match the following :

(a) Bold Text	(a) Ctrl + X
(b) Copy Text	(b) Ctrl + I
(c) Change case of letters	(c) Ctrl + C
(d) Paste Text	(d) Ctrl + U
(e) Cut Text	(e) Shift + F3
(f) Left alignment of Text	(f) Ctrl + J
(g) Italicise Text	(g) Ctrl + B
(h) Centre aligned	(h) Ctrl + V
(i) Right alignment of Text	(i) Ctrl + E
(j) Underline Text	(j) Ctrl + L
(k) Justified Text	(k) Ctrl + R

4. What is a word processor? What are the uses of a word processing package?
5. Give the names of some of the popularly used word processing packages.
6. Explain the following terms:
   a) Application Window
   b) Document Window
   c) Title Bar
   d) Menu Bar
   e) Status Bar
7. Discuss all the contents of the Menu Bar in detail.
8. List any five advancements that have been done in WORD 97.
9. What are the two methods of opening a document? Discuss in detail.
10. Why the file has to be saved before closing it?
11. What do you mean by editing documents?
12. How can the text be selected?
13. What is the difference between INS mode and OVR mode?
14. What is the difference between 'Copying text' and 'Moving text'?
15. What does alignment of text mean?
16. How can the text be made bold and italicised?
17. How can you change the case of the text?
18. Discuss the steps by which bullets and numbers can be put to existing text entries.
19. Explain the significance of a word processing package in corporate sector.

CHAPTER 8

Spreadsheets

LEARNING OBJECTIVES

- Introduction
- What is an Electronic Spreadsheet
- How to Start Excel 97
- Working with Documents
- Exiting Excel
- Data Entry and Editing
- Types of Cell Entries
- Commonly Used Functions
- Absolute and Relative Cell Referencing
- Number Format
- Autofill
- Charting with EXCEL
- Macros
- Importing and Exporting Files
- Printing a Workbook
- Application of a Spreadsheet in Corporate Sector

INTRODUCTION

EXCEL 97 is a very powerful and easy to use spreadsheet package which is being commonly used these days. It is basically an end user application package. It works very well with numbers and their complex calculations. EXCEL 97 helps to put and prepare your data in an organised, orderly and meaningful fashion. EXCEL 97 finds its major contribution in creating reports, using formulas and performing calculations. It is best suited for scientific and statistical analysis. EXCEL 97 can also be used to prepare Profit and Loss accounts, Balance Sheet and other Tax statements. It works well for both simple and complicated numbers. EXCEL 97 can do anything for you. Your imagination can be the only limit. It can be used for preparing analytical reports including statistical analysis, forecasting and regression analysis. Good looking and attractive charts can be created which depict data in clearer and meaningful fashion. EXCEL 97 can also be used to create relationships between different types of data. EXCEL 97 can do all the work of a full fledged word-processor but it lacks the advanced features of desktop publishing. It also supports the high level features of object linking and embedding which means data from WORD can be safely and easily put and linked with data in EXCEL and vice versa is also true.

WHAT IS AN ELECTRONIC SPREADSHEET

An *Electronic Spreadsheet* is a network of rows and columns. Each row is given a unique number whereas each column is identified by a unique alphabet or pair of alphabets. So, it can be stated that an electronic spreadsheet is a grid that contains cells.

Popular Spreadsheet packages

The popularly used spreadsheet packages are:

- MS-EXCEL
- Lotus 123
- Supercalc
- Framework
- VP Planner Plus

Uses of Electronic Spreadsheets

Electronic Spreadsheets satisfy the needs of a large number of users and meet with their varied requirements. Some of the things that can be easily done with the help of an Electronic Spreadsheet are mentioned below:

- Arithmetic and Statistical Calculations
- Preparation of Profit and Loss Account
- Preparation of Income Statements
- Preparation of Tax Statements
- Reports
- Charts
- Regression Analysis
- Forecasting

An Electronic Spreadsheet can do a great job with mind crunching numbers. Any kind of complex calculation can be done in a matter of few seconds.

HOW TO START EXCEL 97

The biggest advantage offered by Microsoft Office products is the great similarity between its applications with respect to the overall working, toolbars and menus. Since, we have already made ourselves familiar with WORD 97, learning EXCEL 97 will become easy and less time consuming for us.

To startup EXCEL in Windows 95 or Windows 98, the steps given below can be followed:

1. Click at the Start button, go to the 'Programs 'option.
2. Select 'Office 97' option. Finally, select 'Microsoft Excel' option from the cascading menu. EXCEL will be loaded in the computer's memory.

You will find that the above menu options are very much similar to Figure 8.1. As stated in the previous lesson also, the menu options shown in this figure might not exactly resemble those seen on your computer. So, you need to do a bit of exploring job to find out where actually MS-EXCEL is installed . . . puter.

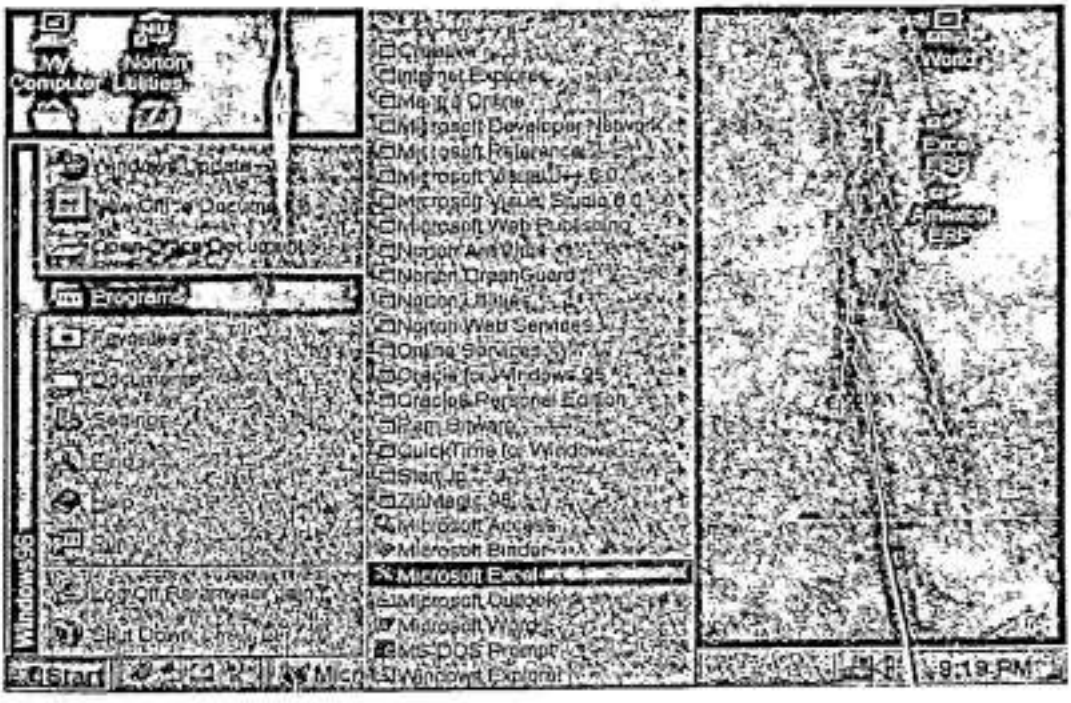


Figure 8.1: Figure showing how to start EXCEL

Alternatively, MS-EXCEL can also be started up through the following steps:

1. Click at the Start button.
2. Select 'New Office Document'. A 'New Office Document' dialog box appears on the screen. Double-click at the blank workbook option or select one of the other tabs, such as spreadsheet to start EXCEL 97.

Once EXCEL 97 is loaded in the computer's memory, a blank workbook shoots up on the screen. A typical name given to a file in EXCEL is Workbook. The terms *Excel Document*, *Excel Workbook* and *Excel File* carry the same meaning and can be used interchangeably. This blank file by default gets the name - Book1. The extension given to a file in Excel is 'XLS'. A typical Excel screen resembles Figure 8.2.

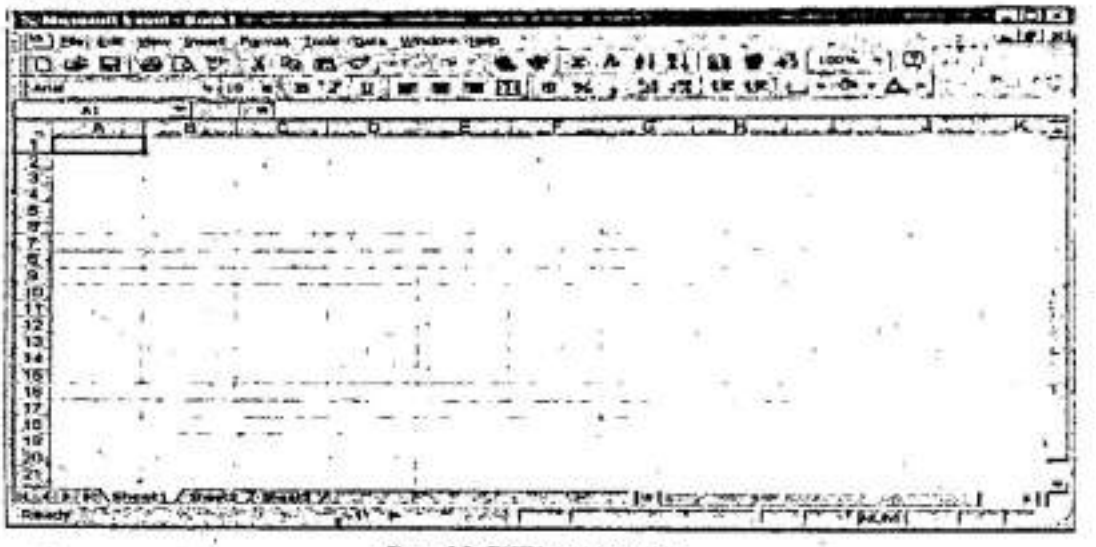


Figure 8.2: EXCEL's opening screen

Screen Elements

Let us look at different parts of an EXCEL screen which are shown in Figure 8.3. We have already discussed many of the screen elements in our previous lesson also.

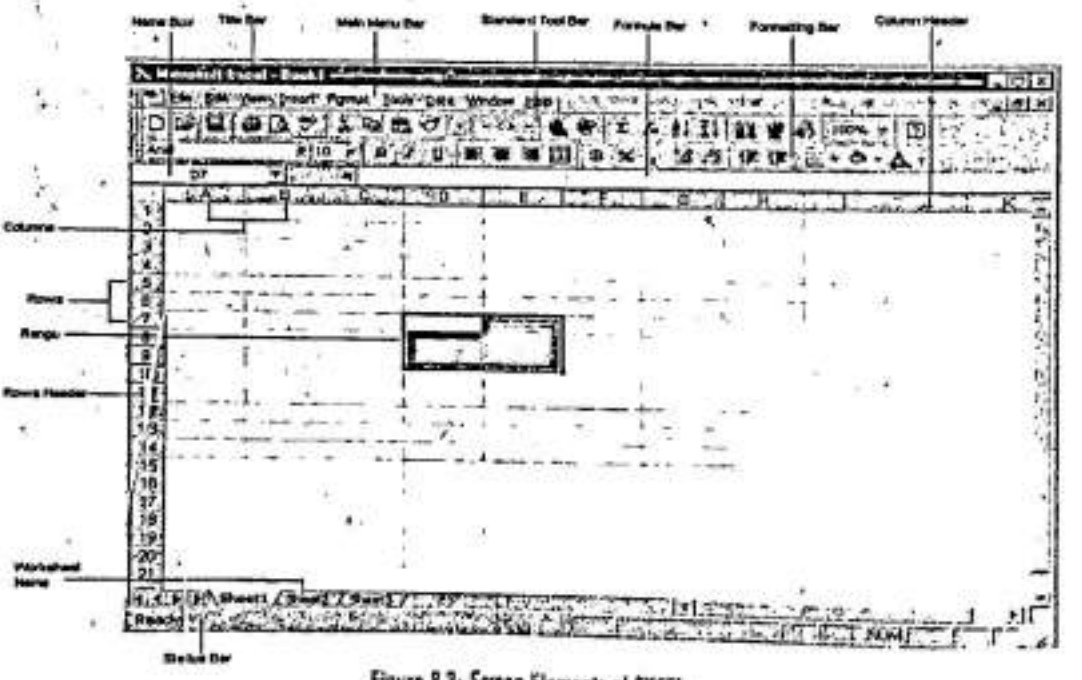


Figure 8.3: Screen Elements of EXCEL

Table 8.1 summarises the various parts of a typical EXCEL screen.

Table 8.1: Description of Screen Elements

Screen Element	Description
Title Bar	Located at the top of the screen. It displays the name of the application (here 'Microsoft Excel') and the active document name (here 'Book1').
Main Menu Bar	It is located under title bar. It shows menu options of EXCEL like File, Edit, View....Help. Each menu option has a corresponding pull down menu.
Standard Toolbar	Located exactly below the menu bar. It has got icons like New, Open, Save, Print, etc.
Formatting Toolbar	Lies below the standard toolbar. It has got options for controlling different fonts and other formatting features.
Status Bar	It is situated at the bottom of the screen. The status bar gives information like 'Ready' or 'Edit' depending upon the data present in the currently active cell.
Cell	An intersection of row and column. It is used to store data, letters, numbers, values, etc.
Rows	They are horizontal and are numbered as 1,2,3... A workbook can have a maximum of 65536 rows.
Columns	They are vertical and labelled as A,B,C...,AA,AB,AC...BA,BB,BC..A workbook can have a maximum of 256 columns.
Range	It is a group of continuous cells. For example, the range D7:E9 includes the cells D7,D8,D9,E7,E8 and E9.
Name Box	This box shows the address of the currently active cell.

A workbook has got three worksheets in it by default. New worksheets can be added to it. It is a good idea to keep all the related work in different worksheets of the single workbook. So, it can be safely said that a workbook is a binder and the worksheets are its sheets. A worksheet can be moved from one workbook to another.

WORKING WITH DOCUMENTS

In order to work in EXCEL, you have to either open an existing file or create a new one. So, let us find out how to create, open, save and finally close files..

Creation of a New Workbook

EXCEL offers a variety of ways by which new workbooks can be created. So, for creating a new workbook, you can follow any one of the methods discussed below:

1. A new workbook can be created by clicking at the 'File' menu and then selecting the New 'option.
2. You can also open a new workbook by clicking at the 'New' button available on the standard toolbar.
3. If you are a keyboard person, then don't feel disappointed. Pressing <Alt+F+N> keys together will also achieve your work of creating a new workbook.

Opening a Workbook

If your document is stored on any of the storage device like hard disk or floppy disk, then it becomes possible to retrieve that document. EXCEL offers a number of ways to open your document which are discussed below:

1. Click at the 'File' menu and select the option 'Open'.
2. Alternatively, for opening a document, just doubleclick at the 'Open' button available on the standard toolbar.

An 'Open' dialog box appears on the screen as shown in Figure 8.4. In this 'Open' dialog box you would notice a 'Look in' box which is used for selecting the drive as well as the folder where your workbook has been stored. Double-click the folder to see the workbooks under it. From the 'Files of type' box, select the kind of file that you want to open. Suppose you want that only the EXCEL documents should be shown in the file list then click at the pull down arrow and from the drop down list, select 'Microsoft Excel Files' option. Finally click the workbook name in the file list and click at the <Open> button or double click the workbook name to open it up.

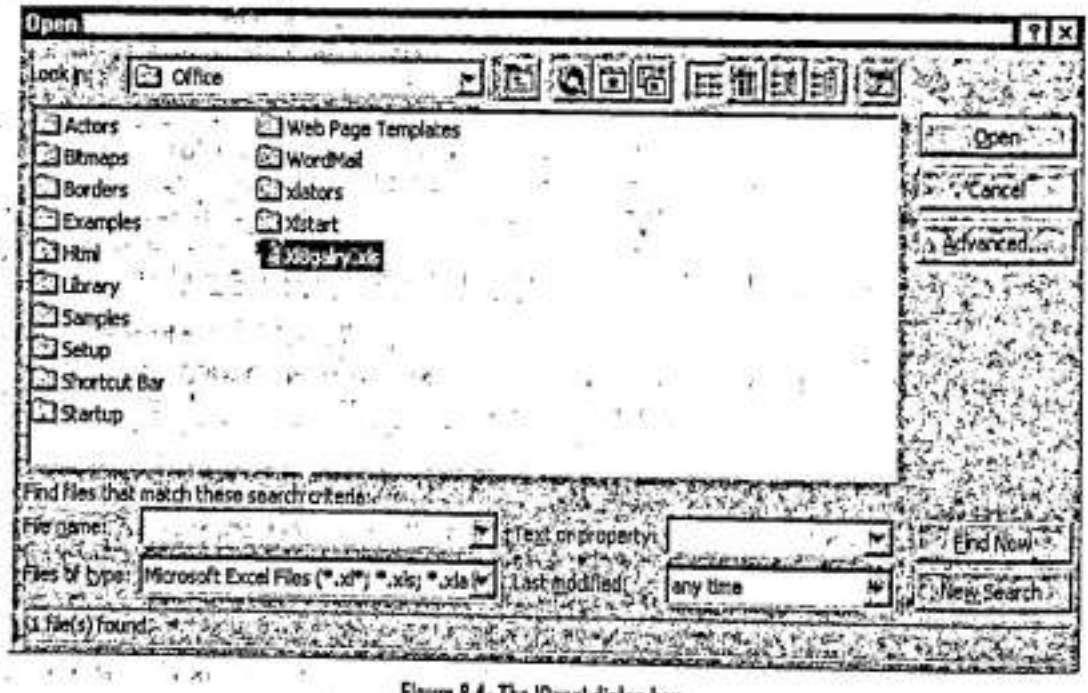


Figure 8.4: The 'Open' dialog box

Saving a Workbook

A workbook should be saved properly before closing it or quitting EXCEL for its future retrieval. Once all the text is entered, save the document with any of the following methods:

1. Click at the 'File' menu and then select 'Save' option.
2. The other way of saving your files is by clicking at the 'Save' button available on the standard toolbar.

When the workbook is being saved for the very first time, the 'Save as' dialog box comes up because EXCEL needs some additional information from you. EXCEL wants you to give a name to your workbook. If you want to save your workbook with a name that is already given by EXCEL, simply click at the <Save> button. However, if you want to give some other name, then erase off the existing name from the 'Filename' box and give a new name to the workbook.

The 'Save as' dialog box is displayed only once till the time you don't give a name to your workbook. Once the workbook has a name, next time if you try to save your file after making a few changes in it, then the 'Save as' dialog box will not appear on the screen. So, if you intentionally want to change the name of your workbook, select the Save as 'option from the File 'menu. Replace the name of the workbook with a new name in the 'Filename' box. It will create two copies of the same workbook—one with an old name and the other with a new name that you have just given.

It's a good idea to keep saving your workbooks after every few minutes. The reason is if the computer goes down or a power failure occurs, then the chances of recovering something in the document are high. Unsaved new documents are the most vulnerable.

Closing a Workbook

It is extremely easy to close workbooks in EXCEL. So, for closing a workbook, click at the File' menu and select the Close 'option. If you have made any changes in your workbook after saving it, then EXCEL prompts you to save your workbook before closing it. Thus, if you want that your workbook should be saved before it is closed, then click at <Yes> button otherwise hit the <No> button in the dialog box that appears next. A case may arise when you want to continue working in the same document after issuing 'File\Close' command. Select the <Cancel> button. It will allow you to work again in your document thus cancelling the issued command.

EXITING EXCEL

EXCEL offers a large number of methods for shutting itself down. You can follow any of the below-mentioned approaches:

1. Click at 'Close' button present in the upper right corner of the title bar.
2. Select 'Exit 'option from the 'File' menu.
3. Press <Ctrl + W> keys together.

EXCEL will close all the currently opened workbooks on its own. EXCEL wants you to play a safe game. It will again prompt you to save your files before quitting like it did while closing your workbook.

DATA ENTRY AND EDITING

A cell contains the data entered by you. At any time, one cell is always highlighted which is called the currently active cell. The address of this currently active cell is shown in the 'Name' box which lies in the upper left corner of the screen, exactly above the column letter A. You can place your data in any portion of the worksheet. Take your cell pointer at a place wherever you want to put your data with the help of either the mouse pointer or arrow keys. Enter the data. Once you have finished typing in the current cell, press <Enter> key. Now, to go to the next cell, either click it with the help of mouse pointer or move to that particular cell with the help of arrow keys. Similarly, in order to select a group of continuous cells, take your mouse pointer

at the cell from where you want your range to start. Click at that cell and then drag your mous pointer diagonally to the opposite corner. Release the mouse pointer when the desired rang is made. All the cells in the range become highlighted.

Inserting Text

Generally, when you startup EXCEL, it is in the Insert Mode, which means as text is typed in the following text is pushed towards the right side. So, if you are only interested in putting new text in the cell then, take your cursor at that particular location of the cell and start typing in.

Sometimes, old text has to be replaced with new text. Take your cursor at a place wherever any change has to be effected. Type in the new contents and erase off the existing contents with the help of <Del> key. However, if the EXCEL is in the 'Typeover' mode, then the old contents are automatically replaced with the new contents. If you want to put yourself back to the insert mode, press the <INS> key once from the keyboard.

Editing the Cell Entry

Many a times, the contents entered in a cell have to be modified and new contents are required to be put in it. So, for making changes in the cell entry, first take your cell pointer to that particular cell. Then, hit the <F2> key or double-click at that cell with the help of mouse pointer. Make the necessary changes and press the <Enter> key again.

Moving and Copying Text

The contents of a cell or range of cells can be moved as well as copied to some other location in the worksheet. Copying cells mean duplicating the contents of a cell or range of cells at some other desired place. Moving text means removing text from one portion of the worksheet and placing it at some other location.The procedure for copying and moving text is almost the same with a little difference. For copying cell contents, follow the steps given below:

1. Select a cell or range of cells.
2. Press <Ctrl + C> keys. Alternatively, select the 'Copy' option from the 'Edit 'menu.
3. Take the cursor to the cell wherever you want the text to be pasted.
4. Hit <Ctrl + V> keys. Alternatively, select the 'Paste 'option from the 'Edit 'menu.

You can also use the 'Copy' and 'Paste' button available on the standard toolbar for copying and pasting text. On simlar grounds, for moving the cell contents, select the 'Cut' option instead of 'Copy' from the 'Edit 'menu. Rest of the steps are the same as that of copying cell contents.

Deleting Text

A passage of text can be very easily erased by selecting it and pressing <Del> key from the keyboard. You can also delete a single character by positioning the cursor at that particular character and hitting the <Del> key.

If you want to scrap off only a single word from your document, select the word by double clicking it and hit the <Del> key. You can also delete words by following commands:

- Press <Ctrl + Del> keys to delete next word.
- Press <Ctrl + Backspace> keys to delete previous word.

Inserting a Row

In order to insert a new, blank row in between two rows, follow the steps given below:

1. Take the cursor where a new row has to be inserted.
2. Select 'Rows' option from the 'Insert' menu. A blank row will be inserted above the current row.

Inserting a Column

To insert a blank column, the steps given below can be followed:

1. Take the cursor where a new column has to be inserted.
2. Select 'Columns' option from the Insert' menu. You will find a new blank column inserted to the left of the current column.

Deleting a Cell or Group of Cells

In order to delete a single cell or group of cells, follow the steps given below:

1. Select the cell or range of cells that is to be deleted.
2. Right click your mouse button.
3. Choose the 'Delete' option from the menu that appears.

Clearing the Contents of a Cell or Group of Cells

To clear or erase off the contents of a single cell or group of cells, carry out the steps given below:

1. Select the desired cell or range of cells from which the contents are required to be cleared.
2. Right click the mouse button.
3. Choose the 'Clear Contents' option from the popup menu that appears on the screen.

Clearing the contents of a single cell or range of cells is different from deleting them. When you clear a cell or range of cells, the contents are erased, leaving the cells blank. However, when a cell or cell range is deleted, the other cells re-adjust themselves to fill in the empty space created by deleting them.

Changing the Row Height

You can change the overall look of the whole workbook. You may require to change the height of a row for adjusing text in case a larger font size than default is applied onto it. So, if the font size is made larger than the cell height, then some part of the text might be hidden. Now, to change the height of rows, the steps given below can be applied:

1. Select the row whose height has to be changed. This can be done by either clicking in any cell of that particular row or by clicking at the row header.
2. From the 'Format' menu, select the 'Row' option. Then, choose 'Height'.
3. Enter the height of the cell that you want to achieve.

In order to change the height of a group of rows, select all those rows. From the 'Format' menu, select the 'Rows' and then the 'Height' option. Key in the desired row height. All the selected rows will have the same row size.

Changing the Column Width

On similar grounds, the width of a column can also be altered. Column width can be re-adjusted according to your own special requirements. Thus, for changing the column width, carry out the steps given below:

1. Select the whole column either by clicking at the column header or by clicking at any cell of that particular column.
2. From the Format 'menu, choose the 'Column' option. It will display a 'Column Width' dialog box on the screen.
3. Type in the new column width. Finally, click at the <OK> button.

TYPES OF CELL ENTRIES

EXCEL can very smartly make out the type of data as you type in. You can key in values and formulae from the keyboard. Values can contain text, numbers or special characters. The formulae can perform calculations based on the values present in other cells. You can apply any font type, size and alignment pattern on these values. Let us discuss the different types of cell entries in detail:

Text Values

We can put both text and numbers in a cell. Any entry that contains text, numbers or any special character is recognised as a text entry. A text purely in alphabets is mostly used for giving titles and identifying information such as Salesman Name', Sales (pieces)', etc. Generally, a text entry is given at the top and left side of the worksheet. A number entry can be formatted to text in a case when no mathematical calculaton is required on it. By default, a text entry is left aligned. Looking at the alignment of the entry, you can easily make out the category in which EXCEL has placed your data. In order to apply any particular type of format on your data, select the cells and activate 'Cells' option from the 'Format' menu. Choose any of the formats to apply it on the selected text.

Numeric Values

Any entry is treated as a numeric value if the first character entered is a number or a mathematical operator such as + or - . Numbers are typed directly. A numeric value can contain any of the following characters:

0123456789+-(),/$%.Ee

By default numeric values are right aligned. These numbers can also be formatted depending upon the kind of presentation you require. EXCEL has some pre-defined formats for each kind of numeric value.

Formulae

EXCEL offers a very powerful tool to use existing data values to calculate new values. Formulae establish relationship between two or more cells. It performs a mathematical or arithmetical operation on these data values. The formula can contain numbers as well as cell addresses

and can be created using the arithmetic operators like +(addition), -(subtraction), *(multiplication), /(division) and ^(exponent). The formula entry can be made by beginning the entry with a +, @ or = sign. While entering a formula, key in an opening bracket followed by cell address. It must end with a closing bracket.

Let us now create a simple worksheet and learn how to put labels, values and formulae in it. Follow the steps given below:

1. Take your mouse pointer to the cell C2 and typein "RUBY BAKERY PRODUCTS". Then, press the <Enter> key.
2. Go to the cell D3 either with the help of arrow keys or by clicking it with the mouse pointer. Thereafter, enter "Jun-98". Press the <Enter> key. Similarly, typein "Jul-98" in the cell E3 and again hit the <Enter> key.
3. Similarly, enter all the data as shown in Figure 8.5.

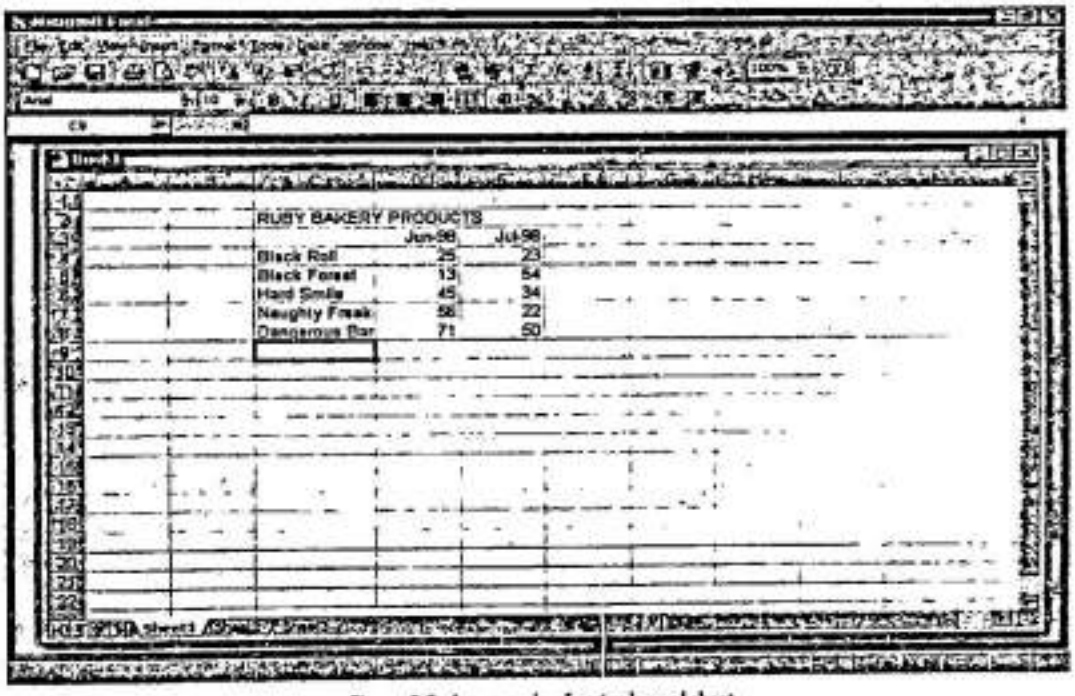


Figure 8.5: An example of a single worksheet

4. Now, we want to find out the total sale for the month of Jun-98. This requires the entering of a formula in the cell D9. So, take your cell pointer to the cell D9. The formula entry shall begin with a + sign or an opening parenthesis.
5. The formula can be entered by two methods:
   a) The first approach is to type in the cell addresses in the cell where you want to see the result of the formula (like +D4+D5+D6+D7+D8) as shown in Figure 8.6 and then press the <Enter> key. You will find the result of the formula at the cell address D9.

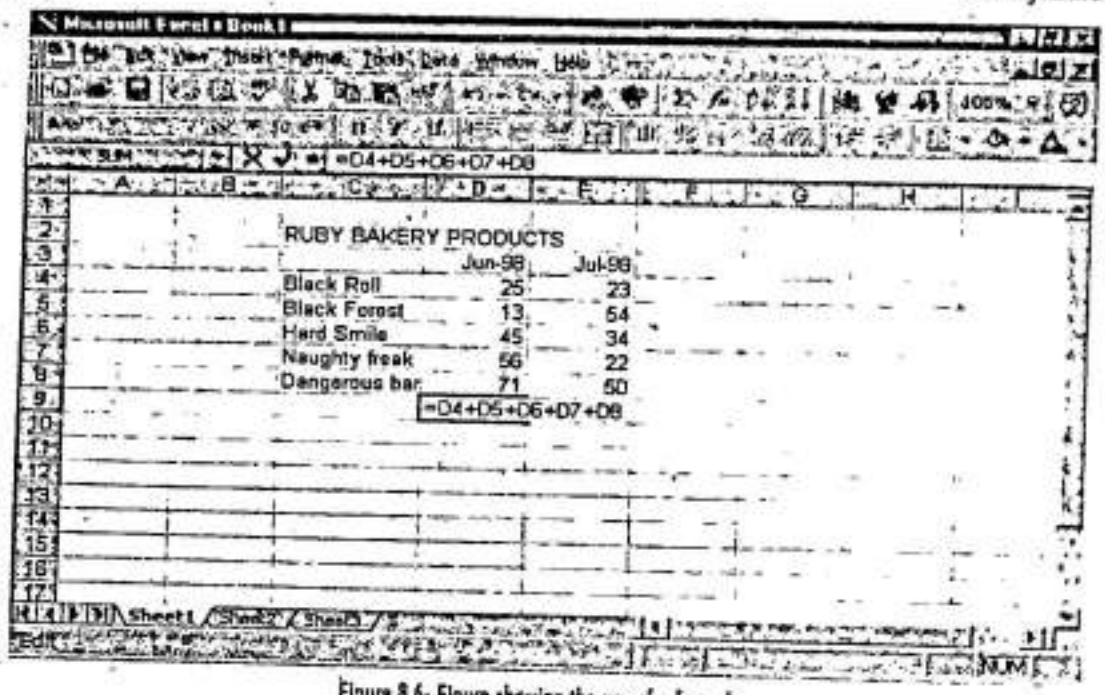


Figure 8.6: Figure showing the use of a formula

b) The second way of entering a formula is by Pointing method. In this method, first of all, enter a + sign in the cell where the formula is required (here, in our example the cell address is D9). Then, move the cell pointer to the cell D4. You will find this cell address appearing automatically at the cell D9. Thereafter, typein the + sign again. Move the cell pointer to the next cell. Keep repeating it till the complete formula is keyed in. Finally, hit the <Enter> key. Now, you will find the result of this formula at the cell D9 as shown in Figure 8.7.

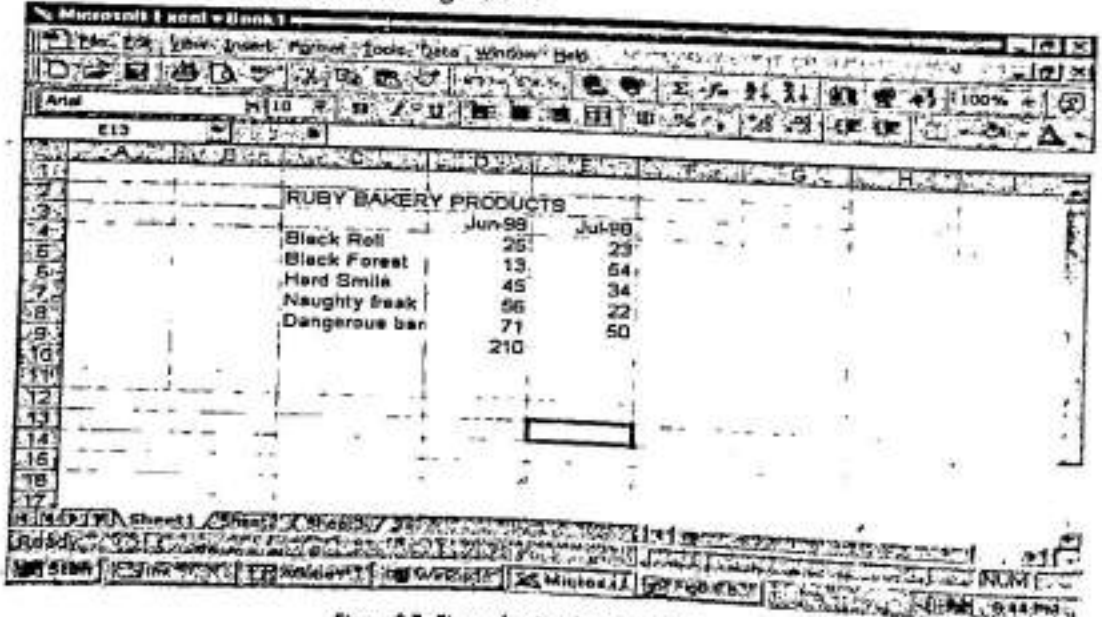


Figure 8.7: Figure showing the result of a formula

COMMONLY USED FUNCTIONS

EXCEL offers a variety of in-built functions which are very easy to use. These functions simplify operations like finding out sum, average, maximum, minimum, count and so on. All these functions start with the @ sign. The syntax of a function is given below:

@FUNCTION-NAME(<RANGE OF CELLS>)

where,

FUNCTION-NAME is the name of the standard in-built function as offered by EXCEL and <range of cells> specifies the cell range on which the action of the function has to be performed. Let us discuss some of these functions one by one. We will take the example of the workbook as shown in Figure 8.7 in explaining these functions.

The @SUM(<range of cells>) Function

This function adds the values of the cells specified in the range. For example:

@SUM(D4:D8)

It would show the added up value of the cells D4,D5,D6,D7 and D8 as 210.

The @AVG(<range of cells>) Function

The @AVG function finds out the average value of the cells given in the range of cells. For example:

@AVG(D4:D8)

It would display the average value of the cells D4 through D8 as 42.

The @MAX(<range of cells>) Function

The @MAX function determines the greatest value out of the specified range of cells. For example:

@MAX(D4:D8)

It shows the highest value, 71 ,contained in cells D4 through D8.

The @MIN(<range of cells>) Function

The @MIN function ascertains the smallest value amongst the range of cells provided to it. For example:

@MIN(D4.D8)

It will give the result 13 because this is the smallest value contained in cells D4 through D8.

The @COUNT(<range of cells>) Function

The @COUNT function counts the number of entries in the given range of cells. For example:

@COUNT(D4:D8)

It will give back the answer as 5 since there are five entries in the above specified range. This function can be useful if you want to find out the number of entries made in a particular range especially when the worksheet is very big.

ABSOLUTE AND RELATIVE CELL REFERENCING

You can very well copy formulas in EXCEL. As and when a formula is copied, the cell references in the new formula are changed. The new formula corresponds to the position it was in relative to the original formula cell. Let us once again concentrate ourselves on the Figure 8.6. Now, if we try to copy the formula given in the cell address D9 to D10, then the formula is going to become =E4+E5+E6+E7+E8. This is called Relative Referencing. In this case, since the references are relative, the formula automatically adjusts with the new value. However, sometimes you may require to make the reference absolute or fixed. This means that when the formula is copied to some other destination, then the formula should not change. This is called Absolute Referencing. Absolute Referencing can be enforced by preceding the row or the column letter with a ($) dollar sign like D5. Now, when you try to copy this reference (D5) to any place in your workbook, then the reference is not going to change. An absolute reference works well for a constant that can be used in a formula stored in a cell. If the row letter is preceded with a dollar sign, then only the row is fixed eg. D$5. When D$5 is copied to some other location then, the column letter is going to take the new reference address but the row number would still remain 5. In the similar manner, column letter can also be preceded with a dollar sign eg. $D5. This will make the column fixed while copying but row is going to take the new reference.

NUMBER FORMAT

EXCEL has got some pre-defined formats that can be applied to numbers. These number formats differ in terms of number alignment, placement and other accompanying symbols with it. When the number format is applied to cells, the numbers are rounded off to the specified number of decimal places. As and when the the numbers are rounded off the change is reflected only on the screen. However, in memory the actual form is stored. At the time of performing calculations, the actual number stored in memory is used. For example, if you round off two numbers 5.6 and 3.2 in two different cells, the display on the screen will be 6 and 3. However, if you try adding up these two numbers, the sum that will be shown on the screen is 9. The Table 8.2 shows the different types of formats that can be applied to numbers.

Table 8.2: Pre-defined Number Formats

Format Name	Explanation
General	For all numbers on which no formatting is to be applied.
Number	For numbers in which number of decimal places is to be specified.
Currency	For converting numbers into monetary values.
Accounting	For all those monetary values that are to be aligned at the decimal point.
Date	For showing date in different styles.
Time	For showing time in one of the many styles available.
Percentage	For converting your numbers into percentage.
Fractions	For converting numbers into fractions.
Text	For those numbers which are to be treated as text.
Scientific	For converting numbers into scientific notations.
Custom	For creating your own formats.

Any of the above mentioned formats can be applied to either a single cell or range of cells before or after typing in the value. In case, any specific format is applied to blank cells, then any entry that is typed in those cells will be automatically converted to the selected format. Let us proceed further and learn how to apply a few formats. In order to format numbers, follow the steps given below:

1. Select the cells that need to be formatted.
2. From the 'Format' menu, choose cells option. A 'Format Cells' dialog box appears on the screen.
3. Click at the 'Number' tab.
4. Select the format that you want to apply.
5. Finally, click at the <OK> button.

AUTOFILL

Autofill tool offered by EXCEL helps you to repeat a cell entry. It looks at the series entered by you in adjacent cells and tries to complete it for you. For example, if you want to enter the labels for all the twelve months of a year simply, typein first two entries, i.e. Jan and Feb in two adjacent cells. Then, highlight both the cells by selecting them. Take your mouse pointer at the bottom right corner of the selected cells. Your mouse pointer is going to take the shape of a + (plus) sign as shown in Figure 8.8. This plus sign is called Autofill handle. Drag your mouse pointer either across or downwards for those many cells till you wish to continue the series. Autofill keeps filling the series till the time the mouse pointer is dragged. So, you are saved the effort of keying in the labels of the rest of the months. The output given by Autofill is shown in Figure 8.9. While using Autofill, you can drag the mouse pointer up, down, right or left. Look at some of the examples of sequences that the Autofill feature can identify:

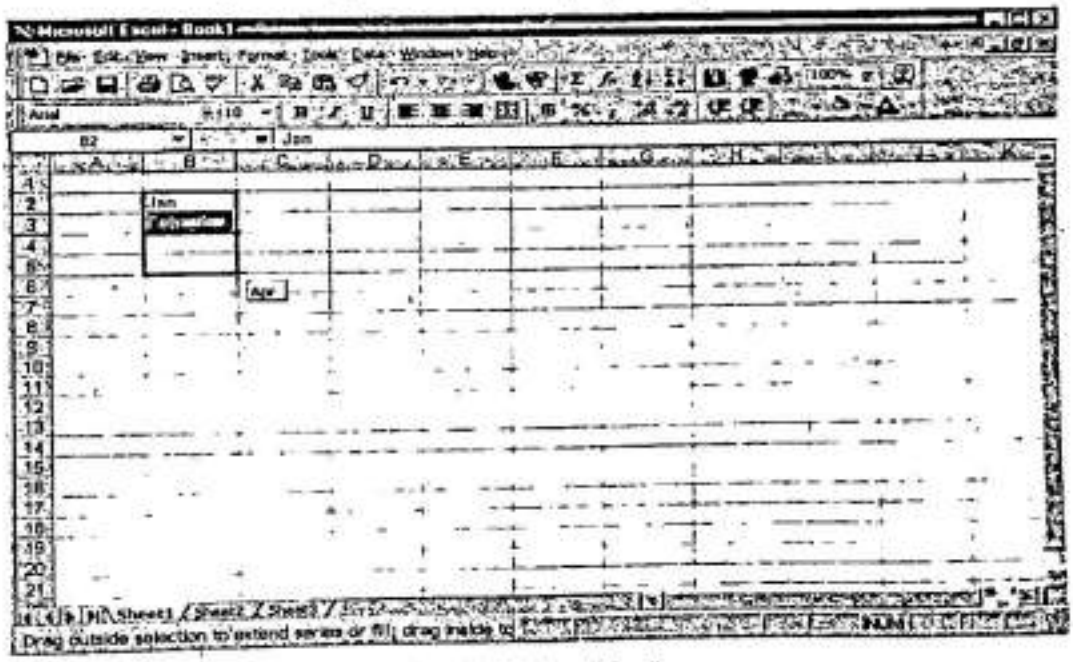


Figure 8.8: The 'Autofill' handle

(i) Monday, Tuesday.....

(ii) 10, 20, 30.....

(iii) 1, 2, 3.....

(iv) A1, A2, A3....

(v) 5:10, 5:20....

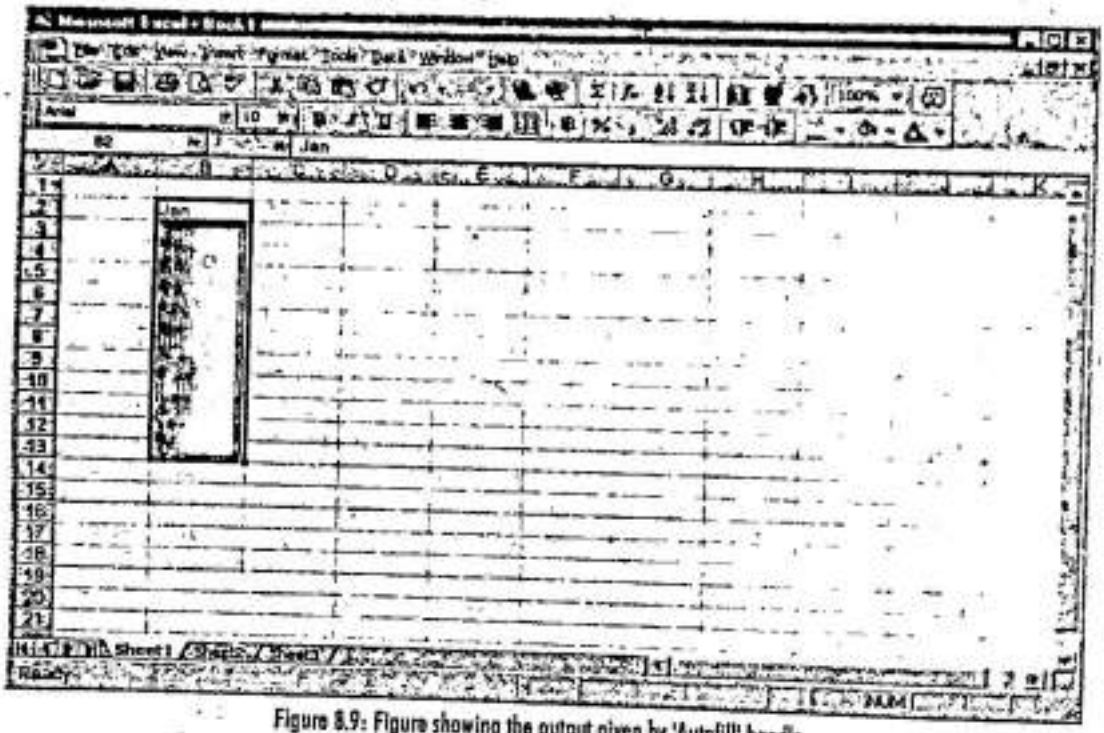


Figure 8.9: Figure showing the output given by 'Autofill' handle

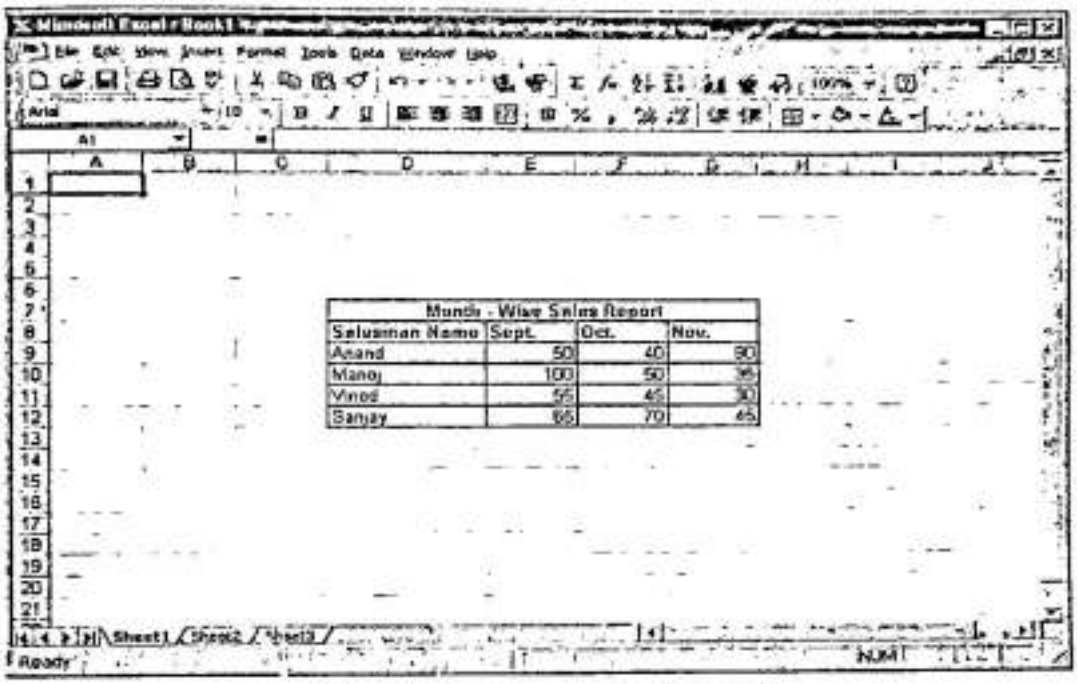
CHARTING WITH EXCEL

As the common saying goes 'A picture is worth a thousand words' is found true by almost all of us. Any kind of message can be best said and understood through its representation in pictorial form. A chart or a picture gives a bird's eyeview of the entire scenario in a single look. So, let us see how we can utilise the EXCEL's power of making charts. EXCEL supports many different kinds of charts according to the vast and varied needs of the user. EXCEL also allows you to link your charts with your data. So, as and when some changes are made to the data, these are automatically reflected in your chart.

A typical worksheet showing data arranged in rows and columns can be safely used for creating charts. Thus, enter data in a tabular form with proper row and column headings. EXCEL is very good at figuring out an appropriate chart on its own.

Let us first of all create a worksheet with the data given in Figure 8.10. This figure gives the number of sales made by each salesman in a particular month.

To create a chart, select one of the cells in the table and press F11 key. EXCEL would automatically create a chart for you as shown in Figure 8.11. This is the easiest way of creating a chart.



