TEST EDITION

THE TEXTBOOK OF

COMPUTER SCIENCE

For Grade 9

THE TEXTBOOK OF COMPUTER FOR CLASS 9

SINDH TEXTBOOK BOARD, JAMSHORO

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COMPUTER SCIENCE

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Prepared by **ASSOCIATION FOR ACADEMIC QUALITY (AFAQ)** for SINDH TEXT BOOK BOARD JAMSHORO.

Reviewed by Provincial Review Committee Directorate of Curriculum Assessment and Research Sindh Jamshoro (DCAR).

Prescribed as a Textbook by the **Boards of Intermediate and secondary Education, Karachi, Hyderbad, Sukkur, Larkana and Mirpurkhas** for Secondary School Certificate Examination in the Province of Sindh.

Approved by the **Education and Literacy Department, Government of Sindh.** No. SED/HCW/181/2018 Dated 22-7-2020 for the province of Sindh.

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Printed at:

PREFACE

The New Textbook of Computer Science for Grade 9 is in your hand. This book is written on the Reviewed Curriculum of Computer Science 2018 by Directorate of Curriculum, Assessment and Research Sindh, Jamshoro. It took some time to develop and publish this book. No doubt that Textbook of Computer should be revised frequently and this is what STBB commits now with all the stakeholders.

I hope that this book will be helpful for teachers to impart latest knowledge and skills in students. This book will meet the diverse needs of students at large. Computer Science Textbook discourages rote learning and promotes performance based skill development for students. Readers of this book will find and appreciate the rigorous effort to promote critical thinking, creativity, analysis and self-learning.

The world is changing rapidly. To compete with the world we need to equip our youth with IT skills. Teachers bear this responsibility and do their best to offer academic excellence. This textbook will be a great tool for teachers in this regard.

Our organization is indebted to all the Authors and Reviewers of this book who made rigorous efforts to deliver a book that is competitive with any other textbook at this level.

We encourage teachers, students, parents, researchers and all the stakeholders to give their feedback and suggestion to further improve this book.

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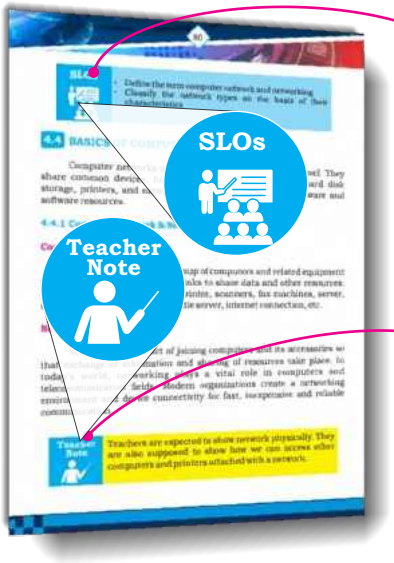
Sindh Textbook Board, Jamshoro

About the Book

The new textbook of Computer Science is for Grade 9 holds some important features. This book is aligned with the Curriculum of Computer Science (2018) reviewed by Directorate of Curriculum, Assessment and Research Sindh Jamshoro. To provide better experience of teaching and learning there are some important things which are included in this book.

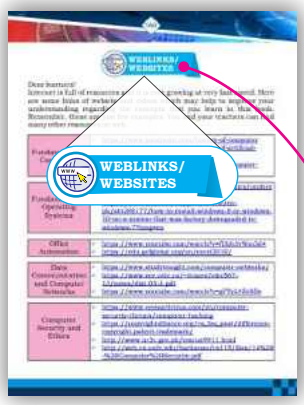


A Textbook is a means to achieve the standards and benchmark that are set in curriculum. The standards and benchmarks are described in curriculum through Students Learning Outcomes (SLOs). SLOs are measureable instructional goals established for a specific group of students over a set period of time. The formative and summative assessments should be based on SLOs. Since in many institutions teachers and students do not have access to curriculum, therefore SLOs are given in each unit.

Teacher Note: Teachers are given some guidelines in this textbook wherever needed. This guideline will express how teachers are expected to teach a specific concept.

The exercises in this book discourage rote learning. Many questions are inquiry based. Teachers are expected to facilitate students to find the answers and accept and appreciate the variety of answers as far as they address the questions.

At the end of each chapter, activities are given in this textbook. The purpose of these activities is to inculcate skills and attitude in students to propel self-learning. These activities will challenge students to learn unconventionally.



In our context, students often cannot buy additional reference books. However, in this era of technology, students and teachers can access internet at very low cost. Therefore, the readers can find weblinks at the end of this book for further reading and understanding of any concept given in this book.

بِسۡمِ اللّٰہِ الرَّحۡمٰنِ الرَّحِیۡمِ

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FUNDAMENTALS OF COMPUTER

Unit 1

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.

