

SLOs

- Demonstrate the understanding about the history of computers
- Outline the various generations of computers
- Classify the computers as per their size and technology used to date

1.1 INTRODUCTION TO COMPUTER

A computer is an electronic data processing machine or device that performs processes, calculations and operations based on instructions provided by a program. Computers are now used vastly in every field of life. The advancement in computer caused advancement in knowledge, science and technology. Today, computers are used in fields of business, industry, education, banking, transportation, research, explorations, media, entertainment, etc.

1.1.1 Evolution Of Computers

The computers which we see today are modern shape of computers which have been evolved since centuries. The evolution of computers is generally divided in following three eras.

(i) Mechanical Era (Dark Age)

Men have been trying to invent machines that can solve mathematical problems. In mechanical era, human became successful to make simple machines that could help performing simple arithmetic operation, in other words computing. These machines were manually operated since the electricity was not invented. Some of the important machines of this era are:

(a) Abacus (3000 B.C.)

Abacus was invented about 5000 years ago. It is also known as counting frame. Abacus is still used to teach basic arithmetic operations to the students. Abacus is considered as first computer prototype.

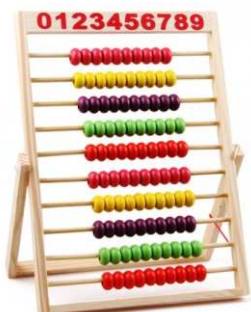


Fig: 1.1 Abacus

(b) Napier's Bones (1612 A.D.)

Scottish mathematician John Napier developed Napier's Bones, in 1612. It is also called Napier's Rods. It was a small machine that contained ten rods. The rods were made up of bones, wood or metal. Napier's Bones was used for multiplication and division.



Fig: 1.2 Napier's Bones

(c) Slide Rule (1622 A.D.)

English mathematician William Oughtred invented a Slide Rule. This was basically a pair of two moveable rules placed side by side. They had a standardized set of markings called scales. These scales were used for mathematical computations. Slide Rule was used to multiply and divide numbers. The modern slide rules are still used in some countries.

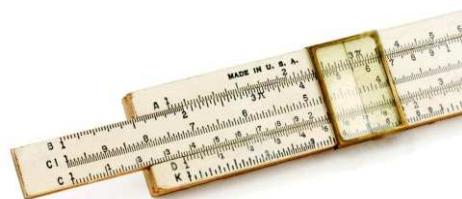


Fig: 1.3 Slide Rule

(d) Pascaline or Pascal's Calculator (1642 A.D.)

French mathematician Blaise Pascal invented a mechanical calculator which was called Pascaline. He developed this machine to help his father who was a tax collector. Pascaline can perform addition and subtraction by eight figures. User had to adjust wheels in order to perform these calculations.



Fig: 1.4 Pascaline

(e) Leibniz's Calculator (1694 A.D.)

Leibniz's Calculator was developed by the German mathematician Gottfried Wilhelm Leibniz. It was also called stepped reckoner. It was the first calculator that could perform all four basic arithmetic operations; addition, subtraction, multiplication and division.

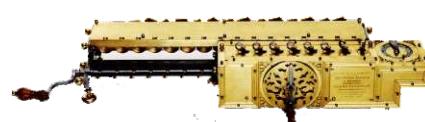


Fig: 1.5 Leibniz Calculator

(f) Babbage's Difference and Analytical Engines (1822 and 1837 A.D.)

Charles Babbage was an English mathematician and mechanical engineer. He is known as Father of Computer because he developed the first complete computing machine. His first invention was Difference Engine. It was an automatic mechanical calculator. Difference Engine was a large machine, made of metal and was powered by steam. The Difference Engine had storage (mechanical memory) that could hold the data temporarily for processing and to store results. It was used to allow a user to enter calculations and get printed results. The Difference Engine worked on difference equations.

Then, Charles Babbage designed but could not build a very big machine in 1837. This was named Analytical Engine. The proposed design included an ALU with basic programmatic flow control. It was programmed using punched cards and contained integrated memory. Historians consider it to be the first design concept of a general-purpose computer because of its comprehensive design.



Fig: 1.6 Babbage's Difference Engine

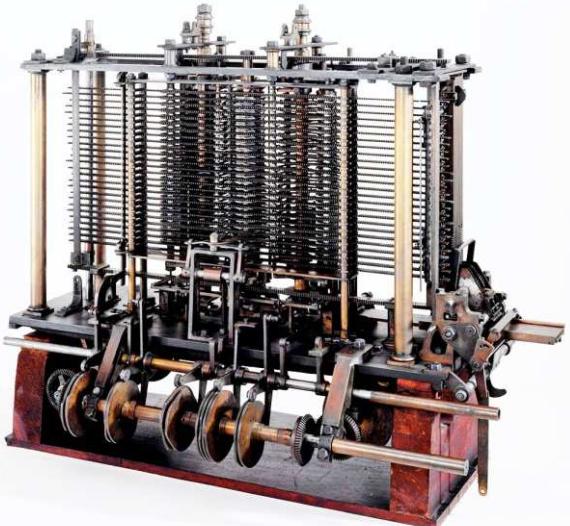


Fig: 1.7 Babbage's Analytical Engine

(ii) Electro-Mechanical Era (Middle Age)

This era starts from the mid of 19th century. In this era scientists became able to develop faster and more accurate computing machines as they were powered by steam and electricity. One of such machines was Tabulating Machine.

(a) Herman Hollerith's Tabulating Machine (1890 A.D.)

It was invented by American inventor Herman Hollerith in 1890. Hollerith's first tabulator was used for the U.S. 1890 Census. Because of Hollerith's tabulating machine census data took only six months to compile, which was very fast as compared to previous U.S. census in 1880 which took 7 years to be completed. Hollerith Tabulating Machine became very famous and used in many offices of U.S. Government.



Fig: 1.8 Tabulating Machine

(iii) Electronic Era (Modern Age)

The advancement in the vacuum or electron tube gave birth to the electronic era. In this era the true computers were invented which worked on the principle of input, store, process and output. Continuous advancement in electronic engineering increased efficiency and speed of computers considerably. The electronic era may be categorized in generations on the basis of core technology used to build computers.

(a) First Generation of Computers (1940 to 1956)

Based on vacuum tubes, first generation computers were very large in size. This generation computers used machine language (i.e. 1's and 0's). Magnetic drums were used as primary internal storage medium and punched cards for input. In this generation mainly batch processing operating system was used. Computers of this generation were primarily used for scientific and research purposes. Electronic Numerical Integrator and Calculator (ENIAC), Universal Automatic Computer (UNIVAC) are examples of first generation computers.



Fig: 1.9 Vacuum Tubes

(b) Second Generation of Computers (1956 to 1963)

Because of transistors computers became smaller, faster, cheaper and more efficient. Assembly language and a high-level language FORTRAN were introduced. Magnetic core was used as primary internal storage medium. Punched Cards were used for input. Batch processing and Multiprogramming Operating systems were used. These computers were mainly used for commercial productions, scientific and engineering analysis and design. Examples are IBM 7094 and IBM 1401.



Fig: 1.10 Transistors

(c) Third Generation of Computers (1964 to 1971)

Use of ICs further decreased size of computers and increased the speed and efficiency. Less expensive computers were introduced. High level programming languages such as Pascal and COBOL were used. Keyboard as input and monitor as output also eased the use of computer. Time-sharing and Realtime Operating Systems were used. The use of computers was extended to database management and automatic industrial control. IBM 360 and IBM 370 are the examples of this generation's computers.



