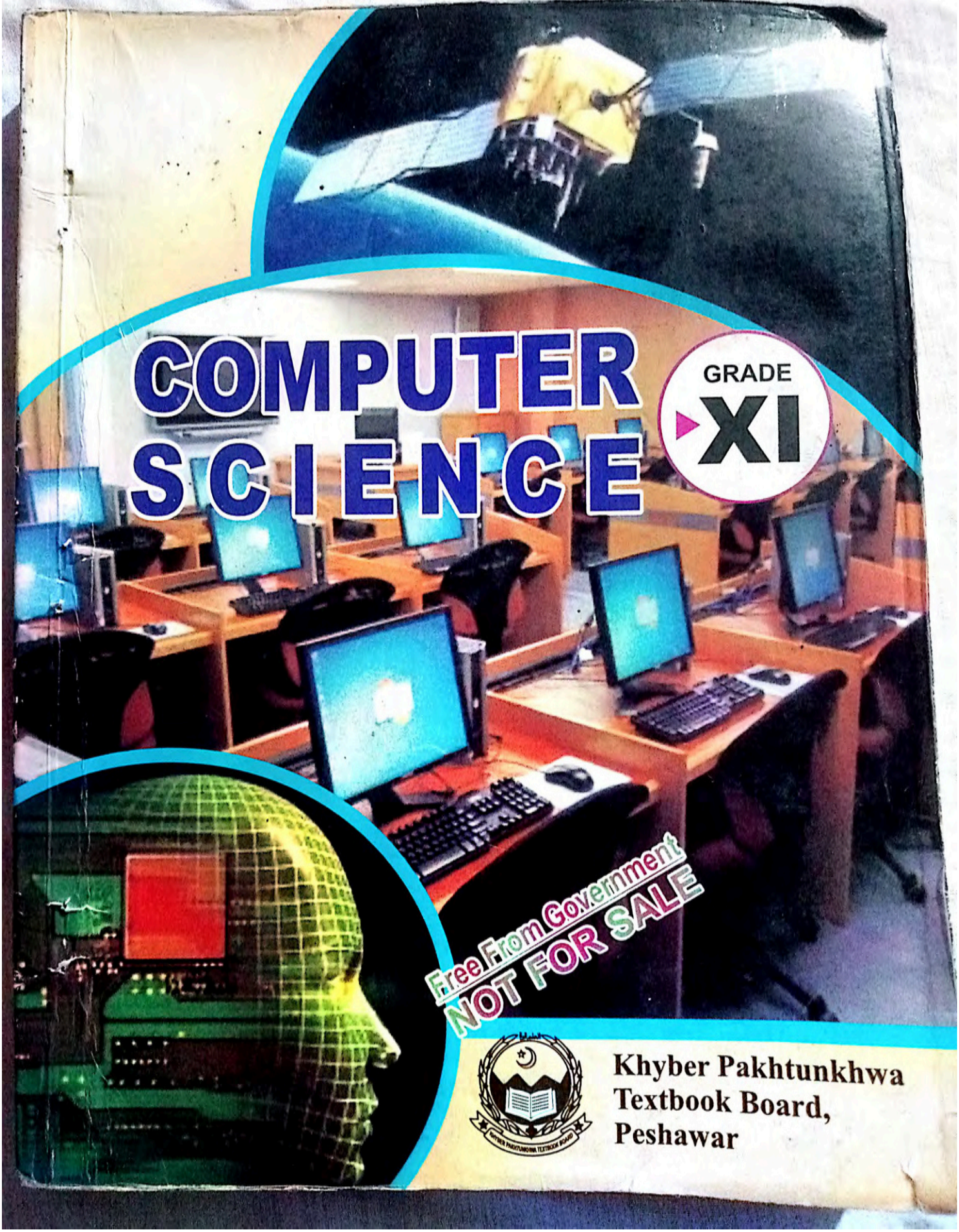

COMPUTER SCIENCE

GRADE XI

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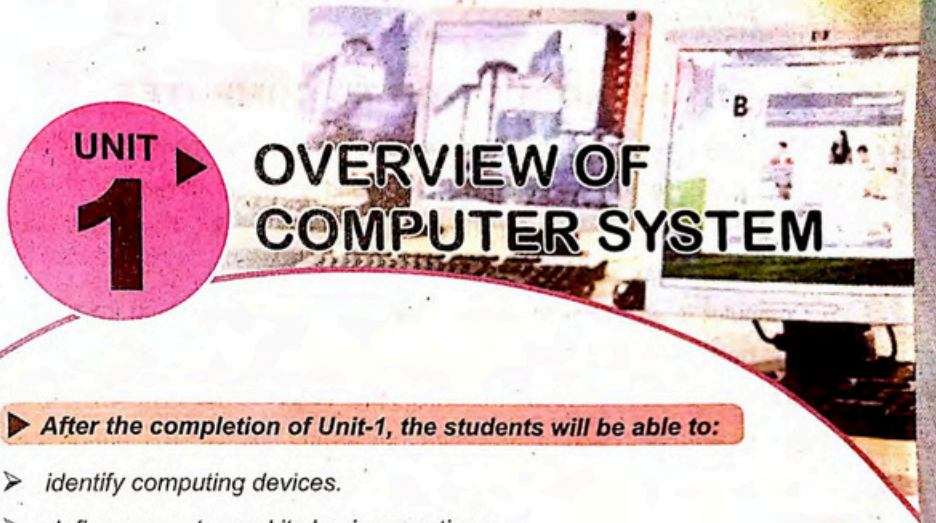

UNIT 1

OVERVIEW OF COMPUTER SYSTEM

After the completion of Unit-1, the students will be able to:

- *identify computing devices.*
- *define computer and its basic operations.*
- *classify computers (micro, mini, mainframe, super and mobile computers).*
- *differentiate between hardware and software.*
- *describe system software and application software.*
- *describe the types of system software (operating system, device driver, utility software, language processor).*
- *describe types of application software (productivity, business, entertainment, education software).*
- *elaborate licensed software, open source software, shareware and freeware.*
- *define firmware.*
- *define computer hardware (input/output, memory, cpu).*
- *describe different types of input devices.*
- *describe different types of output devices.*
- *differentiate between softcopy and hardcopy.*

1.1 INTRODUCTION TO COMPUTER

In today's information age, computers are used in every walk of life for different purposes. The computers are found in many devices from MP3 players to fighter aircraft and from toys to industrial robots. They have made the life of ma easy and comfortable.