Month - Wise Sales Report			
Salesman Name	Sept.	Oct.	Nov.
Anand	50	40	80
Manoj	100	50	35
Vinod	55	45	30
Sanjay	65	70	45

Figure 8.10: Figure giving an example of a worksheet

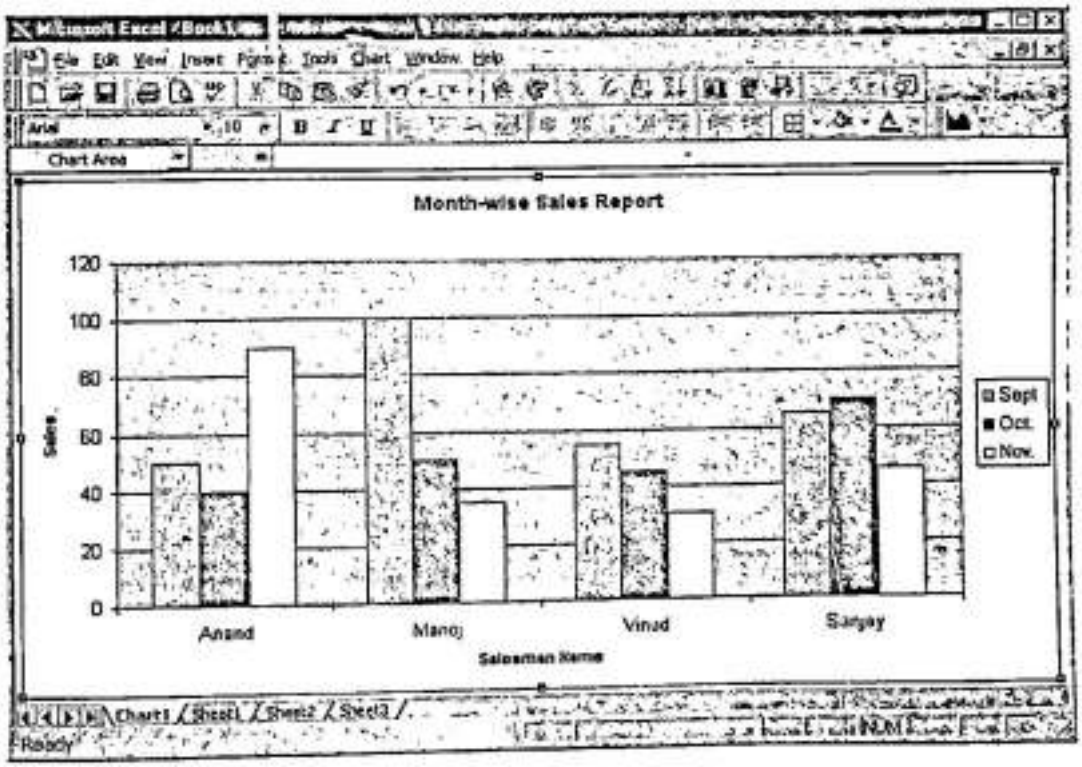


Figure 8.11: Figure showing a chart

Let us find out how to create charts using Chart Wizard. A wizard is a tool offered by EXCEL which takes you through a series of steps to complete a particular process. So, while working through a wizard, it shows a dialog box which asks for more information. You can either accept the default settings or you can give in your own information according to your requirement. Thus, to create a chart using the data given in Figure 8.10, let us begin by selecting a cell within the table.

Step 1 of the Chart Wizard

A chart can be put in the worksheet by two methods. One is to click at the 'Chart' button available on the standard toolbar. The second approach is to select the 'Chart' option from the Insert menu. A dialog box shown in Figure 8.12 appears on the screen.

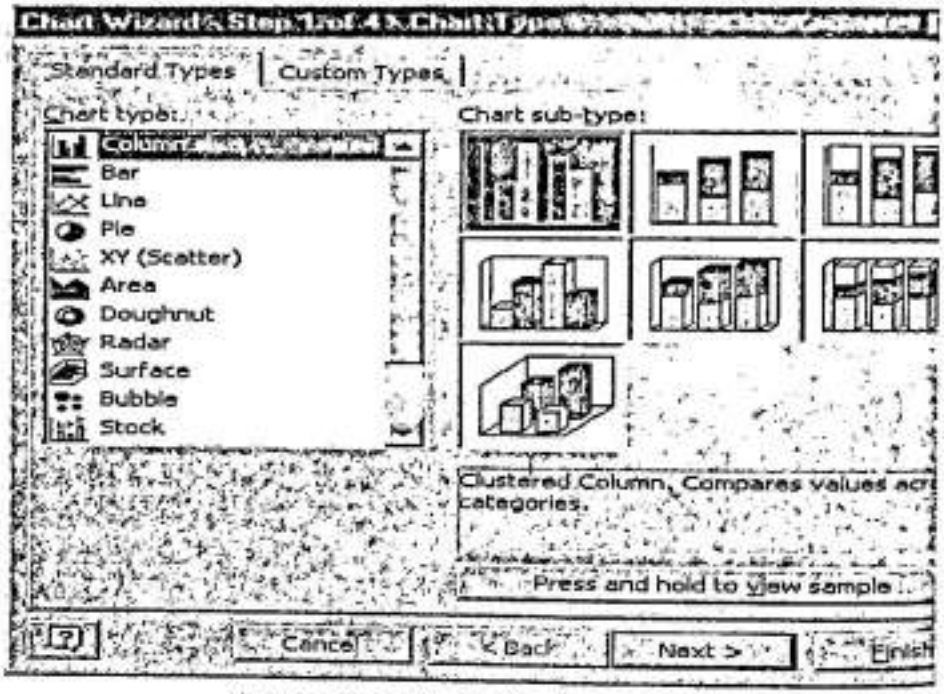


Figure 8.12: Step 1 of the Chart Wizard

Select the 'Standard Types' tab. Now, select the kind and type of chart into which the data has to be converted from the 'Chart Type' box. Then, select the chart sub-type from the adjacent window. Finally, click at <Next> button.

Step 2 of the Chart Wizard

A dialog box as shown in Figure 8.13 appears on the screen. This dialog box gives you an opportunity to decide the data orientation (i.e. which data label has to be shown on the bottom axis of the chart). In our sample data, we have two labels - 'Salesman Name' and 'Sale'. If you want that the 'Salesman Name' should come along the bottom axis and the 'Sales' along the left axis, then click at 'Columns' radiobutton. However, if you want to change the orientation, click at the 'Rows' radiobutton. This will make 'Sales' come along the bottom axis and the 'Salesman Name' along the left axis.

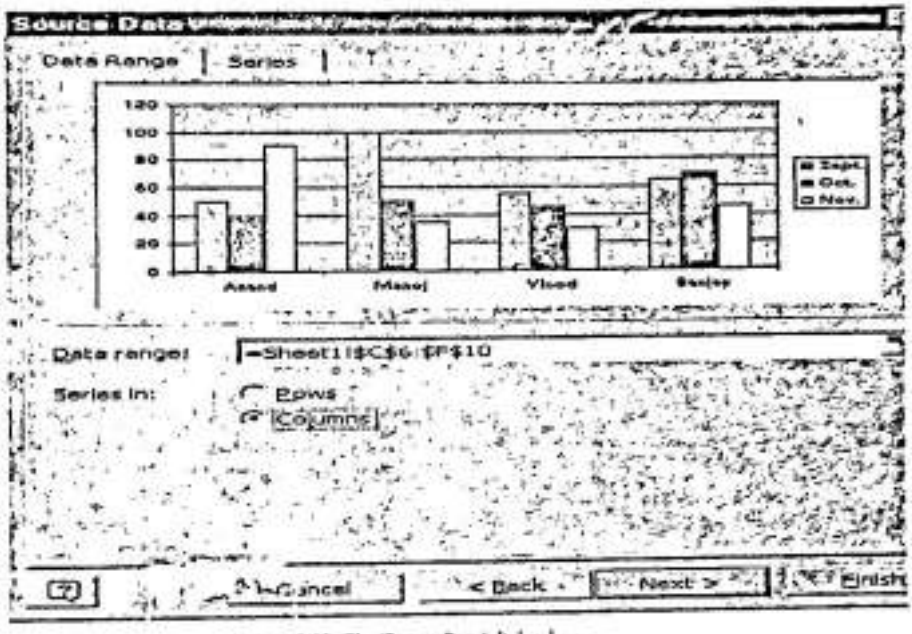


Figure 8.13. The 'Source Data' dialog box

Data range included in the chart can be changed very easily. Click at the 'Collapse' dialog icon which appears at the end of the 'Data Range' text box. A collapsed dialog box appears on the screen as shown in Figure 8.14. This will make your worksheet apparent again. The data that has been selected for creating a chart is shown by dashed lines. In case, you want to use a different data range, then you can select that particular data from here. Click at the 'Expand' dialog icon which is located at the right corner of the collapsed dialog box to go back. Now, you have the desired range and orientation. Click at the <Next> button.

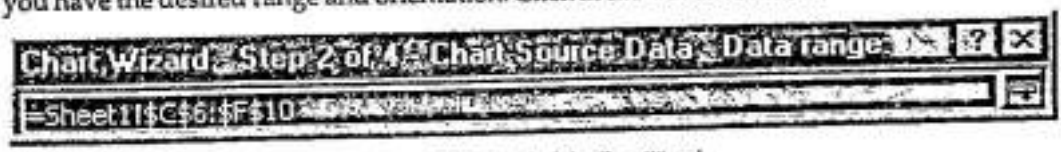


Figure 8.14: Step 2 of the Chart Wizard

Step 3 of the Chart Wizard

A dialog box as shown in Figure 8.15 appears on the screen. Click at the 'Titles' Tab. It will label your chart and its axis. In the 'Chart Title' box, give any label. In our example, the appropriate label that can be given to our chart is 'Month-Wise Sales Report'. In the Category(X) axis, provide a label for the X-axis. In the similar manner, issue a label for the Y-axis in the Value(Y) axis text box.

You can change the overall look of the chart by making other changes in the default settings. Hit the 'Axes' tab to control the labels for the value on the axes. The 'Gridlines' tab can be used to get rid of gridlines entirely. This will make your chart free from any gridlines. You can make the grid look finer or show it in any one direction. The 'Legend' tab can help you in deciding the placement of legend box on the screen. With the 'Data Labels' tab, you can decide whether the actual data numbers (in our example – Sept, Oct, Nov,) and the corresponding data labels (like Salesman Name) are to be displayed or not. The 'Data Table' tab helps you to specify

whether or not a formatted table of the data is to be included along with the actual chart or not. Finally, click at the <Next> button after making all those desired changes.

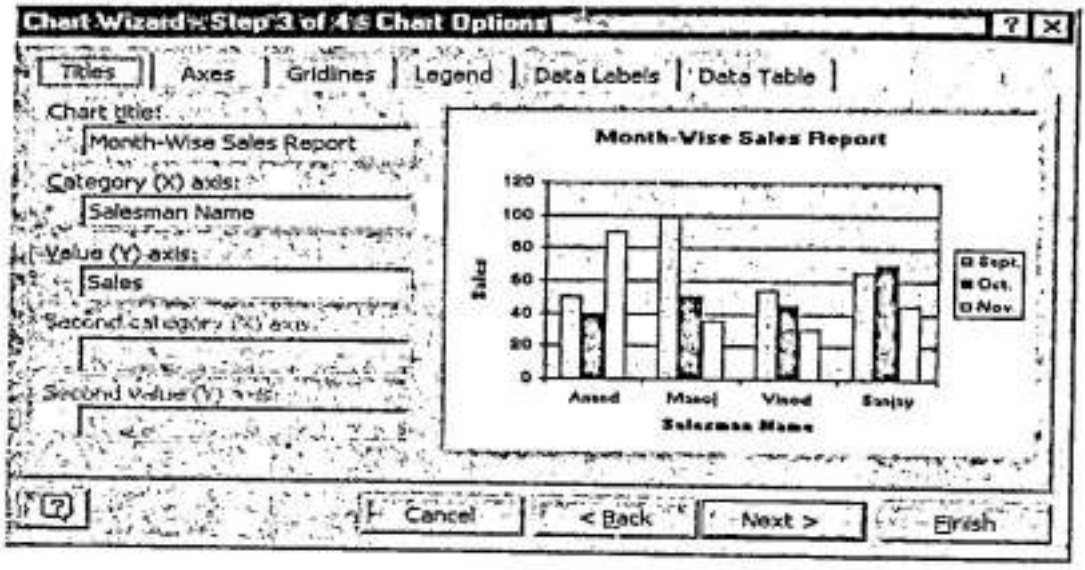


Figure 8.15: Step 3 of the Chart Wizard

Step 4 of the Chart Wizard

This is the last step in the process of chart creation. All the necessary details required by the chart are given in Step 1 through Step 3. The fourth and the final step asks you whether the chart is going to be displayed in the worksheet where the data is located or in a separate worksheet. So, in this last step as shown in Figure 8.16, you have to decide whether the chart is to be embedded as an object in a worksheet or it is to be placed in a separate worksheet. Let us find out the difference between these two types of charts:

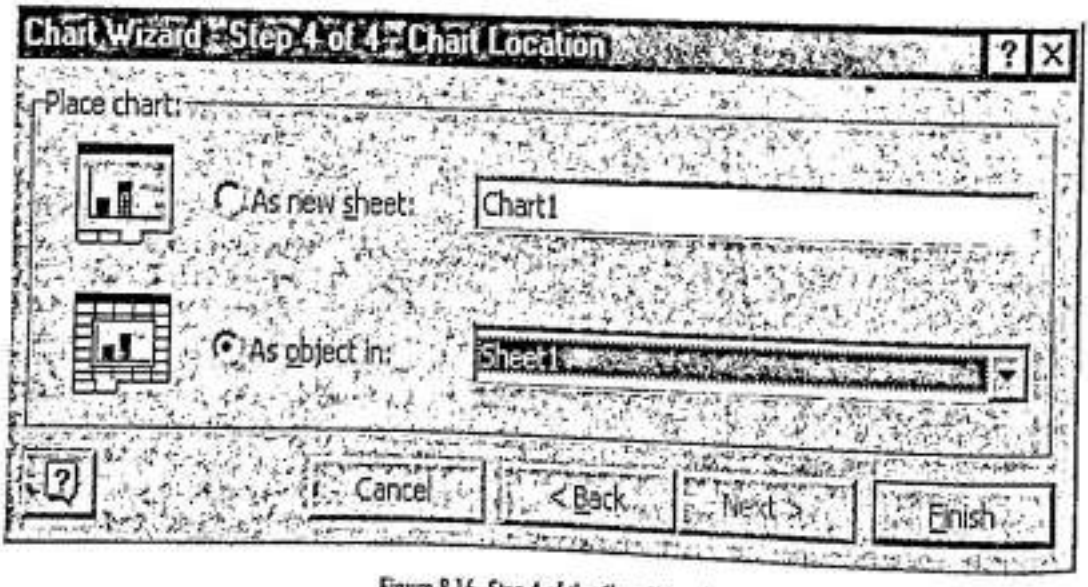


Figure 8.16: Step 4 of the Chart Wizard

1. *Embedded Charts:* These charts can be linked to the data based on which the chart is created. So, if any changes are made to the data, the corresponding chart also changes.
2. *Chart Sheets:* These charts can also be linked to the data. The only difference is that these charts are placed in separate worksheets. The chart is put in the middle of the new worksheet. It leaves very little scope of moving the chart.

Finally, click at the Finish.

The different components of a chart are shown in Figure 8.17.

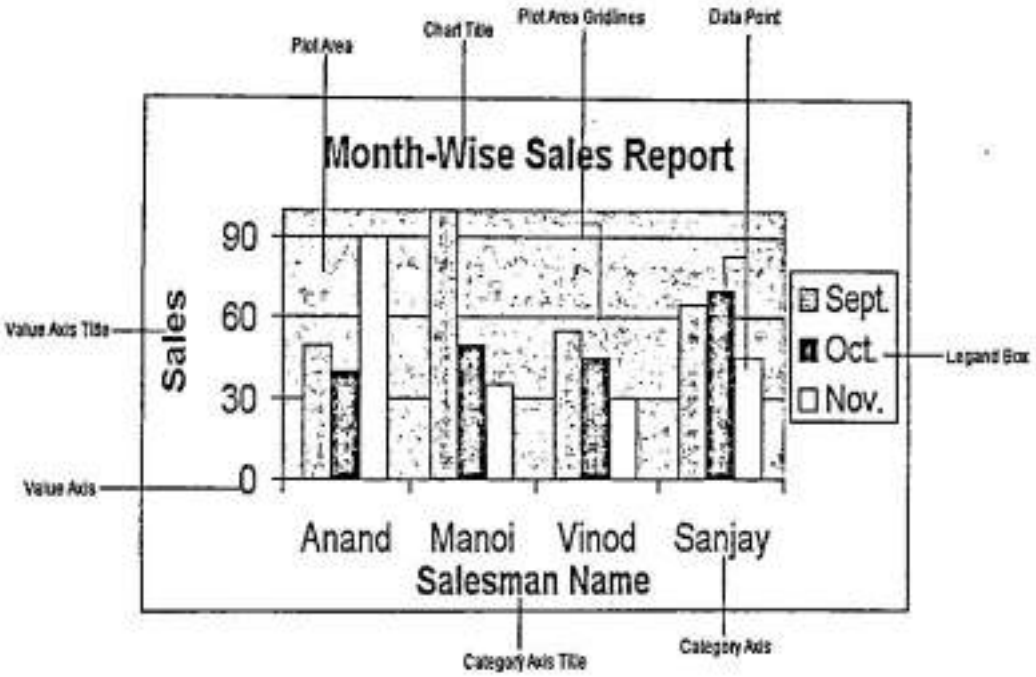


Figure 8.17: Different Components of a Chart

MACROS

The very word 'Macro' gives the impression of a huge big giant. Macro is not the hero of a horror movie but a small program that carries out pre-defined and pre-recorded series of steps by giving a few keyboard shortcuts. So, we can state that a macro is like a recorded movie which can be run any number of times. Macro is just a way of doing your work in a series of steps which it carries out automatically once it is triggered. It can be very easily said that a macro is like a batch fie created in DOS. It contains a series of commands. So, as and when a macro is called and run, the instructions given in it are executed one by one.

A macro automates your tasks, thus saving a lot of your precious time. Macro can just do anything for you. Your imagination can be the only limitation to it. EXCEL offers macros in two languages – Excel Visual Basic and Excel 4.0 Macro language. You can use either language to create macros but Excel Visual basic is more difficult to use. Moreover, you also need to know Excel Visual Basic language itself So, throughout our session, we would concentrate on learning how to create macros using Excel 4.0 macro language

Creating and Naming a Macro

A macro is very easy to create. Before proceeding further, first decide the steps that your macro is supposed to carry out. Suppose you want to write a macro that would cut a range of cells and paste it at some other location. Thus, in order to create a macro, carry out the following steps:

1. Select 'Tools\Macro' option from the main menu.
2. Select 'Record New Macro' option from the cascading menu. It would display 'Record Macro' dialog box as seen in Figure 8.18.

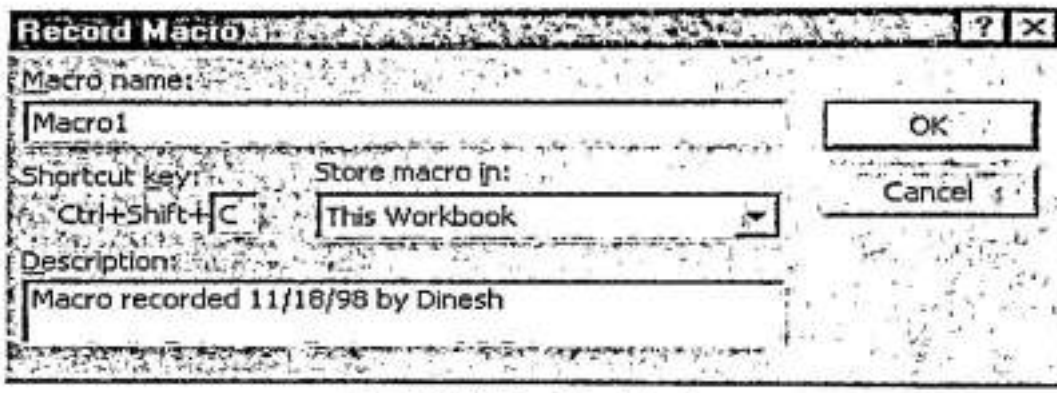


Figure 8.18: The 'Record Macro' dialog box

3. Name the macro under which you want to save it. Name to a macro can be given in 'Macro Name' box. A long name upto 255 characters can be given to a macro. However, you cannot include spaces in your macro name. Your macro name can have only numbers, letters and underscore character. But there is one limitation to it. The macro name cannot start with a number or an underscore character.
4. After assigning a name, you are required to give a keyboard shortcut to it. Giving a keyboard shortcut is absolutely at the discretion of the user. A keyboard shortcut is assigned only if the user wants to execute the macro using a keyboard. However, if any lowercase alphabet is given in the 'Shortcut key' box, then the macro can be executed by pressing the <Ctrl + 'alphabet'> keys together. However, if an uppercase alphabet is used, then you need to press <Shift + Ctrl + 'alphabet'> keys together. Suppose you give the alphabet 'C' in the 'Shortcut key' box, then this macro can be activated by pressing <Shift+Ctrl+C> keys together. On the contrary, only if 'c' in the 'Shortcut key' box is given, then in that case , the macro can be activated by pressing <Ctrl + C> keys only.
5. Now, we proceed on to the 'Store Macro in' box. If you want to use the macro that you are now trying to create in the current workbook only, then select the option 'This Workbook' from the drop-down list. However, if you want to make your macro available to other workbook, then select 'New Workbook' option from the drop down list.
6. In the 'Description' box, give some relevant and important details about your macro like the date on which macro was recorded, the owner of the macro, the purpose for which the macro has been created, etc. Thus, any kind of descriptive text can be given in this box. It enables you to remember all the important things about your macro.

7. Now, as and when all the relevant details are filled in the 'Record Macro' dialog box, click at the <OK> button. A very small 'Stop Recording' toolbar will appear on the screen. Till this point of time, we have only told Excel that we want to create a macro. It is actually now when the process of recording starts.

Recording the Macro

You can now proceed on to record your macro. Just perform all the essential steps to complete your particular task. For this example, in which we have to cut a range of cells and paste at some other location, do the following steps to record them in your macro.

1. Select the range of cells that has to be cut.
2. From the Edit 'menu, select the 'Cut 'option.
3. Take your cursor at a location where you want to paste this range of cells.
4. Again, from the 'Edit' menu, select the 'Paste' option.
5. Click at the 'Stop Recording' button available on the 'Stop Recording 'toolbar.

The macro is now ready to be executed. This macro is by default made available to all the worksheets of the current workbook. However, if you want this macro in other workbook, then select 'New workbook' option in the 'Record Macro' dialog box. Don't forget to click at the Stop Recording' button once all the necessary steps to be included in the macro are over. Otherwise your macro is going to become unnecessarily big with unwanted steps in it.

Saving the Macro

The macro that we have just created in our previous example is made available only to the current workbook. But, if you want that this particular macro should be made available to other workbook, then choose 'New Workbook' option in the 'Record Macro' dialog box. EXCEL will then ask you the name of the new workbook in which the macro has to be saved.

Using a Macro

Till this time, we were on our path of creating a new macro. Now, let us learn how to run or execute a macro. You can run your macro in any of the following ways:

- If a shortcut key has been assigned to your macro, then it can be activated by pressing <Ctrl+'key'> or <Shift+Ctrl+'key'> depending upon the case of the 'key'.
- A macro can also be run by selecting 'Tools\Macros\Macros' from the main menu. Then, click at the macro name that you want to execute. Once the macro starts running, you can stop it abruptly in between by pressing the 'Esc' key.

Deleting a Macro

If a macro is no longer needed, then it is advisable to delete it. In order to delete a macro, click at the 'Tools\Macro\Macros' option from the main menu. A 'Macro' dialog box appears on the screen. Select the macro that has to be deleted. Finally, click at the <Delete> button to complete the process.

Editing Macro Options

Many a times, a macro requires some changes to be made to it. You can change the shortcut key or description that has been given to the macro. Thus, in order to make changes to your

macro, click at the 'Tools\Macros\Macro' option of the main menu. A 'Macro' dialog box appears on the screen. Click at the <Options> button to show the 'Macro Options' dialog box. Make all the necessary changes and finally click at the <OK> button.

IMPORTING AND EXPORTING FILES

EXCEL allows you to import data from databases created by other programs such as Lotus 123 and dBase. So, this makes reading from and writing into files created by other spreadsheet and database programs possible. It can help you in sharing information with other spreadsheet programs like Lotus 123, Quattro Pro or Multiplan. EXCEL takes all the responsibility of converting files from other worksheet database programs automatically as and when the file is either saved or opened. The 'File\Open' command reads the file extension of the files created by other programs. In the similar manner, when you try to save files, the 'File\Save as' option helps you to save your file in other types also. Files can be exported by clicking at the desired file and then selecting a required file type in the 'Save as' dialog box. Files can also be imported which are created by various versions of dBASE and Lotus 123. You simply have to pick the file using 'File\Open' option. EXCEL can also open plain ASCII text files. Let us import the file 'Shruti.Txt'. Start the EXCEL program first and display a blank workbook.

1. Open the file 'Shruti.Txt' by selecting 'Open' option from the 'File' menu. Figure 8.19 appears on the screen.

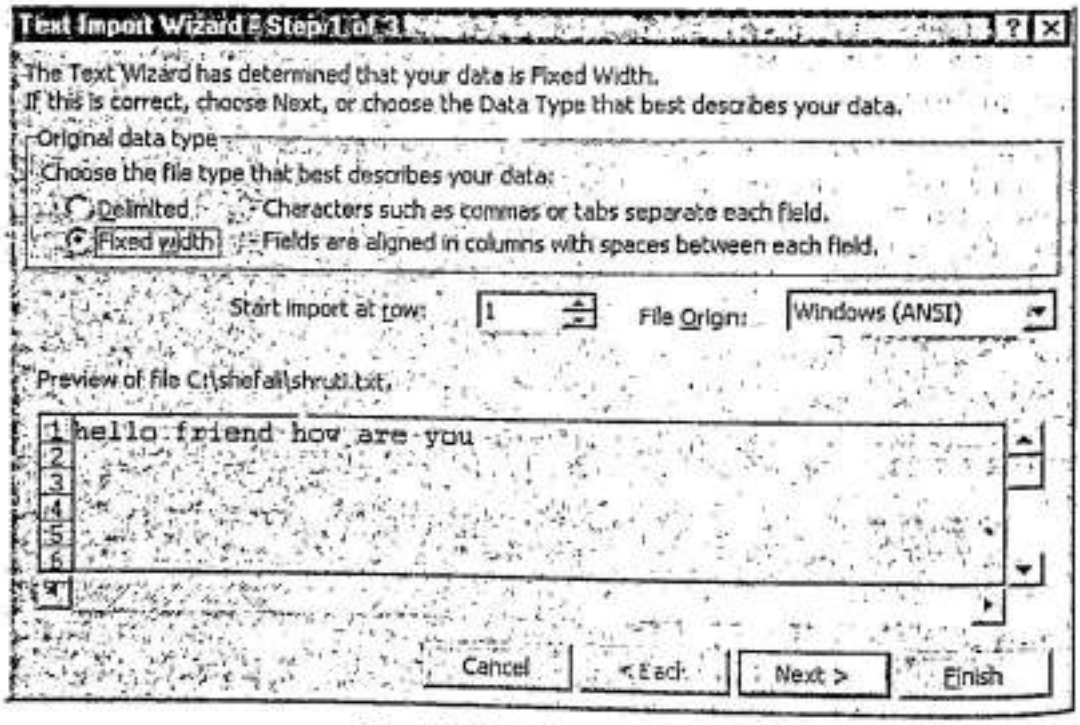


Figure 8.19: Step 1 of Text Import Wizard

2. Click at the <Next> button.

3. A dialog box by the name 'Text Import Wizard – Step 2 of 3' appears on the screen. It guesses where the columns should be put as shown in Figure 8.20.

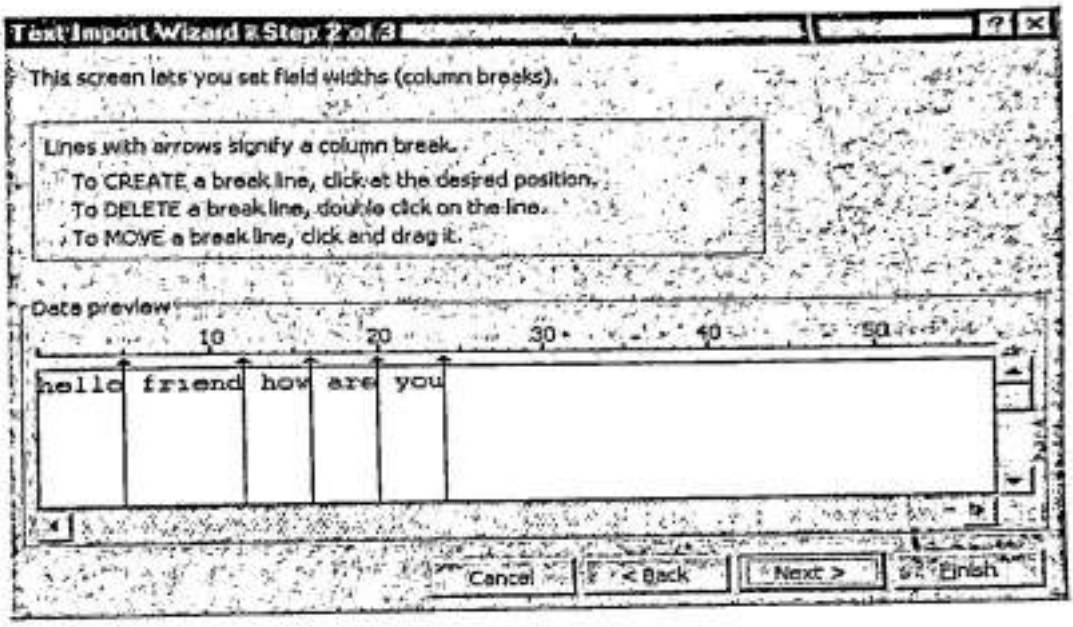


Figure 8.20: Step 2 of Text Import Wizard

4. In case you want the columns to appear at some other place, then move the line by clicking it and then dragging it. You can also remove a line in case you do not require it by double-clicking at that particular line. Then, click at the <Next> button.

5. A 'Text Import Wizard – Step 3 of 3' is shown on the screen as can be seen in Figure 8.21. This dialog box allows you to set the Data Format for each column. You can also leave the data as it is without changing the data format. Finally, click at the <Finish> button.

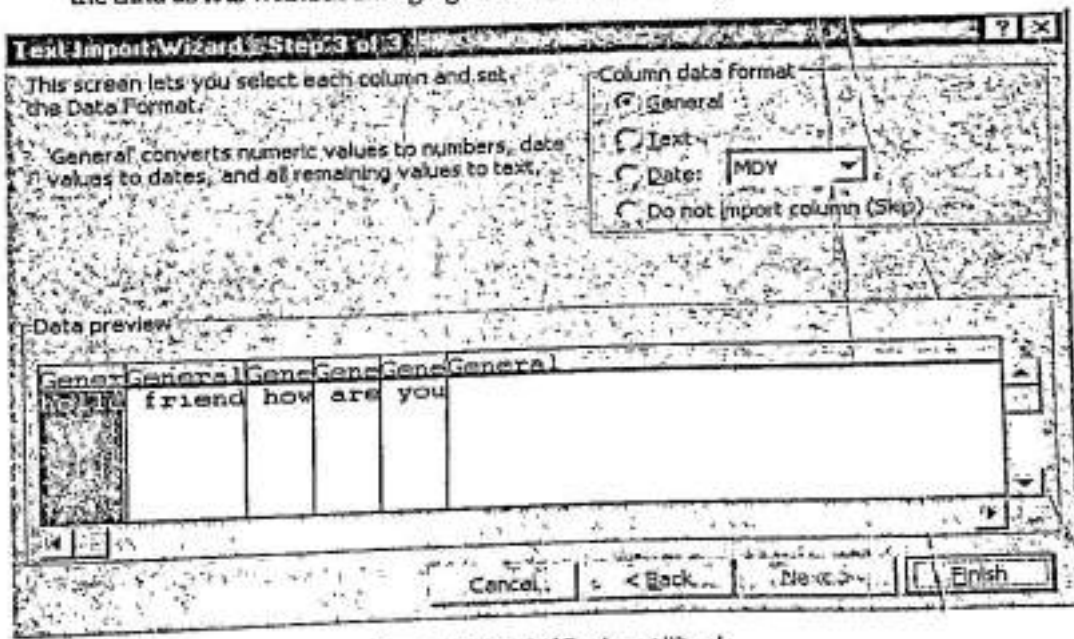


Figure 8.21: Step 3 of Text Import Wizard

PRINTING A WORKBOOK

There could be a number of reasons for taking a printout of the workbook that you have just created. You may be required to give the yearly status of the overall working of the company to your boss or you may want to keep a copy of the workbook for your own future reference. EXCEL offers a very easy way of printing the workbook. You can very well control the overall look of the whole printout and modify it to suit your own special requirements. You can preview your document before taking a final printout. It will give the overall look of how your printout is actually going to look on paper. So, for previewing the workbook, activate the 'Print Preview' option of the 'File' menu. The Figure 8.22 shows a preview of a worksheet. Now, after previewing the workbook, you are ready to take a printout. So, proceed with the steps given below:

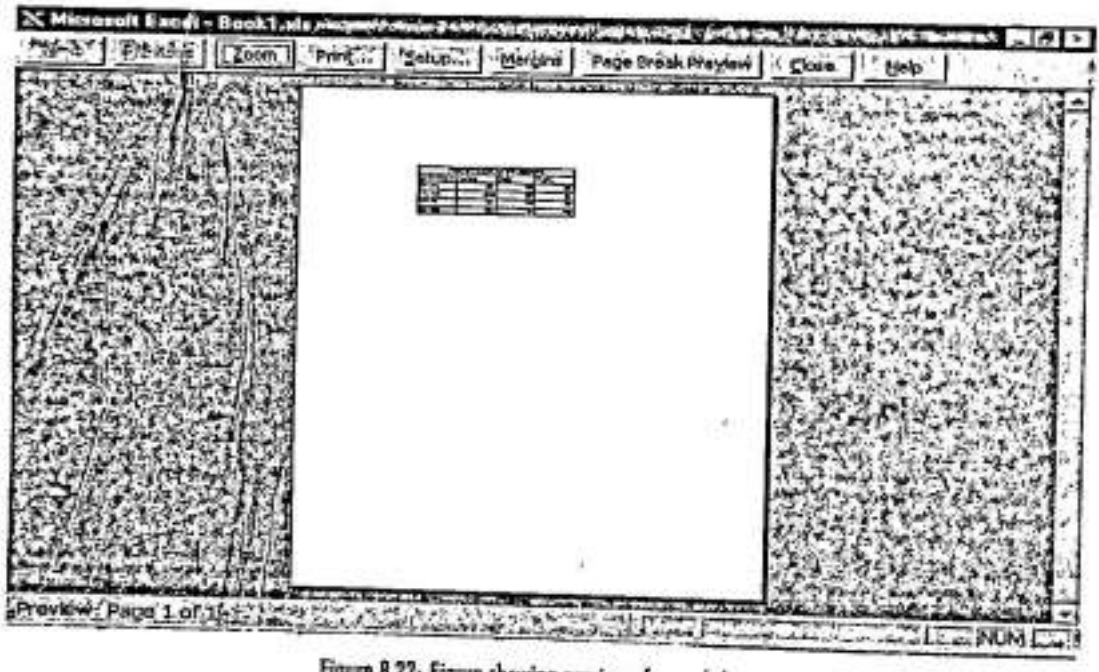


Figure 8.22: Figure showing preview of a worksheet

1. Open the file whose printout has to be taken.
2. From the 'File' menu select the 'Print' option. A 'Print' dialog box appears on the screen as shown in Figure 8.23.
3. Choose the printer that you want to use out of all the installed printers on your system from the 'Name' drop down list.
4. You can select the pages of the workbook you want to print. Through the 'Print range' option of the 'Print' dialog box. For example, if you want to take a printout of all the pages of the current workbook, then click at the 'All' radiobutton. But sometimes, you require only selective pages to be printed. For that matter, click at the 'Pages' radiobutton and typein the starting number of the page in the 'From' box. Similarly, enter the page number till which the printout has to be taken in the 'To' box.
5. Enter the number of copies you want to print in the 'Number of Copies' box.

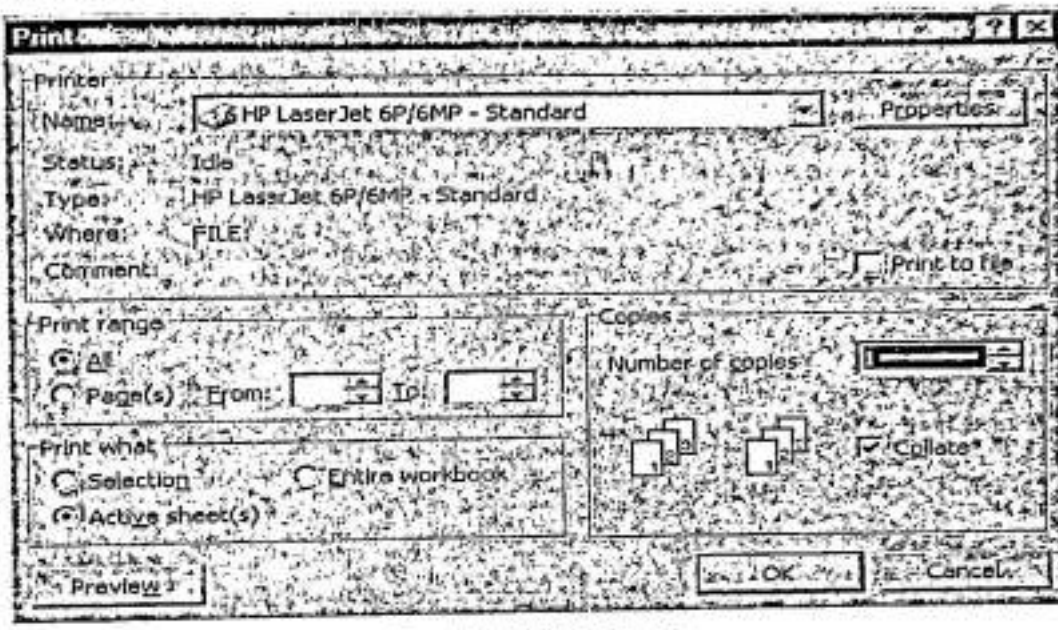


Figure 8.23: The 'Print' dialog box

6. The 'Print What' option lets you to decide in printing, either the selected portion of the worksheet or the whole workbook or just the active sheet(s).

7. You can also see the preview of the workbook by clicking at the 'Preview' button.

APPLICATION OF A SPREADSHEET IN CORPORATE SECTOR

Electronic spreadsheets contribute a lot in the day-to-day working of corporate sector. All the managerial reports, price lists, etc., are prepared with the help of electronic spreadsheets. It helps the management to take quick decisions. It is able to answer the important 'what if' questions of the managers based on which they can design and develop various marketing and sales strategies. These days almost all the managers make use of spreadsheets extensively.

SUMMARY

EXCEL 97 is a very powerful and easy to use spreadsheet package. It's easy to use interface has made it very popular among end-users and non-programmers. It can perform complex calculations in a matter of few seconds. Data can be put in more organised and in orderly fashion which can make the understanding very simple and less complicated. It can also act as a word-processor though it lacks the advanced features of desktop publishing. It helps us in analysing and interpreting complex data. A file in EXCEL is called a document or a workbook. One workbook contains many worksheets under it. The idea is to put all the related information at one place. The default name given to a file in EXCEL is 'Book1'. The extension of an EXCEL file is 'xls'. An electronic spreadsheet is a grid of rows and columns. An intersection of a row and a column is called a cell. A group of continuous cells is called a range. At any one time, one cell is always highlighted and this cell is called the currently active cell. Any kind of entry can only be done in a cell. A cell entry can be modified by double-clicking at that particular cell. New rows and columns can be inserted in the worksheet. The row height and the column width can be changed to suit special requirements. Different types of cell entries can be made in EXCEL which include Text, Number and Formulae. The text entry can contain text, number or any special character. Any entry is treated as numeric value if the first character entered is a number or a mathematical operator such as + or -. Formulae establish relationships between two or more cells. It performs mathematical or arithmetical operation on these data values. EXCEL offers some built-in functions which are very handy to use. Some of these functions include @SUM, @AVG, @MAX, @MIN and @COUNT. It is very easy to copy formulae from one cell address to another. However, if the new cell address corresponds to the position it was relative to the original formula cell, then it is called Relative cell referencing. Sometimes, when the formula is copied to some other destination, it does

not change. This is called Absolute cell referencing. The reference is made fixed or static by preceding the row or column letter with a dollar sign. EXCEL has got some pre-defined formats that can be applied to numbers. These number formats differ in terms of number alignment, placement and other accompanying symbols with it. Some of the different types of formats are General, Number, Currency, Accounting, Date, Time, Percentage, etc. The AutoFill tool of EXCEL helps to repeat a cell entry. It looks at the series entered by you and then tries to complete it for you. EXCEL can very safely convert a worksheet into a good looking and impressive chart. A chart can be created by using the chart wizard facility of EXCEL. The chart wizard takes you through a series of steps and guides you at each step. You can create a large variety of charts. The macro is a small program that carries out pre-defined and pre-recorded series of steps by giving a few keyboard shortcuts. A macro automates your task, thus saving a lot of your precious time. A macro is like a batch file of DOS. It contains a series of commands which are executed in the sequence specified. The electronic spreadsheets help to prepare professional managerial reports, price lists, etc. They contribute a lot in the day-to-day working of corporate sector.

REVIEW QUESTIONS

1. Fill in the blanks:
   (a) An electronic spreadsheet is a network of _____ and _____.
   (b) The extension given to an Excel file is _____.
   (c) The cell entry can be edited using the _____ key.
   (d) The different types of cell entries are _____, _____ and _____.
   (e) The _____ tool helps in repeating a cell entry.
2. Write True or False:
   (a) An electronic spreadsheet can be used for preparing Income and Tax statements.
   (b) The terms 'Excel Document', 'Excel Workbook' and 'Excel File' can be used interchangeably.
   (c) Range can also be comprised of a single cell.
   (d) The highlighted cell is called the currently active cell.
   (e) New rows and columns cannot be inserted in a worksheet.
3. What is an electronic spreadsheet? Discuss the areas where an electronic spreadsheet finds its major contribution.
4. Give the names of some of the popularly used electronic spreadsheet packages.
5. Explain the following terms:
   a) Title Bar
   b) Main Menu Bar
   c) Standard Toolbar
   d) Formatting Toolbar
   e) Cell
   f) Status Bar
   g) Rows
   h) Columns
   i) Name Box
   j) Range

6. Discuss any one method of opening EXCEL.
7. What is the difference between a workbook and a worksheet?
8. What is the key combination given to open a document?
9. What all information has to be given in the 'Open' dialog box?
10. What is the difference between the 'Save' and 'Save as' option?
11. What is meant by the currently active cell? How can a cell entry be edited?
12. Discuss the steps you would follow to insert a blank row or a column in your worksheet.
13. What is the difference between deleting a cell and clearing the contents of a cell?
14. Can the row height and column width of a cell be changed. How?
15. What are the different types of cell entries? Discuss in detail.
16. Name some of the commonly used functions. Explain by giving suitable examples.
17. What is absolute and relative cell referencing?
18. What are the different formats offered by EXCEL? How can you apply a particular format on either a single cell or range of cells?
19. Explain the Autofill tool offered by EXCEL.
20. What is a Chart Wizard? Explain the steps to create a chart.
21. What are the different types of charts?
22. What is a macro? What are the uses of a macro?
23. Discuss the steps to create a macro.
24. How can you print a workbook?
25. Explain the importance of an electronic spredsheet in corporate sector.
26. Create the following worksheet.
    a) The name given to the file should be 'Sales.xls'.
    b) Insert a blank row before column D. Enter the following details in the newly inserted column. The cell address D4 should contain 'Imports'. Enter 2586, 2997, 2616, 2345, 1983 and 2341at the cell addresses D6,D7,D8,D9,D10 and D11.
    c) Change the row height and column width to adjust the text.
    d) Find the total production of all the years in the cell address D12. Copy the formula to the cell addresses D13,D14 and D15 to find the respective totals.
    e) Find out the year in which maximum number of cars were produced. Similarly, find out the year in which maximum imports were carried out.
    f) Find out the year in which the least number of cars were produced. Similarly, find out the year in which the imports were at the minimum value.

g) Change the format of all the numbers by putting a comma.

h) Enter the number (1,2...) series starting from the cell address A6 and ending at A11 with the help of Autofill tool.

i) Create a suitable Bar chart with the data provided to you by giving appropriate titles and labels.

j) Preview your file named 'Sales.xls'.

k) Save the file and exit EXCEL.

CHAPTER 9

Database

LEARNING OBJECTIVES

- Introduction
- What is a Database
- How to Start Access 97
- Opening a Database
- The Access Window
- The Database Window
- Creating a Database
- Creating a New Table
- Closing and Saving a Database
- Exiting Access
- Working with Tables
- Working with Forms
- Working with Reports
- Creating a Report

INTRODUCTION

Microsoft Access is a Windows based relational database management system (RDBMS). It has received huge acceptance by users because of its versatility and easy to use interface. MS-Access is best suited for maintaining any type of information. It can keep huge records of data ranging from keeping an address book to inventory details. Access finds its immense usage in registering telephone numbers, expense details, store or warehouse information. Whatever data is entered, it can be viewed from different angles using forms. Data can also be sieved and extracted based on certain conditions using queries. Reports help in analysing the data and help you to come at certain meaningful inferences. The very frequently used operations can be automated by creating and saving macros.

WHAT IS A DATABASE

A database is a collection of related information. An example of a typical database is a private telephone directory. It contains related information about each person like his name, address and telephone number. Other examples of a database include list of customers and suppliers, maintenance of stock in warehouses, collection of tapes in libraries, maintenance of members in a country club, etc.

Components of a database

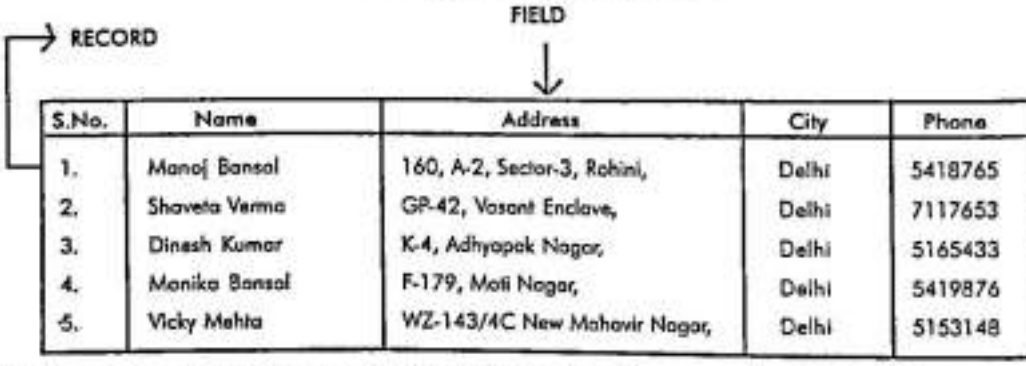
All the information stored in an Access database is kept in tables as illustrated in Table 9.1.

Table: A table is a collection of some specific kind of data. It is the basic element of the database. Data put in a table is organised in rows and columns.

Record: Each row is called a record and it contains the complete information about one particular item, eg. in a telephone directory all the essential details about a single person like his name, address and city form one record.

Column: Each column is called a field. It holds information about a certain type for all records. A field could be a name, address, telephone number, etc.

Table 9.1: An example of a typical table



S.No.	Name	Address	City	Phone
1.	Manoj Bansal	160, A-2, Sector-3, Rohini,	Delhi	5418765
2.	Shaveta Verma	GP-42, Vasant Enclave,	Delhi	7117653
3.	Dinesh Kumar	K-4, Adhyapak Nagar,	Delhi	5165433
4.	Monika Bansal	F-179, Moti Nagar,	Delhi	5419876
5.	Vicky Mehta	WZ-143/4C New Mahavir Nagar,	Delhi	5153148

In the example shown in Table 9.1, the table contains four records and five fields. Thus, each record contains a complete and wholesome information about one item. Each column contains the same type of information for all the records like S.No., Name, Address, etc. The field 'Name' contains the information related to 'Name' for all records. So, you can have any number of records as well as fields in your table. You can add more records to your table. In the similar manner, you can also expand the field list. Your database can have any number of tables. The 'Relational' concept allows to build relations between different tables.

HOW TO START ACCESS 97

In order to startup Access in Windows 95 or Windows 98, follow the steps given below:

1. Click at the Start button. Select the Programs option.
2. Select Microsoft Access option from the cascading menu. Access will be loaded in the computer's memory. By default, the name given to an Access database is 'db1'. The extension given to a database in Access is 'mdb'.

OPENING A DATABASE

In order to access any table form or report created in a database, it has to be opened first. A database can be opened by any of the following methods:

Method 1: If you have just started Access:

This method is used for opening a database if you have just launched Access. Follow the steps given below:

1. Select the 'Open an existing database' option from the opening Microsoft Access dialog box as shown in Figure 9.1 and click at the <OK> button.

