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COMPUTER FUNDAMENTALS

INTRODUCTION

The term computer is derived from the word 'compute', which means 'to calculate'. The impact of computers in our day to day life is tremendous and visible in all fields. Similarly in modern libraries, various activities are performed with the help of computers.. In this lesson, you will learn about works, and functions of a computer.

OBJECTIVES

After completing through this lesson, you will be able to:

- define a computer, identify its characteristics and functions;
- list types of computers;
- explain hardware and software;
- recognize Input and Output units and devices; and
- list types of operating systems;

1.1 WHAT IS A COMPUTER

Computer is an electronic device which is capable of receiving information or data and perform a series of operations in accordance with a set of operations. This produces results in the form of data or information. Computer is a machine capable of solving problems and manipulating data. It accepts and processes the data by doing some mathematical and logical operations and gives us the desired output.

Therefore, we may define a computer as an electronic device that transforms data into information. Data can be anything like marks obtained by you in various subjects, it can also be name, age, sex, weight, height, etc. of all the students in your class or income, savings, investments, etc. of a country.

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1.2 BASIC COMPUTER OPERATIONS

A computer basically performs five major operations or functions such as :

- Accepts data or instructions by way of input.
- Stores data,
- Processes data as required by the user,
- Gives results in the form of output, and
- Controls all operations inside a computer.

Each of these operations are discussed and shown in the figure given below:

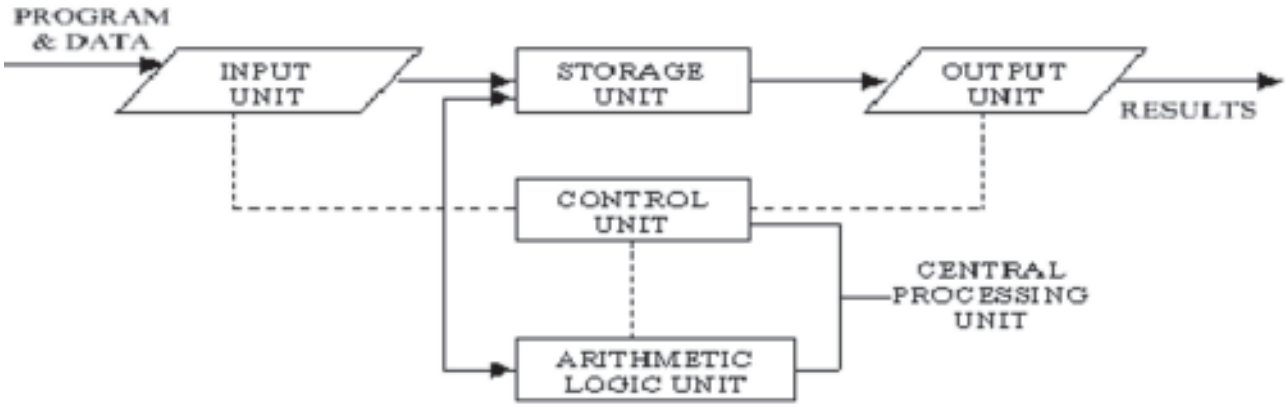

Fig.1.1 Basic computer Operations

Let us know the details of basic computer operations.

1.2.1 Input

This is the process of entering data and programs in the computer system. Therefore, the input unit takes data from us to the computer in an organized manner for processing.

1.2.2 Storage

The data and instructions are saved/ stored permanently in storage unit. The storage unit performs the following major functions:

- All data and instructions, before and after processing, are stored here,and
- Intermediate results of processing are also stored here.

1.2.3 Processing

The task of performing operations like arithmetic and logical operations is called processing. The Central Processing Unit (CPU) takes data and instructions from the storage unit and makes all sorts of calculations based on the instructions given and the type of data provided. After this data is sent back to the storage unit.

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1.2.4 Output

This is the process of producing results from the data for getting useful information. The output produced by the computer after processing is stored inside the computer before it is given to you in human readable form. The output is also stored inside the computer for further processing.

1.2.5 Control

Controlling of all operations like input, processing and output are performed by control unit. It takes care of step by step processing of all operations inside the computer.

