Paper VI-Basics of Information Technology

Unit1

Information Technology, What is information Technology, Components of Information Technology, Importance of Information Technology

Unit2

Evolution of Computers, Generation of Computers, Types of Computers

Unit 3

Fundamentals of Computers, Components of a Computer- Input, Output Devices, Types of Printers, Secondary Storage Devices, Computer Language

Unit 4

Computer software- Systems software, Operating Systems- Open Source and Proprietary Software, Application Software (General Study)

Unit 5

Library Automation, need for Library Automation, Areas of Library Automation. Library management softwares (General study)

Unit 6

Information Network, Types of Networks, Internet services

Unit1

Information Technology, What is information Technology, Components of Information Technology, Importance of Information Technology

Unit-1

Information Technology

1.1 Introduction

Technology has been defined as "Systematic knowledge ad action, usually of industrial process but applicable to any recurrent activity". In providing tools and techniques for action, technology at once adds to and draws from a knowledge base in which theory and practice interact and compact. In general technology may be regarded as definable and specifiable way of doing anything. Technology "is a codified, communicable procedure for solving problems".

According to Manfred Kochen, the impact of technology in three stages. First, it enable us to do what we are now doing, but better faster and cheaper; second, it enables us to do what we cannot do now; and third, it changes our life styles.

Information technology is a recent and comprehensive term, which describes the whole range of process for generation, storage, transmission, retrieval and processing of information.

1.2 History

There are 4 main ages that divide up the history of information technology.

1.2.1. Premechanical Age (3000B.C. - 1450 A.D.)

The premechanical age is the earliest age of information technology. When humans first started communicating they would try to use language or simple picture drawings known as *petroglyths* which were usually carved in rock. As alphabets became more

popular and more people were writing information down, pens and paper began to be developed. It started off as just marks in wet clay, but later paper was created out of papyrus plant by the Chinese. This is where the first books and libraries are developed. Also during this period were the first numbering systems. Calculator was the very first sign of an information processor. The popular model of that time was the abacus.

1.2.2 Mechanical Age (1450 -1840)

A lot of new technologies were developed in this era such as analog computer used for multiplication and division. Blaise Pascal invented the Pascaline, a very popular mechanical computer, Charles Babbage developed the difference engine.

1.2.3 Electromechanical Age (1840-1940)

The telegraph was created in the early 1800s. The telephone (one of the most popular forms of communication ever) was created by Alexander Graham Bell in 1876. The first radio developed by Marconi in 1894. The first automatic digital computer, MARK 1 was developed by Harvard University around 1940.

1.2.4 Electronic Age (1940-)

The electronic age is what we currently live in. The ENIAC was the first high-speed, digital computer capable of being reprogrammed to solve a full range of computing problems.

There are 4 main sections of digital computing. The first was the era of vacuum tubes and punch cards like the ENIAC and Mark 1. Rotating magnetic drums were used for internal storage. The second generation replaced vacuum tubes with transistors, punch cards were replaced with magnetic tape, and rotating magnetic drums were replaced by magnetic cores for internal storage. Also during this time high-level programming languages were created such as FORTRAN and COBOL. The third generation replaced transistors with integrated circuits, magnetic tape was used throughout all computers, and magnetic core turned into metal oxide semiconductors. An actual

operating system showed up around this time along with the advanced programming language BASIC. The fourth and latest generation brought in CPUs (central processing units) which contained memory, logic, and control circuits all on a single chip. The personal computer was developed (Apple II). The graphical user interface (GUI) was developed.

It has been said that information technology is the science of information handling, particularly by computers used to support the communication of knowledge in scientific technical, economic and social fields.

1.3 Definition of Information Technology

Macmillan Dictionary of Information Technology defines IT as "the acquisition, processing, storage and dissemination of vocal, pictorial, textual and numerical information by a micro-electronics-based combination of computing and telecommunications".

UNESCO defines Information Technology as "scientific, technological and engineering disciplines and the management techniques used in information handling and processing information, their applications; computers and their interaction with man and machine and associated social, economic and cultural matters".

It may be stated that communication systems are as essential to information technology as computers. As a consequence, we have a convergence of three strands of technologies: computers, communication technology and reprographic and micrographic technologies. It is important to bear in mind that information technology is not just concerned with new pieces of equipment but with much broader spectrum of information activities. Information technology encompasses such different things as book, print; reprography, the telephone network, broadcasting and computers.

1.4 Components of Information Technology

The three major components of information technology are : Computer Technology, Communication Technology and Reprographic and Micrographic Technology.

1.4.1 Computer Technology

Computer technology may conveniently be grouped into: processor technology, storage technology and software aspects.

Processor Technology

Computers consist of electronic components assembled in a design or "architecture" that will perform necessary functions of input, output, computation and control (control of both the computer itself and of attached peripheral devices that perform input and output functions and store the files).

In the past, electronic components were expensive, so a minimum number were used in a single processor that alternately performs input, control, processing and output. Besides, the first generation of computers, operated by means of **vacuum tubes or valves**, were relatively bulky and energy consuming. The first major innovation, leading to micro-electronics was the discovery of **transistor**, a product of solid state physics, which used semiconductor materials. Being much smaller than the vacuum tube, the transistor quickly replaced it in all electronic equipments. However, transistors and other equipment had to be wired together and a single piece of equipment might have thousands of such components. The wiring and assembly of such elements were a delicate and costly process. This naturally paved the way for research towards the concept of **integrated circuit (IC)**. At first IC's were simple but, as the technology developed, they rapidly became smaller and more complex. This led to the miniaturization and refinement.

