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Study Material

For

Computer Knowledge

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INDEX

A) History & Development of Computers-

The biggest milestone in the achievement of mankind has been the discovery of numbers. In early ages man used pebbles and stones for counting purposes. The discovery of zero in India gave real boost to development of numbering system. Later Egyptians introduced symbols for ten, and powers of ten in recording number in the year 3400 before Christ.

The earliest and simplest calculating device called Abacus, consisting of heads strung on rods was used in Greece and Egypt in *450* before Christ. In 200 BC, Greeks devised a system of written numbers based on ten using alphabetic symbols to represent the numbers. For writing purposes, wax was spread on a wooden plate and a metal stylus used to scratch the wax surface.

In 100 BC a form of pocket abacus was used by Romans, though counting with pebbles on a table or counting board was still the more common method of calculating. Developments in number systems continued. Decimal point was introduced in 1492 in Italy. In 1614 John Napier, a Scottish mathematician introduced concept of logarithms, a method of multiplying and dividing numbers quickly and accurately by performing additions and subtractions. In 1617, a mechanical aid known as Napier's bone for multiplication and division was introduced. In 1620, Gunter's scale used with dividers as slide rule was introduced. In 1645, Pascal's adding machine—a device with eight counter wheels linked by ratchets for carry over was introduced.

Bissaker's straight slide rule was first used in 1654. In 1694, a calculating device (Von Leibnitz's stepped cylinder reckoner) capable of handling the four basic arithmetic operations was introduced. In 1812 Charles Babbage introduced a calculating machine (Difference Engine) capable of computing mathematical and statistical tables using difference theory. In 1837, Babbage's Analytical Engine was developed. It was a design for a digital computer.

Since early ages, man has always been thinking of producing devices which can simplify the chores of doing arithmetic and processing information. In the eighteenth century, mechanical calculators capable of performing mathematical operations were developed. In 1833, Charles Babbage developed a "calculating engine" based totally on mechanical principles. This machine worked on the principle that the mathematical equations can be solved by dividing the complete job into simple steps of addition and sub traction etc. and performing various steps one after other in a sequential manner.

In fact, this is the principle on which the present day computers are working. Thus really speaking, the history of computers began with Charles Babbage. The second major event took place in the last quarter of 19th century when Herman Hollerith, an American statistician devised machines that used punched cards as carriers of information. Another landmark occurred in 1944 when an electro-mechanical machine, *(51* feet long and 8 feet high) considered as the first approximation to Babbage's analytical engine was developed by Aiken, an American. Soon with the development of electronic technology of valves—the vacuum glass tubes, it became obsolete.

However, development of digital electronics in mid-1940 gave real boost to the field of development of computers and it became possible to automate the operation of the machine built by Charles Babbage. It became possible to code and store the data to be operated upon as well as the instructions for controlling the machine operations. The world's first electronic computer was developed in 1945, named Electronic Numerical Integrator and Calculator (ENIAC).

It was about 15 meters long and 2 meters high. It contained 19,000 small bottle- sized valves, which constituted the machine's central processing unit (CPU). It consumed about 200 kilowatt power. This machine did not have any facility for storing programs, and the instructions had to be fed into it by a readjustment of switches and wires. The concept of stored program was adopted in 1949. The main store or memory which is directly accessible to CPU for instructions and data, in

the first generation machine was made of a device called magnetic drum. The machines developed in nineteen fifties contained miles of wires, thousands of electronic components, lakh of soldered joints and as such these were extremely bulky, very power consuming and highly unreliable.

Thermoinic valves were soon replaced by transistors (germanium and silicon semiconductors), thereby reducing size and power consumption. In fact the invention of the transistor in 1947 heralded the era of miniaturization and paved the way for development of second generation of computers (First generation was with thermionic valves—the vacuum glass tubes containing metal strips which performed various functions such as amplification of an electric current). Transistors compared to valves are much smaller, more reliable and far more versatile. Transistors are electronic switches, made of semiconductors—-the materials which are neither good conductors of electricity nor bad ones (like silicon).

The transistors could do all the functions of vacuum tubes, are much more reliable than vacuum tube, occupy much less space, are easy to handle, consume less power and are less costly. The fully transistorised computer with its CPU made of transistors and memory made of magnetic cores (strings of small iron rings) appeared on the market in the early sixties. Later attempts were to develop discrete components like resistances, capacitors, etc. and interlink them into an electronic circuit on a single piece of semiconductor. Such components, known as ICs (integrated circuits) were perfected in *1959.*

Invention of integrated circuit (IC) complete electronic circuit fabricated on a single piece of pure silicon of size 3 mm x 3 mm x l mm in 1959 gave birth to third generation computer. In the case of integrated circuits, all the components like capacitors, resistors, amplifiers are gathered on the same piece of silicon that earlier had only the transistors. Such integration is done by introducing some impurities (of other metals) in very thin, very pure wafers of silicon.

The complete circuit is then etched on the wafer by a process that resembles photography or by using electron beams. For very complex circuits. An intricate, maze like pattern is finally produced on the wafer and the electrons pass through the tracks on the maze. Such machines with CPU and main store made of I.C. chips, appeared on the market in the second half of the sixties. Earlier ICs contained small number of components and with gradual development, present day ICs accommodate very large number of components on a single chip, known as very large scale integrated circuits (VLSI). These chips resulted in smaller size, more reliable, less power consuming   and   less   expensive   computers.

The invention of integrated circuits made the real beginning of developments that led to present day microprocessor based computers on chips. The circuits on chips with time grew in complexity and the computer's powers increased tremendously; size and cost decreased. Almost every four years, the number of components that could be put on a chip increased by a factor of 10. The chip graduated from small scale integration (upto 10 components per chip) to medium scale integration (10-100 components), large scale integration (100-1000 components) to very large scale integration (VLSI) having more than 1000 components on a single chip. Today chips (5 mm sq and 03 mm thick) can accommodate more than 100,000 electronic components. This gave birth to fourth generation computers.

Microprocessor (computer on a chip) also called microcomputer became reality in 1970 when the memory of central processing unit could also be achieved on the integrated circuit, thus dispensing with the slower and bulky magnetic memories. Advances in memory chips have tremendously improved the capacity and efficiency of computers. The first memory silicon chip was produced in 1971 and it could store only 1024 bits (one kilobit or 1 KB) of information. The chips produced today are so sophisticated that single chip can store *256* KB of information. Attempts are to develop bubble chips which will be able to store upto 2560 KB.

Computer's main memory is random access memory (RAM). Due to random access it has high speed of computation. On the other hand, in sequential type of memory devices like mag tape etc., computer has to leaf through all the stored memory to get particular data and thus lot of time is wasted. The RAM chips supply the wanted data directly to the logic unit of computers in about a millionth of a second. The main program is stored in ROMs (Read Only Memory). The CPU reads the program from the ROM chips and calls up the data wanted by its instructions from the RAM chips almost instantaneously. The bulk of the data is stored on auxiliary memory and the desired data is transferred to RAM in computer in advance as and when it is desired.

B) Basic Fundamentals of Computers-

The term computer is derived from the word 'to compute' and therefore, can literally be applied to any calculating device. However the term computer has come to mean as electronic Computing device with certain characteristics e.g. high speed, memory, Stored program etc.

In simple terms, the computer can be defined as an electronic data Processing machine It receives data as input, processes the data, i.e., performs arithmetic and logical operations on the same and produces output in the desired form on output device as per the instructions coded in the program. The processing function of the computer is directed by the Stored program, a set of coded instructions stored in the memory unit, which guides the sequence of steps to be followed during processing.

1. Characteristics of Computers

I. **Speed -** The speed of electronic computers is very fast because the signals can pass at the speed of electricity which is same as that of light i.e. 2997x 108 m/sec. Thus millions of calculations can be done in a second. Such speeds are beyond the comprehension of the human brain.

II. **Storage and retrieval of information -** Computer can store large amount of data, instructions and information on its internal memory or secondary Storage device and the same can be easily accessed and retrieved.

III. **Consistency -** Computers do not become boared or tired or lose concentration when performing highly repetitive jobs unlike human beings. Every time same work is done with equal diligence by the computer.

IV. **Automatic operation -** Once data and program have been fed into the Computer, Operation of the computer is automatic in the sequence of steps defined by the program as opposed to mechanical or electronic calculator in which operator intervention is require at every step.

V. **Accuracy -** Computer works very accurately and results are always same as Per design. Accordingly software needs to be designed Properly, and proper checks and controls are necessary in the program and data.

(vi) Flexibility. General purpose computers may be used for Variety of PUrpose depening upon the programs fed into the computers.