Fig: 1.11 Integrated Circuits (ICs)

(d) Fourth Generation of Computers (1971 to Present)

The invention of microprocessors was revolutionary which caused the development of faster, less expensive, smaller and more reliable computers. They used semi-conductor memories RAM and ROM and magnetic storage became popular. More high-level languages were introduced like C, C++, Java, etc. These computers are used in almost every field of life, like space applications, business and art work.



Fig: 1.12 Microprocessors

Time sharing, real time and distributed operating system are used. This generation also saw the development of Graphical User Interfaces (GUIs). Examples are Apple Macintosh, IBM PC.

(e) Fifth Generation of Computers (Present and Beyond)

Fifth Generation computing devices are still being developed. In this generation computers will be capable of self-learning, reasoning and generalization. These computers or controlled machines like robot will also be able to process human languages. The branches of AI include; Machine Learning, Deep Learning, Natural Language Processing, Robotics and Expert Systems.

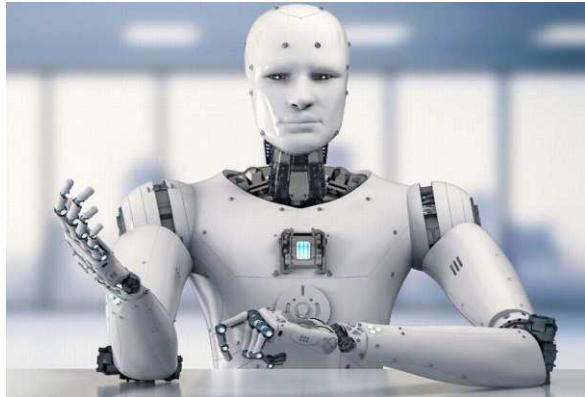
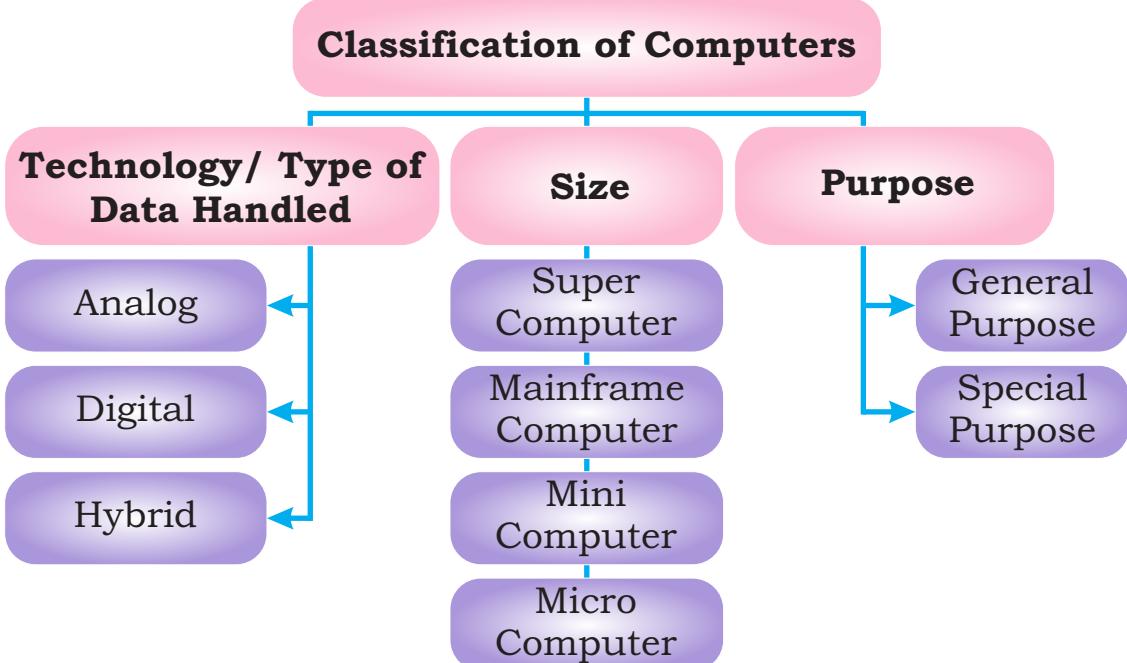


Fig: 1.13 Humanoid Robot

1.1.2 Classification Of Computers

Computers can be classified into different ways as shown below:



(i) According to Technology

According to technology or type of data they handle, computers are classified into three types.

(a) Analog Computers

Analog Computers are used to process analog data. Analog data are in the form of continuously varying physical quantities like pressure, temperature, voltage, speed and weight. Examples of Analog computer are speedometer of a car, voltmeter etc.



Fig: 1.14 Analog Computer

(b) Digital Computers

Digital Computers are most commonly used type of computers. They are used to process information with quantities using the binary number system (0's and 1's). Digital Computers are used in home, educational institutes, offices, business, scientific fields, etc.



Fig: 1.15 Digital Computer

(c) Hybrid Computers

Hybrid Computers are the combination of Analog and Digital Computer system. These computers combine analog and digital features of computers in a single machine. A Hybrid Computer uses analog to digital and digital to analog conversion. It may input or output either digital or analog data.



Fig: 1.16 VA Meter

(ii) According to Size

Computers are also divided into four groups according to their size.

(a) Super Computers

Super Computers are the most powerful, fastest and largest computers. They are extremely expensive. These computers are widely

used in scientific applications such as aerodynamics, design simulations, processing of geological data, weather forecasting and nuclear research.

(b) Mainframe

Mainframe Computers are powerful multi-user and multi-processors computers. They can process huge amount of calculations at very high speed. Mainframes are also very expensive and require a lot of technical expertise to be installed and operated. They are used in banks and many large business organizations where several users work simultaneously.

(c) Minicomputer

These are smaller than mainframe computers, but they are more powerful than Microcomputers. Minicomputers usually use multi-user operating system. Multiple users can use the Minicomputers through terminals. Minicomputers may be used as network servers and Internet servers. DEC VAX and IBM AS/400 are good examples of minicomputers.

(d) Microcomputers

Microcomputers are also called Personal Computers (PCs). The use of microprocessor has made computers cheaper yet faster and more reliable. These are the smallest computers designed to be used by individuals. PCs can be used for variety of tasks like documentation, calculations, illustration and entertainment. The power of network and internet has also made it more useful. Now computers are also used for communication and socialization.

(iii) According to Purpose

According to purpose, computers are either general purpose or special purpose.

(a) General Purpose Computers

Most computers in use today are General Purpose Computers. These computers can process variety of tasks. These computers can store and execute different programs in their memory. Therefore, various tasks like word processing (typing & editing), payrolls, accounts, inventory

control, manipulating facts in a database, making scientific calculations and statistical data analysis, and controlling security system of an organizations are achieved by these computers. Desktops, laptops, tablets and smart phones are examples of General Purpose Computers.



Fig: 1.17 General Purpose Computer

(b) Special Purpose Computers

As the name states, Special Purpose Computers are designed to perform specific tasks. Special Purpose Computers repeatedly perform single job more efficiently. They are also known as Dedicated Computers. These computers are useful in traffic lights control system, navigational system, aviation, weather forecasting, satellite tracking and ATMs.



Fig: 1.18 Computerized Wheel Alignment Machine



- Explain the uses of computers in different fields of life.
- Discuss how computer is affecting our lifestyle by providing variety of choices for entertainment and day to day tasks.
- Tell about scope of the different careers in IT sector.

1.2 ROLE OF COMPUTER

The role of computer in our lives is increasing day by day. In this section, we will discuss different aspects of the changing role of computer.