The most important development of these today is based on the non-metallic element **`silicon'**. The initial small silicon chips contained only a few components and circuits, but the average number of chips components has doubled each year since 1965. Early

Small Scale Integration (SSI) efforts, first gave way to Large Scale Integration (LSI) chips that contained thousands of components. Now Very Large Scale Integration (VLSI) chips contain hundreds of thousands elements and Ultra Large-Scale Integration (ULSI) chips with millions of components are also going to be available in near future.

The central feature of micro-electronics is the development of **micro-processor**, a special form of IC with functions of arithmetic, logic and control - similar to those of Central Processing Unit (CPU) of a computer and contained in a single chip. In addition, the microprocessor includes units to interpret instructions from the stored programme to supply the control memory, the information necessary to retrieve instructions and send out data as required. The microprocessor is the building block from which modem computer systems are assembled. The microprocessor uses very, little energy and has few environmental requirements of older machinery. Air conditioning, for example, might not be necessary for a general purpose computer using microprocessor technology. The practical significance of this is that it is now possible to bring the computer to the problem instead of bringing the problem to the computer.

Storage Technology

In the previous section, the, recent innovations relating to the processing aspects of computer technology were discussed briefly. In considering some of the advances in devices for digital information storage, it may be stated that most of the primary storage in computers is now supplied by semi-conductor circuits. There have been significant developments in **memory technology** affecting three areas of performance spectrum; the high speed, high performance; the midrange and the low speed bulk memory systems.

It is now possible that even a small computer system might have **cache memory**, a small associative memory retaining most recently referenced information and in a readily available place. In some cases, cache memory may be at the top of a hierarchy of memories having a wide variety of characteristics. Memory management, dynamic

memory allocation, and virtual memory schemes, generally found in large computer systems, are now appearing on computers which are small and less costly.

The development of charge coupled devices (CCDs) and bubble memories has filled the gap which previously existed in the continuum of memory devices such as fixed-head magnetic disks and these are slower than other semi-conductor memories. These memories have advantage over magnetic disks in that they contain' no mechanical parts and could be used to store significant amount of information and can be treated as a structured file system.

There has been a continuous improvement in recording densities of magnetic media. Floppy disks and microfloppies provide a convenient media to store data. The development of video disk has added a new dimension to the information storage technology. Video disks could' be used to store large volumes of information in digital form. These kind of mass storage devices are believed to be very useful in the development of information storage and retrieval systems. It May be stated that all these innovations in storage technology provide us a variety of alternatives depending on the requirements of speed of operation. These developments add more capabilities to the storage aspects and may be considered advances in the storage technology.

Software Aspects

Software is a generic term covering the concepts, procedures and instructions which enable computer systems to do useful things. Usually, software is conceived in terms of computer programs, discrete units of software which make the computer to carry out specific tasks, and or systems or packages.

The importance of software is obvious, since it is the software which applies the power of the computer to solve the users' problems. Many of the users need a clear understanding of the capabilities of software more than hardware aspects. It is known for some years now that the "rapid increase in the capabilities of computer systems has not been matched by corresponding increases in the development and quality of software. This situation has caused much disenchantment with computer systems.

The methods by which computer software is produced have changed considerably in recent years with the emergence of "software engineering", which enabled improvements in programming practice, such as structured, or modular programming.

As one of the solutions to the software problem increased production and availability of packaged software is encouraged. Another solution to the problem is the use of fourth generation languages and flexible integrated software to produce prototypes of programmes to meet the user needs. It is hoped that these solutions would be able to meet fairly standard requirements. For the average user they mean that there will be an increasing number of packages to meet most of his needs.

1.4 .2 Communications Technology

The recent IT revolution has transformed the communication-conscious human society into, an information global village in a short span of just two decades. The new technologies like the laser, fiber optics, telephone, teleprinter, telex, television dictaphone, silicon chip, Internet and many other telecommunication devices have come to constitute an important and inevitable component of written and oral communication media network. These modern communication technologies have the potential to bypass several stages and sequences in the process of development encountered in the earlier decades. The advents of communication technology have revolutionized the activities of library and information system. The concept of virtual or digital library has emerged and is synonymous to future library which largely works with ever-shifting arrays of allies, instead of acquiring large number of document employing staff to process them.

The word communication is derived from the Latin word "*communis"*, which means commons. In its application it means a common ground of understanding. It is a process of exchange of facts, ideas, opinions, feelings and as a means that individuals or organizations share meaning and understanding with another. Communication is a tool of management to get the things done through people. Generally the process of communication demands the necessity of a transmitter, message, symbols, channel,

decoding, receiver, action and feedback. It is a continuous process or cycle of sending message and feedback. The basic methods and guiding objectives of development and technical co-operation are richly embodied in the term *communication*.

Charles Cooley defines communication technology as *.the mechanism through which all human relations exists and developed-all the symbols of the mind together with the means of conveying through space and preserving them in time.* George Lundberg considers communication as, *.a sub category of interaction, namely the form of interaction using symbols, gesture, picture, verbal or any other which would serve as stimuli to behavior.* According to Newman and Summer, *communication is an exchange of facts, ideas, opinions or emotions by two or more persons*. Theo Haiman has discussed communications as *the process of passing information and understanding from one person to another.* It is the process of imparting ideas and making oneself understood by other.