2. Future Trends in Computers

At present the latest computers calculate 500 million operations per second. Efforts to develop a radical computer chip design capable of performing one thousand billion operations per second are on. Efforts are also being made at present to devise a natural language computer system that can recognize more than 3000 words in a specific knowledge area; have a reasonable command of grammar and respond to different voices.

Another important area of research is the "computer vision". There will be computers that can read maps to "intelligent" anti-aircraft missiles capable of recognizing an enemy plane from a friendly plane and bring down the enemy craft. Already warheads are in operation which find the target with the aid of a contour map of the terrain and the picture of the target. They don't have to be aimed accurately, but just fired in the general direction and they find their way.

There are proposals to build unmanned vehicles that can navigate upto 50 km of difficult terrain, recognizing and avoiding obstacles along the way while moving at speed upto 40 km an hour. This will require an image processing capability of over 10 billion instructions per second. Efforts to develop fifth generation computers are on in the two most powerful industrial nations in the world, *viz,* the United States and Japan.

These fifth generation computers will be able to "see", "talk" and "think". High tech buffs are thinking aloud of even the possibility of inventing altogether different machines—optical and organic computers—which will be many times faster than the present day super fast computers. Thus instead of electronic components, single molecules of some organic chemicals shall be used which would enable billions and billions of switches to fit into a conventional chip.

3. First electronic computer

The first electronic computer was the ENIAC (Electronic Numerical Integrator and Calculator). It was produced in 1946 in the Moore School of Electrical Engineering at the University of Pennsylvania. It took three years to build. It contained around 19,000 valves, weighed 30 tonnes and consumed 200 kilowatts of electricity. It was extremely fast by the standards of the day. It could multiply two 10 digit decimal numbers in 3 milliseconds. A large team vas responsible for the design and construction of ENIAC, most notably J.P. Eckert and J.W. Mauchly.

This machine had the problem of huge effort of programming which discouraged it use for any other than extensive Computational problems. This computer did not have memors unit and did not use stored program concept. The programming had to be done manually by plugging and unplugging sets of Connecting wires. Data could be entered using a punched card reader, and results output on punched cards or on an electric type writer.

John von Neumann, a member of Moore School at University of Pennsylvania (responsible for introduction of first electronic computer ENIAC in 1946), is credited with the idea of a stored-program machine in which program and data share a common memory. As a result of this, computer operates automatically in the sequence of instructions defined by stored program.

4. Analog Computers

The analog computer operates by measuring rather than by counting. Physical processes are represented by electrical current or voltage signals and thus changes in electrical signals represent behaviour of the process under study. Analog computer has only limited memory facility and is restricted in the type of calculations it can perform. It can be used for certain specialised engineering and scientific applications involving differential equations.

5. Difference Between Analog Computer & Digital Computer

The analog computer processes work electronically by analogy. It uses an analog for each variable and produces analogs as output. It, thus, measures Continuously. It does not produce number but produces its results in the form of graph. It is more efficient in continuous calculations. Digital computer performs calculations by counting and thus counts discretely. It is the most versatile machine.

The analog computer accepts variable electrical signals (analog values) as inputs, and its output is also in the form of analog electrical signals.

Digital computer operates on inputs which are on-off type (being digits 0 or 1) and its output is also in form of on-off signal. Analog computer operates by measuring analog signals whereas digital computer are based on counting operation.

Most of the computers available today are digital computers and therefore term computer usually stands for digital computers.

6.   Hybrid Computer

A hybrid computer is combination of both analog and digital computers i.e. a part of processing is done on analog computer and a part on digital computer. A hybrid computer combines the best characteristics of both analog and digital computers. It provides greater precision than can be attained with analog computers, greater control and speed than is possible with digital computers. It can accept input data in both analog and digital form. It is used for simulation applications.

7.   Fifth Generation Computers

Computers based on Artificial Intelligence are under development in Japan, USA and some European countries and are termed as Fifth generation computers. These computers mark major shift from the previous four generation of computers as these will be equipped with reasoning and decision making capability close to that of human being. These computers are also called Knowledge Information Processing Systems (KIPS).

8.   Main Frame Computers, Mini Computers and Micro-Computers

Main frame computers are large scale general purpose computer systems. The word Main frame has its origin in early computers which were big in size and required large frame works to house. Main frame computers have large storage capacities in several million words. Secondary storage directly accessible by these computers is of the order of several billion words. These computer systems have one or more CPUs and can support a large number of terminals (upto 100 or more). These computers are fast in operation (approximately 100 million instructions/sec) and accept all types of high level languages. Word length in these computers is 16 or 32 or 64 bits.

Mini computers are general purpose computer systems with reduced storage capacity and performance as compared to main frame computers. These computers operate at a CPU speed of few million instructions/sec, These computers can also accept all types of high level languages and word length in these computers is 16 or 32 bits. These can support upto about 20 terminals. With the fast development in electronics, it has become difficult to draw a line of demarcation between small main frame computers and large Mini Computers.

Micro computers are small sized computers which utilize micro-processors The CPU of a micro computer is usually contained on one chip. Microcomputers have low storage capacity maximum being of the order of 256 K words and are slow in operation (approximately 100 thousand instructions/sec). Microcomputers are usually provided with video display Unit, floppy drive and printer. Some microcomputers can support hard disks also. Commonly Used language on these microcomputers is BASIC. However they can also accept other high level languages viz. PASCAL, FORTRAN etc. Maximum word length of these computers is 16 bits. However most of these use 8-bits words.

9. Basic Elements of a Computer system

I.   **Input** - The data (basic facts) and instructions (dictate action to be taken to data) are first recorded on a machine readable medium, like punched card, and then fed into the computer via a device that codes them in a manner which is suited to conversion into electrical pulses before entering memory.

II. **Memory** - Data and instructions enter the main memory, and are held until needed to be processed. The results of action taken on data are held until they are required for output. Main memory is supplemented by less costly auxiliary or backing memory for bulk storage.

III. **Control Unit** - It fetches instructions from main memory, interprets them, and issues the necessary signals to the components making up the system. It issues commands for all hardware operations necessary in obeying instructions.

IV. **Arithmetic Logic Unit (ALU)** - It does necessary arithmetical operations on the data and ensures that instructions are obeyed. It also performs logical Operations. (The ALU combined with control unit and main memory is called central processing unit).

V.   **Output** - Results are taken from main memory and fed to an output device which displays results in user readable form.

10. Basic Operations of Computers

I.   Input/output operations. These allow information (data or program instructions) to be placed inside the CPU or allow program results to be displayed on Output device.

II. Arithmetic operations (perform four functions of arithmetic).

III. Comparison/logic operations (making decisions). This facility enables computer to decide by a logical operation as to which of two paths to follow at any given instant.

IV. Movement of information (data or structuring data) from one unit to another.

11. Difference Between Hardware & Software

The term hardware is applied to physical equipment (mechanical, magnetic, electrical or electronic devices/circuits) that can be seen and touched and have colour, size and shape.

The term software is used to describe computer programs, procedures and possible associated documentation concerned with the operation of a data processing s stem e.g. compilers, manuals, circuit diagrams etc.

12. Super Computers

Super computers are large general purpose computers capable of executing more than 100 millions instructions per second and have a storage capacity of millions of hits. The high speed in these computers is due to use of a number of processors working in parallel and high storage densities are obtained by using magnetic bubble memories and charge coupled devices, thus reducing the cost of storage. The super computers are extensively being put to defense research.

13. Microprocessors

A microprocessor is a L.S.T. (large scale integration) chip which can perform the functions of central processing unit (CPU) of digital computer. Apart from computers microprocessors are also used in electronic calculators and many house hold appliances viz TVs, VCRs, washing machines etc.

14. Computer Graphics

The term computer graphics refers to the concept of man communicating with a computer by means of graphical symbols such as dots, lines, curves, alphabetical or numerical symbols, etc. This mode of man machine communications provides for a high rate of information transfer. Examples of computer graphics are bar charts, graphs, curves, engineering drawings, fashion patterns etc.

15. Classification of Computers

There are several ways of classifying computers.

I.   Depending on the technology used, computers are generally classed as

   a.   First generation, based on vacuum tubes.
   b.   Second generation, based on transistors.
   c.   Third generation, based on small scale integrated circuits.
   d.   Fourth generation, based on large and very large scale integrated circuits (microprocessor based).
   e.   Fifth generation, having artificial intelligence.

II.   Depending on the principle of working, these are classed as

   a.   Digital computers—In which mathematical expressions are represented as binary digits and all operations are done using these digits at very high rate. These produce very accurate and precise results.
   b.   Analog computers—These obtain continuously varying signals and thus depend to a great extent on accuracy of measurement of signal. These are fast and best suited for solving, differential equations.
   c.   Hybrid computers—These use best qualities of both analog and digital computers.