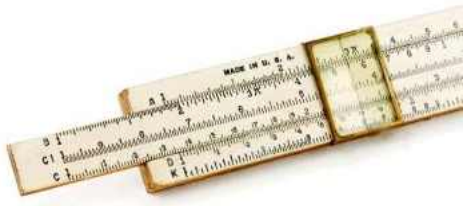


Fig: 1.3 Slide Rule

(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.

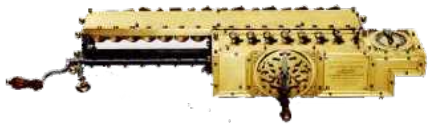


Fig: 1.5 Leibniz Calculator

(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

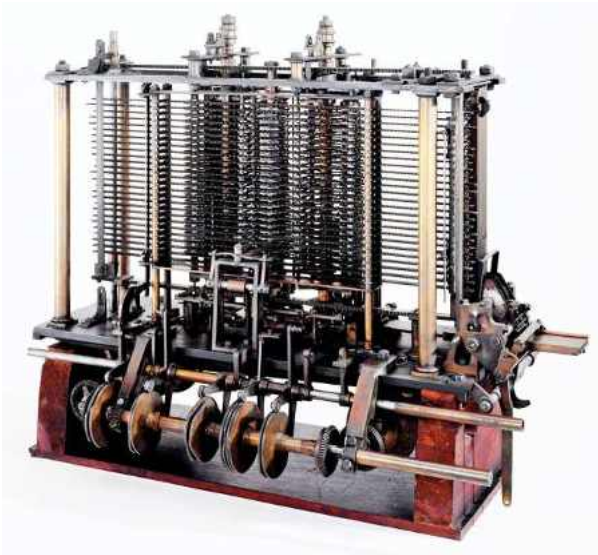


Fig: 1.7 Babbage's Analytical Engine

(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 to1956)

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.

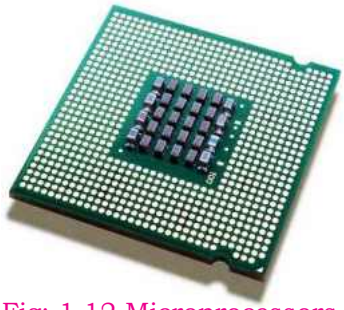


Fig: 1.12 Microprocessors

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.

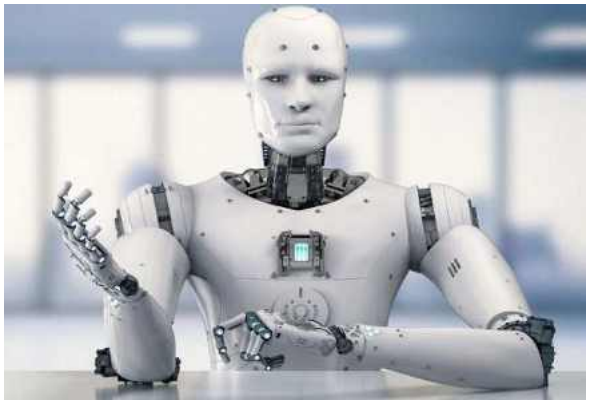
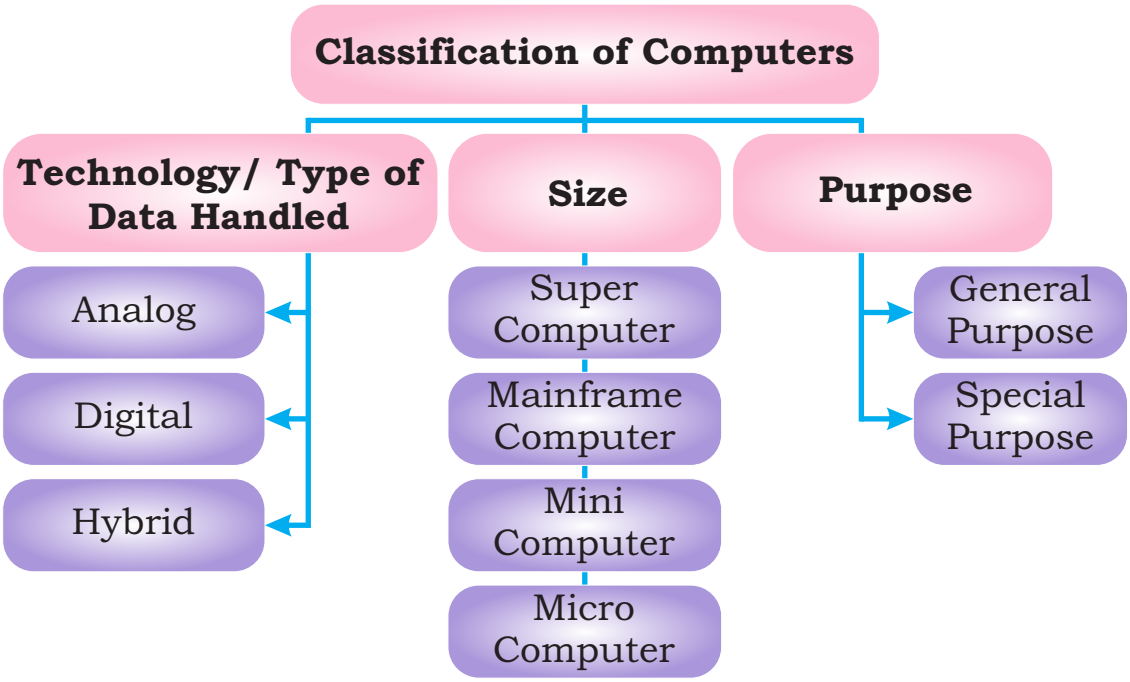


Fig: 1.13 Humanoid Robot

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

SLOs

- 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.