Process of Communications

Communication is a process of exchange of ideas, facts opinions and manner by which the receiver of the massage shares meaning and understanding with another. It is organizational process, because a group of people and group activities are involved without this process, organizational activities do not progress. According to David K. Berlo, the whole process of communication involves six different steps as:

Ideation ⇨ Encoding ⇨ Transmission ⇨ Receiving ⇨ Decoding ⇨ Acting .

The entire process of communication consists of eight important elements as follows:

i) Message: A piece of information, spoken on written to be passed from one person to another. It is the subject matter of communication. It may involve any fact, idea, opinion, figure, attitude or course of action including information. It exists in the mind of the communicator.

ii) Transmitter: Transmitter is sender of message or communicate or speaker, a person who transmit the message. In the case of mechanical device used for

communication, Para transmitter is an operator that transmit message. The person who conveys the message is known as the communicator or sender.

iii) Encoding: The process of conversion of the subject matter into symbols is called encoding. The message or subject matter of any communication is always abstract and intangible transmission of the message requires the use of certain symbols. Encoding process translates ideas, word, facts, feelings, opinions into symbols, signs actions, pictures and audio-visuals, etc.

iv) Communication Channel: Communication channel means the medium or through message passes. The words, symbols, or signs selected should be transmitted to the receiver through certain channel or medium. The media may be written media or oral media. Further there are various forms of written media like letters, reports, manual, circulars, notes, questionnaires etc. The forms of oral media includes face-to face conversation, dictaphone, telephone, teleconferencing, television, documentary films, CD-ROMs, etc. represent audio-visual channels.

v) Receiver: Receiver is the person to whom the message is meant for by the sender. A person, who receives the message is called receiver. Responding or acting to the message done by the receiver only.

vii) Decoding: Decoding is the process of translation of an encoder message into ordinary understandable language. Receiver converts the symbols, word or sign received from the sender to get the meaning of the message.

viii)Acting: According to the understanding of the message, the receive acts or implements the message.

ix)Feedback: Feedback is though the last element an important one in the communication process. The sending back of the knowledge about the message to the transmitter is known as feedback. It ensures that the received the message and understood in the same sense as the sender meant.

The development of communications technology is, in a sense, a symbol of man's effort to communicate rapidly over great distances. Communications technology is older than computer technology. It has grown as rapidly as the computer technology in recent times. These two technologies are now fusing into what Anthony Oettinger has

called `compunications'. This newly emergent technology is changing our life styles as few technologies have before. This new technology has probable and important uses in the home, office, factory, community and in information exchange system and holds prospects of immediate relevance to information profession. Some of the significant aspects of information transmission technology are discussed briefly in the following paragraphs.

A communication system can establish paths over which messages can be sent between any two instruments in specified locations at desired times. This type of system is generally known as switched .network.' Communications technology has advanced to the extent that now it is possible to hire services from a commercially operated network. Hence, there is a steady growth of computer-to-computer data traffic. Also, computer manufactures are offering network architectures which together offer multiple operating systems running on families of similar computers. A terminal of a computer network may have access to any of the computers within the network, if it is authorised to do so. A computer serves as a terminal when connected for providing computation, information retrieval, etc., in accordance with the request of the terminal. A multi-lateral access capability allows the users of the terminal to share these resources. Such networks are characterised by a new technique known as packet switching in which the message is divided into a number of message blocks called packets and are transmitted between nodes in store and forward basis. Among the information resources to be shared are the data bases. A number of information systems have come into operation based on this concept.

Another advancement of great significance in telecommunications from the technological point of view is that of a fundamental and massive shift from analog to digital modes of transmission. This shift is underpinned by new transmission channels of enormous capacity. This shift is massive in that it involves the replacement or upgrading of costly equipment. It also involves types of communications namely voice, facsimile, computer transmissions and television communication, which will all be affected. For example, every manufacturer of semi-conductor circuits has started to produce a device called Codec-short for `Coder-decoder'. This circuit takes the human

voice and transmits by the standard voice-grade telephone channel, samples the signal 8,000 times per second, and encodes it into a digital bit stream. Digitised signals from hundreds of telephone conversations are then bundled, transmitted over a high capacity communication links, decoded at the other end, and reconstituted into a very close approximation of the original voice. While this may appear to be an elaborate and excessively complicated procedure, the switch from analog to digital makes good sense from a number of points of view. Firstly, the cost performance of digital circuits continues to improve remarkably. Secondly, noise problems inherent in analog devices can be eliminated. This transformation from analog to digital mode has resulted in the intelligent communication channel and has reduced even the thin line of distinction between communications and computing.

As a result of rapid technological progress, a variety of services, which have traditionally been considered separate, are now becoming increasingly similar. This tendency is generally referred to as convergence of service modes. Telecommunications can now handle not only speech and data but also visual information in a unified manner. Broadcasting is now capable of providing two-way or selective dissemination of audio and visual information by way of a broad-band cable in addition to conventional one way dissemination. With the result, two traditionally separate 'services, telecommunications and broadcasting tend to merge together in their mode of operation and thereby provide users with diversified types of information more efficiently. This innovation could be utilised for the publication of journals through the extensive use of techniques like facsimile text processing and word processing. Library and information services may also be included into the integrated whole. To handle the economy of scale, the concept of Integrated Services Digital Network (ISDN) is evolving very rapidly.