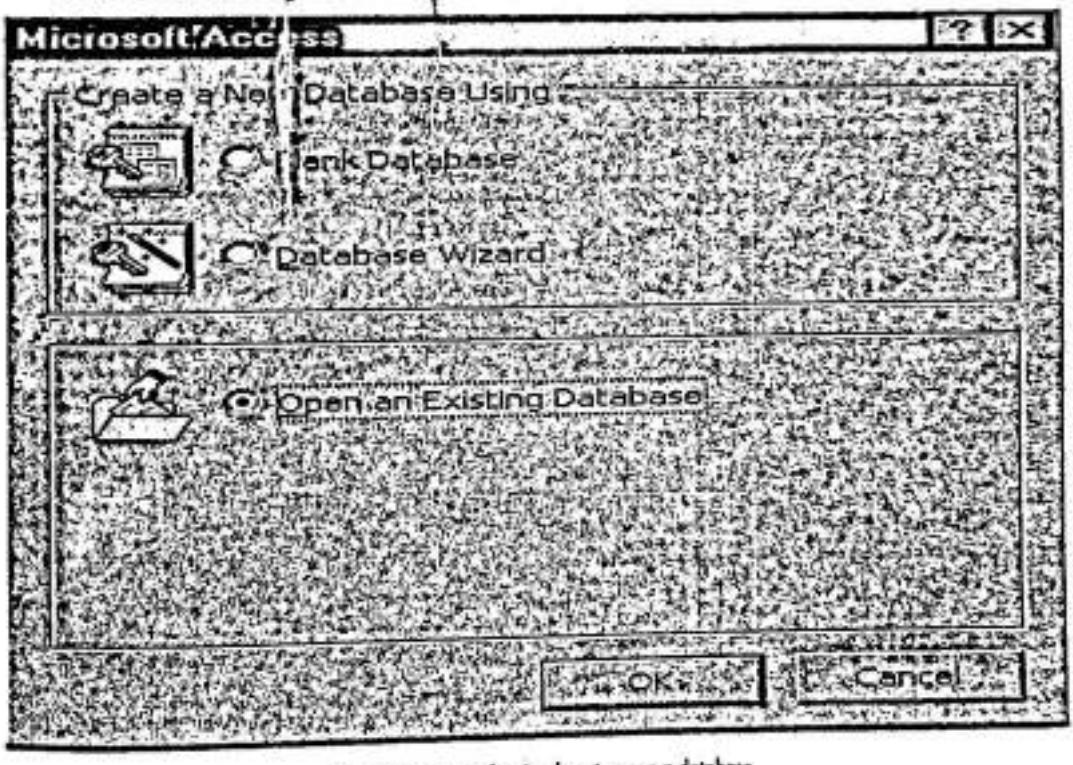


Figure 9.1: Figure showing how to open a database

2. An 'Open' dialog box appears on the screen as shown in Figure 9.2 In the 'Open' dialog box select the folder that contains the database that has to be opened from the 'Look in' drop-down list. In the 'Files of type' box, select the Microsoft Access database (*.mdb) option.

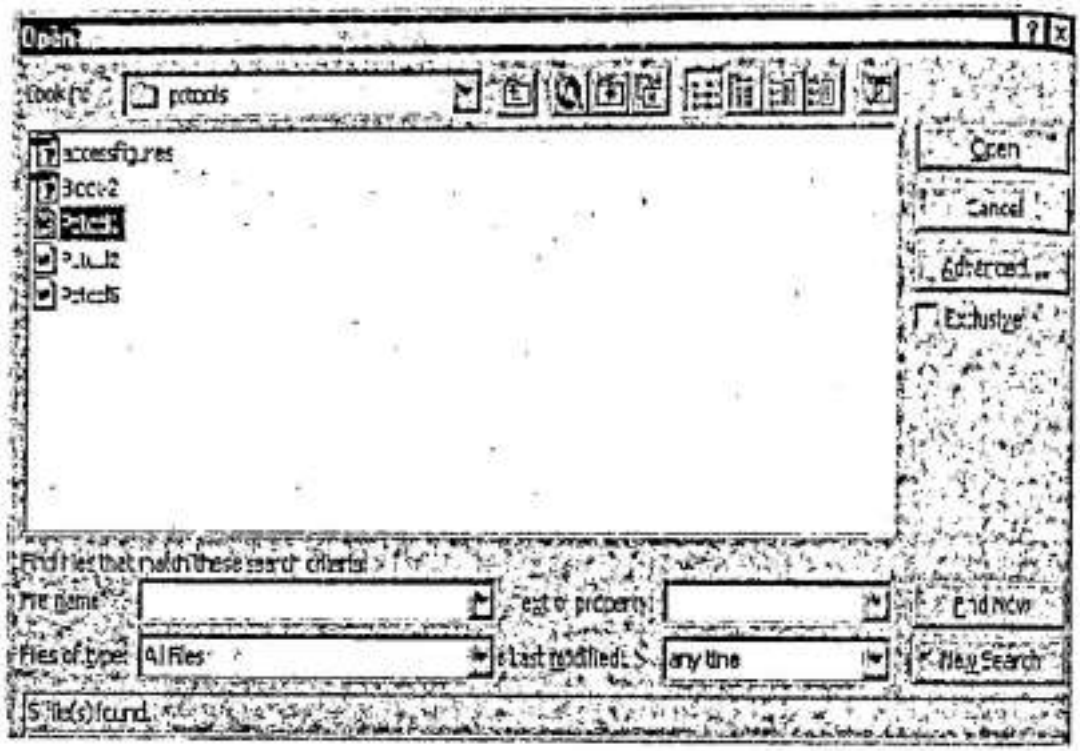


Figure 9.2 : An 'Open' dialog box

3. Finally, double click on the database name or select it and then click at the <Open> button. This will show the Database window on the screen.

Method 2: If you are already in Access:

This particular method is followed when Access has already been started up. Follow the steps given below:

1. From the 'File' menu, select the 'Open Database' option. Alternatively, press the <Ctrl + O> keys together in order to open a database. This will show the 'Open' dialog box on the screen.
2. From the 'Open' dialog box, select the database that has to be opened.
3. Finally select the database that has to opened and click at the <Open> button. The Database Window appears on the screen. Now, you can go about opening and manipulating the tables, forms, reports, etc. present in the database.

THE ACCESS WINDOW

The different parts of an Access Window are shown in Figure 9.3. You are already familiar with most of the components of this window. You have already been introduced to title bar, minimize button, maximize button, close button, control menu button, menu bar, toolbars and status line. The term 'Database Window' has been brought up for the very first time before us.

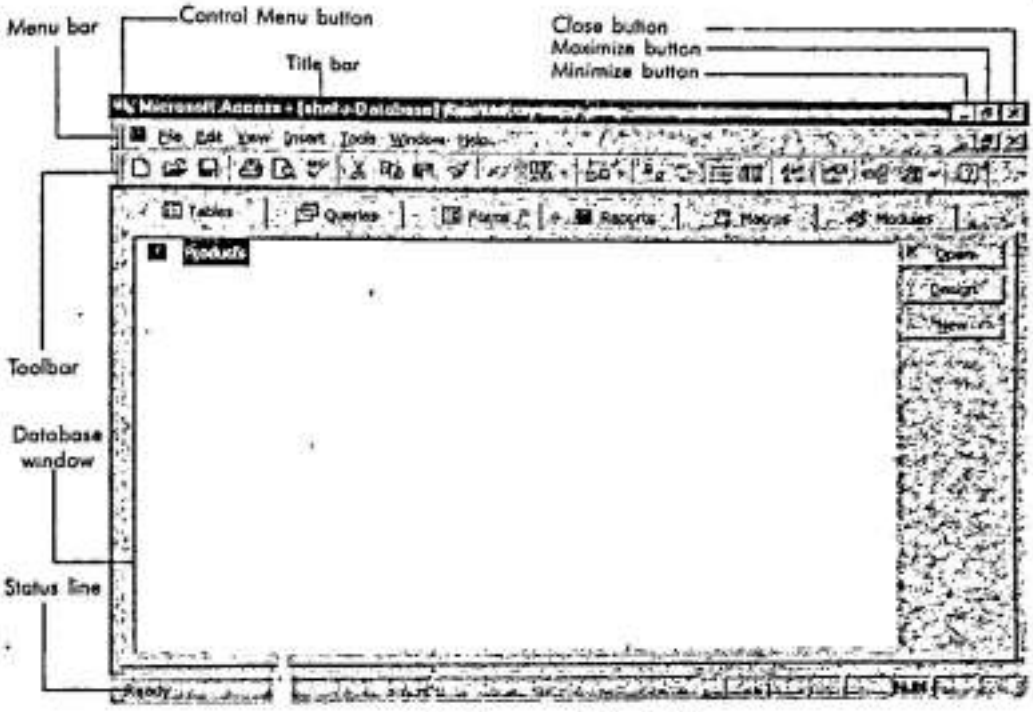


Figure 9.3: Different parts of Access Window

THE DATABASE WINDOW

The elements of an Access database are brought together in the database window. Every time a database is opened, the database window displays information about the database and all the objects it contains. The database window comprises of three parts. You will find six object tabs at the top of the horizontal bar. Each of these tabs help you select any particular object that has to be worked with. By default, the table tab is always selected when the database window is opened. It shows all the tables that have been created in that particular database. You can select any object by taking your mouse pointer at that particular tab and clicking it. Then, you will find the command buttons towards the right side of the window. These command buttons help you to place the database object in a different view. The <Open> button helps you to open up and see the selected object. The <Design> button shows the selected object with all the properties set for that object. The <New> button helps you to create a new object from scratch. This newly created object becomes a part of the current database. The features of a database window are as follows:

Table: It shows the list of all the tables created in the current database. You can create new tables and modify the existing tables.

Queries: It shows a list of all the queries in the current database. A query is nothing but a question about the data stored in the table. A query can be opened, modified as well as created from here. A query is used to extract certain information from a database.

Forms: It displays the names of all the forms created in the current database. A form is used for entering data in the table. Forms can show data in more meaningful and structured manner.

Reports: It shows the reports that have been created in the current database. A report is used for showing the data put in the table in an organised manner.

Macros: A macro is a written set of instructions that does your work automatically. It helps to automate repetitive tasks.

Modules: A module is a collection of programs which is written by the user.

CREATING A DATABASE

As we have already discussed, a database contains a large number of tables. The very first step for working in Access is the creation of database. So, as and when Access is loaded in the computer's memory, Figure 9.4 appears on the screen.

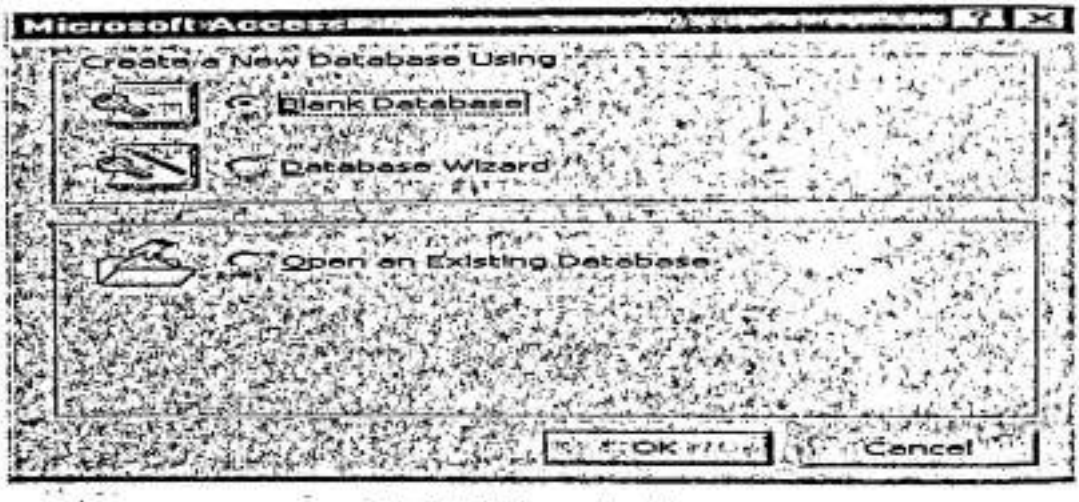


Figure 9.4 : Database creation window

1. Click at the Blank Database option to create a new database. Finally, click at the <Ok> button. The Figure 9.5 appears on the screen.

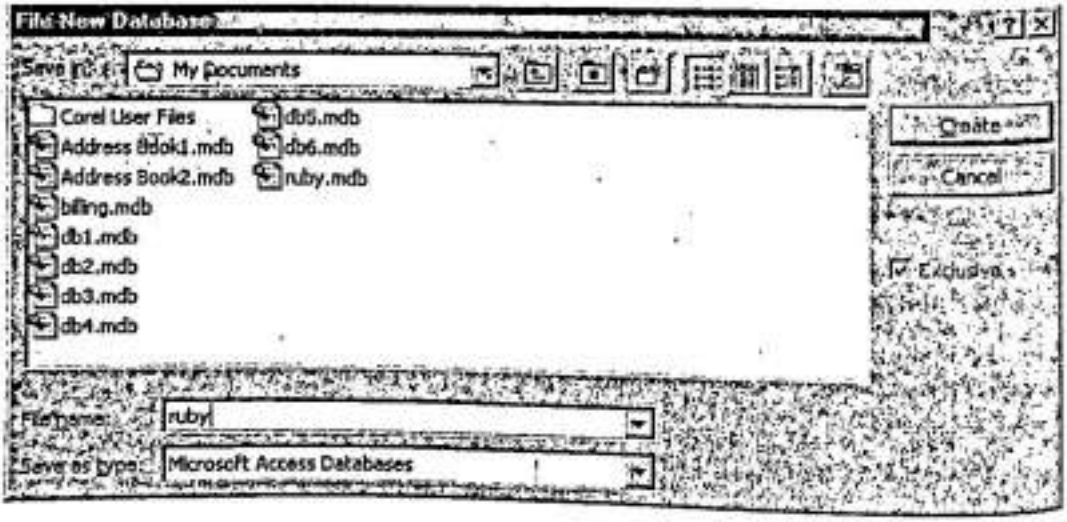


Figure 9.5: 'File New Database' dialog box

2. Access wants you to give a name to your database. So, in the 'Filename' box, type in the name of the database. Here, the name given to an Access database is 'Ruby'. Then, click at the <Create> button. Now, the Figure 9.6 appears on the screen.

Figure 9.6:The Database Window

CREATING A NEW TABLE

A table contains all the necessary information. We will learn how to create a table using a wizard. A wizard takes you through a series of steps to accomplish your work. Thus, in order to create a table, click at the <Table> tab and then at the <New> button as shown in Figure 9.6. Figure 9.7 appears on the screen. After clicking at the 'Table Wizard' option, click at the <Ok> button.

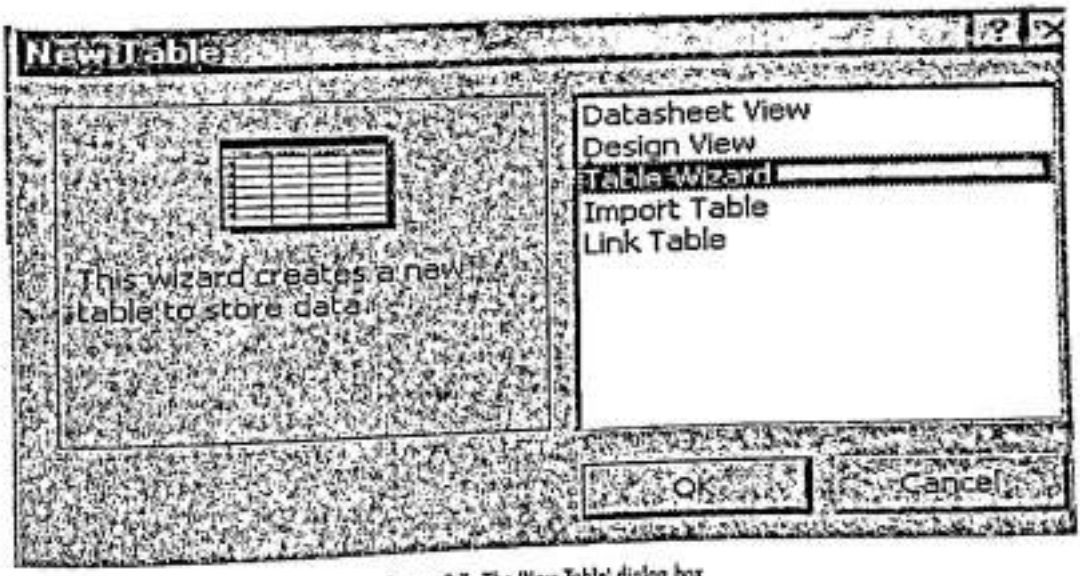


Figure 9.7: The 'New Table' dialog box

The 'Table Wizard' contains some sample tables as shown in Figure 9.8. Select the table in the 'Sample Tables' window according to your requirement. The corresponding fields of the table are shown in the adjacent window. You can put all the fields from the sample table. You can also decide and put a few fields in your table from the fieldlist. So, for putting the fields selectively, select the field and click at the single arrow pointing towards the right side. However, if you wish to put all the fields from the sample table into your table, click at the double arrow pointing towards the right side. In case, if you have accidentally put a wrong field into your table, then select that field and click at the single arrow pointing towards the left side. This will clear the field from your table. The double arrow facing towards the left side will remove all the fields from your table. However, if you wish to give a new name to your field, then click at the <Rename> button. A 'Rename' dialog box comes up on the screen. Simply, type in the new name. Finally, click at the <Next> button.

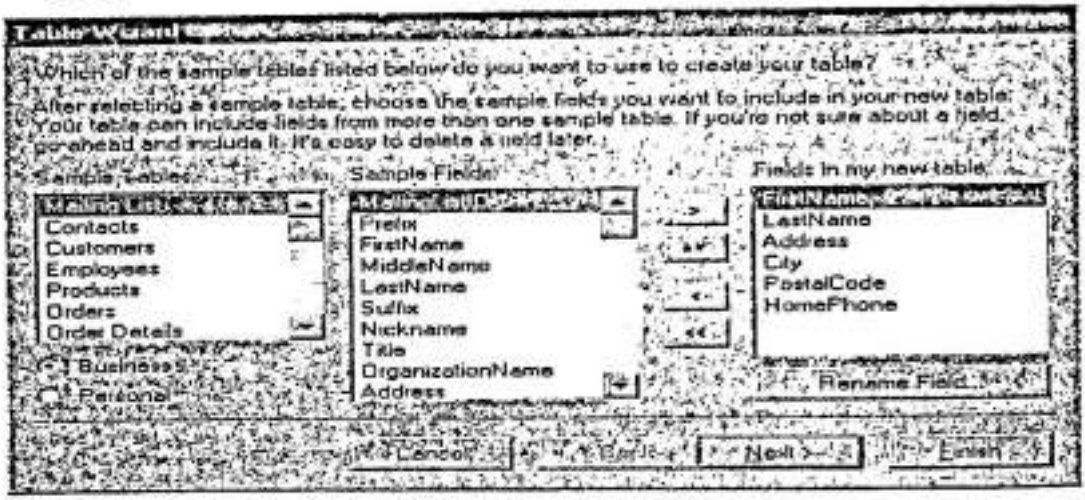


Figure 9.8: The 'Table Wizard' dialog box

The Figure 9.9 appears on the screen. The 'Table Wizard' appears on the screen. You can give a name to your table. The name given to the table in the example is 'Mailing List'.

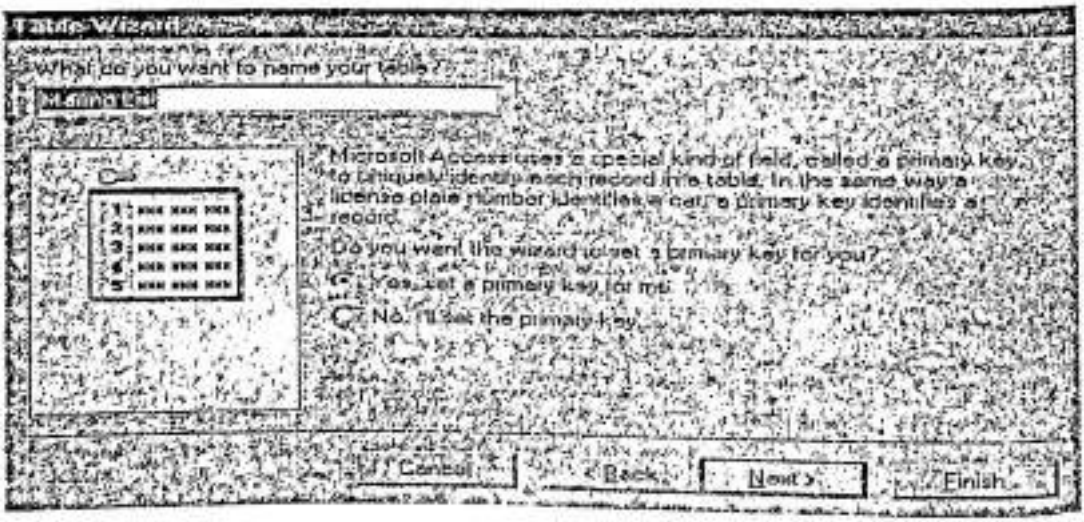


Figure 9.9: Figure showing the name given to a table

Click at the <Next> button. Figure 9.10 appears on the screen. Access allows you to create a temporary form for entering data through the 'Enter data directly into the table' option. However, if you wish that the form should also be saved for future use, then click at the option <Enter data directly into the table> using a form the wizard creates for me'. In the latter case, the wizard will automatically create a new form for you according to the fields that you have decided to put in your table. Finally, click at the <Finish> button. Figure 9.11 appears on the screen.

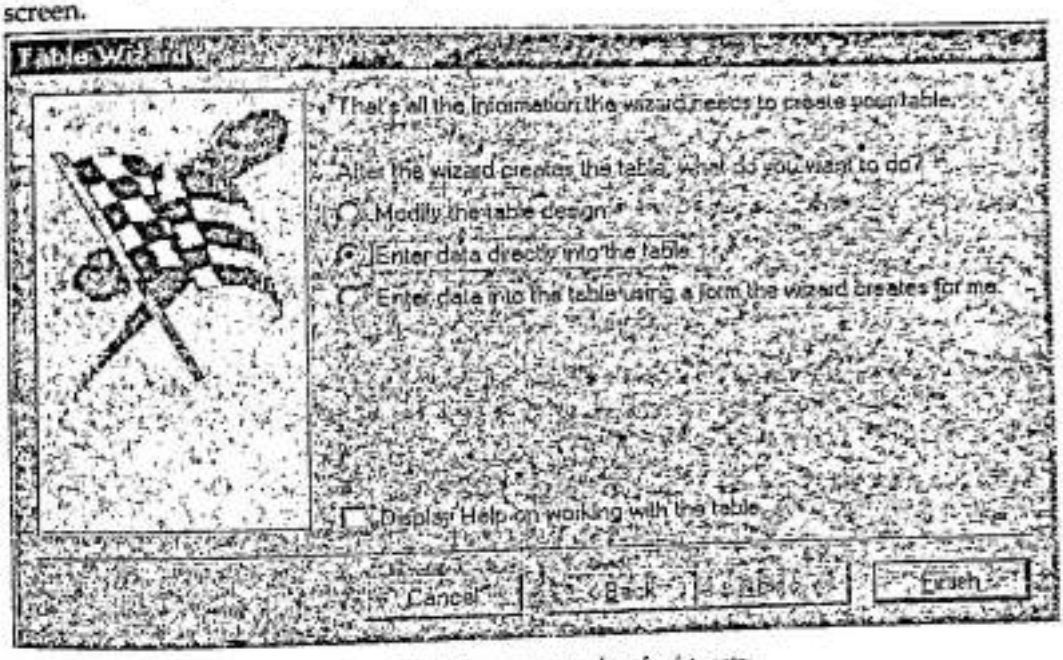


Figure 9.10: Figure to create a form for data entry

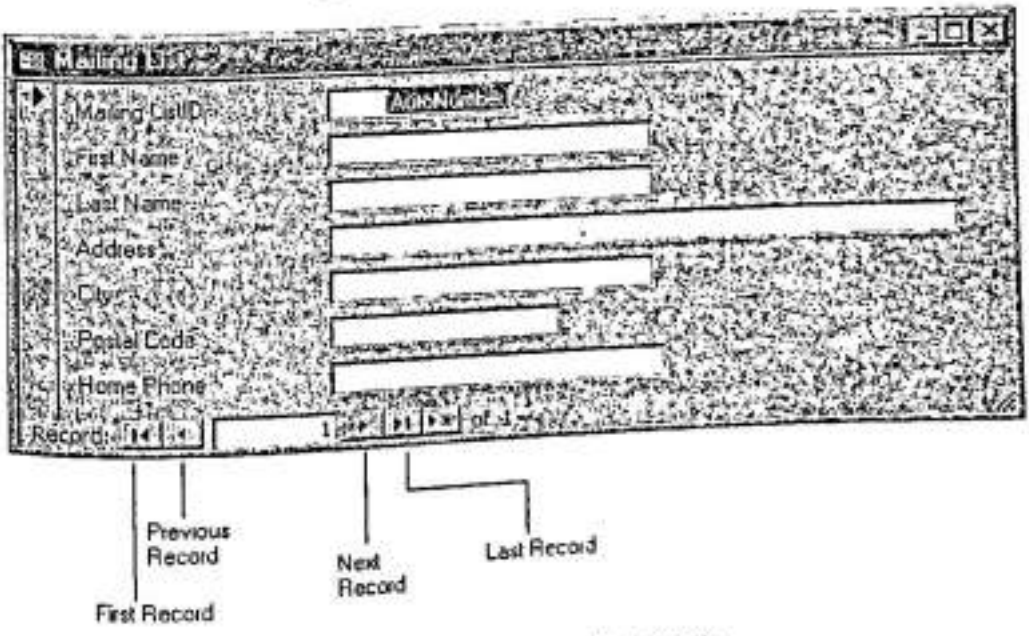


Figure 9.11: Form for entering data in the table

Click in the <First Name> box and enter the first name of the person. In a similar manner typ in the rest of the appropriate details by clicking in respective box. Once all the details of single record are entered, click at the <Next Record> button. It will take you to the next recor and there you can type in the details of the second record. The 'Next Record' button is als used for seeing the contents of the next record of the table. The 'Last Record' button shows yo the details of the last record. The <Previous Record> button will take you to the previou record. The very first record of the table can be seen with the help of the 'First Record' butto Once all the records are entered, click at the *Save As* option of the *File* menu to save the for and give an appropriate name. Click at the <Close> button appearing on the extreme right o the screen to get back to the Database Window.

Viewing the contents of the table

The contents of the table can be seen by going back to the 'Database Window'. Click at th <Forms> tab and select the form name whose contents are to be seen. Lastly, click at th <Open> button. You can navigate between different records to see their details.

CLOSING AND SAVING A DATABASE

In order to close a database, click at the 'Close' option of the File menu. Alternatively, clic every <Close> button of the database window. It would automatically save your databas and update the changes done to it.

EXITING ACCESS

To quit Access, click at the Exit option of the File menu.

WORKING WITH TABLES

We have already seen how to create a table. A table contains the basic data stored on a database. A database can contain a single table as well as multiple tables. In order to open a table, go to Database window and select the table tab by clicking it with the help of mouse pointer. Now, you have to decide whether you want to see the table in the Datasheet view or the Design view. The Datasheet view shows you all the data and records present in the table. The Design view, however, shows you the properties that have been set for each field of the table.

Opening a table in Datasheet view

To open the table 'Products' in the Datasheet view, click at the <Open> button. Figure 9.12 appears on the screen. It shows you the field names of the table at the top and the corresponding data below it. Each horizontal line of the window forms a single record. So, as many lines are there in the window, there are going to be those many records in it.

In order to move around the datasheet, you can make use of either the keyboard or the mouse. You can select any data element by clicking it with the help of mouse pointer. Using the keyboard, press the <Shift + Tab> keys together to move from one field to another. Once you have reached the last field in the curent row, press the <Tab> key again to go to the first field of the next record. However, if you are in the first field, pressing the <Shift + Tab> keys will take you to the last field of the preceding record. You can also use the up and down arrow keys to move from one record to another. In order to select the entire record, click in the left most column of that particular record's row.

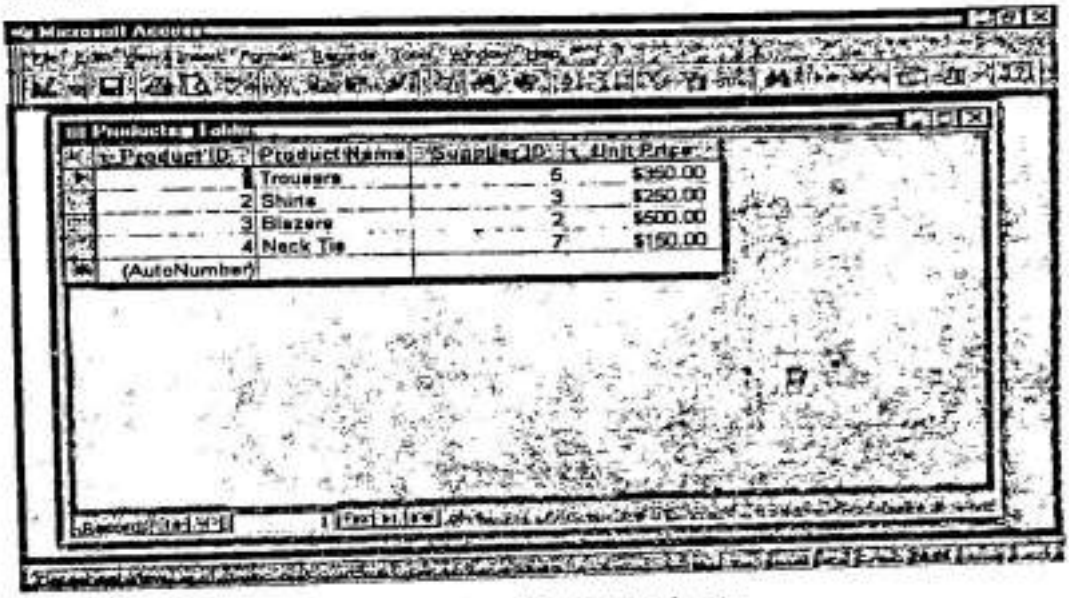


Figure 9.12: The Products table in Datasheet view

If you want to add a new record in your table, just click in the last row of the datasheet and type in your data. However, you can also edit the data of the table. Simply, click in the cell (with the help of mouse pointer) which has to be edited and then type in your contents.

Opening a table in Design view

A table can be opened in a Design view by first of all selecting the table in the Database window and then clicking at the <Design> button. Figure 9.13 shows the 'Product' table in the Design view.

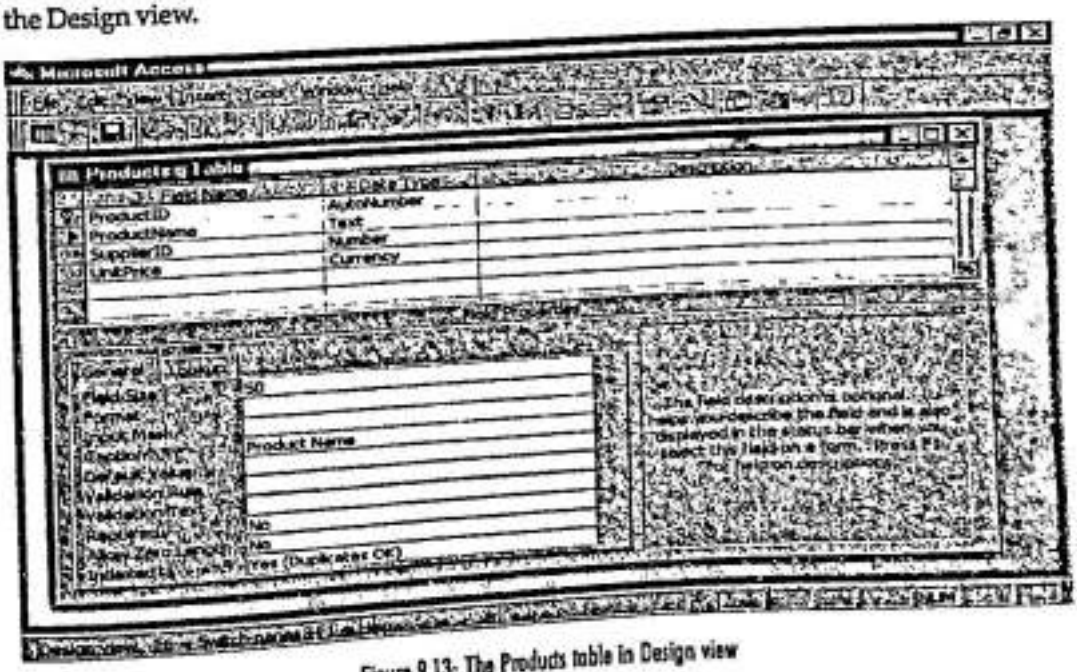


Figure 9.13: The Products table in Design view

A table is opened in the Design view in order to examine its structure. It shows the fields present in the table as well as the data type and properties for each field.

The grid at the top of the Design view window shows all the fields, their data types and some description about the field. The lower part of the window shows the other properties of the field that has been selected in the upper grid. At one time, the properties of only one field that is selected is shown in the lower window.

You can very easily view the details of another field by simply clicking anywhere in the grid row on which it appears. The information in the lower window changes to match the properties for the newly selected field. Access shows the currently selected field by putting an arrow on the row in the left most column of the upper window.

If the left most column of the grid displays a key icon, then that field is being used as the primary key for the table. This means that this particular field is being used as a unique field. This field can never contain a repetitive entry. All the data for this field is uniquely identifiable. Therefore, this field is said to be the 'primary key' of the table. Now, let us study the basic structure of a table in detail.

1. *Field Name:* The Field name column present in the upper window specifies a name for the field. No two fields in the table can carry the same name. You can provide any name to your field. However, the Field name cannot have more than 64 characters. It can contain any combination of letters, numbers, spaces and special characters except periods, exclamation marks or square brackets. Field names can never start with a space.

2. *Data Types:* The Data Type column is present next to the Field name column. It signifies the type of information stored in the field. The edit box for this column is a drop-down list box which contains all the available data types. Let us briefly explore all the available data types:

   a) *Text:* It stores the alphanumeric data which contains a string of characters.

   b) *Number:* Any kind of numeric data is held by this data type.

   c) *Date/Time:* It stores the date and time.

   d) *Currency:* It is a special numeric data type used for holding monetary values.

   e) *Autonumber:* This kind of data type is mostly used for primary key fields. Fields of this data type are read only. Access automatically inserts the next number in the sequence.

   f) *Yes/No:* This data type can hold only one of the two values such as Yes/No or True/False.

   g) *Memo:* This data type is used for storing long text fields upto a limit of 64,000 characters. This data type is used, to store long comments or notes.

3. *Description:* The Description column is present adjacent to the Data type column. This is used to give a short description about the field. The Description column provides complete explanation of the purpose the field serves.

4. *Properties:* Each field has got its own set of properties. It further defines the fields and how it is used in the database. So, as you move from one field to another in the upper

window, the corresponding properties in the lower window also change. Now, let us look at some of these properties:-

a) *Field Size:* The Field size property appears only for the Text and Number data types. This property specifies the maximum number of characters that can be stored in the field for a single record for a text value. For Number fields, field size specifies the type of number that will be stored in the field. The available choices are Byte (a number from 0 to 255, whole numbers only), Integer (-32,768 to 32, 767, whole numbers only), Long Integer (-21, 47, 483, 648 to 2147, 483, 647, whole numbers only), Single (can hold a very large number and fractional numbers) and Double (stores numbers larger than single). The choice made here does affect the amount of space Access uses to store the field. Therefore, you should be very careful in deciding the field size.

b) *Caption:* The Caption property specifies a string that has to be displayed as the column heading whenever the field is displayed in the Datasheet view.

c) *Default Value:* The Default value specifies a value that will be put into the field if it is not given by the operator at the time of entering the record.

d) *Validation Rule and Validation Text:* The Validation rule property specifies a test that is performed on any data that is entered into the field. If the data does not pass the rule, then a message is shown on the screen. However, if any message is typed in the Validation text property, then that message is displayed, otherwise some system error message is shown on the screen. For example, for a price field if you specify the validation rule as '>100', then any data below 100 will not be accepted and the computer will prompt you to re-enter.

e) *Required:* The Required property forces you to enter a value if it has been set to 'Yes'. You cannot leave that particular field empty at the time of entering record in your table.

WORKING WITH FORMS

All the data in your database is stored in tables. You can view as well as edit data in a table but forms provide a much easier and flexible interface to view and edit data. Forms allow you that view all or just a few record at once while also showing the field names. Forms provide an easy way to enter, change and delete records.

Opening a form

First of all, open the database that contains the required form. Now, in the database window, click at the forms tab. All the forms of the currently active database are shown in the window. Select the Form name with the help of the mouse pointer and finally click at the <Open> button. Figure 9.14 appears on the screen. Using the arrow keys, you can view the other records of the table.

Creating a form

A form can be very easily created using the Form wizard. The form wizard is the quickest and the easiest way to create a form that is bound to a table. You can use the form immediately or you can make changes to get the form look exactly the way you want. Thus, in order to create a form using the form wizard, first of all, select the Forms tab in the Database window. Finally, click at the <New> button. A 'New form' dialog box appears on the screen as shown in Figure 9.15.

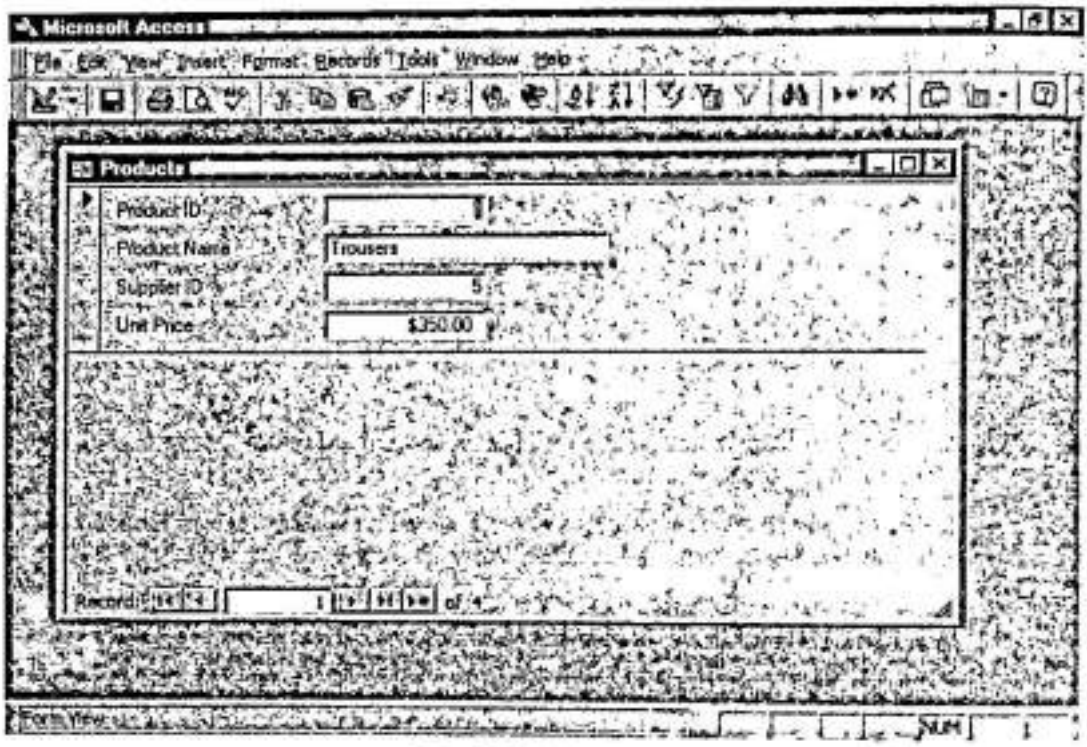


Figure 9.14: An Open Form

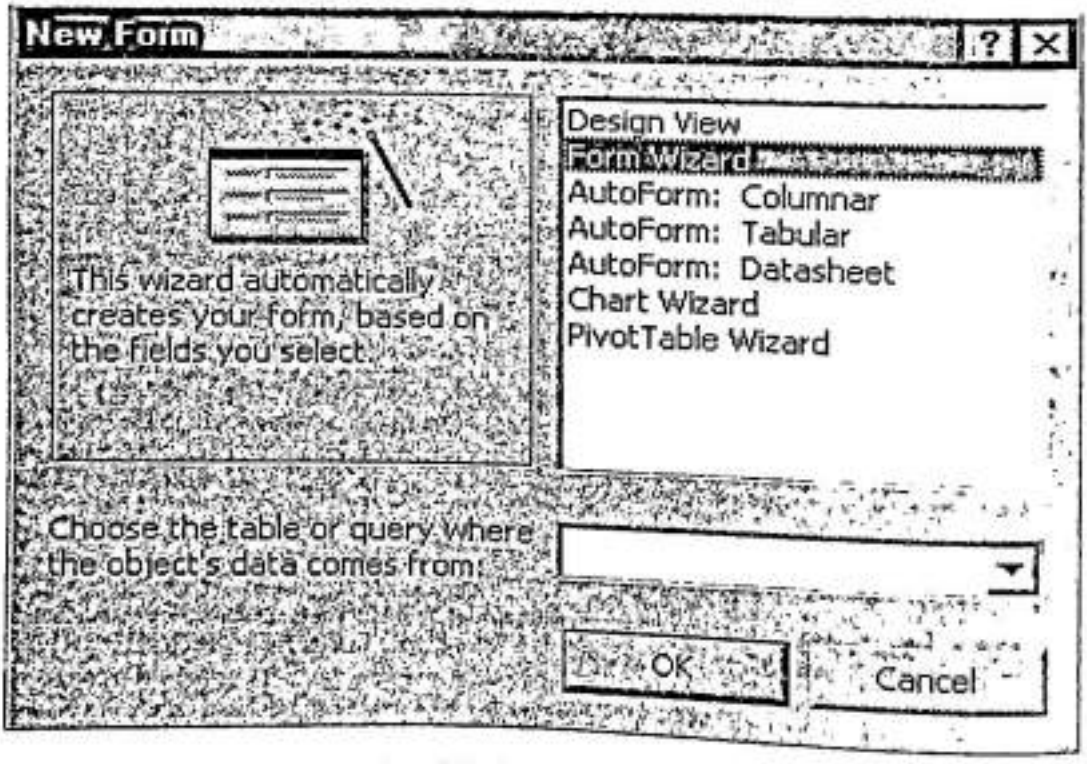


Figure 9.15: The New Form dialog box

From the 'New Form' dialog box, select the Form wizard option. Then select the table from which the information has to be displayed on the form. Click <OK> button to start the Form wizard. We will create a form on the 'Products' table. So, select the Products table to create a form on it and click at the <OK> button. You will see Figure 9.16 coming up on the screen.

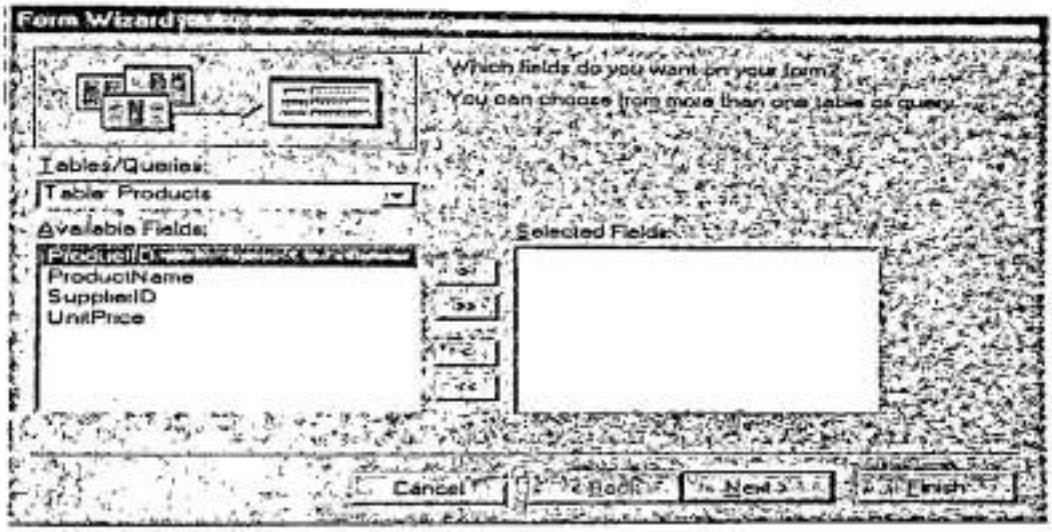


Figure 9.16: The First Step of Form Wizard

This Form wizard dialog box wants you to select the fields from the table that need to be added to the form. By clicking the single arrow pointing towards the right side, you can add fields one by one to your form. You can add all the fields into your form by clicking at the double-arrow pointing towards the right side. After you have decided and put the fields, click at the <Next> button. You will find Figure 9.17 coming up on the screen.

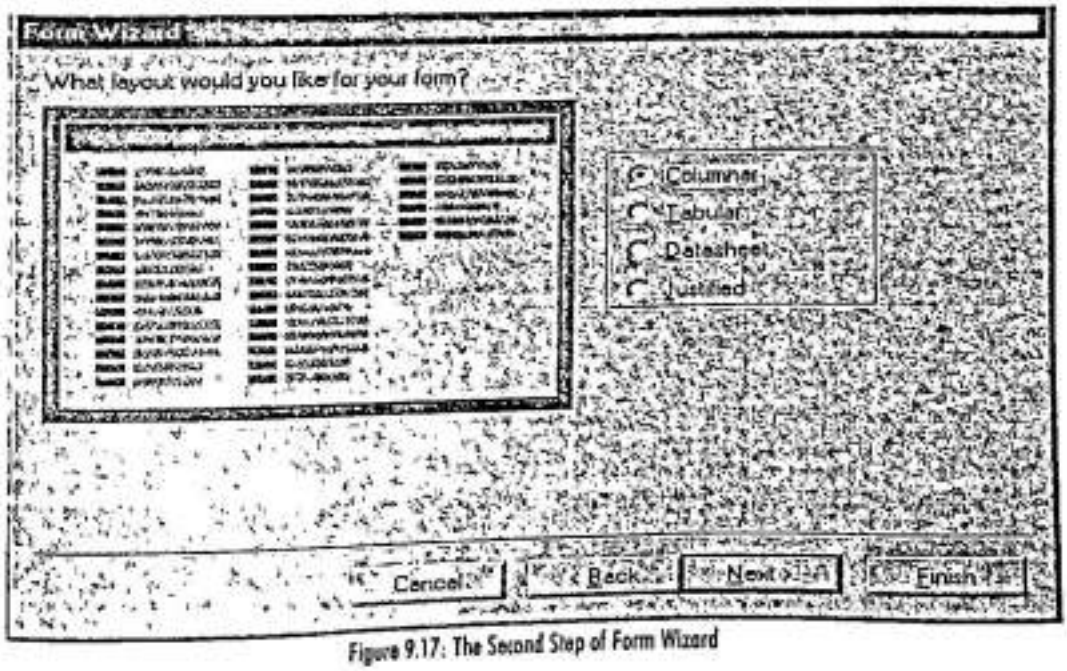


Figure 9.17: The Second Step of Form Wizard

This dialog box asks you to decide and to choose the layout in which you want to see your new form. By default, the layout of the form is columnar. Whichever form layout you choose, the left side of the window shows the arrangement of fields on the table. Choose the layout and click at the <Next> button. Figure 9.18 appears on the screen.

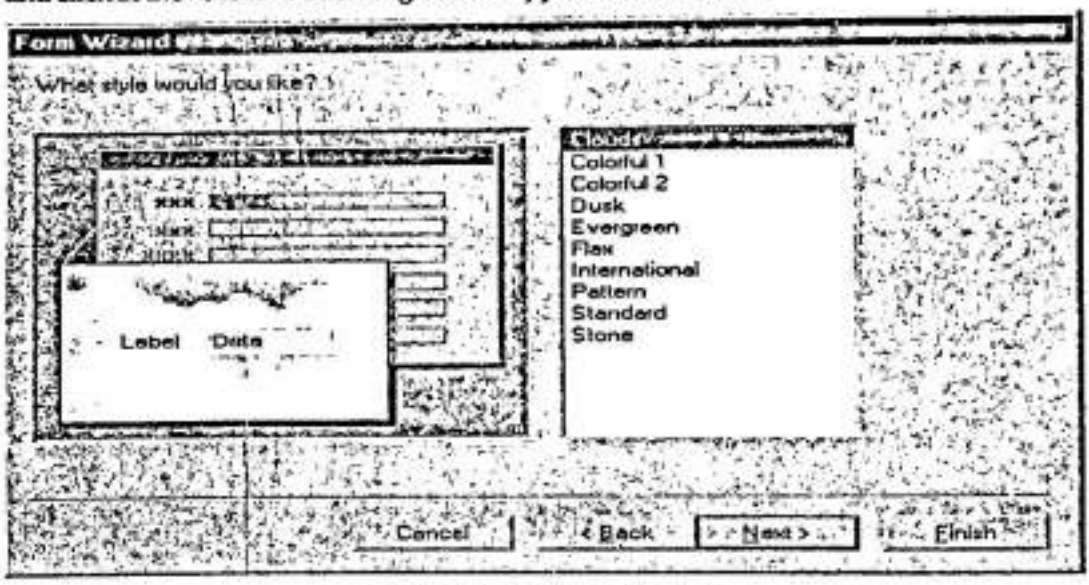


Figure 9.18: The Third Step of Form Wizard

The next dialog box of the form wizard enables you to choose the style of your form. The style controls the colour and the font of the data that is to be displayed on the form. It also takes care of the background colour and picture of the form. By default, the 'clouds' option is active, choose the style and click at the <Next> button. You will find Figure 9.19 coming up before you.

