Unit 1 Introduction to Computers

Structure:

1.1 Introduction

As you know computers play an important role in the modern world and today computers have become part of our life. Computers are being used in almost all the fields like medical, engineering, production, automobile, education, science and research, military, aviation, banking, weather forecasting, satellite launching, transportation, offices and homes etc. Usage of computers in different fields has become a necessity in the present competitive world. Computers are just the machines and you must specify the work that is to be carried out by the computer. Thus to carry out a specific task series of instructions must be given to the computer in a particular order. As a user of a computer, one has to understand the basic fundamentals of computer. In this unit, you will study about the definition of computer and its basic block diagram. You will also study other related concepts like software, hardware, levels of programming languages and operating system. Finally in last section of this unit, you will study about the classification of computers.

Objectives:

After studying this unit, you should be able to:

- define the computer
- explain the basic block diagram of digital computer system
- define microprocessor
- explain microprocessor based system.
- define instruction, software and hard ware
- explain machine and assembly level language
- explain the function of an operating system.
- list the characteristics and applications of computers
- give the classification of computers

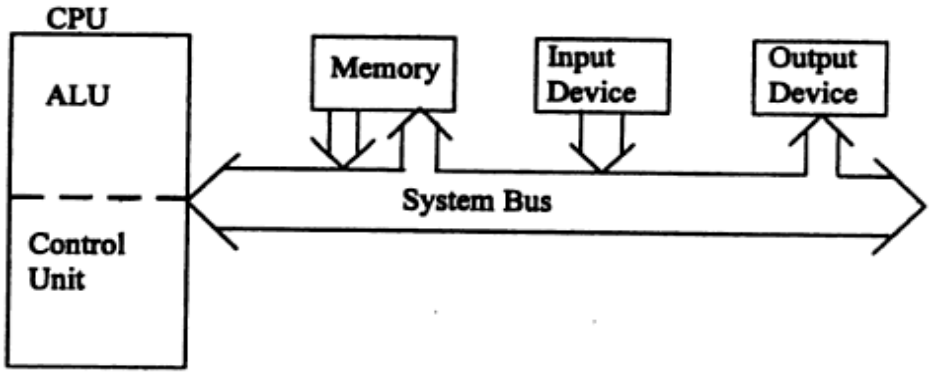
1.2 Definition of a Computer

The term computer is derived from the word *compute* which means to calculate. So a computer is usually considered to be a calculating device that can perform arithmetic operations at enormous speed. A ***computer*** can be defined as a device that receives information (in the form of digitalized data) processes it according to a set of instructions, and gives back a result as output. A computer can also be defined as an electronic machine that accepts data from the user, processes the data according to the instructions given and produces the desired output result. A computer is a general purpose device that can be programmed to carry out a finite set of arithmetic or logical operations. A computer performs both simple and complex operations with speed and accuracy. A computer system recognizes and operates or processes only in binary digits (bits) 0 and 1. A *bit* is an abbreviation of binary digit. A group of 8 bits is called a Byte. You can ask the computer to do some particular task or operation by giving a suitable command or instruction. An ***instruction*** is a binary command or binary pattern (0s and 1s) entered through an input device in memory to command the microprocessor to perform specific function. The figure 1.1 shows an example of a computer system called desktop computer system which you might have seen in offices or in homes.