III.   Depending on the size of the computers, these could be classified as:

   a.   Large scale computer—It may have one or more CPUs for computation. The main storage capacity may be several million characters and the secondary storage capacity ranges in billions of characters. The terminals are connected at several places for interaction with computer by several users. The system can typically work on a number of different programs.
   b.   Medium. scale and small scale computers—These have same features as large scale but the storage capacity reduces. All these are basically main frame computers, i.e. whole of the CPU is concentrated at one central place. In contrast to this, distributed arrangement is also possible in which case CPU is distributed physically and computations are thus carried out locally at several places.
   c.   Minicomputer system—It is so small in size that it can be mounted on a rack or put on a table. It is fast in basic operations but has a limited set of instructions. Main memory is of the order of 8 K to 32 K bytes, and the number of input/output devices is also limited. It is frequently dedicated to a specific function.

16. Internal Parts & Working of Computers

A computer system comprises of central processing unit (CPU), [which itself comprises of Arithmetic and Logic Unit (ALU), main memory, and control unit], auxiliary or secondary storage, input and output devices.

The Main memory is also known as internal memory or primary storage. It is very fast in operation. It may be either core type which retains information even on supply failure, but is large in size, consumes more power and is relatively slow, or semiconductor type which is volatile, but fast and occupies less space. it contains a part of the operating system software one or more execution programs being executed, the data being processed and required by the programs for execution, and processed data awaiting output.

The control unit of CPU is the nerve centre as it controls and co-ordinates all the operations and input/output devices. It is a functional unit of a digital computer which calls up the individual commands of a program in a defined order, decodes them and initiates the required operation to be carried out by appropriate control signal. The data instructions pass in and out of the main memory via, memory data register (a special register which holds them temporarily). The machine instructions being currently interpreted are also held in a Special register called control instruction register. Control Unit stores the program in the memory, takes instructions one by one, interprets them and issues appropriate commands to the other units. It also transfers the results from ALU to the memory and then to the output device.

The ALU, unit of a digital computer is a section which performs all arithmetic comparisons like addition, subtraction, multiplication, division, etc., and data manipulation by logic actions based on AND and OR functions, shifting, rounding off and comparisons. A control console (comprising of video display unit for observing data/output from computer) and a Keyboard/Mouse for operator to interact with computer is also provided.

ALU also contains a number of accumulator and registers. It derives the desired data from the main memory as directed by control unit based on program fed. The data to be manipulated gets loaded into the accumulators. The result of arithmetic operation On data as per instruction is placed in the main storage or retained in the accumulator for further calculations.

Decision making quality of the computer is achieved by the capacity of ALU to perform logical operations.

The auxiliary memory or secondary storage is closely linked with the main memory of the CPU. Since main memory can't be flooded with unwanted data at particular moment, same is stored in auxiliary memory from which desired data is fed to main memory as and when required by it. Thus secondary storage is used to hold mass of information i.e. system software and application programs not currently required in main memory and the data files. Obviously the capacity of secondary storage is very high compared to main memory or primary storage.

Auxiliary memory is usually in the form of magnetic discs, magnetic tapes, floppy disks or diskettes, fixed/moveable disk, Winchester disk, magnetic bubble memory, charged coupled devices, etc. and in some cases even solid state type is used as auxiliary memory. However non-volatile memory is preferred for auxiliary memory, i.e. its contents should not get washed on supply failure. Solid state memory and charged-coupled device type are volatile type of memories.

Before data is fed into input unit, it has to be properly prepared so that it is in machine readable form. This work is done by Data Preparation Equipment which may be in the form of card punch, or key disk system. In both these equipment data is captured by manual operation from the

document. This process is time Consuming, expensive and error prone. To overcome these problems, now-a-days use is made of terminal (YDU and keyboard). It converts the data directly in machine-readable form as the data is entered, thus avoiding manual data conversion.

Input devices (like Keyboards, Mouse, punched card readers, paper tape readers, magnetic tape, magnetic disk, floppy disk, teletype writer terminal, optical scanners (optical mark reader, optical character reader), magnetic ink character reader, visual display unit, voice data entry terminal,mic etc.) read the machine-readable input medium prepared by data preparation equipment and feed it into the internal memory for processing, writing on secondary storage, or output.

Output device (like Monitor, printers, mag tapes, flopy disks, optical printers, laser printers, typewriters and visual displace devices, graph plotters, speakers etc.) are used to provide soft or hard copy of the desired information from the computer.

17. BIT , BYTE & WORD

A Binary digit (BIT) (0 or 1) is called bit. One bit Occupies one store location. A group or combination of 8 bits is called a BYTE. A Computer word is a combination of one or more bytes handled together as one unit for processing and may thus be of 8, 16, 32 or 64 bits. The length of word varies from machine to machine but is predetermine for each machine.

In some computers, the grouping of bits, bytes or words is flexible in design to meet the differing storage requirements of numbers, alphanumeric characters and instructions.

A computer reads and processes all the bits of the word at a time.

18. Different Type of Memories

Memory devices have various characteristics depending on their principle, system and material.

Read only memory (ROM) and read/write memory - In read only memories (ROM), data is written only once and it can't be changed thereafter but it can only be retrieved (read). In read/write memories, data can be stored, read, erased-and rewritten as desired.

Read and write memories include integrated circuits (bipolar or Metal oxide semiconductor), magnetic thin film (wire or plate), magnetic core, magnetic drum (fixed head or moving head), magnetic disk (fixed lied or moving head), disk pack, magnetic tape and delay line. ROM includes IC (bipolar or MOS), magnetic thin film (wire or plate), magnetic material (UI core or ring core), capacitor, resistor, punch card and. punch tape.

Random access memory (RAM) and Serial Memory - In RAM, any word can he accessed in same time but in sequential (Serial) memory (such as disk, drum, tape) data is available sequentially, only in the same sequence as originally stored and thus more time is required to search it.

Volatile and non-volatile memories - A non-volatile memory is one that retains its contents even if power supply fails (as with ferrite core, drum, disk and tape memory). Volatile memory is one which loses its contents on electric failure (semiconductor type memory).

Destructive and non destructive memory - In the case of destructive memory, its contents get lost when it is read and thus to save the memory it has to be rewritten automatically after read operation. In non-destructive memory, the contents are retained even after reading operation. Core memory is destructive read out type and IC, drum, disk and tape are non destructive read out type.

Static and dynamic memories - In a static memory, the contents are retained indefinitely as long as system supply power is applied. Dynamic memories usually store a binary digit as charge on a capacitor which will discharge after some time. It, therefore, needs refreshing periodically by a clock control which reads the cell content and rewrites it.

19. RAM & ROM

RAM (Random Access Memory) has the capability of storing new information in a specific memory location by a write operation. Information retained in RAM can be transferred to some other device by a read/write operation, that is why, it is sometimes also referred to as a read/write memory. However RAM is volatile and its contents get lost on power supply failure. RAM enables quick read or write operation because the required memory location can be selected easily and quickly via, its unique address. ROM memory has also got random access capability.

ROM (Read Only Memory) does not have both read and write facilities; it can only be read. ROM is used for holding the programs which must be permanently held in memory so that the set of instructions is immediately available for execution when power is supplied to the equipment. In ROM, the memory device is pre-programmed during the manufacturing stage, leaving the information permanently stored for later retrieval.

20. EPROM & EAROM

EPROM is Erasable Programmable Read Only Memory (EPROM). When this chip is exposed to ultra-violet light, all its binary information is reset to a state of binary 1, thereby destroying the original information. This can be programmed again by special prom-programmer devices. Once the chip has been re-programmed, it is put back into the computer and can be used in read-only mode.

EAROM is the Electrically Alterable ROM, also sometimes called Electrically Erasable ROM. It can also be removed from the computer and re-programmed several times. However, it differs from EPROM in that an electrical charge can be applied to any of the binary digits in order to reset its state. Thus the amount of re-programming is reduced.

21. Types of BUS

To form an operational system, various parts of the computer are connected by a number of wires. A collection of such wires, which have some common identity, is called a bus. Thus a bus consists of a collection of distinct lines, serving different purposes.

The Data Bus (having lines corresponding to number of bits in the word) is used for transmitting data.

The Address Bus carries the address bits of memory location from CPU to the memory to enable accessing the data in the memory. The bus also contains a few control lines to carry control commands.

Address Bus consists of up to 16 parallel lines (for 16 bit word length computer) along which a binary code can be fed. The code is used as an address to select either a certain storage location in main memory or an input/output port and hence a specific peripheral device.

Data Bus also consists of parallel lines (number being equal to word length) used to carry data and instructions from one unit to another.