1.2.1 Computers In Different Fields Of Life

We are living today in the information era and the information has become one of the most valuable assets. To process this information, we make use of computers in various fields in our daily life. Computers have been integrated in our life in different shapes and sizes like desktops, laptops, mobile phones, gaming consoles and smart devices. Our lives have become so dependent of computers that we cannot work even a single day without the help of it. We have automated many of the repetitive tasks with the help of more advanced, faster and accurate computers and



brought our routine tasks, office works, businesses, researches and industrial applications to a new level.

Computers are largely used in every field of life. Manufacturing, ecommerce, education, medical, banking, communication, entertainment, engineering, agriculture, architecture, business, defense, and sports are highly influenced by computers.



Fig: 1.19 Radiology computer

Computers Today and Tomorrow

21st century is the era of technological revolution. Previously, technology was only used to access and share information. However, with the passage of time, the rapid change in technology has made it nearly impossible to perform any human activity without its use.

Computers are playing an important part in our daily life. News, weather updates, travelling information and bookings, money transfer and even taxi bookings are done with the help of mobile phone apps. Many managerial tasks are also done by computer software. School, library and hospital management are some examples. Online shopping is becoming a trend in our society too.

Computers are also providing variety of choices for entertainment like online games in which players from different parts of the world can participate simultaneously. 3D graphical software has given a new look to movies in which different comic characters can act with human actors. Photo, sound and video editor software not only help artists and singers to produce extraordinary creations but also inexperienced people can enjoy their productivity with ease of use.

The emerging technologies are also getting better day by day and we can imagine that how computer will be used in future. Artificial Intelligence, Robotics, Wireless Communication and Virtual Realities are some areas which are shaping the modern world.

Artificial Intelligence is based on simulating human intelligence in machines that can easily mimic and execute tasks from simple to more complex operations. The term A.I. may also be referred to any machine that displays qualities associated with a human brain such as learning, reasoning and problem solving. A.I. is also used for Machine Learning. It learns from our daily routines and suggests us different options. Like google maps suggest the best ways for our daily commute. A.I. is vastly used in scientific experiment, healthcare and space technologies.

Robots are the machines that can be controlled by a computer and are capable of carrying out a complex series of actions automatically. Robots can be controlled by an external control device or through programming. Robotics deals with designing, creating and programming of the robot and enhancing it by taking sensory feedback and processing information. Robots are commonly used in manufacturing, industry, science, medicine and education.

Wireless Communication has become an integral part of our lives. Wireless communication technology transmits information using electromagnetic waves like IR (Infrared), RF (Radio Frequency), satellite, etc. Global Positioning System (GPS) is now used to find real time location of people and objects. Smart phones that include 3G, 4G and 5G networks have transformed the conventional use of telephones. These phones not only provide better coverage but also fast mobile internet experience. Wireless communication is also giving new meaning to the socialization and human interactivity.

Virtual Reality is an artificial environment that is created with software and presented to the user in a way that the user feels it as a real environment. Virtual reality can be used for the simulation of a real environment for training and education. It is also used for development of an imagined environment for a game or interactive story.

Teacher Note



It is very important to orient students about the contemporary and upcoming technologies. Teachers may show videos on smartphone or projectors for better understanding of students, in this regard.

1.2.2 Careers In IT Field

Today Computer Science plays a key role in all fields of life. Computer Science (CS) jobs are ranked as having some of the highest salaries in the world. It's no surprise that Computer Science and Information Technology (IT) are changing tomorrow's job market. Let's look at different careers that are present in the IT sector.

(i) Software Engineer

A Software Engineer is a person who uses different programming languages to develop software products like games, Learning Management System (LMS), business applications, educational and entertainment software.

(ii) Network Administrator

Network Administrator is an IT expert who manages an organization's network. He or She is responsible for installing, maintaining and upgrading any software or hardware required to efficiently run a computer network.

(iii) Database Administrator

A Database Administrator (also known as DBA) is a skilled professional who maintains a secure database environment in an office, business or organization.

(iv) Web Designer

Web is short for World Wide Web or www. This is another name for internet. Web designers are people who build websites. They prepare a site's content with eye-catching designs, attractive images and strong text. They rely on many web designing tools to ensure an interactive website. How the site works and how it looks is the responsibility of web designers. They are also responsible for maintaining and updating an existing site.

(v) Graphic Designer

Graphic is another word for image. Graphics Designers develop overall layouts of brochures, magazines and other types of published

advertisements and documents. They do this by using various computer graphics software. This task is usually accomplished by combining art and technology, conveying ideas through images, layout of websites and printed matter.

(vi) Information Security Analyst

These people protect networks. They plan and carry out security measures to ensure that no loss of data (or information) occurs. We can call them the police force of the internet. Computer technology has expanded into online banking and businesses. Computer hackers are always on the lookout for customer account details that they can use to steal money. Information Security Analysts ensure that no such theft occurs.

(vii) Computer Science or IT Teacher

Another very rewarding career for Computer Science graduates and post-graduates is teaching in schools, colleges and universities. These instructors instill in their students the importance of computers in today's world, and the impact these machines will have in their later lives.



- Describe computer hardware
- Explain the function of different parts of system unit like: Motherboard, Processor
- Differentiate between various input devices
- Recognize different output devices
- Differentiate between Primary and Secondary memory
- Classify different hardware devices as per their functionality

1.3 COMPUTER HARDWARE

Computers consist of software and hardware. Software is the programs and applications that run on computer. Hardware is the physical parts of the computer that run programs and applications. Hardware can be seen and touched while software cannot.

Computer hardware is a collection of all the physical parts or components of a computer. It includes the computer casing, the CPU or Central Processing Unit, computer memory, VGA graphics card, sound card, and the motherboard.

1.3.1 System Unit

A System Unit is the part of a computer that contains the primary devices. The system unit performs operations and produces results for complex calculations. It includes the motherboard, CPU, RAM and other components, as well as the case in which these devices are enclosed.

(i) Motherboard

The motherboard is the main board which connects different parts of computer. It includes the following general components: Microprocessor (CPU), Slots, Ports, Buses, RAM, ROM and other electronic components for example resistors, capacitors, diodes, transistors, jumpers etc.



Fig: 1.20 Motherboard

Just like nervous system it allows communication between all parts of the computer. We can find CPU, memory slots, expansion slots and a number of chipsets on motherboard. Motherboards are made of layered fiberglass. These layers contain copper lines that form the circuitry by which electrical signals are provided to all parts of computer. Various components of computer may be attached, detached and upgraded on motherboard according to need of the user. Motherboards also have connectors called ports. These ports are used to connect input, output and other peripheral devices.



Uncover the casing of computer and demonstrate different parts on and attached with motherboard. Ask students to write names and functions of the components.

(ii) Microprocessor (CPU)

CPU or microprocessor is the brain of computer. The microprocessor is a chip containing millions of tiny transistors. These transistors manipulate data. Microprocessor performs all the calculations necessary to make the computer work. These calculations are performed at very high speed and accuracy. Microprocessor is made up of silicon. The microprocessor fetches, decodes, executes and stores all the instructions given by the user or any other device. The speed of computer mainly depends upon the speed of microprocessor. A microprocessor that has faster clock speed (measured in GHz) and more cores and cache works faster.



Fig: 1.21 Microprocessor

There are typically five components of a microprocessor.

(a) Arithmetic Logic Unit (ALU)

ALU performs all the actual calculations like arithmetic operations and logical comparisons. Arithmetic operations include addition, subtraction, multiplication and division while logical comparisons include comparing, selecting and matching of data.

(b) Control Unit (CU)

Control Unit is responsible for controlling the transfer of data and instructions among other units of a computer. This unit controls the operations of all parts of the computer but does not carry out any actual data processing operations. CU functions just like a traffic policeman. It manages and coordinates all the units of the computer.