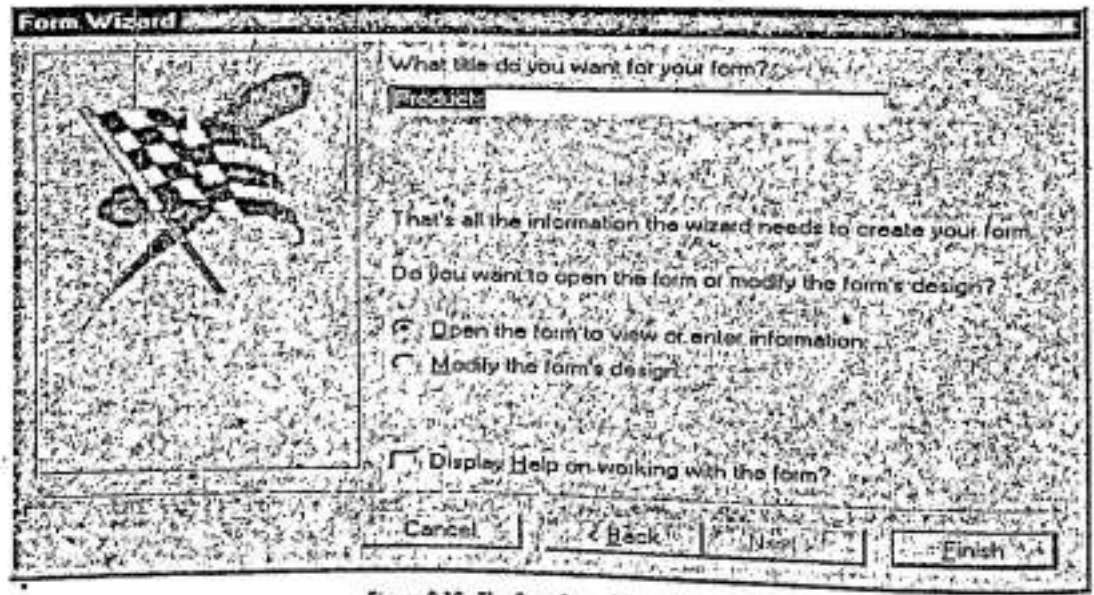


Figure 9.19: The Four Step of Form Wizard

This is the last dialog box of the form wizard. Here, you are required to give a name to your form. You can straight away start entering data into your form or you can modify the form design. Hence, give a name to your form and open it up for viewing and entering data in it. Finally click at the <Finish> button. Now, you can see your form all ready on the screen as shown in Figure 9.20.

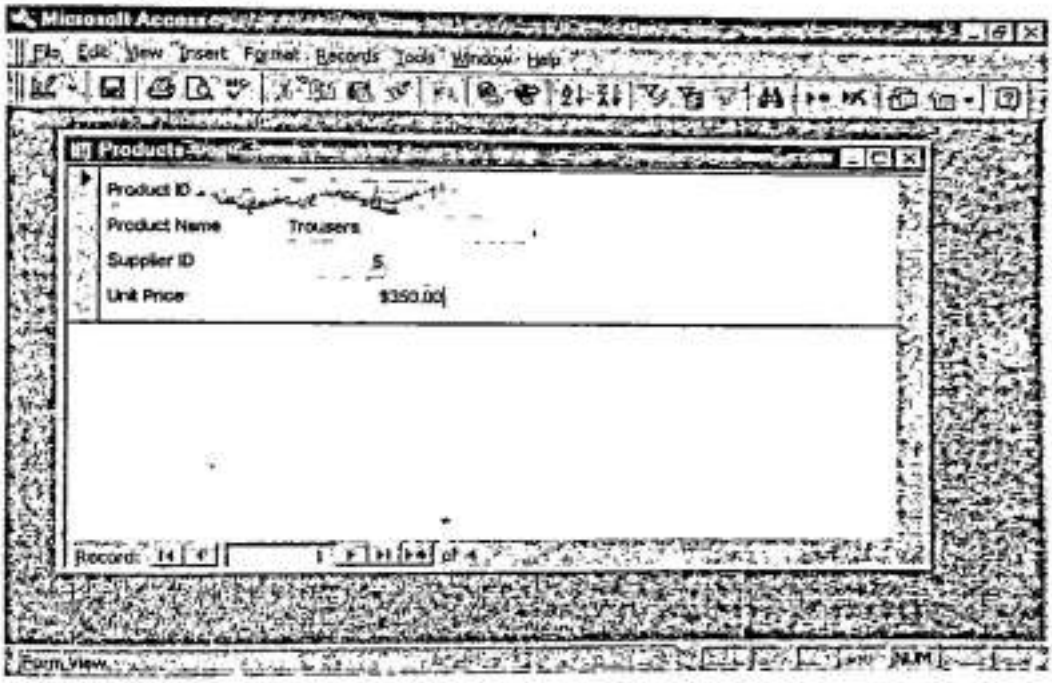


Figure 9.20: The Form on Products table

Adding and Editing Records in a Form

To add a new record, click at the <New Record> button available in the form that you have created. To edit or modify any of the field data, you are simply required to click that field with the help of mouse pointer and then type in the new data. You can make use of the <Tab> key from the keyboard to move around the form and then edit any field by simply typing in.

Deleting Records in a form

It is very easy to delete records. You can delete information in fields by selecting that field with the help of mouse pointer and pressing the <Delete> key from the keyboard.

Saving and closing Forms

Access automatically saves each record as you move ahead.

To close the form and return to the Database window, choose File/Close option or click the <close> box available in the upper right corner of your screen.

WORKING WITH REPORTS

Reports provide information in a very systematic, organised and compact way. You can view and print this information in any format and style. Reports help in taking managerial decisions effectively and efficiently.

Opening and Viewing Reports

Opening a Report is very much similar to opening forms. First of all, go to the database window and select the Reports tab. All the reports contained in the database will be shown on the screen. Select the report that has to be opened and click at the <Preview> button. Figure 9.21 shows a sample report formed on the Products table.

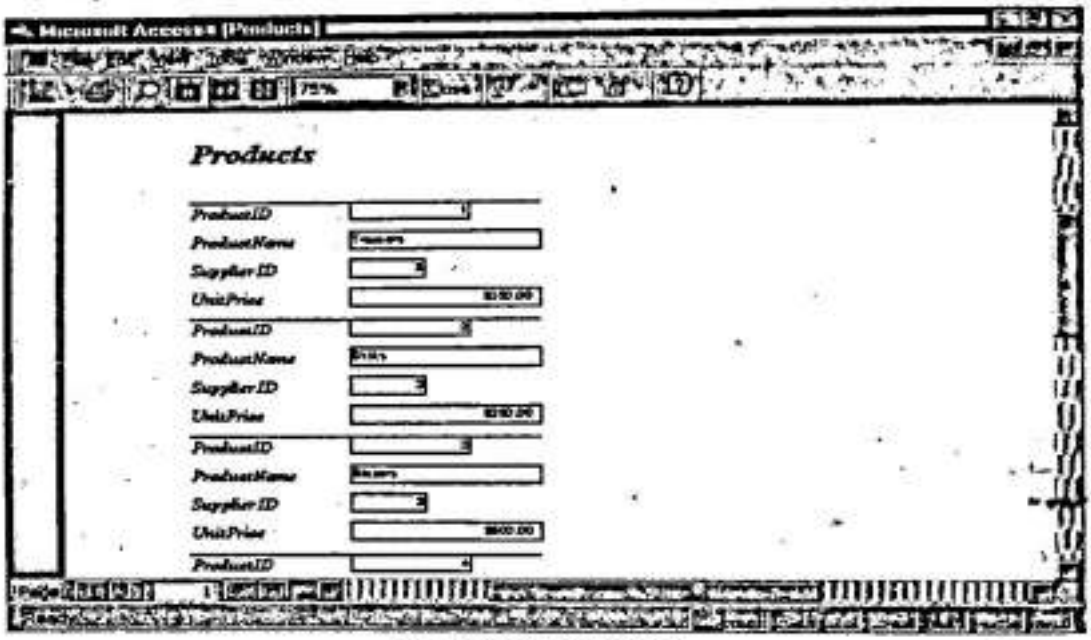


Figure 9.21: The Products Report

CREATING A REPORT

A simple report can be created using the 'Auto Report' feature of Access. 'Auto Report' creates a report automatically containing all the fields and records from the selected table. Each field on the report appears in a single line carrying a label on the left side of the page. You can create a report by first going to the main window and then clicking at the Reports tab. Click at the <New> button present on the main database window. Finally, click at the 'Auto Report' option. 'Auto Report' creates a single-column or tabular reports. 'Auto Report' is the quickest and the easiest way of creating reports.

Printing a report

Most of the times, a hard copy of the report is taken out and put in record file. It helps in taking very useful and quick decisions. To print a report select it from the Report tab in the main database window and then choose 'File/Print' option from the Database window. A 'Print' dialog box appears on the screen. Use this dialog box to choose the printer that will print the report, which pages to print, what range of pages to print, how many copies and other print properties.

Saving and Closing Reports

A report can be saved by choosing the File/Save option. When the report is being saved for the very fist time, a dialog box appears before you which asks you the name of the report. By default, the name 'Report 1' is given to your report. In order to close a report, click at the Close box available at the right corner of the screen.

APPLICATION OF A DATABASE IN CORPORATE SECTOR

The software packages called Database Management Systems provide a very high level language interface which can be learned very easily by an end-user. The manager need not learn the programming techniques at all. Moreover, small business information systems can be easily implemented in a few days using this package.

Moreover, it becomes very handy for a manager to maintain data and prepare reports based on these data. A variety of reports can be generated depending upon the precise and specific requirements of the managers. It also allows you to create queries and provides you an answer to the manager's most difficult decision oriented questions.

SUMMARY

Microsoft Access is a Windows based relational database management system. It can keep huge records of data ranging from keeping an address book to inventory details. Access can keep track of telephone numbers, expense details, store or warehouse information. In Access, all the information is put in a database. Further, a table is the basic element of the database. A table is a collection of some specific kind of data. Each row in a table is called a record. Each column of the table is called a field. All the elements like Table, Queries, Forms, Reports, Macros and Modules are brought together in the database window. It is extremely easy to create tables, forms and reports through Table wizard, Form wizard and Report wizard respectively. You can set properties of different fields of the table through the Design view of the table. The Microsoft Access is able to generate a variety of reports and queries to meet the specific needs of the managers.

REVIEW QUESTIONS

1. Fill in the blanks:
   (a) A _____ is a collection of related information.
   (b) The components of a database are _____, _____ and _____.
   (c) The default name given to an Access database is _____.
   (d) The basic element of a database is _____.
   (e) _____ help in analysing the data and help you to come out at meaningful inferences.
2. Write true or false:
   (a) A record contains information about a specific type like name, address, etc.
   (b) A macro is a written set of instructions that does your work automatically.
   (c) No extension is given to an Access database.
   (d) A form is used for entering data.
   (e) You can have any number of records as well as fields in your table.
3. What is a database? Discuss the components of a database.
4. Discuss the two methods of opening a database.
5. What is a database window? Briefly explain the features of a database window.
6. Write down the steps to create a table through Table wizard.
7. What is the difference between the datasheet view and the design view of a table?
8. Discuss the different datatypes offered by Access in detail.
9. What is validation rule and validation text?
10. What is primary key? Why do you need to create a primary key?
11. Discuss the application of a database in corporate sector.

BLOCK 3

HARNESSING PC

CHAPTER 10

Office Automation Backbone

LEARNING OBJECTIVES

- Office Automation Backbone: Groupware
- PC Groupware Standard: Lotus Notes
- Starting Lotus Notes
- Elements of Notes Workspace
- E-mail on Lotus Notes
- Notes Database
- Notes Document
- Notes Web Navigator for Internet Browsing

OFFICE AUTOMATION BACKBONE: GROUPWARE

Office Automation refers to integration of office information features, including word processing, data processing, graphics, desktop publishing and e-mail. The aim of automation is to increase the productivity of an employee and thereby, of an organisation. LAN (Local Area Network) is the major part of office automation. Groupware is the software that is designed for use in a network and serve a group of users that work on a related project. A successful groupware product incorporates the power of messaging (i.e. e-mail) as well as client/server technology (an architecture in which client is the PC or workstation and server is the LAN file server or mini/mainframe computer). Groupware is the backbone of office automation. It allows you to work together with a group of other people.

PC GROUPWARE STANDARD: LOTUS NOTES

Lotus Notes (simply called Notes) is a groupware that lets you to communicate and interact electronically with other people. It is a strategic systems application that helps people work together to accomplish business goals. It has now become the groupware standard for most organisations. Lotus Notes server provides a way to link diverse business units, subsidiaries, suppliers and customers. The latest version of Lotus Notes (Release 4.0) also supports Internet. With Lotus Notes, you can use the Internet resources and integrate your Notes documents with web pages.

Features of Lotus Notes

Lotus Notes is a truly useful and powerful software that provides the following features:

- In Notes, you can add text enhancements (such as boldface, italics, underlining, changing colors/fonts, etc.) and graphics to your e-mail messages.
- Using Notes, e-mail messages can be mailed in predefined route for preferential viewing/editing and forwarding down the hierarchy.
- In Notes, all documents that you create are stored in databases with other documents of same type. The information stored in these databases can be accessed only by you and the authorised people chosen by you.
- Notes provide a unique feature of replication of data. Replication enables Notes to contain the same information in all the databases created on many servers of your organisation. This feature provides an up-to-date information of databases accessed from different servers in same organisation.
- The Notes client helps you to build task-oriented databases and response forms for placing on the server for others (local or remote users) for sharing, editing or adding documents.

STARTING LOTUS NOTES

To start Notes for the first time, give the following commands:

(a) Double-click the Notes program icon from the Windows 95. You will see the first screen of Notes, called the splash screen.

(b) After showing the splash screen, Notes will display Notes Workstation Setup dialog box. This dialog box comes only when you run Lotus Notes for the very first time. Through this dialog box, you tell Notes the type of connection for your Notes server and

the source of your User ID. The type of connection can be either via LAN or Modem or even both. The User ID is a file that was created by your administrator at the time of installation of Lotus Notes.

(c) After giving instructions in the Notes Workstation Setup dialog box, enter your password in next dialog box.

(d) The setup is complete now. You will see a starting screen, called *Notes Workspace*. Notes will now add three database icons to your workspace. These icons represent: (i) Your personal mail box, (ii) Your personal name and address book, and (iii) Your company's name and address book.

ELEMENTS OF NOTES WORKSPACE

There are five main elements of Notes Workspace as shown in Figure 10.1. These are described below:

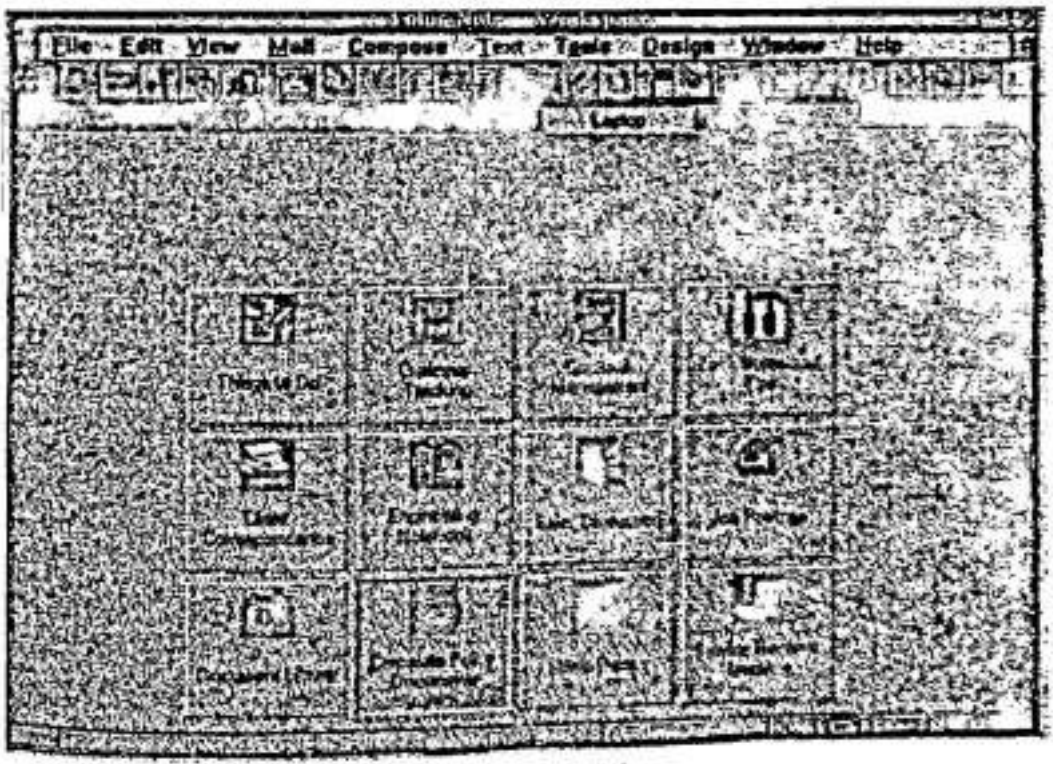


Figure 10.1: The Notes Workspace

1. *The Menus:* On top of the screen are the various menu items. These menu items or options include File, Edit, View, Mail, Compose, Text, Tools, Design, Window and Help. The functions of these options are somehow similar to other windows based applications.

2. *The SmartIcons:* Below the menu items are the small pictures each of which represents a command that can be executed by selecting it. These icons are called SmartIcons. You must be familiar with function of many of these while working on Word, Excel or Access.

3. *The Workspace Tabs:* The Notes Workspace displays six pages, each with a tab stick up just below the menu bar. These pages are called Workspace Tabs. These tabs are us to store and organize various database icons.

4. *The Database Icons:* Each of the little blocks in Notes Workspace is called a Databa Icon. Each database icon represents a database icon. The database icons can be se below the SmartIcons.

5. *The Status Bar:* At the bottom of screen is the Status Bar. The status bar displa information about e-mail messages and can also be used to change font types and siz

E-MAIL ON LOTUS NOTES

Using Lotus Notes, you can send and receive e-mail messages with many new features.

Opening the E-mail Database

To open your e-mail database, either just double-click on the database icon or Choose 'Fi Open' option from the menu. You will see a screen divided into following four parts:

1. *Navigation Pane:* This pane is used to sort the messages in your e-mail messages. Ea of the items in the navigation pane is called a folder. There are following eight m folders in this pane:

   (i) *Inbox:* It contains the messages that have been sent to you.

   (ii) *Drafts:* It contains those messages that you have composed but not mailed ye

   (iii) *Sent:* It contains the messages that have been sent to the other people.

   (iv) *All Documents:* It contains all documents.

   (v) *To do:* It contains those things that keep you busy.

   (vi) *Trash:* It contains those documents that you are going to delete.

   (vii) *Archiving:* It contains old messages that you have deleted.

   (viii) *Discussion Threads:* It contains messages listed together according to their subj

2. *View Pane:* This pane displays the summary of the messages in your e-mail datab Each row in the view pane represents information about an individual message. As t selection bar in the view box is moved by pressing up and down arrow keys, the previ of the each message is displayed on the preview pane. The message can be displayed the entire screen in the form of a document by just double-clicking on that messag view pane. The following keys are used to read next/previous message:

   (i) *The <Enter> key:* to move to the next message.

   (ii) *The <Backspace> key:* to move to the previous message.

   (iii) *The <Tab> key:* to move to the next unread message.

   (iv) *The <Shift+Tab> key:* to move to the previous unread message.

   (v) *The <F4> key:* to see next unread document.

   (vi) *The <Shift+F4> key:* to see previous unread document.

Besides pressing any of the above key, you can also click on the related SmartIcon. After reading the message you can close it by pressing <ESC> key and choosing 'File - Close' option from the menu. The message disappears and you come back to the view pane.

3. *Preview Pane:* This is the pane where an actual e-mail message is displayed when you double-click the desired message in the view pane. You can also see the preview of message by choosing 'View-Document Preview' option.

4. *Action Bar:* This bar contains various buttons used to perform different actions on e-mail messages. These buttons are somehow similiar to SmartIcons and change depending upon the different functions performed by you.

Creating the E-mail Message

To create a new e-mail message, either choose 'Create-Mail-Memo' or click on the related SmartIcon. You will see a blank memo form having following four parts:

1. *The Action bar:* It contains the following five buttons:
   (i) The 'Address' button
   (ii) The 'Save as Default' button
   (iii) The 'Send' button
   (iv) The 'Send and File' button
   (v) The 'Delivery Options' button.
2. *Sender's Name:* It contains your name, today's date and current time.
3. *Receipt's Name and Description:* It contains the name of memo's recipients and a short description of the message to be given in following three fields:
   (i) *To:* Specify the name of the memo's primary recipient.
   (ii) *cc:* Specify the name of person whom you want to send a courtesy copy of your memo.
   (iii) *bcc:* Specify the name of person whom you want to send a blind courtesy copy of your memo. The blind courtesy copy is one about which no other recipient is aware about.
4. *The Body field:* In body field of the memo, the e-mail message is typed. You can also add text enhancements (such as boldface, italics, underlining, changing colors/fonts, etc.) and graphics to the typed message.

Steps to create E-mail Message

In order to create you E-mail messages in Notes, follow the steps given below:

1. Choose 'Create-Mail-Memo' option and write you message in the body field of the memo.
2. Choose 'Delivery options' button from the Action bar of the memo for providing the following special delivery features to your message.
   (a) *Importance:* If your message is urgent, choose 'High' in the Importance pop-up menu. If it is unimportant, you can choose 'low' otherwise by default the message is

considered with 'Normal' Importance, Depending upon the setting of Importance, the message is received in the receipent's mail database in various kinds of envelopes.

(b) *Delivery Report :* In order to ensure the delivery of you message, you can select different settings from the 'Delivery report' pop-up menu. There are four kinds of settings that can be specified in 'Delivery Report'. If you select 'Confirm Delivery' option from the 'Delivery Report' pop-up menu, Notes will inform you the date, time and destination of the delivered message. If you select 'Trace Entire Path' option, Notes will inform you about the destination where the message was stopped. If you select 'None' option, you will not get any delivery report. By default, the setting in 'Delivery Report' is 'Only on Failure' which means that you will get the report only if message is not delivered and you will also be informed the reason for the failure in delivery.

(c) *Mood stamp:* You can paste a picture at the top of your message by choosing an appropriate option from the 'Mood stamp' pop-up menu. There are twelve mood stamps available in the 'Mood stamp' pop-up menu with different pictures.

(d) *Delivery priority:* You can send your message quickly or slowly by choosing an option from the 'Delivery Priority' pop-up. If you choose 'Low' option, the message is send at the time when the network is free. If you choose 'High' option, the message is delivered very quickly. By default, the setting in 'Delivery Priority' is 'Normal' that means the message is send on the basis of mail delivery schedules prepared by your administrator.

3. When you have typed your message along with specifying the special delivery options, give the name of persons (one on many) to whom the message has to be delivered by choosing 'Address' button from the Action bar of the memo. Enter the receipt's name and description of the message in the three fields, 'To', 'cc' and 'bcc' as discussed earlier.

4. After flaming all the above steps, you can send your e-mail message to the Receipt's mail database by choosing 'Send' button from the Action bar of the memo. You can also keep the record of the message sent by choosing 'Send and File' button from the Action bar. This command will save your message in a file and send it to years destination. If you do not want to send the message right now, choose 'Save as Draft' button from the Action bar. Your message will be saved in a file and you send it later on. If you neither want to send the message nor want to save it, press <ESC> key and choose 'Discard' changes option.

NOTES DATABASE

Notes is a popular database software. Database is a collection of information in an organised way. You can use Notes database for creating Note documents in any format desired by use. Before learning to create and opening a database, let us first understand the following terminology used in Notes database:

Form: A part of database used to view, compose and edit Notes document.

Field: A group of related information organised in a column such as names, addresses, salaries etc.

Data: A summary of Notes document in a database. You can view documents in many formats by using Notes database.

Creating a Notes Database

For creating a new Notes database, follow the steps explained below:

1. Choose 'File-Database-New' option from the menu. You will see a New Database dialog box with following text boxes:

   (a) *Server text box:* Select the option 'Local' in Server text box for storing the new database on your workstation.

   (b) *Title text box:* Specify a descriptive title of your database in Title text box. For instance, you can give title as 'Personal Records of Employees'.

   (c) *File Name text box:* Specify the name of the database file for storing and the disk in the file name text box. By default, the title and file names are same. But you can also change the file name. The secondary name (extension) of the Notes database is NSF which must not be changed.

   (d) *Templates box:* In Notes, same database templates are also available. You can see the information of the desired template by highlighting it and selecting the 'About' button located below the template box. If you find the fields of this template suitable for your database, select 'OK' button. Notes will create a new database file and you can also make changes to the template. If you want to make database without using any template, choose 'blank' option in the template box.

   After specifying all the required information in the database dialog box, select <OK> option.

2. You will now see the database's Policy document. Press <ESC> to close it. You will see a newly created database with following five parts. On the top of the database screen is the menu bar.

   (a) *Menu bar:* It contains various menu options viz. File, Edit, View, Create, Actions, Window and Help. The next part of the screen is SmartIcon pallete.

   (b) *SmartIcon Pallete:* It contains various icons used as a shortcut button for commonly used menu options.

   (c) *Action Buttons:* Below the SmartIcon palette, there are some action buttons used to perform various actions. The important action buttons are -

      (i) *Graphic Folders:* Click this button to see various folders in graphic form in the Navigation pane of the screen. These folders are called Navigation folders.

      (ii) *Standard Folders:* Click this button to replace the Navigator folders with a menu in the navigation pane.

      (iii) *New Main Topic:* Click this button to create new forms of the database. Alternatively you can select 'Design-Forms' option from the menu in the Navigation pane.

   (d) *Navigation pane:* Navigation pane is the left part of the screen located below the action buttons. It contains the name of folders in graphic as menu form.

(e) *View Pane*-View pane is located towards right of the Navigation pane. You can see the last of all forms in the database in this pane.

3. After selectivly 'Design - Forms' option, you will see the design screen for the Main Topic Form of database. In this screen, you can add same static text (text that cannot be changed) and a field of the database as exlained below:

   (a) To add a static text in the form, first click on the screen where you want to type the text. Now type the text by highlighting it and click right button of the mouse. You will see a menu on the screen. Select 'Text Properties' option and specify font, size and style of the text. Close the 'Text Properties' dialog box.

   (b) To add a field in the form, click on the screen where you want to place the field. Specify the static text that should be associated with this field. Now select 'Create-Field' option from the menu. Enter the field name and select the type of the field from type box. Close the 'Field Properties' dialog box.

4. Select 'File-Save' option or click on the 'Save SmartIcon' to save the form.

5. To the form, select 'Design - Test Form' option from the menu and add some data in the fields. Press <ESC> and choose <Yes> to save the data.

NOTES DOCUMENT

A document created in Notes contains the information about a particular subject based on the database used. For instance, if you are using an e-mail database, then each document is a message and for your Sales database, each document is a customer record. A Notes document contains the following elements, which are not available with any word processor:

1. *Static Text:* It is a permanent part of your document. It is called static because it cannot be changed.

2. *Field:* Contrary to static text, field is not a permanent part of your document. You can add, delete or change information in field (just like in a database field) while composing or editing your document. The basic types of a field are described below:

   (i) *Text Field:* Contains any combination of characters.

   (ii) *Rich Text Field:* Similiar to text field, however you can also do text enhancements (like boldface, italics, changing of font type and size etc.)

   (iii) *Date Field:* Contains only valid dates in the specified format (such as MM-DD-YY).

   (iv) *Number Field:* Contains only numbers and a decimal only.

   (v) *Name Field:* Contains only names of persons for security purposes.

3. *Buttons:* Button is a rectangular picture resembling a button, which, when clicked with the mouse execute certain commands depending upon their assigned functions. You can also add buttons to your document.

4. *Hotspot:* Hotspot is a special part of a document, which, when clicked launches an action depending upon its assigned function (e.g. opening a document in another database). Hotspot may be in the form a pop-up (text enclosed in a box), link (cross-reference to some other Notes database), object (usually data from another program) or an Icon.

Creating a New Document

To create a new document, first click the Database icon on the workspace and then choose 'Create' menu. When you choose 'Create' menu, you will see a list of the document types that can be created by using the opened database. This list of document types may vary from one database to another. After selecting the document type, fill out the fields in your new document. The various keyboard and mouse commands used to different tasks while working with Notes document are summarised in Table 10.1. Various commands used to enhance texts in Notes document is summarised in Table 10.2.

Table 10.1: Working with Notes Documents

Task	Keyboard	Mouse or Menu
Read selected document	Enter	Double-click
Delete selected document	Delete	Edit—Clear
Clear document from screen button	Esc	Double-click right mouse
Edit document	Ctrl+E	Double-click open document
Send a message	Esc and then Send or Actions..Send	Click Send button
Forward a document	Actions—Forward	
Send a memo when you're in another database	Create—Mail—Memo	
Update a view	F9	View Refresh

Table 10.2: Enhancing Text in Notes Documents

Purpose	Keyboard Commands	Menu Commands
Italic	<Ctrl> + I	Text—Italic
Bold	<Ctrl> + B	Text—Bold
Underline	<Ctrl >+U	Text—Underline
Strikethrough	<Alt>+<Enter>	Text Properties, first tab
Superscript	<Alt>+<Enter>	Text Properties, first tab
Subscript	<Alt>+<Enter>	Text Properties, first tab
Normal Style	<Ctrl >+T	Text—Normal Text
Delete	<Delete>	Edit—Clear
Cut to Clipboard	<Ctrl >+ X	Edit—Cut
Copy to Clipboard	<Ctrl >+C	Edit—Copy
Paste	<Ctrl >+V	Edit—Paste
Append to Clipboard	<Ctrl >+<Shift>+<Insert>	No menu item
Change front	<Alt>+<Enter>	Text properties, first tab
Align paragraph	<Alt>+<Enter>	Text properties, second tab
Indent paragraph	<F7>/<F8>	Text properties, second tab

Saving the Document

To save a document, press <ESC> key to move from document window to a save dialog box. Now, choose <Yes> to save your document in the database. Alternatively, you may also choose File-Save option from the menu.

Abandoning the Document

If you don't want to save the document, choose <No> from the save dialog box.

Editing the document

To edit the document, highlight it in the View pane and then either click the Edit SmartIcon or choose 'Actions-Edit-document' from the menu.

Printing the document

To print the document, either click the Print SmartIcon or choose 'File-Print' option from the menu.

NOTES WEB NAVIGATOR FOR INTERNET BROWSING

One of the important features of Lotus Notes Release 4 is its ability to access the Internet. You can brouse world wide web pages and download files from FTP sites by using Notes. World wide Web pages can be treated like any other Notes document. As Notes stores these pages in a database, you can retireve them quickly without reconnecting to the Internet. An InterNotes Server is a special notes server that connects you to the Internet.

Navigator is a program used to find web pages on the Internet Notes has a built in Navigator. All web pages that are accessed by you using notes are saved into your office's Web Navigator database. When you open the Navigator database you see the sampler part of the Navigator page. The sampler part is used to view web pages that have been already sorted into various categories. You can click on any of the categories to view their pages. InterNotes Web Navigator provides an Internet Directory search option for finding Web pages about any topic. It also provides a Users Guide option for helping you to use Notes Web Navigator.

SUMMARY

Office automation refers to integration of office automation functions, including word processing, data processing, graphics, desktop publishing and e-mail. Groupware is the software that allows you to work together with a group of other people on a related project. Lotus Notes is a groupware that lets you to communicate and interact electronically with other people. Using Lotus Notes, you can send and receive E-mail messages with many new features. In Notes, you can add text enhancements and graphics to your e-mail message. All documents that you create in Notes are stored in databases with other documents of same type. Notes is actually a database software that allows you to create documents in any format desired by you. A Notes document has two parts - a static text which cannot be changed and a field which is permanent. Notes has a built-in Navigator used to find web pages on the Internet. It is an important office automation tools for corporate sector.

REVIEW QUESTIONS

1. Fill in the blanks:
   (a) _____ serves a group of users that work on a related project.
   (b) _____ enables Notes to contain the same information in all the databases created on many servers of your organisation.
   (c) Each of the items in the _____ pane is called a folder.
   (d) The permanent part of Notes document is called _____ text.
   (e) _____ is a special part of a document, which, when clicked launches an action.

2. Write True or False:
   (a) Notes documents can be integrated with web pages.
   (b) The first screen of Notes is called The Notes Workspace.
   (c) Inbox contains those messages that you have composed but not mailed yet.
   (d) In Notes, you can do text enhancements in text field.
   (e) View pane displays an actual e-mail message.
3. Match the following:

(a) <Tab>	(i) To move to the next e-mail message.
(b) <Shift+Tab>	(ii) To move to the previous e-mail message.
(c) <F4>	(iii) To move to the next unread e-mail message.
(d) <Enter>	(iv) To move to the previous unread e-mail message.
(e) <Shift+F4>	(v) To see the next unread document.
(f) <Backspace>	(vi) To see the previous unread document.

4. What is Lotus Notes? Write the important features of Lotus Notes.
5. What is a Notes Workspace? Describe its main elements.
6. What are the four parts of the screen used to display e-mail messages in Lotus Notes? Write their functions.
7. Describe the four parts of a blank memo used to create e-mail message in Lotus Notes.
8. Name the different elements of a Notes Document alongwith their functions.
9. Write the menu command for each of the following functions:
   (i) To open an e-mail database
   (ii) To create an e-mail database
   (iii) To send an e-mail message
   (iv) To save a Notes document
   (v) To edit a Notes document
10. Discuss the importance of Notes Web Navigator in browsing world wide web page on Internet.
11. Discuss the role of a groupware in corporate sector.

CHAPTER 11

DeskTop Publishing

LEARNING OBJECTIVES

- Definition and Importance of DTP
- DTP Software: PageMaker
- Starting the PageMaker
- Creating the New Publication
- The PageMaker Desktop
- Editing Text in PageMaker
- Importing Text
- Paragraph Specifications
- Type Specifications
- CorelDRAW: Another DTP Software
- Starting the CorelDRAW
- CorelDRAW Tools
- Drawing Basic Shapes
- Adding Text to the Drawing
- File Commands
- Keyboard Shortcuts used in CorelDRAW
- Use of DTP Software in Corporate Sector

DEFINITION AND IMPORTANCE OF DTP

Every office needs some kind of printed materials or documents in the form of letters, office forms, stationery, catalogues, manuals or even books. These documents or printed materials are always expected to be designed properly with required type-settings and graphics. When a document is printed or published, it should be put into a form that looks attractive and readable to other people. DeskTop Publishing (DTP) is the technique that is used mainly by publishers and printers to design the documents required to be printed/published using a desktop computer (i.e. PC).

Using a DTP software, you can produce a high-quality printout with attractive graphics for commercial printing. You can also create text and graphics by using a DTP software. However, only few DTP softwares provide full-featured word processing and graphics capabilities.

DTP SOFTWARE: PAGEMAKER

PageMaker is the ideal program for desktop publishing. You can use it for creating all kinds of publications in black and white as well as colour. Although you may also design publication documents using a sophisticated word processor (such as MS Word or Word Perfect), still you need PageMaker. This is because PageMaker provides more control over look of the finished printed material than any word processor or graphics software.

Hardware and Software Requirements

PageMaker (version 5.0 for Windows) requires minimum a PC/AT 286 Computer with atleast 4 MB RAM, 40 MB free hard disk space, SVGA monitor and Windows 3.1 or higher.

STARTING THE PAGEMAKER

To start PageMaker in Windows 3.1/ Windows 95, open the program group or folder containing PageMaker and double-click on the PageMaker application icon. You will first see the start-up screen with a portrait of Aldus Manutius (Father of Publishing) followed by screen showing your registration information and finally the PageMaker desktop screen as shown in Figure 11.1.

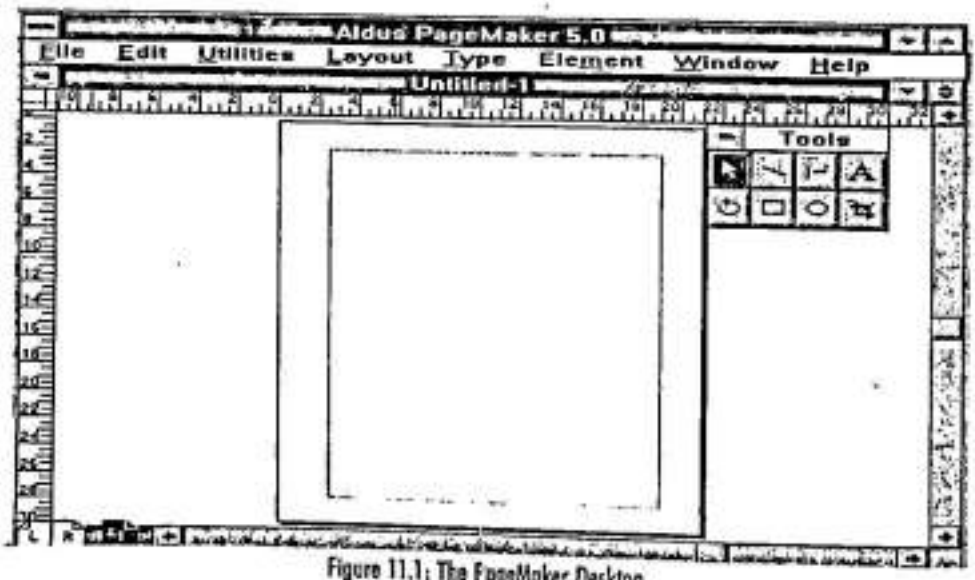


Figure 11.1: The PageMaker Desktop

CREATING THE NEW PUBLICATION

To create a new document, either choose 'File-New' option from the menu or press <Ctrl+N> keys. You will see the page setup box as shown in Figure 11.2. This setup box contains the following elements:

(a) *Page:* Used to select the type/size of your page (such as letter/legal/A4/Custom, etc.)

(b) *Orientation:* Used to select orientation of the page (i.e. Tall or wide).

(c) *Start Page #:* Specify here the starting page number of your publication.

(d) *No. of Pages:* Specify the number of pages in your publication.

(e) *Double-sided:* Specify here whether the pages in your publication are to be printed on both sides or single side by selecting or deselecting the 'Double-sided' option respectively.

(f) *Facing:* Selecting this option displays both left and right pages on your desktop screen otherwise you can see only single page at one time.

(g) *Restart Page Numbering:* Selecting this option restart your page-numbering. However, normally it is never selected.

(h) *Margins:* Here you specify the inside, outside, top and bottom margins in inches, mm or other unit of measurements as set by 'File-Preferences' option from the menu.

(i) *Compose to printer:* Specify here the name of printer where publication will be printed.

(j) *Target Printer Resolution:* Specify here the type of the printing quality (such as 300/600 DPI where DPI stands for Dots Per Inch) of your publication.

After specifying all the options in the page setup dialogue box, click on the <OK> button. You will see now the PageMaker desktop screen.

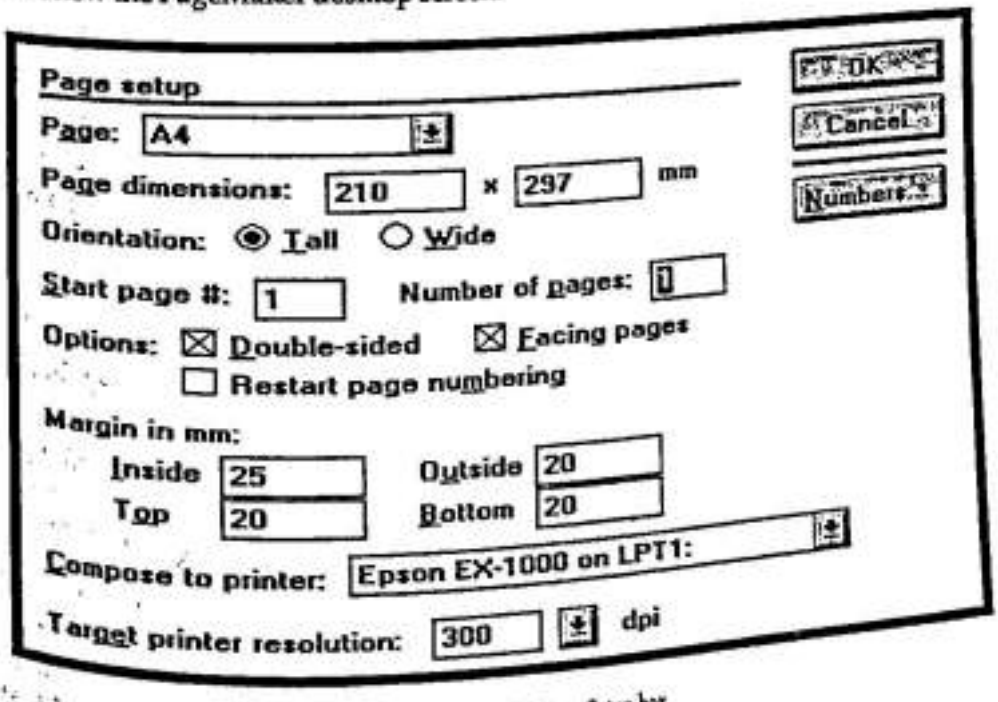


Figure 11.2: The Page Setup box

THE PAGEMAKER DESKTOP

The PageMaker desktop screen has the following main parts as shown in Figure 11.1:

1. *Menu Bar:* It is located at top of the screen. You can select different options from this menu bar.
2. *The Page Window:* This is the screen where you actually place, edit and design your page by using text and graphics.
3. *The Toolbox:* The PageMaker Toolbox appears in the upper right part of the desktop screen but you can also move it to any other place. You can also close it either by pressing <Ctrl+6> keys or choosing Window-Toolbox option from the menu. The toolbox contains the following eight tools:

(i) *Pointer Tool:* Used to select, move and resize text or graphics.

(ii) *Diagonal Line Drawing Tool:* Used to draw angled lines that can be pointed in any direction.

(iii) *Perpendicular Line Drawing Tool:* Used to draw vertical, horizontal or precise 45 degree angled lines.

(iv) *Text Tool:* Used to create/ edit the text.

(v) *Rotation Tool:* Used to rotate any element, text, graphics, shapes or line to any degree.

(vi) *Box Tool:* Used to draw a rectangular/square box.

(vii) *Oval Tool:* Used to draw an oval or circular shape.

(viii) *Cropping Tool:* Used to crop a portion of graphics.

4. *The Pasteboard:* The pasteboard surrounds the pages of your publication window. It is just like your rough text/drawing sheet. You can first type the text or make the graphics on the pasteboard and then using pointer tool move it to any part of your visible page. For moving this text/graphics to another page, do the following steps:
   (i) Cut the selected text/graphics either by choosing Edit-Cut option or pressing <Ctrl+X> keys.
   (ii) Go to the desired page number either clicking the page no. box from the bottom line of the screen or choose Layout-Go To Page option from the menu.
   (iii) Move the cursor to the desired place on your page and either choose Edit-Paste option or press <Ctrl+V> keys.
5. *The Rulers:* At the edges of the pasteboard, you can see vertical and horizontal rulers. These rulers will help you to measure the distances between two portions of the page. If you don't want to view ruler lines, either press <Ctrl+R> keys or deselect Layout-Ruler option from the menu.

EDITING TEXT IN PAGEMAKER

For typing a text in PageMaker, choose the Text tool, move the cursor to the desired place of the page and start typing. Press <Enter> key only at the end of your paragraph. After typing one

paragraph, you select the pointer tool, move the cursor to our text area and click the right mouse button (Left mouse button in PageMaker 5 is used to toggle between Fit in Window and Actual views). You will see two handles, one at top and another at bottom of the text area. This selected text area with two handles is called the *Text Block*. You can change the size of this text block and move it anywhere on the page or pasteboard by moving the mouse and using pointer tool.

Saving the Publication

After typing every few paragraphs, you should keep on saving the publication. To save your publication, either press <Ctrl+S> keys or select 'File-Save' option from the menu. When you will save the file for first time, you will also be required to enter the file name of your publication otherwise the file is saved with same name. You can also save the file by a new name by choosing 'File-Save' *as* option from the menu.

Abandoning the Changes

You can also abandon your recent changes made to your publication and open its previously saved version by choosing 'File-Revert' option from the menu.

OPENING THE PUBLICATION

You can open your previously saved publication either by choosing 'File-Open' option from the menu or pressing <Ctrl+O> keys and then specifying name of the file in the Open dialogue box.

IMPORTING TEXT

Although you can type the text directly by using the word-processing feature of the PageMaker, it is not a convenient method because PageMaker does not offer complete word-processing features. Normally the text is typed by using a word processor (such as Word Star, MS Word or Word Perfect) and then it is imported to the PageMaker publication. This method makes the tasks of word processing as well as page type-settings easier and more comfortable.

Placing the Text

To place a word processing text into your new publication, do the following procedures:

(a) ***Choose File:*** New option from the menu to create a new publication.

(b) ***Select Layout:*** Autoflow option from the menu.

(c) ***Choose the File:*** Place option from the menu or press <Ctrl+D> keys and select the name of file to be imported from the dialog box shown on screen.

(d) Select <OK> from the dialog box and click the right mouse button at top of the page.

You will see the imported text flowing on your new publication window.

Importance of Autoflow

Why do you choose Autoflow option before placing the text? Autoflow feature of PageMaker flows the imported text on all the pages of your publication. If you will not select the Autoflow option, your importing text would be placed only on the first page and in that case you will have to place the text on other pages by first clicking on the bottom handle of the text block and then clicking again on the next page.

Adjusting Blocks of Text

The text blocks which you have placed on your publication page can be adjusted in many ways. You can change the length/width of the text block and can also move it to another portion of your page or the pasteboard. This can be done by first selecting the pointer tool and then clicking on a block of the text. You will see two types of handles in this text block. The window shade handles on top and bottom of the text block are used to adjust length of the block. The black square handles at each corner of the text block are used to adjust the size of the block.

PARAGRAPH SPECIFICATIONS

After placing and adjusting the text, the next step is to format each paragraph. This can be done by the following steps:

(a) Select text tool from the toolbar and click on the beginnung line of the paragraph.

(b) Choose Type-Paragraph option from the menu or just press <Ctrl+M> keys, You will see a paragraph specifications dialog box as shown in Figure 11.3.

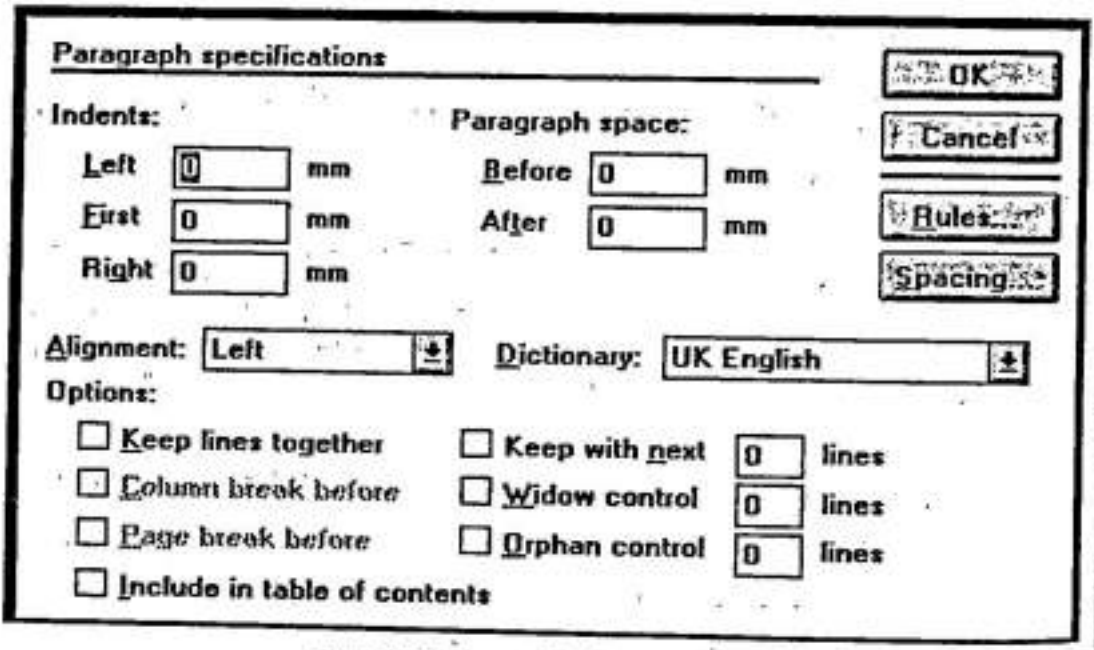


Figure 11.3:The Paragraph Specifications Dialog box

(c) Specify right and left indents (margins). Specify the margins for the first line of the paragraph in First indents column.