"A Computer is an electronic device that accepts input data and instructions with the help of input devices, stores them until needed, processes it and then produces the output as a result with the help of output devices".

Computers are composed of the central processing unit (CPU), input devices, output devices, primary storage, secondary storage, and communication devices. The CPU is the main component of a computer that interprets and executes instructions.

1.1.1 Computing Devices

The term "Computing Device" is used for all such machines that can perform calculations. These calculations could be very simple, like adding two numbers to very complex, like managing the stock control system for a big shopping mall. Computer is considered to be the fastest computing device ever. A computing device can perform or help to perform computations. The computing devices can be classified into early and modern computing devices.

a. Early Computing devices

The **abacus**, which emerged about 5,000 years ago in Asia and is still in use today, may be considered the first computer. This device allows users to make computations using a system of sliding beads arranged on a rack.

Figure 1.1 Abacus

In 1694, a German mathematician and philosopher, Gottfried Wilhem Von Leibniz created a **Computing machine** that could add, subtract and multiply. Leibniz's mechanical multiplier worked by a system of gears and dials. The real beginnings of computers was laid by an English Professor of Mathematics, Charles Babbage. In 1822 Babbage proposed a machine to perform differential equations, called a **Difference Engine**. After working on the Difference Engine for 10 years, Babbage was suddenly inspired to begin work on the first general-purpose computer, which he called the **Analytical Engine**.

Figure 1.2 Leibniz Calculator

Figure 1.3 Analytical Engine

In 1889, an American inventor, Herman Hollerith applied the Jacquard loom concept to computing and developed a **tabulating machine**. His first task was to find a faster way to compute the U.S. census.

Vannevar Bush developed a **Calculator** for solving differential equations in 1931. The machine could solve complex differentials.

In 1940, John V. Atanasoff , a professor at Lowa State College and his graduate student, Clifford Berry, envisioned an **All-electronic computer** that applied Boolean algebra to computer circuitry.

Figure 1.4 Tabulating Machine

By 1941 German engineer Konrad Zuse had developed a computer, the **Z3**, to design airplanes and missiles.

Figure 1.5 Z3 Computer

Howard H. Aiken, a Harvard engineer working with IBM, succeeded in producing an all-electronic calculator by 1944. The Harvard-IBM Automatic Sequence Controlled Calculator, or **Mark I** for short, was an electronic relay computer. It used electromagnetic signals to move mechanical parts perform basic arithmetic as well as more complex equations.

Figure 1.6 Mark 1 Computer

Another computer development was the Electronic Numerical Integrator and Computer (**ENIAC**). It was developed by John Presper Eckert and John W. Mauchly. ENIAC was a general-purpose computer that computed at speed 1,000 times faster than Mark I.

Von Neumann designed the Electronic Discrete Variable Automatic Computer (**EDVAC**) in 1945 with a memory to hold both a stored program as well as data.

Figure 1.7 UNIVAC-1 Computer

In 1951, the **UNIVAC-I** (Universal Automatic Computer), built by Remington Rand, became one of the first commercially available computer.

b. Modern Computing devices

By 1948, the invention of the **transistor** greatly changed the computer's development. The first large-scale machines to take advantage of this transistor technology were early supercomputers, Stretch by IBM and LARC by Sperry-Rand. These computers, both developed for atomic energy laboratories, could handle an enormous amount of data, a capability much in demand by atomic scientists.

Throughout the early 1960's, there were a number of commercially successful computing devices used in business, universities, and government. One important example was the **IBM 1401** computer, which was universally accepted throughout the industry. The development of Integrated Circuits (**ICs**) in 1958 by Jack Kilby had completely revolutionized the computing devices in terms of processing speed, memory and peripheral supporting capabilities.

Figure 1.8 IBM 1401 Computer

The **Intel 4004** chip, developed in 1971, took the integrated circuit one step further by locating all the components of a computer (central processing unit, memory, input and output controls) on a single chip.

In 1981, IBM introduced its personal computer **(PC)** for use in the home, office and schools. Computing devices continued their trend toward a smaller size, working their way down from desktop to laptop computers to palmtop or tablet PCs which can fit inside a pocket. Figure 1.9 shows some modern computing devices.

Figure 1.9 Modern Computing devices

1.1.2 Computer and its Basic Operations

A computer is an electronic machine that accepts data, stores it, processes the data according to the instructions provided by the user, and finally returns the results to the user in the form of output. The computer can do all these operations with very high speed as compared to humans.

All computers perform four basic operations: input, processing, output, and storage to carry out any task. The four basic operations of computer are shown in Figure 1.10.

Input Operation: It is the process of capturing or accepting data or information, by using input devices. Input can take a variety of forms, from commands we enter by the keyboard to data from another computer or device.

Processing Operation: It is the transformation process to convert the input into output. The central processing unit (CPU) performs processing tasks under the direction of a program. To process the data, the CPU stores the program instructions and the data in the computer's memory, where it is directly accessible for processing.

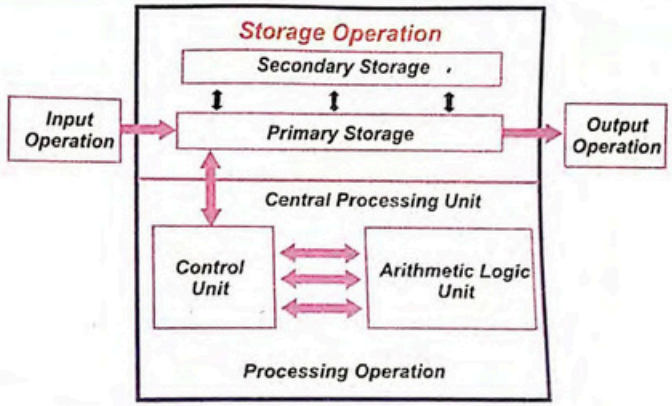

Figure1.10 Basic Operations of Computer

Output Operation: It is the result, which comes from the transformation process or it is the outcome of the processing. The monitor shows the results of processing operations on the screen. Speakers enable users to hear the results of sound processing. The printer generates output on paper.

Storage Operation: It is the process of storing the data or information or instructions, so that the user can retain and retrieve it whenever required. Computer data storage is referred to as storage or memory, which can save digital data. Examples are RAM, Hard Disks or removable memory sticks, etc.