Control lines are used to control the flow of information between units.

22. Binary Number System

Computer use electrical/electronic/magnetic devices to handle the information and these devices can only indicate two states or conditions. All information is represented within the computer by presence or absence of a pulse or voltage For this reason computers use binary number system which has only two digits 0 (no pulse) and 1 (pulse is present). Various symbols (alphabets A to Z, digits 0 to 9 and certain special characters) are represented in the computer by combinations of bits, each symbol being represented by a unique pattern of eight bits. By using six bits, it is possible to represent 64 alphanumerical character set, but most computers use eight bits.

In our day to day working, we use denary system, i.e. the system using ten different characters from 0 to 9. Numbers larger than 9 are expressed using same characters but using further columns. In two columns we can count upto one hundred numbers, in 3 columns upto one thousand numbers.

On the other hand, digital computer operates on binary system. Such a system operates by two characters 0 and 1. Exactly as in denary system, in binary system also bigger numbers are expressed by using same characters 0 and 1 in other columns. For instance 1 is represented by 1, and for representing 2 we make use of next column and shift to the left one column and write 1 in new column and 0 in original, thus 2 is written as 10. Similarly 3 is written as 11, 4 a 100, 5 as 101, 6 as 110, 7 as 111, 8 as 1000, 9 as 1001, and 10 as 1010 (read one zero one zero and not as one thousand and ten). It would be noted that when we add 1 and 1, we write 0 and carry over 1 to next column, It would be noted, presence of 1 in various columns is equivalent to as follows : in column 1—1, in column 2—2, in column 3—4, in column 4—8 and so on.

There are various reasons to use a binary system in computers instead of denary system.

(i) This system is ideal for coding purposes for the computer because of the two state nature of the electrical components, i.e. a transistor conducting or non-conducting, an electrical pulse present or not present, magnetic material magnetized in one direction or the other.

(ii) It is difficult to maintain a device capable of recognizing ten characters in a sufficiently reliable state of operation. On the other hand it is very easy to have a highly reliable device which is either 'on' representing 1 or 'off' representing 0.

(iii) It is much simpler.

(iv) Operations are performed most rapidly.

(v) Reliability of operation can be ensured.

Its only disadvantage is the need of many more digits and columns to express given numbers.

23. Computer Peripherals

Input, Output and Secondary Storage Devices are collectively known as peripherals.

The processor or Central Processing Unit (CPU) makes all the calculations of the computer. In order for a process to be possible we need to feed in data to the computer through the input devices.

The computer will then process the data according to a particular program and finally deliver information through the output devices.If the information produced needs to be stored for the future, we will store this into a secondary storage peripheral device.

24. Input Devices

Input devices are all those hardware equipment that are used to enter data into the computer. Various type of input devices are listed below with explanations to understand clearly.-

Keyboard - This is the most common and widely used input device. There are different types of keyboards but the QWERTY keyboard is the most widely used. Apart from the normal alphabetical keys, the keyboard has:

- A Numeric Keypad
- Navigation Keys
- Function Keys

Mouse or Trackball - The second most commonly used input device is the mouse.   The mouse helps the user to point and access items on the computer.   Its main function is to control the cursor or pointer on the computer's screen. The mouse can have 2 or 3 buttons, used according to the software application being used.   Today, most mice also have a scroll wheel which is used mainly to scroll through documents.

The trackball has the same basic functions of the mouse. The only difference is that the trackball is stationary and one doesn't need to move it on a mouse pad. In order to navigate with the pointer, the user must move a ball situated at the top of the device. Similar to the mouse, the trackball has 2 or 3 buttons used to select items from the screen.

Touchpad - This is a small sensitive pad used on portable computers (laptops). The touch pad is used as a pointing device. The pointer is moved on screen by touching the touch pad with the finger. Tapping on the touch pad will give the same results as when using the mouse buttons. The touchpad is particularly useful for persons with disability whom can have limitations in moving their hand.

Scanner -The scanner is a device that transfers printed text and images to a computer. Today, most home users have a scanner connected to their computers. These are generally called flatbed (others less common such as barcode readers are called handhelds). The scanner alone is not enough to capture the data and transform it to a format that can be understood by the computer.

Joystick - This device is well known with young people as it is mainly used for playing computer games. As the name implies, it is like a stick connected to a platform, which can be moved in all directions. These movements in turn will move something on screen depending on the game. Usually joysticks have buttons also called triggers.

Barcode Reader - When we buy products from shops we usually see small labels containing white and black stripes called barcodes. These labels contain information on the product.   In order to read this information, one must pass the barcode in front of a special reader.   This reader can be in a form of a pen or installed on the shop's counter.   The barcode reading consists of a light emitting diode that will emit light on the code. The reflected light from the barcode is translated to the computer by a light sensitive diode.

Optical Mark Reader - This device reads marks in predetermined places on specially prepared cards.   These are usually used in multiple-choice questions. The student will have to fill a space with a pencil, usually HB. The filled examination paper is then inserted into the OMR so as to enable it to read the answers marked.

Magnetic Ink Character Reader (MICR) - This system uses special ink to write numbers with coded magnetic ink. This special ink contains the written numbers magnetically. This system is

widely used on cheques issued by banks. The MICR is much faster than OCR or other methods when reading codes and thus identifying cheques.

Graphics Table - Professionals, such as draftsmen and engineers, usually use this input device. It is used to speed up their drawing work. The device consists of a hand held operated device (similar to a pen) used to trace diagrams placed on a digitized table. The drawing will then be transferred to the computer.

Pen - Pens are used on hand held computers such as PDA's (Personal Data Assistant).   These hand held computers have a special sensitive screen. When the user touches the screen it will interact with the computer

Summary of Input Devices -

Input Device	Advantages	Disadvantages
Keyboard	Typists can use with ease	Relatively slow
Mouse	No typing skills are required	At times can be tricky to use
Light Pen	No typing skills are required	Needs much software to make it versatile
Bar Code Reader	Quick and easy entry of data	Needs specialized software under non-ideal conditions
OCR	Can be programmed to read	Elaborate hardware and text and neat handwriting software required, needs training
Mark Reader	Fast input	Elaborate hardware and software required
MICR	High volume, very reliable	Only 14 characters are represented
Joystick	Easier than keyboard	Special interface needed
Digital camera	Easy image capture	Still relatively costly
Graphics Tablet	Enables operator to enter pictures	Slow
Speech Reader	No hands needed	Limited vocabulary
Touch Screen	Easy operation	Needs specialised hardware Intuitive and software
Hand Held Terminals	Can have add-ons for sophisticated operations	Relatively slow
Scanner	No artistic performance required	High quality graphics require large amounts of disk space

25. Output Devices

After processing the inputted data, the computer will give its output. Various type of output devices are listed below with explanations to understand clearly.-

Monitor or Visual Display Unit (VDU) - The monitor is the most common type of output device and is also called Visual Display Unit (VDU).

Resolution-This term refers to the clarity or sharpness of a printout or display screen.   The more pixels there are per square inch, the better and greater the resolution.

One can find different standards for monitors.   They support different colour depths (number of colours it supports). The most common standards for monitors are:

a. VGA (Video Graphics Array) mode appeared in 1987. It offered a resolution of 720x400 in text mode and a resolution of 640 by 480 (640x480) in 16-colour graphics mode. It also offered a resolution of 1024 x 768. The VGA quickly became the baseline display mode for PCs.

b. SVGA (Super Video Graphics Array) is a graphics mode which can display 256 colours at resolutions of 640x200, 640x350 and 640x480. SVGA can also display higher definitions such as 800x600 or 1024x768 by using fewer colors.

c. XGA (eXtended Graphics Array). is an IBM display standard introduced in 1990. Today, it is the most common appellation of the 1024×768 pixels display resolution, but the official definition is broader than that. It was not a new and improved replacement for Super VGA, but rather became one articular subset of the broad range of capabilities covered under the "Super VGA" umbrella.

The Different Types of Monitors -

Cathode Ray Tube (CRT) - uses the same technology as used in television sets. The CRT uses a vacuum tube in which an electron gun is installed. When electrons fired by the electron gun touch the phosphor layer situated at the internal side of the screen, this will glow. This dot of light is called a Pixel.

Liquid Display Unit / Liquid Crystal Display (LCD) - we usually find this installed in laptops and handheld computers. The technology used is different from that of the CRT. LCD uses tiny capsules filled with liquid crystals. When the molecules of the liquid are subjected to an electric field, the liquid crystals align and light reflects off them. Without the field, their alignment reverts to its original, non-reflecting arrangement, so the elements appear dark. Combinations of LCD's are arranged to form patterns of reflected light that spell out numbers, symbols or letters.