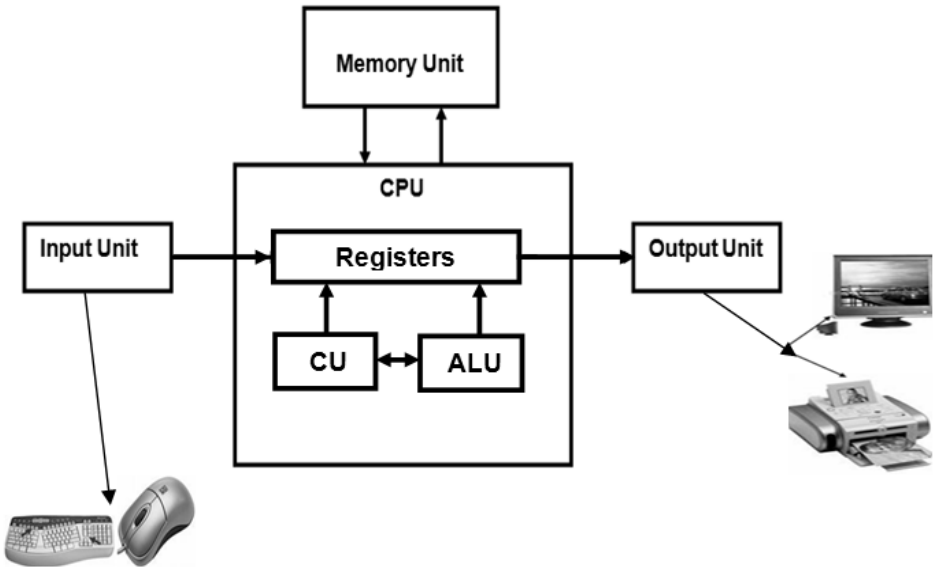
Figure 1.1: Example of Computer

1.2.1 Block Diagram of Computer

A computer is a fast and accurate device, which can accept data, store data, process them and gives desired results as output. The figure 1.2 (a) gives the basic block diagram of a general purpose digital computer. The figure 1.2(b) gives a more detailed version of computer system showing the various sections of Central Processing Unit (CPU) and input/output (I/O) devices.



(a)



(b)

Figure 1.2: Computer System (a) Block Diagram (b) Block Diagram showing input and output devices.

As shown in figure 1.2, the computer is organized into four units such as, Input unit, Output unit, CPU and Memory.

Input Unit (or Input Device)

Any device designed to assist in the entry of data into a computer is known as Input device. The computer accepts input data from the user via an input device. Input devices convert data from any convenient external format into binary codes that a computer can store and manipulate internally. Some of the most common and popularly used input devices are: Keyboard, Mouse, Joy Stick, Scanners, Optical Character Readers etc.

Output Unit (or Output Device)

Any peripheral device that converts the stored binary coded data into convenient external forms such as text, pictures, sound, document etc., are known as Output devices. The output is the result generated after the processing of data. The computer may display the output on a monitor, send output to the printer for printing, play the output, etc. Some of the most popularly used output devices are: Monitors (like LED monitor, LCD Monitor, CRT Monitor), Printer etc.

In computer system we often use the term ***Peripherals*** which refers to the devices that are connected to a computer for performing specific tasks. They are usually related to the input or output of data, i.e., they are input or output devices. So I/O devices are also called as peripheral devices.

Central Processing Unit:
The central processing unit (CPU) is the electronic brain of the computer. CPU consists of Arithmetic Logic Unit (ALU) and Control Unit (CU).

(a) Arithmetic Logic Unit (ALU): The arithmetic logic unit (ALU) is responsible for arithmetic and logical operations. Basically an Arithmetic-Logic Unit (ALU) is an electronic circuit used to carry out the arithmetic operations like addition, subtraction, multiplication and division. It also carries out logical operations like greater than, less than, equal to etc. It performs the operation on the data provided by the input devices. It also does the comparison operation which allows a program to make decisions based on its data input and results of the previous calculations. The ALU operates on the data available in the main memory and sends them back after processing again to main memory.

(b) Control Unit (CU): CU controls the overall operations of the computer. it is the chief coordinator of all the operations or activities taking place in the computer system. Its main functions are to control the transfer of data and information between various units and to initiate appropriate actions by the arithmetic-logic unit. It fetches instructions from the memory, decodes them, and directs them to various units to perform the specified tasks.

In addition to ALU and CU, CPU also has a set of registers for temporary storage of data, instructions, addresses and intermediate results of calculation. The processor is plugged into the computer's motherboard. The processing capacity of a computer is measured in terms the amount of data processed by the CPU in one operation.

Memory Unit: Memory unit stores the data, instructions, intermediate results and output temporarily, during the processing of data. This memory is also called the ***main memory*** or ***primary memory*** of the computer. The input data that is to be processed will be usually brought into the main memory before processing. It also stores the instructions required for processing of data and any intermediate results. The output is stored in

memory before being transferred to the output device. CPU can work with the information stored in the main memory. The following points are important as far as memory is concerned.

8 Bits = 1 Byte

1024 Bytes = 1 Kilobyte (KB)

1024 Kilobytes = 1 Megabyte (MB)

1024 Megabytes = 1 Gigabyte (GB)

The number of bits stored in a register is called a ***memory word.*** Different kinds of primary memory are Random Access Memory (RAM) and Read Only Memory (ROM). You can read and write data in RAM but it is volatile meaning whenever the power is switched off the contents of RAM is lost. So it is required to store the data in the secondary memory if the data is required for the future use.

Secondary Memory

Another kind of storage unit is the secondary memory of the computer. The data, the programs and the output are stored permanently in these storage units of the computer. Examples of secondary memory are: Magnetic disks, optical disks, pen drives and magnetic tapes. This is the permanent memory. The data stored in it is permanent. But you can delete the data if you want. The figure 1.3 gives you the examples of secondary memory devices.