(c) Clock

Clock generates pulses and instructions are executed on the basis of pulses. Clock speed is measured in MHz and GHz.

(d) Registers

It is a temporary storage area that holds the data that is being processed. It is also known as programming model which may be of 8 bits, 16 bits, 32 bits or 64 bits.

(e) Cache

Cache is an intermediate storage area, which is available inside microprocessor. The immediate processed information is stored in cache. The cache inside the microprocessor is called internal cache and outside is called external cache.

(iii) Buses

In computer, Buses are the electric paths on which data is sent and received by different components. They are just like roads. As roads connect different places, buses connect all the parts of the computer to each other. They also connect all internal components on the motherboard.

There are three types of buses; control bus, data bus and address bus.

Control Bus carries command between different components to control all activities in a computer.

Data Bus carries data between the processor, memory unit and other components.

Address Bus carries the address of the data (but not the data).The address bus is used to specify memory location to be used by microprocess for specific operaation.

1.3.2 Input Devices

Input devices are used to enter data into computers. These devices can be categorized into Text Entering, Pointing and Image Scanning Devices.

(i) Text Entering Devices

Keyboard: It is the most common text entering device and used to enter data usually in text format or to perform other controlling functions.

When a key is pressed, keyboard controller chip sends its corresponding code in keyboard buffer called scan code, which is then processed by CPU.

(ii) Pointing Devices (Mouse and its variants)

They are used for the quick movement of cursor on screen needed usually in graphic mode. It includes mouse, joy stick, track ball and track pad.

(iii) Image Scanners

Scanners convert image into electronic format understandable by computers through light sensing. They also work on Optical Recognition which occurs when a device scans a clear printed surface and translates the image into machine-readable formats that a computer understands. Image scanners include Optical Mark Recognition (OMR), Optical Barcode Reader (OBR) and Optical Character Recognition (OCR).

(iv) Other Types of Input devices

There are also other input devices. For example, microphones are used to accept sound input and convert it in digital audio format. Microphones are also used for voice recognition which can convert voice input into text files. Touch Screen is also used for input. It accepts input directly on monitor by touching finger or any object on the screen. Magnetic Ink Character Recognition (MICR) and Magnetic Strip Reader are also used for input.

1.3.3 Output Devices

A hardware device that sends data from a computer (CPU) to another device or user is called an output device. The most common output devices of a computer are monitor and printer. There are two types of output devices.

(i) Soft Copy Output Devices

It is screen display or voice output. It is volatile output and lost when other output is shown or computer is turned off. Following are some of the devices used to give output in soft form.

(a) Monitors

It is TV like device that displays data by small bright dots called pixels. Monitors are of two types.

- Cathode Ray Tube (CRT)
- Flat Panel Display (FDP)

(b) Data Projectors

Data projectors are used to show colorful slides and images directly from computer disk on a wall or large screen through an optical lens. They are also called digital light projectors and video projectors.

(c) Speakers

Speakers give output in form of sound. They are good for people with visual disabilities or where display is not easy.

(ii) Hard Copy Output Devices

It is output on paper. It is nonvolatile output that is relatively stable and permanent form. Hard Copy Output Devices are:

(a) Printers

They usually give output on paper and can print both text and graphics. There are two types of printers:

- Impact
- Non-Impact

(b) Plotters

Like printer it gives images on paper but typically used to print large format images such as maps, construction drawing, advertising hoardings etc.

1.3.4 Storage Devices

A storage device refers to a hardware used to store information. There are two types of storage devices; Primary and Secondary.

(i) Primary Storage Devices

Primary storage devices are used by computer during processing. They are quite smaller in storage capacity. Most primary storage devices are found inside the computer, and they have the fastest access to data. Primary devices include RAM and ROM.

ROM is the Read Only Memory. It is permanent memory. ROM is quite small in capacity. It stores the major setting of computer permanently.

RAM is Random Access Memory. RAM is volatile, means it loses its content as the power supply is disconnected. This is used to store data and instructions temporarily.

(ii) Secondary Storage Devices

Secondary storage devices have a larger storage capacity and can store data permanently. Users save their data on secondary storage devices. Hard Disk, CD and DVD, SD Card and USB flash disk are the examples of secondary storage devices.



- Understand the basic operations of computer
- Differentiate among the four basic operations of computer
- Draw the block diagram of computer's basic operations

1.4 BASIC OPERATIONS OF A COMPUTER

A computer is a machine that acts according to the instructions given by the user. A computer performs four basic operations: input, processing, output and storage.

(i) Input

Computer input has many forms. It can be from a command entered using a keyboard or a mouse. It can be data sent from another computer on a network.

(ii) Processing

Processing is done inside the computer by CPU. Processing is the conversion of input into output. After processing, data is turned into meaningful information. This is carried out with the help of arithmetic and logical operations.

(iii) Storage

Storage refers to the holding or saving data. RAM, ROM and Hard Disk are the devices that are used for storage.

(iv) Output

Output is the result of a computer processing. Output may be viewed on a monitor screen, heard through speakers or printed on paper. Here, monitor screen, speakers and printer are called output devices.

SLOs



- Develop the understanding about computer software
- Recognize various types of system software
- List out the names of different application software
- Differentiate between application software and system software

1.5 COMPUTER SOFTWARE

Software is a set of instructions that a computer uses to perform a task. It is a general term for a computer program. There are two main types of software; System Software and Application Software.

1.5.1 System Software

System software is a computer program that coordinates all activities and functions of a computer. It also controls all the operations of the computer hardware. It includes operating systems, device drivers, utility programs and language translators.

(i) Operating System

Operating system is the master control program that manages all the system resources. It creates an interface between computer system and user. Windows and Linux are commonly used operating systems.

(ii) Device Drivers

Device drivers are computer programs that control a particular device when it is connected to a computer. Any hardware that we have in our computer must have a device driver to communicate with operating

system. A device driver is a translator between the operating system and the hardware device. For many devices, operating system has drivers pre-installed in them. This gave rise to the concept of Plug and Play, where the device would be attached to the computer and the operating system will instantly recognize it. A non-plug-and-play device would require you to go through several steps of installing drivers and setting up the device before it would work.

(iii) Utility Programs

Utility means being useful. Utility programs are useful computer programs that help to manage, maintain and control computer resources. Operating systems usually have pre-installed programs that can serve the purpose, but utility software provides further functionality. One example of utility program is an antivirus software. This computer program helps to protect a computer from viruses and other harmful files.

Hard Disk tools are also part of utility programs. They manage hard disk drives and other storage devices. This includes utilities to scan the hard disks for any potential problems. Disk cleaner utility is used to remove any unnecessary files while disk defragmenter is used to re-organize file on a hard disk drive to increase performance of disk.

(iv) Language Translators

Language Translators are used to translate human readable instructions into machine language. Computer can only understand machine language which is composed of 0's and 1's. The computer languages are used to make computer programs (software). Generally, software is written in high-level languages, using natural language words. Language translator are of three types; assembler, compiler and interpreter.

Teacher Note



Teachers are suggested to demonstrate how to configure/install device drivers and use utility programs like Disk Defragmenter, Disk Cleaner etc.

- (a) **Assembler:** The assembler translates the program written in assembly language into machine language instructions for execution.
- (b) **Compiler:** It translates the entire high-level language program at once into machine language before it is executed.
- (c) **Interpreter:** It translates the high-level language program line by line into machine language.

1.5.2 Application Software

Application Software is used to complete specific tasks, such as creating documents, databases, spreadsheets and presentations. Computer games, media players and web browsers are also the examples of application software. User needs to install application software to accomplish specific tasks. Application software are not pre-installed on operating system. They are installed separately. For example, making spreadsheet is not possible with Windows. For that application software such as MS Excel is used. There are different types of application software.