TFT - TFT (Thin Film Transistor) is a variant of LCD which uses thin film transistor technology to improve image quality.

Printers - Printers are output devices that transfer the output of the computer on paper (hardcopy). The printers can be divided into two categories Impact and Non-Impact:

- Impact - refers to all those printers whose printing heads touch the paper. An example is the Dot matrix printer.
- Non-Impact - are all those printers whose printing heads do not touch the paper. An example is a Laser or an Ink-Jet printer.

The following is a list of the different types of printers that exist:

Dot Matrix Printers - Dot matrix printers are categorised as character printers because they write one character at a time. The printing head is made up of several pins, which form a column. The printing head is attached to a belt which moves it from side to side along the width of the paper and at the same time the paper is rolled up by means of a roller. In order to write, the head pins are fired with the aid of an electro magnet, which hit the ribbon and paper.

Inkjet Printers - These types of printers are the most popular nowadays. It is basically what most home users have today. These printers have good resolution, are silent and for small amount of printing are not particularly expensive. These printers are called page printers. In the inkjet printing mechanism, the print head has several tiny nozzles, also called jets. As the paper moves past the print head, the nozzles spray ink onto it, forming the characters and images.

Laser Printers - Laser printers offer the best quality in terms of printout quality and resolution. On the other hand they are the most expensive to run. Laser printers are called page printers since they print one page at a go. The laser printer uses a laser beam, a drum and a toner.

Plotters - The plotter uses pens to write on paper and is usually used for engineering drawings.

Summary of Output Devices -

Output Device	Advantages	Disadvantages
Dot Matrix Printer	Versatile graphics and text, Cheap	Average quality, slow speed
Daisywheel Printer	Letter quality print	Very slow, no graphics
Chain Printer	Fast	No graphics
Line Printer	Can cope with high volumes	Very noisy, average quality
Thermal Printer	Quiet	Special paper needed
Ink - Jet Printer	Very quiet	Ink smears occasionally
Laser Printer	High quality, fast	Expensive to run
Flatbed Plotter	Large paper handling capabilities	Very expensive
Drum Plotter	Large paper handling capabilities, Occupies less space	Very expensive
Microfilm Viewer	Very small	Needs special machine to view
VDU	Fast output, vivid colors	Radiation (High on CRT and low on LCD)
Speech Synthesizer	Do not need to use eyes	Limited sound range

26. Secondary Storage Devices

Secondary storage devices cannot be classified under input or output devices.   These devices are used to store data for later use.

Secondary storage devices can be categorized in 3 main groups:

1. Magnetic
2. Optical
3. Electronic

1. Magnetic Storage - Magnetic storage devices store the data on a magnetic layer. Examples of such devices are:

a. Floppy Disk
b. Hard Disk
c. Magnetic Tape

The technology used is very simple to understand. The magnetic layer is magnetized when there is a binary 1 and left un-magnetized when there is a binary 0.

Floppy Disk - Floppy disks store small amount of data typically not larger than 1.44MB. These small diskettes are used mainly to transport small files from one computer to another. The construction of the floppy is basically a plastic disk coated with magnetic material, enclosed in a PVC jacket to protect the magnetic material. In order to write data to a floppy this must be first formatted.   This procedure involves the creation of sectors and tracks.   On the diskette, data is recorded on closed concentric rings (tracks). Each track is divided into sectors.   These are invisible wedged-shaped sections used by the computer for storage reference purposes.

Hard Disks - As the name implies, hard disks are built with metal or glass platters covered with a substance that allows data to be held in the form of magnetised spots.   Today hard disks are composed of more than one disk (also named as platter), which are stacked on each other.   This technology gives the possibility of having large storage capacity.   Typically computer systems today have an 160GB (or more) hard disk capacity.

Magnetic Tape - This type of storage media is used in large computers where large amounts of data are stored.   The tape is made up of a thin plastic tape having horizontal running tracks and vertical frames.   Magnetic tape is ideally suited to store a list of records whose sequential order is sorted for later processing.   Payroll systems and record updating is ideal for tape.   A sorted tape can be used to issue pay cheques, update a list of customers etc.

2. Optical Storage -

The CD-ROM Disk - CD-ROM stands for Compact Disk - Read Only Memory.   This is an optical disk where information is stored at the time of manufacturing. Examples of CD-ROM are Music CD's and software that one buys from computer shops such as games. Optical disks write data with a high power laser beam, which records data by burning tiny pits onto the surface of the disk.   In order to read data, a low power laser beam reads data by reflecting smooth areas, which are interpreted as 1 bits, and not reflecting pitted areas which are interpreted as 0 bits. The typical storage capacity of a CD-ROM is 650Mb, which makes them a very versatile data storage media when it comes to store data for short and long term periods of time.

CD-R - CR-R which stands for Compact Disk- Recordable is a CD format that allows users to use a CD-R drive to write data, only once, onto a specially manufactured disk that can then be read by a standard CD-Rom drive.

CD-RW - CD-RW stands for Compact Disk - Rewritable.   This type of media allows users to copy and erase data. Thus, this disk can be used over and over again.

DVD-Rom - DVD-Rom stands for Digital Video Disk or Digital Versatile Disk.   This optical disk looks like a normal CD but in fact, it can store much more data than a CD

3. Electronic Storage - Electronic memory is the latest technology in secondary storage media. This is also referred to as Flash memory. Flash memory is non-volatile solid-state computer memory storage that can be electrically erased and reprogrammed. It is a technology that is primarily used in memory cards and USB flash drives for general storage and transfer of data between computers and other digital products. It is a specific type of EEPROM (Electrically Erasable Programmable Read-Only Memory). This type of memory media has no mechanical moving parts and thus it offers some advantages when compared to the other type of media.

Advantages: Very small , Does not consume a lot of energy in order to function , Noiseless , Limited heat emission , Portable

Disadvantages: Limited amount of memory capacity when compared to the other type of media (Currently big advancements are being made and the maximum capacity of this media is 60GB).

Because of their small size and big capacity, electronic memory is suitable to be used in portable devices. Today electronic memory is being used in Digital cameras, Mp3 Players, PDAs, Mobile phones and Laptops.

Backing Storage Device, Media and Access Type -

DEVICE	MEDIA	TYPE	ACCESS
Cassette Tape Drive	Cassette Tape	Magnetic	Serial
Reel to Reel Tape Drive	Reel Tape	Magnetic	Serial
Floppy Disk Drive	Floppy Disk	Magnetic	Direct
Hard Disk Drive	Hard Disk	Magnetic	Direct
Zip Drive	Zip Disk	Magnetic	Direct
CD-Rom Drive	CD-Rom	Optical	Direct
WORM Drive	WORM	Optical	Direct
CD-R, CD-RW	CD-R, CD-RW	Optical	Direct
DVD Drive	DVD	Optical	Direct
Flash Memory Unit	Flash Memory Card	Electronic	Direct

27. IDENTIFIERS, ARRAYS & STRINGS (Data Processing)

IDENTIFIERS - Arrangements involving several data items are referred to as data structures. In handling data, it is usual practice to associate names or letters with data values. For example, N can stand for the number to be stored. Then N is called an identifier. If the data value associated with it is always same, it is called 'constant', and if it changes then the identifier is called variable.

ARRAYS - When we have to deal with a set of data items like examination in a class, then it is convenient to arrange them in a sequence and refer that by a single identifier. For instance, marks of 8 standents could be arranged as

MARKS=(95, 82, 78, 95, 91, 90, 89, 96).

Such an arrangement in a data structure is called **'array'**. Individual data items in the array may be referred to separately by stating the position in the array. Thus MARKS (4) would refer to 95. The subscript 4 could be written by a variable like 'I' which can be given different values.

The individual data items in an array are called elements.

Two dimensional arrays have elements arranged into rows and columns. The rows and columns may be numbered by subscripts.

STRINGS - For text handling, a sequence of characters need to be handled as a single unit of data, which is called a string. String identifiers are denoted by a letter followed by a $ sign,

e.g. A$="RAJA", B$="RANI".

The strings can be joined together and then they are said to be concatenated. For example,

C$="RAJARANI".

Here C$ is the concatenation of A$+B$ and A$ and B$ are called the substrings of C$.

Each character position in the string is numbered in sequence. Each substring is stated by first and last character position.

For example in string

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

A$=

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| H | E | | L | I | K | E | S | | C | O | M | P | U | T | E | R | S |

A$ (4, 5) is L I

A$ (10, 16) is COMPUTE.

Fixed length strings have a fixed number of character places available for data storage but variable length strings provide the data with just the number of spaces it needs. Since constant space is provided for each string in fixed length strings, lot of space wastage occurs. In variable length strings, end of each string is indicated by a * mark ; resulting in saving of space.