(d) Specify the alignment of text (Left/Right/Centre/Justified).

TYPE SPECIFICATIONS

You can also change the size, font and style of the text in your publication. This can be done by following steps:

(a) Select the Text tool from the toolbar and highlight the text by using mouse pointer.

(b) Choose 'Type-TypeSpecs' option from the menu or just press <Ctrl+T> keys. You will see the type specifications dialog box as shown in Figure 11.4.

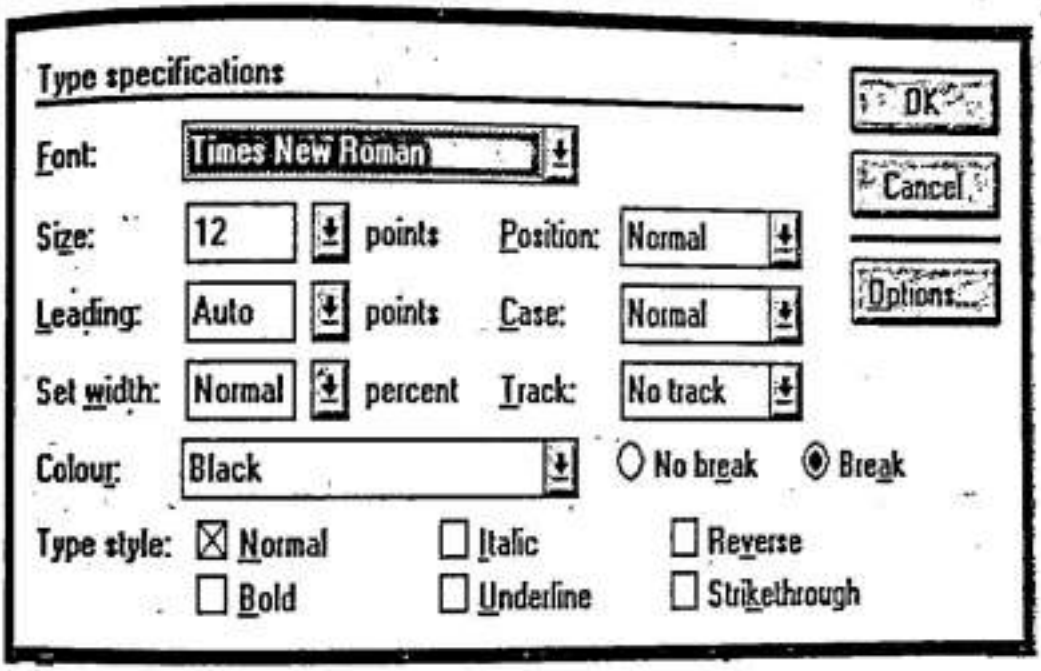


Figure 11.4: The Type Specifications Dialog box

(c) Select the type face from the Font column.

(d) Type the point size in the Size column.

(e) Specify the type style (bold, italic, etc.) by selecting the required option.

(f) Specify the position of text (normal/subscript/superscript) in the Position column.

(g) Specify whether the text should be in capital, normal or small caps in the Case column.

Exiting PageMaker

To come out of PageMaker, either press <Ctrl+Q> keys or choose 'File-Exit' option from the menu.

CORELDRAW: ANOTHER DTP SOFTWARE

CorelDRAW is an application software which is designed to work with graphic images of various shapes, sizes and colors. It is primarily a sophisticated graphics package which is very easy to operate. The graphics designed on the CorelDRAW can easily be exported to your PageMaker publication. Therefore, CorelDRAW is also a major application software required for desktop publishing.

STARTING THE CORELDRAW

To start CorelDRAW in Windows, you just double click on the CorelDRAW program icon. You will see the opening screen of CorelDRAW as shown in Figure 11.5.

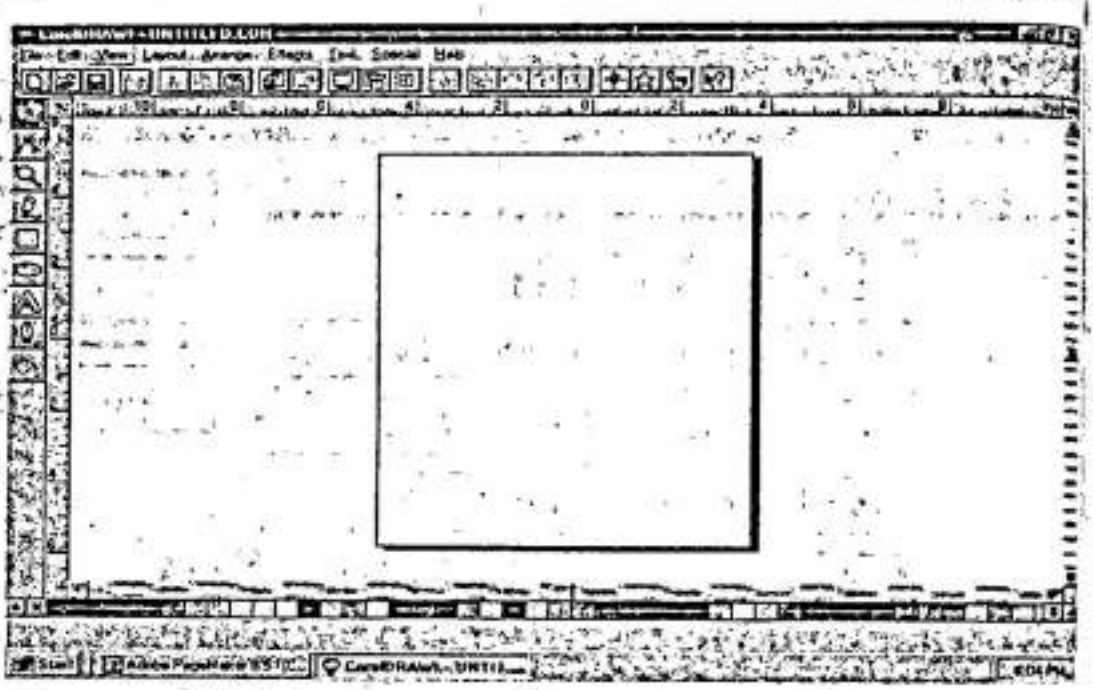


Figure 11.5: The CorelDRAW opening screen

Parts of the Screen

The various parts of the CorelDRAW (version 5) opening screen are described below:

1. *The Windows border :* It is the outer edge of the screen that allows you to scale the size of the window within which CorelDRAW operates.
2. *The Title bar:* Below the top of windows border is the title bar. The title bar shows you the name of the program running (i.e. CorelDRAW).
3. *The Menu bar:* It contains various menu options and is located below title bar.
4. *The Ribbon bar:* It contains icons for commonly used commands and is located below the menu bar.
5. *The Toolbox:* It is located along the left side of the screen. It contains various tools which are used for drawing, writing text, viewing and other functions.
6. *The Printable page:* The page outlined in the centre of the screen is the printable page. This is the place where you put your final drawings for printing.
7. *The Drawing window:* The drawing window surrounds the printable page. This is the place where you draw the things and then move it to the printable page. You can also move the drawings from printable page to the drawing window.
8. *Horizontal and Vertical Scroll bars:* Horizontal scroll bars are located at the bottom of screen while verticals along the right side. The little white box on the bars is referred to as the Thumb and the black sections on either side as Elevators. You can move the view of your drawings by clicking on the thumb or elevators.

9. ***The Color Palette :*** It is located along the bottom of the screen. It contains many different colors which can be added to your drawings.

10. ***The Status Line :*** It contains important information regarding the tool in use, the type face and point size of text characters, the location and orientation of the object being drawn and fill or outline selection for particular objects.

CORELDRAW TOOLS

The toolbox in the CorelDRAW opening screen contains various tools as shown in leftmost column of Figure 11.5 and described (from top to bottom) below:

1. ***Pick Tool:*** This tool is used to select objects or groups of objects. After selecting the object, you can use various menu options in order to change the appearance of your drawing. You can also move, stretch, rotate, scale and skew selected objects by using the pick tool. To select a filled object, you click anywhere on the object. For unfilled objects, you click on their outlines.

2. ***Shape Tool:*** The function of this tool depends upon the type of object you select. For instance, if your object is a line or curve, using the shape tool you can change its shape by moving its nodes and control points. If your object is of text type, then shape tool helps you to edit its character attributes.

3. ***Zoom Tool:*** Zoom tool looks like a magnifying glass. Clicking on this tool displays the six viewing icons as shown in Figure 11.6. The function of each of these icons is summarised in Table 11.1.

Figure 11.6: Viewing Icons of Zoom Tool

Table 11.1: The viewing icons of Zoom tool

Zoom Viewing Icon	Description
1. Zoom In	Magnifies a portion of the screen.
2. Zoom Out	Returns you to the view prior to the last Zoom In.
3. Actual Size	Displays the actual printed size of your drawing.
4. Zoom to Selected	Zooms in on only selected objects.
5. Fit In Window	Displays all objects on your view window.
6. Show Page	Displays the entire printable page.

4. ***Pencil Tool:*** Pencil tool is used to draw lines, curves and dimension lines.

5. ***Rectangle Tool:*** It is used to draw rectangles and squares.

6. ***Ellipse Tool:*** Ellipse tool draws ellipses and circles.

7. *Text Tool:* It is used for entering text onto the drawing.
8. *Outline Pen Tool:* It is used to define the size and shape of the lines that outline text characters and objects.
9. *Fill Tool:* Fill tool is used to define the method of filling the inside of object and text characters.

DRAWING BASIC SHAPES

You can use CorelDRAW very easily for drawing basic shapes and designs. You can easily draw straight lines, curves, rectangles, ellipses and circles by using various Corel Tools.

Drawing a Straight Line

To draw a straight line in CorelDRAW, use the following procedure:

(a) Choose the Pencil tool from the toolbox. You will see a menu that lets you to choose the drawing mode (Freehand/Bezier) and the type of dimension line (vertical, horizontal, etc.) you want to draw. Freehand mode is similar to the way you move a pencil on the paper. In Bezier mode, however, you specify the start and end points of the line and the CorelDRAW connects the points.

(b) Select the Freehand mode by clicking on the first option button.

(c) Place the cursor where you want the line to start and click.

(d) Move the cursor now. You will see a line forms between the starting point and the cursor.

(e) To end the line, place the cursor where you want the line to end and click.

Drawing a Curve

To draw a curve in Freehand mode, use the following procedure:

(a) Place the cursor where you want the curve to start.

(b) Press mouse button, hold it and drag the cursor along the path of the curve.

(c) Release the button at the end of the curve.

Shaping a Curve

You can also change the shape of curve by the following procedure:

(a) After drawing a curve, choose Shape tool from the toolbox.

(b) Now, hold the mouse button on the part of the curve you want to shape.

(c) Drag the cursor to give desired shape to the curve.

(d) Release the mouse button after drawing the desired shape of the curve.

Drawing a Rectangle

To draw a rectangular box, use the following procedure:

(a) Click on the Rectangle tool from the toolbox.

(b) Place the cursor to the position from where you want to draw the rectangle.

(c) Press and hold the mouse button.

(d) Drag the cursor to give desired shape to the rectangle.

(e) Release the mouse button. You have drawn a rectangular box.

Drawing a Square

Use the same procedure described above for drawing a square, however also press the <Ctrl> key while drawing.

Drawing a Ellipse

The procedure for drawing a ellipse is also same as for rectangle except choosing the ellipse tool instead of rectangle.

Drawing a Circle

The procedure for drawing a circle is same as for ellipse, however press the <Ctrl> key while drawing.

Shaping Rectangles, Squares, Ellipses and Circles

You can change the shape of Rectangles, Squares, Ellipses and Circles by first choosing Shape tool from the toolbox and then dragging the nodes of these figures and finally releasing the mouse button.

ADDING TEXT TO THE DRAWING

The most flexible and valuable feature of CorelDRAW is its ability to manipulate text characters. To enter and manipulate text characters in your drawing, use the following procedure:

(a) Select the Text tool from the toolbar.

(b) Move the cursor at a location of page where you want to enter text and click there. This will display a text dialog box.

(c) Enter your text in the text dialog box.

(d) Select the justification type (left, right, centre, etc.).

(e) Specify the point size in Size column.

(f) Select the font type.

(g) Select the text style (normal, bold, italic, etc.).

(h) Click on <OK> button.

You can also edit the text later on either by choosing 'Edit Text' option from the Edit menu or pressing <Ctrl+T> keys.

Kerning Text and Changing Character Attributes

You can alter the spacing between characters (kerning) and change character attributes (such as point size, typeface, etc.) by using the text nodes as illustrated in Figure 11.7 and described below:

(a) Select the text tool from the toolbox and type a text - Welcome to CorelDRAW.

(b) Choose Zoom in tool from the toolbox and magnify the text.

(c) Choose Shape tool from the toolbox. You will find a text node at the base and to the left of each character. You will also notice two spacing arrows at each end of the word.

(d) To increase the inter-line spacing (leading) of the text, click on and drag the left pointer (pointing downwards) in a down direction. Move the pointer to where you want the bottom of the text to stop. Now, release the mouse button. You will see that inter-line spacing increases but the point size of the text remains the same. To decrease the inter-line spacing, you have to move the pointer upwards.

(e) To increase the inter-character spacing, click on and drag the right pointer (pointing to right) in right direction. Move the pointer and release the buttons at desired location. To decrease the inter-character spacing, you have to move the pointer towards left.

(f) To set inter-word spacing, hold down the <Ctrl> key while moving right pointer.

(g) To change the point size of characters, click on the Pick tool. You will find small black boxes appearing around the text. You can increase or decrease the size of characters by clicking on and dragging these boxes in the required direction.

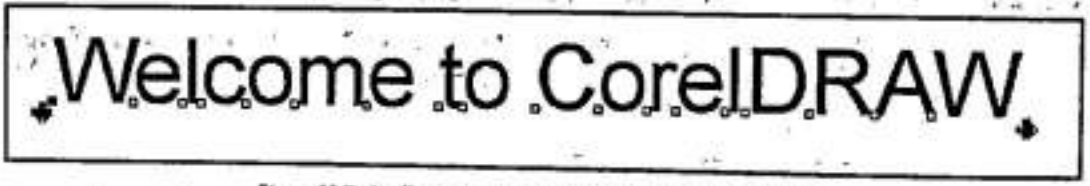


Figure 11.7: An illustration to alter the spacing between characters

FILE COMMANDS

You can save your drawing, create a new drawing, open an existing drawing or come out of CorelDRAW by choosing file commands from the File menu.

Saving the Drawing

To save your drawing, either press <Ctrl+S> keys or choose 'File-Save' option from the menu. Enter the file name in the save dialog box. You will find your drawing file will be saved with extension CDR. You can also save the file with a new name by choosing 'File-Save As' option from the menu.

Displaying a New Page

After saving your drawing, if you want a fresh page for new drawings either press <Ctrl+N> keys or choose 'File-New' option from the menu.

Opening an Existing Drawing

To open an existing drawing, either press <Ctrl+O> keys or choose 'File-Open' option from the menu.

Exiting CorelDRAW

To come out of CorelDRAW program, either press <Ctrl+X> keys or choose 'File-Exit' option from the menu.

KEYBOARD SHORTCUTS USED IN CORELDRAW

Various shortcut keys used in CorelDRAW for different commands are summarised in Table 11.2.

Table 11.2: Shortcut Keys used in CorelDRAW

Purpose	Shortcut Key	Purpose	Shortcut Key
Tool Selection		Break Apart	<Ctrl>+K
Zoom In	<F2>	Convert to Curves	<Ctrl>+V
Zoom Out	<F3>	Align	<Ctrl>+A
Zoom Objects	<F4>	Fit to Path	<Ctrl>+F
Zoom Page	<Shift>+<F4>	Align to Base	<Ctrl>+Z
PENCIL Tool	<F5>		
RECTANGLE Tool	<F6>	**Display Operations**	
ELLIPSE Tool	<F7>	Snap to Grid	<Ctrl>+Y
TEXT Tool	<F8>	Split Preview	<Shift>+<F9>
Shape Tool	<F10>	Full Screen Preview	<F9>
OUTLINE PEN Tool	<F12>	Refresh Wire	<Ctrl>+W
Fountain Fill	<F11>	**Effects Operations**	
INTERIOR FILL Tool	<Shift>+<F11>	Blend	<Ctrl>+B
File Operations		Extrude	<Ctrl>+E
Open File	<Ctrl>+O	**Edit Operations**	
Save File	<Ctrl>+S	Undo	<Alt>+<BS>
Print Drawing	<Ctrl>+P	Redo	<Alt>+<Return>
Exit DRAW	<Ctrl>+X	Repeat	<Ctrl>+R
Transform Object Operations		Cut	<Shift>+<DEL>
Move Object	<Ctrl>+L	Copy	<Ctrl>+<Ins>
Rotate/Skew	<Ctrl>+N	Paste	<Shift>+<Ins>
Stretch/Mirror	<Ctrl>+Q	Clear	<Delete>
Arrange Objects Operations		Duplicate	<Ctrl>+D
To Front	<Shift>+<PgUp>	Edit Text	<Ctrl>+T
To Back	<Shift>+<PgDn>	**Special**	
Forward One	<PgUp>	Preferences	<Ctrl>+J
Back One	<PgDn>		
Group	<Ctrl>+G	**Selecting Objects**	
Ungroup	<Ctrl>+U	Select Consecutively	<TAB>
Combine	<Ctrl>+C	Select in Reverse Order	<Shift>+<TAB>

USE OF DTP SOFTWARE IN CORPORATE SECTOR

DTP software have become an essential part of computerisation for almost all organisations. Whether you are having a publishing house, an institute, a college, an industry or a showroom, you need DTP software for attractive presentation of your documents or preparing course materials. All publishing houses use PageMaker, CorelDRAW and Ventura for designing their books. DTP software are widely used by news paper and advertising houses. They are also used by photo-studios and movie studios for beautiful presentation of photographs and video movies.

SUMMARY

Desktop publishing is the technique that is used by publishers and printers to design the documents required to be printed/published using a PC. PageMaker is the ideal program for desktop publishing. PageMaker provides more control over look of the finished printed material than any word processor or graphics software the PageMaker desktop screen has five parts- Menu Bar, the Page Window, the Tool box, the Pasteboard and the rulers. As PageMaker does not offer complete word processing features, the text is first typed by using a word processor and then it is imported to the PageMaker publication.

CorelDRAW is an application software which is designed to work with graphic images of various shapes, sizes and colours. The graphics designed on the CorelDRAW can easily be exported to your PageMaker publication. The basic shapes and various designs are drawn by using Corel Tools. You can manipulate text character in CorelDRAW in various ways. DTP software are widely used by publishers, institutes, newspapers and advertising houses.

REVIEW QUESTIONS

1. Fill in the blanks (with reference to PageMaker):
   (a) The _____ surrounds the pages of publication window.
   (b) _____ tool is used to select a graphics or text block.
   (c) _____ feature of PageMaker flows the imported text on all the pages of your publication.
   (d) _____ handles of each corner of the text block are used to adjust the size of the block.
   (e) DTP is mainly used by _____ and _____.
2. Write True or False (with reference to PageMaker):
   (a) Perpendicular line drawing tool is used to draw only horizontal or vertical lines.
   (b) You can select either Tall or Wide orientation in PageMaker.
   (c) Right mouse button in PageMaker 5 is used to toggle between two views.
   (d) Text blocks can be adjusted in many ways.
   (e) Selecting the 'double-sided' option in Page Setup box displays both left and right page.
3. Match the following (with reference to PageMaker):

(a) <Ctrl+N>	(i) Save the publication
(b) <Ctrl+D>	(ii) Change the type-specification
(c) <Ctrl+S>	(iii) Create a new publication
(d) <Ctrl+M>	(iv) Change the paragraph specifications
(e) <Ctrl+T>	(v) Place the text

4. Fill in the blanks (with reference to CorelDRAW):
   (a) _____ contains icons for commonly used commands and is located below the menu bar.
   (b) _____ tool is used to select objects or groups of objects.
   (c) Outline Pen Tool is used to define the _____ and _____ of the lines that outline text charcaters and objects.
   (d) _____ icon of Zoom tool magnifies a portion of the screen.
   (e) Press _____ keys to come out of CorelDRAW.
5. Write True or False (with reference to CorelDRAW):
   (a) The menu bar is located below the title bar.
   (b) The printable page is the place where you draw the things and then move to the drawing window.
   (c) Show Page icon of Zoom tool displays all objects on your View window.
   (d) The procedure for drawing a square and rectangle is exactly same.
   (e) To increase the inter-line spacing of the text, click on and drag the right pointer.
6. What is DTP? Why do you use PageMaker for creating your publications?
7. Name and draw the eight tools of PageMaker. Write the importance of the each tool.
8. Describe the procedure for importing word processing file into PageMaker file.
9. Write the menu command for each of the following functions in PageMaker:
   (i) Creating the new publication
   (ii) Exiting the PageMaker
   (iii) Going to the specified page
   (iv) Formatting the paragraph
   (v) Cutting the text or graphics
10. What is CorelDRAW? Name and write the functions of various parts of the CorelDRAW opening screen.
11. Write the functions of following tools in CorelDRAW:
    (a) Pick Tool (b) Text Tool (c) Shape Tool (d) Fill Tool
12. Write the procedure to draw followings in CorelDRAW:
    (a) Straight Line (b) Square
13. Write the procedure for changing the inter-line and inter-character spacings of the text in CorelDRAW.
14. Discuss the role of DTP software in corporate sector.

CHAPTER 12

Engineering Workstation

LEARNING OBJECTIVES

- Definition and Importance of CAD
- AutoCAD: An Engineering Workstation
- Starting AutoCAD
- Creating a New Drawing
- Saving the Drawing
- Opening the Drawing
- Important Commands
- Use of AutoCAD in Corporate Sector

DEFINITION AND PORTANCE OF CAD

Computer Aided Design (CAD) is a technique to design products using computers. CAD software offer a simple and comfortable method to create general or specialised designs such as architectural, electrical and mechanical designs. CAD software are mainly used by draftsperson, engineers and architects.

A CAD software offers many advantages over hand-writing methods. Some of them are summarised below:-

- Using CAD software, you can create drawings much faster than manual methods.
- Modifications in the computerised drawings can be done very easily as compared to manual drawings.
- You can change the plans of drawings drafted using computers much easily than a manual method.
- A CAD software offers many features of easy duplication, editing and accuracy which are not possible in manual methods.
- Printed Circuit Boards (PCBs) and Integrated Circuits (ICs) are designed by using CAD software which is not possible by using manual methods.

AUTOCAD: AN ENGINEERING WORKSTATION

AutoCAD is the most popular CAD software for PCs. It is used as an engineering workstation for PCs. It can be run both on single-user (such as MS DOS) and multi-user (such as UNIX, XENIX, OS/2, etc.) operating systems. You can use AutoCAD for both 2-D and 3-D drawings. AutoCAD is widely used in applications involving architectural design and mechanical drafting. AutoCAD is a general purpose drafting software which helps you to create your own:

- screens and pulldown menus;
- icons, drafting tablet, pointer buttons and dialogue boxes;
- text fonts, hatch patterns (individual line entities), dot-dash linetypes;
- symbols and ports library;
- post-script fill patterns; and
- prototype drawings with custom default settings.

Hardware and Software Requirements for AutoCAD

If you want to install AutoCAD (Release 12) on your PC, then you must have atleast a PC/AT 386 computer with 80387 maths co-processor, 8 MB RAM and ofcourse SVGA monitor (preferably color). You should also have a laser/ink-jet printer or plotter for printing the drawings on paper. You must also have a mouse or digitizing tablet as graphics input device. AutoCAD 12 runs under both DOS (5.0 or higher version) and Windows (3.1 or higher) operating systems.

STARTING AUTOCAD

To start AutoCAD 12 from the DOS prompt, give the following command:

C:\>acadr12 <Enter>

where acadr12 is the name of the batch file (ACADR12.BAT) created in the root directory of hard disk at the time of installation of AutoCAD.

The above command sets some DOS environment variables and load AutoCAD in the computer memory. After loading, first copyright notice screen, then Autodesk Logo screen and finally drawing editor screen as shown in Figure 12.1 will be displayed.

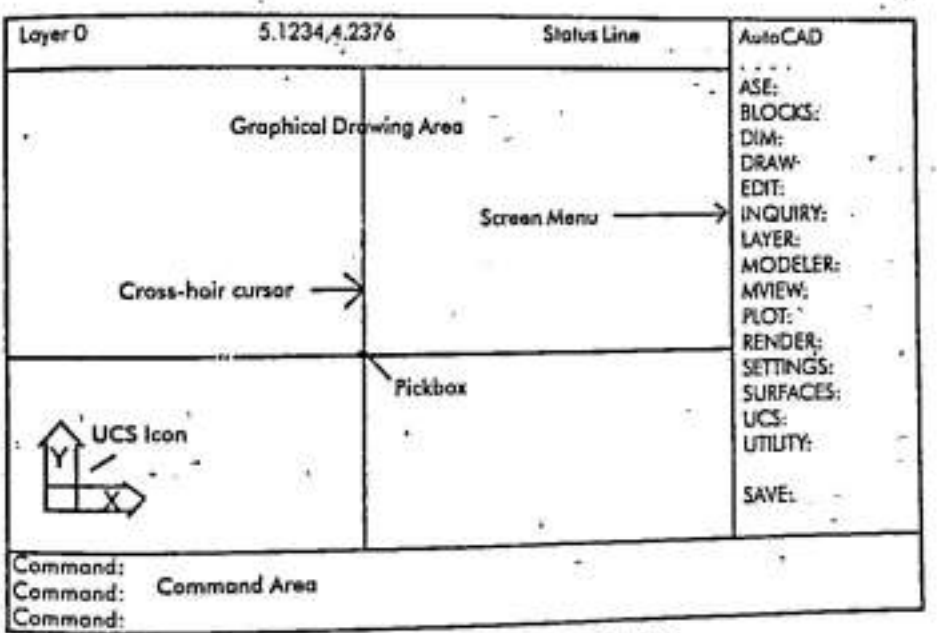


Figure 12.1:The drawing editor screen of AutoCAD

The drawing editor screen consists of following parts:

1. *Graphical Drawing Area:* This is the central area on the screen where you create the drawings by using a graphics cursor, called the cross-hair cursor. The small box in the centre of this screen is called the pickbox. Pickbox is used to draw, select entities and pick the options from menus and dialog boxes.

2. *Screen Menu:* Screen menu comprises a set of AutoCAD commands displayed in the form of menus and submenus. The screen menu is displayed on the right side of graphical drawing area.

3. *Command Area:* Command area is located at the bottom of screen. You can give the commands of AutoCAD on the command prompt. By default, 3 lines of command prompt area is displayed at the bottom of screen. Press <F1> key to see 24 most recent commands given which will be displayed on the entire screen. This is called the text screen. You can come back to graphics screen by pressing <F1> key again. In AutoCAD <F1> key is called the Flipscreen key.

4. *Status Line:* Status line is displayed at the top of screen. It displays the name of current layer, coordinates of the current cursor position, the current color status and status of paper space modes.

CREATING A NEW DRAWING

You can create new drawings by one of the following ways:

(i) As AutoCAD begins with an untitled drawing, you can start making drawings without giving any command. You can name the drawing later on while saving it.

(ii) Alternatively, you can give the following command on command prompt:

Command: new <Enter>

The above command displays a new drawing dialog box. Enter the name of your drawing in the New Drawing Name ... Edit box and select OK. AutoCAD automatically assigns an extension .DWG to the newly created drawing file.

An Example

You can try drawing a few lines by giving the following commands:

(i) At the command prompt, give the following command:

Command: line <Enter>

The above commands changes the prompt 'Command:' to 'From point:'.

(ii) Now, you specify the position from where the line should start. The coordinates of the starting position can be expressed as either 2-D (x,y) or 3-D (x,y,z) points. Points are expressed in relation to the current User Coordinate System (UCS). For instance, you can enter the coordinates as follows:

From point: 3.5, 2.95, 6.25 <Enter>

OR

From point: 3.5, 2.95 <Enter>

When the value of z is not specified, the current elevation is used. You can also specify the coordinates by moving cross-hair cursor by the mouse and pressing the pick button of the pointing device (mouse) for picking a point on the screen.

(iii) After the above command, the command prompt changes to To point. Now, you move the mouse around, you will see the line stretching from the point you picked up. Press the pick button at point where you want to specify the ending position of line. You will see a line drawn on the screen. Alternatively, you can also specify the coordinates as illustrated above.

SAVING THE DRAWING

After creating the drawing, you can save it by one of the following commands:

(i) SAVE Command: This command first requests a file name and then saves the drawing.

(ii) SAVEAS Command: This command saves the current drawing with a new name entered by user.

(iii) QSAVE Command: This command saves the drawing using its current name. So, it does not request a file name if you have already named it the current drawing.

After giving any of the above commands, the Save drawing as dialog box appears on the screen. You can either enter the drawing name in the file:edit box or pick a file name from the file:list box.

OPENING THE DRAWING

Give the following command to open an existing drawing:

Command: open <Enter>

After giving the above command, the Open drawing dialog box appears which is almost similar to Save drawing as box. So, you can either enter the drawing name in the 'file:edit' box or pick a file name from the file:list box.

Exiting AutoCAD

There are two commands to exit AutoCAD:

1. *END Command:* This command saves changes to your current drawing before exiting AutoCAD.
2. *QUIT Command:* This command allows you to select one of the following options before exiting AutoCAD:
   (a) *Save:* Save changes
   (b) *Discard:* Changes are not saved
   (c) *Cancel:* Cancel the command

The above commands are given at the command prompt.

Mode of Entering Commands

AutoCAD commands can be entered in many ways. The commonly used three ways are:

(a) ***From the keyboard:*** Type the command and press <Enter> or <Spacebar> key.

(b) ***From Screen Menu:*** Move cursor to the menu item and press the mouse button.

(c) ***From Pull-down Menu:*** You can also select items from pull-down menus available from the menu bar at the top of screen if status is configured to be on.

IMPORTANT COMMANDS

ARC — Used to draw an arc of any size by specifying two end points and a point along the arc. The options used with this command are:

A	To include an angle.
D	To specify starting direction
L	To give length of chord
C	To specify the center point
E	To specify the endpoint
R	To give the Radius
<Enter>	To set start point and direction as end of last Line or Arc.

AREA	Used to compute the area of a polygon, polyline or circle with following options:	
	A	To set Add mode .
	E	To compute area of selected circle or polyline.
ARRAY	Used to make multiple copies of selected objects in a rectangular or circular pattern with following options:	
	P	To make polar (circular) array objects
	R	To make a rectangular array.
BHATCH	Used to fill an automatically defined boundary with a hatch pattern through the use of dialog boxes.	
BLOCK	Used to form a compound object from a group of entities with following option:	
	?	To list specified names of defined blocks
BREAK	Used to erase part of an object or splits it into two objects.	
CHANGE	Used to erase the location, size, orientation or other properties of selected objects with following options:	
	P	To change common properties of objects
	C	To specify color
	LA	To specify the layer
	T	To specify the thickness
	E	To give elevation of the object
	LT	To specify the linetype.
CIRCLE	Used to draw a circle of any size.	
COLOR	Used to establish the color for subsequently drawn objects. The options used with this command are:	
	BYBLOCK	To set color of floating entity.
	BYLAYER	To give layer's color for entities.
	Number	To set entity color number.
	Name	To set entity color to standard color name.
COPY	Used to draw a copy of selected objects.	
DDEDIT	Used to allow Text and Attribute Definition editing via a dialog box.	
DIM	Used to permit many dimension notations to be added to a drawing.	
DIST	Used to find distance between two points.	

DIVIDE — Used to divide a selected object into a specified number of equal parts with the option:

B	To use specified block as marker

DTEXT — Used to draw text items dynamically.

ELLIPSE — Used to draw ellipses with following options:

C	To specify the centre point
R	To specify eccentricity via rotation rather than second axis
I	To draw issomic circle in current isoplane

END — Used to exit AutoCAD after saving the drawing.

ERASE — Used to erase entities from the drawing.

FILES — Used to perform a disk line-utility tasks.

HATCH — Used to perform cross-hatching and pattern-filling.

HELP — Used to display a list of valid commands and data-entry options.

HIDE — Used to regenerate a 3D visualisation with hidden lines removed.

LAYER — Used to create a named drawing layer and assign color and linetype properties to those layers. The various options used with this command are:

ON a, b	To turn on layers a and b
OFF a, b	To turn off layers a and b
C a	To set specified layers to color a
Fa, b	To freeze layers a and b
L t	To set specified layers to linetype t
LO a	To lock layer a
U a	To unlock layer a
M a	To make layer a the current layer
N a, b	To create new layers a and b
S a	To set current layer to existing layer a
?	To list specified layers and their associated colours, linetypes and visibility.

LIMITS — Used to change the drawing boundaries and their controls checking with following options:

ON	It enable limits checking
OFF	It disables limits checking.

LINE — Used to draw straight lines of any length with following options:

- Enter — The line starts at the end of previous line or arc
- C — To close polygon.

LINETYPE — Used to define linetypes (sequences of alternating line segments and spaces) and load them from libraries. The various options used with this command are:

- C — To create a linetype definition
- L — To load a linetype definition
- S — To set current entity linetype
- ? — To list a linetype library.

LIST — Used to list database information for selected objects.

MEASURE — Used to place markers at specified intervals along a selected object.

MENU — Used to load a file of commands into the menu areas.

MIRROR — Used to reflect designated entities about a user-specified axis.

MOVE — Used to move designated entities to another location.

OPEN — Used to open an existing drawing.

PAN — Used to move the displayed window.

PLINE — Used to draw two-dimensional polylines with following options:

- H — To set new half-width
- U — To undo previous segment.

QSAVE — Used to save the drawing without requesting a filename.

QUIT — Used to exit AutoCAD.

ROTATE — Used to rotate existing objects.

SAVE — Used to request a filename and save the drawing.

SAVEAS — Used to save the current drawing with a new name.

SCALE — Used to alter the size of existing objects.

SETVAR — Used to display or change the value of system variables.

SHAPE — Used to draw predefined shapes.

SKETCH — Used to permit freehand drawing. The following options are used:

- C — To connect restarts SKETCH at endpoint
- E — To erase temporary lines
- P — To raise or lower sketching pen

	Q	To discard temporary lines and exits SKETCH
	R	To record temporary lines and remains in SKETCH
	X	To record temporary lines and exits SKETCH.

STRETCH Used to move a portion of drawing while retaining connections to other parts of the drawing.

STYLE Used to create named text styles with user selected combinations of font, mirroring, obliquing and horizontal scaling with the following option:

?	To list specified currently defined text styles.

TEXT Used to draw characters of any size with selected styles with following options:

I	To prompt for justification options
S	To list or select text style
A	To align text between two points
C	To center text horizontally
F	To fit (adust) text between two points, with specified height
M	To centre the text horizontally and vertically
R	To right-justify the text
BL	To align text at bottom left
BC	To align text at bottom centre
BR	To align text at bottom right
ML	To align text at middle left
MC	To align text at middle centre.

UCS Used to define or modify the current User Coordinate System with following options;

S	To save the current UCS
P	To restore the previous UCS
R	To restore a previously saved UCS
D	To delete one or more saved coordinate system
E	To set a UCS with the same extrusion direction as that of the select entity
O	For shifting the origin of the current coordinate system.

VIEW Used to save the current graphics display and space as a Named View. The options used with this command are:

?	To list specified named views
D	To delete named view

	R	To restore named view to screen
	S	To save current display as name view
	W	To save specified window as named view.
ZOOM	Used to enlarge or reduce the display of the drawing with following options:	
	A	Zoom all
	L	Zoom in the lower-left corner
	C	Zoom in centre
	P	Zoom to previous
	W	Zoom to window.

USE OF AUTOCAD IN CORPORATE SECTOR

AutoCAD software is widely used in those manufacturing organisations where a product is needed to be designed by computer. For instance, all electronics industries need AutoCAD for designing PCB (Printed Circuit Boards) and other electronics components. An architect needs AutoCAD to design maps of multistoreyed buildings, flyovers and houses. All vehicle industries need AutoCAD to design various models of cars, scooters and other vehicles. Textile industries also use AutoCAD to design latest model of dresses. AutoCAD software play a major role in all manufacturing organisations.

SUMMARY

Computer Aided Design (CAD) is a technique to create general or specialised designs such as architectural, electrical and mechanical designs using a software called AutoCAD. When AutoCAD is started, its drawing editor screen is displayed. The drawing screen consists of four parts - Graphical Drawing Area, Screen Menu, Command Area and Status Line. AutoCAD commands can be entered in many ways. The commonly used three ways are - (i) From the keyboard, (ii) From Screen Menu and (iii) From Pull-Down Menu. You can create drawings in AutoCAD either by making drawing without giving any command or you can give command NEW on the command prompt. The drawing is saved by any of the three commands - SAVE, SAVEAS and QSAVE. AutoCAD software is widely used by all manufacturing organisations.

REVIEW QUESTIONS

1. Fill in the blanks:
   (a) _____ software are mainly used by architects and engineers.
   (b) _____ is used to draw, select entities and pick the options from menus and dialog boxes.
   (c) The extension of an AutoCAD drawing file is _____.
   (d) _____ commarid is used to draw two dimensional polylines.
   (e) _____ command is used to enlarge/reduce the display of the drawing.
2. Write True or False:
   (a) In AutoCAD, the <F1> key is called the 'Flipscreen' key.
   (b) QUIT command saves changes to your current drawing before exiting AutoCAD.
   (c) MOVE command is used to move the displayed window.

(d) The screen menu is displayed on the left side of Graphical Drawing Area.

(e) DIVIDE command is used to erase part of an object.

3. Match the following:

(a) BHATCH	(i) Draws straight lines.
(b) DTEXT	(ii) Draws 2-D polylines.
(c) HATCH	(iii) Draws text items dynamically.
(d) LINE	(iv) Performs cross-hatching.
(e) PLINE	(v) Fills an automatically defined boundary with a hatch pattern.

4. What is CAD? Why is it more useful than hand-writing methods?

5. Name and write the function of different parts of the AutoCAD drawing editor screen.

6. What are the three commonly used modes of entering commands in AutoCAD?

7. Write the function of each of the following commands:

(a) BLOCK (b) MIRROR (c) DIST (d) CHANGE (e) UCS

(f) VIEW (g) ELLIPSE (h) CIRCLE (i) MENI (j) ARRAY

8. Discuss the role of AutoCAD software in corporate sector.

CHAPTER 13

Multimedia Applications

LEARNING OBJECTIVES

- Definition of Multimedia
- Multimedia Software: Macromedia Director
- Director's Opening Window: The Stage
- The Toolbar
- Director's File Menu
- Score Window
- Director's Paint Window
- Adobe Photoshop: Another Multimedia Software
- Use of Multimedia Software in Corporate Sector

DEFINITION OF MULTIMEDIA

Multimedia refers to presentation of information in the form of images, sound and movement using a high speed PC (usually Pentium). Images represent the strongest component of multimedia. You cannot imagine multimedia without graphics, artworks and photographs. Sound, an another major component of multimedia, includes sound effects, music and narration. Movement is the essential part of video images. Images, sound and movements are created on a PC, generally called *Multimedia Computer*.

MULTIMEDIA SOFTWARE: MACROMEDIA DIRECTOR

Macromedia Director (version 5 for windows) is the most popular software for creating multimedia applications on your PC. You can call this software simply as *Director*. Using Director, you can integrate graphics, music, narration, sound effects and digital video into your multimedia application (such as an interactive movie). Animation is the major feature of Macromedia Director. Technically, animation is defined as the visual information changing in 1/30 of a second. Director's windows and commands will help you to design and handle full-featured animation.

Starting the Macromedia Director

To start the Macromedia Director on your PC, do the following procedures:

(a) Start Windows and double-click the Control panel icon in the main program group.

(b) Now, double-click the Mouse Control panel icon. You will see the Windows mouse control panel.

(c) In the Windows Mouse Control panel, adjust the speed of clicking and tracking with the slider control. Select OK to come out of this control panel.

(d) Now, double-click on the Director's icon to open the Macromedia Director program. You will first see a window, called Splash Screen and then a blank screen which is the Director's opening window called the Stage.

DIRECTOR'S OPENING WINDOW : THE STAGE

Just as a stage is required for making cinema and TV movies, similarly a stage is required for making multimedia applications or movies on a PC. The stage is your canvas, where all the action occurs and you see the information or pictures moving and changing while designing the multimedia application. The stage is actually a blank opening Window of Macromedia Director with a menu bar on the top which can also be hidden. Just, Press <Ctrl+1> keys to hide the menu bar. If you want to see the menu bar again, press <Ctrl+1> keys again. So, <Ctrl+1> keys act as toggle keys.

Modifying the Stage

You can also change the size, location and other characteristics of stage by choosing 'Modify-Movie-Properties' option from the menu.

THE TOOLBAR

You can display toolbar on the screen by choosing 'Window-Toolbar' option from the menu. The toolbar provides few basic commands at click of the mouse. The various toolbar icons are shown in Figure 13.1 and are described in the Table 13.1.

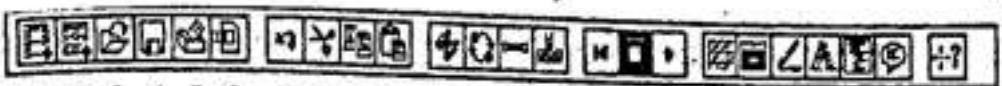


Figure 13.1: The Director 5.0 Toolbar

Table 13.1: Function of various tools in Director's Toolbar

S.No.	Icon Name	Description
1.	New Movie	Creates a new movie.
2.	New Cast	Creates a new Cast window
3.	Open	Opens a movie.
4.	Save	Saves the movie.
5.	Print	Displays the print dialog box with many options.
6.	Import	Recruits cast members to your movie. (Cast member is any part of your movies that changes location, shape or size)
7.	Undo	Abandons the recent changes in your movie.
8.	Cut	Cuts the selection from the movie and put it into clipboard.
9.	Copy	Puts a copy of your selection into the clipboard.
10.	Paste	Inserts the current contents of the clipboard into the current window.
11.	Find Cast Member	Searches the cast member.
12.	Exchange Cast Member	Exchanges the selected sprite (caste member in the score window) with selected caste member.
13.	In-Between	Creates intermediate frames from beginning and ending frames selected in the score window.
14.	Align	Aligns selected sprites on the stage.
15.	Rewind	Rewinds the current movie to frame 1.
16.	Stop	Stops playback of the current movie.
17.	Play	Begins playback of the current movie from current frame.
18.	Cast window	Displays the Cast window, where all cast members appear.
19.	Score window	Displays the Score window, where you design your movie.
20.	Paint window	Displays the Paint window, where you create new Bitmap Cast Members or edit imported bitmaps.
21.	Text window	Displays the Text window, where you enter the Rich Text (Similar to word processing-type Text in Director 5)
22.	Script window	Displays the Script window, where you can add a script to a movie by using Lingo (a built-in scripting language of Director 5)
23.	Message window	Displays the Message window, where you can try out lingo scripts one line at a time.
24.	Help pointer	Provides help for using Macromedia Director.

DIRECTOR'S FILE MENU

In the Director's menu bar, the various menus are File, View, Insert, Modify, Control, Xtras and Window. The various options of the most frequently used File menu are summarised in Table 13.2.

Table 13.2: Functions of various File menu options

Menu Option	Description
New	Creates a new movie or cast.
Open	Opens an existing movie.
Close	Closes any window except stage window.
Save	Saves the current movie.
Save As	Saves the current movie with a new name.
Save and Compact	Saves the current movie by compressing the data.
Save All	Saves all the movies and casts.
Revert	Abandons the current changes and returns the current movie to its last saved version.
Import	Adds any graphic or sound file type as caste members in your current movie.
Export	Converts your file into different external file types.
Create Projector	Creates a stand-alone version of selected movies for distribution.
Page Setup	Sets the page size, scaling and orientation settings of your movie.
Print	Prints all or a part of your movie.
Preferences	Sets various options
Quit	Closes your movie and takes you to the desktop or another open program.

SCORE WINDOW.

The score window is the screen of Director, where you actually create your movie. In the score window, you design your movie by deciding which caste members appear and vanish on the stage at your desire or idea. A format of the score window is displayed in Figure 13.2. The various elements of score window are described in Table 13.3.

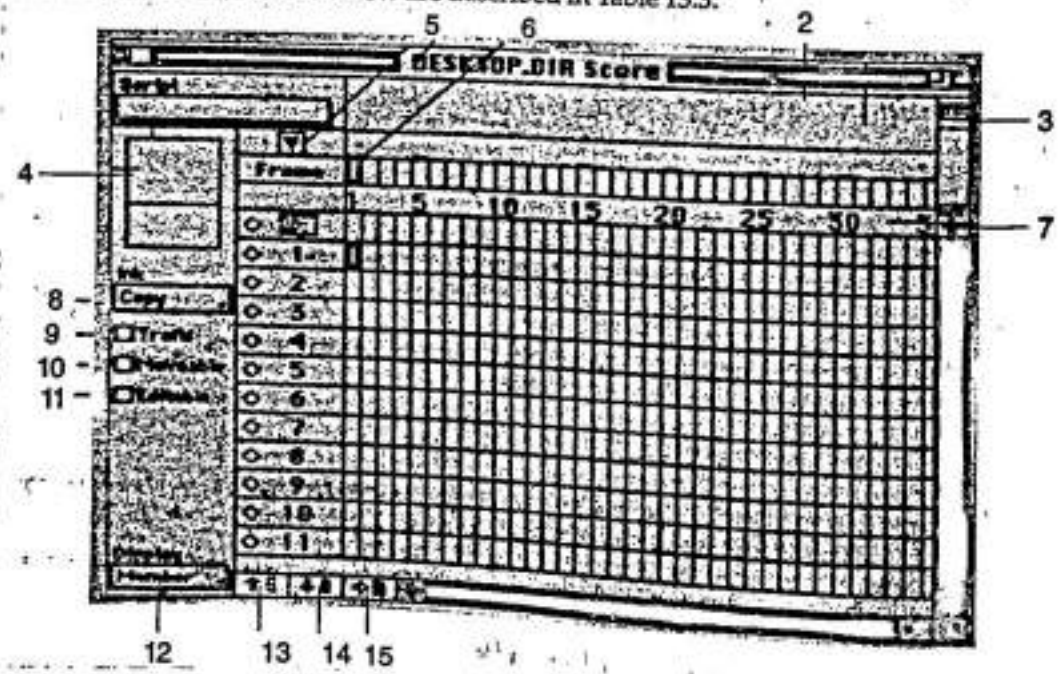


Figure 13.2: The Score Window

Table 13.3: Functions of various elements of Score window

S.No. /Element	Description
1. Script pop-up menu	Displays number and name of scripts added to your movie.
2. Script Preview Button	Displays the first two lines of currently selected script in the script pop-up menu.
3. Show/hide scripting button	Hides/shows the two scripting areas.
4 Sprite Preview button	Displays currently selected sprite in the preview area.
5. Marker button	Labels specific frames of your movie.
6. Playback head	Indicates the current frame of your movie.
7. Frame numbers	Breaks down the score into sets of five frames.
8. Ink pop-up menu	Lists an impressive set of ink effects.
9. Trails check box	Leaves a streak of the sprites as it moves around the stage during playback.
10. Movable check box	Allows you to move a selected sprite while playing of your movie.
11. Editable check box	Allows you to enter text in a field sprite while playing of your movie.
12. Display pop-up menu	Used to customize the view in the score window.
13. Move Up button	Moves selected sprites up the score window.
14. Move Down button	Moves selected sprites down the score window.
15. Move To Head button	Moves selected sprites to playback head.
16. Channel numbers	Labels the visible rows of small, white rectangles where your sprite rests in.
17. Hide/Show Channel buttons	Hides/shows the channels.

DIRECTOR'S PAINT WINDOW

You can draw your graphics and patterns in the Director's Paint window. To start Paint window, either press <Ctrl+5> or choose 'Window-Paint' option from the menu. You will see the paint window as shown in Figure 13.3.

In the Director's Paint window, you can edit an existing bit map or create a new cast member from the score window. Some of the functions of Director's Paint window are similar to that of other graphics application software such as CorelDRAW and Window's Paintbrush.