1.1.3 Classification of Computers

Based on physical size, performance and application areas, the computers are generally classified into Microcomputers, Mainframe, Super and Mobile Computers.

a. Microcomputers

Microcomputers are more commonly known as personal computers (PCs). The microcomputer is generally the smallest and least expensive of the

computer family. Originally, these computers were designed only for individual users, but nowadays they have become powerful tools for many businesses that, when networked together, can serve more than one user.

Microcomputers include the following types:

- Desktop Computers
- Notebook Computers
- Laptop Computers
- Handheld Computers

i. Desktop Computers

A desktop computer is the most common type of micro computer. Many people use desktop computers at work, home, school, or the library. They can be small, medium, or large in style.

Figure1.11 Desktop Computer

ii. Notebook Computers

A notebook computer is designed to provide mobile computing that offer all the power that the mobile users require for work. This is easy to carry around and preferred by students and business people to meet their assignments and other necessary tasks.

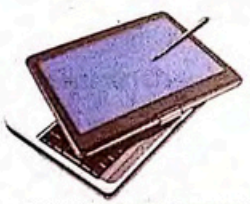

Figure1.12 Notebook Computer

iii. Laptop Computers

A laptop is a portable computer that a user can carry around. The biggest advantage of laptops is that they are lightweight and can be used anywhere and at any time, especially while travelling. Moreover, they do not need any external power supply because a rechargeable battery is completely self-contained.

Figure1.13 Laptop Computer

iv. Handheld Computers

Figure1.14 Handheld Computer

Handheld computers are a unique type of portable computers that allow users to work "on the go." Since these computers can easily be placed on the top of the palm, they are also known as palmtop computers and are lightweight. The most popular types of handheld computers include personal digital assistants (PDAs) and smartphones, iPhones and Treos).

b. Mainframe Computers

Mainframe computers are the second powerful and expensive computers than supercomputers. Mainframes are used mainly by large organizations for critical applications, typically bulk data processing such as census, industry and consumer statistics, enterprise resource planning, and financial transaction processing. These computers have powerful processors and large memories to process large amounts of data at very high speed, such as billions of instructions per second (BIPS). These computers support many terminals at the same time.

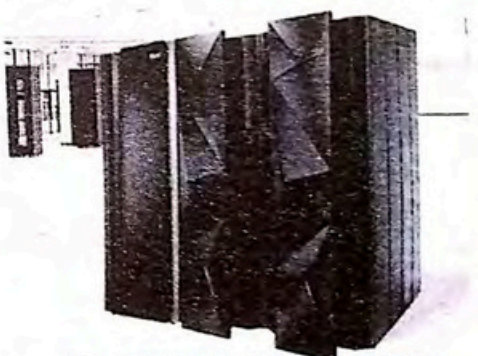

Fig 1.15 IBM's Z12 Mainframe Computer

These are widely used as super-servers for large client/server networks and for high volume websites. Mainly these are used by Airline companies, government departments, banks and insurance companies. Automated Teller Machine (ATM) is an example of a mainframe computer. Airline companies use mainframe systems for flight scheduling, reservations, ticketing, and meeting a range of customer service needs.

c. Super Computers

Supercomputers are the most powerful and the most expensive computers designed for scientific, engineering, and business applications. These computers can process billions to trillions of instructions per second. The usage includes world-wide weather forecasting, weapon research, stock analysis, automobile designing, special effects for movies and used for applications requiring complex mathematical calculations. Supercomputers possess extremely high computing speed, higher capacity for storage, faster primary memory and faster secondary storage as compared to other types of computers. IBM's supercomputer, **Sequoia**, can perform around 16 thousand trillion instructions per second.

These computers are used for research and exploration purposes, like **NASA** uses supercomputers for launching space shuttles, controlling them and for space exploration purpose.

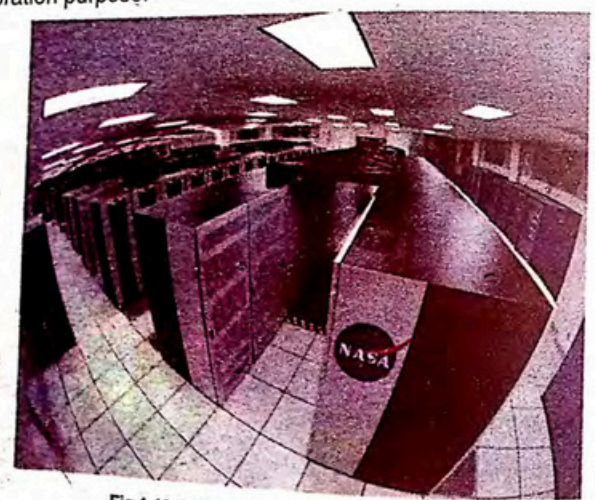

Fig 1.16 IBM's Supercomputer at NASA

d. Mobile Computers

Mobile Computing is a technology that allows processing and transmission of data, voice and video via a computer or any other wireless enabled device

without having to be connected to a fixed physical link. **Mobile Computers** are devices which are used for mobile.computing. These devices include portable Laptops, Smartphones, Tablet Pc's and Personal Digital Assistants.

Figure 1.17 Different types of Mobile computing devices

These devices will have receptor medium that are capable of sensing and receiving signals. These devices are configured to operate in full-duplex, whereby they are capable of sending and receiving signals at the same time. They do not have to wait until one device has finished communicating for the other device to initiate communications. In most cases, it would be a wireless network.

Mobile software is the actual program that run on the mobile hardware. It deals with the characteristics and requirements of mobile applications.

Since portability is the main factor, this type of computing ensures that users are not tied or pinned to a single physical location, but are able to operate from anywhere. It will incorporate all aspects of wireless communications.

1.1.4 Hardware and Software

Computer **hardware** refers to the physical parts or components of a computer such as monitor, keyboard, Computer data storage, hard disk, mouse, CPU, memory, motherboard and chips, all of which are physical objects that we can actually touch. Software refers to the set of programs or instructions that

enable the computer to do something and operate the hardware. A combination of hardware and software forms a usable computing system. Hardware and software work together in digital devices and computers to provide computerized functionality.