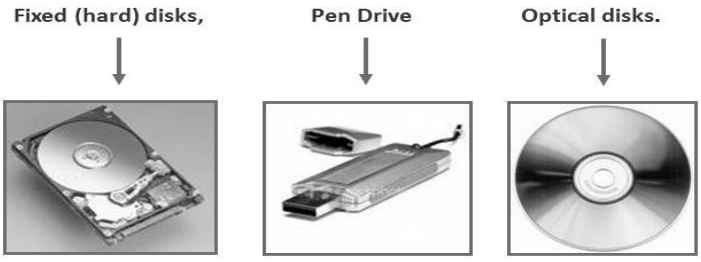


Figure 1.3: Examples of Secondary Memory Devices

1.2.2 Concept of Microprocessor

Earlier ALU section, control section and memory section (register section) were available separately and a combination of all these was called as CPU. Later due to the advancement in semiconductor technology it became possible to fabricate the entire ALU section, control section and register

section in a single integrated circuit (IC). This single IC which consists of ALU, control section and Register section is called ***Microprocessor*** or ***μP*** in short. The computer system which uses microprocessor (*μP)* as its CPU is known as microprocessor based system or simply a microcomputer system or microcomputer. The figure 1.4 shows the block diagram of general microcomputer system.

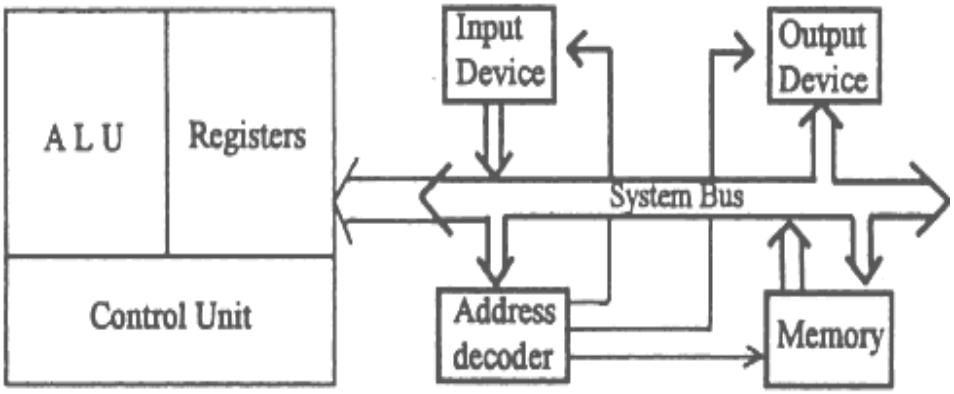


Figure 1.4: Modified Block Diagram of Computer System

The major components of a microprocessor as shown in figure 1.4 are: ALU, Registers and Control Unit. As we already studied, the ALU section does the function of performing arithmetic and logical operations, registers are used for temporary storage of data during the execution of the program and control unit provides the required timing and control signals to carry out the different operations within as well as outside CPU. As we know already, the input unit accepts the data and programs and send it to the CPU and memory. The output devices display or indicate the the processed result to the outside world. The Memory stores the data and instructions during the execution of programs. This memory could be RAM or ROM.

A ***Bus*** is a bundle or group of wires. The input devices, output devices, CPU and memory units are all connected by a group of wires or conductors called ***system bus*** which serves the computer system under its control. This system bus helps these devices to communicate each other by carrying signals.

The address decoder decodes the address sent by the CPU for of a specific device and selects the particular device.

A practical model of a computer system with more details is shown in figure 1.5.