Advantages of Communication Technology

The impact of communication technology in information science has been increasing in importance, as interactive information retrieval systems have been developed, that allow users dispersed over wide region to obtain access to these systems on a real time basis. Computer based information retrieval system form one broad class of system

that can be linked to users in their office, homes as well as to users in libraries and other centers.

i) Time Saving: Modern communication technologies avoid errors, duplication resulting in saving of time. They have more speed with accuracy and can transmit quickly. The message lead which the machine can do is definitely more and resulting in saving of time of superiors and subordinates in the organization.

ii) Saving Labour Cost: New communication technologies are labour saving devices. They save labour as well as payroll cost. Less number of workers or staff are sufficient with the installation of modern communication devices. The staff thereby released can be utilized for alternative works.

iii)Speed: A large quantity of information can be fed into the machine, which in term transmits with considerable speed. In respect of certain matters, speed and quickness are necessary to take quick decision. The handling of transmission is assigned to electrically or electronically or radio-wave operated machine which are known for greater speed of dispatch. Frap Palo, gives an example .where with advanced fiber optics, it is possible to transmit the entire contents of the library of congress (60 terra bytes of information of 60 billion sheets of paper) from Chicago to New York in only two hours. Over the traditional copper wirings the same transmission would take 2000 years to complete.

iv)Reduce Monotony: Routine respective work may lead to fatigue or monotony mechanization of communication system reduces the fatigue of the staff and resulting in improving the efficiency and quality of the work. For instance use of visual and audio-visual aids will reduce fatigue, which improves the quality of work.

v) Equality: New technology can achieve equality in the provisions of communication reaching particularly with reference to geographical location.

vi)Standardization: Standardization of work can be achieved through machines. The ensure consistency uniformity in the quality as well as quantity of work the principle of standardization is so important that no one can afford to ignore its advantages.

vii)Accuracy and Efficiency: Correctness of message transmission is necessary to enable a receiver to understand in same spirit and to act accordingly. The systematic

and automatic technology promotes accuracy. The new technology in general increases efficiency.

1.4.3 Reprographic and Micrographic Technologies

Reprography

Reprography, as a term, has gained international recognition in 1963. It includes "photocopying , micro copying, duplicating and in-plant printing and is characterised by the small scale of its operatives". Reprographic techniques include such processes as diffusion transfer, physical transfer, quick stabilisation, diazo, thermography, and electrostatography for copying documents. Reprographic technology has been playing a vital role in the dissemination of recorded information and has now come to stay as one of the means to provide access to document resources geographically located in different places. Document delivery service largely depends on the facilities afforded by reprography.

Micrography

Micrographic technology is an outgrowth of photographic technology. Since this technology is being increasingly used to supplement computer systems, strong electronic and photo-electronic influences make it multi-technology dependent. Micrographic technology finds its application not only as a publishing medium but also, as a communication medium, computer output medium, and storage medium. In the past, the use of microform as a publishing medium was limited because of inherent limitations. It may be stated that the widely known field of use for this technology was in connection with archivation and for file and library compaction, in which microforms replace traditional paper publications. Micropublishing for selective retrieval should be seen as user-oriented application in the context of changing information' transfer needs. It involves two separate, but interlinked distribution processes, (i) publication of full content on microforms, and (ii) distribution of retrieval support information (i.e., index, access to database, etc.). This support information is the key to the retrieval. It can be made available on any medium (such

as paper, microfilm, magnetic tape or floppy disk) that provides ease of access to location codes for the full information on microforms.

These micro-publications are resources and often essential tools for certain information workers. Their value for the user depends primarily on the human engineering of the retrieval support hardware and software and relevance of information that can be obtained in response to a particular problem. The production process for a micro-publication reflects a dual information flow. The content is either microfilmed or if it is available in machine-readable form, converted directly into microfiche by a COM system. The primary information is inexpensively duplicated and distributed to all those who are in need of it. Microforms permit (as publication and storage media) compaction, organisation for ease of use and partial or full automation of retrieval. Most important, however, are the economic advantages and the potential for up-to-date complete information supply in a decentralised and user-oriented form. As information transfer medium, microforms exhibit many desirable features suitable for use in IRS Systems with automated retrieval and on-demand reproduction. These computer microforms (CMF) systems offer high on-line storage capacity and economic on-demand publishing capabilities, provided special microforms with high reduction ratios are used.

The new technologies are causing rapid changes. The factors which are having impact are computers, microprocessors, lasers, digitisation of information and screen based technology including television and telecommunications. Some of the aspects relevant to information profession are developments in keyboards, OCR, input to photosetting systems, electronic full page composition techniques, and graphic reproduction. Data capture in machine-readable form is becoming easier with the advances in word processing and direct entry photosetters. Increasing digitization of data makes printing a more systems oriented process.

1.5 Importance of Information Technology

The objectives of IT are to provide better means of information of data messages in the form of written or printed records, electric, audio or video signals by using wires, cables and telecommunication techniques, IT plays a vital role in information handling due to developments such as reduction in computing time, capabilities of files on video discs, use of T.V as readymade information screen, telecommunication and satellite communication facilities etc. The objectives of IT Library and information centres can be categorized into the following four groups.