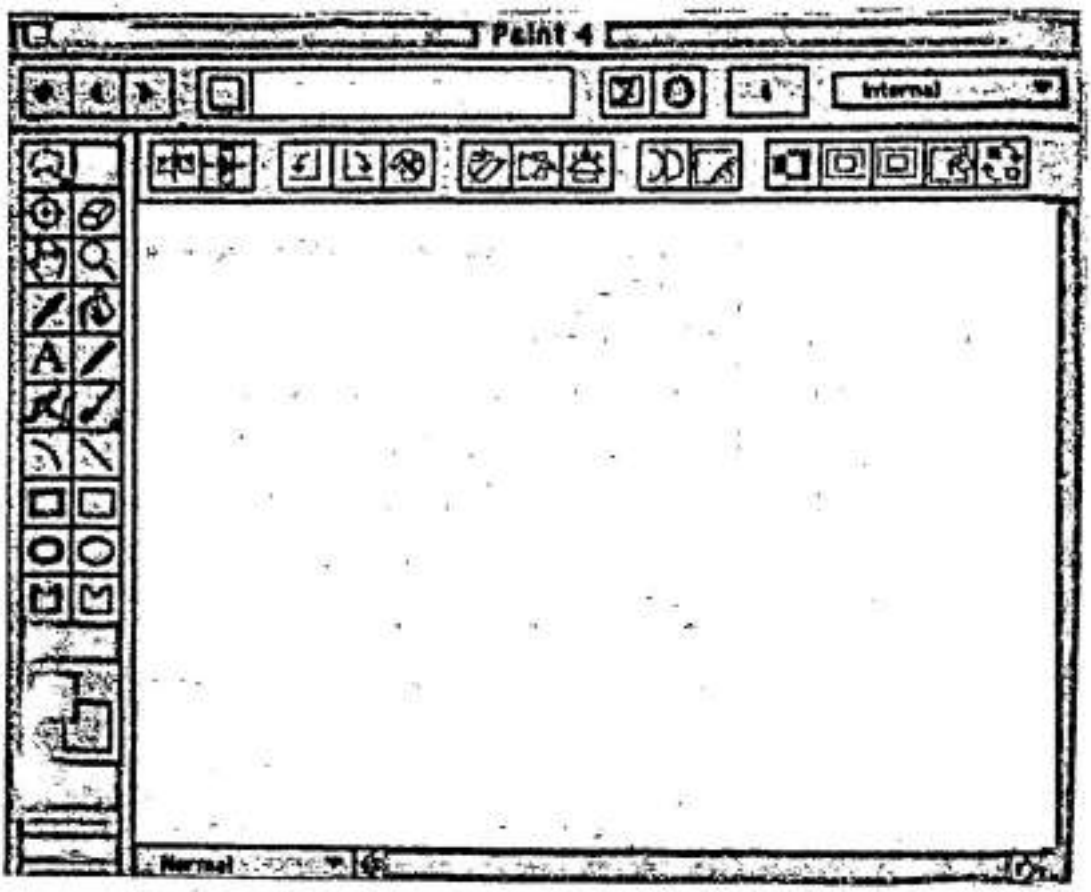


Figure 13.3: The Director's Paint window

ADOBE PHOTOSHOP: ANOTHER MULTIMEDIA SOFTWARE

Adobe Photoshop is another popular software used for graphics and multimedia applications. You can use Adobe Photoshop for Digital Enhancement, Photo Retouching and Image Compositing. Photoshop provides the following important features:

1. *Layers:* Photoshop support for multiple layers for easy compositing. You can merge, flatten, flip, copy, and clip various layers together. Photoshop also supports for non-destructive color- and tonal-adjustment layers. You can make various Layer Effects that add automatic drop shadows, levels, or glows to any object placed on a layer. You can also add Layer Mask for controlling transparency on a layer without destroying image data. In Photoshop, you can distribute multiple layers which are aligned automatically.

2. *Automation:* Photoshop provides enhanced Actions Palette that can automate almost all program functions. It provides Automations Plug-ins that simplify editing operations. It also supports Drag-and-drop facility for easily combining selections from different files or different layers.

3. *Painting Tools:* Photoshop provides full assortment of drawing and painting tools, including Pencil, Brush, Airbrush, Clone, Text, Line, and Gradient Tool. It also provides Retouching Tools, including Smudge, Sharpen, Blur and Rubber Stamp for cloning. The professional photography tools of Photoshop include Dodge and Burn to correct exposure

and Sponge to correct color saturation. In photoshop, you can paint either with textures or patterns. You can define your own soft-edged brushes in Photoshop.

4. *Selection Tools:* Photoshop provides a number of very useful selection tools, which are summarised below:

   (i) *Magnetic Lasso and Pen Tools:* Used for automatic tracing of elements.

   (ii) *Quick Mask Tools:* Used for creating and viewing selection masks directly on the image and for editing them as easily as painting with a brush.

   (iii) *Bezier-based Pen Tools:* Used for drawing precise and complex paths.

   (iv) *Feather-edge Selections Tools:* Used for blending backgrounds and combining foreground and background images.

   (v) *Color Range Tools:* Used for maximum control in building anti-aliased masks based on selected colors in an image.

   (vi) *Rectangular and Elliptical Marquee and Lasso Tools:* Used for regional selections.

   (vii) *Magic Wa* [illegible] Used for automatic color range selection.

   (viii) *Alpha Channels Tools:* Used for saving and revising multiple selections in one document

5. *Text Handling:* In Photoshop, you can create editable text layers that allow changes to text at any time. You can also create anti-aliased text of any size or resolution. Photoshop provides a better formatting control over leading, kerning and tracking. It also provides both horizontal and vertical text tools.

6. *User Interface:* Photoshop offers an excellent user interface. In Photoshop, you can do multiple undos for tracking image editing. You can do zooming and scrolling of large images very easily by using the Navigator Palette. Photoshop provides a Measure Tool that can be used as a ruler or protractor anywhere in an image. You can define Guides and Grids for alignment of layers, selections and painting operations.

7. *Extensive Filter Collection:* Photoshop provides more than 95 special effects filters, including image sharpening, softening, stylising, natural media, distortion, removal of dust/scratches and lighting.

8. *Transformations:* In Photoshop, you can select, position and rotate photographic objects as if they are three-dimensional. Photoshop provides a free Transform command to distort, scale, skew, rotate, move, and add perspective all in one step, with improved image fidelity. You can also transform images, paths and selection borders. A number of transformations for precise positioning, scaling, skewing and rotation of selections are available in Photoshop.

9. *Powerful Color-correction Tools:* Photoshop provides very powerful color-collection tools. These tools offer:

   (i) Color Samplers that provide consistent value measurement of upto four locations in an image.

   (ii) Variations to adjust image color and brightness by previewing a range of modified images simultaneously.

(iii) Adjustments for brightness, contrast and midtones.

(iv) Controls for selectively adjusting hue, saturation and brightness of any range of color in an image.

(v) Replace Colors for correcting the color of a selected area.

(vi) Selective Color Correction for adjusting the ink values of individual color channels or plates by entering absolute or relative values.

(vii) Channel Mixer for creating custom color mixes.

10. *Professional Color Separations:* Photoshop provides a professional level control on Under Color Removal (UCR), Gray Component Replacement (GCR) and Under Color Addition (UCA). It also supports spot-color channels for incorporating varnishes, metallic inks and other specialty colors into print jobs. It provides full support for ICC-based color management systems, including Apple ColorSync and Microsoft ICM.

USE OF MULTIMEDIA SOFTWARE IN CORPORATE SECTOR

Multimedia Software are the most exciting and extremely useful tools for film, and television industries. They are widely used by movie makers, serial makers, advertising agencies and photograhers for wonderful presentation of their programmes. Macromedia Director and 3D studio are widely used by film and photo studios to make animations. Adobe photoshop is mainly used by publishers to design graphics for book covers.

SUMMARY

Multimedia refers to presentation of information in the form of images, sound and movement using a PC. Micromedia Direction is the most popular software for creating multimedia applications on your PC. The Director's opening window is called the Stage. The Stage is your canvas, where all the action occurs while designing the multimedia application. The Director's tool bar provides few basic commands at click of the mouse. In the Director's Menu bar, the various menus are File, View, Insert, Modify, Control, Xtras and Winow. The Score window is the screen of Director, where you actually create your movie. You can draw your graphics and pattern's in the Director's Paint window.

Adobe Photoshop is another popular software used for graphics and multimedia applications. You can use Adobe Photoshop for Digital Enhancement, Photo Retouching and Image Compositing. Photoshop provides many useful features for making high quality graphics. Multimedia softare are widely used by film and photo studios besides advertising houses and publishers.

REVIEW QUESTIONS

1. Fill in the blanks (with reference to Macromedia Director):

   (a) Multimedia refers to presentation of information in the form of _____, _____ and _____.

   (b) The _____ is actually a blank opening window of Macromedia Director.

   (c) The _____ is the screen of Director where you actually create your movie.

   (d) The icon _____ recruits caste members to your movie.

   (e) The menu option _____ creates a stand-alone version of selected movies for distribution.

2. Write True or False (with reference to Macromedia Director):

   (a) The menu bar on the stage can be hidden by pressing <Ctrl+5> keys.

   (b) Playback head of score window indicates the current frame of your movie.

(c) Script window is used to enter the Rich Text.

(d) Frame numbers element of Score window break down the score into set of 5 frames.

(e) You cannot change the location of a Stage.

3. Fill in the Blanks (with reference to Adobe Photoshop):

(a) Adobe Photoshop is mainly used for _____, _____ and _____.

(b) Photoshop offers _____ support for combining selections from different files or different layers.

(c) _____ provide consistent value measurement of upto four locations in an image.

(d) _____ text layers allow changes to text at any time.

(e) _____ palette is used for easy zooming and scrolling of large images.

4. Match the following (with reference to Adobe Photoshop):

(a) Magnetic Lasso/Pen Tools	(i) Automatic color range selection.
(b) Bezier-based Pen Tools	(ii) Combining foreground and background images.
(c) Magic Wand Tools	(iii) Automatic tracing of elements.
(d) Alpha Channel Tools	(iv) Drawing precise and complex paths.
(e) Feather-edge Tools	(v) Saving and revising multiple selections.

5. Define the terms Multimedia and Animation. Name and discuss the main features of a multimedia software.

6. Write the functions of following tools of Director:

(i) Exchange Cast Member

(ii) Import

(iii) Play

(iv) In-between

(v) Cast window

7. Write the File menu command in Director for each of the following functions:

(i) Sets various options

(ii) Saves the current movie by compressing the data.

(iii) Add any graphic or sound file type as cast member into your movie.

(iv) Abandon the current changes made in your movie and open its previously saved version.

8. What is Adobe Photoshop? Why is it used widely for graphics and multimedia applications?

9. Describe the major features of Adobe Photoshop.

10. 'Photoshop provides very powerful color-correction tools.' Discuss.

11. Discuss the role of multimedia software in corporate sector.

BLOCK

MULTIUSER PC

CHAPTER 14

Communication Concepts and Use of Modems

LEARNING OBJECTIVES

- Introduction
- What is Data Communication
- Asynchronous Transmission
- Synchronous Transmission
- Error Management in Data Transmission
- Approaches for Data Transmission
- Modes of Data Transmission
- Serial and Parallel Transmission
- Lines of Communication

INTRODUCTION

Over the years since the age of computers began in 1960s till today, there have been rapid strides in the development of computing and communication technologies. The need of information sharing and dissemination through computer networks is being realised and more appreciated with the improvement and advancement in communication technologies. Whereas previously as late in 1980s the technical aspects of data communication and networking were generally ignored in the management studies these are being taken seriously now. The reasons for these trends are not difficult to comprehend. Improvement in the stature of MIS, evolution of decision support systems and realisation of TQM and BPR principles in the modern systems owe largely to development of these technologies. The structure of an organisation has been overrriden by the technology advancement. The three tiers of management are converging to analytical and operational levels.Thus, a need has emerged for a manager who is involved in the analysis of data online on a computer terminal to rise above mere awareness level and understand basic technical aspects of computing and communication technology. This would enable a manager to decide an ideal computer and networking system as per his requirement of MIS.

WHAT IS DATA COMMUNICATION

Flow of information for purpose of efficient management and business process control requires effective use of computer systems and networking technologies. Even for a simple important exercise of printing any information from a computer by an attached printer to a computer, there is a requirement for error free data transmission from the computer to the printer. The whole concept of data communication is based upon principles of sending data, checking and confirming its receipt following error correction technique to ensure accurate data transmission.

This communication is possible with the approach known as protocols. The data flows between two devices as sequential bits (0 and 1) accross a transmission medium say copper wire.These bits are grouped to form a character. A character may be a number, an alphabet or a symbol. As a standard, generally 8 bits form a byte or a character.Each bit (0 or 1) is represented as a voltage level on a transmission medium. As a standard, bit 0 represents a positive voltage and bit 1 represents a negative voltage. These signalling conventions are followed by most of the communicating devices. The most common interface standards are RS232c or V5, X.21 etc. In RS232c signalling standard, voltage level between +5V to +15V represents bit 0 and voltage level between -5 to -15V represents bit 1. During an idle state while the data is not being transmitted, only the electric current flows through a transmission medium (wire). At the instance of data transmission the current in the wireline is intercepted in a particular way to superimpose data that is representable as the voltage levels to traverse towards receiving device.

ASYNCHRONOUS TRANSMISSION

In asynchronous mode of data transmission each character (byte) is transmitted one at a time. Each character is preceded by a start bit. The purpose of start bit is to inform the receiving device that a character transmission has begun.The transmitted character ends with a stop bit. The stop bit suggests that a character has been transmitted. Each bit represents a voltage

level for a specific length of time to enable the receiving device to recognise and record the incoming signal accurately.This specific length of time determines the rate of data transfer that may be measurable in bits per second. In asynchronous mode of transmission there is no indication of the speed at which the character is being transmitted. Therefore, there is no perceptible method for the receiving device to sample the incoming signal precisely to recover the transmitted data. For this lack of synchronisation of transmission this mode of transmission is called asynchronous transmission.This anamoly of non synchronisation is overcome by providing internal clocks at each end, transmitting as well as receiving. Both internal clocks work at the same rate such that on the receipt of start bit the receiver device starts its internal clock to instruct receiver's interface to sample the incoming signal.

Some systems may require more than one stop bit as a character terminator. This is generally for slower devices typically with slow mechanical components. Other important point to know is that there are several kinds of bit representations of a character. Most commonly used are ASCII (American Standard Code for Information Interchange) and EBCDIC (Extended Binary Coded Decimal Information Code). In widely used ASCII representation 7 bits uniquely represent a character. The 8th bit is called parity bit and used primarily for identification of success or failure of a character transmission device to sample the frame of information appropriately at correct signalling rate.

SYNCHRONOUS TRANSMISSION

In synchronous mode of data transmission a block of characters is transmitted one at a time. Each block of characters is preceded with a few synchronisation (SYN) characters. These SYN characters contain the timing information which is used by the receiving device clol to lock onto the sending device's signal. Since, in this mode of data transfer the block contains the timing information using SYN characters that allows automatic synchronisation, this process is known as synchronous transmission. Ther size of blocks of characters may vary therefore there exists the ASCII control characters termed as STX (start of text) and ETX (end of text) that are used as delimitters. The synchronous mode of data transmission is advantageous when there exists large volume of data to be transmitted at a higher data transfer rate.The efficiency of synchronous transmission varies according to the block size and depends upon the protocol. If the block size is too small the overheads of protocol is more due to additional SYN characters and delimitters in header although the probability of error in transmission reduces. In case the block size is too large the general efficiency for large data transfer may improve in terms of data transfer rate but the probability of error in transmission increases. Therefore for a reliable error free data transfer over a long distance requires that a maximum block size be fixed. Frequently used block size standard in most of the protocol is 512 bytes. Generally the level of efficiency in the synchronous mode of transmission is higher than in the asynchronous mode of transmission. (Refer Figure 14.1)

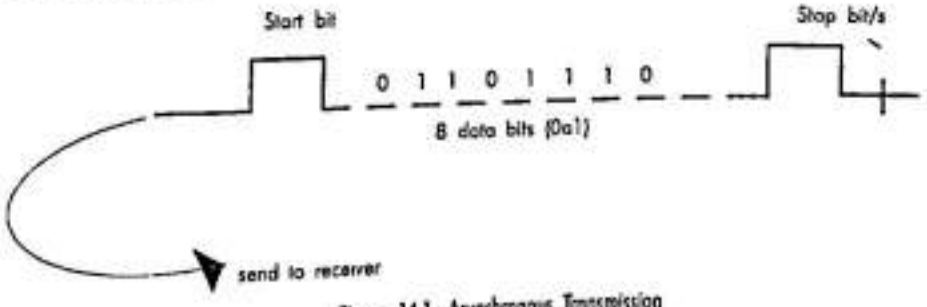


Figure 14.1: Asynchronous Transmission

A block of data is also referred as a packet. A sequence of blocks that is transmitted from a sending device need to be reassembled at the receiving device. Each packet contains a packet or block identity number and routing address for destination for accurate reassembly as the original data. In case of identification of error on receipt of a packet, a request is sent to the sending device for retransmission of that packet again. (Refer Figure 14.2)

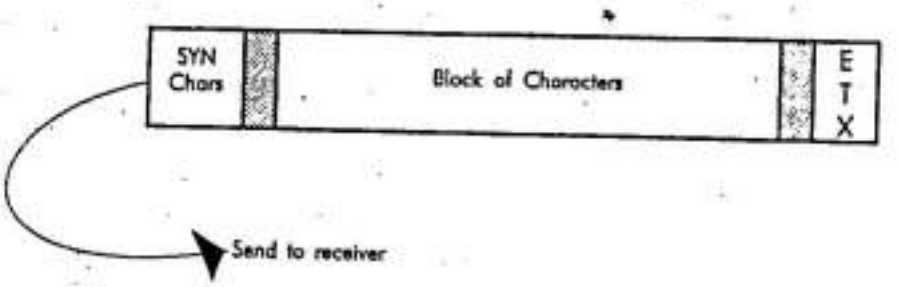


Figure 14.2 (a): Synchronous Transmission

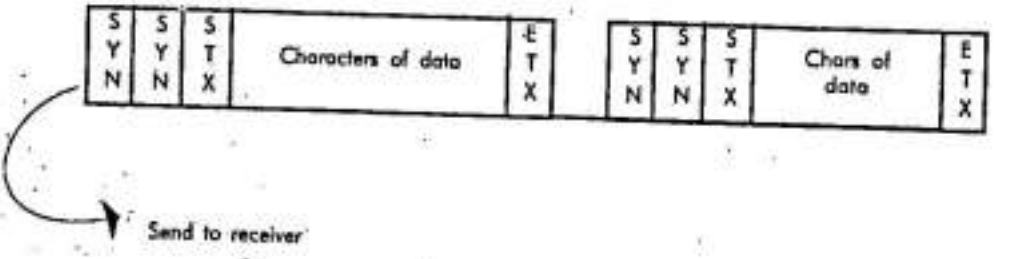


Figure 14.2 (b): Synchronous Transmission of variable block sizes

ERROR MANAGEMENT IN DATA TRANSMISSION

In synchronous transmission, the most common approach of error detection in data transmission is CRC (Cyclic Redundancy Check) or check sum. This is adopted as a CCITT standard. CCITT (Consultive Commmitee for International Telephony and Telegraphy) is an international commitee of telecom standards based in France. A checksum that is a remainder of data is divided by a fixed polynomial or a bit pattern is appended to the data bits before transmission. At the receiving device the data is verified against the checksum. For recovery of erroneous data packets in general and an error free data transfer in particular, generally it is implicit for the receiving device to send a copy of data back to the sending device as a means of acknowledging correct or incorrect receipt. In the case of a satellite link connection a technique known as FEC (Forward Error Correction) is followed primarily for memory access and also for data transmission and recovery. This approach deters response back to the sending device by incorporating some additional information embedded in the data. The receiving device makes the necessary correction automatically by the identification of these codes in the embedded data. These codes are also referred to as Hamming codes.(Refer Figure 14.3)

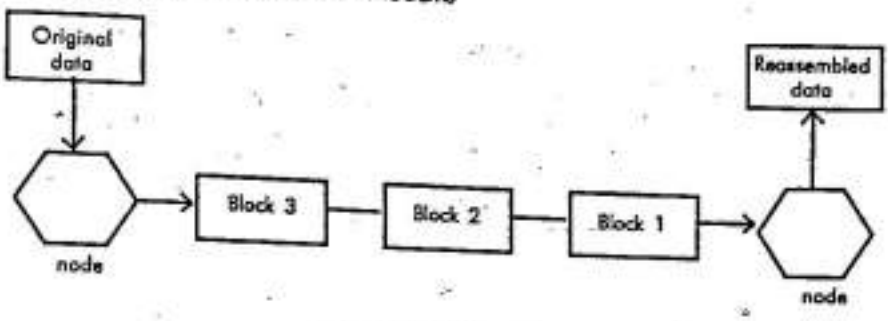


Figure 14.3: Packet switching

Issues of Interoperability

- The structure of the unit of data sent should be recognised at the receiving end;
- The representation of data (ASCII/EBCDIC) should be the same on both sides of data communications;
- There should be a method of introducing checkpoints for recovery during large data transfer in the event of failure;
- There should be adequate security measures;
- There should be end to end protocol in both communicating hosts to recover from errors in a similar fashion;
- Both communicating hosts should use similar addressing techniques.

APPROACHES FOR DATA TRANSMISSION

In a network of communicating devices there are two popular approaches for data transmission. First approach is to open a connection across the network and let the data pass through that connection. At this connection, the routing information is established and route numbers are assigned to blocks of data. This connection is also referred as a virtual circuit. Another approach is a connectionless approach. In this approach all packets carry full address of its destination and sequence identity. Each packet takes routes independently without a pre-established route and reassemble and resequence at the receiving device. This approach is also referred to as a datagram service.

MODES OF DATA TRANSMISSION

In the simplest form of data transmission data flows in one direction. In a half duplex system of data transmission data flows in the forward and backward directions to the receiving and the sending devices but not simultaneously. Most common example of a half duplex system is a radio link or a wireless set. In a full duplex system of data transmission data flows in both directions simultaneously. A typical example of a full duplex data transmission is the RS232c interface.RS232c interface is typically designed to connect any digital equipment to a data communication equipment. A modem is a typical DCE.

Working and Uses of Modem/Fax Modem

A modem is a modulation and demodulation device. A typical function of a modem is to convert the digital output of a computing device into analog signals at the transmitting end.

This modification of a digital signal is known as modulation. A modem also converts the analog signal into digital at the recieving end of computing device. This function is known as demodulation.The computing devices (computers) connected with modems are also known as DTE (Data Terminal Equipments).The basic function of a modem is to enable communication between computers located remotely. Modem is connected to a computer port via a telephone line. The analogue signals are carried through the telephone line (Refer Figure 14.4).

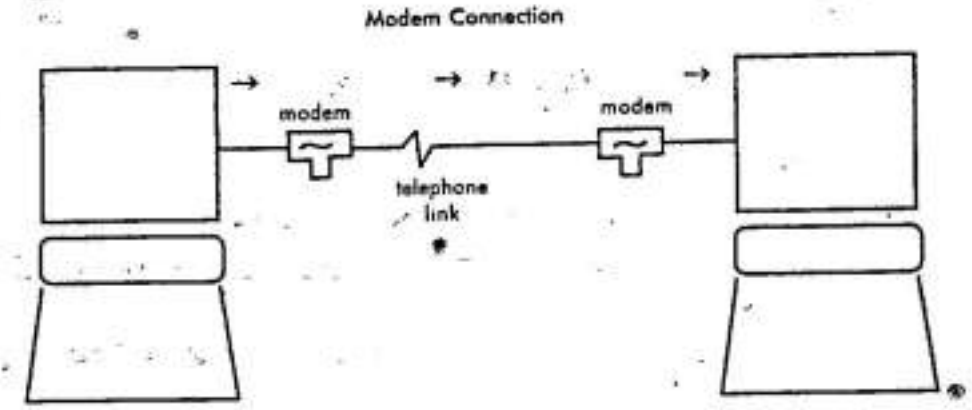


Figure 14.4: Working of a modem

The criteria for selection of modem should depend upon the speed of transmission, error correction, data compression capabilty and Hayes compatibility. The modems that are less than 14400 bits/sec data rates as speed are mostly obsolete now. User should prefer a modem with speed equivalent or greater than 28800 bits/sec. A modem should be easily configurable to be used for TCP/IP (Transmission Control Protocol/ Internet Protocol). This protocol enables a modem to communicate with most of the other modems, use of internet and most of the networking technologies. A modem should support V protocol. V4.2 protocols have supplanted the old Microcom's MNP4 protocols for error correction. For data compression, V.42bis protocol should be preferred. MNP5,MNP10 are data compression protocol available from Microcom. The shortcoming of MNP protocol is that these cannot handle already compressed data. A modem should be Hayes compatible. Hayes compatibility has become de-facto standard for modems because most modems follow Hayes command set for their configuration (Refer Table 14.1)

Table 14.1: Modem Speed & Protocol

Modem speed	Basic Protocol	Error correction	Data compression
14.4 kps	V.32	V.42	V.42bis
28.8 kps	V.34	V.42	V.42bis

There are two types of modems; internal and external. Internal modems are card sized and installed inside the computer. An external modem is box shaped powered by an external power adapter and connected to the computer with a serial cable. For faster modems 14.4 kps and above the computer should be fitted with 16550 UART chip based serial port. Fax modems are designed to send and receive faxes in addition to data. Fax software is also needed to send

fax. There are fax standards ranging from Group I to Group IV or Class 1 and Class 2. Group IV and Class 2 are faster,more efficient and the latest standard and therefore generally preferred.Some of the modems come with digitalised voice capability also. These modems can function as voice answering machine also when used with appropriate software.

The popular brands of modems available today are TEK from MroTek, Boca from Boca Research/Power Tel, Zoltrix from Zoltrix/Amketee, Optima, Accra from Hayes/ Datamatics, Sportster from US Robotics/Zoom from Zoom Telephonics, MT Series from multitech, Comsphere from AT&T, Paradyne/ Crompton Greaves etc.

SERIAL AND PARALLEL TRANSMISSION

In serial transmission each byte of information takes eight time slots for transmission. In parallel transmission eight separate wires are used to send each bit simultaneously. Over long distances serial transmission is a popular approach for data transmission. Parallel transmission is generally used over short distances because of its advantange of speed in comparison to the serial transmission. Generally the interface between a computer and a printer have a parallel connection. The cost overheads of parallel transmission is higher than serial transmission. Internal clocks facilitate the synchronisation of data received from eight transmission lines because these bits may traverse at marginally different speeds.

LINES OF COMMUNICATIONS

There are basically two popular lines for communications. A public telephone is the ordinary voice grade line. This line is routed through many relay systems and electromechancial systems. This line of communication is also referred to as PSTN (Public Switched Telephone Network). A leased line of communications is generally not subjected to the level of switching as in PSTN. This line of communications accommodates wider range of frequencies than the voice grade. A leased line of communications consists of bidirectional simultaneously operating two telephone circuits.

SUMMARY

The concept of data communication is based upon principles of sending data, checking and confirming its receipt following error correction technique to ensure accurate data transmission. This communication is possible with the approach known as protocols.In asynchronous mode of data transmission each character (byte) is transmitted one at a time. A block of data is a packet. A sequence of blocks that is transmitted from a sending device need to be reassembled at the receiving device. In a network of communicating devices there are two popular approaches for data transmission. First approach is to open a connection across the network and let the data pass through that connection. This connection is called virtual circuit. In a connectionless approach, all packets carry full address of its destination and sequence identity. This approach is also called a datagram service. A modem is a modulation and demodulation device. In serial transmission each byte of information takes eight time slots for transmission. In parallel transmission eight separate wires are used to send each bit simultaneously. A public line telephone is the ordinary voice grade line. This line is routed through many relay systems and electromechancial systems. This line of communication is called PSTN (Public Switched Telephone Network). A leased line of communications is generally not subjected to the level of switching as in PSTN. Multiplexing is a technique of channelling multiple data inputs into one connection.

REVIEW QUESTIONS

1. Fill in the blanks:

   (a) Rules of data communication are known as _____.

   (b) Modem converts _____ signals to _____ signals and vice versa.

   (c) _____ enables a modem to communicate with most of other modems.

(d) An _____ modem is connected to the computer with a serial cable.

(e) A typical example of a full duplex data transmission is the _____ interface.

2. State True or False:

(a) In synchronous mode of data transmission each character (byte) is transmitted one at a time.

(b) Frequently used block size standard in most of the protocols is 512 bytes.

(c) In a half duplex system of data transmission data flows simultaneously in both forward and backward directions.

(d) Conversion of analog signal into digital at the receiving end of computing device is known as modulation.

(e) In serial transmission, eight separate wires are used to send each bit simultaneously.

3. What is data communication? Discuss, whether it is important to know technical aspects of data communication to set up an information systems in an organisation.

4. Compare an contrast the following terms:

a) Asynchronous and Synchronous transmission

b) Virtual circuit and Datagram services

c) Half duplex and Full duplex modes

d) Serial and Parallel Transmission.

5. Describe working of a modem. What is the criteria for selection of a modem?

CHAPTER 15

Use of LAN as Intelligent Terminals/Servers/ Gateways

LEARNING OBJECTIVES

- Networks of Computers
- OSI Labout and IEEE
- Popular Types of LAN
- Internetworking
- Public Networks
- Network Operating Systems
- Network Management
- LAN in Business Environment
- Starting Your Computer
- The Netware File System
- Understanding Netware Rights

NETWORKS OF COMPUTERS

Till now we have covered the basic concepts of data communication, therefore we are in a position to study the methodology of communication in a network of interconnected computers located in different places. The typical hardware in a network of computers consists of the following components:

a) computers,

b) peripherals such as printers, scanners, plotters and modems,

c) cables, network interface cards,

d) hubs and switches,

e) repeaters, bridges, routers, gateways.

Local Area Network (LAN)

A LAN is a network of computers that are interconnected in a particular fashion and contained within a limited area say a building.

A typical LAN has two components:

a) A host computer that is called 'File server'. Large networks may have more than one Fileservers.

b) Workstations or the terminals of a LAN are interconnected and connected to the Fileserver. Workstations in a LAN are personal computers that have their own processing power.

The significant feature of a LAN is that its workstations are intelligent terminals with a capability of distributed processing. This is unlike in a mainserver or miniframe centralised server based environment where the connected terminals are dumb without processing power of their own.

The prominent reasons which led to development and popularity of LANs are:

1) Sharing of expensive resources such as disk, files, printers, plotters, modems and software was needed.

2) Diskless nodes (workstations) of a LAN provided security and virus protection by not allowing to download important data from server or uploading unwanted software.

3) Distributed processing for inter-user communication within an organisation and information exchange was the most suitable model for MIS development.

4) Data management in a LAN environment is more efficient than the centralised processing systems. Since, no users directly request to server for data without resorting to file transfer on a stored media like floppy or hard disk.

5) LANs are more flexible and modular. This implies that LANs can be expanded easily by adding of workstation with the support of networking software. If more disk storage is needed, another hard disk can be installed or other fileserver can be connected in a LAN. More than one LAN can be bridged to share data and communicate.

6) Most LANs have fault tolerant features such that in case of power failures LANs are capable of disk mirroring and disk duplexing to safeguard data.

The hardware components hubs, switches, repeater, bridges routers and gateways are generally applied whenever expansion of a LAN is required beyond geographic limits of optimum performance or when two or more LAN systems are needed to be integrated for sharing of peripherals and data resources. Modems are used along with telephone lines in the following cases:

i) WAN (Wide Area Network) is needed for communication of computers located in remote sites of an organisation.

ii) A computer user needs to access information from remote file server.

iii) A computer user needs to send/receive electronic mail to/from a remote computer system.

We would describe this component appropriately while discussing internetworking of LANs.

Uses of a Network

The network provides an intelligent switching capability between the devices for purpose of sharing. For instance an expensive laser printer in network can be shared by many microcomputers in a network. The network enable creation of a large buffer where data accumulates from various computing devices. In case of print sharing the buffer activates as a queue on a special device known as print server. In a typical office environment the facilities of terminal access to central computing machine such as mainframe, access to external and remote devices, access to database or messaging or e-mail provisions necessitate the networking of devices. The environments like point of sales in retail outlets, central heating thermostats and time clocks, automatic telling machines to banks main computers, process control devices in a manufacturing environment are not feasible without networking.

Topology

The structure or layout of the cabling in connecting devices together to form a network is called topology of the network.The advantage of a structured topology is that it is easier to add or delete a node in the network.

Bus

The Bus consists of a single communication channel. Each connected device is attached to the media at an interface point. Each connected device has a unique hardware address. Data transfer takes place using these hardware addresses.The bus will have more complex arrangements with several interconnected segments.

Advantages:

- Simple layout
- Ease in connectivity
- Locating cable faults is easy
- Ideal for one to many data transmissions since all connected devices see the traffic on the cable.The signal reaches all stations regardless of their position on the bus.

Bottlenecks:

There is no automatic acknowledgement of receipt by virtue of the topology.The signals stop on reaching the end of the cable and do not return by default to the sender. Therefore, the higher level protocol exists which can ensure that data is successfully exchanged.

Ring

Unlike bus topology, in a ring configuration the data transmission is unidirectional. Data transmissions are received by each station's interface as the data passes through the interface connection. Like bus topology, each interface only copies the data from the network. Thereafter data communicates to the device connected to the network on basis of the packet's destination address. Each network interface connection has its own hardware address for identification. Typical ring topology is generally used in the large network Fibre Distributed Data Interface (FDDI).

In ring topology, each interface station allows data transmission to pass through the interface with only a few bits delay. For instance, consider circulation of a data packet (say 128 bytes), the start of data packet may well have circulated around the ring and arrived back at the originating station before the end of the packet has left for circulation. There is always only one circulating data packet on the ring.

Advantages:

- No routing problems since everyone on the ring receives the data. The addressed node makes copy of the data for circulation.
- Every generated packet eventually returns to the node therefore the acknowlgement of successful data transmission is trivial.
- Larger networks may be constructed from a number of interconnected rings.

Bottlenecks:

In case one of the nodes fails network comes to a halt.

Star

Generally, it includes a central switching system or hub. In the figure, if station D wishes to talk to station B, it does so via the hub. In case a new device is required to be added it interfaces with another cable attached to the central point. And if the hub is physically close to the connected device then the individual cable runs would not be problematic. (Refer Figure 15.1, 15.2 & 15.3).

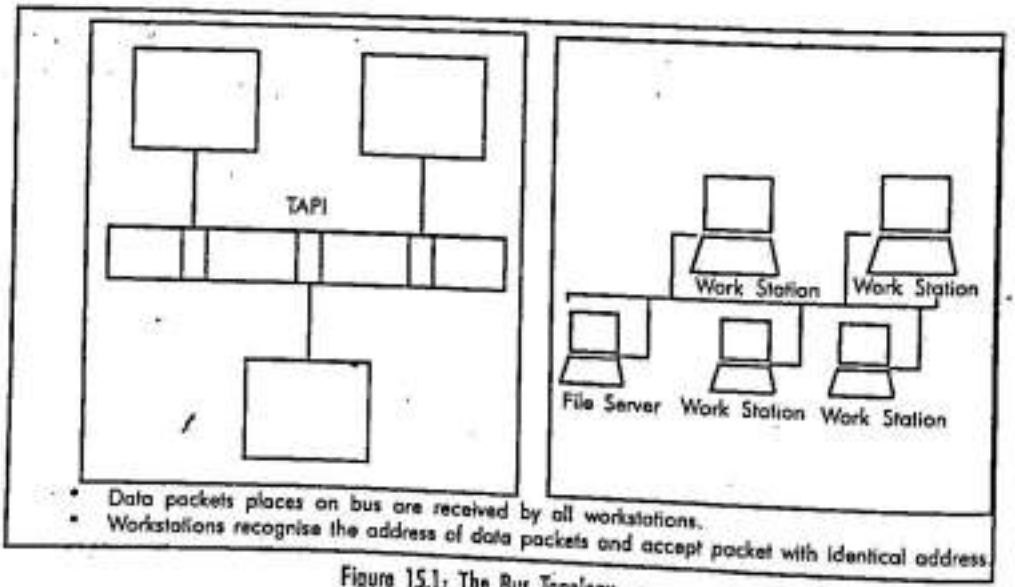
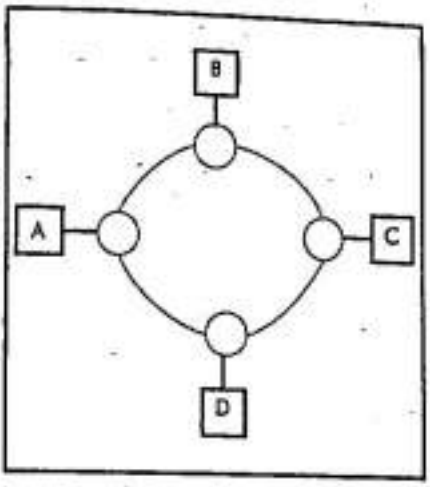
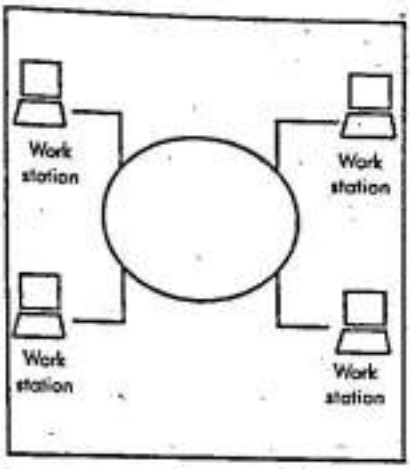


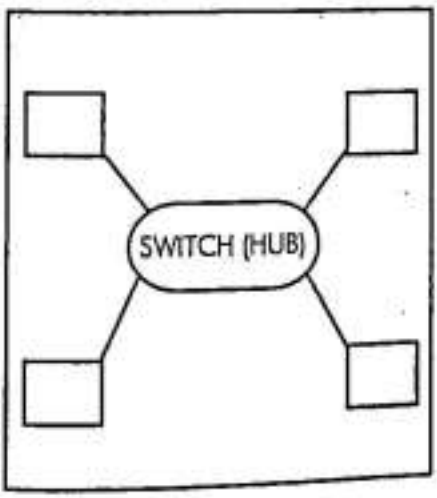
Figure 15.1: The Bus Topology

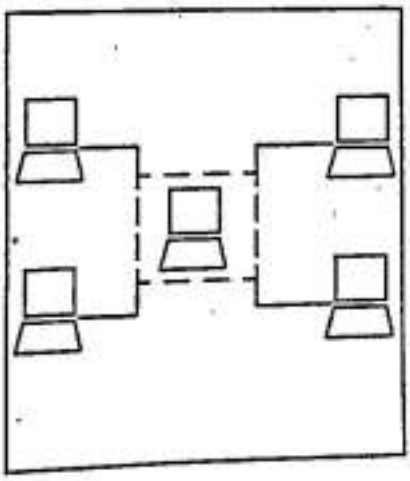




- Nodes connect, point to point to form a ring.
- Signals gets regenerated at each node.
- Spanned distances are large.
- If one node fails network comes to halt.

Figure 15.2: The Ring Topology





- The Hub makes the muting decisions.
- Nodes interface is simple.
- If the switch fails, entire network halts

Figure 15.3: Star Topology

Advantages:

- Better overall reliability against cable faults provided the central point which is switching data to the destination is robust.
- Only a single node will be unavailable in the event of cable failure.
- LANs implemented on the star topology are sometimes based on existing telephone wiring in the building and do not normally have high data transfer rates.

Bottlenecks:

In case the switch or hub fails the entire network is halted.

Networking Cables

The main transmission media used in LANs are twisted pair, coaxial cable and fibre optic.

Twisted Pair Cable

It consists of two wires which provides a signal path and a return palyethylene dielectric and shielded by braided metal. This is covered in a plastic jacket. There are many types of coaxial cables reflecting the differing number and type of protection shield used.

Data rates, as high as 500 Mbps, are supportable, but normally it is upto 50 Mbps. Error rates may be of the order of 10e-9. Distances up to 500m can be covered without signal degradation. Co-axial cable support baseband as well as broadband transmission. Baseband transmission possess digital signals from one workstation to another usually at a speed of 10 Mb/s upto distance of nearly 10000 feet. Broadband transmission enables transmitting of voice, audio, video and data signals (e.g. television and cable television transmission) at a speed of nearly 5 Mb/s over distances nearly 10 Km.

The cost of cable installation is usually higher than the cost of cable itself. Flexible coaxial cable is used in thin wire Ethernet. Therefore it is relatively easy to install. Rigid coaxial cable is used in the original thickwire Ethernet. Therefore it is more difficult to install for it requires more careful handling.

Fibre Optic Cable

It consists of hair like grass strands, covered with cladding and an outer jacket. This is often used for backbone networks and is the foundation for the over 100Mbps FDDI network. These span long distances without signal degradation. Through these are highly reliable, installation of these cables is much more expensive than other type of available cables for category of cables and their features refer Table 15.1, 15.2.

Table 15.1: Cable category is rated in Mhz

Category 1	Ordinary telephone cable or RS232
Category 2	Data cables upto 4 Mbps
Category 3	Data cables upto 16 Mbps
Category 4	Data cables upto 20 Mbps
Category 5	Data cables upto 100 Mbps

Table 15.2: IBM cable specifications

IBM type 1 cable	AWG 22 grade copper wire with 2 shielded twisted pair (category 5)
IBM type 2 cable	AWG 24 grade copper wire with 2 to 4 unshielded twisted pair (category 2 to 5 depending upon quality)
IBM type 6 cable	AWG 26 grade copper wire with 2 shielded twisted pair used as panel cable

OSI LAYOUT AND IEEE

ISO (International Standards Organisation) has put forward (ISO/OSI) reference modem to ensure interoperability of LAN systems provided by various vendors. LAN operations and accessing schemes are described in OSI (Open System Inter connection) standards. Several IEEE committiees have developed a set of standards for LAN topologies and access methods using the OSI standards as a foundation. (Refer Table 15.3). These standards aim at networking designs to become more flexible and open.

Table 15.3: IEEE established 802 committees to set various LAN standards

802.3	CSMA/CD (Ethernet)
802.4	Token Bus
802.5	Token Ring
802.6	MAN (Metropolitan Area Network)
802.9	Data and Voice networking standard
802.11	Wireless LAN infrared,power line,spread spectrum (CDM), microwave transmessions
802.12	100 Mbps LAN

We discuss seven layers of OSI in a sequence, layer 1 to layer 7. We would percieve importance of OSI layering system later in our discussion where emphasis is drawn on usage of these layes by various components of LAN for a smooth functioning. (Refer Figure 15.4)

7	File transfer, access and management document and message interchange etc.	Application layer
6	Date representation transformation and security.	Presentation layer
5	Dialogue and synchronisation control.	Session layer
4	End to end transfer management	Transport layer
3	Network routing and addressing	Network layer
2	Framing, data transparancy, error control	Link layer
1	Mechanical and electrical network interface definations	Physical layer

Figure 15.4: OSI Reference Model

OSI Seven Layers Model

Physical Layer

This is the bottom layer of the model. It specifies–

- The way the data and control characters are physically signalled to each other
- All the properties related with the representation of a bit
- Physical connections i.e. specifications of plugs and sockets
- Details of the media

Link Layer

Flow control of data is implemented within this layer. This layer ensures that the bits carried by physical layer have a structure. This layer is responsible for transfering blocks or packets of information between each of the connecting points.

Network Layer

Network layer is primarily responsible for routing of information on basis of internet address format. This level receives packet sized data block from transport level and maps to network addresses.

Transport Layer

Flow control and sequencing of data blocks is performed at this level. Transport layer provides reliable end to end exchange of data. This layer is responsible for optimisation of the transmission by multiplexing.

Session Layer

Session layer provides coordination between users by selecting mutually acceptable protocols. This layer establishes calls to exchange the data bit streams. This layer effects check points for recovery of data.

Presentation Layer

Presentation Layer maps the various data representations into an external data format enabling correct interpretation of the information received. This layer implements the confidentiality or security of data. This layer enables the compression of data.

Application layer

Application Layer provides a range of service interfaces for application programs such as E-Mail, directory services, file transfer etc. This effects the interchange of information amongst various application processes.

POPULAR TYPES OF LAN

The most popular types of LAN are as follows:

- Ethernet
- ARCNet
- Token Ring

- Switched Ethernet
- 100VG Any LAN
- Fast Ethernet
- Fibre Distributed Data Interface
- ATM

The types d), e), f), g) and h) are the latest developments in the LAN types. The development of these LANs was necessitated due to increase in demand of network's bandwidth. The discussion on these LANs would be followed after we define the term 'bandwidth' and seek reasons for its increased demand in the modern corporate world. We initiate our discussion with explanation of the first three LAN types.

Ethernet

Ethernet network was designed and developed by Xerox and DEC. It was initially designed to use coaxial cable through later development enabled it to use other cabling systems. The methodology of communication for ethernet is CSMA/CD (Carrier Sense Multiple Access/ Collision Detection). In the protocol CSMA/CD, the physical layer of user's workstation generates a carrier sense signal. This signal is listened to by the other workstation. This other workstation waits and begins communication only if such a signal is not detected. Popular cable connections for ethernet are thick ethernet coaxial and thin ethernet coaxial.

ARCNet

ARCNet network was designed and developed by Datapoint Inc.,United States. ARCNet is a baseband token passing network system.In an ARCNet network transmission speeds are nearly 2.5 Mbps. Generally, ARCNet LAN is on a hybrid topology that is combination of liner bus and star.

Token Ring

Token ring network is physically a star and electrically a ring. It is based on IEEE 802.5 standard. In a token ring network token passing scheme is used. It involves a hardware known a MAU (Multistation Access Unit) that is used to connect upto 8 stations in a network.

All LAN connections need a network interface card and a networking operating software such as Novell Netware,Vines etc. A LAN has a particular cabling system such as coaxial, thin or thick ethernet, twisted pair etc. A LAN uses hubs,switches and connectors through the cabling system and networking topologies. A hub is a centralised distribution point for all traffic on a network just like a warehouse distribution centre. In bound data traffic from NIC (Networking Interface Card) arrives at the hub. The hub receives and rebroadcasts it's copy to all workstations connected to the hub. Stackable hubs are stacked and connected through a proper interface port such that they appear as single hubs. These are also called Active hubs. Nonstackable hubs are not connectable. Active hubs split and relay network signals and amplify the signal strength whereas Passive hubs only split and relay network signals without strengthening signals. Active hubs are connected to the network backbone. Passive hub is generally connected to the active hubs. Intelligent hubs include a pooling protocol SNMP (Simple Network Management Protocol) that obtains network performance and the status data from network. Dumb hub needs management from MIS and networking department.

Bandwidth

Bandwidth of a communication network can be described as the amount of data that can be fit through a network connection. In broadcasting, bandwidth is the measure of the spectrum between the highest frequency and the lowest. Unit of bandwidth is hertz (Hz.).The evolution of more network capacitiy bandwidth in terms of computing efficiency and network speed in data communication has gained momentum owing to:

- The rapid increase in computing power at the desktop level
- The proliferation of bandwidth hungry applications such as multimedia, e-mail, messaging groupware and distributed databases.
- Advent of Internet and Intranet access; and availability of Web servers and browsers.

The corporate is demanding high bandwidth networks to boost quality of their data communication and management information systems. More users, file servers, application servers, workstations and peripherals of high performance capabilities has contributed to increase in network traffic.The aim of the corporate to improve the sharing of information by consolidating multiple LANs into one shared LAN has necessitated the search for high speed nerworking technologies.

Switched Ethernet

Switched Ethernet 10 Mbps uses switch to segment a large LAN into smaller LANs. This ensures dedicated 10 Mbps connection to a particular PC at all times. Though the switched Ethernet hub is inexpensive and effective solution,it has a drawback. In some of rituations it can move the bandwidth bottleneck to another point in the network.

100VG Any LAN

This LAN was developed by Hewlett Packard and IBM and standardised under IEEE 802.12 specifications.This is based on DPAM (Demand Priority Acess Method) which is somewhat similar to Token ring or FDDI. This LAN has not become much popular because other technologies like ATM and Fast Ethernet provide better compatibility with existing networks.

Fast Ethernet

Fast Ethernet or 100BaseT is an extension of Ethernet specification as approved under IEEE 802.3.These networks provide higher bandwidth with data rate as high as 100Mbps.These networks preserve core Ethernet protocols CSMA/CD and are compatible with existing ethernet wiring types, media and applications.

Fibre Distributed Data Interface

FDDI is an ANSI standard technology for fibre optic networks mostly suitable for high end workgroups requiring data rates around 100 Mbs. CDDI (Copper Distributed Data Interface) uses similar technology and is relatively much cheaper networking solution. Since FDDI is an expensive technology, it is being used mostly as a backbone interconnect between low speed LANs. Backbone is a wire that stretches between networks. Other application areas where it has been found useful are data intensive and bandwidth hungry such as multimedia, CAD/CAM (Compuer Aided Design and Manufacturing), 3D modelling etc.

The user workstations are connected to servers. Servers are connected to a network backbone. Generally backbone networks use braodband network system. The advantage of this system is that it provides large bandwidth and is capable of transmitting across very large distances.

ATM

Asynchronous transfer mode is promoted by ITU (International Telecommunication Union) as s high speed communication link for desktops as well as a high performance backbone for LANs and WANs. The most salient feature of ATM is its scalability in speed varying from 25 Mbps to multiple Gigabits per second. The other feature of ATM is that it allows simultaneous transmission and receipt of data without interruption (duplex mode). ATM also allows simultaneous transmission of video, image, audio and data over a single line. Despite the high potential of ATM technology for high bandwidth networking, the prevalence of ATM is currently severely restricted due to several factors. Firstly, ATM is considerably expensive technology. Secondly, many of the applications need alteration to be successfully run on high bandwidth provided by ATM. ATM may be considered if volume of transactions on a network is very high and a seemless integration of LANs and WANs is required.