(i) Productivity Software

This kind of application software is used to produce things such as documents, spreadsheets, databases and presentations. Many of the productivity software are intended to be used in businesses and offices. MS Office for Windows is an example of productivity software.

(ii) Business Software

Business Software are used to manage business activities efficiently. It is used to provide many business functions such as billing, database management and inventory management.

(iii) Entertainment Software

This type of software provides amusement and fulfills a user's hobby. The most common entertainment software are video games.

(iv) Educational Software

Educational software is used for teaching and learning. This kind of software is used in many schools to enhance knowledge of students in learning different subjects.



SUMMARY

- ◆ A computer is an electronic data processing machine or device that performs processing, calculations and operations based on instructions provided by a software or program.
- ◆ The evolution of computers is generally divided in three eras like Mechanical era, Electro-mechanical era, Electronic era.
- ◆ First Generation of Computers (1940 to 1956): Technology Used: Vacuum Tubes.
- ◆ Second Generation of Computers (1956 to 1963): Technology Used: Transistors.
- ◆ Third Generation of Computers (1964 to 1971): Technology Used: Integrated Circuits (ICs).
- ◆ Fourth Generation of Computers (1971 to Present): Technology Used: Microprocessors.
- ◆ Fifth Generation of Computers (Present and Beyond): Technology Used: Artificial Intelligence Technology.
- ◆ Computers are classified in three types according to technology like Analog Computers, Digital Computers and Hybrid Computers.
- ◆ Digital Computers are further divided into four groups according to their size like Super Computers, Mainframe Computers, Minicomputers and Microcomputers.
- ◆ According to purpose; computers are either General Purpose or Specific Purpose.
- ◆ Different careers are present in the IT sector like Software Engineer, Network Administrator, Database Administrator, Web Designer, Graphic Designer, Information Security Analyst, Computer Science or IT Teacher.
- ◆ Computers consist of software and hardware.
- ◆ Software is set of instructions or a program.
- ◆ Computer hardware is a collection of all the physical parts or components of a computer.
- ◆ A system unit includes the motherboard, CPU, RAM and other components, as well as the case in which these devices are housed.

- ♦ The motherboard is the main board which connects different parts of computer. It includes the following general components: Microprocessor (CPU), Slots, Ports, Buses, RAM, ROM, other electronic components for example resistors, capacitors, diodes, transistors, jumpers, etc.
- ♦ There are typically five components of a microprocessor (CPU); Arithmetic Logic Unit (ALU), Control Unit (CU), Clock, Registers and Cache.
- ♦ Clock generates pulses and instructions are executed on the bases of pulses. Clock speed is measured in MHz and GHz.
- ♦ Register is a temporary storage area known as programming model of 8 bits, 16 bits, 32 bits and 64 bits. Registers are visible as well as invisible on the microprocessor.
- ♦ Cache is an intermediate storage area, which is available inside microprocessor IC known as internal cache and outside microprocessor IC known as external cache.
- ♦ CPU has three buses; control bus, data bus and address bus.
- ♦ The most common input devices of a computer are keyboard and mouse.
- ♦ The most common output devices of a computer are monitor and printer.
- ♦ There are two types of storage devices; Primary and Secondary.
- ♦ Primary storage devices include RAM and ROM
- ♦ A secondary storage device like hard disk has a larger storage capacity and can store data permanently.
- ♦ A computer performs four basic operations: input, processing, output and storage.
- ♦ System software includes operating systems, device drivers, utility programs and language translators.
- ♦ Language translators are of three types; assembler, compiler and interpreter.
- ♦ Different types of application software are Productivity Software, Business Software, Entertainment Software, and Educational Software.



EXERCISE

A. Choose the right answer:

9. Graphical User Interface (GUI) was developed in:
- second generation
 - fourth generation
 - mechanical era
 - electro-mechanical era
10. A person who uses different programming languages to develop programs is:
- database administrator
 - web designer
 - software engineer
 - graphic designer

B. Respond the following:

- Discuss the use of computer in any two fields of life.
- Differentiate Compiler and Assembler.
- Differentiate System and Application software.
- Describe artificial intelligence with examples.
- Discuss Impact and Non-Impact Printers with examples.
- Write the use of these storage devices: Hard Disk, USB Flash Disk, SD Card.
- Which monitor will you prefer in your school; CRT or FPD? Why?
- List any five components present on motherboard.
- Prepare a table of generations.

Generation	Period	Technology	Example of Machines
First			
Second			
Third			
Forth			
Fifth			

10. Give examples of business, education, entertainment and productivity software.

S.No.	Business	Education	Entertainment	Productivity
(i)				
(ii)				
(iii)				

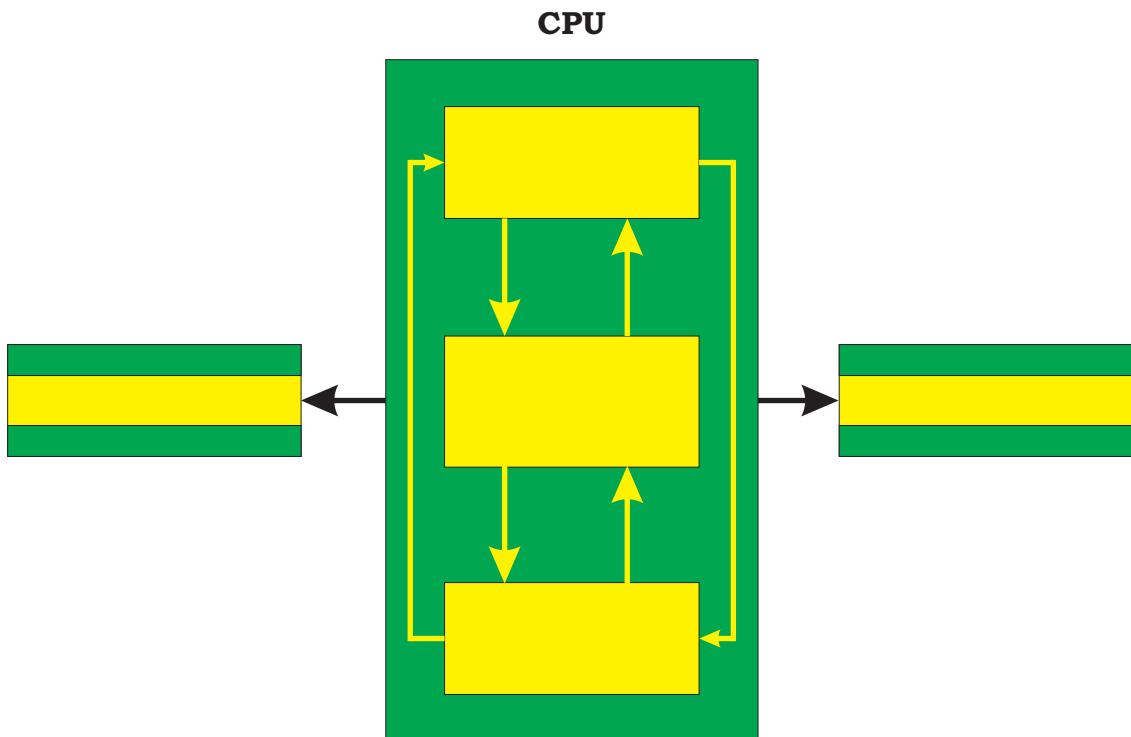
C. Match the columns:

S.NO.	A	S.NO.	B	C
(i)	ALU	(a)	Period of manually operated machines	
(ii)	Input Devices	(b)	PC	
(iii)	Secondary Storage Devices	(c)	Process information using binary number system	
(iv)	Productivity Software	(d)	Perform arithmetic and logical operations	
(v)	Mechanical Era	(e)	Helps to produce spreadsheets, database etc	
(vi)	Digital Computers	(f)	Large storage capacity, store data permanently	
(vii)	Microcomputer	(g)	Hardware device that sends data into a computer	



ACTIVITIES

1. Develop a timeline for major innovations in computer evolution.
2. Prepare a list of input and output devices and write their uses.
3. Make a list of specifications that you should know before buying a computer.
4. List analog, digital and hybrid devices from your surroundings (any five).
5. Label the following block diagram of computer system.