Difference between hardware and Software

	Hardware	Software
1	Hardware refers to the physical components of the computer required to store and execute the software.	Set of instructions that enable a user to interact with the computer.
2	It is physical in nature.	It is logical in nature.
3	Hardware understands only Binary Data or digits i.e. 0s and 1s in the form of voltage pulses	Software tells the Hardware everything in the form of Binary Data or digits i.e. 0s and 1s only.
4	Types: Input, storage, processing, output and communication devices.	Types: System software and Application software.
5	Hardware starts functioning once software is loaded.	Software includes the programs that run on the hardware, such as Microsoft XP is the software that makes the computer functional.
6	Hardware faults are physical.	Software faults are logical.
7	Examples: Monitor, printer, hard disk, video card, scanners, routers, and modems, etc.	Examples: Windows, Word, Excel, games, graphic programs and many more.

1-2 COMPUTER SOFTWARE

Computer software is set of instructions that direct the computer what to do and how to do. It turns the data into information that makes computer a useful machine. A computer needs instruction for doing a job because it is a machine and cannot do anything on its own. The instructions given to the computer are done with the help of a program which is written in a specific computer language and the set of such computer instructions (programs) are called software.

1.2.1 Types of Software

The computer software are broadly divided into two categories.

a. System Software
b. Application Software

a. System Software

System software are set of programs that operate and control the computer system. System software can do one or more of the following jobs:

- Supports the development of other application software.
- Supports the execution of other application software.
- Monitors the efficient use of various hardware resources.
- Communicate with and controls the operation of peripheral devices.

Operating system, device drivers and language processors are some examples of System software.

b. Application Software

Application software is a type of software that can be used for a variety of tasks. It is not limited to one particular function. It helps to solve problems in the real world. Examples include enterprise software, accounting software, office suites, graphics software, and media players.

1.2.2 Types of System Software

System software falls into following categories.

a. Operating System
b. Device Driver
c. Utility Software
d. Language Processor

a. Operating System

Operating system is a set of programs that manages and coordinates the hardware of a computer and provides services to application software, programmers and users of computer. Without operating system a computer cannot do anything useful.

Some common examples of operating systems include Windows, Macintosh Operating System, UNIX, Linux, OS/2, and DOS.

b. Device Driver

A device driver is a program that controls a particular type of device that is attached to the computer. Without driver, a hardware device would not be able to work with the computer. There are device drivers for printers, monitors, CD-ROM drives, diskette drives, etc. When we buy an operating system, many device drivers are built into the product. However, if we later buy a new type of device that the operating system did not anticipate, we will have to install the new device driver.

c. Utility Software

Utility software is a kind of system software designed to analyze, configure, optimize and maintain the computer. A single piece of utility software is usually called a utility or tool. Utility software usually focuses on how the computer infrastructure operates. Most of the operating systems come with several pre-installed utilities. Examples of utility software are Disk Defragmentation, Disk Cleaner, Backup, Antivirus etc.

d. Language Processor

Language processor or translator is a type of system software that translates a source program (other than machine language) into object program (Machine language).

There are three types of language processors.

i. Interpreter

A language processor that translates a high level language program line-by-line (statement-by-statement) and carries out the specified actions in sequence is called Interpreter. It translates and runs the program at the same time. It converts one program statement into machine language, executes it, and then proceeds to the next statement. Examples of languages that use interpreters include BASIC, LISP, Smalltalk, PHP and PERL.

ii. Compiler

Compiler is a program that translates source code (written by programmer in a high-level language e.g., C++) into a set of machine-language instructions that can be understood by a digital computer's CPU. Compilers are very large programs, with error-checking and other abilities. Examples of languages that use compilers include COBOL, FORTRAN, C/C++, JAVA, etc.

iii. Assembler

An assembler is a translator which is used to convert an assembly language program into a machine-language program for later execution. Assembly language is also called a Symbolic language.

1.2.3 Types of Application Software

Application software includes a variety of programs that can be subdivided into general-purpose and customized categories.

a. General Purpose Application Software

General-purpose applications software are programs that perform common information processing jobs for end users. These are called packages or

commercial software. A single software can be applied to a wide variety of tasks. By using such software a user can fulfill his or her general needs. These are divided into the following main categories.

i. Productivity Software
ii. Business Software
iii. Entertainment Software
iv. Education Software

b. Special Purpose or customized Application Software

The software that is designed to perform a specific task is known as special purpose application software. This is also called Custom software. The Software can perform only one task for which it has been designed. Custom software for the tasks of a large organization may be extremely complex and takes a lot of time to develop.

For example, Software to process inventory control, software to maintain Bank Accounts, etc.

Types of General Purpose Application Software

i. Productivity software

The productivity software is a type of Application software that is used to produce documents, presentations, databases, charts and graphs.

Some common types of productivity software are:

Database Software: This software allows creating a database and to retrieve, manipulate, and update the data that we store in the database. e.g. MySQL, Microsoft SQL Server and Oracle.

Multimedia Software: They allow the users to create and play audio and video media. They are capable of playing media files. Examples of this type of software include Real Player and Media Player.

Word processors: Word processing software is used to create, edit, and format text documents . The most popular examples of this type of software are MS-Word, WordPad and Notepad.

Spreadsheet Software: Spreadsheet software are used to work with numbers and formulae. User enters numbers in the grid of rows and columns on the worksheet and computer performs the calculations. MS Excel and Lotus 1-2-3 are examples of Spreadsheet software.

Presentation software: Presentation software is designed for creating on-screen presentations, reports, and slideshows. It allows to combine both text and graphics in a single document. Microsoft PowerPoint is the best example of presentation software.

ii. Business Software

Any software that helps business to increase or measure its productivity is called business software. The term covers a large variation of uses within the business environment, and can be categorized by using a small, medium and large matrix. Some common types of business software include, Marketing software, Payroll system, Inventory control system, Communication software and Accounting software, etc.

iii. Entertainment software

Entertainment software allows a computer system to be used as an entertainment tool. Some examples of entertainment software are Media Player, Video Game, etc.

iv. Educational software

Education software allows a computer system to be used as a teaching and learning tool. Some examples of education software are:

Computer Based Training (CBT): These Application software are used for the purpose of training.

Example: A training software for pilots how to fly an airplane and also for doctors to train them surgeries.

Encyclopedia: Encyclopedia software contains entries like dictionary and provides complete linguistic information about them. Encyclopedia articles focus on information or knowledge collected from the whole. The main aim of the encyclopedia software is to preserve the knowledge of present time to the

new generation for their use. Encarta and Britannica are popular encyclopedia software.

Computer Aided Learning (CAL): The term Computer Aided Learning (CAL) covers a range of computer-based packages, which aim to provide interactive instruction usually in a specific subject area. These can range from sophisticated and expensive commercial packages to applications developed by individuals.