INTERNETWORKING

In our earlier discussion we have learnt that a LAN is network of computers generally contained within a limited area say a building. These networks of computers are usually built on one type of network card and cable. A LAN may be expanded to a limited extent by adding workstations and limited length of cable. Beyond these limits performance of a LAN may degrade. Expansion of a LAN is possible by boosting the signals to accommodate long distances. A repeater may be used for this purpose.

Bridges are the devices that link two distinct LANs. Bridges may also be used to divide a overloaded LAN with great data traffic into two separate trunks. A router is bridge like device that interconnects several types of LANs. The main function of router is to provide the best route for the packets of information through the interconnection of LANs. Bridges can direct data to different segments of a network using physical addresses but they cannot direct data traffic to another network. A router directs data using logical addresses therefore it can send data to traffic bounds to unknown destination, to another router, which knows the destination. A Switch is a high speed bridge that segments a LAN traffic such that it switches packets from one segment of LAN to another in a matter of milliseconds. This switching is done so efficiently that it appears that the whole and each segment of LAN has full access to the entire bandwidth of the network.

A Gateway is used to interconnect two dissimilar LANs. Since, a sort of translation is needed for two dissimilar networks therefore gateway is more sophisticated, slower in performance and expensive relay device. For example, if a Novel netware network which is running IPX/SPX protocol is connected to a VAX host running VMS operating system, the data from netware LAN has to be correctly interpreted by the VAX host. The Gateway relay device is extremely useful for communication of LANs as distinct as running on SNA and DECnet protocols. The Gateway operates on network layer and above. Besides the already described internetworking devices, there is another internetworking device known as Brouter which functions as a bridge as well as a router.

One of the popular vendors marketing Brouters is Bay Networks. Brouter routes when routing is possible and if unable to do so it bridges. Refer Figure 15.5 (A,B,C,D,E,F) to get a better understanding of the functionality of the internetworking devices.

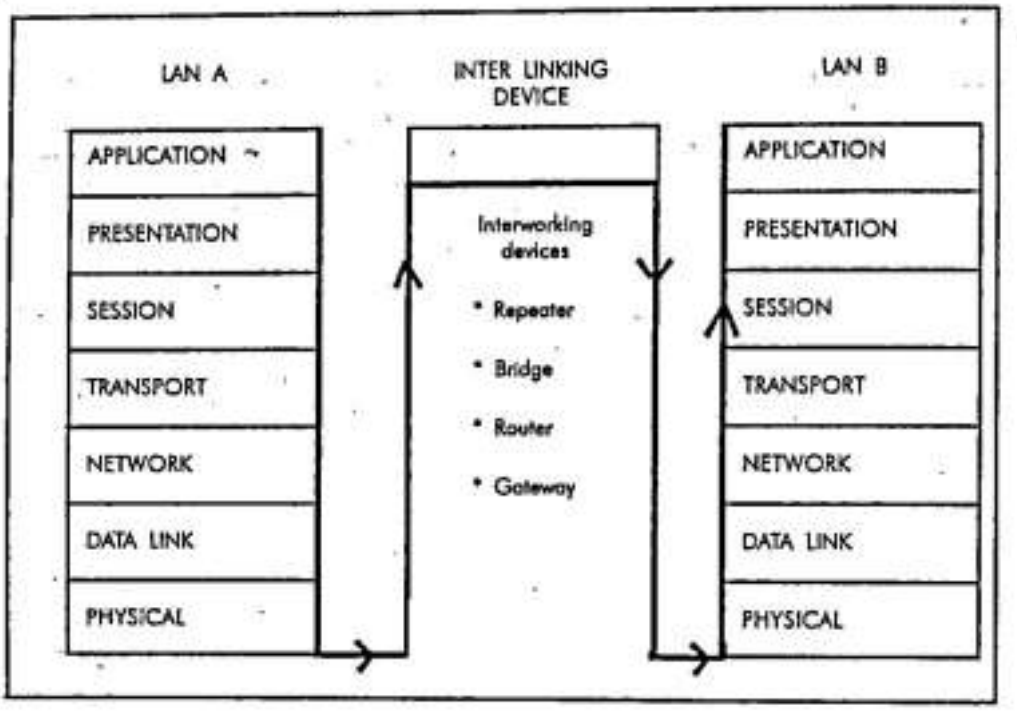


Figure 15.5 (a): Different internetworking devices

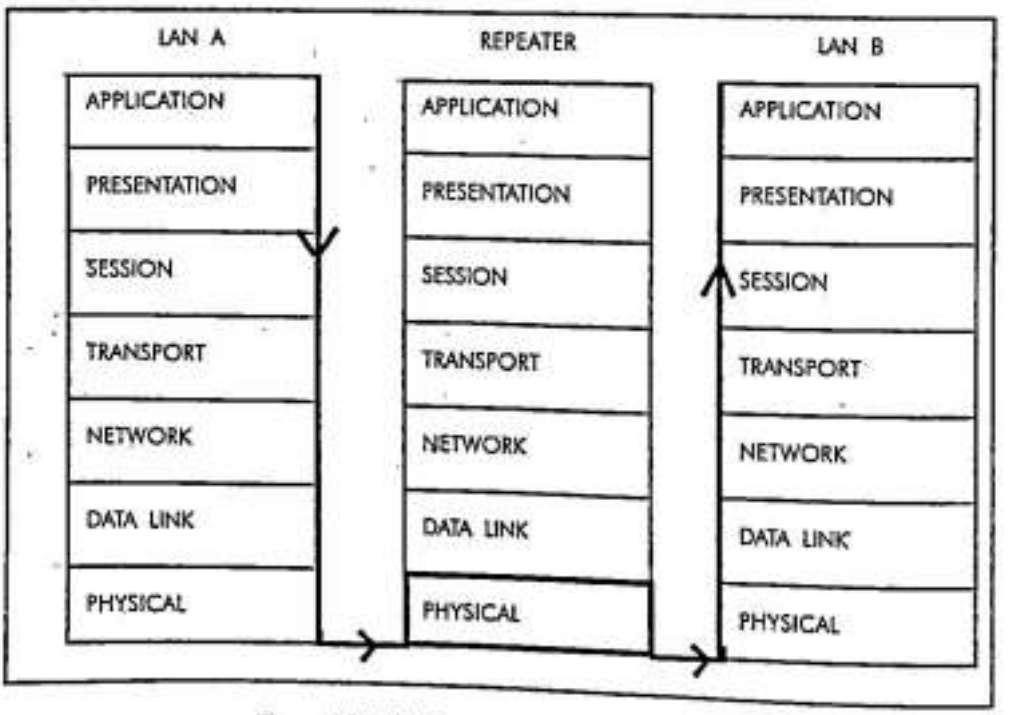


Figure 15.5 (b): Repeater works on Physical layer

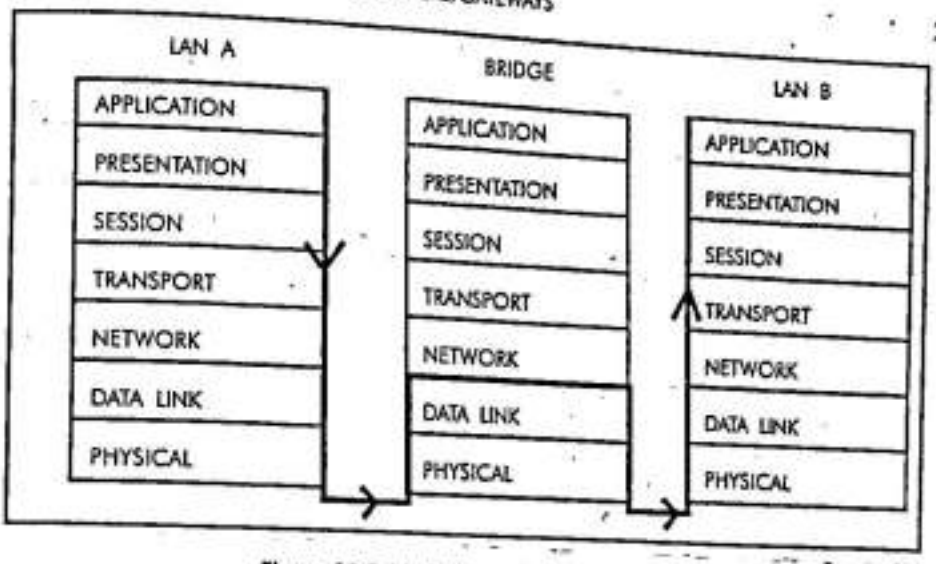


Figure 15.5 (c): Bridge works on data link layer

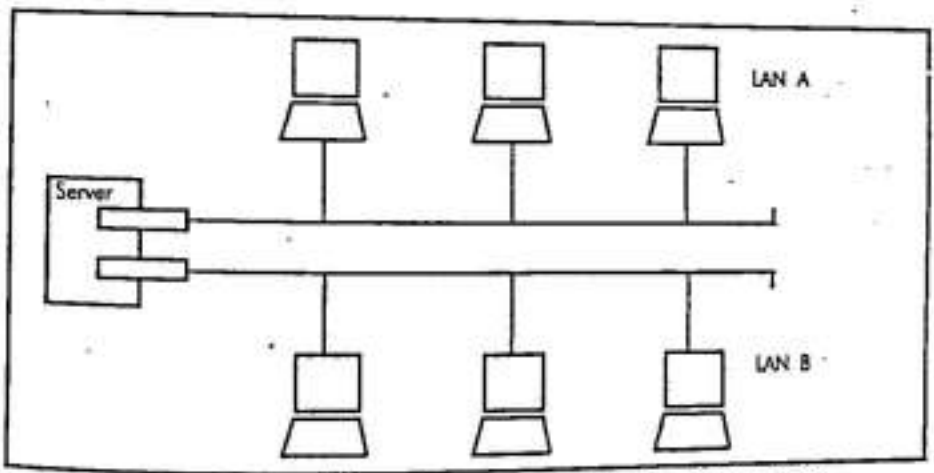


Figure 15.5 (d): A bridge joins two similar networks for network expansion and increase performance by reducing network traffic

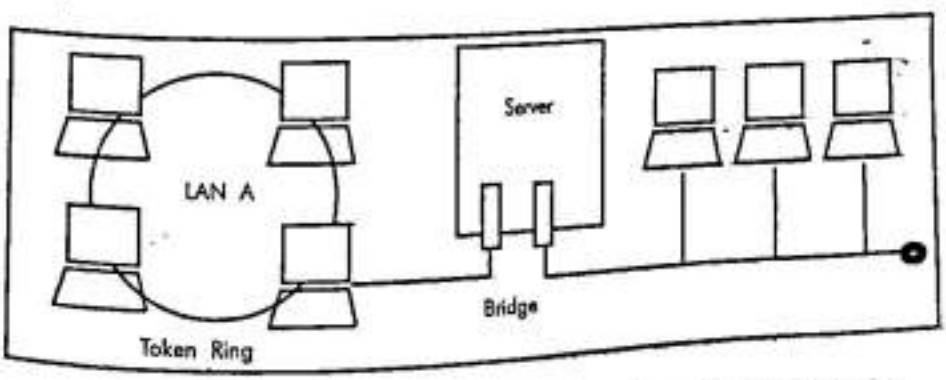


Figure 15.5 (e): A bridge also connects dissimilar LANs such as ethernet and Token Ring

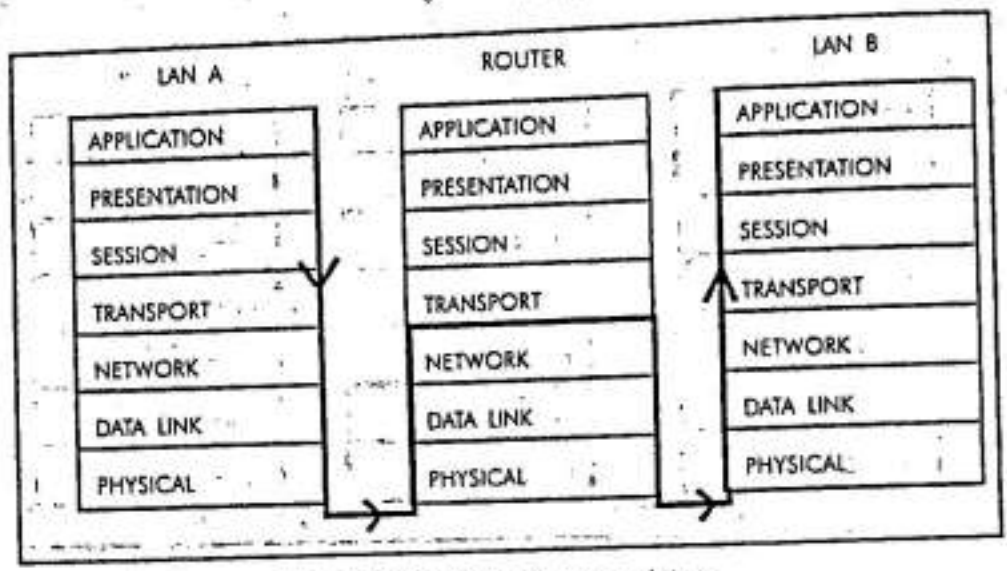


Figure 15.5 (f): Router works on Network Layer

PUBLIC NETWORKS

The most common public networks that have been available consist of X.25 services. X.25 network is interface between many remote LANs connected through gateways or routers. Frame relay and ATM are lately being used as alternative ot X.25 services. X.25 implements, addressing, routing and multiplexing at network layer whereas the X.25 services are available worldwide therefore interconnection between LANs is achievable on global basis. The speed of connection is 64 kps, though in practice lower speeds such as 8 kps are available at busy times. This renders high speed burst from LANs connected to X.25 without any advantage. Frame relay implements addressing,routing and multiplexing at data link layer. Frame relay services range normally from 64 Kbps to 2.048 Mbps. ATM and Frame relay technologies are generally complimentary. ATM can be used for high volume transmissions while Frame relay may be used for low speed connections in the same data network.

Salient features of Frame relay are:

1) Unlike X.25, Frame relay works without network layer involvement.
2) Frame relay uses error detection rather than error correction on transmission as in X.25.
3) The conversion of X.25 to frame relay is not tedious.
4) The Frame relay can carry voice.
5) The Frame relay has also been in use in broadband ISDN (Integrated Services Digital Network). ISDN is a digital phone connection technology that provides voice,data and image transmission facility over single connection. ISDN is capable of providing internet access speed to the tune of 56 KB.

Client Server V/s Peer to Peer Networking

There exist two kinds of LANs: Client server and Peer to peer that may be installed as per the requirement of an organisation. In Client server LAN the server is centralised and has the large database, large internal memory, user interface and application software. Workstations

request for the server resources. The server executes the request. Any workstation cannot act as a server to any other workstation even if it has got the storing capacity containing data and the application software. Peer to peer are low cost LANs where each workstation may act as a server to any other workstation. Peer to peer networking is only suitable for maximum of 25 workstations only. It is generally suitable for sharing of office oriented software such as spreadsheet, databases, e-mail, word processing softwares but not a large application of online billing, statistical process control, inventory control (Refer Table 15.4). The typical examples of available Client Server LANs are Novel Netware, Windows NT, LAN Manager, Bayan Vines, Artisoft LANtastic etc. The typical examples for Peer to peer networks are Novell Netwarelite and Windows for workgroup from microsoft.

Table 15.4: Client Server V/s Peer to Peer LAN

	Client-Server	Peer-To-Peer
Workgroup size	10-500	2-25
Remote location	May include many remote locations.	Limited to telephone access
Applications	Primarily a large data base. Can also include standard productivity software.	Primarily productive software such as spread sheets, graphics etc.
Security	Data is sensitive and requires full authentication of user for ech application. Security administrator is required to make changes.	Password is appropriate for most data users who determine security needs for themselves.

NETWORK OPERATING SYSTEMS

The salient feature of a networking operating system is that each workstation in a network works uniformly through the same operating system based at the server. This provides seemless integration in the working environment. For example Networking operating systems Unix, Novell netware or Wndows NT the file system is accesible by just providing the path search for particluars file from workstation to remote server. The structure and access control to all files is identical. We would discuss Novell netware as a LAN operating system in some details.

Novell Netware

Novell Netware (current version 4.1) is presently one of the most popular NOS (Networking Operating Systems). Netware is compatible both with IBM compatible PCs and the Macintosh range of Apple computer systems. Netware is a very open system because it operates across multiple platforms and multiple protocols such as IPX/SPX (Internetwork Packet exhange/ Sequenced Packet exchange), TCP/IP (Transmission Control Protocol/ Internet Protocol), Appletalk, X.25 and so on. Netware fileserver provides a common file system implemented through NCP (Netware Core Protocol). The facilities provided by NCP are:

1. File access in read, write, open, close modes.
2. File locking that protects file and enables only one user to modify a file at a time.

3. Security levels that determine rights of file for users, groups and everyone. Rights may be executable, read only, read and write etc.

4. Network security that is maintained by assigning a login name and password to every individual LAN users. The LAN administrator has supervisor login name that gives him all rights for LAN maintenance such as creating groups, changing passwords or login names etc.

5. Print server and queue management.

6. Network management.

7. Resource allocations to users/groups such as disk space, networking time and accounts etc.

8. The netware include SFT (System Fault Tolerance) level 1, level 2 security. In case of server failure, in level 1 of SFT duplexing of FAT and directory entry table takes place. In similar cases, SFT level 2 provides disk mirroring and provides an object oriented approach in managing resources and users on internetwork. Other salient features are:

   - Login through windows
   - Graphical network analysis
   - WAN connectivity
   - Mulfiple language capability of success or failure of a character transmission
   - Imaging services using HCSS (High Capacity Storage System) that enables transfer or migration of image document and other files. HCSS also provides support for mounting optical devices and juke boxes as Netware server volumes
   - Management capability through NetView or SNMP (Simple Network Management Protocol.

Netware 4.1 is available in packs of ten users and above. For small scale implementation of LAN, Novell offers Netware Lite, a peer to peer networking system. Novell netware is a client server based networking operating system.

NETWORK MANAGEMENT

Having broad overview of LAN, we briefly discuss the technical issues of LAN management. The concern for interconnection and interoperabilty of LANs necessitates this discussion. There are variety of LANs available with variety of protocols such as TCP/IP, OSI, XNS (Xerox Networking System), SNA/APPC (System Network Architecture), ATP(Apple Transport Protocol), NETBEUI and IPX/SPX. The network management assumes more relevance where integration of these variety with interoperability is concerned. The popular range of network management tools that are available are CMIS/P (Common Management Information Service and Protocol) from BT, Operview from HP, Netview from IBM, NMS from Novell, Spider Sentgel from Spider, SunNet Manager from SUN, SNMP Lattiset from SynOptics, Net Director from U-B. In a networking environment a network manager is responsible for maintaining the configuration, allocating necessary disk space, ensuring the appropriate growth and installation of LAN, user training and providing the appropriate security levels for smooth functioning of LANs. A networking uses the network management tools for troubleshooting any discrepancy in LAN functioning at any time.

LAN IN BUSINESS ENVIRONMENTS

LAN environments vary in functionality and services in distinct business environments. When we talk of business environment we take a note of the type of business the organisation conducts such as hospitality, marketing, manufacturing, tours and travels, banking, finance, stock and shares, engineering etc. For example, LAN in a manufacturing set up may have numerically controlled machines, automatic guides vehicles, robotics and mini or mainframe as server, microcomputers as workstations, Novell netware or Vines or Unix as an operating system, CAD/CAM software (like Autocad) and a database software system such as sybase, infoxmix, ingres etc. A tour and travel reservation office may have a pentium microcomputer as a fileserver and microcomputer terminals (nodes) as workstations for on-line billing generation, networking operating system such as Microsoft windows NT or Novell netware, a database engine based on RDBMS Oracle, Ingres, Informix or Foxpro. (Refer Figure 15.6 (a,b)

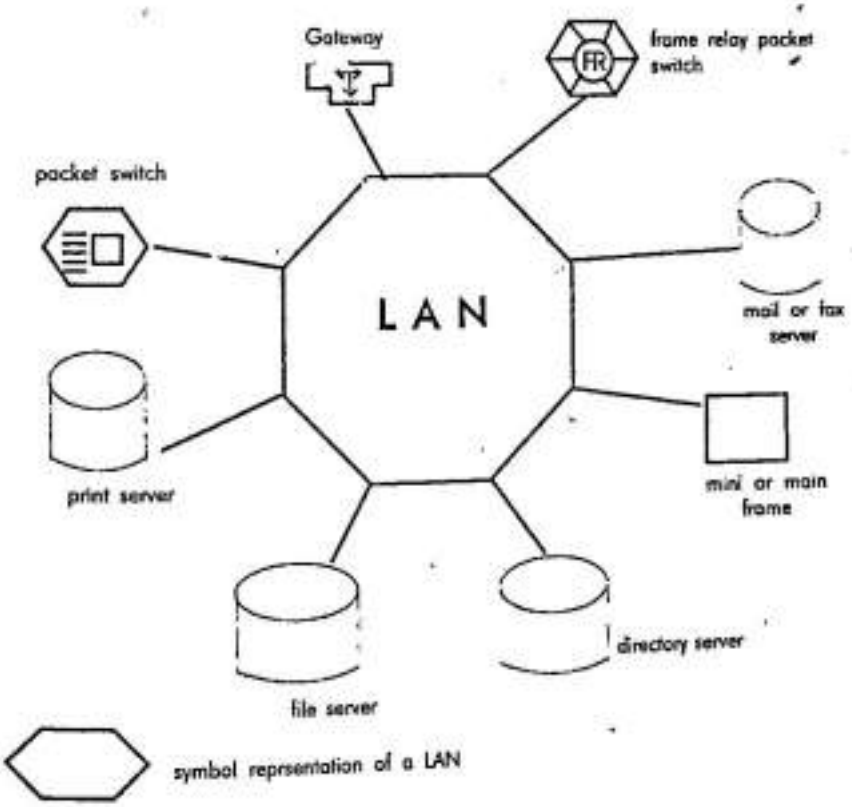


Figure 15.6 (a): Servers

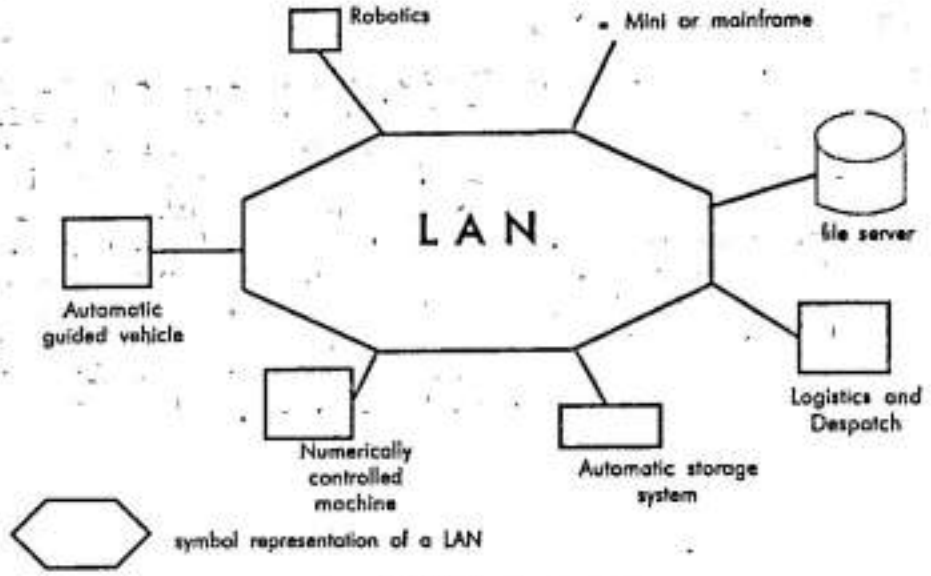


Figure 15.6 (b): Manufacturing environment

STARTING YOUR COMPUTER

The PC on which you are working runs on DOS which is a single user operating system. A series of steps have to be carried out in order to switch your PC from DOS to a multi-user LAN operating system. You have to carry out the below given steps:

1. Establish the rules for communication between your workstation and the server.
2. Establish the connection between your workstation and the server.
3. Changing from the DOS drive to the network drive.
4. Giving your login identity.
5. Giving your password.

The IPX command

The IPX command is a communications protocol for a network. Basically, IPX makes sure that the Netware is able to understand the requests made by the user. You can load IPX by the following command:

C:\>IPX <Enter>

IPX stands for International Packet Exchange. In Netware 3.11, the workstation and the server communicate with each other and the IPX ensures that this communication is smooth and orderly.

The NETx Command

The second step involves the establishment of connection between your workstation and the server. This can be achieved with the help of NETx command which can be given in the following manner:

C:\> NETx

where 'x' should be replaced by the DOS version that you are using currently. For instance, if you are using DOS version 4, then the command that you would give is NET 4.

Changing Drives

The third step involves the changing of drive from DOS to Netware. To change the drive, just type in F: at the DOS prompt.

C:\>F: <Enter>

You will find the following prompt coming on the screen.

F:\>

However, the workstations that do not have hard disks do not boot thorugh DOS. They directly boot through Netware 3.11. Hence, you will straighaway go to F prompt. In such a case you are not required to give the IPX and the NETx commands. You also do not need to change from the DOS drive to Netware 3.11 drive. These steps are required for those workstations that have their own hard disks and boot through DOS.

Logging In

Logging in is the process of requesting from a file server the permission to access files and resources available through the network. You can very easily log in by specifying the server name, your user name and your password. Netware then checks up whether you are a valid and authorised user or not. On finding that you are a valid user, the netware grants you various rights, depending on how your administrator has set you up. Suppose the login name that is assigned to you is 'chat', then you can give in the following command:

F:\> **LOGIN CHAT** <Enter>

However, if you have many servers and you wish to log in to a specific server then type in login, a space, the server name, a slash and then your user name. For instance, you want to log on to the server whose name is SER 4, issue the following command:

F: \> **LOGIN SER4/CHAT** <Enter>

Giving your password

Netware will now prompt you to give in your password. Password are of immense importance in any LAN. Once you enter LAN giving a password, you would enter your 'user area' where you can manage and manipulate your files. No other user has access to these files. You also do not have access to the files created in other user areas created by other users. The login name identifies you as a LAN user. The password sets your boundaries as a LAN user. Type your password and then press <Enter> again. However, if you typed in the correct user name and password, then only you are logged in if you give anything wrong, then the following message appears on the screen:

Access to server denied

Logging Out

The Logout command breaks your connection to the file server. Once this command is issued, you no longer remain a LAN user. You also loose the right to access the files, applications and other resources of LAN. Your computer once again becomes stand alone. Hence, to access the

LAN resources again, you must log in again. In order to log out, issue the following command:

F:\> **LOGOUT** <Enter>

Netware will display a message giving your login name, server name, the time and date when you last logged in; and the time and date of logout. It is very necessary to logout once you have finished working on Netware 3.11. This is because any user can fiddle with your files without taking your permission.

THE NETWARE FILE SYSTEM

One of the major advantages that Novell Netware 3.11 offers is that it is very much similar to DOS. If you are already familiar with DOS and its commands, then working on Novell Netware 3.11 is extremely easy for you. Most of the commands are like DOS. The way DOS organises files in hierarchical structure, on similar grounds LAN also supports multi-level tree structure wherein the directories and sub-directories correspond to the branches and the files correspond to leaves. A network, being a larger and more complex system needs a bit more order. Therefore, the network storage is first divided into volumes. Each volume contains its own directory structure. On Novell Netware 3.11, there are many types of network directories. So, on the server, the top most level in the directory structure is the volume. Each volume carries a unique name. Each file server has at least one volume and this is called SYS. The SYS volume is created when the file server is installed. A file server can have other volumes also. The volumes that come after SYS are named as VOL 1, VOL 2 and so on. Thus, in Novell Netware 3.11, you have

—> Files, which are in

—> Subdirectories, which are in

—> Directories, which are in

—> Volumes of a file server.

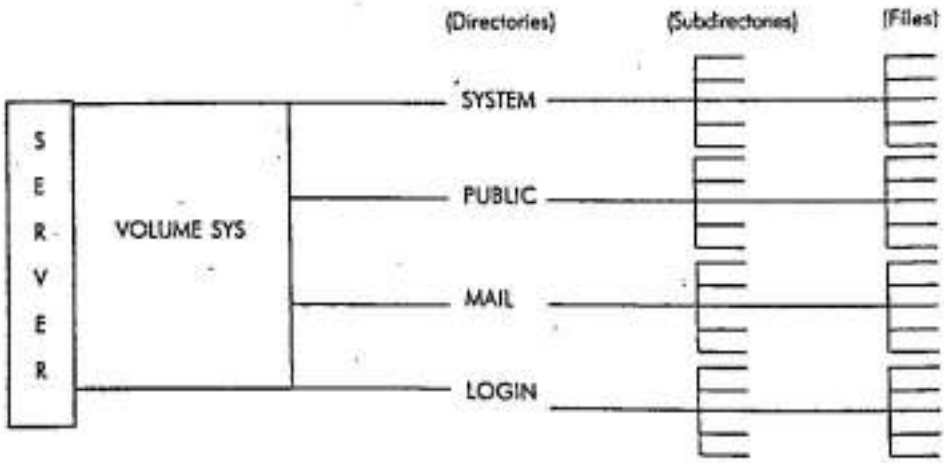


Figure 15.7: Netware directory structure

The Netware directory structure is shown in Figure 15.7. The default volume of Netware 3.11 ie SYS contains four directories under it. These are SYSTEM, PUBLIC, LOGIN and MAIL. The SYSTEM directory contains Netware 3.11 operating system files, netware 3.11 utilities and programs that are reserved and managed by the supervisor. The PUBLIC directory contains

program files that help to run certain utility programs of Netware 3.11. These can also be used by regular users. The LOGIN directory contains login information of all the users. The MAIL directory contains program files that help the user in utilising the Netware's E-mail facility.

Apart from these four directories, the user can create more directories under the SYS volume. More volumes can be added to the hard disk. It is always up to the supervisor to decide as to how many volumes have to be created.

However, each directory can contain any number of sub-directories under it. Each such sub-directory can have any number of files under it. A volume can straight away contain more files under it but this should be avoided at all costs.

In order to locate any file on the Netware, the full path has to be specified. This would include the server name, the volume name, the directory and the sub-directory name. For instance, the full path of the file My file would be:

NTLSERV\SYS: PUBLIC\MARKET\MYFILE

which indicates that the file 'Myfile' is in the sub-directory 'Market' which is in the directory 'Public'. The 'Public' directory resides in the SYS volume of the 'NTLSERV' server. However, you can avoid writing the server name and the volume name if your LAN has a single server and a single volume. If your LAN has more than one server and may volumes and if you do not specify the server name and the volume name, then Netware 3.11 assumes the current server and current volume.

UNDERSTANDING NETWARE RIGHTS

Right is a very special word in Netware 3.11. Each user on LAN has a set of rights and the user has to live within those rights. There are certain restrictions imposed on every user. On LAN, a right is just a security measure which makes sure that no unauthorised user fiddles with your files and directories. Every user possesses the rights to work only in certain directories on the file server. The user rights keep varying from directory to directory and file to file. When any user is given a set of rights in a directory he is said to have become the 'trustee' of that directory. The trustee rights on Novell Netware 3.11 control which directories or files you can access and what you can do with them. There are eight types of trustee rights which are being discussed below:

The 'Read' Right

If you have the Read Right in a directory, you can open and read files in that directory. You can also run a program that is stored in that directory. The Read Right is represented by the letter 'R'.

The 'Write' Right

The 'Write' Right allows the user to open and modify files in a directory. This right is represented by the letter 'W'.

The 'Create' Right

The 'Create' Right allows the user to create subdirectories and files in that directory. This right is represented by the letter 'C'.

The 'Erase' Right

If the user has the 'Erase' right in a directory, then he is allowed to delete files and subdirectories. This right is represented by the letter 'E'. The Erase right must be used with extreme caution and care.

The 'Modify' Right

The 'Modify' right allows you to change the names of the subdirectories and files in the given directory.This right is represented by the letter 'M'.

The 'File Scan' Right

The 'File Scan' right allows the user to see the listing of files on giving the DIR command. However, if you do not have this right in a directory, a directory listing will only display the names of sub-directories. It will not show the filenames. Thus, on giving DIR command, you will remain with the impression that there are no files in that directory. This right is represented by the letter 'F'.

The 'Supervisory' Right

The presence of the 'Supervisory' right grants all rights in a directory automatically. The supervisory right overrides any restrictions that have been placed on a directory or a file. The user who has the supervisory right in a directory can grant others supervisory rights to that directory. This right is represented by are letter 'S'.

The 'Access Control' Right

The 'Access Control' right in a directory allows you to grant any trustee right except the supervisory right to all other users on LAN, in that particular directory. Any user possessing this right can grant rights to or revoke rights from the supervisor. This right is represented by the letter 'A'.

All the trustee rights of a user are created when the user is created. When a user is created the supervisor makes him a part of one or more groups. The user automatically inherits all the rights that the group has been assigned. To put it in simple words, the user gets exactly those rights in exactly those directories that the user group itself has. Apart from the user-group trustee rights, the supervisor can assign the user his own special directories or sub-directories where he has a set of rights.

SUMMARY

A LAN is a network of computers that are interconnected in a particular fashion and contained within a limited area say a building. A typical LAN has two components: fileserver and workstations. Workstations of LAN are intelligent terminals with a capability of distributed processing. The most usefulness of a LAN is for sharing of expensive resources such as disk, files, printers, plotters, modems and software. In an office environment the facilities of terminal access to central computing machine such as mainframe, access to external and remote devices, access to database or messaging or e-mail provisions neccesitate the networking of devices. The environments like point of sales in retail outlets, central heating thermostats and time clocks, automatic telling machines to banks main computers, process control devices in a manufacturing environment are not feasible without networking.The structure or layout of the cabling in connecting devices together to form a network is called topology. The popular LAN topology are Bus, Ring, and Star. The main transmission media used in LANs are twisted pair, coaxial cable and fibre optic.The popular types of LAN are as Ethernet, ARCNet, Token Ring, Switched Ethernet, 100VG Any LAN, Fast Ethernet, Fibre Distributed Data Interface and

ATM. Repeaters,bridges,switches,routers and gateways are the Internetworking devices. The most common public networks consist of X.25 services. X.25 network is an interface between many remote LANs connected through gateways or routers. Frame relay and ATM are lately being used as alternative of X.25 services. There exist two kinds of LANs Client server and Peer to peer. In Client server LAN the server is centralised and has the large database, large internal memory, user interface and application software. Workstations request for the server resources. In Peer to peer LANs each workstation may act as server to any other workstation. Novell Netware (current version 4.1) is presently the most popular NOS (Networking Operating System). Network management tools that are available are CMIS/P (Common Management Information Service and Protocol) from BT, Openview from HP Nature ... Novell, Spider Sentgel from Spider, SunNet Manager from SUN, SNMP ... Director from U-B. LAN environments vary in functionality and services in distinct business environments.

REVIEW QUESTIONS

1. Fill in the blanks:

   (a) The workstations of a LAN are _____ terminals with a capability of distributed processing.

   (b) _____of the network is the layout of the cabling in connecting devices in a network.

   (c) _____, _____and _____are three popular LAN topologies.

   (d) _____topology is physically a star and electrically a ring.

   (e) _____, is presently one of the most popular networking operating systems.

2. State True or False

   (a) Data management in LAN environment is more efficient than the centralised processing systems.

   (b) Physical layer is the bottom layer or OSI model.

   (c) A Gateway is used to interconnect two siminar LANs.

   (d) In client server LAN, the server is centralised.

   (e) Novell Network is the typical example of client server LAN.

3. What are the features of Local Area Network Discuss the prominant reasons which led to development and popularity of LANs?

4. What are the important uses & a Networks?

5. Compare and conrast popular LAN topologies.

6. Describe seven Layers OSI modet for networking.

7. Take a hypothetical organisation with major functions of manufacturing and sales. Prepare a project report of selling network of computers for the efficiency of it's business operations.

8. When is Internetworking required? Describe the important hardware components used for Internetworking? Discuss their features with examples.

9. Distinguish client server and Peer to Peer networking. How should the manager decide which kind of networking is appropriate for his business operations.

10. Describe the role of Local Area Networks in different business environments. Illustrate with examples.

BLOCK 5

SECURITY ASPECTS FOR PC

CHAPTER 16

Importance of Security

LEARNING OBJECTIVES

- Definition of Security
- Needs of Security
- Forms of Computer Crimes
- Software Piracy in India
- PC and Computer Crimes
- Risk Analysis

DEFINITION OF SECURITY

The protection of computer-based resources which include hardware, software, data, procedures and people against unauthorised use or natural disaster is known as security or system security. Contrary to system security, which concerns with the whole system, data security refers to the protection of data from modifications, deletions, destruction or disclosure by unauthorised persons.

NEEDS OF SECURITY

The computer and information systems represent valuable assets of the organisation. They are required to be protected against unauthorised access, fraud, embezzlement, fires and natural disasters. Without providing proper safeguards to computer-based resources, an organisation cannot survive. Security of PCs and information systems is mandatory for every organisation. Security is needed mainly due to following reasons:

(a) *Privacy:* Privacy defines the rights of the individual users or organisations to keep their personal data and information secret. Most people feel that their personal information should not be monitored by others without their consent. However, the present information technology enables people to monitor and collect personal data without the individual's consent. Without security, the important confidential data of organisations is often sold or sent to other companies and is misused. Mailing lists of customers is also sold or sent to the competitors of the organisation. Therefore, all individual users and organisations need security for keeping privacy of their confidential data and softwares.

(b) *Accuracy:* Most of the damage to data and systems of an organisation is caused by errors and omissions made by people. An organisation always needs accurate data for transaction processing, providing better service to their customers and making effective decisions. As computerised organisations mainly rely on databases, it is most likely that employees change the data intentionaly or accidentaly. The incorrect data leads to erroneous results and conclusions. The customers always suffer due to erroneous statements. Therefore, all organisations need security to maintain the accuracy of data.

(c) *Threats by Dishonest Employees:* A dishonest employee is a major threat to an organisation. A dishonest programmer can easily access any software or data, if proper control measures are not provided to the system. The dishonest employees can monitor the confidential letters, financial data/statements or other official documents and can send to the competitors of the organisation. They can easily steal secrets from computers which can be even more profitable than robbing banks. Therefore, security becomes mandatory for organisations to disable the dishonest employees from stealing official data from computers.

(d) *Threats of Fire and Natural Disasters:* Fire and natural disasters like floods, storms, snowstorms, lightning etc. are likely to cause excessive damage to the PCs, softwares and data. There should be adequate measures to protect computer-based resources against such disasters.

(e) *Computer Crimes:* Computer resources can be misused for unauthorised or illegal functions, which are called as computer crimes. Computer crime includes embezzelling money by bank employees, unauthorised copying of costly softwares, unauthorised modifications of data to falsify important records, malfunctioning of computers/

networks and performing other illegal functions for causing harm to computers. An organisation must provide adequate security measures for preventing computer crimes.

FORMS OF COMPUTER CRIMES

There are several forms of computer crimes which are described below:

1. *Data Diddling:* Data diddling refers to the unauthorised modification of data by dishonest employees of the organisation. Data diddling is mostly done by the staff. For instance, an employee may falsify his/her record by making modifications in the data. An accountant may change the amount figures of the debtors, which could cause excessive loss to the organisation. A bank employee performing reconciliation can embezzle millions of rupees by making modifications of data. He/she can also illegally transfer money to his/ her account.

2. *Trapdoor Programs:* Trapdoors refer to the special routines of a program, which allows the programmer to monitor storage area of memory (such as memory addresses) or other technical details of system in order to check whether the program is performing correctly or not. These routines (if available in the system) allow the users to illegaly access passwords (secret codes) and other important information. Although trapdoors are used to judge the performance of the system, they may be misused for making computer crimes.

3. *Superzap Programs:* Superzaps refer to the another special routines of the softwares, which do not have regular control mechanisms and passwords. These are used only when the normal functioning of the software is disturbed or stopped. Although only authorised persons can only use superzap programs, there is a possibility that unauthorised persons may use them. In those circumstances, superzap programs may lead to computer crimes.

4. *Logic Bombs and Viruses:* Logic bombs are the most dangerous computer crimes. Logic bombs refer to special routines that cause excessive damage to the data or vital programs (such as operating system files) and thus either disturb or completely stop the working of the system. For example, a logic bomb may be a program–

   - to format the hard disk;
   - to erase system files;
   - to delete important files on a particular date;
   - to change important data; or
   - to copy itself to other programs alongwith creating many problems to the system, which is called a virus.

   Viruses: Viruses are the most common form of logic bombs. Viruses refer to the programs that invades and disrupts the normal working of PCs by spreading from one PC to another. A virus spreads like a biological virus as discussed below:

   (i) A virus attacks when someone writes or copies a program that embeds itself in a host program.

   (ii) The virus attaches itself to the host program and travels from one PC to another either through floppy disk or data communications networks.

(iii) The virus may cause minor or severe damage to the data or create unexpected problems in the infected PCs.

We are discussing about viruses in details in the next unit.

5. *Hacking:* Hacking refers to get into someone else's computer system without permission in order to find out information or do something illegal. Hacking has become very widespread over the last decade. A person who gains access to a computer system or network without authorisation is called as Hacker. Hackers generally write programs in assembly or C language and break into a computer system just for accepting the challenge of doing so. For instance, in April 1992, some hackers invaded the system of a U.S. credit bureaus company and stole credit history records of numerous individuals.

6. *Leakage:* Leakage refers to unauthorised copying of confidential data from hard disk to floppy disks. Leakage results when an employee leaves the office by carrying sensitive data on small floppies, which cannot be detected by security persons. The leakage of sensitive data enhances computer crimes.

7. *Eavesdropping and Wiretapping:* Eavesdropping refers to monitoring of data transmissions which are meant for other persons. Wiretapping is one of the methods of eavesdropping. Wiretapping refers to setting up a special transmission path for diverting the flow of data. Wiretappers generally attach a cable on the local area network for diverting the flow of transmitted data.

Eavesdropping on Internet: As an access to the internet cannot be easily restricted, any information that is transmitted on the Internet is subject to eavesdropping. This is because of the following reasons:

(a) In Internet, the information is passed through multiple sites and telecommunication links before reaching the target destination. So, anybody on the way can easily eavesdrop the information.

(b) Most of the hosts of the Internet are Unix-based, which is notoriously weak on security. Thus, eavesdropping on Internet is easier.

8. *Downloading:* Downloading refers to receiving of data and softwares, which are transmitted from other computers. Download has become a common method of copying files via Internet. So, Internet helps computer users in unauthorised copying of data and programs from all over the world and thus provide a convenient way for making computer crimes.

9. *Software Piracy:* Software piracy refers to illegal copying of softwares for the purpose of distribution or sale. It is the most common and widely spread form of computer crime. This is because that most users prefer to use pirated copies rather than spending money on buying softwares. Software piracy is the most serious problem of today's software industry.

SOFTWARE PIRACY IN INDIA

For many years, the Indian software market has been dominated by pirated softwares. It is a very serious computer crime which is done by 99% Indian users. The copies of all latest software such as Windows, MS Office, PageMaker, CorelDRAW, Oracle etc. costing lakhs of rupees are available on pirated CDs or Floppy Disks in just few hundreds of rupees or even sometimes free of cost. The users want to invest only in hardware and expect free copies of

software with every PC. Hardware vendors also promote software piracy because they understand that they will be unable to sell a PC in India, unless they offer few softwares free of cost with every PC. Actually in India, the user mentally sets the value of software simply as the cost of a floppy disk. This is because that the legal software are very costly in India as compared to hardwares. Although, software piracy has become the greatest threat to software industry, it does not harm too much to the security of an organisation because it is the data which is important for an organisation and not the software.

PC AND COMPUTER CRIMES

Personal computers are vulnerable to most form of computer crimes due to the following reasons:

- The operating environment of a PC does not contain any password. There is a common tendency to put all data on hard disk without taking backups and hard disk of a PC is not only highly volatile but also vulnerable. Important data maybe lost due to hard disk failure. Important files become untraceable due to system failure or power fluctuations.
- Copying of software and data is easier on PCs due to non-locking of floppy drives.
- In large organisation, PCs are mainly linked to mainframes, so remote users can access the data easily.
- Local area networks of PCs are easier accessible by Wiretappers.
- Viruses can be easily spread from one PC to another.
- The operating system of PC does not provide any mechanism to prevent files stored on hard disk from being duplicated illegally. However, Contrary to PCs, operating system of mainframe/ minicomputer provide a centralised security system.

RISK ANALYSIS

The organisation must prepare a security plan to adopt the preventive measures. Risk analysis is a part of the organisation's security plan. It is carried to evaluate the various risks which threat the security of PCs and to implement the preventive measures against such risks. The major functions of risk analysis are–

- To analyse the areas of vulnerability.
- To analyse various threats to the security.
- To determine the probability of various security risks.
- To determine the cost of possible disasters.
- To know the impact of a potential loss due to possible disasters.
- To implement various recovery measures in case of disasters.
- To adapt various preventive measures in order to avoid disasters.

SUMMARY

Security or security system is the protection of computer-based resources which include hardware, software, data, procedures and people against unauthorised use or natural disaster. The computer and information systems are required to be protected against unauthorised access, fraud, fires and natural disasters. The personal computers are

vulnerable to most form of computer crimes. Therefore, the organisation must prepare a security plan to adopt the preventive measures. Risk analysis forms a very essential component of the organisation's security plan.

REVIEW QUESTIONS

1. Fill in the blanks:
   (a) _____ refers to the unauthorised modification of data by dishonest employees of the organisation.
   (b) _____ is a person who gains access to a computer system without authorisation.
   (c) Wiretapping is one of the methods of _____.
   (d) _____ are vulnerable to most form of computer crimes.
   (e) _____ is carried out to evaluate the various risks which threat the security of PCs.
2. Write True or False:
   (a) System security concerns with the protection of data from modifications by unauthorised persons.
   (b) Security defines the rights of the individual users to keep their personal data secret.
   (c) Trapdoors refer to the special routines of a program, which do not have passwords.
   (d) The operating system of a PC does not provide a mechanism to prevent files stored on hard disk from being duplicated illegally.
   (e) Virus is the most common form of computer crime.
3. Match the followings:

(a) Superzap Programs	(i) A threat to security
(b) Logic Bombs	(ii) Illegal duplication of programs
(c) Software Piracy	(iii) Computer crimes
(d) Fire	(iv) Unauthorised copying of data
(e) Leakage	(v) Special routines of programs

4. Define security with reference to information systems. Why does an organisation need security? Discuss in brief.
5. What is a computer crime? What are its different forms? Explain with suitable examples.
6. 'Any information that is transmitted on the Internet is subject to eavesdropping'. Do you agree with this statement? Discuss.
7. What is software piracy? Write a short note on software piracy in India.
8. Why PC is a vulnerable to most computer crimes? Discuss.
9. What is risk analysis? Why is it important for making a security plan for an organisation?
10. Define the following terms:
    (a) Privacy (b) Data security (c) Hacking (d) Downloading

CHAPTER 17

Security Measures, Disaster Recovery and Ethics

LEARNING OBJECTIVES

- Security Measures for PC
- Physical Security
- Identification of Users
- Access Control
- Encryption and Decryption
- Encryption and Decryption Software
- Audit Control
- Security on Networks
- Disaster Recovery
- Computer Ethics

SECURITY MEASURES FOR PC

In last unit, we discussed the importance of security for an organisation and an individual's PC. In this unit, we will emphasise on various security measures. Before discussing these measures, let us first see the difference between the following terms:

System Integrity: System integrity refers to the proper functioning of computer components (hardware/ software) by providing physical security and safety measures against external threats.

Data Integrity: Contrary to system integrity, data integrity refers to surety of the completeness and consistency of data by providing appropriate security measures such as data validation. Data validation refers the measures taken to ensure the validity, completeness and consistency of data.

The organisation must follow the following control measures for providing adequate security to PCs and information systems:

- Physical Security
- Identification of Users
- Access Control
- Encryption and Decryption
- Audit Controls

PHYSICAL SECURITY

Physical security includes safeguards against damage of hardware, softwares and data due to the physical environment of the PCs. The computer room and data library are the most critical areas of physical security. The major threats to the physical security are:

- Destruction of hardware
- Loss of documentation
- Damage of databases
- Fire
- Water
- Theft of Computer-based Resources
- Sabotage (To prevent the success of computerisation by destroying computer equipments)
- Loss of Power

The organisation must take following preventive measures against the above threats:

- The entry and exit to computer room and data library should be restricted and properly monitored by closed circuit televisions and security gaurds.
- The hardware, software and data must be protected against theft by installing locked doors, theft-proof safes and vaults, burglar alarms and closed-circuit televisions in the computer room and data library.

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- The hardware, software and data must be protected against theft by installing locked doors, theft-proof safes and vaults, burglar alarms and closed-circuit televisions in the computer room and data library.

- Sensors for early detection of fire, fireproof vaults and wall-mounted fire-extinguishing systems must be installed in the entire office building.
- Water pipes should be located away from the computer room, data library and communication lines.
- Ceilings and walls should be properly sealed against water seepage.
- External Storage devices having backups of data and softwares should be stored either away from the computer rooms and data library in the same building or off the office building.
- Sprinklers (equipments for scattering water to put out fires) should be fitted in the office premises.
- Fiber optic cables, which are relatively safe from wiretaps, should be used in cabling of local area networks.