FUNDAMENTALS OF OPERATING SYSTEM

Unit

2



Microsoft®
Windows®



SLOs

- Define OS
- Develop the understanding about different functions of OS
- Distinguish among various types of interfaces of OS

2.1 INTRODUCTION OF OPERATING SYSTEM (OS)

An Operating System is a software which performs all the basic tasks like booting the computer, file management, memory management, process management, and controlling peripheral devices such as hard disk, printer, etc. It manages computer resources efficiently. Most common operating systems are: DOS, Windows, Linux, Android, Mac OS and iOS.

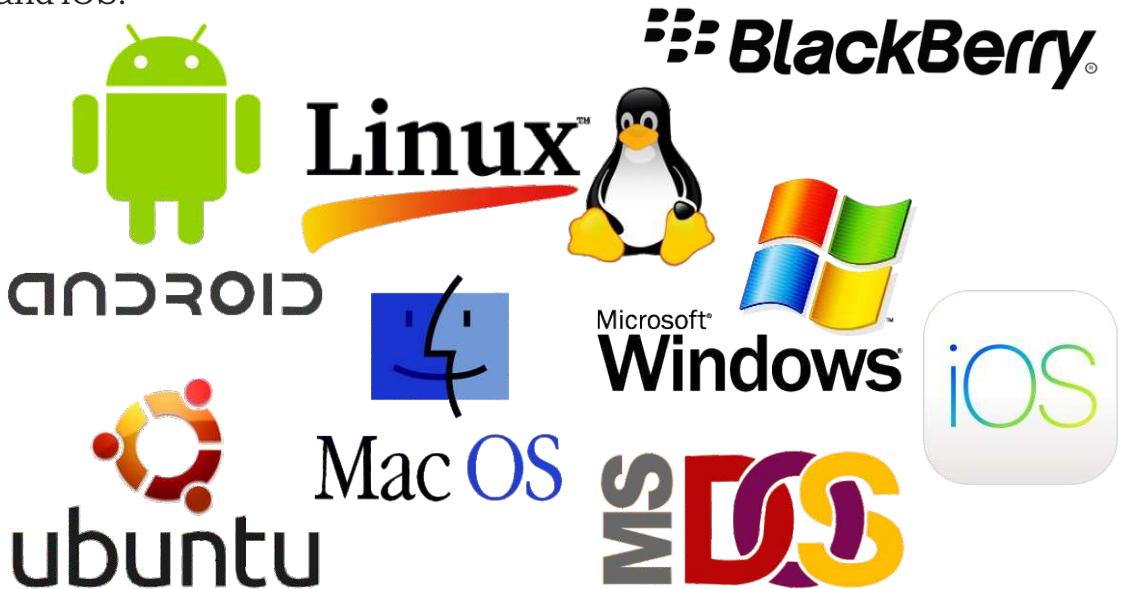


Fig: 2.1 Different Operating Systems

2.1.1 Function Of Operating System

Operating system manages every activity of a computer. It is the master control program that provides an interface for a user to communicate with computer. System software and application software run on operating system as shown in figure 2.2. Operating System performs the following functions.

(i) Booting

Booting is a process of starting the computer operating system. It checks the computer resources and makes it ready to perform different tasks.

(ii) Resource Management

Operating system manages all the hardware and software resources. This includes allocation and de-allocation of processor, memory, access to shared cache memory and access to network resources.

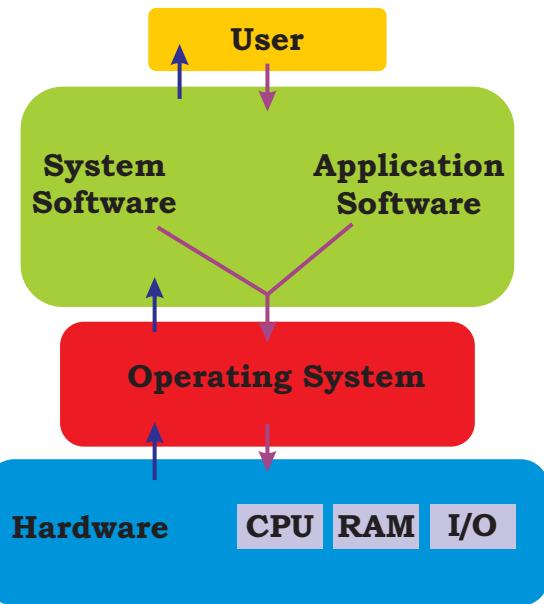


Fig: 2.2 Operations of an OS

(iii) User Interface or Command Interpreter

We interact with operating system through user interface. Command interpreter is one of the parts of operating system which reads the commands from user, interprets them and translates them into machine language instructions that the computer hardware can understand.

(iv) Memory Management

Memory management module performs the task of allocation and de-allocation of memory space to programs and data in need of these resources.

(v) Input / Output (I/O) Management

An Operating System provides the device driver to facilitate I/O functions involving I/O devices. These device drivers are software that control I/O devices through their controllers.

(vi) File Management

It manages all the file-related activities such as organization, storage, retrieval, naming, sharing, and protection of files.

(vii) Process Management

A process is a job or activity to be performed by the system. Process management manages creation, deletion, suspension and resumption of processes. The term process refers here to program code that has been loaded into a computer's memory for execution by the central processing unit (CPU). In a multiprogramming system, there will be a number of computing processes. The operating system must ensure that each process gets a fair share of the CPU's time. The OS decides the order in which processes have access to the processor, and how much processing time each process should get. This function of OS is called process scheduling.

Name	1% CPU	45% Memory	0% Disk	0% Network
Apps (4)				
> Microsoft Excel	0%	53.3 MB	0 MB/s	0 Mbps
> Microsoft Word	0%	104.5 MB	0 MB/s	0 Mbps
> Task Manager	0%	10.5 MB	0 MB/s	0 Mbps
> Windows Explorer	0%	32.6 MB	0 MB/s	0 Mbps
Background processes (40)				
> Antimalware Service Executable	0%	64.4 MB	0 MB/s	0 Mbps
> Application Frame Host	0%	3.0 MB	0 MB/s	0 Mbps
> AppVShNotify	0%	1.1 MB	0 MB/s	0 Mbps
> COM Surrogate	0%	1.1 MB	0 MB/s	0 Mbps

[Fewer details](#) [End task](#)

Fig: 2.3 Task Manager

(viii) User Management

In modern operating systems, user management describes the ability of administrators to control user access to various computer resources like software, I/O devices, storage system, networks, etc.

2.1.2 Types Of Interface

An interface is a program that allows a user to interact with the computer or another computer over a network.