(i) Supporting technical functions associated with acquisitions, technical processing, serial control, SDI/CAS, OPAC and circulation work.

(ii) Supporting information storage, retrieval and dissemination systems.

(iii) Supporting management information services for libraries, especially analyzing library statistics.

(iv) It can best be used in service and orientation courses for practicing librarians, continuing education programs for faculty teachers of library and information science, correspondence studies and library extension services.

The application of information technology to modern librarianship practice has resulted in the overall improvement in the performance of libraries and other related information institutions. There is no doubt that the future of librarianship practice in our society is closely linked with the development of information technology. This is for the fact that many of their activities and services are amenable to information technology application in libraries. Areas of such applications in libraries include automated technical services to provide efficient reference and information services as well as network operations like cataloguing, authority control, interlibrary loan, and international bibliographic projects.

Thus, there is a direct link between the increasing advances in information processing technologies and modern librarianship practice. These advances in information technology allow for extensive possibilities for the communication of Scientific and

Technology Information (STI). Indeed, their impact on information processing, storage and dissemination, and consequently on the output of the scientific and technology enterprise has been growing rapidly since the early 1970s in the industrialized countries .

Libraries, as the traditional information institution, have had their fair share of the impact of information technology. Its impact on libraries has been on activities concerned with information storage and retrieval, and other such in-house keeping routines as acquisition, cataloguing, serials control. Implication of these is that libraries now provide their users with much better and more efficient information services through the use of information technology. This is because from remote database through the use of online services, computer terminals and telecommunication networks have provided desired links between different kinds of libraries and other remote computer databases where vital information could be located. Also having positive effects on information management-and component of modern librarianship practice-is the optical disk technology which is another development in information technology . The optical disk has paved the way for new ways of information acquisition, recording, processing, storing and distributing; particularly by means of the CD-ROM (Computer Disk Read Only Memory). The use of this technology in libraries saves library money, space and other logistics associated with the purchase, processing administering and the use of hard copy. Some of the major areas of application of information technology to librarianship practice are:

i) CD-ROM services
ii) Library Networks
iii) Electronic- Mail
iv) Electronic- copying
v) Internet Connectivity
vi) It allows easy integration of various activities
vii) It facilities cooperation and the formation of library networks.

viii) It helps to avoid duplication of efforts within a library and between libraries in a network.

ix) It helps to increase the range of services of its services offered.

x) It provides marketing opportunity of its services.

xi) It ultimately may save and generate money

xii) It increases efficiency.

1.6 Conclusion

Information Technology has not left any human activity untouched with its influence. The IT tools like computers and communication have added new dimension in information handling in libraries. New technologies supplement the older ones and form together with a complex of technologies, which allows for choosing a certain technology for a certain application from a broad variety of technologies for certain application from a broad variety of technologies. The largest single factor, which has caused changes, if any in the library and information services, is Information Technology. It has made it possible to introduce new services, revolutionize many existing services by providing new media, by increasing speed and efficiency of processing and retrieval, by overcoming distance and communication barriers and so on.

Unit2

Evolution of Computers, Generation of Computers, Types of Computers

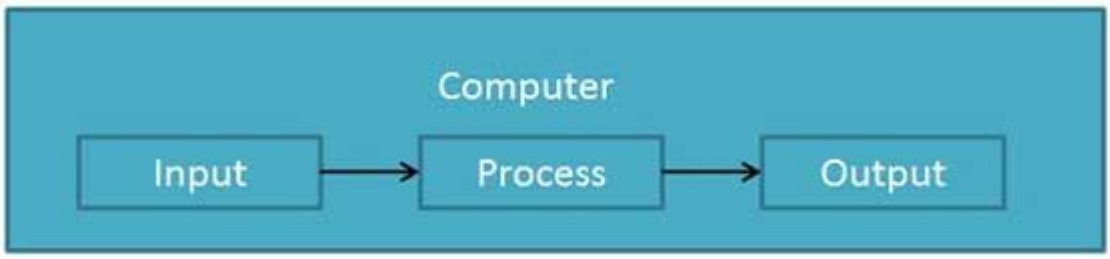
2.1 Introduction

Today's world is an information-rich world and it has become a necessity for everyone to know about computers. The word computer has been derived from the Latin word "Computere" means 'to calculate' or 'to reckon'. Hence the term can logically apply to any calculating device. However in technical parlance the term has come to refer specifically an 'electronic computer'.

2.2 Functionalities of a computer

Any digital computer carries out five functions in gross terms:

- Takes data as input.
- Stores the data/instructions in its memory and can use them when required.
- Processes the data and converts it into useful information.
- Outputs the information.
- Controls all the above four steps.



2.3 Definition

Computer System is an electronic data processing device, which does the following:

- Accept and store an input data.
- Process the data input.
- And output the processed data in required format.

A computer is a fast and accurate symbol manipulating system that is designed to automatically accept and store input data, process them and produce output results under the direction of a stored program of instructions.

2.4 Advantages

Following list demonstrates the advantages of Computers in today's arena.

2.4.1 High Speed

- Computer is a very fast device.
- It is capable of performing addition of very big data.
- The computer has units of speed in microsecond, nanosecond and even the picosecond.
- It can perform millions of calculations in a few seconds as compared to man, who can spend many months for doing the same task.

2.4.2 Accuracy

- In addition to being very fast, computers are very accurate.
- The computer has performed calculations 100% error-free.
- Computers perform all jobs with 100% accuracy.