SLOs

- 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.

Teacher Note

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)

Fig: 1.21 Microprocessor

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.

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 measure 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.

SLOs

- 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 to1956): 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 resisters, 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:

1. The device that converts hard copy into soft copy is:
   a) printer b) plotter
   c) scanner d) barcode reader

2. The volatile memory
   a) is permanent
   b) loses contents as the power is disconnected
   c) possesses large storage
   d) manages hardware resources

3. Media players are:
   a) business software b) education software
   c) entertainment software d) productivity software

4. The programs that are generally installed to manage and maintain overall computer resources is:
   a) operating system b) utility program
   c) language translator d) device driver

5. Modern languages use
   a) compiler b) interpreter
   c) convertor d) assembler

6. A collection of wires connecting the CPU with main memory that is used to identify particular locations is:
   a) control bus b) data bus
   c) address bus d) memory bus

7. The inexpensive and most commonly used computers are:
   a) super computer b) mainframe computer
   c) minicomputer d) microcomputer

8. Computer cannot start without:
   a) operating system b) utility program
   c) device drivers d) business software

9. Graphical User Interface (GUI) was developed in:
   a) second generation b) fourth generation
   c) mechanical era d) electro-mechanical era

10. A person who uses different programming languages to develop programs is:
   a) database administrator b) web designer
   c) software engineer d) graphic designer

B. Respond the following:

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

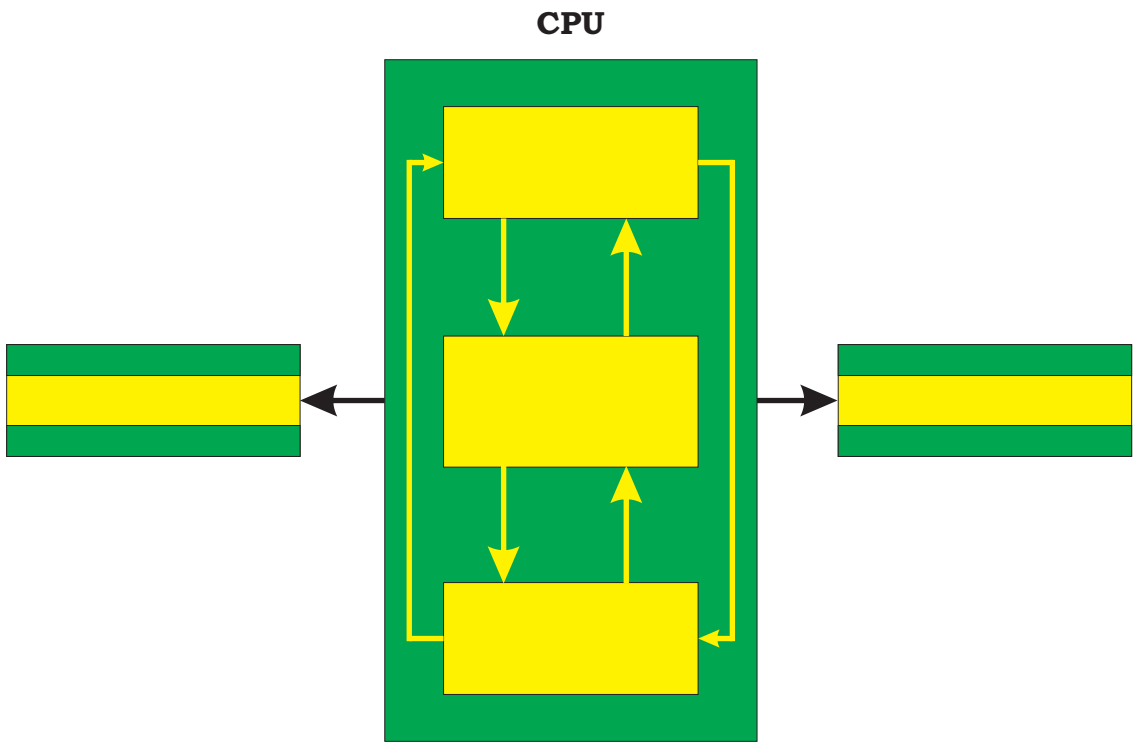
Generation	Period	Technology	Example of Machines
First			
Second			
Third			
Forth			
Fifth			

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.