28. Database Management

One of the basic principles of good data base management is that data redundancy should be minimized. Such situation can occur when different files are created and a particular data repeats in more than one files. In such case, any data change would have to be corrected in each file in which it appears. in good data base management technique, data accuracy improves, because a change, once made would immediately be available to every program.

Using the data base approach, data is treated as an important organisation resource and not as the property of an individual programmer or department. Often, to improve accessibility, logically related elements of data are linked together. All the information is collected into a single integrated base instead of a series of independent files. Building well-planned integrated data base is a tough job. Data base design starts with the definition of organisation's data resource, identifying key inter-relationships between individual elements of data, putting the pieces together as an integrated whole.

29. Programming

Programming is basically the operation of breaking down any simple or complex task into a logical sequence of smaller tasks or steps, ensuring that all likely problems have been anticipated, and that all the necessary connections between the steps have been programmed properly. It would be found that many of the smaller tasks are interdependent, i.e. whether a particular Step is taken next will depend on the outcome of previous step. Further the steps have to be programmed specifically for the computer, keeping its basic operations in mind. The total computer program should perform the initial task satisfactorily.

30. Computer Languages

a) **Machine Language -** A Machine Language is a programming language in which the instructions are in a form which allows the Computer to perform them immediately, without any, further translation. Instructions in machine language are in the form of a binary code, also called machine code and are known as machine instructions. Machine instructions are stored in the same way as data and each instruction corresponds directly to a hardware facility on the machine for which it is written.

b) **Low level language -** Low level languages are machine oriented languages in which each instruction corresponds to or resembles a machine instruction. The (symbolic) low level

language must be translated into machine language before use. Each computer manufacturer normally desires a low level language which corresponds closely to the particular machine language used by that manufacturer. This language is called "Assembly Language". The manufacturer provide a program called as ASSEMBLER which translates the 'Assembly Language' into machine code.

c) **High level language -** The development of high level language was intended to overcome main limitations of low level language. These limitations are (1) Programming is a relatively time-consuming job for the programmer and they. are on 'ONE for ONE' basis. (2) Low level languages are machine oriented, each conforming to the instruction set of the machine on which they are to be used. The high level languages have an extensive vocabulary of words, symbols and sentences. The program written in this Language facilitates translation of whole statement into several instructions. This translation is often done by a special program called a 'compiler'. As they are problem oriented, the programmer can work to some extent independent of the machine.

31. Translators

A translator is a software program which converts statements written in one language into another e.g. converting assembly language. to machine code, etc. The assembly language program are called 'Source-program' and the machine code program are called 'object program'.

There are three types of translators.

a) **Assembler -** An Assembler is a program which translates assembly language into machine code. The main functions of Assembler are translation of the nemonic operation codes into machine code together with the symbolic addresses into machine addresses, allocation of areas of storage in the memory, detection and indication of initial source language, instructions production of the object program on card, tape or disc as required and production of a printed listing of the source and object program with comments.

b) **Compiler -** A Compiler is a program which after machine code translates a high level language into a machine oriented language. The resulting program can only be executed when compilation is executed. The main functions of a compiler are translation of the source program into machine code, generator of the object program on cards, tape or disc as required, production of a printed listing of the source and object programs when required and tabulation of list of errors found during compilation, e.g. the use of 'word' or statements not included in the language vocabulary or violating the rules of systems.

c) **Interpreter -** An Interpreter is a program which translates and executes each source statements in logical sequence as the program is executed. The main functions of Interpreters are debugging (i.e. removing program faults) and handling of software produced for or by a different computer. An interpreter may be essential if two dissimilar computers are to be connected together for operation, or when software produced on an old model has not been used and has to be run on a new one.

32. Software

Sometimes abbreviated as S/W, software is a collection of instructions that enable the user to interact with a computer or have it perform specific tasks for them. Without software, computers would be useless. For example, without your Internet browser software you would be unable to surf the Internet. Computer software includes all computer programs regardless of their architecture. Software is usually written in high-level programming languages that are easier and more efficient for humans to use (closer to natural language) than machine language. High-level languages are compiled or interpreted into machine language object code. S/W examples -

Software can be divided into three big categories: Operating Systems, Programs and Data.

33. Operating Systems-

Operating Systems - An Operating system is a program that controls the execution of application programs and acts as an interface between the user of a computer and the computer hardware. An operating System (OS) is an intermediary between users and computer hardware. It provides users an environment in which a user can execute programs conveniently and efficiently. **In technical terms, it is software which manages hardware.** An operating System controls the allocation of resources and services such as memory, processors, devices and information. Definition of an operating system is a program that acts as an interface between the user and the computer hardware and controls the execution of all kinds of programs.

There are several classes of operating systems and many variations: Mainly DOS. UNIX and Mainframe OSs from IBM. **DOS (Disk Operating System)** later became Windows while UNIX led to different variants such as: Linux, Sun Solaris, Free BSD, AIX.. etc. IBM operating systems were mainly targeted towards mainframes and some of the well known ones are OS/360. OS!390 and OS/400. Apple Macintosh can also be considered as a separate class of OS rather than a variant of UNIX. DOS was the first disk based OS which was developed for IBM PC by Microsoft.

It was concerned about keeping OS, application programs and all user files on a disk and managing them through set of commands called DOS commands. There are two well known variants of DOS called PC-DOS (Personal Computer DOS) and MS-DOS (Microsoft DOS). PC-DOS was developed and sold with IBM PCs while MS-DOS was sold in open market. DOS was simple to use and learn therefore Microsoft was able to win a large market share among other PC OSs.

Microsoft released their first version of GUI (Graphical User interface) based OS called Windows 1.0 on 1985. However. only Windows 3.1 was commercially successful Early versions of Windows were just an application running on top of DOS, behind the screen GUI was actually issuing DOS commands. With the success of Windows 3.1 Windows 95 was introduced. Then with the introduction of "Windows 98" Microsoft was able to purely escape from DOS and built a compute GUI based OS which does not depend on DOS. From year 2000 onwards Microsoft has released number of versions of Windows. Like, Windows Vista, The Most Popular Windows XP, Recent Version Windows 7 and Windows 8.

One of the most important OS to be discussed is the UNIX. It was developed in 1969 at Bell Labs by Ken Thompson and Dennis Ritchie. UNIX is still being used with large number of variants and versions.

Another important OS is LINUX. Linux was developed by Linus Torvalds in 1991. Linux is a UNIX like OS developed originally for Home PCs. The most important thing about Linux is its totally free. You are even given the source code of the OS. Since its freely available many people around the world had studied and improved it. Therefore Linux is a complete OS which is stable, reliable and efficient compared to most other Oss. It also supports excellent networking facilities. If you compare Windows and Linux ; Linux requires lesser disk space, memory and processing power than Windows.

34. Application Software

In order to install the Application Software, it is necessary to have an Operating System previously installed; Most modern application software comes on a CD or DVD. Installing a program is not simply done by copying the contents of the CD onto the hard disk. In order to perform the program installation one usually needs to run the installer or set-up program usually present. This program provides an interface and guides you step by step on how to install the program. In the progress, program files might be uncompressed, put into their correct sub directories, and the system configured for usage. If a problem with the installation should arise, you should consult the installation manuals provided with the software.

35. Programs

Programs are software which is used to do particular tasks. For example Microsoft Word is a program for document writing. Internet explorer is a program for internet navigation, the calculator is a program for mathematical operations and so on.

36. Data

Data is everything which is produced either by the user or by the programs (sometimes even by the operating systems) to store information. For example a document file produced by Microsoft word is data. An excel sheet is data, a downloaded web page is data.

37. Computer Networks

A network is any collection of independent computers that communicate with one another over a shared network medium. A computer network is a collection of two or more connected computers. When these computers are joined in a network, people can share files and peripherals such as modems, printers, tape backup drives, or CD-ROM drives. When networks at multiple locations are connected using services available from phone companies, people can send e-mail, share links to the global Internet, or conduct video conferences in real time with other remote users. When a network becomes open sourced it can be managed properly with online collaboration software. As companies rely on applications like electronic mail (E-Mail) and database management for core business operations, computer networking becomes increasingly more important.

Every network includes:

- At least two computers Server or Client workstation.
- Networking Interface Card's (NIC)
- A connection medium, usually a wire or cable, although wireless communication between networked computers and peripherals is also possible.
- Network Operating system software, such as Microsoft Windows NT or 2000, Novell NetWare, Unix and Linux.