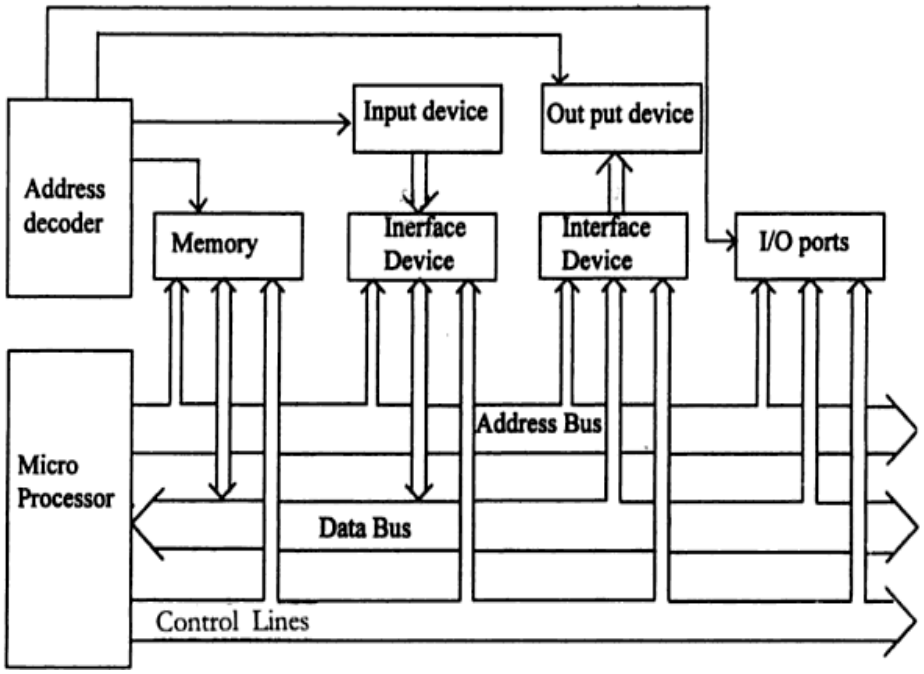


Figure 1.5: Practical model of a microprocessor based system.

An interface is a circuit that connects external devices to the microprocessor. For example, a key board interface which connects keyboard to the CPU and a display interface which connects display unit like LED to the CPU.

Bus is divided into three categories like" address bus, data bus and control Bus. All these buses not only carry information regarding data, address and control bus but also connect microprocessor to memory (RAM or ROM) and I/O devices. So the system bus may be an address bus, a data bus or a control bus.

Address Bus: If the bus carries the address of an input or output devices or location of memory device then it is called ***address bus***. The address bus is a set of parallel connected lines. The address bus consists of 16, 20, 24 or more parallel signal lines. On these lines the CPU sends out the address of the memory location that is to be written to or read from. The number of

memory locations that the CPU can address is determined by the number of address lines. If the CPU has N address lines then it can directly address 2^N memory locations. For example, a CPU with 16 address lines can address 2^{16} or 65, 536 memory locations.

Data Bus: If the system bus carries only the data, then it is called **data bus.** The data bus consists of 8, 16, 32 or more parallel signal lines. Data bus is used to transfer, information between microprocessor, I/0 devices and memory. It is also called bi-directional bus. This is because the data flow in both directions between the microprocessor and memory and peripheral devices. Usually the number of data lines used in the data bus is equal to the size of data word being written or read.

Control Bus: If the system bus carries only the control and timing signals, then it is called ***control bus*.** This bus control the direction of data flow on the bidirectional data bus and also differentiate between a memory address and an I/O address. Some of the control bus signals are Memory read, Memory write, I/O read and I/O write.

Port: Usually the microprocessor will not directly interacts or communicates with input/output (I/O) devices since the I/O devices are electromechanical and are very slow compared to the speed of the microprocessor. So microprocessor will communicate with I/O ports which are semiconductor chips working at electronic speeds. These I/O ports communicate with I/O devices. A ***port*** is a device to receive the bytes from external peripheral(s) [or device(s) or controllers] for reading them using instructions executed on the processor or to send the bytes to external peripheral/s using instructions executed on processor. A Port connects to the processor using address decoder and system buses. For example, COM1 and COM2 are the ports in an IBM PC.

The unit of processing capacity of the CPU is defined in terms of Millions Instructions Per Second (MIPS) of Floating point Operations Per Second (FLOPS).

Self Assessment Questions

1. A computer accepts data from the user processes the data according to the instructions given and produces the desired output result. (True /False)

2. RAM stands for _____.
3. A single IC which consists of ALU, control section and Register section is called _____.
4. What is the name of the system which carries only the control and timing signals?

1.3 Hardware and Software

When working with computers you hear the terms hardware and software which play an important roles in computer system. The computer consists of a body that is the hardware and a mind that is the software just as a human being can be seen as a combination of body and mind. Now let us study these concepts.

Hardware: Hardware is the name given to the physical devices and circuitry of the computer. In other words, the physical components of the computer are called ***hardware***. Any part that we can see or touch is the hard ware. Computer hardware includes all the electrical, mechanical, and the electronic parts of a computer.

Computer hardware includes

1. System Unit
2. Peripheral devices
3. Input devices i.e. keyboard, mouse, scanner, Bar code reader etc.
4. Output devices i.e. Display Unit, printer etc.
5. Storage devices like hard disk drives.

Software: The functioning of the computer is not dependent on hardware alone. So, what else is required? It requires a set of instructions that tells the computer what is to be done with the input data. The entire group of instructions determines what functions the microprocessor can perform and this set is called instruction set. In computer terminology, this set of instructions is called a program and one or more programs or a group of programs is termed as ***software***. Software refers to the programs written for the computer.