Teachers can use audio video software aids through computer to prepare lesson plans. They can use Power Point to prepare electronic presentations about their lectures. These electronic presentations can be displayed on multimedia projectors in class rooms.

1.2.4 Software Terminologies

a. Licensed or Proprietary Software

A computer software that is licensed, giving the right to use the software under certain conditions, but restricted from other uses, such as modification, further distribution and re-building etc under exclusive legal right of the copyright holder. Examples of proprietary or licensed software include Microsoft Windows, Adobe Flash Player, Adobe Photoshop, Google Earth, Skype and WinZip etc.

b. Open Source Software

Computer software of which source code is also available to the user. Its license allows the user to study, change, improve and at a time also to distribute the software. Such software are often developed in a public, collaborative manner. Example Includes LINUX operating system.

c. Shareware

Shareware is also called trial-ware and refers to licensed software that is delivered to the user without payment for trial uses with limited functionality

and for a specific period after which it expires. Such software are developed for the purpose that the user becomes used to it and to knows that whether it meets his requirements or not. They are often downloadable from the Internet.

d. Freeware

The term freeware refers to the meaning "free software". It is a computer software available to the user with no cost or for an optional fee, but usually with one or more restrictions to the user like copy, distribute and make derivative works of the software.

1.2.5 Firmware

It is a term often used for the fixed, small programs embeded in hardware that control various electronic devices. These programs are written in machine languages and are permanently embedded in the hardware for which it is developed. Examples of devices containing firmware are ROM, Mobile phones, Digital cameras, Toys, etc. In all such devices firmware is used to enable the device's basic operation as well as implementing higher-level functions. Users can not change such software by their own.

1.3 COMPUTER HARDWARE

Hardware are the physical components that make up a computer system. They include all electrical and mechanical devices attached to the computer for the purpose of input, process, storage and output operations.

Generally all hardware components are classified as follows.

a. Input devices
b. Output devices
c. CPU
d. Memory

a. Input devices

Input devices are the external hardware components that are used to enter or accept data and instructions into computer memory for processing. Examples include: Keyboard, Mouse, Track ball, Joy stick, Touch Screen, Light pen, Scanner.

b. Output devices

Output devices are used to give results of processing to the user. Examples include: Monitors, Printers, Plotters, Speakers.

Some types of hardware can act as both, input and output. These devices are called **I/O devices**. One example is the Touch screen, a type of monitor. Users can also touch and give input to the computer using a touch screen.

c. CPU (Central Processing Unit)

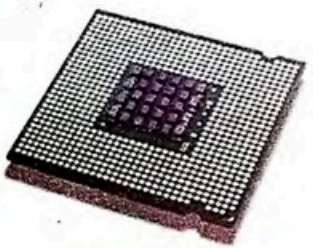

Figure 1.18 CPU

It is the main hardware of every computer system. It consists of two parts i.e the Control unit (CU) and Arithmetic Logic Unit (ALU).The CU is responsible for controlling the overall activities of the computer system while the ALU performs two types of operations i.e. the Arithmetic operations such as addition, subtraction multiplication, division, etc. and Logical operations such as comparison like greater than, smaller than, equal to.

d. Memory

Computer memory is a semiconductor hardware device used to store data or programs for use in computers either on permanent or temporary basis. Data or program in computer is represented as binary code, written as a stream of 0s and 1s. Each binary digit (or "bit") has bi-stable capability to represent 0 for OFF and 1 for ON. RAM and ROM are common examples of computer memory.

1.3.1 INPUT DEVICES

The following are some important types of input devices.

a. Keyboard

Keyboard is the most commonly used input device to enter data and instructions into the computer directly. Keyboards are almost compulsory part of every computer system. Keyboard has a set of keys like a typewriter. A keyboard has over 100 keys on it. When we press a key a predefined value (code) in the form of electrical signal is sent to the computer to tell it which key is pressed. The keys are arranged in different groups.

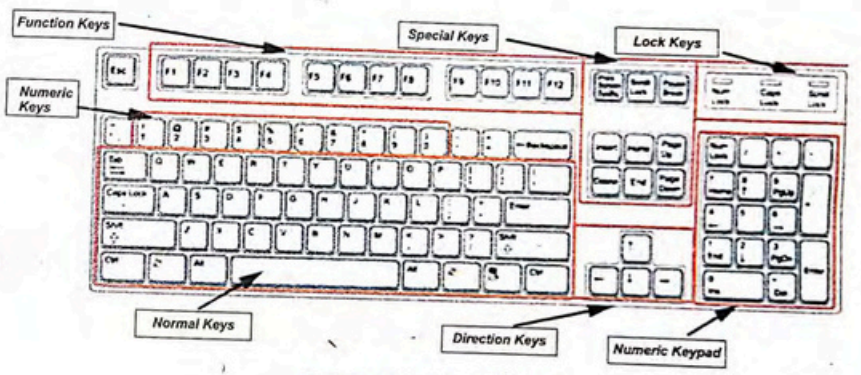

Figure 1.19 Standard Keyboard

b. Pointing Devices

Pointing devices are used to enter data into the computer by pointing the data or commands through Graphical User Interface (GUI). The pointing device movements are echoed on the screen by movements of the pointer. Examples of pointing devices include the mouse, trackball, light pen, joystick and touch screen.

i. Mouse

Figure 1.20 Mouse

Mouse is an input device with two or more buttons used to open and close files, navigate the screen or web sites. It is very user-friendly device. As we move the mouse, the mouse pointer (the little arrow on the screen) moves in the same direction. It controls the motion of pointer on screen. A mouse has two or three buttons called Left, Right and Middle button. Buttons are used to perform different functions. Old mouse has a rubber or metal ball inside its body. Mouse is rolled over a flat surface called mouse pad. The movement of ball is detected by internal circuits of mouse. These circuits convert this movement into digital signals, which are sent to computer. The optical mouse uses an LED to detect changes in movement by scanning a surface. A laser mouse is a type of mouse that uses a laser beam rather than a ball to track the movement of the user's hand. Mouse is used in many graphical applications.

ii. Trackball

Figure 1.21 Trackball

Track Ball is a pointing input device. This is like an upside-down mouse where the users roll the wheel in the direction they want the pointer to go. They are often used with video games and information kiosks. A tracker ball (or trackball) is an alternative to a mouse. It works in the same way as a mouse except that the ball is on top. This ball is moved by fingers or thumb and the pointer moves accordingly on screen. Tracker balls are used mainly when there is not enough space for a mouse as in portable computers or laptops.

iii. Joystick

Figure 1.22 Joystick

A joystick is an input device consisting of a stick situated on a base and reports its angle or direction to the device. It has one or more push-buttons whose state can also be read by the computer. Joysticks are often used to control video games.

iv. Touch Screen

Figure 1.23 Touch Screens

A Touch screen is an electronic visual display that can detect the presence and location of a touch within the display area with the help of pressure sensitive sensors. It can be touched with a finger or stylus (also called a pointing stick). It is used as mobile screens, in airports and large shopping malls to guide people.

v. Light Pen

Figure 1.24 Light Pen

A light pen is a pointing input device. It provides input in the form of a light-sensitive pen used in combination with a computer's monitor. It allows the user to point to display objects, or draw on the screen, in a similar way to a touch screen but with greater positional accuracy. A light pen can only work with any CRT-based display.

vi. Touchpad

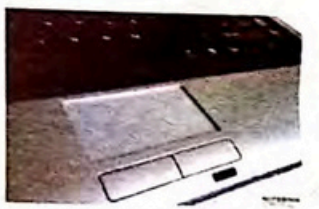

Figure 1.25 Touchpad

It is also called track-pad. It is a pointing device consisting of specialized surface that can translate the motion and position of a

user's fingers to a relative position on screen. They are commonly used in laptop computers. They can also be found on PDAs.

Figure 1.26 Microphone

c. Microphone

A microphone, also called a mic, is a voice input device. It uses special sensor that converts sound into an electrical signal. Microphones are used in many applications such as telephones, tape recorders and hearing aids.

d. Digital Cameras

A digital camera is an input device that takes videos or still photographs, or both, digitally by recording images via an electronic image sensor. Digital cameras are incorporated into many devices ranging from PDAs and mobile phones to vehicles.

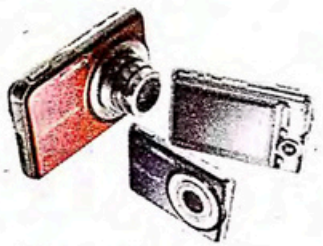

Figure 1.27 Digital Cameras

e. Scanner

Scanner is an input device. It is an electronic device that scans printed or handwritten text documents, images, or a particular object to convert them into a digital file format. The following are some common types of scanners.

i. Handheld Scanners

There are two forms of Handheld scanners; **Document Scanner** and **3D Scanner**. The document scanners are dragged across the surface of the image to be scanned and requires a steady hand.

The 3D scanners are used for producing three-dimensional models of objects and are expensive than document scanners. These scanners are used in industrial design, digital manufacturing and medical applications.

Figure 1.28 (a) Document Scanner

Figure 1.28 (b) 3D Scanner

ii. Flat-bed Scanner

A flatbed scanner has a glass pane, under which there is a bright light which illuminates the pane, and a moving optical array in CCD (Charged Couple Display) scanning. Images to be scanned are placed face down on the glass. The sensor array and light source move across the pane, reading the entire area. An image is therefore visible to the detector only because of the light it reflects.

Figure 1.29 Flatbed Scanner

iii. Optical Scanner

Optical Scanner uses optical light to read text or illustrations printed on paper and translate the information by digitizing an image, dividing it into a grid of boxes. The resulting matrix of bits, called a bit map, can then be stored in a file, displayed on a screen, and manipulated by programs.

Figure 1.30 Optical Scanner

f. Magnetic cards/devices based systems

Magnetic cards/devices based systems are widely used by many different organizations to provide both convenience and security. Hotels use them for room access, credit card companies use them for handling purchases, and

college campuses use magnetic cards for both building access and electronic payments. The following are some common types of magnetic cards.

i. Magnetic Ink Character Recognition (MICR)

MICR system reads characters printed in a special magnetic ink into the computer. The main users of MICR are banks. They use it to read information from cheques into their computers so that the cheques can be cashed. Figure 1.31 shows some information stored on a cheque using MICR.

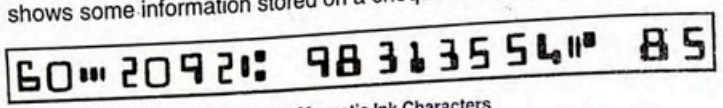

Figure 1.31 Magnetic Ink Characters

ii. Magnetic Stripe Card

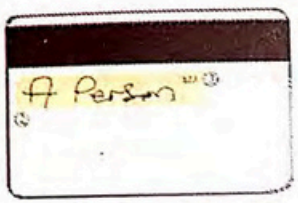

Figure 1.32 Magnetic Stripe Card

Magnetic stripes are built into many plastic cards such as credit cards. The strip can contain up to 60 characters (numbers or digits) of information which is stored magnetically. Usually the information is put onto the strip when the card is made and is never changed. To read the card it is swiped through a Magnetic stripe reader, which quickly and accurately reads the pattern of magnetism. The information stored on the card can be destroyed by exposure to magnetic fields, by scratching or by coming into contact with some liquids.

iii. Smart card

A smart card contains a small RAM chip. When the card is put into a Smart card reader data can be read from the card or written onto it. A smart card can store much more data than a magnetic stripe. It is more secure than Magnetic stripes though more expensive to produce.

Figure 1.33 Smart Card

A new generation of smart cards is now appearing which contain a small microprocessor as well as memory.

1.3.2 OUTPUT DEVICES

Output devices are computer hardware which are used to communicate the results of data processing carried out by the computer to the users. The following are different types of output devices.

a. MONITORS

A monitor or display, sometimes called a visual display unit, is an electronic output device for computers. It displays the results of the user activities. The output produced by monitors is called **softcopy** output. There are different types and sizes of monitors, each can be distinguished on the basis of the following features:

Size: The size of the monitor is measured diagonally. Standard size is 15 to 19 inches.

Color: The monitor can be either monochrom (one color) or color monitor.

Resolution: The number of pixels (or dots) per square inch is called resolution.

Refresh Rate: It is the speed with which the monitor redraws the screen in per unit time.

Dot Pitch: The distance between the pixels on the monitor is called dot pitch. The lesser dot pitch monitors have sharp images.