38. Types of Computer Networks

LANs (Local Area Networks) - A network is any collection of independent computers that communicate with one another over a shared network medium. LANs are networks usually confined to a geographic area, such as a single building or a college campus. LANs can be small, linking as few as three computers, but often link hundreds of computers used by thousands of

people. The development of standard networking protocols and media has resulted in worldwide proliferation of LANs throughout business and educational organizations.

WANs (Wide Area Networks) - Wide area networking combines multiple LANs that are geographically separate. This is accomplished by connecting the different LANs using services such as dedicated leased phone lines, dial-up phone lines (both synchronous and asynchronous), satellite links, and data packet carrier services. Wide area networking can be as simple as a modem and remote access server for employees to dial into, or it can be as complex as hundreds of branch offices globally linked using special routing protocols and filters to minimize the expense of sending data sent over vast distances.

Internet - The Internet is a system of linked networks that are worldwide in scope and facilitate data communication services such as remote login, file transfer, electronic mail, the World Wide Web and newsgroups. With the meteoric rise in demand for connectivity, the Internet has become a communications highway for millions of users. The Internet was initially restricted to military and academic institutions, but now it is a full-fledged conduit for any and all forms of information and commerce. Internet websites now provide personal, educational, political and economic resources to every corner of the planet.

Intranet - With the advancements made in browser-based software for the Internet, many private organizations are implementing intranets. An intranet is a private network utilizing Internet-type tools, but available only within that organization. For large organizations, an intranet provides an easy access mode to corporate information for employees.

MANs (Metropolitan area Networks) - The refers to a network of computers with in a City.

VPN (Virtual Private Network) - VPN uses a technique known as tunneling to transfer data securely on the Internet to a remote access server of your workplace network. Using a VPN helps you save money by using the public Internet instead of making long-distance phone calls to connect securely with your private network. There are two ways to create a VPN connection, by dialing an Internet service provider (ISP), or connecting directly to Internet.

39. Uses of Internet

a) **The Email (Electronic Mail)** - Probably the most common use of the internet. Email is much faster than traditional methods of sending documents (postal system). Documents travel as binary files and are then converted back into plain text using special software. Email is efficient and convenient. The email provides the facility to send letters through the Internet to people who have access to the net. Multiple copies can be sent to multiple addresses just by adding the address to the address list. You can check for post at any time of day. This is achieved by means of special application software such as Microsoft Outlook Express or Netscape Communicator. One of the greatest features of emails is the ability of attaching files to the letter in the form of documents, pictures, sounds, and movies. E.g. Gmail, Hotmail, Yahoo Mail, Rediffmail etc.

b) **Information Browsing** - One of the most used features of the Internet is to search for particular information through large databases all over the world This information provided in the form of web sites makes part of the so - called **World Wide Web** or more commonly known as **WWW**. This is a means to search information centres all over the world. Examples of software used to access the WWW are MS Internet Explorer , Mozilla Firefox, Google Chrome, Opera etc.

c) **File Transfer** - **FTP or File Transfer Protocol** is a system used on the Internet to make possible the transfer of information from one computer or network to another. Anonymous FTP refers to those archive sites which allow anyone to access it.

d) **Socializing (Chat, Newsgroups, Social Media)** - An important part of the Internet which is widely used by youngsters is the Chat or Internet Relay Chat - IRC. With this facility, people can communicate real - time through the keyboard. Another form of socialising, are newsgroups (known as Usenet). This allows you to post and read articles on newsgroups. Usually newsgroups are grouped and have a particular topic. Other examples of social media includes Facebook, Twitter, Google Circles, Online Forums etc.

e) **HTML (Hypertext Mark-up Language)** - HTML is a language that is used to create Web - Sites. This language gives the facility of linking different pages together. On web - sites this can be seen when the cursor is dragged over a particular word or phrase. The cursor will change from an arrow sign to a palm sign. When the mouse button is double clicked on that word or phrase, another page will be loaded.

f) **URL (Universal Resource Locator)** - This is the address that shows in which computer (information centre) the web - site is held. An Internet address (for example, http://www.laqshya.in/contact/), usually consisting of the access protocol (http), the domain name (www.laqshya.in), and optionally the path to a file or resource residing on that server (contact).

g) **TCP/IP** - TCP stands for Transmission Control Protocol and IP stands for Internet Protocol. The term TCP/IP is not limited just to these two protocols, however. Frequently, the term TCP/IP is used to refer to a group of protocols related to the TCP and IP protocols such as the User Datagram Protocol (UDP), File Transfer Protocol (FTP), Terminal Emulation Protocol (TELNET), and so on.

40. Frequently used words & their Meaning

Acrobat: This is a special "Reader" that lets you look at many different files on certain programs…it is like an "acrobat" because it is able to "contort" so many different files into a recognizable form!

Baud: This is how many bits a second a modem can send or receive information. It is usually called a "baud rate."

Bit: This bit stands for Binary digIT. This is the smallest unit of computer data and is based on a binary code, either the number 0 or 1. It is the way your computer reads information.

Bookmark: This is a way for you to mark a site on the Internet that you may want to visit again, just like putting a bookmark where you left off in a story you are reading.

Boot: This is a term that means to "start up," or "boot up," your computer, or basically, to "boot it into gear!"

Browser: This is kind of like having your own personal "page finder" on the Internet. This is software that is used to help you "surf," or navigate, the Internet. It is what allows you to view "pages" on the Web.

Bug: These are little errors in either programs or equipment that sometimes cause them to stop running properly.

Buddy List: This is a list that you have the option of keeping on your Internet Service Provider. It can contain screen names of your friends and family that you like to "talk" with through instant messaging or e-mailing.

Byte: It usually takes 8 or 10 bits to make a byte, so a byte is bigger than a bit!

Cache: A place on your hard drive that keeps words and pictures from Web pages so that when you visit them more than once, they come up quickly.

Chips: These are really tiny electrical "circuit" boards that are capable of storing millions of bits of information.

Cookies: When you access certain Web Pages, you may be asked to enter some information. This information is then kept in a specific place, called "cookies" on the hard disk in the computer. The next time one of these pages is accessed, the computer checks for these cookies on the hard disk.

Cursor: It is a small blinking box or line that appears on the monitor screen. It allows you to see where you are working.

Cyberspace: This is a modern "slang" term used to mean the Internet or World Wide Web.

Database: This is actually information that is stored in a file. Databases are usually used to store information that is similar, for example, names and addresses, club members, etc.

Debug: This is a slang term for fixing problems in computer hardware or software. If you don't "get" these bugs, they can "eat" or destroy your hard drive or your programs.

Directory: This is like a copy of the "Yellow Pages"…instead of listing all of the numbers and places you can call, it lists all of the files you have stored on your computer.

Disk: There are two kinds of disks: hard disks and floppy disks. They are both used to store information. Floppy disks store small amounts of information, usually about 1.4 megabytes. Hard disks can store anywhere from a small amount of megabytes to a large amount of gigabytes.

Disk Drive: This is the "hardware" or equipment that a floppy disk is inserted into. This piece of equipment "drives," or runs the information stored on the disk.

Domain: This is the name of a network or computer that is linked to the Internet. It is found after the "@" in a URL, or Web address. There are different types of domains, for example, ".com" stands for company, ".gov" is government, ".org" is organization, ".edu" stands for education, and ".in" for India.

DOS: This stands for a very early computer operating system for IBM-Compatible computers. It stands for Disk Operating System. It's kind of like a foreign language that only your computer understands!

Download: To "download" information from the Internet means to transfer information from a particular site to a file or folder on your computer so that you can "view" the downloaded information at a later time.

E-Mail: This is short for "Electronic Mail." You can send a letter, memo, short message, business information, or simply a "Hi" with the simple click of a mouse button. This message system works between networked computers and can be sent instantly to a computer in the next room, the next state, or the next country! It's like two computers talking with each other on the telephone…actually they are talking over telephone lines!

FAQ: This is an abbreviated code used on the Internet to represent: Frequently Asked Questions.

File: This is an area that you put data or information in, like putting information in a "folder" and then into a "file" and putting it all into a "file cabinet" (your hard disk).

Floppy disk: A small, portable storage "container" that stores about 1.4 megabytes of information and can be used to transport information from one computer to another.

Folder: This is another place to store information on your computer and you can even "personalize" a folder with your name on it to hold your special information. In some operating systems, folders are called "directories."

FTP: This is short for File Transfer Protocol. This is a common way of moving files from one Internet site to another, just like moving the information in files from one file cabinet to another.

Gigabyte: This is one thousand megabytes.

Glitch: Sometimes things suddenly go wrong with computer hardware or software for no apparent reason and your computer "freezes" up. Sometimes you have to "re-boot" your computer system and may lose information you were working on.