1.3 COMPUTER SYSTEM

In order to carry out its operations, a computer system is divided into three separate units. They are: 1) Arithmetic logical unit, 2) Control unit, and 3) Central processing unit. All these three units are known as functional units.

1.3.1 Arithmetic Logical Unit (ALU)

The processing of the data and instructions are performed by Arithmetic Logical Unit. The major operations performed by the ALU are addition, subtraction, multiplication, division, logic and comparison. For processing, data is transferred from storage unit to ALU. After processing, the output is returned back to storage unit for further processing or for storing purpose.

1.3.2 Control Unit (CU)

The next component of computer is the Control Unit, which acts like the supervisor seeing that things are done in proper way. The control unit determines the sequence in which computer programs and instructions are to be executed. Activities like processing of programs stored in the main memory, interpretation of the instructions and issuing of signals for other units of the computer to execute them are carried out by CU. It coordinates the activities of computer's peripheral equipment which include input and output devices. Therefore, it is the manager of all the operations mentioned in the previous section.

1.3.3 Central Processing Unit (CPU)

The ALU and the CU of a computer system are jointly known as the central processing unit(CPU) . You may call CPU as the brain of any computer system. It is just like brain that takes all major decisions, makes all sorts of calculations and directs different parts of the computer functions by activating and controlling the operations. The CPU (Central Processing Unit) is the device that interprets and executes instructions.

A computer system includes a computer, peripheral devices, and software.

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1.4 CHARACTERISTICS OF COMPUTER

Let us now identify the major characteristics of a computer. These are:

1.4.1 Speed

As you know computer can work very fast. It takes only a fraction of a second for calculations that manually take hours to complete. It takes few minutes for the computer to process huge amount of data and give the result.

1.4.2 Accuracy

The degree of accuracy of computer is very high and every calculation is performed with the same accuracy. The accuracy level is determined on the basis of design of the computer. The errors in computer are mainly due to human and inaccurate data.

1.4.3 Diligence

A computer is free from tiredness, lack of concentration, fatigue, etc. It can work for hours without any error.

1.4.4 Versatility

The computer is highly versatile. You can use it for a number of tasks simultaneously such as, for inventory management, preparation of electrical bills, preparation of pay cheques, etc. Similarly, in libraries computer can be used for various library house keeping operations like acquisition, circulation, serial control, etc. and also by students for searching library books on the computer terminal.

1.4.5 Power of Remembering

Computer has the power of storing large amount of information or data. Any information can be stored and recalled whenever required for any numbers of years. It depends entirely upon you how much data you want to store in a computer and when to retrieve or delete stored data.

1.4.6 Dumb Machine with no IQ

Computer is a dumb machine and it cannot do any work without instructions from the user. It performs the instructions at a tremendous speed and with great accuracy as it has the power of logic. It is for you to decide what you want to do and in which sequence. So, a computer cannot take decision of its own as human beings can take.

1.4.7 Storage

The computer has an in-built memory where it can store huge amount of data. You can also store data in secondary storage devices such as CDs, DVDs, and pen drives which can be kept outside the computer and can be carried to other computers.

INTEXT QUESTIONS 1.1

Fill in the blanks

1. Computer is a _____ machine with no IQ.

2. Computer can perform number of tasks _____.

3. The task of performing operations like _____ operations is called processing.

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1.5 GENERATION OF COMPUTERS

The history of computer development is in reference to different generation of computing devices. The first generation computers appeared in mid-1940s. The present day computer, however, has undergone rapid changes for the last seven decades. This period, during which the evolution of computer took place, can be divided into five distinct phases known as Generations of Computers that are being presented in the table given below:-

Generation	*Period*	*Technology*
First	1946-59	Based on vacuum tube technology
Second	1957-64	Transistor based technology replaces vacuum tube
Third	1965-70	Integrated circuit (IC) technology developed
Fourth	1970-90	Microprocessors developed
Fifth	1990-till date	Use of Bio-Chip technology

INTEXT QUESTIONS 1.2

Fill in the blanks.