Software used for computers may be of different types. Some of which are:

1. Application Software
2. System Software

Application Software

Software specially suited for specific applications for example, railway and airline reservation, billing, accounting or software which enables creation and storage of documents are termed as application software.

System Software

System software is used to run the computer hardware. It includes mainly the Operating system and device drivers. The programs that are part of the system software include assemblers, compilers, file management tools, system utilities, and debuggers. The Operating System manages the various I/O devices of the computer and enables the user to interact with the machine. The computer as we know understands only machine language i.e. 0's and 1's. In the above example how do you think it understands the reservation clerk's query in English? There has to be software which translates the user language into machine language. The software which does this translation are compilers and interpreters.

Firmware: It is the term given to the programs stored in ROMs or in other devices which keep their stored information when the power is turned off.

1.4 Levels of Programming Languages

There are two major types of programming languages. These are Low Level Languages and High Level Languages. Low Level languages are further divided in to Machine language and Assembly language. The programming language that any computer can actually understand and execute is its own native binary machine code. This is the lowest possible level of language in which it is possible to write a computer program. All other languages are said to be high level or low level according to how closely they can be said to resemble machine code.

In this context, a low-level language corresponds closely to machine code, so that a single low-level language instruction translates to a single machine-language instruction. Machine code is the only language a microprocessor can process directly without a previous transformation.

A high-level language instruction typically translates into a series of machine-language instructions.

Low-level languages have the advantage that they can be written to take advantage of any peculiarities in the architecture of the central processing unit (CPU) which is the "brain" of any computer. Thus, a program written in a low-level language can be extremely efficient, making optimum use of both computer memory and processing time. However, to write a low-level program takes a substantial amount of time, as well as a clear understanding of the inner workings of the processor itself. Therefore, low-level programming is typically used only for very small programs, or for segments of code that are highly critical and must run as efficiently as possible.

Machine Level Language: It is a programming language which can be directly understood and executed by a machine. This is the language of 0s and 1s. It is also called ***machine language*** or ***machine code***. The very lowest possible level at which you can program a computer is in its own native machine code, consisting of strings of 1's and 0's and stored as binary numbers. The only advantage is that program of machine language run very fast because no translation program is required for the CPU. The main problems with using machine code is that programmer has to remember a lot of codes to write a program which results in program errors it is very easy to make a mistake, and very hard to find it once you realize the mistake has been made. In other words, debugging is difficult.

Assembly Language: The set of symbols and letters forms the Assembly Language. A symbolic language closely related to a machine language. No matter how close assembly language is to machine code, the computer still cannot understand it. The assembly-language program must be translated into machine code by a separate program called an assembler. The assembler program recognizes the character strings that make up the symbolic names of the various machine operations, and substitutes the required machine code for each instruction. At the same time, it also calculates the required address in memory for each symbolic name of a memory location, and substitutes those addresses for the names. The final result is a machine-language program that can run on its own at any time; the assembler and the assembly-language program are no longer needed. To help distinguish between the "before" and "after" versions of the program, the original assembly-language program is also known as the

source code, while the final machine-language program is called the object code.

The advantages of assembly languages are: The symbolic programming of Assembly Language is easier to understand and saves a lot of time and effort of the programmer, it is easier to correct errors and modify program instructions and Assembly Language has the same efficiency of execution as the machine level language. Because this is one-to-one translator between assembly language program and its corresponding machine language program.

One of the major disadvantages is that assembly language is machine dependent. A program written for one computer might not run in other computers with different hardware configuration.

Low level language: A machine language or assembly language. A low-level programming language is a programming language that provides little or no abstraction from a computer's instruction set architecture. Generally this refers to either machine code or assembly language. A program written in a low-level language can be made to run very quickly.

High level language: High-level language is a language that conceptually closer to the problems to be solved than to the hardware on which it runs. High-level languages permit faster development of large programs. You know that assembly language and machine level language require deep knowledge of computer hardware whereas in higher language you have to know only the instructions in English words and logic of the problem irrespective of the type of computer you are using. Higher level languages are simple languages as they use English and mathematical symbols like +, -, %, / etc. for its program construction. You should know that any higher level language has to be converted to machine language for the computer to understand. Also Higher level languages are problem-oriented languages because the instructions are suitable for solving a particular problem.

Currently, programmers almost never write programs directly in machine code, because it requires attention to numerous details which a high-level language would handle automatically, and also requires memorizing or looking up numerical codes for every instruction that is used. Higher level languages have a major advantage over machine and assembly languages

that higher level languages are easy to learn and use. It is because that they are similar to the languages used by us in our day to day life.