A User Interface (UI) is the part of operating system, program, or devices that allows a user to enter and receive information. There are many types of User Interfaces. Two most common user interfaces are discussed below:

(i) Command Line Interface

```
C:\>chkdsk
Volume Serial Number is 3E76-4B58

2,146,467,840 bytes total disk space
    131,072 bytes in 2 hidden files
        32,768 bytes in 1 directories
    7,405,568 bytes in 124 user files
2,138,898,432 bytes available on disk

        32,768 bytes in each allocation unit
        65,505 total allocation units on disk
        65,274 available allocation units on disk

    655,360 total bytes memory
    602,704 bytes free

Instead of using CHKDOSK, try using SCANDISK. SCANDISK can reliably detect
and fix a much wider range of disk problems. For more information,
type HELP SCANDISK from the command prompt.

C:\>_
```

Fig: 2.4 Command Line Interface (CLI)

A Command Line Interface (CLI) is a screen or text based representation in which the user types the commands on place called prompt to operate the computer. Command contains string of characters. CLI is difficult to use because the user has to remember the commands and their syntaxes but it is fast in use because text mode takes less resources. It was primarily provided to users by computer terminals on UNIX, and personal computers including MS-DOS and Apple DOS.

(ii) Graphical User Interface (GUI)

A GUI provides a user friendly environment where user can interact with computers through graphical objects such as menus, icons, buttons and other graphical objects. It is easy to use as users are supposed to just click on a picture to run commands without memorizing them. GUI is slower than CLI as graphical mode takes more memory and resources. Windows and IOS are the example of GUI.



Fig: 2.5 Graphical User Interface (GUI)



- Discuss different types of OS
- Differentiate among the various types of OS

2.2 TYPES OF OPERATING SYSTEM

The Operating System can be categorized as under:

- Single User and Multi-User OS
- Batch Processing OS
- Time Sharing OS
- Real Time Processing OS

2.2.1 Single User And Multi-user Operating System

In a Single User Operating System, a single user can access the computer system at a time. These types of operating systems are commonly used. DOS for PCs and Windows 98 for PCs are example of single user operating system.

A Multi-User Operating System allows multiple users to access the computer at same time. The operating system manages the memory and resources among the various users according to the requirement. Linux and UNIX are the most common examples of the multi-user operating system.

2.2.2 Batch Processing Operating System

General term of Batch Processing is used for programs that are executed with minimum human interaction. This type of operating system does not interact with the computer directly (Figure 2.5). Each user prepares his job and submits it to the computer operator. To speed up processing; jobs with similar needs are batched together and run as a group by an operator. The main function of a batch processing system is to automatically keep executing the jobs in a batch.

The benefits of batch processing are:

- Batch systems can be shared by multiple users.
- The idle time for batch system is very less.
- Next job starts just after the current one.

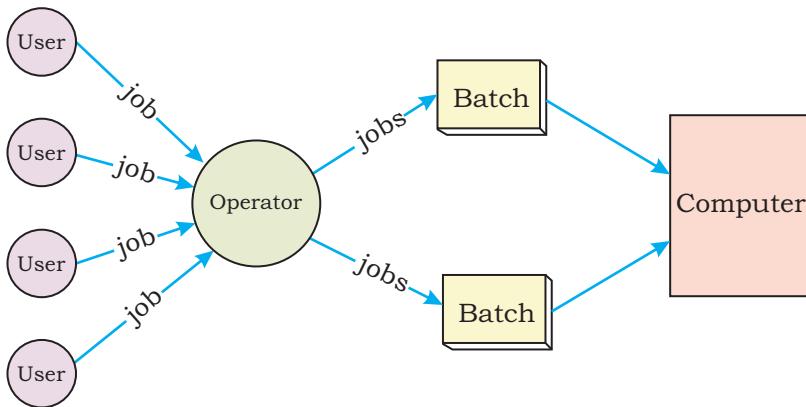


Fig: 2.6 Batch Processing Operating System

2.2.3 Time Sharing Operating System

Time sharing is a method that allows multiple users to share resources simultaneously. Multiple users can use specific computer at the same time in different places. A time sharing operating system is that in which from many tasks each task is given some time to execute so that all processes run smoothly without any problem. Multiple jobs are executed by the CPU by switching between them. As the system switches rapidly from one task or user to the other, a short time slot is given to each task or user for their executions and all feel that system is not shared. Thus, the user can receive an immediate response. For example, in a transaction processing, the processor executes each user program in a short time. These systems are also known as Multitasking Systems. The task can be from single user or from different users also. The time that each task gets to execute is called quantum. After this time interval is over OS switches over to next task.

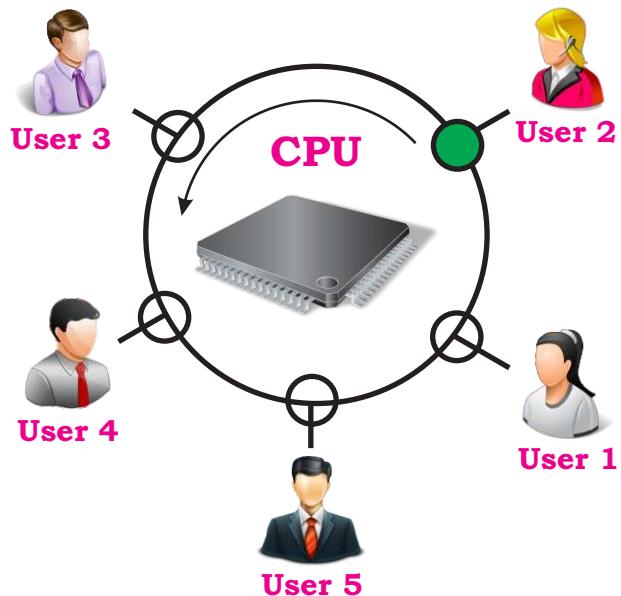


Fig: 2.7 Time Sharing Operating System

2.2.4 Real Time Processing Operating System (RT OS)

A Real Time Processing Operating System is a time bound operating system which has fixed time limit. Processing has to be done within the defined time limit otherwise system will be failed. Real Time Process System classified into two parts:

Hard Real Time System: A Hard Real Time System guarantees that critical tasks complete on time, even the shortest delay or urgency is not acceptable. Here system should meet the deadline. Missile systems and Air Traffic Control System are best examples of Hard Real Time System.

Soft Real Time System: In this time constraint is less strict. The meeting of deadline is not compulsory for each task, every time. A critical real-time task gets priority over other tasks until it completes. It does not guarantee that task will be completed in defined time but before a certain time and according to the priority. Online Transaction System, Airline Ticket Reservation in which reservation could be delayed but should be done after checking available seats and completed before aeroplane flight, etc. are the examples of Soft Real Time System.

SLOs



- Apply and demonstrate the installation process of Windows OS and other software in a computer
- Apply installation process of any antivirus in a computer.

2.3 SOFTWARE INSTALLATION

Software installation is the process of making programs ready for execution. Software installation or installer is a computer program that installs files, such as applications, drivers, or other software, onto a computer. Software is installed onto a computer by various means. They can be downloaded from the internet. They can also be installed from an installation CD or DVD or from a USB flash drive.

2.3.1 Installing Windows Operating System

Operating system is the most essential software and there are many operating systems available. Windows is the most commonly used operating system which is developed by Microsoft. Choosing an operating system depends upon the hardware that we have. To maintain compatibility between hardware and software, the operating system vendor specifies the minimum hardware requirement. For installing Windows 10, we will need at least the following configuration.