1. The evolution of computer can be divided into _____ distinct phases.

2. The first generation of computer used _____ Technology.

1.6 TYPES OF COMPUTERS

Present day computers can be categorized as below:

a) Super Computer

Supercomputers are fastest computers and are very expensive. These are employed for specialized applications that require immense amounts of mathematical calculations. For example, weather forecasting requires a supercomputer. Other uses of supercomputers include animated graphics, fluid dynamic calculations, nuclear energy research, and petroleum exploration.

b) Mainframe Computer

It is a very large and expensive computer and is capable of supporting hundreds, or even thousands of users simultaneously. In the hierarchy that starts with a simple microprocessor (in watches, for example) at the bottom and moves to supercomputers at the top, mainframes are just below supercomputers. In some ways, mainframes are more powerful than supercomputers because they support simultaneous programs. But, supercomputers can execute a single program faster than a mainframe.

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Fig.1.2: Mainframe Computer

The chief difference between a supercomputer and a mainframe is that a supercomputer channels all its power into executing a few programs as fast as possible, whereas a mainframe uses its power to execute many programs concurrently.

c) Mini Computer

It is a mid sized computer in size and power. It lies between workstations and mainframes. In the past decade, the distinction between large minicomputers and small mainframes has blurred. In general, a minicomputer is a multiprocessing system capable of supporting from 4 to about 200 users simultaneously.

Fig.1.3:Minicomputer

d) Micro Computer

i. **Desktop Computer:** a personal or micro-mini computer sufficient to fit on a desk.

Fig.1.4:Desktop Computer

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ii. **Laptop Computer:** a portable computer complete with an integrated screen and keyboard. It is generally smaller in size than a desktop computer and larger than a notebook computer.

Fig.1.5:Laptop Computer

iii. **Palmtop Computer/Digital Diary /Notebook /PDAs (Personal Digital Assistant):** a hand-sized computer, Palmtop, does not have keyboard, but its screen serves both as an input and output device.

Fig.1.6

Fig.1.7

Fig.1.8

e) Workstations

It is a terminal or desktop computer in a network. In this context, workstation is just a generic term for a user's machine (client machine) in contrast to a "server" or "mainframe."

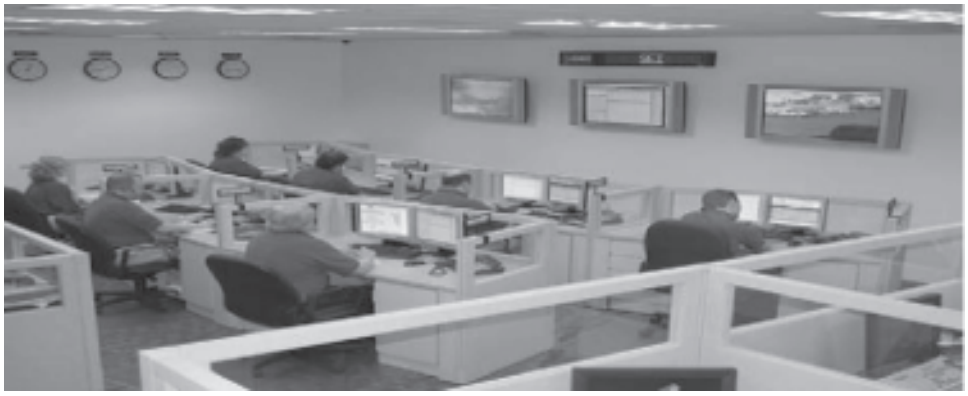

Fig.1.9:Work station

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Activity 1.1

1. Observe and make a list of input and output units in your computer system.

INTEXT QUESTIONS 1.3

State True or False.

1. A desktop computer is a portable computer complete with an integrated screen and keyboard.
2. Super computes are fastest computers and are very expensive.
3. A workstation is a terminal or desktop computer in a network.

Let us now learn about Hardware and Software.