CRT (cathode ray tube) and LCD (Liquid Crystal Display) are the two common types of monitors.

i. Cathode Ray Tubes (CRT) Monitors

Figure 1.34 CRT Monitor

CRT monitors are similar to the standard television sets because they contain Cathode Ray Tube. The Cathode Ray Tube (CRT) is a vacuum tube containing an electron gun and a phosphors coated screen. The electron gun, fires a beam of electrons which falls repeatedly on the phosphors coated screen and it glows for a fraction of a second. In color CRT monitors there are three electron guns while the phosphors atoms are in three different colors i.e. Red, Green, Blue (RGB). Other colors are produced by the combinations of these three colors.

ii. Liquid crystal display (LCD) Monitors

Figure 1.35 CRT Monitor

Liquid Crystal Display (LCD) is a thin and light weight monitor. It contains a substance called liquid crystal between two sheets. The molecules of this substance are lined up in such a way that the light behined the screen is blocked or allowed to create an image on the screen. LCDs provide a sharper image than CRT monitors and emit less radiation. They are used in a wide range of applications, including computer monitors, televisions, and clocks. They are usually more compact, lightweight, portable, less expensive, more reliable, and easier on the eyes than CRT monitors.

b. PRINTERS

Printers are output devices which are used to produce output on physical media such as paper. The output produced by printers is called **hardcopy** output. Printers are divided into the following two categories.

i. Impact Printers
ii. Non-Impact Printers

i. Impact Printers

An Impact printer creates an image by pressing an inked ribbon against the paper, using pins or hammers to shape the image. It works like a typewriter, which uses small hammers to strike the ribbon. Each hammer is embossed with the shape of an alphanumeric character; that shape is transferred through the inked ribbon onto the paper, resulting in a printed character. Common types of impact printers are Dot Matrix printer, Drum printer and Chain printer.

Dot-Matrix Printer

Figure 1.36 Dot Matrix Printer

A type of impact printer that produces text and graphics by striking pins against an ink ribbon to print closely spaced dots in the appropriate shape. Different characters are printed by using different pin combinations. The printer receives the data from the computer and translates it to identify which character is to be printed and the printing head prints dots on the paper.

Dot-matrix printers vary in terms of speed and the number of pins they have. The number of pins, which can vary between 9 to 24, determines the quality of the print job. Dot matrix printers are commonly used for printing invoices, purchase orders, shipping forms and labels.

Figure 1.37 Drum Printer

Drum Printer

In these printers a fixed font character set is engraved onto a number of print wheels. The wheels, joined to form a large drum, spin at

high speed. As the desired character for each column passes the print position, a hammer strikes the paper from the rear, which presses the paper against the ribbon and the drum, causing the desired character to be printed on the continuous paper. A full set of hammers delivers (600 lines-per-minute of output) and a half set of hammers delivers (300 LPM).

Chain Printer

A chain printer uses a printing mechanism that uses character typefaces linked together in a chain. The chain spins horizontally around a set of hammers aligned with each position. When the required character is in front of the selected print position, hammer in that position hits the paper into the ribbon against the character in the chain.

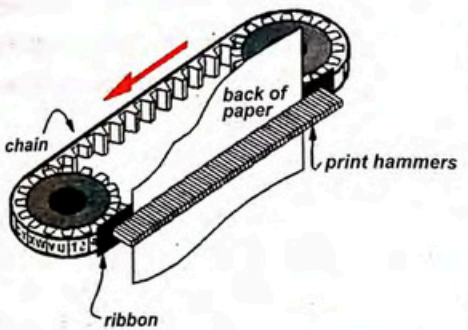

Figure 1.38 Chain Printer mechanism

This printer is not commonly found around microcomputers, because it is a very expensive, high-speed machine designed originally for mainframes and minicomputers.

ii. Non-impact printers

Non-impact printers print characters and graphics on the paper with Lase or with sprayed ink or with heat and pressure without striking the paper. These printers are faster, not noisy and have high quality of print but costly as compared to impact printers. Laser-jet or inkjet and Laser printers are common types of non-impact printers.

Inkjet or Laser jet Printer

Inkjet or Laser jet Printer is the most popular printer. It sprays tiny drops of ink onto a page to create an image. This is achieved by using magnetized plates

which direct the ink's path onto the paper in the desired pattern. Ink-jet printers are capable of producing high quality print which almost matches the quality of a laser printer. A typical ink-jet printer has a resolution of 300 to 600 dots per inch (dpi).

Figure 1.39 Inkjet Printer

Laser Printer

Laser printer utilizes a laser beam to produce an image on a drum. The drum is then rolled through a toner (containing dry ink), and the electrically charged portions of the drum pick up ink. Finally, using a combination of heat and pressure, the ink on the drum is transferred onto the page. Laser printers print very fast and produce very high-quality print. Laser printers are sometimes called page printers.

Figure 1.40 Laser Printer

One of the important characteristics of laser printers is their resolution. The available resolutions range from 300 dpi to 1200 dpi.

c. PLOTTERS

Plotters are hardcopy output devices. They are mainly used by architects, engineers, and others who need to generate high-precision graphical output of large sizes on papers. Plotters are more expensive than printers.

Figure 1.41 Drum Plotter

i. Drum Plotter

In the drum plotter the paper, on which the design has to be made is placed over the

drum, which can rotate in both clockwise and anti-clockwise direction. The drawing pens are mounted on the drum. During rotation of the drum the pens move left and right and create the desired image on the paper. The advantage of drum plotter is that the length of the plot is almost unlimited and the width of the image depends on the width of the drum.

ii. Flatbed Plotter

A flatbed plotter plots a design on a sheet in such a way that the sheet is spread and fixed over a rectangular flatbed table. In such plotters the pen holding mechanism is designed to provide all types of motions under the computer control, necessary to draw a design or graph. Most flatbed plotters have one or more pens of different colors and width.

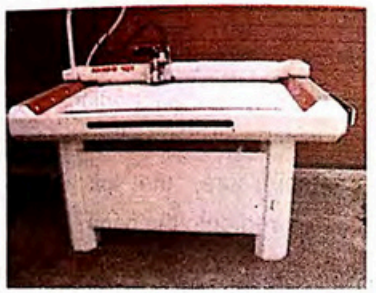

Figure 1.42 Flatbed Plotter

d. Speakers

Speakers and headphones are the audio output devices. These devices have an internal amplifier and are connected to a sound card in the system unit. The sound card is used to capture as well as playback recorded sound. Laptops come with integrated speakers.