Assembler, Interpreters and Compilers

An Assembler is a program which converts an assembly language into machine level language.

An Interpreter is a program which converts an high level language into machine level language.

A compiler is a program that translates a high level language into a low level language. Once the program has been written in high level language, it is translated to the equivalent machine code by a compiler. Once the program has been compiled, the resulting machine code is saved separately, and can be run on its own at any time. Compiler languages are the high-level equivalent of assembly language.

Both interpreter and compiler convert a high level language into machine level language but the difference is that the interpreter reads instructions line by line one after the other and after reading one line it converts that into machine language. But the compiler reads the all the lines of the program at once and then converts them into corresponding machine codes.

Note that the compiled machine code is less efficient than the code produced when using assembly language. This means that it runs a bit more slowly and uses a bit more memory than the equivalent assembled program. To offset this drawback, however, we also have the fact that it takes much less time to develop a compiler-language program, so it can be ready to go sooner than the assembly-language program.

Addressing Mode: The data can be read from memory location or it can be in register or can be provided as a part in the instruction itself or can be read from the input port. So there are various ways that the data can be obtained. The various ways of specifying the data (or operand) is called ***addressing mode***. Each Microprocessor supports many addressing modes.

Self Assessment Questions

5. The physical components of the computer are called _____.
6. System Software is suited for specific applications. (True/False)
7. Machine language can be directly understood and executed by a machine and it is the language of 0s and 1s. (True/False)
8. The various ways of specifying the data is called _____.

1.5 Operating System (OS)

Consider an example of airline reservation, the clerk types your name and other details through the keyboard. But how does this go to the system unit? This activity is done by a set of instructions called the Operating Systems. An operating system is a software component that acts as the core of a computer system. An operating system (OS) is a collection of software that manages computer hardware resources and provides common services for computer programs. An operating system (OS) can also be defined as a program that controls the execution of application programs and acts as an interface between the applications and computer hardware. Application programs require an operating system to function. The purpose of an OS is to provide an environment in which a user can execute programs in a convenient and efficient manner. You can find operating system on almost any device that contains a computer – from cellular phones and video game consoles to supercomputers and web servers. Some of the examples of operating systems are Windows95, Windows 98, Windows 2000, Windows NT, Windows Vista, Windows XP, Windows ME, Windows CE, Linux and UNIX etc.

Functions of operating system

The main functions of a modern operating system are as follows:

- **Process Management:** The operating system handles the creation and deletion of processes, suspension and resumption of processes and scheduling and synchronization of processes.
- **Memory Management:** The operating system handles the allocation and deallocation of memory space as required by various programs.
- **File Management:** The operating system is responsible for creation and deletion of files and directories. It also takes care of activities such as organizing, storing, retrieving, naming, and protecting the files.
- **Device Management:** Operating system provides input/output subsystem between process and device driver. It handles the device caches, buffers and interrupts.
- **Security Management:** It protects system resources and information against destruction and unauthorized use.
- **User Interface:** Operating system provides the interface between the user and the hardware.

1.6 Characteristics and Applications of Computers

The important characteristics of computers are:

1. Speed
2. Accuracy
3. Capacity to take large amount of work.
4. Storage capacity
5. Efficiency
6. Versatility

Computer work at a very high speed and are much faster than humans. The human equivalent of an average computer would be more than one million mathematicians working 24 hours a day. In other words, the computer can process data very fast, at the rate of Millions of Instructions per Second (MIPS). By using computers, you can complete some calculations that would have taken hours and days within a few seconds. In addition to being fast, computers are very accurate. If the input and the instructions are accurate the output will also be accurate. Unlike humans, computers do not get bored or tired. The monotony of repetitive work for long hours does not affect the computers. Large volumes of data and information can be stored in the computer and also retrieved whenever required. Computer is versatile in nature. It can perform different types of tasks with the same ease. At one moment you can use the computer to prepare a letter document and in the next moment you may play music or print a document.

In spite of all the above characteristics, computers also have several limitations. Computer can only perform tasks that it has been programmed to do. Computer cannot do any work without instructions from the user. It executes instructions as specified by the user and does not take its own decisions.

Applications of Computers

Computer can be used for various types of applications. Some of applications of computers are:

1. Railway reservation
2. Banking and Accounts
3. Weather Forecast
4. Space Research
5. Medical Diagnosis

6. Chemical Analysis
7. Business
8. Science and research

The figure 1.6 shows the some of the applications of computer.