Processor	1GHz (speed of CPU should be at least 1 Gigahertz)
Memory	1GB for 32-bit or 2GB for 64-bit (RAM – Random Access Memory – a type of computer memory, 32 bit and 64 bit are data units)
Storage	32GB (hard disk space should be at least 32 Gigabytes)
Graphics card	DirectX 9 or later with WDDM 1.0 driver (graphics card is computer hardware that produces images seen on monitor screen)
Display	800x600 (computer monitor capability)

Major Steps for Installing Windows

- Insert the Windows Installation DVD/Flash Drive
- Restart your Computer
- Wait for the first startup screen
- Press or hold Del or F2 to enter the BIOS screen
- Locate the Boot order / Boot sequence
- Select Boot order / Boot sequence as per your installation source
 - a. USB Flash/USB Hard Disk
 - b. USB CD/DVD ROM
 - c. Internal CD/DVD ROM
- Select any option:
 - a. Upgrade
 - b. Customize Installation (Advance)
- Select any drive for installing your operating system
- Follow the on screen instructions

Teacher Note



- Teachers should focus and reinforce on important steps of installation like selection of drive, formatting and deleting drive and other setting.
- Ideally, students should be given a chance to install Windows in groups.

2.3.2 Installing Office Automation Software

Windows is an Operating System which needs to install other software to make the best use of our computer. Office Automation software is the most common software package that we install on our computers. Office Automation software is a group of computer programs that help users in their daily work. Generally you will find MS Office in school lab, offices and other places. MS Office contains word processor (MS Word), spreadsheet (MS Excel), multimedia presentation (MS PowerPoint), database management system (MS Access) and email application (MS Outlook). In class 9, we will use MS- Word, MS Excel and MS-Access in coming units.



Fig: 2.8 Common Programs in MS Office

To install MS- Office package we need to take following steps.

- Run the MS- Office setup from USB, DVD or Hard Disk backup.
- Check the box marked 'I accept the terms of this agreement' and click on 'Continue'.
- Enter Product Key
- Click on Install Now or Customize procedure.
- Select the package which you want to install. Click on 'Install Now'.
- Then installation begins.
- MS Office installer will notify automatically after finishing the installation.

Before installing MS- Office, make sure that your hardware and software meet with the minimum requirements for the version of MS-Office that you want to install. The minimum requirements may differ from version to version. (For MS- Office 2013 the minimum requirements are: 1.6 GHz processor, 1 GB RAM, 3 GB hard disk free space, minimum Windows 7 operating system and graphics driver).

2.3.3 Installing Antivirus

To keep our computer secure and free from viruses, we need to install an antivirus software. A number of free antivirus software are available online. AVG, Avast, Avira and Kaspersky are some of the free antivirus software. These days we need to download installation file from respective antivirus software and run it but make sure that computer has the access of internet. After running the installation file, antivirus software will be automatically installed on our computer.

Most important component of an antivirus software is the virus database which antivirus software updates time to time. We must update our virus database for preventing virus threats.

Teacher Note



- There are 5 lab periods allocated to complete the SLOs of this unit. However, teachers can manage more practical for students and help enhancing their skills to use operating system efficiently. Students at this level should be able to manage files and folders and configure simple settings of operating system.
- Teachers are also suggested to demonstrate the installation and configuration process of any hardware driver e.g. printer.



SUMMARY

- ◆ An Operating System is a software which performs all the basic tasks like booting the computer, file management, memory management, process management, and controlling peripheral devices such as hard disk, printer, etc.
- ◆ Operating System performs the following functions like Booting, Resource Management, User Interface or Command Interpreter, Memory Management, Input / Output Management, File Management, Process Management, User Management.
- ◆ An interface is a program that allows a user to interact with the computer or another computer over a network like Command Line Interface, Graphical User Interface (GUI).
- ◆ The Operating Systems have been evolved as Single User and Multi-User OS, Batch Processing OS, Time Sharing OS, Real Time Processing OS.
- ◆ A single user operating system allows only one user to operate computer at a time.
- ◆ A Multi-User Operating System allows multiple users to access the computer at same time.
- ◆ In fact the real time operating system consists of Windows, Linux, etc.
- ◆ In batch processing operating system each user prepares his job and submits it to the computer operator.
- ◆ Time sharing is a method that allows multiple users to share resources simultaneously.
- ◆ A Real Time Processing operating system is a time bound operating system which has fixed time limit.
- ◆ A Hard Real Time System guarantees that critical tasks complete on time. Missile systems and Air Traffic Control System are best examples of Hard Real Time System.
- ◆ Soft Real Time System does not guarantee that task will be completed in defined time. Online Transaction systems, Airline Ticket Reservation, etc. are the examples of Soft Real Time System.
- ◆ Software Installation means to put something in a new place, ready to be used.

- ♦ Office Automation Software is a group of computer programs that help office workers in their daily work.
- ♦ MS Office 2010 contains MS Word, MS Excel, MS PowerPoint and MS Outlook.
- ♦ For MS- Office 2013 the minimum requirements are: 1.6 GHz processor, 1 GB RAM, 3 GB hard disk, minimum Windows 7 operating system and graphics driver.



EXERCISE

A. Choose the right answer:

1. The software which performs all basic tasks is:

a) antivirus	b) start menu
c) operating system	d) office automation
2. A program that enables user to interact with computer is called:

a) my document	b) start menu
c) desktop	d) interface
3. The process of checking computer, starting operating system and making it ready to work is referred to as:

a) resource management	b) booting
c) error checking	d) file management
4. The number of user(s) that can access the resources simultaneously on a Multiuser OS is /are:

a) one	b) two
c) many	d) only administrators
5. Which management controls the dynamic allocation and de-allocation of processor, memory, etc?

a) Resource	b) File
c) I/O	d) User
6. In which operating system jobs are executed in groups?

a) Batch Processing	b) Time Sharing
c) Single User	d) Real Time

7. The system that guarantees that critical tasks should be completed without shortest delay is:
- a) Batch Processing
 - b) Hard Real Time
 - c) Soft Real Time
 - d) Time Sharing
8. DOS is an example of:
- a) Real Time Processing OS
 - b) Multi Processing OS
 - c) Single User OS
 - d) Multi User OS
9. The group of programs that helps office workers to do a number of routine tasks easily and efficiently is called:
- a) operating system
 - b) e-mail
 - c) anti-virus
 - d) office automation
10. The operating system that allows frequent switching from one task to another is:
- a) Batch Processing
 - b) Real Time Processing
 - c) Single User
 - d) Time Sharing

B. Respond the following:

1. Define Operating System. Give three examples of operating systems.
2. List the functions of an OS? Write briefly about any two.
3. Differentiate between CLI and GUI. Write any two benefits of each.
4. Which resources are managed by Resource Management function of OS?
5. What is the difference between single user and multi user OS? If you are a manager of a large organization which type of OS will you prefer? Justify your answer with any two reasons.
6. What is the purpose of office automation software? With examples, explain how can office automation help employees to be productive and efficient?
7. List the programs available in MS Office and write why each program is used?
8. What is the major difference between Soft Real Time and Hard Real Time systems?
9. Why it is important to install an antivirus?

C. Match the columns:

S.NO.	A	S.NO.	B	C
(i)	CLI	(a)	Time bond operating system	
(ii)	Windows	(b)	Office automation	
(iii)	Process	(c)	Function of operating system	
(iv)	Ms Excel	(d)	Operating system	
(v)	Real time processing operating system	(e)	A job to be performed by the system	
(vi)	Input / Output Management	(f)	Interface	



ACTIVITIES

1. Teacher should demonstrate installation process of
 - Windows Operating System (feasible version)
 - Microsoft Office (feasible version)
 - Any free antivirus software
2. Students should be given task to make use of antivirus software.
3. Student should observe and work with different
 - icons on Windows Desktop
 - Start Menu
 - Utility Programs available
4. Student should also practice creating, copying, moving and deleting files and folders.
5. Teacher should also demonstrate the Task Manager for explaining Task Management concept.
6. Teacher should also demonstrate the BIOS screen.