2.4.3 Storage Capability

- Memory is a very important characteristic of computers.
- The computer has much more storage capacity than human beings.
- It can store large amount of data.
- It can store any type of data such as images, videos, text, audio and any other type.

2.4.4 Diligence

- Unlike human beings, a computer is free from monotony, tiredness and lack of concentration.
- It can work continuously without creating any error and boredom.
- It can do repeated work with same speed and accuracy.

2.4.5 Versatility

- A computer is a very versatile machine.
- A computer is very flexible in performing the jobs to be done.
- This machine can be used to solve the problems relating to various different fields.
- At one instant, it may be solving a complex scientific problem and the very next moment it may be playing a card game.

2.4.6 Reliability

- A computer is a reliable machine.
- Modern electronic components have failure-free long lives.
- Computers are designed to make maintenance easy.

2.4.7 Automation

- Computer is an automatic machine.
- Automation means ability to perform the task automatically.
- Once a program is given to computer, i.e., stored in computer memory, the program and instructions can control the program execution without human interaction.

2.4.8 Reduction in Paper Work

- The use of computers for data processing in an organization leads to reduction in paper work and speeds up the process.

- As data in electronic files can be retrieved as and when required, the problem of maintenance of large number of files gets reduced.

2.4.9 Reduction in Cost

- Though the initial investment for installing a computer is high but it substantially reduces the cost of each of its transaction.

2.5 Disadvantages

Following list demonstrates the disadvantages of Computers in today's arena.

2.5.1 No IQ

- A computer is a machine and has no intelligence of its own to perform any task.
- Each and every instruction has to be given to the computer.
- A computer can not take any decision on its own.

2.5.2 Dependency

- It can perform function as instructed by user, so it is fully dependent on human being.

2.5.3 Dependency

- The operating environment of computer should be dust-free and suitable to it.

2.5.4 No Feeling

- Computer has no feeling or emotions.
- It cannot make judgment based on feeling, taste, experience and knowledge unlike a human being.

2.6 Evolution of computers

The history of computer dates back to a long ago, when man used his fingers for counting. The Stone Age man used stone, then sticks, knots on the ropes etc. Hence number was discovered. The number system laid the foundation for modern computers.

The computer is neither a product of a single stroke of genius; nor is created overnight, as it may have seemed to some people. The computer actually evolved from devices used in earlier centuries, and in our own century many different people over many years contributed to its remarkable development. Computer field, itself is developing very fast. Hardware (HD) has replaced old punch-card, tapes, drums and CDs. Computer Technology has undergone tremendous changes in both Hardware (HW) and Software (SW) capabilities.

During the 16th and 17th centuries, commerce in Europe was flourishing to such an extent that manual machine were considered as inadequate. In their quest for greater speed and dependability, inventors began to come out with more complex mechanical machines as described below:

Year	**Inventor**	**Name of the machine**
Early 1600s	John Napier (Scotland)	Napier.s Bones (Calculating device)
1642	Blaise Pascal (French)	Mechanical Calculator
1671	Gottfried Wilhelm von Leibniz	Calculator for all the calculation
1786	J. H. Miller(German)	Difference Engine

1822-32	Ada Augusta Lo Velace	Analytical Engine Base(Computer Programme)
1942	John Vincent and Clifford Berry	ABC
1944	AikeriMH(Harvard)	MARK-1
1947	J.P Eckert and J.P Mauchly	UNIMAR-I

Till 1930, there were no significant developments. During this time Howard H. Aiken, Harvard University, a mathematics professor, was probing into the possibilities of electrically operated high speed **mechanical calculating devices**. In 1944, he produced the first electromechanical computer called **MARK-I**. International Business Machine Corporation (popularly known as IBM, who was engaged in producing business, financed it. Aiken actually incorporated many features in his electromechanical computer that Babbage had conceived hundred years earlier. It was 51 feet long, high, huge machine and relied on vacuum tubes Dr. John Vincent Atanasoff of Iowa State College together with his assistant Clifford Berry constructed a working model of **ABC** (Atanasoff- Berry-Computer) in 1942 now as a digital computer as it used the On/Off state of electricity to represent numerical digits. MARK-I and ABC influenced the development of the next major computer system **ENIAC** (Electronic Numerical Integrator and Computer). It was completed in 1946 and was the fastest calculator to-date Dr. John von Neumann, who served as a consultant to ENIAC system came with the concept of computer memory and the stored programme. In 1952, at the University of Pennsylvania, Neumann's concept was implemented in the digital computer, Electronic Discrete Variable Automatic Computer **(EDVAC)**. In 1947, J.P. Eckert and J.W Mauchly built **UNIMARC-I** (Universal Automatic Computer). In 1951, UNIVAC become the first commercially available stored-programme computer and the computer race was on.

2.7 Computer Generations

Generation in computer terminology is a change in technology a computer is/was being used. Initially, the generation term was used to distinguish between varying hardware technologies. But nowadays, generation includes both hardware and software, which together make up an entire computer system.

There are totally five computer generations known till date. Each generation has been discussed in detail along with their time period, characteristics. Following are the main five *generations* of computers:

First Generation

The period of first generation: 1946-1959. Vacuum tube based.

Second Generation

The period of second generation: 1959-1965. Transistor based.

Third Generation

The period of third generation: 1965-1971. Integrated Circuit based.