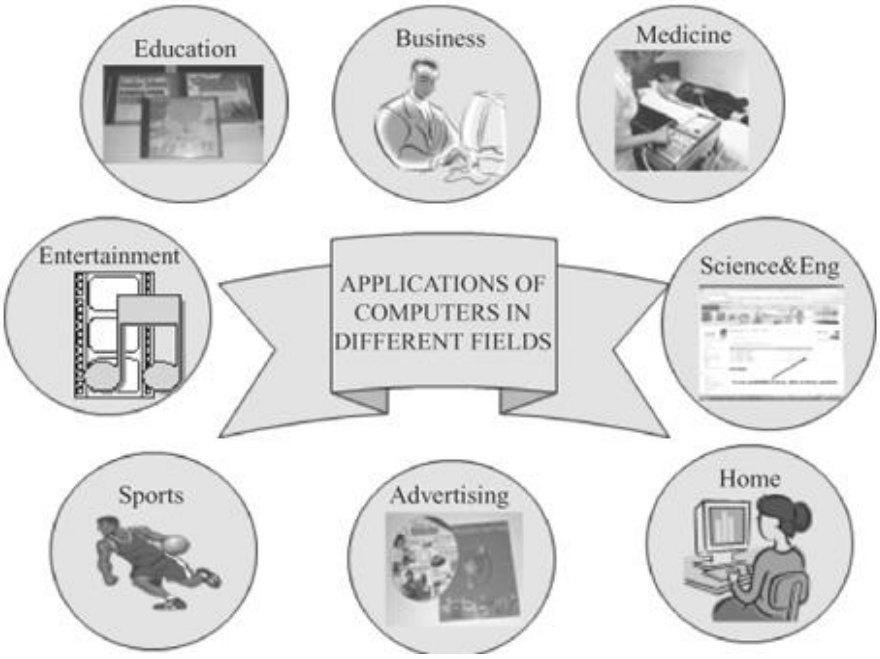


Figure 1.6: Applications of Computer

1.7 Classification of Computers

Computers are classified according to their data processing speed, amount of data that they can hold and price. Depending upon their speed and memory size, computers are classified into following four main groups.

1. Supercomputer
2. Mainframe computer
3. Mini computer
4. Microcomputer

1. Supercomputer

Supercomputer is the most powerful and fastest computer, and also very expensive. It was developed in 1980s. It is used to process large amount of data and to solve the complicated scientific problems. It can perform more

than one trillions calculations per second. It has large number of processors connected in parallel. So parallel processing is done in this computer. Super computer are mainly used for:

- Weather forecasting
- Nuclear energy research
- Aircraft design
- Automotive design
- Online banking
- To control industrial units

The supercomputers are used in large organizations, research laboratories, aerospace centers, large industrial units etc. The examples of supercomputers are IBM Roadrunner, IBM Blue gene, Intel ASCI red CRAY-1, CRAY-2, etc. The Figure 1.7 shows an example of Super Computer.

Figure 1.7: Super Computer

2. Mainframe Computers

Mainframe computers are also large-scale computers but supercomputers are larger than mainframe. These are also very expensive. The mainframe computer specially requires a very large clean room with air-conditioner.

This makes it very expensive to buy and operate. It can support a large number of various equipments. It also has multiple processors. Large mainframe systems can handle the input and output requirements of several thousands of users. The mainframe computers are specially used as servers on the World Wide Web. The mainframe computers are used in large organizations such as Banks; Airlines and Universities etc. The examples of mainframes computer are IBM S/390, Control Data CYBER 176 and Amdahl 580 etc. The Figure 1.8 shows an example of Mainframe Computer.

Figure 1.8: Mainframe Computer

3. Minicomputers

These are smaller in size and have lower processing speed. Also have lower cost than mainframe. These computers are known as minicomputers because of their small size as compared to other computers at that time. The capabilities of a minicomputer are between mainframe and personal computer. These computers are also known as midrange computers. The minicomputers are used in business, education and many other government departments. Minicomputers are commonly used as servers in network environment and hundreds of personal computers can be connected to the network with a minicomputer acting as server like mainframes, minicomputers are used as web servers. Single user minicomputers are used for sophisticated design tasks. The Figure 1.9 shows an example of Minicomputer.

Figure 1.9: Minicomputer

4. Microcomputer

Microcomputers are small, low-cost and single-user digital computer. The microcomputers are also known as personal computers or simply PCs. Microprocessor is used in this type of computer. These are very small in size and cost. The most popular types of personal computers are the PC and the Apple. Apple is another family of computers made by Apple computer. Microcomputers include desktop computers, notebook computers or laptop, tablet computer, handheld computer, smart phones and netbook, as shown in figure 1.10.