Figure 1.43 Speakers

1.3.3 Difference between Soft Copy and Hard Copy

	Soft Copy	Hard Copy
1	The output which is stored in a memory and displayed on the screen is called Soft Copy	The output which is printed on a paper is called Hard Copy.
2	It is easy to modify and correct.	It is hard to modify and correct.
3	An electronics medium is required to read out softcopy output.	No electronics medium is required to read out hard copy output.
4	Soft copy is intangible	Hard copy is tangible.
5	Soft Copy is electronic/digital version of a document.	Hard copy is a physical version of a document printed on paper.
6	Soft copy can be transmitted electrically to any place.	Hard copy can only be transmitted physically from one place to the other.

SUMMARY

- A Computer is an electronic device that accepts input data with the help of input devices, stores it until needed, processes it and then displays the output as a result with the help of output devices.
- The term "Computing Device" is used for all such machines that can perform calculations.
- The abacus, which emerged about 5,000 years ago in Asia and is still in use today, may be considered the first computer.
- By 1948, the invention of the transistor greatly changed the computer's development.
- Processing operation is the transformation process to convert the input into output.
- Storage operation is the process of storing the data or information or instructions, so that the user can retain and retrieve it whenever required.
- Microcomputers are more commonly known as personal computers (PCs). The microcomputer is generally the smallest and least expensive of the computer family.
- Mainframe computers are the second powerful and expensive computers than supercomputers. Mainframes are used mainly by large organizations for critical applications, typically bulk data processing such as census, industry and consumer statistics, enterprise resource planning, and financial transaction processing.
- Supercomputers are the most powerful and the most expensive computers designed for scientific, engineering, and business applications. These computers can process billions to trillions of instructions per second.
- Mobile Computing is a technology that allows transmission of data, voice and video via a computer or any other wireless enabled device without having to be connected to a fixed physical link.
- Computer hardware refers to the physical parts or components of a computer such as monitor, keyboard, Computer data storage, hard disk, mouse, CPU, memory, motherboard and chips.

- Computer software is a step by step set of instructions that directs the computer what to do and how to do. It turns the data into information - that makes a computer useful.
- System software are set of programs that operate and control the computer system.
- Application software is a type of software that can be used for a variety of tasks according to the user requirements.
- Operating system is a set of programs that manages and coordinates the hardware of a computer and provides services to application software, programmers and users of computer.
- A device driver is a program that controls a particular type of device that is attached to the computer.
- Utility software is a kind of system software designed to analyze, configure, optimize and maintain the computer.
- Language processor or translator is a type of system software that translates a source program (other than machine language) into object program (Machine language).
- General-purpose applications software are programs that perform common information processing jobs for end users.
- The software that is designed to perform a specific task is known as special purpose application software.
- The productivity software is a type of application software that are used to produce documents, presentations, databases, charts and graphs.
- Licensed or Proprietary Software is a computer software that is licensed, giving the right to use the software under certain conditions, but restricted from other uses, such as modification, further distribution and re-building under exclusive legal right of the copyright holder.
- Open Source Software is computer software of which source code is also available to the user.
- Shareware is also called trial-ware and refers to licensed software that is delivered to the user without payment for trial uses with limited functionality and for a specific period after which it expires.

- Firmware is a term often used for the fixed, small programs embedded in hardware that control various electronic devices.
- Input devices are the external hardware components that are used to enter or accept data and instructions into computer memory for processing.
- Output devices are used to display results of processing to the user.
- CPU (Central Processing Unit) is the main hardware of every computer system. It consists of two parts i.e. the Control unit (CU) and Arithmetic Logic Unit (ALU).
- Computer memory is a hardware device used to store data or programs for use in computers either on permanent or temporary basis.
- Scanner is an input device. It is an electronic device that scans printed or handwritten text documents, images, or a particular object to convert them into a digital file format.
- Printers are output devices which are used to produce output on physical media such as paper.
- Plotters are hardcopy output devices. They are mainly used by architects, engineers, and others who need to generate high-precision graphical output of large sizes on papers.

EXERCISE

Q1. Select the best choice for the following MCQs.

i. Which of the following device is considered to be the first computer?
A. Difference Engine B. ABACUS
C. Tabulating Machine C. Mark 1

ii. Which of the following is the process of storing the data, information and instructions?
A. Input operation B. Processing operation
C. Output operation C. Storage operation

iii. _____ computers are the second powerful and expensive computers than supercomputers.
A. Microcomputers B. Mini computers
C. Mainframe computers C. Laptops

iv. Which of the following software are set of programs that operate and control the computer system?
A. Freeware B. Shareware
C. System Software D. Application Software

v. _____ is not a portable computer.
A. Laptop B. PDA
C. Notebook D. Mainframe

vi. _____ is a program that controls a particular type of device that is attached to the computer.
A. Operating System B. Device Driver
C. Utility Software D. Language Processor

vii. Which software is used to analyze, configure, optimize and maintain the computer?

A. Operating System B. Device Driver
C. Utility Software D. Language Processor

viii. _____ translates a high level language program line-by-line.

A. Interpreter B. Compiler
C. Assembler D. Processor

ix. Which of the following is not an input device?

A. Mouse B. Scanner
C. Digital Camera D. Speaker

x. Which software is delivered to the user without payment for trial uses with limited functionality and for a specific period of time?

A. Open source B. Firmware
C. Shareware D. Freeware

xi. _____ is a term often used for the fixed, small programs that control various electronic devices.

A. Open source B. Firmware
C. Shareware D. Freeware

xii. The number of pixels (or dots) per square inch area of a monitor is called _____.

A. Size B. Resolution
C. Dot Pitch D. Refresh Rate

xiii. The distance between the pixels on the monitor is called _____.

A. Size B. Resolution
C. Dot Pitch D. Refresh Rate

xiv. The output produced by printers is called _____.

A. Hardcopy output B. Softcopy output
C. Plain output D. Rough output

xv. _____ Printer creates an image by pressing an inked ribbon against the paper.

A. Laser jet Printer B. Plotter
C. Laser Printer D. Dot-Matrix Printer

Q2. Give short answers to the following questions.

i. What is a Computer?
ii. What is processing operation?
iii. Show basic operations of a computer with the help of a block diagram.
iv. What is a notebook computer?
v. State five differences between hardware and software.
vi. Differentiate between an Interpreter and a compiler.
vii. How Application software help Users?
viii. Differentiate between shareware and freeware.
ix. What is Licensed Software?
x. What is firmware?