Fourth Generation

The period of fourth generation: 1971-1980. VLSI microprocessor based.

Fifth Generation

The period of fifth generation: 1980-onwards. ULSI microprocessor based

2.7.1 First Generation

The period of first generation was 1946-1959.

First generation of computers started with using vacuum tubes as the basic components for memory and circuitry for CPU (Central Processing Unit). These tubes like electric bulbs produced a lot of heat and were prone to frequent fusing of the installations, therefore, were very expensive and could be afforded only by very large organisations.

In this generation, mainly batch processing operating systems were used. In this generation, Punched cards, Paper tape, Magnetic tape Input & Output device were used.There were machine codes and electric wired board languages used.

The main features of First Generation are:

- Vacuum tube technology
- Unreliable
- Supported Machine language only
- Very costly
- Generate lot of heat
- Slow Input/Output device
- Huge size
- Need of A.C.
- Non-portable
- Consumed lot of electricity

Some computers of this generation were:

- ENIAC
- EDVAC
- UNIVAC
- IBM-701
- IBM-650

2.7.2 Second Generation

The period of second generation was 1959-1965.

This generation using the transistor were cheaper, consumed less power, more compact in size, more reliable and faster than the first generation machines made of vacuum tubes. In this generation, magnetic cores were used as primary memory and magnetic tape and magnetic disks as secondary storage devices.

In this generation, assembly language and high-level programming language like FORTRAN, COBOL were used. There were Batch processing and Multiprogramming Operating system used.

The main features of Second Generation are:

- Use of transistors
- Reliable as compared to First generation computers
- Smaller size as compared to First generation computers
- Generate less heat as compared to First generation computers
- Consumed less electricity as compared to First generation computers
- Faster than first generation computers
- Still very costly
- A.C. needed
- Support machine and assembly languages

Some computers of this generation were:

- IBM 1620
- IBM 7094
- CDC 1604
- CDC 3600
- UNIVAC 1108

2.7.3 Third Generation

The period of third generation was 1965-1971.

The third generation of computer is marked by the use of Integrated Circuits (IC's) in place of transistors. A single IC has many transistors, resistors and capacitors along with the associated circuitry. The IC was invented by Jack Kilby. This development made computers smaller in size, reliable and efficient.

In this generation, Remote processing, Time-sharing, Real-time, Multi-programming Operating System were used. High-level language (FORTRAN-II TO IV, COBOL, PASCAL PL/1, BASIC, ALGOL-68, etc.) were used during this generation.

The main features of Third Generation are:

- IC used
- More reliable
- Smaller size
- Generate less heat
- Faster
- Lesser maintenance
- Still costly
- A.C. needed
- Consumed lesser electricity
- Support high-level language

Some computers of this generation were:

- IBM-360 series
- Honeywell-6000 series
- PDP(Personal Data Processor)
- IBM-370/168
- TDC-316

2.7.4 Fourth Generation

The period of Fourth Generation was 1971-1980.

The fourth generation of computers is marked by the use of Very Large Scale Integrated (VLSI) circuits. VLSI circuits having about 5000 transistors and other circuit elements and their associated circuits on a single chip made it possible to have microcomputers of fourth generation. Fourth Generation computers became more powerful, compact, reliable, and affordable. As a result, it gave rise to personal computer (PC) revolution.

In this generation, Time sharing, Real time, Networks, Distributed Operating System were used. All the higher level languages like C and C++, DBASE, etc., were used in this generation.

The main features of Fourth Generation are:

- VLSI technology used
- Very cheap
- Portable and reliable
- Use of PC's

- Very small size
- Pipeline processing
- No A.C. needed
- Concept of internet was introduced
- Great developments in the fields of networks
- Computers became easily available

Some computers of this generation were:

- DEC 10
- STAR 1000
- PDP 11
- CRAY-1 (Super Computer)
- CRAY-X-MP (Super Computer)

2.7.5 Fifth Generation

The period of Fifth Generation is 1980-till date.

In the fifth generation, the VLSI technology became ULSI (Ultra Large Scale Integration) technology, resulting in the production of microprocessor chips having ten million electronic components.

This generation is based on parallel processing hardware and AI (Artificial Intelligence) software. AI is an emerging branch in computer science which interprets means and methods of making computers think like human beings. All the higher level languages like C and C++, Java, .Net, etc., are used in this generation.

AI includes:

- Robotics
- Neural networks
- Game Playing
- Development of expert systems to make decisions in real life situations.

- Natural language understanding and generation.

The main features of Fifth Generation are:

- ULSI technology
- Development of true artificial intelligence
- Development of Natural language processing
- Advancement in Parallel Processing
- Advancement in Superconductor technology
- More user friendly interfaces with multimedia features
- Availability of very powerful and compact computers at cheaper rates

Some computers types of this generation are:

- Desktop
- Laptop
- NoteBook
- UltraBook
- ChromeBook

2.8 Types of Computers

Computers can be broadly classified into five based on their speed and computing power. They are :

1. Micro computers or PC (Personal Computer): Single user computer system. Moderately powerful microprocessor.
2. WorkStation: Single user computer system. Similar to Personal Computer but have more powerful microprocessor.
3. Mini Computer: Multi-user computer system. Capable of supporting hundreds of users simultaneously.
4. Main Frame: Multi-user computer system. Capable of supporting hundreds of users simultaneously. Software technology is different from minicomputer.
5. Supercomputer: An extremely fast computer, which can perform hundreds of millions of instructions per second.