IDENTIFICATION OF USERS

The authorised users must be identified before using computer resources. The identity of users may be established by one or more of the following methods:

(1) *Using Password:* Password is a group of characters, used to access certain hardware, software or data. A password is the most commonly used method for verifying the identity of user. A password should have the following characteristics:

(i) It should be a meaningful word or phrase that can be remembered easily. For instance, 'DELHI', 'YEAR2000', 'I LOVEYOU', 'GOODDAY', etc. are some of the meaningful passwords.

(ii) It should not be related with the system to be accessed. For instance, for using the payroll system, the passwords 'PAY', 'SALARY', 'PAYMAKER', 'BASICPAY', etc. can be guessed by other persons. Therefore, a password must be easy to remember but hard to guess.

(iii) It should not be the name of user who is using the system or the name/ place of company where it is installed. For instance, if the user named 'Dr. Suchitra' is authorised to use a system of company named 'National Computer Lab (Regd.)' located at 'Vikas Puri, Delhi', the passwords 'DOCTOR', 'SUCHITRA', 'NCL', 'NATIONAL','VIKASPURI', 'DELHI', etc. can be easily guessed.

(iv) Never use the passwords consisting of only numbers. For instance, '12345','1998','2000','39230', etc. may be difficult to remember but easier to guess.

(v) Never write the passwords on any paper or in the computer file because it may be leaked out.

(vi) Use only unrelated word or phrases as passwords which nobody could think about them. For instance, using a 'Financial Accounting System', the passwords 'CRICKET', 'BUTTERFLY', 'CAT', 'I LOVEYOU', etc. are extremely difficult to guess.

(vii) Change your passwords regularly.

Passwords are not always 100 percent secure because they may be:

- leaked out
- forgotten by the user
- guessed by others even if the chances are less than 1percent
- find out by experts having knowledge of systems programming
- searched by computer utilities.

(2) *Using Fingerprints:* Fingerprints can also be used for identity of users in an organisation by using the latest technology. Although it is the best method for identifying the users, it is not used due to non-availability of the required hardwares/softwares in many organisations. Currently, Fingerprints technology is only used in law enforcements.

(3) *Using Access Cards:* In some organisations, access cards are provided to authorised users. Besides knowing password, the user must possess access card in order to use the system. For instance, access cards are used in automated teller machines for withdrawing money.

(4) *Using Keys:* Users are provided keys to unlock their terminals. The user is identified on the basis of the key.

(5) *Restricted System Use:* Users are allowed to use only those terminals and resources to which they are authorised. The restricted use of system makes the identification of users easier.

ACCESS CONTROL

The access to various computer resources by authorised users must be properly controlled. The main guidelines to control access are–

- Provide a single entrance to the computer room monitored by security guards.
- Note down the name of user, his/her ID No., terminal used, time and duration of use, purpose of use etc. in the entry register.
- Use an encoded card system which serve as a key to unlock doors. The encoded card system consists of a magnetic key and a lockport. When card is inserted into the lockport, the door is unlocked.
- Employ a librarian to monitor the use of floppies and various hardware/ software resources by permitting authorised persons only.

ENCRYPTION AND DECRYPTION

Encryption is an effective and practical method to secure data. Encryption refers to encode data by converting the standard data code into a proprietary code. Just opposite to encryption, decryption is the process to convert encrypted data into its original form. Encryption and decryption techniques are commonly used during transmission of data from one computer to

another. The basic concept of encryption/decryption process is illustrated in Figure 17.1. and is explained below:

(i) The plaintext message, which has to be transmitted, is encrypted to produce a ciphertext.

(ii) The ciphertext is transmitted to other terminals over communication lines.

(iii) The ciphertext is received at authorised receiver and is decrypted back into plaintext.

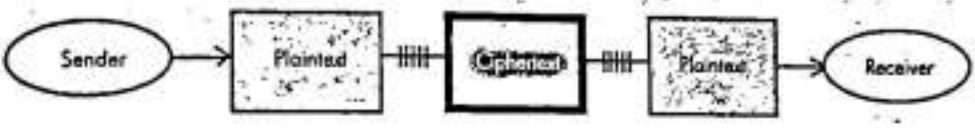

Figure 17.1: Concept of Encryption/ Decryption

The general technique of encryption/decryption is based on algorithms given by National Bureau of Standards. This technique is known as Data Encryption Standard (DES). It is widely used in many network security systems. DES uses a binary number as the key for encryption. This key offers more than 72 quadrillion combinations. The binary number is used as a pattern to convert the bits at the both ends of transmission. For each transmission, the key can be changed randomly.

ENCRYPTION/DECRYPTION SOFTWARE

Data files can also be encrypted by using utility software. These software permit the user to encrypt and/or decrypt files in an interactive menu driven mode. These software encrypts a file by randomly selecting one of the encryption algorithms available. The encrypted files can be decrypted by authorised persons only due to use of password during encryption/ decryption process.

AUDIT CONTROL

Although all the above discussed security measures are sufficient to protect the system, there may be some breaches in the security. Audit control protects the system from possible security breaches and frauds. Audit, with respect to systems, refers to examination of working systems (hardware/software) in order to determine their efficiency. Softwares implementation and maintenance process must be audited properly to prevent any embezzlement. Various audit control softwares can also be used by auditors to examine databases for their correctness, completeness and consistency. The best way for audit control is that the application software should have inbuilt audit control procedures so that the system can examine itself.

SECURITY ON NETWORKS

Security is critical for maintaining the integrity of data stored on the network servers. Security, with reference to a network, refers to operating system controls used by the network administrator to limit users' access to approved areas. Security is implemented in the network operating system at following levels:

- Login and Password Security
- Account Security
- Directory and File Rights Security

Login and Password Security

Login, with reference to networks, refers to establish a connection to the server by an authorised user. It requires a password to access the system. The first level of network security is the

password protection, which enables the user to use one or more passwords to prevent unauthorised access. To prevent an individual user from login to the network from several workstations, the number of concurrent connections can be limited. The timings of day, when a user can access network, can also be restricted.

Account Security

On local area networks, an account is set up for each user. A user account is used to control access to a network established and maintained by the network administration. The elements of a user account include the following details–

(i) Password information

(ii) Rights of the user

(iii) Information about groups to which the user belongs.

Directory and File Rights Security

Each user on network is given limited rights to access specific directory and files. The various types of file and directory rights available in LAN are summarised in **Table 17.1.**

Table 17.1: Types of File and Directory Rights in LAN

Right:	Function
	Permits the user –
Open:	To open an existing file in a sub-directory
Create:	To create a new sub-directory or file
Read:	To read the contents of a file
Write:	To modify the contents of a file
Delete:	To delete a file
Search:	To list the files in a sub-directory
Modify:	To change the attributes of a file
Parental	To read, rename and delete a sub-directory

Security Levels

The United States Department of Defense Standard specifies the security levels for various operating systems and networks which are summarised in **Table 17.2.**

Table 17.2: Security Levels as specified by U.S. Department of Defence Standard

Level	Description
Class D	An operating system that is not secure (e.g. MS DOS).
Class C1	Requires an individual login, but allows group identification;
Class C2	Requires an individual level of login by password with an audit mechanism (e.g., Novel Netware 4.x, Windows NT Server).
Class B1	Requires Department of Defense Security clearance levels.
Class B2	Guarantees a path between the user and the security system, and ensures that clearances cannot be changed.
Class B3	Security based on a mathematical model that must be viable and repeatable. The system must be managed by a network administrator in charge of security and must remain secure when shut down.
Class A1	The highest level of security based on a mathematical model that can be proven.

DISASTER RECOVERY

Inspite of all security measures, organisations are always vulnerable to disaster. Disaster recovery refers to the contingency measures that an organisation must take to recover the data in case it is damaged or lost due to security breaches. Backup is the most efficient method of disaster recovery.

Backup

Backup, with reference to software and data, refers to create duplicate copies of important data and softwares on various storage devices, such as magnetic tapes and floppies in order to restore data in event of hardware or software failure. Backup is extremely important in a disaster recovery procedure. Backup, sometimes, is also defined with reference to hardware. Hardware backup involves keeping duplicate hardware components especially computer peripherals (I/O and Storage devices) in case of their failure or malfunctioning. However, 'backup' term is generally understood as 'backup of data and software'.

Guidelines for Taking Backups

The basic guidelines for taking backup of data are as follows:

- Make a proper plan and follow a suitable strategy for backup and recovery procedure.
- Keep backup of data files regularly preferably on daily basis.
- Keep multiple copies of backup (Minimum two copies).
- Store backup floppies or tapes away from the data processing centre.
- Use only genuine floppies for taking backups.

COMPUTER ETHICS

Standards of moral conduct to be followed by employees for using various computer resources are called as Computer Ethics.

Besides all the discussed security measures, ethics are also required to maintain the system security. Although unethical acts are not always illegal, they may cause harm to the security

of the organisation. Unethical acts may be performed by both employees and people outside organisations.

Code of Computer Ethics

Organisations develop a code of ethics in order to create awareness among employees to understand their duties. Employees must know the difference between right and wrong in order to be ethical. Some of the guidelines which are generally given in a code of computer ethics are described below:

- All employees will maintain the privacy and confidentiality of the organisation's data and official documents.
- No employee, other than proper authorisation, shall make changes in the data in any way form.
- Employees will not carry with them floppies having official data while leaving office.
- No employee, for whatever reason, shall give any floppy having official data and legal software to any outsider.
- No employee shall be involved in any conduct related to software piracy.
- All employees will use the software in accordance with the license agreement between purchaser and seller.
- No employee shall access the data meant for others.
- Employees will not use knowledge of a confidential nature for their personal use.

SUMMARY

The organisation must follow certain control measures for providing adequate security to PC's and information systems. It includes physical security, Identification of users access control, Encryption, Decryption and Audit controls. Physical security includes safeguards against damage of hardware, software, and data due to the physical environment of the PCs. Moreover, the authorised users must be identified before using computer resources. Encryption is an effective and practical method to secure data. Decryption is the process of converting encrypted data into its original form. Security is implemented in the network operating system through Login and password security, Account security and Directory and File Rights Security. Inspite of all security measures adopted, the organisations are still vulnerable to disaster. Backup is the most efficient method of disaster recovery. Certain standards of moral conduct are to be followed by employees for using various computer resources.

REVIEW QUESTIONS

1. Fill in the blanks:
   (a) Fire and water are the major threats to _____ security.
   (b) _____ is an effective and practical method to secure data.
   (c) The first level of network security is the _____ protection.
   (d) _____ is the most efficient method of disaster recovery.
   (e) Organisations maintain a _____ in order to create awareness among employees to understand their duties.

2. Write True or False:

   (a) Floppies having backups of data should be stored in the computer room in order to provide physical security to the organisation.

   (b) Access cards are used to identify the user.

   (c) A password should be related with the system to access.

   (d) Audit controls protects the system from possible security breaches and frauds.

   (e) If all security measures are followed, organisations are not vulnerable to disasters.

3. Match the followings:

(a)	System Integrity	(i)	Destroying computer equipments
(b)	Decryption	(ii)	Security Level
(c)	Data Validation	(iii)	Providing physical security
(d)	Sabotage	(iv)	Ciphertext
(e)	Account Security	(v)	Identification of users
(f)	Class B1	(vi)	Duplicate Copies
(g)	Fingerprints	(vii)	Security on networks
(h)	Backup	(viii)	Data Integrity
(i)	Password	(ix)	Automated Teller Machines
(j)	Access cards	(x)	Law Enforcements

4. What are the major control measures for providing adequate security to PCs? Explain in brief.
5. What is physical security? What are the major threats to physical security?
6. What are the different methods to identify the users? Which one of them is the best and why?
7. Explain with examples the characteristics of a good password.
8. Describe the concept of encryption and decryption.
9. Discuss the various levels of security on local area networks.
10. What do you mean by the term 'Backup'? Write the basic guidelines for taking backups.
11. What are computer ethics? Write the guidelines which are generally given in a code of computer ethics.

CHAPTER 18

Viruses: Detection and Prevention

LEARNING OBJECTIVES

- Definition of a Virus
- Virus Characteristics
- What is Sinister about Viruses
- Virus History
- How Viruses are Spread
- Different Kinds of Virus
- Damage Done by Viruses
- Virus Prevention
- Networks and Viruses
- Network Protection
- Things That are Not Viruses
- The Future of Viruses
- Anti-Virus in the Future

DEFINITION OF A VIRUS

Biologically, virus is defined as a link between living and non-living organism. Outside the body of host it behaves like a non-living organism, but inside the body of host it utilises the resources /machinery of the host and multiplies and behaves like a living entity. Generally viruses are pathogenic in nature and they cause various diseases in plants and animals. But as far as computer related activities are concerned *a virus is a program that infects a computer, copies itself to other programs in system and may create a lot of problems in the computer.* That is the definition of a virus.

In retrospect, it is unfortunate that the word 'Virus' was used– it makes the problem sound a lot worse than it is. It might have been better to use the word 'weed'. But we're stuck with 'virus'. A virus does nothing more than replicate in order to be a virus - indeed, 95 percent of viruses do no more than that, plus doing something insignificant like beeping the keyboard or displaying a message.

However, if a program does something nasty which you were not expecting it do, that does not make it a virus, unless it replicates. Such a program is called a *'Trojan'*, named after the famous horse of Troy.

VIRUS CHARACTERISTICS

A virus has one or more of the following characteristics:

- Fast Infection
- Slow Infection
- Stealth
- Polymorphism

Fast Infection

A fast infector spreads rapidly within a computer by infecting everything that is accessed. A fast infector is not as bad as it sounds– it is just as easy to clean a computer with 1000 infected files as one with 10, provided you have an anti-virus program that does a good cleaning job. However, most anti-virus products check memory for viruses. This is because of the possibility of a fast infector in memory. If there is a fast infector in memory and the product opens all your files, you end up with every file on the computer being infected. This doesn't matter as much as it might sound, if you follow up by cleaning all those files with a good cleaner.

Slow Infection

The objective of some viruses is to spread slowly. Since it is slow, it may take a long time to notice it and kill it. There are various ways that a slow infector might work, but the classic slow infector works by only infecting those files that you had intended to change anyway. This means that if you are running a change detector as an anti-virus measure, the change detector will trigger each time there is an infection, but since you had intended the file to change anyway you will tell it to accept the change.

Slow infection can also take place in the following sequence:

- Virus only infects files as you copy them from your hard disk.
- So, no file on the hard disks ever changes and the change detector is satisfied.

- When you copy a file to a floppy disk, the copy is infected.
- When you take this to another computer protected by the change detector, the change detector warns you of the existence of the new file.
- You then reassure the change detector that you knew about the new file.
- The change detector is satisfied and another system is infected.

Stealth

Some viruses reside in the boot sector and when any program tries to read the boot sector, they present the information of that boot sector from where they were written. So, you get unexpected information during booting of your system. This characteristic of viruses is known as Stealth. It is much more common to see stealth in boot sector viruses than in file viruses because it is much easier for the virus author to implement stealth in a boot sector virus.

Polymorphism

The commonest kind of anti-virus program that people use is the virus-scanner, looking for a repertoire of viruses. Therefore, for the virus authors, this is the kind of product that they would like to defeat. A polymorphic virus is one where if you take two instances of the virus, there are no bytes in common between them, so you cannot write down a byte-sequence and go looking for that to detect the virus.

WHAT IS SINISTER ABOUT VIRUSES

Although sometimes a virus causes no significant harm to your system except copying itself, you get so worked up when you have one. Why? This is because you may become very upset if you come across situations similar to following:

- If you run Windows 95 and you get a partition sector virus, then even if the virus does nothing, you'll lose 32 bit disk access, so your computer will run somewhat slower than it should. Also, if you do not get rid of the virus, there is a strong likelihood that eventually you will pass it on to a supplier or customer, who will be upset.
- Many of viruses that actually spread in the wild are memory-resident. Therefore, there is the possibility of incompatibilities between the virus and other programs you run. For example, a virus named 'Jerusalem' tries to use one of the resources that Novell NetWare uses, so you cannot run both Novell NetWare and Jerusalem on the same system.
- Even though the virus has been analysed and documented, you might remain nervous that the virus does more than has been documented. In almost every case you would want to get rid of the virus apart.

As removing viruses from several floppies takes your valuable time, it would be nice if you only had to worry about those PCs and floppy disks that are infected. However, of course, you do not know which ones of these are infected until you have done the virus-hunt on all floppies. Therefore, you have to check all floppy disks, hard disks and other storage media to verify that your all software and data are absolutely virus free. This is sinister about viruses.

VIRUS HISTORY

The history of computer virus can be traced to the year 1986 when two Pakistani programmers, Basit and Amjad, were upset over the fact that they could not land up with a good job. They

realized that the boot sector of a floppy disk contained executable code and this code is run whenever they start up the computer with a disk in drive A:. They thought that they could replace this code with their own program, so that the program would become memory-resident. This program could copy itself on each floppy disk used on the same drive. They called it a *Virus*. But it only infected 360 KB floppy disks. To be able to understand how different types of viruses evolved, following is the brief description of each one of them:

1. *'(c) Brain':* In 1987, the students of University of Delaware realised that their computers had a virus when they started seeing the volume label '(c) Brain' on floppy disks. That is all it did – copy itself and put a volume label on disks. This virus did no harm to data or software except just putting a volume label on the floppy disk.

2. *Charlie:* In 1987, Franz Swoboda became aware that a virus was being spread in a program called Charlie. He called it the Charlie virus.

3. *Jerusalem:* In Tel Aviv, Israel, another programmer was testing his first virus called Suriv-OI (Virus spelled backwards). It was a memory-resident virus, it could infect any COM file. His fourth effort escaped into the world and became known as the Jerusalem virus. Every Friday, 13th, instead of infecting files that are run, it deletes them. As this date is not common, the virus remains pretty inconspicuous most of the time. It avoids infecting COMMAND.COM because in those days many people believed that this was the file to watch.

4. *Ping Pong:* In Italy, at the University of Turin, a programmer wrote another boot sector virus. This one put a bouncing ball up on the screen, if the disk was accessed exactly after half-hour basis. It became known as Ping Pong. It is also known as *Italian virus* and *Bouncing Ball*. But, this virus had a major limitation that it could infect only 8088 or 8086 computers. This is because it uses an instruction that does not work on more advanced chips. Hence, this virus has almost died out.

5. *DataCrime:* In March of 1989, a new virus was written in Holland. A Dutchman found a virus all over his hard disk. When the virus was disassembled, it was found that on any day after October 12th, it would trigger a low-level format of cylinder zero of the hard disk, which would, on most hard disks, wipe out the File Allocation Table and leave the user effectively without any data. As it was another non-memory-resident virus, it was unlikely to spread.

6. *Aids Information Disk:* In 1989, about 20,000 copies of Aids Information Disk were mailed to users taken from mailing lists. The disk came with installation instructions and a request for $189. When it was installed, it created hidden directories and hidden files and edited the AUTOEXEC.BAT file. So one of these hidden files was run on each boot-up. This counted up to 90 and when it reached that number of boots the Trojan would trigger. The Trojan encrypted all the file names of the infected hard disk and gave them the hidden attribute and it looked as if there was only one file on the hard disk, which was an invoice for $189 to be sent to Box 7, Panama.

7. *Dark Avenger:* The Dark Avenger viruses introduced two new ideas. The first idea is the 'fast infector'. With these viruses, if the virus is in memory, then simply opening a file for reading triggers it. Soon, the entire hard disk is infected. The second idea is that of subtle damage. Dark Avenger-1800 occasionally overwrites a sector on the hard disk. If this is not noticed for a period of time, the corrupted files are backed up and when the backup is restored, the data is still no good. Dark Avenger targets backups, not just data.

8. *Whale:* In the second half of 1990, a virus called Whale appeared. Whale was a very large and complex virus. Generally it crashed the computer when you tried to run it. But it was an exercise in complexity and confusion and it arrived in the virus researcher's hands like a crossword puzzle to be solved.

9. *Vaporware:* It was also in 1991 that Dark Avenger announced the first virus 'Vaporware'. He threatened a virus that had 4,000,000,000 different forms. In January 1992, this virus appeared, but it was not a virus. January 1992 saw the Self-Mutating Engine (MtE) from Dark Avenger.

10. Starship: Another virus that came out at about that time was Starship. Starship is a fully polymorphic virus with a few neat anti-debugging tricks and it also aims to defeat checksummers with a very simple trick.

11. *Michelangelo:* Probably the greatest event of 1992 was the Michelangelo scare. One of the American anti-virus vendors forecast that five million computers would go down on 6th March. PC users went into a purchasing frenzy, as the media whipped up the hype. On the 6th March, only 5,000 to 10,000 computers went down and naturally the US vendors that had been hyping the problem put this down to their timely and accurate warning. It will p[illegible]er be known how many people had Michelangelo, but certainly in the days leading up to the 6th March many computers were checked for viruses.

12. *Girafe:* In early 1993, a new virus writing group appeared in Holland, called Trident. The main Trident author, Masud Khafir, wrote a polymorphic engine called the Trident Polymorphic Engine (TPE) and released a virus that used it called GIRAFE.

13. *Natas:* (Satan spelled backwards) It is the most successful American virus ever released. It appeared on bulletin boards in early 1994 and is rampant worldwide, but particularly in Mexico. It is extremely polymorphic and also multipartite, which means that in addition to infecting files, it also infects boot sectors of floppy disks and partition sectors of hard disks. A user, who fails to clear up all three infections, finds that they keep coming back. This factor and the fact that second rate products fail to detect all instances, means that the virus can quickly spread. It was written in Czechslovakia, this virus ranks (so far) as the most difficult for anti-virus vendors to handle.

14. *One Half:* It infects the partition sector of the hard disks, in addition to the files and has another nasty habit. Every time that the user boots from the infected hard disk, the virus encrypts cylinders of the hard disk, starting one cylinder from the end and working backwards. It keeps a record of the last (lowest) cylinder that it encrypted, in the infected partition sector. When it has encrypted half of them, it displays the message 'is one half', which gives the name. If the user cleans up the partition sector, without first copying the files to an external device, the data on the encrypted cylinders are lost.

15. *Macro Virus:* August 1995 saw a significant new development, the first macro virus that infects Word for Windows 6 documents (*.DOC) and the NORMAL.DOT template. When an infected document is opened under Word for Windows for the first time, the virus gets control as an AutoOpen macro and infects the NORMAL.DOT template (or any other template, if it has been selected as a global default template). A Word for Windows message box, with the text 1, appears on the screen. After this, every document saved using the File | SaveAs command is infected with the virus.

The glut has continued in the year 1997 and 1998 and there are more than 16,000 viruses and variants.

Some of the interesting viruses are:

Oprah Winfrey virus	:	200 MB H.D. will shrink to 80 MB and then slowly expands back to 200 MB.
Right to life	:	Won't allow you to delete a file.
Adani and Eve	:	Takes a couple of Bytes out of your apple.
Michael Jackson	:	Hard to identify because it will constantly change the appearance.
Airline Virus	:	You are in Dallas, your data is in Singapore.
Elvis	:	Your Computer gets fast, slow and lazy and then self-destructs.
Star Track	:	Invades your system in places where no virus has gone before.
Health Care	:	Treats your system for a day, finds nothing wrong and sends you a Bill for Rs 8500/-.

HOW VIRUSES ARE SPREAD

It seems to be a common belief that viruses are spread by games, by shareware, by Internet file downloads or by Bulletin Board Systems (BBSs). The truth is more intricate. A physical disk has to be involved in case of a boot sector virus, whether it contains any software or not. You cannot get a boot sector virus by using a BBS.

The most likely routes by which a virus gets into an organisation are engineers, parents, or colleagues:

- *Hardware engineers* use disks on a large number of computers. This increases their chances of picking up an infected disk and spreading a virus.
- *Parents* have *children*, and if there is a PC at home, and the children are young teenagers, then they quite possibly swap software at school. The disks that they bring home might well be infected, and if the parent is taking disks to and from work, a virus could easily be taken into work.
- A boot sector virus could be on a data disk obtained from a *friend* or *relative*.
- The commonest way for a macro virus to enter a company is as an *attachment* to an *e-mail*.

Other ways of getting a virus include:

- *Shrink-wrapped Software:* Some of the largest companies have accidentally shipped a virus in shrink-wrapped software.
- *Purchased Hardware:* Most hardware comes with disks containing utilities or drivers.
- *Sales Persons Running Demonstrations:* They could unwittingly install the virus they picked up from the last place they ran their demonstration.

- *Pirated Software:* Commercial software is usually scanned for any viruses. On an average pirated software can definitely have a virus.

DIFFERENT KINDS OF VIRUS

To be able to analyse and remove viruses from the computer system, it is important first to know about different kinds of viruses. The various kinds of viruses are -

- Macro Viruses
- Devolving Viruses
- Boot Sector Viruses
- TSR File Viruses
- Non TSR File Viruses
- Companion Viruses
- Overwriting Viruses
- Multipartite Viruses

We are discussing below about these viruses in details.

Macro Viruses

Macro virus is the first virus to infect data files, rather than executables. Macro viruses infect files in the form of macro or OLE objects and are easier to write than 'traditional' file viruses which are mostly written in assembly code. Today many applications have macro languages, so the problem is a growing one. Macro viruses spread by people sending infected document files to each other, entirely innocently, either on floppy disk, or via the internal LAN (often attached to e-mails), or via an external e-mail system (such as the Internet).

Many applications provide the functionality to create macros. A macro is a series of commands to perform some application-specific task. Macros are designed to make life easier like automating some everyday tasks, for instance, doing calculations.

Macros can be saved as a series of keystrokes (the application records what keys you press); or they can be written in special macro languages (usually based on real programming languages like C and BASIC). Modern applications combine both approaches. When the macro language allows files to be modified, it becomes possible to create macros, which copy themselves from one file to another. Such self-replicating macros are called *macro viruses*. Most macro viruses are written for Microsoft's Word for Windows and Excel for Windows. However, there are also macro viruses for Lotus AmiPro (e.g. APM/Greenstripe).

Devolving Viruses

Some viruses are badly written and 'lose' their own macros. The original virus may consist of the set {AutoOpen, FileSave, and FileSaveAs}. If it replicates via AutoOpen, the complete macro set will be preserved. However, if the user invokes File | SaveAs, the virus will fail to copy the FileSave macro. The resulting virus set {AutoOpen, FileSaveAs} is known as a *Devolved Macro* and original virus is devolving.

Boot Sector Viruses

One of the most common kind of viruses are boot sector viruses, for example, Form and Stoned. These viruses infect the floppy disks in either of the following parts:

- Master Boot Record (MBR)
- Partition sector of the DOS Boot Record (DBR)
- DOS boot sector of hard disks.

The following example shows how a boot sector virus spreads: You have got a floppy disk with data on it, perhaps some page maker file. This is part of a project that you are doing jointly with a classmate. What your classmate does not know is that their computer is infected with a boot sector virus and therefore, so is the disk that has been sent to you. You put the disk in drive A: and start using these files. So far, the virus has not done anything. But when you finish for the day, you switch off the computer and go home. The next day, you come in and switch on. The floppy disk is still in drive A. So the computer tries to boot up from there. It loads the first sector into memory and executes it (normally, this is a small Microsoft program to load DOS), or if it cannot find DOS on the disk, tells you: 'Not a system disk, please press any key to continue'. Everyone has seen this message numerous times. So you do as instructed.

However, this disk is infected with a boot sector virus, so what was executed was not just the program by Microsoft, but the virus as well. The virus installs itself on the hard disk, replacing the MBR and copying the original MBR to a location a little further down the disk. When you start up from the hard disk, the MBR runs, but this is the virus. The virus goes memory-resident, capturing the disk read/write interrupt 13h and then it loads the original MBR and the boot-up process continues as normal. However, now the disk read/write interrupt is captured. Every time you make any write or read access to drive A: virus decides to write anyway. Sooner or later one of these will be sent to another person and the cycle continues.

The detail of various boot sector viruses is different, but the principle is the same. They are carried by the boot sectors of infected disks and only in that way. A boot sector virus cannot spread across a network. Thus, the only way to get infected is to try to boot from an infected disk, even if the boot fails.

Boot sector viruses infect PCs. They do not care what operating system is running, or what security software is installed, because at the time the boot sector virus installs itself the operating system or security program is not yet running. However, with some non-DOS operating systems, although the PC is infected the virus cannot copy itself on to subsequent disks and cannot spread. It can, however, still do damage, as was discovered by one surprised UNIX user when Michelangelo went off on March 6th. To most people, the fact that viruses can infect in this way comes as a big surprise, which partly accounts for boot sector viruses being so common.

Boot sector viruses work under DOS and Windows 3.x., some work under Windows 95, but they will not work under Windows NT or OS/2 (including Warp).

TSR File Viruses

A less popular kind of virus is the Terminate-and-Stay-Resident (TSR) file virus. As the name suggests, these infect files, usually COM and EXE files. Although over 99 percent of executable programs have the extension COM or EXE, some do not.

For a TSR virus to spread, someone has to run an infected program. The virus goes memory-resident, typically looking at each program run thereafter and infects it (if it is not already infected). Some viruses are called fast infectors and they infect if you just open the file (for example, a backup might open every file on the drive)– Dark Avenger was the first fast infector. In the case of Green Caterpillar, the infection trigger is anything that determines what files are present (for example, DIR). Other triggers have been used, but the commonest is to infect each program that you are about to run.

Non-TSR file Viruses

It is much easier to write a non-TSR virus and so many of the budding virus authors do so. But it is quite rare for such a virus to be encountered in the wild. There are less than 1percent of reported outbreaks of a non-TSR virus. With such a virus, running an infected program runs the virus, which at that time looks for another file to infect and infects it. Vienna is the most common non-TSR virus seen very rarely these days. Vienna was the first file virus in the wild and is still reported occasionally. There are a lot of viruses based on Vienna.

Companion Viruses

There are two types of companion viruses:

(1) *COM and EXE companion:* If you have a COM file and an EXE file with the same filename and you type that name, DOS runs the COM file in preference to the EXE file. Companion viruses use this fact– each EXE file that you have acquires a companion COM file with the same name. Then, when you try to run your EXE program, the COM program is actually run and that is the virus. When the virus has finished doing what it wants do, i.e. creating another companion for another file, it runs the EXE program, so everything seems to work normally.

There have not been many successful companion viruses. The main advantage to the virus author is that because the EXE file does not change, some change-detection software might not realise that a virus is spreading.

(2) *Path companion:* This sort of virus puts a program in a directory that is earlier in the DOS PATH. When you run a program that is not in your current subdirectory, DOS searches for the program in various subdirectories, as specified by the PATH command in your AUTOEXEC.BAT file. Path companions are harder to write than ordinary companions, so there are not many of them.

Overwriting Viruses

An overwriting virus simply overwrites each file it infects with itself. Once overwritten the program will not function. It will become so glaringly apparent that something is wrong that either you will get rid of it or copy it again. This is the main reason that overwriting viruses were/are never successful in spreading.

Multipartite Viruses

Some viruses infect multiple objects. When you run an EXE infected with a multipartite virus, **Tequila**, it installs itself on the MBR. When you boot up the computer, Tequila runs from the MBR and goes memory-resident. While Tequila is memory-resident, it infects EXE files thereby infecting multiple objects. Other viruses like **Anticad** infect COM, EXE and MBRs interchangeably. Some viruses infect COM, EXE, MBRs and device drivers. Multipartite viruses are the third most common kind of virus.

There are some viruses that infect OBJ files. The **Starship** virus infects by creating a new DOS Boot Record (DBR), leaving the old one intact, leaving the code on the MBR intact and changing the pointer in the MBR so that the Starship DBR is executed before the original DBR. The **Dir. Byway** virus infects file systems by changing the File Allocation Table (FAT) and directories so that files on the hard disk are all cross-linked to the virus.

DAMAGE DONE BY VIRUSES

According to the severity of the damage, we can categorise the damage done by viruses into six groups. Some authors claim the possibility of a virus that actually does good, but no one has yet demonstrated such a virus. We define damage as the virus doing something different from what it should not do. The damage does not inlcude the damage done during a mistaken attempt to get rid of the virus. For example, it is remarkable how many people will format the hard disk to try to repair Stoned. It will lose all your data while the virus is untouched. This virus resides in the MBR, which is not touched by Format. The damage also does not include damage done by obscure incompatibilities between the virus and the system. For example, if a computer that was originally set up under earlier DOS version but now you are running a later DOS version which is infected by Stoned, then a large number of files will be corrupted because the design of the virus had not anticipated this situation.

The major damages done by viruses are discussed below:

1. *Trivial Damage:* This is the most insignificant damage done by a virus (e.g. Form). It will simply makes the speaker beep on the 18th of every month every time you press a key. All you need to do is to get rid of the virus. This will usually take seconds or minutes.

2. *Minor Damage:* A good example of minor damage is the way that the Jerusalem virus deletes any program that you try to run after the virus has gone memory-resident on Friday the 13th. At worst, you will have to reinstall some programs, but repairing the damage is unlikely to take more than 30 minutes per computer.

3. *Moderate Damage:* The most famous virus for moderate damage is Michelangelo. Moderate damage is done when a virus formats the hard disk, scrambles the File Allocation Table (FAT), or overwrites the hard disk. The damage is moderate only because you know that it has happened. You can reinstall DOS and reload yesterday's backup, because you do take a backup every day. So, you will lose on average half a day's work, plus maybe an hour doing the reinstall and restore.

4. *Major Damage:* Every 16th time that a Dark Avenger-infected file is run, it overwrites a random sector on the hard disk with 'Eddie lives... somewhere'. Major damage is done when such a virus infects your backups as well as your hard disk. This might have been going on for several weeks. When you find 'Eddie lives' at several places in several files you discover Dark Avenger, you get rid of the virus. You restore yesterday's backup and find 'Eddie lives' in the backup files.

   You might have to go back a few weeks before you can find clean data files. However, when you have restored a 6-week old backup, you will find that you do not actually have any way to redo the work you have lost, because you do not have your original documents.

5. *Severe Damage:* When a virus (e.g. Dark Avenger) makes gradual, progressive changes so much that backups are also corrupted, but the changes are not obvious, so you end up simply not knowing whether your data is correct or changed. However, the virus might have done severe damage.

6. ***Unlimited Damage :*** Some viruses make an effort to get to the system manager password and pass it to a third party. Cheeba virus creates a new user with maximum privilege with a fixed user name and password. The third party person, who can log in to the system, can do anything and in turn can then do unlimited damage.

VIRUS PREVENTION

The question now arises is how to prevent viruses from invading our computer systems. A number of solutions have been proposed in the past. A few of these are Legislation, Awareness of Users, Use of Anti-virus software, Use of Virtual device drivers, Use of Scanners and Checksummers. We are discussing below about these measures in details.

- Legislation
- Awareness of Users
- Use of Anti-virus Software
- Use of Virtual Device Drivers
- Use of Scanners
- Checksummers

Legislation

You should use only legal softwares to prevent your system from viruses. The government must punish people who write virus programs. This will reduce the number of viruses written by various authors. However, it cannot make an impact on the thousands of viruses that already exist though it can certainly slow down creation of new viruses.

Awareness of Users

Users do not regard computer problems as their own. They regard them as the domain of the MIS department. Users are too busy doing their jobs to pay any attention to looking out for viruses. Users can be given precise procedures to follow, to check all incoming software and about how to acquire software. Procedures tell users how to obey the rules. The procedure for checking disks should be written down in detail.

However, most of the users just ignore procedures. A user may see a virus once in many years. Thus, after say six months of applying such procedures, they learn that when you go through the procedures, you do not find any viruses. So the procedures fall into disuse. Procedures can be backed up with some rules. A good set of rules might be as follows:

- Any incoming floppy disk must be virus-checked.
- If your anti-virus software finds a virus, tell your PC Support department.
- If the rules are broken, users can be 'punished'.

Use of Anti-virus Software

Anti-virus software is the solution to many problems created by viruses. There are many kinds and brands of anti-virus software. You should use a scanner on any incoming software. In practice, it does not happen always as you do not always do as you are told, however, computers do. So, the best idea is you tell the computer to virus-check everything each time

when it is loaded. This means that your programs will be checked more often than necessary, but that is irrelevant as compared to the damage caused by virus attacks.

Use of Virtual Device Drivers

On a Windows 3.x or Windows 95 machine, you can install an anti-virus Virtual device driver (VxD). A VxD is a 32-bit device driver, which checks everything that arrives on the computer, whether it is a floppy disk, running program or the accessed file.

You no longer have to rely on the user knowing what to do, that is built into the program. The user interface is simple– the user has to do nothing, just use their computer in the normal manner. If the VxD alerts, then it has found a virus and an alert is displayed on the user's screen and a network message can be sent to the supervisor. If a virus is found, there is also no option to allow the user to load it. On a Windows NT machine, you can install a File System Driver (FSD), which will provide similar cover.

So, anyone having a problem with the Concept virus should install a VxD (or FSD) on all their computers and tell the network to update it regularly. This will strangle the virus to death. A VxD will check incoming files no matter where they come from, for example, via the Internet, via the parallel port, or via the floppy drive.

Use of Scanners

A scanner is a program that knows how to find a particular repertoire of viruses. Scanners are updated, quarterly or monthly. For many users, quarterly upgrades are sufficient, but every now and then, a new virus comes out and spreads very fast (for example, Tequila, or SMEG). In that case, you would be unable to detect this new virus for several weeks, depending on where you are in the update cycle. So you should subscribe to monthly upgrades to avoid this situation.

VirusGuard (DOS) and WinGuard (Windows 3.x. Windows 95 and Windows NT) are on-access scanners and work continuously. As soon as any disk is accessed, it is checked for boot sector viruses; and as soon as any file is used, it is checked for file viruses. Both programs may be optionally configured to check files as they are written to the hard disk.

VirusGuard occupies approximately 9 KB of conventional (DOS) memory. VirusGuard is a DOS TSR program. It does not have the full facilities of FindVirus. It is not able to find macro viruses (which do not work under DOS anyway) and a small percentage of extremely polymorphic viruses. VirusGuard will find polymorphic viruses in memory, if an infected program has been run.

WinGuard, which is a Windows-specific program, uses zero conventional memory. Any additional time-overhead involved in checking the disk or file is unlikely to be noticeable in most cases. WinGuard does not have the constraints of a DOS TSR program and has the same detection capability as FindVirus.

Checksummers

A checksummer is a change detector. Executable files should not change, except for a good reason like updating of the software. A checksummer aims to detect changes. The advantage of checksummers is that they do not detect a repertoire of viruses, so do not need updating. The downside of checksummers is that they are more of a hassle than scanners because files change on your computer more often than you might have thought, for good and valid reasons. They also do not detect all viruses. For example, checksummers do not detect slow viruses,

they do not detect all boot sector viruses (if the hard disk code is left unchanged) and they have problems with stealth viruses.

NETWORKS AND VIRUSES

Network whether it is a local area network or wide area network provides interesting opportunities for viruses to spread to several computers or terminals. There is a common perception that once a virus gets onto a network, it flashes round the whole network very quickly. The truth, of course, is more complex. Boot sector viruses cannot travel across networks if several computers on a network are infected. This is because the boot sector virus spread via floppy disks in the usual way. An example of how a file virus spreads across a network is as follows:

- User 1 get their computer infected. The virus goes TSR, memory resident.
- User 1 runs other programs on their hard disk. They get infected.
- User 1 runs some programs on the network. They get infected. A network emulates a DOS device, so reading and writing to files on the server is done in exactly the same way as locally. The virus does not have to behave any differently to infect files on the server.
- User 2 logs on to the server, and runs an infected file. The virus is now TSR in User 2's computer.
- User 2 runs several other programs, on their local hard disk, and on the server. Each file becomes infected.
- User 3, User 4 and User 5 log on and run infected files. And so on.

Macro viruses are especially good at spreading on networks, because people commonly share data across networks, and e-mail documents to each other. They may even share common templates.

NETWORK PROTECTION

You should apply the following procedures to protect your network from the attack of viruses:

- You can make the directories in the hard disk of server computer as read-only. However, some packages cannot be run from read-only subdirectories, because they want to write to some temporary or other setup files in the same directory.
- You can make programs execute-only. This means that although the directory is read/write, the executables cannot be written to, or even read. They can only be run. Some programs will not run if they are execute only, because they have overlays that are added on to the end of the EXE file. So if the EXE file cannot be read, the overlays cannot be loaded.
- You can make individual files read-only using the DOS attribute, and then deny the user the 'modify attribute privilege' in that directory.

Using a combination of these techniques, you should be able to make a large percentage of the files on the server uninfectable. This stops viruses infecting most of the executables on the server. However, the user has read/write access to the data (needed to do the job), and so the virus also has read/write access to the data. So you cannot make the data files as read only. The only solution is to keep viruses off the workstation.

THINGS THAT ARE NOT VIRUSES

Certain problems in the system may be misunderstood by you as caused by viruses. However, those things may not be viruses.

Let us discuss about these things in detail.

- Bugs
- False Alarms
- Jocks
- Hoaxes
- Trojans
- Corrupted Programs
- Intended Viruses
- Droppers

Bugs

Bug is a persistent error in the software. All sufficiently complex software generally have bugs because programmers may make mistakes during development of these software. As programmers are human beings, they have pride and hence do not like to admit that they make mistakes, so they call them 'bugs'.

False Alarms

A false alarm is when you think you have a virus, but you are mistaken. The following things definitely indicate that the alarm (a warning message on system) is false:

- Sometimes, you have some hardware or software fault and after running some diagnostics, you eliminate the possibility of hardware or software problems, conclude that it is therefore a virus and proceed on that assumption.
- More often, a false alarm is the result of running anti-virus software. Anti-virus software, in common with other software, is not infallible. The two main mistakes that an anti-virus program can make are to fail to find a virus that is there or to claim that a virus is present when there is not. That is called a false alarm. When an anti-virus program gives a false alarm, it looks pretty much like the real thing.

However, there are certain things that might indicate that the alarm is false :

- Only one file is giving the alarm (or perhaps two files, but they are copies of the same file).
- Only one product gives the alarm - other products say the system is clean.
- You get the alarm after running multiple products, but not when cold-booting and running any one product.
- The virus that is detected is not listed as in the wild.
- The product says it cannot clean the virus.

- The product says the virus is in memory, but when you boot with a clean disk, the product doesn't find a virus.

Actually there is no fix rule that can be applied for knowing whether the alarm is false or not. You cannot say it is a false alarm if one of the above is true. The only way to really check a false alarm is to send the suspected file to the product vendor giving the alarm and ask them to verify if it is a virus by analysing it. You might try deleting the offending file and re-installing the software that is causing the false alarm, but sometimes even when you have finished doing that you might still get the false alarm.

Jokes

A joke is something that is funny. However, what one person finds funny is not the same as what another person finds funny– it depends on your sense of humour. A program that pretends to format your hard disk and then reveals that it has not– is that funny? It depends on your sense of humour. Some virus authors love to play practical jokes. Jokes are not viruses.

Hoaxes

There are a number of common hoaxes, which are widely believed. The most common of these are Good Times, Ghost, Free Money, Eyes, AOL4FREE, Join the crew, etc.

The Good Times hoax has been around for couple of years. It is usually in the form of a warning not to read any e-mail with Good Times in the title. People pass along the warning because they are trying to be helpful, not realising the damage that this does. Every now and then, there's a fresh spurt of Good Times warnings. Ghost is another hoax, which has received excessive publicity online after being falsely accused of containing malicious code.

Although, hoaxes are not viruses, the programs themselves could be infected in the future. The main way to deal with hoaxes is not to pass on warnings unless they have come from a serious source.

Trojans

A Trojan is a program that does something more than you were expecting and that extra function is damaging. This leads to a problem in detecting Trojans. If a program could detect whether another program formatted the hard disk, could it be said that this program is a Trojan? Obviously not– if the other program was supposed to format the hard disk (like Format does, for example), then it is Trojan. But if you were not expecting the format, then it is a Trojan. The problem is to compare what the program does with your expectations. You cannot determine a user's expectations of a program.

Therefore, some judgements have to be made. The Aids Information Disk is generally considered to be a Trojan. Approximately 20,000 copies of this were mailed to users in 1989, purporting to be a program that teaches you about AIDS. In fact, it was a Trojan– after you re-boot your computer 90 times, it encrypts and hides all the filenames on your hard disk and demands that you pay for your license to use it. Although, the documentation that came with it told you that something bad was likely to happen, it is generally considered to be a Trojan.

A recently appeared Trojan variation targets Internet Service Providers (ISPs) and their users. There is a large family of Trojan programs, designed to steal the passwords of ISP user accounts. The number of password stealing Trojans is growing quickly. Most do not cause damage to your data, but send your confidential data or password to the author of the Trojan.

Many of these Trojans are distributed as innocent programs. Typically, they claim to be able to provide better access, or new services (for example, 'new magnificent viewer'), games or images (for example, 'run it - it's fun') and so on. Some Trojans are embedded in DOC or RTF files and when the user double-clicks on the file the Trojan is executed.

The best way to avoid Trojans is that you should not use programs from untrusted or unknown sources. However, because of the Internet and the ease with which programs can be posted and distributed around the world in minutes, these programs are rapidly becoming a severe menace. If a Trojan is detected, the file should be deleted.

Corrupted Programs

Some files are simply corrupted perhaps by a hardware problem and hang the computer when run. For some reasons, these sometimes end up in virus collections, unless the collection is carefully maintained. If you look at the collections that can be found on most underground virus exchange sites, you'll find 20 percent or 30 percent garbage files.

Intended Viruses

Some virus authors are less capable than they would like to be and write what is clearly intended to be a virus, but for some reasons there is such a major bug that the virus does not work at all. However, they release these in the fond belief that no one will ever test them or perhaps they did not test them themselves. One typical mistake is to get confused about decimal versus hexadecimal and so their source code presumably says 'int 21' for the DOS function interrupt, but it should have said 'int 21h' (which is 33 in decimal).

Droppers

A dropper is a program which is not a virus but when it is run, it installs a virus into memory or onto the disk or a file. Droppers have been written sometimes as a convenient carrier for a virus and sometimes as an act of sabotage.

THE FUTURE OF VIRUSES

It is very difficult to predict about the future of viruses. Infact it is unwise to try and be too specific about what is likely to happen. There will be more viruses– that is an easy prediction but how many more is difficult to predict. There were over 8,000 viruses by the middle of 1996 and 15,000 by the end of 1997. Nevertheless, it is impossible to make a broad assessment of future virus developments. With over 15,000 known viruses in existence and over 300 new ones surfacing every three months it is really an uphill task for a group of serious anti-virus researchers.

ANTI-VIRUS IN THE FUTURE

The fundamental truth about viruses is that they are people's problem. The people, who are potential victims of this phenomenon, should acquire knowledge about viruses, which are a real threat to their computer systems. What is likely to happen in the future? Well, the databases that scanners use will get larger. Each new virus needs to be detected, identified and removed. Loading the databases will take longer and some programs have memory shortage problems. As Windows 95 and Windows NT become popular, users will be increasingly reluctant to run scanners under DOS. But to run Windows, you have already run software on the hard disk and if one of the things you have run is infected by a virus, you have a virus in memory. If there is a virus in memory, you cannot trust what the computer is saying– it could be a stealth virus.

In other words, Windows will make anti-virus software less secure. The R&D effort to keep scanners up-to-date will continue to increase. The virus problem will be with us for many years to come.

SUMMARY

A virus is a program that copies itself onto other programs. Some viruses spread rapidly while others slowly within the computer system. When viruses attack your computers, you get worked up because you would not only spend a lot of time in removing the viruses but your important data may also be lost. The history of virus can be traced to the year 1986 when first virus was developed by two Pakistanis. After that many viruses viz. '(c)Brain', Charlie, Jerusalem, Ping Pong, Data Crime, Dark Avenger, etc. have been evolved. The most likely routes by which a virus gets into an organisation are hardware engineers, parents, children, friends and e-mail. Viruses also spread by pirated and demonstration software. There are many kinds of viruses viz. Macro viruses, Devolving viruses, Boot Sector viruses, TSR viruses, Non-TSR viruses, Companion viruses, Overwriting viruses and *Multipartite* viruses. Viruses cause many damages to your systems or files, which can be classified into Trivial, Minor, Moderate, Major, Severe and Unlimited damages, depending upon the severity of the damage. Viruses can be prevented by Legislations, Awareness of users in understanding their duties, Use of Anti-virus software/ Virtual Device Drivers/ Scanners and by Installing Checksummers on your systems. Network provides the best opportunities for viruses in spreading to several computers quickly. So, you should take special precautions to protect your network against virus attacks. This battle between good (You) and evil (Virus) will go on. As always goodness will stay for long, the life of evil is short.

REVIEW QUESTIONS

1. Fill in the blanks:
   (a) An example of Slow infection is _____.
   (b) The most common roots by which virus gets into an organisation are through _____, _____ and _____.
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8. How does viruses spread? Discuss about the most likely routes by which a virus gets into an organisation.
9. What are different kinds of viruses? Explain with examples.
10. Write a short note on Boot Sector viruses. Give some examples of these viruses?
11. How does a TSR file virus differs from a Non-TSR file virus.
12. What are the two types of Companion viruses? Discuss in brief.
13. Discuss about the severity of the damage caused by various viruses with examples.
14. How can you prevent your system from attack of viruses?
15. What are Checksummers? How do they differ from scanners?
16. How can you prevent your network from viruses?
17. Certain things are misunderstood by user as viruses. What are these things and why they are not viruses?
18. What do you think about the future of viruses? Discuss.