1.7 HARDWARE AND SOFTWARE

1.7.1 Hardware

Hardware refers to the physical equipment used for the input, processing, output and storage activities of a computer system. It consists of mechanical and electronic devices, which we are able to see and touch easily. Some of them are central processing unit (CPU), primary storage devices, secondary storage devices, input and output unit and communication devices. These are explained below:-

- **Central processing unit (CPU):** It manipulates the data and controls the tasks performed by the other components.
- **Primary storage:** It stores temporarily data and program instructions during the processing.
- **Primary memory (main memory):** These are RAM (Random Access Memory/Read-Write Memory), and ROM (Read-only-memory).
- **Secondary storage:** These store data and programs for future use. These are Hard Disk (Local Disk) and External Hard Disc, Optical Disks,(CDR, CD-RW, DVD-R, DVD-RW), Pen Drive, Memory Cards, etc.

Fig.1.10

Fig.1.11

Fig.1.12

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Secondary Storage Devices

Communication Devices: These are used for communication or flow of data from one computer to another computer. Some of them are Modem, Switch, Router, TV tuner card, etc.

Fig.1.13

Fig.1.14

Fig.1.15

Communication devices

1.7.2 Software

A computer cannot do anything on its own. It has to be guided by the user. We have to give a sequence of instructions to the computer in order to do any specific job. Software is simply a computer program or a set of instructions. Software guides the computer at every step indicating where to start and stop during a particular job. The process of software development is called programming.

1.7.2.1 Types of software

There are two types of software, namely, system software and application software.

System software

System Software are general purpose programs designed to perform tasks such as controlling all operations required to move data into and out of the computer. It communicates with keyboard, printer, card reader, disk, tapes, etc. It also monitors the use of various hardwares like memory, CPU, etc. System software acts as an interface between hardware and application software. Remember that it is not possible to run applicaion software without system software. Some of the system softwares are Disc Operating System(DOS), Windows, Unix/Linux, MAC/OS X etc.

Application software

It is a set of programs, which are written to perform specific tasks of the users of computer. These softwares are developed in high level languages to help the user to get the computer to perform various tasks. Some of the application software are MS Office, Macromedia (Dreamweaver, Flash, Freehand), Adobe (PageMaker, PhotoShop), LIBSYS, SOUL, WINISIS, KOHA, etc.

INTEXT QUESTIONS 1.4

What is full form of the following:

1. RAM

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2. ROM
3. CD
4. DVD

1.8 INPUT AND OUTPUT UNIT

An input and output unit consists of two parts namely, input devices and output devices. Normally, an Input and output unit can control one or more peripheral devices. These units are explained below:

1.8.1 Input Unit

The data is entered / input into the computer through input devices. The input devices translate the data / information from a natural language in which the user is working, into the machine language which the computer can understand. Computer language is in the form of binary code (0 and 1). Input devices are classified as follows:

- Human data entry devices - keyboard, mouse, joystick, trackball, digitizing labels and; pick devices - light pen touch screens.

Fig.1.16:Keyboard

Fig.1.17:Scanner

Fig.1.18: Web camera

Fig.1.19:Joystick

Input Devices

- **Source data entry devices** (Audio input –speech recognition; video input - digital camera; scanners - optical scanner OCR, OMR, MICR, Barcode Reader). Pictures of some of the source data entry devices are given in Fig. 1.20 to 1.23.

Fig.1.20:Barcode Reader

Fig.1.21: Microphone

Fig.1.22: Optical Mark Reader

Fig.1.23:.:Magnetic Card Reader

- **Output Unit**

  The output unit accepts output data from computer via output devices and transforms the data into human readable form. All the information inside the computer is in the form of binary digits (0 and 1). Output devices convert them to numbers, words, graphics, sound and motion which we can easily understand.

Output devices are classified as

- Hard copy device (Printer, Plotter, Computer Output on Micro-film)
- Soft copy devices (Monitor, Visual Display Terminal, Video Output and Audio Response). Output devices are shown in Fig. 1.24 to 1.27

Fig.1.24:Monitor

Fig.1.25: Printer

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Fig.1.26:Video Output

Fig.1.27: Audio Unit

Activity 1.2

1. Differentiate between the features of a Desktop, laptop and a palmtop by actually handling each one of them.

INTEXT QUESTIONS 1.5

Tick Mark (√) the correct answer.