2.8.1 Micro computers or PC (Personal Computer)

The invention of microprocessor (single chip CPU) gave birth to the much cheaper micro computers.

A PC can be defined as a small, relatively inexpensive computer designed for an individual user. PCs are based on the microprocessor technology that enables manufacturers to put an entire CPU on one chip. Businesses use personal computers for word processing, accounting, desktop publishing, and for running spreadsheet and database management applications. At home, the most popular use for personal computers is for playing games and surfing the Internet.

Although personal computers are designed as single-user systems, these systems are normally linked together to form a network. In terms of power, nowadays high-end models of the Macintosh and PC offer the same computing power and graphics

capability as low-end workstations by Sun Microsystems, Hewlett-Packard, and DELL.

They are further classified into:

i) Desktop Computers
ii) Laptop Computers
iii) Handheld Computers(PDAs)

Desktop Computers

Today the Desktop computers are the most popular computer systems. These desktop computers are also known as personal computers or simply PCs. They are usually easier to use and more affordable. They are normally intended for individual users for their word processing and other small application requirements.

Laptop Computers

Laptop computers are portable computers. They are lightweight computers with a thin screen. They are also called as notebook computers because of their small size. They can operate on batteries and hence are very popular with travellers. The screen folds down onto the keyboard when not in use.

Handheld Computers(PDA)

Handheld computers or Personal Digital Assistants (PDAs) are pen-based and also battery-powered. They are small and can be carried anywhere. They use a pen like stylus and accept handwritten input directly on the screen. They are not as powerful as desktops or laptops but they are used for scheduling appointments, storing addresses and playing games. They have touch screens which we use with a finger or a stylus.

2.8.2 WorkStation

Workstation is a computer used for engineering applications (CAD/CAM), desktop publishing, software development, and other such types of applications, which require a moderate amount of computing power and relatively high quality graphics capabilities.

Workstations generally come with a large, high-resolution graphics screen, large amount of RAM, inbuilt network support, and a graphical user interface. Most workstations also have a mass storage device such as a disk drive, but a special type of workstation, called a diskless workstation, comes without a disk drive.

Common operating systems for workstations are UNIX and Windows NT. Like PC, Workstations are also single-user computers. However, workstations are typically linked together to form a local-area network, although they can also be used as stand-alone systems.

2.8.3 Minicomputer

It is a midsize computer. These are intermediate in power and may function as small mainframe computers. These are dedicated to a particular purpose such as database access and support several users at a time. They are less expensive than mainframe computers. A minicomputer is a multi-processing system capable of supporting from up to 250 users simultaneously.

2.8.4 Mainframe

Mainframe is a very large in size and an expensive computer capable of supporting hundreds, or even thousands, of users simultaneously. Mainframe executes many programs concurrently. Mainframes support many simultaneous programs execution.

2.8.5 Supercomputer

Supercomputers are one of the fastest computers currently available. Supercomputers are very expensive and are employed for specialized applications that require immense amounts of mathematical calculations (number crunching). For example, weather forecasting, scientific simulations, (animated) graphics, fluid dynamic calculations, nuclear energy research, electronic design, and analysis of geological data (e.g. in petrochemical prospecting).

2.9 Types of computers based on principles of operation

There are three different types of computers according to the principles of operation. Those three types of computers are: Analog computers, Digital computers and Hybrid computers.

2.9.1 Analog Computers

Analog Computer is a computing device that works on continuous range of values. The results given by the analog computers will only be approximate since they deal with quantities that vary continuously. It generally deals with physical variables such as voltage, pressure, temperature, speed, etc.

2.9.2 Digital Computers

On the other hand a digital computer operates on digital data such as numbers. It uses binary number system in which there are only two digits 0 and 1. Each one is called a bit.

The digital computer is designed using digital circuits in which there are two levels for an input or output signal. These two levels are known as logic 0 and logic 1. Digital Computers can give more accurate and faster results. Digital computer is well suited for solving complex problems in engineering and technology. Hence digital computers have an increasing use in the field of design, research and data processing. Based on the purpose, Digital computers can be further classified as General Purpose Computers and Special Purpose Computers.

Special purpose computer is one that is built for a specific application. General purpose computers are used for any type of applications. They can store different programs and do the jobs as per the instructions specified on those programs. Most of the computers that we see today, are general purpose computers.

2.9.3 Hybrid Computers

A hybrid computer combines the desirable features of analog and digital computers. It is mostly used for automatic operations of complicated physical processes and

machines. Now-a-days analog-to-digital and digital-to-analog converters are used for transforming the data into suitable form for either type of computation.

For example, in hospital's ICU, analog devices might measure the patients temperature, blood pressure and other vital signs. These measurements which are in analog might then be converted into numbers and supplied to digital components in the system. These components are used to monitor the patient's vital sign and send signals if any abnormal readings are detected. Hybrid computers are mainly used for specialized tasks.

2.10 Conclusion

All these types of computers serve a different purpose but there are a few things common in all of them, that is, they help us save time and aid in achieving accuracy in our work. From occupying a whole room to fitting in our pocket, the computer has indeed come a long way. And the best part is that in spite of so many developments and differences in features, it's journey has just begun, as the possibilities of what they can do are limitless.