Gopher: This is the odd name given to a type of search tool on the Internet that allows you to get text and other information by using different menus. "Gopher" this and "gopher" that!

Groupware: This is special software that enables you to work in groups on documents, programs, or databases. This can only be done when computers are networked.

Hacker: Hackers are computer experts who work at a high level of expertise with computer systems and software. Hackers can be good or bad! Some hackers come up with good ideas this way and share their ideas with others to make computing more efficient. However, some hackers intentionally access personal information about other people with their expertise, and use it to commit computer crimes! They are often caught by "Cybercops" who patrol the Internet looking for "bad" hackers.

Hard Copy: This is a "printed" copy of whatever page you have decided to print from your computer. It is very important that you keep a "hard copy" of any threats or inappropriate e-mail or instant messages that are sent to you, since once your computer is turned off, they are sometimes permanently gone from your computer.

Hard Disk: This is an internal storage "container" where you can store large amounts of information permanently on your computer. It can store large gigabytes of information. Information can be erased from the hard disk.

Hardware: These are the actual "hard" parts or pieces of equipment of your computer that you can actually touch. Hardware can mean the keyboard, monitor, disk drives, chips, and printers…anything that you can touch…and replace if it breaks! These are the "nuts and bolts" of your computer system.

Home Page: This is the "main" page of a Web Site, for a person, company, school, etc. From this page, you can be directed to other pages of interest in that site and can usually return to the home page from other pages in that site. It's kind of like a "Table of Contents" or "Index" in a book…you can find out where you need to go from this page!

HTML: HTML is short for Hypertext Markup Language and is the way that web browsers read and show text on web pages. For example, blue, italic, bold, etc. It's a special "browser language."

HTTP: This stands for Hypertext Transfer Protocol. This is the system that is used to find and send documents on the WWW. This is the first part of all URLs and is at the beginning of every address sent: http://www.laqshya.in

Hyperlink: These are usually blue underlined words or pictures that take you immediately to another site on the Internet when you click on them, like a chain contains links to connect one part to another. It quickly "transports" or "hyperlinks" you to another place on the Web.

Hypertext: This is a word document that is linked to another by a hyperlink.

Icons: A small picture or graphic on your computer that takes you into a program or another screen when you click on it. Icons are kind of like "eye-cons" since they are easily recognizable when you see them. You can place these on your opening screen and easily access the programs you use most often.

Input: Information or data that goes into a computer device. For example, when you learn something by listening to your teacher or parents, you have received input from them.

Instant Message: This is a message that is sent "instantly" and electronically to you by someone who has you on their "buddy list" on the Internet. You have the options to respond to these messages or have them blocked from your computer.

Internet: A huge collection of over 80,000 independent networks combined to form a vast global Internet connecting your computer to computers all over the world. The Internet evolved from the ARPANET of the late 60's and early 70's.

Internet Service Provider: This is your connection to the Internet. This is the provider that you pay to get connected to the Internet. There are both national and local Internet Service Providers available to you that allow you to connect to the Internet through your modem and phone line to a local access number.

Java: This is a programming language that allows software developers to create programs called "applets." When your web browser finds an applet on a page that you have accessed, it runs it if it "understands" the language, or if it doesn't, it runs the rest of the page as it would look without the applet. For example, if you speak Hindi and you hear Telugu, you might not understand it because it is a different language from the one you know.

Kilobyte: A thousand bytes.

Login: This is the name you use to gain access to your computer system, a program, the Internet, and some pages that require "membership" on the Internet. This is also a term used as a verb to mean to "login" or enter your computer system.

Megabyte: A million bytes.

Memory: The memory in your computer is like your brain – some things you just want or need to know for a short time, some things you want to remember for a long time. Memory is made up of chips and is used to hold information that computers use. Some memory is needed to hold data that your computer needs when it is on and some memory is used to hold data when your computer is turned off, like saving information on hard disks or floppy disks for later use.

Menu: When you click on a word or icon on your toolbars, a "menu," or list, of functions drops down. It has different selections for you to choose from, just like the menu at your favorite restaurant. You choose what actions you wish to take in a program or on the Internet from these menu selections.

Merge: Combining two pieces of information together. An Example is: two lanes of traffic "merge" into one lane on the highway!

Modem: This is an internal, or sometimes external, device that connects your phone line to your computer and allows you to connect to the Internet or link to other computers.

Multimedia: Using a computer to combine text, sound, graphics, and video. Examples include: games, and interactive software and some educational software.

Network: Any two or more computers that are connected to share information and resources are networked, or connected, together. When two or more networks are connected together, this is called an Internet.

Offline: If you work offline, you are not connected to another computer through a modem.

Online: When you work online, you are connected to another computer through a modem.

Output: This is the information, or data, given out by a computer. For e.g. When your teacher asks you a question about something you've learned, you give an answer, or output.

Password: This is the "secret" name that you use to login to your computer system, the Internet, or programs. Never give this secret word to anyone!

PC: This stands for "Personal Computer" like your computer at home.

Plug-ins: These are special pieces of software, usually downloadable from the Internet, that add new capabilities to a web browser program. For instance, they allow special multimedia features that add sound and movies on some sites that we may choose to access.

Port: Although this sounds like an area where ships dock, a port is actually a socket on the back or front of your computer system that allows you to connect other devices to your computer, such as your mouse, keyboard, printers, and scanners.

Program: Computer programs, usually called software, are really sets of instructions that tell your computer what specific function to perform.

Programming Language: Special codes used to feed instructions into your computer. Just like there are different languages in different countries for different people, there are different programming languages to do different things on your computer or on the Internet.

RAM: Random Access Memory, this is the memory that your computer uses while it is turned on and needs to run the programs that you are using at that time. When you turn your computer off, this memory disappears.

ROM: Read-Only Memory. This is memory that never disappears. This is the memory that stays permanently in your computer and contains the instructions that it needs to run. This is like your permanent memory, your name, your birthday, memory that is permanent, not temporary!

Search Engine: It is a program that looks or "searches" for information for you on the Internet. You type in a word, or group of words, that you want to find information on and the search engine you chose finds all of the "matches" to your request. There are many different search engines and they all "search" in different ways. You may have a favorite that turns up more information for your needs than others. For e.g. Google, Yahoo, MSN search.

Server: It is a computer that "serves" other computers, or clients, on a network. This term can refer to particular software or to the machine on which the software is running. An example is software that manages mail for clients on a network. Sometimes your mail-server will be "down" (not working properly) and no e-mail can be sent.

Shockwave: This is a "plug-in" to the browser that allows you to view interactive Web pages that contain games, movies, advertisements, etc. This browser is free and available to anyone on the Web.

Software: This is a set of instructions that your computer receives to perform a specific function. This software is usually kept on floppy disks or CD/DVD ROMs. They allow you to load the necessary information onto your computer that allows you to use these instructions, called programs, whenever you use your computer. Some software programs require the use of disks when used to access large amounts of data that you may not want to permanently store on your hard disk. You are not allowed to copy and share your software disks because of copyright laws!

Spreadsheets: Worksheets that are mathematical tables showing figures in rows and columns.

SSL: Secure Sockets Layer. This is the technology that encrypts, or encodes, information that is sent from your browser to a Web server. It is a type of "scrambling" system that scrambles

information that you send over the Internet. When you send or receive information over a "secure server," such as credit card information, it is much harder for a hacker to steal…because it is all scrambled up!

Surf: This is a slang term meaning to move from one Internet location to another, simply by clicking on hyperlinks.

URL: This is short for Uniform Resource Locator. This is basically the Internet "address" that you type in to access a particular site on the Web. Just like putting a specific address on a letter to make sure that it gets to a particular destination, each "site" or destination on the Internet also has its own "specific" address! These addresses usually start with "http://" followed by letters and/or numbers for a site.

USENET: This is like a giant "bulletin board" on the Internet that offers a large number of Newsgroups that focus on a variety of topics ranging from news to fan clubs to stock information.

User Name: This is the name that you use to "sign on" with an Internet Service Provider. In addition to your registered "user name" you will also use a password.

Virus: This is a harmful "illegal" computer code that can damage your computer system and makes it seem likes it's sick! It is silently spread from one computer to another through e-mail, downloaded files, and shared disks.

Web: A short term for the WWW, or World Wide Web. It actually comes from the idea of a spider web because it starts out small, with your computer, and webs out, or spreads out, over the entire world!

Webmaster: A person who creates and maintains a Web site on the Internet. They must update their site to keep it current. Just like a spider builds, repairs and maintains their web, a webmaster builds, updates and maintains their web site!

WWW: This is short for the "World Wide Web" or Internet. It represents the entire network of different resources that can be used by you on the Internet. The World Wide Web allows you access to people, places, things and information, all over the world.