Figure 1.10: Examples of Microcomputers

Desktop Computer or Personal Computer (PC) is the most common type of microcomputer. It is a stand-alone machine that can be placed on the desk. Externally, it consists of three units – keyboard, monitor, and a system unit containing the CPU, memory, hard disk drive, etc. It is not very expensive and is suited to the needs of a single user at home, small business units, and organizations. Apple, Microsoft, HP, Dell and Lenovo are some of the PC manufacturers. Notebook Computers or Laptop resemble a notebook. They are portable and have all the features of a desktop computer. Laptops can be placed on the lap while working (hence the name). Laptops are costlier than the desktop machines. Netbook are smaller notebooks optimized for low weight and low cost, and are designed for accessing web-based applications. Netbooks deliver the performance needed to enjoy popular activities like streaming videos or music, emailing, Web surfing or instant messaging.

Tablet Computer has features of the notebook computer but it can accept input from a stylus or a pen instead of the keyboard or mouse. It is a portable computer. Tablet computer are the new kind of PCs. Handheld Computer or Personal Digital Assistant (PDA) is a small computer that can be held on the top of the palm. It is small in size. Instead of the keyboard, PDA uses a pen or a stylus for input. PDAs do not have a disk drive. They have a limited memory and are less powerful. Casio and Apple are some of the manufacturers of PDA. Over the last few years, PDAs have merged into mobile phones to create smart phones. Smart Phones are cellular phones that function both as a phone and as a small PC. They may use a stylus or a pen, or may have a small keyboard. They can be connected to the Internet wirelessly. They are used to access the electronic-mail, download music, play games, etc. Blackberry, Apple, HTC, Nokia and LG are some of the manufacturers of smart phones.

Self Assessment Questions

9. An operating system is a software component that acts as the _____ of a computer system.
10. _____ performs parallel processing.
11. The _____ computers are specially used as servers on the World Wide Web.
12. PDA stands for _____.

1.8 Summary

Let us recapitulate the important concepts discussed in this unit:

- A computer can be defined as an electronic machine that accepts data from the user processes the data according to the instructions given and produces the desired output result.
- An instruction is a binary command or binary pattern (0s and 1s) entered through an input device in memory to command the microprocessor to perform specific function.
- The computer is organized into four units such as, Input unit, Output unit, CPU and Memory.
- The arithmetic logic unit (ALU) is responsible for arithmetic and logical operations.
- A single IC which consists of ALU, control section and Register section is called Microprocessor.
- If the CPU has N address lines then it can directly address 2^N memory locations.
- The physical components of the computer are called hardware.
- Software refers to the programs written for the computer.
- Machine language is a programming language which can be directly understood and executed by a machine.
- An operating system (OS) is a collection of software that manages computer hardware resources and provides common services for computer programs.
- Depending upon speed and memory size, computers are classified into four main groups. They are supercomputer, Mainframe computer, Minicomputer and Microcomputer.
- Microcomputers are small, low-cost and single-user digital computer.

1.9 Terminal Questions

1. What is a computer? Explain the block diagram of a general purpose digital computer.
2. What is a microprocessor? Explain the block diagram of Microprocessor based computer system.

3. What do you mean by hardware of a computer system? Give examples.
4. Write a brief note on system software.
5. Discuss about (a) Machine level language (b) Assembly Level Language
6. List the characteristics of a computer.
7. Give the classification of Computers and explain them briefly.

1.10 Answers

Self Assessment Questions

1. True
2. Random Access Memory
3. Microprocessor
4. Control bus
5. Hardware
6. False
7. True
8. Addressing mode
9. Core
10. Supercomputer
11. Mainframe
12. Personal Digital Assistant

Terminal Questions

1. A computer can be defined as a device that receives information (in the form of digitalized data) processes it according to a set of instructions, and gives back the result as output. Refer to section 1.2 for details.
2. A single integrated circuit (IC which consists of ALU, control section and Register section is called Microprocessor (μP) in short. Refer to sub-section 1.2.2 for more details.
3. The physical components of the computer are called hardware. Refer to section 1.3 for details.
4. System software is used to run the computer hardware. Refer to section 1.3 for details.

5. Machine language is a programming language which can be directly understood and executed by a machine. This is the language of 0s and 1s. The set of symbols and letters forms the Assembly Level Language or simply Assembly Language. Refer to section 1.4 for more details.
6. The important characteristics of computers are: speed, accuracy etc. Refer to section 1.6 for more details.
7. Depending upon speed and memory size, computers are classified into four main groups. They are: supercomputer, mainframe computer, minicomputer and microcomputer. Refer to section 1.7 for more details.