1. Which one is not an output device?
   a) Printer
   b) Monitor
   c) Keyboard
   d) Modem
2. Which one works as an input as well as an output device?
   a) Modem
   b) Scanner
   c) Mouse
   d) Monitor

Let us now learn about operating systems.

1.9 OPERATING SYSTEM

An Operating System is a system software that acts as an interface between a user and hardware of a computer. Modern operating systems usually feature a graphical user interface which uses a pointing device such as mouse or keyboard for input. Operating Systems are viewed as resource managers that manage the resources of a computer. The main resource is the computer hardware which is in the form of processors, storage, input/output devices, communication devices, and data. A good operating system should be efficient, reliable, take short time in execution of programs, occupy small memory as small as possible.

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The main Operating Systems are:

1. **Network Operating System**
   - WINDOWS 2000
   - Unix
   - Linux
2. **Desktop Operating System**
   - WINDOWS
   - DOS (Disc Operating System)
   - Mac OS
3. **Mobile Operating System**
   - Palm OS
   - Pocket PC

Some of the operating system are presented in the following table along with their main characteristics:

DOS	Mac OS	MS Windows	Linux	UNIX	Palm OS/ Pocket PC
1. Single-User, Single tasking	1. Single-User Multitasking	1. Single-User Multitasking	1. Multiuser, multitasking	1. Multiuser, multitasking	1. Single-User Multitasking
2. Command-line user interface	2. Graphic User Interface	2. Graphic User Interface	2. Command-line user interface	2. Command-line user interface	2. Graphic User Interface
3. Disc Operating System (DOS) has been replaced by MS windows OS	3. Mac has easy- to- use Graphic User Interface (GUI)	3. The first true MS Windows OS is Windows 95.	3. LINUX is open source software	3. Unix has several versions but they lack interoper-ability	3. They are specifically designed for PDA
4. Desktop OS	4. Desktop OS	4. Desktop OS	4. Network OS	4. Network OS	4. Mobile OS

Activity 1.3

1. Identify the various application softwares available in your computer system.

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INTEXT QUESTION 1.6

Match the following:

a)	MS Windows	i)	Mobile OS
b)	Palm OS	ii)	Open Source software
c)	UNIX	iii)	Desktop OS
d)	Linux	iv)	Network OS

WHAT YOU HAVE LEARNT

- Computer is a calculating device which accepts, stores, processes data and can retrieve data as and when required can print the results in the desired format.
- The characteristics of computer are speed, accuracy, diligence, versatility and storage.
- The components of a computer include and Arithmetic and logic unit; control unit and control processing unit.
- The input devices are used to transfer data and instructions to the computer. The output devices get output or processed information from the computer.
- Computers can be classified as super, mainframe, mini, micro and laptop, palm-top computers etc.
- Hardware refers to physical components which are used for the input, processing output and storage activities of a computer systems.
- The instructions given to the computer in the form of a programme is called software.
- There are two types of software, viz. system software and application software.

TERMINAL EXERCISE

1. Differentiate between system software and application software.
2. Explain the three components of the computer system.
3. List the various characteristics of a modern computer.
4. Give a brief overview of the generations of computers.

ANSWER TO INTEXT QUESTIONS

Notes

1.1

- 1. Dumb
- 2. Simultaneously
- 3. Arithmetic and logic

1.2

- 1. Five
- 2. Vacuum Tubes

1.3

- 1. False
- 2. True
- 3. True

1.4

- 1. Random Access Memory
- 2. Read-only-memory
- 3. Compact Disc
- 4. Digital Versatile Disc

1.5

- 1. Keyboard
- 2. Modem

1.6

- (iii)
- (i)
- (iv)
- (ii)

TERMS:

The terms covered in this lesson which require further explanation are given below in an alphabetic order. The learner is required to explain each term.

Notes

Bar code:

Barcode Reader:

Cloud computing:

DVD:

Input:

MODEM:

Operating System:

Output:

Pen Drive:

Primary Storage:

Processing:

Router:

Scanner:

Secondary Storage:

Storage:

Web Browser: