

**Q. How Computers Work ?**

**Input:** This is the process of entering data and programs in to the computer system. Since computer is an electronic machine like any other machine which takes as inputs raw data and performs some processing giving out processed data, the input unit takes data from user to the computer in an organized manner for processing. Information and programs are entered into the computer through input devices such as the keyboard, disks etc.

**Storage:** The process of saving data and instructions permanently is known as storage. Data has to be fed into the system before the actual processing starts. It is because the processing speed of Central Processing Unit (CPU) is so fast that the data has to be provided to CPU with the same speed. Therefore the data is first stored in the storage unit for faster access and processing. **Processing:** The task of performing operations like arithmetic and logical operations is called processing. The CPU or central processing unit takes data and instructions from the storage unit and makes all sorts of calculations based on the instructions given and the type of data provided. It is then sent back to the storage unit.

**Output:** This is the process of producing results from the data for getting useful information. Output devices display information on the screen (monitor) or the printer and sends information to other computers.

**Q. Explain the units of CPU.**

The ALU and the CU of a computer system are jointly known as the central processing unit. The term CPU relates to a specific chip or the processor. CPU may be considered as the brain of any computer system. It is just like brain that takes all major decisions, makes all sorts of calculations and directs different parts of the computer functions by activating and controlling the operations. The fundamental operation of most CPU is to execute a series of instructions called as a program. **Arithmetic Logical Unit (ALU):-** The Arithmetic Logical Unit is an important component of the CPU, which carry the actual execution of the instructions. After entering the data through the input device it is stored in the primary storage unit. Then processing of the data and instruction are performed by Arithmetic Logical Unit. The major operations performed by the ALU are addition, subtraction, multiplication, division, logic and comparison. **Control Unit (CU)** The next component of computer is the Control Unit, which acts like the supervisor seeing that things are done in proper fashion. The control unit determines the sequence in which computer programs and instructions are executed. Things like processing of programs stored in the main memory, interpretation of the instructions and issuing of signals for other units of the computer to execute them. It also acts as a switch board operator when several users access the computer simultaneously.

**Von Neumann Architecture:-** Mathematician John Von Neumann conceived a computer architecture which forms the core of nearly every computer system in use today. This architecture is known as Von Neumann architecture. It is a design model for the modern computers which has central processing unit (CPU) and the concept of memory used for storing both data and instructions. This model implements the stored program concept in which the data and the instructions both are stored in the memory. All computers share the same basic architecture which have memory, an I/O system, arithmetic logic unit (ALU) and control unit.

**The Transistor vs. the Vacuum Tube:-** The transistor is the most important one for the development of modern computers. Before the transistor, engineers had to use vacuum tubes. Just as the transistor, the vacuum tube can switch electricity on or off, or amplify a current. The vacuum tube looks and behaves very much like a light bulb; it generates a lot of heat and has a tendency to burn out. Also, compared to the transistor it is slow, big and bulky. When engineers tried to build complex circuits using the vacuum tube, they quickly became aware of its limitations. The first digital computer ENIAC, for example, was a huge monster that weighed over thirty tons, and consumed 200 kilowatts of electrical power. It had around 18,000 vacuum tubes that constantly burned out, making it very unreliable. When the transistor was invented in 1947 it was considered a revolution. Small, fast, reliable and effective, it quickly replaced the vacuum tube.

**OPERATING SYSTEM :-** All computers need some sort of hardware platform to run the software; these platforms are called Operating System (OS). Operating system is a program that acts as an interface between user of computer and the computer hardware. The purpose of an operating system is to provide an environment in which user can execute program in a convenient and efficient manner. Operating system is an important part of almost every computer system. It manages all resources of computer system. Operating system is installed in secondary memory, while it's some part are stored permanently in read only memory. Some part of the operating system resides in random access memory and the computer begins to execute this part of the system. The majority of modern home computers use some form of Microsoft's operating systems. The original Microsoft operating system was called DOS (Disk Operating System) though most computers use Windows.

**Components of a Digital Computer** The key elements of a digital computer, as elaborated in the block diagram given in Figure include: Central Processing Unit, Input, Output and Memory. The Central Processing Unit (CPU) is like the brain of the computer. It is responsible for executing instructions. It controls and coordinates the execution of instructions. It is comprised of a Control Unit (CU), an Arithmetic & Logic Unit (ALU) and registers. The CU controls the execution of instructions by decoding the instruction and generating micro-operations to be performed for executing that instruction. The ALU is responsible for performing arithmetic and logic operations. Input devices are used to read the instructions and data to be processed and output devices display the results obtained after executing the program. Keyboard, Mouse and Scanner are examples of input devices, whereas Monitor, Printer and Plotter are examples of output devices. Memory is used as a working storage for temporarily storing the data and intermediate results generated during program execution. Computers use two kinds of memories: primary & secondary. The primary memory is often referred to as RAM in everyday language. It is a read/write memory used to store both the program and data.

**Motherboard:-** If we open the CPU cabinet of our PC, we will notice that it contains a printed circuit board on which a number of devices are plugged in. This printed circuit board is often called the mother board. All other major components of the computer are either plugged in directly to this mother board or connected through a bunch of wires. CPU, RAM and Device Cards are plugged in various slots of the mother board. Devices like Hard Disk, Floppy Drive, CDROM Drive, which are attached to the CPU cabinet, are connected through wire ribbons. The mother board has printed circuitry which allows all these components to communicate with each other. CPU cabinet also houses a power supply unit which provides power to all the components of the computer system. On the back end of the CPU cabinet, you can notice a number of connection slots. These slots are used to connect various input/output devices such as keyboard, mouse, printer, scanner, to the computer.

**Q. Briefly state the reason why ASCII can not be less than 7 bit code?**

ASCII Code is required to have unique code for every key press on the keyboard. Through the keyboard we can enter 10 decimal digits, 26 letters of alphabets and certain other symbols such as punctuation marks and special characters. Therefore, a minimum of six bits is required to code alphanumeric characters (26 = 64, but 25 = 32 is insufficient). However, the need to represent more than 64 characters (to incorporate lowercase and uppercase letters and special characters), made ASCII a 7-bit code. ASCII code is one such seven bit code that is used to identify key press on the keyboard. ASCII stands for American Standard Code for Information Interchange. It's an alphanumeric code used for representing numbers, alphabets, punctuation symbols and other control characters. It's a seven bit code, but for all practical purposes it's an eight bit code, where eighth bit is added for parity.

**Q. What was the main motivation behind the development of Unicode?**

Unicode was developed as a standard for the consistent encoding, representation and handling of text expressed in most of the world's writing systems. Unicode consists of a repertoire of more than 107,000 characters covering 90 scripts. It is the universal encoding scheme having special significance for Internet and multilingual computing

**Q. Briefly explain the sub cycles involved in execution of a machine instruction.**

Execution of a machine instruction on modern processors involves a complex sequence of operations with multiple cycles. One instruction cycle typically involves Fetch, Decode, Execute and Write back cycles. During Fetch cycle the instruction is fetched from memory. During Decode cycle the instruction is processed by the control unit of the CPU, which generate the set of micro-operations and timing signals required to execute the instruction. The micro-operations are then executed during Execute cycle to complete the instruction and any results generated are then written back to memory during Write back cycle. An instruction cycle may also involve one or more operand fetch cycles. The control unit is responsible for overall control and coordination of instruction execution.

**There are three different ways in which CU can generate these micro-operations: through a hardwired logic, by reading a programmable Array (PLA) table or by reading a Programmable Read Only Memory (PROM).** In hardwired control, the mapping between machine instruction and consequent micro-operations to be generated is permanently wired within the processor. It is relatively faster way although it cannot be modified. In PLA control the sequence of micro-operations to be generated for executing an instruction is stored as a PLA table. In Micro program control, the logic of the control unit is specified by a microprogram. Microprogram specifies the micro-operations. The microprogram control has a control memory (a PROM chip) which stores the sequence of micro-operations.

**The Memory** unit is an important component of a computer where all the data and information are stored in the form of binary digits (combination of 0's and 1's) and retrieved whenever necessary. Computer systems use a variety of devices for storing instructions and data. The computer memory is the place where the computer holds data and programs that are in use. Computer memory refers to the physical devices in a computer. If our computer's CPU had to constantly access the hard drive to retrieve every piece of data it requires, the operation will be very slow. On the other hand, when the data or information is kept in memory the CPU can access it much more quickly. There are two main functions of the memory: 1) To store programs, data and information into the computer. (2) To store the results of computation.

**The storage devices of a computer system are ranked according to the following criteria:**

- 1. Access time:** This is the time required to locate and retrieve stored data from the storage unit in response to a program instruction. That is the time interval between the read/write request and the availability of the data. A fast access time is always preferred.
- 2. Storage capacity:** It is the amount of data that can be stored in the storage unit. A large capacity is preferred.
- 3. Cost per bit of storage:** It is the cost of a storage unit for a given storage capacity. Low cost per bit of storage is always preferred. The final goal is to minimize this cost.

**Cache memory** is high speed memory, which is used to increase the speed of processing by making current programs and data available to the CPU at a rapid rate. Cache memory is a relatively small, high speed memory that stores the most recent used instructions or data. It acts as a high-speed buffer between main memory and the CPU. The cache memory is placed in between CPU and main memory. Cache memory access time is about 0.5 to 2.5 ns which is much less than that of the main memory. The access time of main memory is about 50-70 ns. Because of its very high cost, the capacity of the cache memory deployed is 2 to 3 percent of that of the main memory.

**There are two basic methods of accessing information from various memory devices**

1) **A Sequential-Access** memory device reads data in sequence. In other words, information on a serial device can only be retrieved in the same sequence in which it is stored. Data is recorded one after another in a predetermined sequence (such as in numeric order) on a storage medium. Sequential processing is quite suitable for such applications like preparation of monthly pay slips, or monthly electronic bills etc., where each address needs to be accessed in turn. If you are working with a sequential access device and information is stored at the last address, then data stored at the last address cannot be accessed until all preceding locations in the sequence have been traversed. That is locating an individual item of data requires searching the recorded data on the tape until the desired item is located. 2) **A Random Access** device the information is available at random, i.e., any location in the device may be selected at random. So any location in the device can be accessed in approximately equal time in any order. In other words, we can say that each storage position (1) has a unique address and (2) can be individually accessed in approximately equal time without searching through other storage positions. Magnetic disk and CDROM are typical random access storage devices. Any data record stored on a magnetic or optical disk can be accessed directly in approximately the same time period.

**Basic Storage Fundamentals :-** Data is processed and stored in a computer system through the presence or absence of electronic or magnetic signals in the computer's circuitry (ie., RAM) or in the media it uses (i.e. magnetic Disk). This is called a "two-state" or **Binary representation** of data. Transistor and other semiconductor circuits are either in conducting or in non-conducting states. For Magnetic media, such as magnetic disk or tapes, these two states are represented by having magnetized spots whose magnetic fields have one of two different directions or polarities.

**Seek time (Ts):** The time required to move the read/write head on a specific (address) track. Seek time varies depending on the position of the arm assembly when a read/write command is received. Seek time will be maximum, if the arm assembly is positioned on the outer most track and the track to be reached is the inner most one and it will be zero if the arm assembly is already on the desired track. The average seek time is thus specified for most systems which is generally between few milliseconds to fractions of a second.

**Latency Time (tL) or Search time:** Time required to bring the needed data under the R/W head. Latency time is also a variable and depends on the following two parameters:

- 1) Distance of the desired data from the initial position of the head on the specified track.
- 2) Rotational speed of the disk.

**Pen Drive:--** Now-a-days a Pen Drive is available as a very convenient and flexible data storage medium which can store up to 256 GB data. It can be used for the same purposes as floppy-disks or CD-ROMs. Pen Drives are a smaller, faster, durable and more reliable storage medium. Compared to floppy disks or CD-ROMs it has thousands of times more data storage capacity. It is a portable USB flash memory device. It is integrated with a USB (Universal Serial Bus) interface. It can be used to quickly transfer data from one system to another. The pen drive derives its name from the fact that many of these devices resemble a small pen or pencil in shape and size. Flash drives implement the USB mass storage device class so it is possible for modern operating systems to read and write from them without installing the device driver software. Some computers can even boot up from flash drives.

**Magnetic Tapes:--** A Magnetic tape is a sequential access type secondary storage device. It is used for backups in servers, workstations, and large computers. The main advantages of magnetic tapes are that they are cheaper and since these are removable from the drive, they provide unlimited storage capacity (20 GB to 150 GB). The read/write heads of magnetic tape drives record data in the form of magnetized spots on the iron oxide coating of the plastic tape. Magnetic tape devices include tape reels and cartridges in mainframes and midrange systems, and small cassettes or cartridges for PCs. The main drawback of magnetic tapes is that they store information sequentially. A file or some particular information stored on a magnetic tape cannot be accessed directly on random basis as is possible in the case of hard-disks or floppy disks. These devices are slower, but due to their low cost, they are still widely used for massive data warehouse and other business storage requirements.

**Optical memories** or Optical disks are alternate mass storage devices with huge capacity (up to 20 GB). Information is written to or read from an optical disk using a laser beam. Only one surface of an optical disk is used to store data. An optical disk is relatively inexpensive, and has a long life of at least 15 years. Since the read/write head does not touch the disk surface, there is no problem of disk wear or head crash. The main draw back of the optical disk system is its slow average access time.

**MEMORY HIERARCHY AND THEIR NEEDS:--** Every programmer wishes to have a large and fast memory. However, the two requirements are conflicting. Fast memories are expensive and small; and slow memories are cheaper and large. To give a user the illusion of both fast and large, the memory system of modern computers is organized in a hierarchical way. The very top of the hierarchy is CPU registers, between the CPU and main memory, a fast cache memory is added. The hard disk is used by the technique of virtual memory to expand the capacity of main memory. Most computer systems make use of a hierarchy of memory technologies as a single type of memory is not sufficient. This hierarchy is known as the memory hierarchy.

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#### **WHAT IS PORT ?**

Port is a connecting socket, outside the system into which different types of cables are plugged. It is a specific place from which other devices can be physically connected. I/O ports are the interfaces through which computers communicate with external devices such as printers, modems, joysticks and terminals.

**Parallel Port:--** Various peripherals can be connected through parallel port, which is a parallel communication physical interface. A parallel port transmits 8 bits of a byte of data in parallel. It is used for transmitting fast data over short distances. It is used to connect a printer to a computer. Since a parallel port transmits an entire byte at a time, it operates I/O devices at a relatively high speed. A Parallel port is primarily used to connect printers to a computer and hence it is often called a printer port.

**Serial Port:--** Serial port transmits one bit of a byte, one at a time as a single stream of bits. It is meant for transmitting slow data over long distances. Communication over a phone is an example of serial communication. It is a serial communication physical interface which transmits one bit at a time. Dial-up modems and serial mice use serial ports.

**Universal Serial Bus (USB):--** A USB Port can connect up to 127 peripheral devices such as a digital camera, digital speakers, scanners, speakers etc. It permits *Plug and Play* – configuring of expansion cards and peripheral devices as and when they are installed.

**Small Computer System Interface (SCSI) Port :-** SCSI-Small Computer System Interface Port allows data to be transmitted in a daisy chain to up to 7 devices at a speed higher (32 bits at a time) than those possible with serial and parallel ports. It is a fast data transmitting device and is used to connect HDD, CD ROM drives and scanners with the computer system.

**System Software** is set of programs which are used to run the system. System software manages all the other resources of the computer. It controls all the operations of the computer. One important system software requires to work any computer system is Operating System (OS). Operating system is one of the most important system software. An operating system commonly called OS, is system software which acts as an interface between a user and computer hardware. It also acts as a bridge between application programs and the computer hardware. Without operating system computer is of no use. A OS controls and manages all the hardware components of a computer as well as it also controls input and output, memory and files.

**Application software** is the set of programs necessary to carry out operations for a specified application. These are programs written by programmers to enable computer to perform a specific task such as inventory control, accounting, railway reservation, billing or any such type of applications in real life. These software are user-oriented applications..

**Media Player** It is one of the other common examples of application software. It is an application which is used to play multimedia files. Most of the media players can play both audio and video files. Media library is a common part of almost all media players which contains available songs. It is generally used to watch movies and listen to music on the computer.

#### **Q. What is the need of a motherboard in a computer? List some major components of a motherboard.**

Utility software is basically a set of programs that helps user to perform routine system task and maintenance such as taking back ups of data, checking disks for potential errors, disk management etc. It basically deals to optimize, manage, configure and analyze the computer system. Generally utilities are included with the operating systems. Generally Utility programs play supporting roles and it is small programs for specific tasks. Examples of Utility Software:

System Restore  Disk Defragmenter  Data Compression  Disk Management  File compare

#### **Q. Why System Restore is used? Explain how you will use the System Restore.**

System restore is used to undo changes to the computer and it restores its settings and performance. System restore helps us to restore computer's system files to an earlier state. System restore backs up system files such as .dll, .exe etc and saves it for later use. System restore creates restore point for this purpose. To use System Restore follow these steps:

1. Click on **Start button**, select **All Programs**, from there choose **Accessories**, click on **System Tools**, and then click **System Restore**. System Restore starts.
2. On the **Welcome to System Restore** page, click **Restore my computer to an earlier time** (if it is not already selected), and then click **Next**.
3. On the **Select a Restore Point** page, click the most recent system restore point in the **On this list, click a restore point** list, and then click **Next**.
4. On the **Confirm Restore Point Selection** page, click **Next**, System Restore restores the previous Windows XP configuration, and then restarts the computer.
5. Log on to the computer as Administrator. The System Restore **Restoration Complete** page is displayed.
6. Click **OK**

**Dial-up Internet Connection** It is a way to connect to the internet in which public switched telephone network (PSTN) is used to make a Internet connection via telephone lines to an internet service provider (ISP). In dial-up connection telephone network is of prime importance. Since dial-up connection requires telephone lines which have limited capacity. Its transmission speed is limited and it is slow. Generally dialup operate at speeds of 14.4Kbit, 28.8Kbit, or 56Kbit. Dialup speeds vary by the quality of the phone line and the many different user configurations. A MODEM is required for dial-up internet connection. MODEM is short form of modulator-demodulator. A modem is a hardware device or a software application program that is used in a computer to transmit data/ information over a network such as a telephone or cable lines.

**Broadband Internet Connection** Broadband Connection is a high data rate connection as compared to dial-up connection. Broadband has very high rate of data transmission. In contrast to dialup connection, it is a permanent connection, which can be set up over a high-speed communication links. Generally, an internet connection of 256 kbps (kilo byte per second) or more is considered as broadband Internet connection. Multimedia applications such as video and computer games, can be downloaded very quickly and easily with broadband connection which was not possible, as fast in dial-up connection.

**Proxy server** is used in a computer network. Proxy server is a server which acts as an intermediary between the client application and the Web server. Proxy server is used to improve performance and for filtering purposes. In an organization, proxy server can be used to prevent its employee to access certain types of website. It provides security and check to the overall system. It can also improve the performance of the network.

**Q. WHAT IS SOFTWARE?** A set of simple and step-by-step sequence of instructions that tell the hardware what to do and how to do it. This organized set of instructions written in a defined order and to accomplish a specific task is called **computer software** or **computer program**. Hence, a computer software provides intelligence to the hardware, which otherwise is just a collection of circuits and pieces of plastic and metal.

**Mainframe Architecture:**— all computing was controlled through the central mainframes server. Multiple users could connect to the central host through unintelligent terminals which captured the keystrokes, sent the information to the host and displayed the text output. All the processing was done by the applications residing on the main central server. Only large transaction-oriented applications were developed during that time. Business tasks such as accounts receivable, accounts payable, general ledger, credit account management and payroll that were repetitive and could be run as batch jobs were automated.

**File Sharing Architecture** The development of microprocessor, PC and LAN transformed dumb terminals into —smart clients. This brought a complete change in the computing environment. The client workstations or desktops, with there enhanced capabilities were now responsible for the user interface and execution of the application logic. The server provided access to computing resources like printers and large hard drives for storing the files. It downloaded the file from the shared location on the server to the client machine. The user application that worked on the data was run on the client and the file was written back to the server. The application had to be installed on each workstation that accessed the file.

**Client/ Server Architecture** As the capacity and power of personal computers improved, the need to share the processing demands between the host server and the client workstation increased. This need for greater computing control and more computing value led to the evolution of client/server technology. In client/server architecture, the tasks or workloads are partitioned as:

- server programs – providers of a resource or service
- client programs – requester of resource or service

Clients and servers may reside in the same machine or they typically reside in separate pieces of hardware and communicate over a computer network. A server machine is a host that runs one or more server programs which share their resource with clients. A client does not share any of its resources, but requests a server function or service. The server program fulfills the client request. Clients initiate a communication session with the server.

**Two-tiered architecture:** This approach basically introduced a database server to replace the file server. The emergence of relational database management systems and graphical user interface applications led to database server which could be accessed through the GUI based client applications. Since, the clients query the database over the network and only the relevant data is supplied to the client, the network traffic is greatly reduced in comparison to the file server system. The application or business logic in client server applications may reside on the server or on the client. clients and server interact over the network, increases in the number of users often lead to network congestion. Also, maintenance of the application becomes difficult with more users. This lack of scalability and flexibility gave rise to 3-tiered and n-tiered architectures.

**Three-tiered architecture:** A new generation of client/server implementation takes a step further and adds a middle tier in between client and server to achieve —3-tier architecture. The 3-tier architecture attempts to overcome some of the limitations of 2-tier schemes by separating presentation (user interface), processing (business functionality) and data into separate distinct entities. This leads to enhanced network performance and improved extensibility of business systems. Still, it has been found that three-tier methodology lacks some critical features such as reusability of application logic code and scalability. There may arise a situation whereby a collection of application logic code can not be reused and also they do not communicate with one another. Thus, there came a need for a viable architecture that mainly facilitates reusability of business logic as reusability phenomena has been found to reduce the cost of software development and the time to market and its quality is assured.

**Software Evolution N-tiered architecture:** The 3-tier architecture can be extended to N-tiers when the middle tier provides connections to various types of services, integrating and coupling them to the client, and to each other. Partitioning the application logic among various hosts can also create an N-tiered system. Encapsulation of distributed functionality in such a manner provides significant advantages such as reusability, and thus reliability

**Internet-based architecture:** In the late 1990's, the client/server trend was augmented by the internet. The users access the web servers through the web browsers on the client machines and over the internet. This led to very thin client based applications, which reside on corporate web servers.

**Cloud Computing** As the technology has evolved from Mainframe-based large proprietary (Computer Programs that are exclusive property of their developers or publishers, and cannot be copied or distributed without complying with their licensing agreements) systems to Client-Server architecture based open systems to Open Source software based solutions, software vendor's business has also evolved over the period of time. Cloud-based software services typically mean that the consumer does not own the hardware and software, but still gets the desired service. It is an IT delivery model that offers large-scale, shared infrastructure and computing resources as a service through self-service pay-per use access. Although it leverages recently developed technology, cloud computing is a business, not a technical trend. Key features of cloud computing are:

**Infrastructure sharing:** Cloud computing enables dynamic sharing of resources so that demands can be met cost effectively. **Scalability:** To handle ever increasing workload demands and support the entire enterprise, cloud computing must have the flexibility to significantly scale IT resources. **Self service:** Cloud computing provides customers with access to IT resources through service-based offerings. The details of IT resources and their setup are transparent to the users.

**Pay-per-use:** Because cloud resources can be added and removed according to workload demand, users pay for only what they use and are not charged when their service demands decrease.

**Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS)** – also referred to as On Demand software. This is a software solution delivery model where the software and the associated data are hosted centrally (in the cloud) and are accessed by the consumer through a thin client such as a web browser. Common applications for this are business applications such as – Accounting, Collaboration (Email, Messenger, Web meeting etc), Customer Relationship Management (CRM), Enterprise Resource Planning (ERP), Human Resource Management etc.

#### **Key benefits of Cloud-based solutions are:**

Lower upfront cost to get started, lower time-to-market (as it takes less time to get a customer going on a cloud solution), allows the company to focus on the core business and not worry about hiring and constantly training its staff on the new technology etc.

On the flip side for a Cloud-based solution, certain segment of customers such as large Banks and Financial institutions, Insurance companies may have security constraints in letting their data reside outside its premises (in their own data centers).

**Component Based Paradigm** The concepts of Object Oriented paradigm were extended to component based programming. Component Based Development owes many concepts to object-oriented methods. It gives a more abstract view of software systems than object-oriented methods. This model prescribes that programming problems can be seen as independently deployable black boxes (components) that communicate through contracts. The meaning of component or component based programming is intuitive: programs are broken down into primitive building blocks, which may be flexibly —plugged together] according to well-defined protocols.

**Service Oriented Paradigm**:-Service-Oriented Programming builds on Object oriented programming, adding the premise that problems can be modeled in terms of the services that an object provides or uses. A service is a unit of functionality defined by a set of message exchanges that are expressed using an implementation neutral grammar. It is a behaviour that can be implemented or provided by any component for use by any component based on message exchange.

**Object oriented-design paradigm** introduced the concept of an object as an atomic unit of functionality. Object oriented design is built on the premise that programming problems can be modeled in terms of the objects in the problem domain. In this design, any object of interest in the real world is an object in the program code. This helps to effectively model the real world and interactions of items within it.

#### **Q.What is pay-per-use licensing?**

With advances in networking technology, vendors began to introduce non-perpetual licensing models, such as subscription or pay-per-use licensing. In the pay-per-use, user is charged each time he/she uses the software, service or module and user does not own the software, rather uses it at on rent for the limited period. There is time based pay-per-use arrangement and transaction based pay-per-use arrangement. In a time based pay-per-use arrangement, consumers are charged for the amount of time that they used non-owned copies of the software. In a transaction based pay-per-use arrangement, usage charges occur because a software module has been used. The duration of use is irrelevant.

**Online Processing:** Online simplify mens that the user is directly connected to the computer and when the system is interchanges, the user interacts directly with the program to provide important data and other works.

**Batch Processing:** In batch processing, an user directly interact with the system. Rather than they collect their programs or job(s) in a file or a disk or tape and submit it for later execution. Many business tasks such as banking and insurance operations are performed much effectively in a batch.

**A diagnostic program** is a program written for the purpose of locating problems with the software, hardware, or both, or a network of systems. A diagnostic program provides solutions to the user to solve issues. In practical experience, these tools do not usually identify the exact cause of the system problem, but they often provide some information about what is in the system and how it is working.

**Perverse software** is a program which causes hindrances in other programs execution in such a way resulting in modification or complete destruction of data without the user's intention or even sabotaging the operational system. Perverse Software is also known as Malicious software or malware. It is a type of software that is designed to secretly access a computer system, without the owner's consent, and damage the system.

**Backup utilities** Backup refers to making copies of data so that these additional copies may be used to restore the original after a data loss event. All types of data could be backed up like pictures, word documents, files, executables or an entire database. The main purpose is to recover data in the event of data loss or data getting corrupt. Other purpose could be to recover historical data. A number of Backup software are available that assist you in taking backup of your important data on the computer. Selecting between various back-up software is not only a based on the cost but also on the software that meeting the requirements.

**Open Source Software (OSS)** is software that comes with source code, and importantly also provides rights (typically reserved for copyright holders) to study, change and improve the software. This development happens in a larger collaborative environment, without any direct objective of the software's commercial success. Primary objectives of the Open Source movement are as following: Encourage innovation at the grass-root level and facilitate collaborative software development involving individual talent than it being the prerogative of the large companies. Reduce the software cost. Improve quality and security Avoid forced lock-in to vendor's proprietary software.

Characteristics	LAN	MAN	WAN
Full form	It stands for local area network.	It stands for metropolitan area network.	It stands for wide area network.
Cost	Less Costly	More Costly	Costliest
Speed (in general)(the speed is moving beyond the limit)	Upto 10-1 Gbps	5- 10 Mbps and beyond	256 Kbps to 2 Mbps and beyond
Range	1 Km	Upto 50 Kms	Whole earth (20,000 Km in each direction)
Topology	Bus and Ring	Distributed Queue Dual Bus [DQDB]	ATM, Frame Relay, Sonet
Location of computers connected in the system	Computers are located within the same building.	Computers are located in the city and are connected using modems or telephone lines so that they can be easily connected with each other.	Computers are distributed all over the country or the continent. The connection is made via satellite communication link or via internet.
Examples	LAN's example can be an office whose different departments such as personnel, accounting etc. are located in the same building and connected via bus topology using Ethernet cards.	Example of MAN is bank whose different branches in a city like Delhi are connected using public telephone exchange and the system are connected with each other using LAN within each branch and different branches are connected using modem and bridges.	WAN's example is the connection of various branches of MNC such as Proctor & Gamble. These branches are linked using microwave satellite communication system or internet connection. Each branch has its own LAN circuit. But the different LAN's in various branches are communicating with head office using WAN link.

**The network interface card (NIC) provides** the physical connection between the network and the computer. Most NICs are internal, with the card fitting into an expansion slot inside the computer. Network interface cards are a major factor in determining the speed and performance of a network. It is a good idea to use the fastest network card available for fast transfer of data. The most common network interface connection today is Ethernet cards.

**Repeaters** When a signal travels a network cable (or any other medium of transmission), they lose strength, degrade and become distorted in a process that is called attenuation A repeater is a device that electrically amplifies the signal it receives and re-broadcasts it (Figure 1.17). They are used when the total length of your network cable exceeds the standards set for the type of cable being used.

**A hub** sends any data packet coming from one port to all other ports. It is up to the receiving computer to decide if the packet is for it. Typically used to connect segments of a local area network (LAN), a hub contains multiple ports. Hubs are typically used on small networks where the amount of data going across the network is never very high. A hub is typically the least expensive, least intelligent, and least complicated of the hub, router and switches.

**A switch** is a device that can segment a larger local area network to reduce the traffic load. One should implement a switch when you have a network with 20 or more users that have bogged down the network by excess traffic. It splits the network into two or more segments with devices that normally talk with each other. Conceptually – switching takes data from one interface and delivers it to another interface.

**A router** translates information from one network to another; it is similar to an intelligent bridge. Router selects the best path to route a message, based on the destination address and origin. The router can direct traffic to prevent head-on collisions, and is smart enough to know when to direct traffic along shortcuts. Routers can even —listen|| to the entire network to determine which sections are busiest—they can then redirect data around those sections until they are removed.

**Gateway** Interconnects networks at higher layers than bridges or routers. A gateway usually supports address mapping from one network to another, and may also provide transformation of data between the environments to support end to end application connectivity. Gateway typically limits the interconnectivity of two networks to a subset of the application protocols supported on either one. The main function of a gateway is to convert protocols among communications networks. A router by itself transfers, accepts and relays packets only across networks using similar protocol. A gateway, on the other hand, accepts data formatted for one protocol and convert it to data formatted for another protocol before forwarding it.

**Firewall** is software that works on some set of rules and instructions given by you. A firewall helps to keep your computer more secure and protect from many security problems like; hacking, Trojan Horse, Virus, etc. It restricts information that comes to your computer from other computers, giving you more control over the data on your computer and providing a line of defense against people or programs (including viruses and worms) that try to connect to your computer without invitation.

**Bridge** :-Like a repeater, a bridge can join several LANs. However, a bridge can also divide a network to isolate traffic problems. For example, if the volume of traffic from one or two computers or a single department is flooding the network with data and slowing down entire operation, a bridge can isolate those computers or that department.

#### **How does Web Server communicate with Web browser?**

Communication is started by you when either you click a hyperlink or type a web address (URL) in the browser address bar.

- ☑ The browser first takes the help of DNS to resolve the IP address of the website.
- ☑ Then it requests a TCP connection with the Server and sends the request for the web page once the connection is established.
- ☑ The server in response sends back the required web page and any additional request for pages. This whole communication is governed by HTTP protocol.

**Types of Browsers:-** **Line Mode Browsers:** The initial browsers were line mode text browsers. These browsers were simple and used to display text line by line. They used to provide command line interface to the user on a less sophisticated computers and terminals. These browsers provided fast access to websites as they displayed only the text part. Lynx is a line mode browser. **Graphical User Interface based Browsers:** These browsers run under graphic user interface systems such as Windows, Macintosh etc. A graphical browser, in addition to text can handle images, audio, video and animation. These browsers are very easy to use – You just need a point and click device like mouse. They have good display features. **Java enabled web browsers:** These browsers include a Java Runtime Environment that support Java programming language. These browsers can dynamically load java applet from web server to web client. These browsers are portable, extensible and secure. The example of java enabled browser is —LOBO||. It is open source software written completely in java.

**E-learning** is one of the most used terms on the Internet that describes any form of learning that is facilitated academically by the electronic means. Such means may be in the form of multimedia rich contents, web based lectures and web based tutorials or training programmes. In general, E-learning is strongly supported electronically by the administrative, academic and assessment processes. Some of the major advantages of E-learning are:

- ☑ It allows creation and fast update of online contents.
- ☑ You may use the contents at your own pace and convenience.
- ☑ E-learning also provides a possibility of standardization of contents that can be changed much faster.
- ☑ It has the potential of providing new learning opportunities.
- ☑ It has the possibility of student's interaction.
- ☑ Flexibility of programme/course management such as student may choose courses of their choices.
- ☑ Allows creative development of new courses in specific areas.

#### **Some of the key requirements for a good e-learning system are:**

- ☑ A successful e-learning system depends on good student interaction, self-motivation of individuals.
- ☑ A student has to study in an effective manner. This is essential as there is no teacher to motivate or drive the student.

#### **Q. What is wiki? How is it useful?**

Wiki's are a powerful tool for creating collaborative knowledge resources created by the community. A wiki is a page or collection of Web pages designed to create and edit contents. Wiki supports hyperlinks and has simple text syntax for creating new pages. Wiki's are also used to create websites, to enhance the features of community websites and for knowledge management. The collaborative encyclopedia, Wikipedia ([www.wikipedia.com](http://www.wikipedia.com)) is one of the best-known wiki's.

#### **Q. What is MOODLE?**

MOODLE is a free and open-source e-learning software platform. It provides feature for Learners and content management. In the past decade, it has become very popular for the delivery of e-learning content and student management.

#### **Q. Why is collaboration used on Internet?**

The collaboration helps in sharing of resources. These resources may be your intellectual efforts, hardware computing power or any other form of activity. Collaboration helps in solving complex problem domains by distributing the problems.

**Blog** is a website where entries are written as information or news on a particular subject. You may choose any subject for writing a blog like food, health, or information about IGNOU dates etc. A blog may combine text, images, or other media components; however, most blogs are textual. blog allows you to leave comments in an interactive format.

**The OSI model** is an abstract description for layered communications and computer network protocol design open system means that it can communicate with any other system that follows the specified standards, formats and semantics. **Protocols** give the rules that specify how the different parties may communicate.

**Application Layer:** This layer is the layer for user interaction. We must have application software for dealing with the data. **Presentation Layer:** It converts the data into suitable format. It does tasks like compression, decompression, encryption and decryption.

**Session Layer:** This layer manages connections between different application layers.

**Transport Layer:** This layer converts data into segments and re-assembles the data stream. TCP and UDP are the protocols used in this layer. In this layer, data is converted into so called segments.

**Network Layer:** This layer translates logical address into physical address. This layer also fixes the route for data path. Router works in this layer. In this layer data is called a packet.

**Data-Link Layer:** This layer provides physical identification of a device using Media Access Control Address. It adds source and destination address to packets and convert them into frames. This is the layer that provides error free transmission. **Physical Layer:** This layer provides the functional requirements for activating a physical link. In this layer, data is carried from one device to another.

**Collaborations:-** Collaboration is defined as an act or process of working together on a project or some intellectual activity. in this global world, role of the Internet tools is to enable collaboration among people. From this perspective chat, news groups, wikis all are some basic tools for collaboration. Collaboration involves both communication and sharing of ideas. Modern day science, to certain extent, has become collaborative. Each collaborative project has several social, political, ethical and technical issues that are to be addresses at the start of the project itself.

**Social networking:-** A social network is a network of individuals which have some sort of interdependence on each other. This interdependence may be in the form of friendship, kinship, common causes and so on. A Social networking service may be offered through a web site on the Internet. Some of the popular social networking services are – Orkut, Facebook, Twitter, LinkedIn, MySpace, Friend Finder, Yahoo! 360, Classmates and many more. The Social networking technologies have opened up a new way for information and knowledge sharing. Social networking allows instantaneous communication of information to large audience. It helps in generating large scale public response to emergency situations that may occur during disaster.

**Non-structured programming** is historically earliest programming paradigm. A non structured program usually consists of sequentially ordered statements, usually one in each line. The lines are usually numbered or labeled to allow the flow of execution to jump to any line in program. There is no concept of procedures in non structured program; hence there are no independent reusable units in this programming paradigm.

**Structured design paradigm** introduced the concept of selection and repetition of statements in code execution along with the line by line execution. It allowed writing of procedures and functions. These are the terms used for a block of code that is written to perform a single task. Procedures and functions were the beginning of compartmentalization and hence reusability of program code.

**Time sharing system:-** the requirement for an interactive computing facility can be, and often is, met by the use of a dedicated microcomputer. That option was not available in the 1960s when most computers were big and costly. Instead time sharing was developed. Just as multiprogramming allows the processor to handle multiple batch jobs at a time, multiprogramming can be used to handle multiple interactive jobs. In this latter case, the technique is referred to as time sharing, because the processor's time is shared among multiple users. In time sharing system, multiple users simultaneously access the system through terminals, with the operating system interleaving the execution of each user program in a short burst or quantum of computation.

**OPERATING SYSTEM SERVICES:-** 1) **Command Processor and User Interface:-** Different types of user interface exist. The most common are the **graphical user interface**, or **GUI**, and the **command line interface**. The graphical user interface accepts commands primarily in the form of drop-down menus, mouse movements, and mouse clicks. The command line interface relies on typed commands which provide direct access to various methods within operating system such as File system, I/O system, and network services. 2) **File Management:-** The file management system provides and maintains the mapping between a file logical storage needs and the physical location where it is stored. Users and programs simply access the files by the name, and the file management system handles the details. The file management system identifies and manipulates files by the names provided by their users determines the physical requirements of the file, allocate space for it, stores it in that space, and maintains the information about the file so that it may be retrieved partially or in full, later. The file management system keeps track of the available space on each device connected to the system.

3) **Input/Output Services:-** Every operating system, large or small, provides input/output services for each device in the system. The operating system includes I/O device driver programs for each device installed on the system. These drivers provide services to the file management system and are also available, through the API, to other programs for their use. The I/O device drivers accept I/O requests and perform the actual data transfers between the hardware and specified areas of memory. 4)

**Process Control Management:-** A **process** is an executing program. It is considered the standard unit of work within a computer system. Every executing program is treated as a process. This includes not only application programs, but the programs within the operating system itself. The process concept considers the program, together with the resources that are assigned to it, including memory, I/O devices, time for execution, and the like. 5) **Memory Management:-** The purpose of the memory management system is to load programs into memory in such a way as to give each program loaded the memory that it requires for execution.

**Subroutine :** A subroutine is a type of subprogram, a piece of code within a larger program that performs a specific task and is relatively independent of the remaining code. It is also called a procedure, routine or a method. A subroutine has no value associated with its name. All outputs are defined in terms of arguments; there may be any number of outputs. for e.g

```
SUBROUTINE sub1(A,B,C, SUM)
REAL A,B,C,SUM      SUM = A + B + C      RETURN  END
```

**Function :** The purpose of a function is to take in a number of values or arguments, do some calculations with those arguments and then return a single result. Each language has different rules to define a function. In the C programming language the basic block for function is given as: return value function name (argument list)

```
{      statement;      }
```

**Library function:** These are the functions supplied with the programming language. The code or definition of library functions does not have to be written in a user program while writing it. Coding or definition of these function are defined in header or library files which are required to be included in program. e.g. #include<stdio.h> printf(),scanf() etc. are functions defined in stdio.h header file.

**A macro** is a short program written using VBA that can be used to carry out a specific task. VBA is the language that Excel macros are written in. It is a programming language that is included with all of the Microsoft Office applications e.g. Word, Access, Power Point, Excel as well as others. VBA is a subset of Microsoft Visual Basic, an extremely popular programming language that has been around for over 10 years.

**Q. What is the difference between lead time and lag time?**

**Lead time:** An overlap between tasks that have a dependency. **Lag time:** A delay between tasks that have a dependency. For example, if you need a two-day delay between the finish of one task and the start of another, you can establish a finish-to-start dependency and specify a two-day lag time.

**Q. What is a milestone in a project?**

A milestone is a reference point that marks a major event in a project and is used to monitor the project's progress. Any task with zero duration is automatically displayed as a milestone. You can also mark any other task of any duration as a milestone.

**Microcomputers:** The mass production of silicon chips since 1971 has made it possible to put a "brain" into all sorts of machines. One such machine is the microcomputer. This machine has taken fullest advantage of the use of large-scale integration on silicon chips. The microprocessors literally contain a computer on a chip that can pass through the eye of needle. Microcomputers memories are generally made of semiconductors fabricated on silicon's chips. Today microcomputers are called as Personal Computers more commonly as PCs. These are small, relatively inexpensive computers designed for personal use in home or offices.

**Minicomputers:** Technological advances in the 1960's enabled manufactures to respond to the growing demand for a similar stand-alone machine, the minicomputer, to handle task that large computers could not perform economically. Minicomputer systems (or small mainframe computers) provide faster operating speeds and larger storage capacities than microcomputers systems. These Computers can support a large number of high-speed input/output devices. Operating system developed for minicomputer systems generally support both multiprogramming and virtual storage. This means that many programs can be run concurrently.

**Mainframe Computers :** Mainframes are huge, multi-user systems designed to process millions of instructions per second and capable of accessing billions of data. They can handle gigantic processing jobs in large corporations or government agencies. This computer is commonly used in big hospitals, air line reservations companies and many other huge companies prefer mainframe because of its capability of retrieving data on huge basis. Mainframe allows its user to maintain large information storage at a centralized location and be able to access and process this data from different computers located at different locations. Mainframe computers are normally too expensive and out of reach from a salaried person who wants this computer for his home. Mainframe is the second largest in capability and size of computer family.

**Supercomputers :** The most expensive in price, biggest and fastest machines today are the supercomputers that are used when billions or even trillions of calculations are needed. Supercomputers are ultra fast computers designed to process huge amounts of scientific data then display the underlying patterns that have been discovered. These machines are essential for applications ranging from nuclear weapon to accurate weather forecasting.

**Classification by technology:-** **Analog Computers:** The name analog comes from the word "analogous", meaning similar. Analog signal is a continuous signal whose amplitude can take any value in a continuous range. It can have infinite number of values. Analog computers deal with quantities that are continuously variable. They give only approximate results. **Digital Computers :** It is a machine that specializes in counting. It operates by counting values that are discrete, or separate and distinct, unlike the continuous quantities that can be measured by the analog computer. Digital signal is a discrete time signal that has a discrete number of levels. It can only assume one of the two values 0 or 1. Digital Computers are used for both business data processing and accuracy. The basic operation performed by a digital computer is addition. The digital computer is capable of storing data as long as needed, performing logical operations, editing input data, and printing out the results of its processing at high speed.

**Hybrid Computers:** Although both analog and digital computers are extremely used and widely accepted in various industries, manufacturers have to attempt to design a computer that combines the best features of both types. This special-purpose machine called a hybrid computer which combines the measuring capabilities of the analog computer and the logical and control capabilities of the digital computer. It offers an efficient and economical method of working out special types of problems in science and various areas of engineering. Some Hybrid machines contain special equipment to convert analog voltages into digital voltages, and vice-versa.

**Magnetic Ink Character Recognition** is a character recognition system that uses special ink and characters. When a document that contains this ink needs to be read, it passes through a machine, which magnetizes the ink and then translates the magnetic information into characters. MICR technology is used by banks for faster processing of large volumes of cheques. Numbers and characters found on the bottom of checks (usually containing the check number, sort number, and account number) are printed using Magnetic Ink. To print Magnetic Ink codes, we need a laser printer that accepts MICR toner. **A barcode reader** is an electronic device which is used to read printed barcodes. Barcodes represent alphanumeric data which is a combination of vertical lines (bars) that vary in width and length. It is a fast and effective way to input data. A Barcode reader uses a laser beam to read the series of thick and thin lines which represent the bar code number. **A magnetic stripe reader** is a hardware device which is used to read the information encoded in the magnetic stripe located at the back of a credit/debit card. A bank card holds data about the owner of the card, bank account number and code of the bank branch, where the account is held. **A Plotter** is a device that draws pictures on a page as output, after receiving a print command from the computer. It is also called a graph plotter. In plotters pens are used to draw lines on the paper, which is placed in the plotter. Plotters produce high quality diagrams on the paper and their output quality is good.

**Advantages of using Computer Networks:-** a) **Resource sharing:** A network is needed because of the desire to share the sharable programs, data, and equipment available to anyone on the network without regard to the physical location of the resource and the user.

b) **High reliability:** A network may have alternative sources of supply (e.g., replicated files, multiple CPUs, etc.). In case of one resource failure, the others could be used and the system continues to operate at reduced performance.

c) **Cost-benefit advantage:** A network may consist of many powerful small computers, one per user. You can keep the data and applications on one or more shared and powerful file server machines. This is called the client-server model. Such model offers a much better price/performance ratio than old mainframes.

d) **Scalability:** The ability to increase system performance gradually by adding more processors (incremental upgrade). e) **Powerful communication medium:** Networks make cooperation among far-flung groups of people easy where it previously had been impossible.

**Guided media** provide a physical connection between two devices. A signal traveling through guided media is directed and contained within the physical limits of the medium. There are several different Guided media, however we define only the most popular as given below:

a) Twisted pair cable b) Optic Fiber cable

**Twisted pair cable** is still the most common transmission media. A twisted pair cable consists of two conductors which are normally made of copper. Each conductor has its own plastic insulation typically 1 mm thick. These cables are twisted together. Twisting is done to reduce crosstalk. Twisted Pairs are very effective for relatively short distances (a few hundred feet), but can be used for up to a few kilometers. A twisted pair has a bandwidth to distance ratio of about 1 MHz per kilometer. The performance of the twisted pair can be substantially improved by adding a metallic shield around the wires. Shielded wires are much more resistant to thermal noise and crosstalk effects. **An optical fiber** consists of two concentric cylinders: an inner core surrounded by a cladding. Both the core and the cladding are made of transparent plastic or glass materia, which transmit signals in the form of light. Optical fiber use reflections to guide light through a channel. The core is used for guiding a light beam, whereas the cladding (which has a different refractive index) acts as a reflector to prevent the light signal instead of electrons, it does not suffer from the various noise problems associated with electromagnetic signals. The signal is usually generated by a laser or Light Emitting Diode (LED). Optical fibers can provide bandwidth to distance ratios in order of 100s of MHz per kilometer. They are being increasingly used as telecommunication carriers for long distance digital trunk lines.

**Unguided media** is used for transmitting the signal without any physical media. It transports electromagnetic waves and is often called wireless communication. Signals are broadcast through air and received by all who have devices to receive them. It can be categorized as follows: a) Radio waves b) Micro waves c) Infrared

**Radio Waves:-** Electromagnetic waves ranging in frequencies between 3 Kilo-Hertz and 1 Giga-Hertz are normally called radio waves. Radio waves are easy to generate and can travel long distances and can penetrate buildings easily, therefore widely used for communication. These are omni-directional which implies that these travel in all directions from the source, so the transmitter and receiver do not have to be carefully aligned physically. Radio signals have been used for a long time to transmit analog information. **Microwaves:-** Electromagnetic waves ranging from 1 to 300 Gigahertz are called microwaves. Microwaves are unidirectional that is the sending and receiving antennas need to be aligned. Microwave is by far the most widely used form of radio transmission. It operates in the GHz range with data rates in order of hundreds of Mbps per channel. Telecommunication carriers and TV stations are the primary users of microwave transmission. **Infrared signals** range between 300 Giga-Hertz to 400 Tera-Hertz. These can be used for short range communication. High range infrared rays cannot be used for long range communication as it cannot penetrate walls. This also helps in avoiding interference. Infrared signals are generated and received using optical transceivers.

**Bus topology** is a single common communication to which all the computers are connected. It has a single length of cable with a terminator at each end as shown in the Figure 1.7. It is a passive topology which means only one computer at a time can send a message. Hence, the number of computers attached to a bus network can significantly affect the speed of the network. A computer must wait until the bus is free before it can transmit. **Advantages :-**a) It is simple, reliable, and easy to be used in a small sized local area network. b) It requires least amount of cable to connect computers together and is therefore less expensive than other cabling arrangements. c) It is easy to implement and extend using connectors. **Disadvantages :-**a) In this topology, no two computers can transmit data at the same time. b) It does not cope well with heavy load which can slow down a bus considerably.

**Ring topology** is also known as circular topology. This layout is similar to the linear bus, except that the nodes are connected in a circle as shown in Figure 8. In this topology, each node is connected to two and only two neighboring nodes. The ring does not have an end. It is made of short segments that connect one PC to the next PC and so on Data is accepted from one of the neighboring nodes and is transmitted onwards to another node .Therefore data travels in only direction from node to node around the rings.

**In star topology**, each computer on a network communicates with a central hub (also called as a concentrator) that re-sends the message either to all the computers or only to the destination computer. A hub expands one network connection into many. **Advantages:-** a) It is more reliable (if one connection fails, it does not affect others). b) It is easy to replace, install or remove hosts or other devices, problem can be easily detected.c) Use of multiple cables types in a same network with a hub. d) It has good performance **Disadvantages:-** a) It is expensive to install as it requires more cable b) Central node dependency, if central hub fails, the whole network fails to operate. c) Many star networks require a device at the central point to rebroadcast or switch the network traffic.

**Q. What is TCP/IP? Why is it used?** A stack of protocols called TCP/IP (Transmission Control Protocol/Internet Protocol) implements different rules to handle the data communication from source machine to destination machine. For sending a message from source machine to destination machine, TCP divides the message data into little data packets. It also adds special information e.g., the packet position, error correction code etc., to make sure that packets at the destination can be reassembled correctly and without any damage to data. The role of IP here is to put destination-addressing information on such packets. On Internet it is not necessary that all the packets will follow the same path from source to destination A special machine called routers tries to, load balance various paths that exist on networks. Other special machine called gateways allows different electronic networks to talk to Internet that uses TCP/IP.

**TCP/IP Model:- Host to Host Network:** In fact TCP/IP model does not specify this layer. But it basically combines functionally of physical and data link layers. This layer encodes and transmits data over network communications media in the form of bits which are received by the Physical layer of the destination device. Often combined with this layer is the Data link layer which is responsible for moving packets from the network layer onto different hosts. **Internet Layer:** This layer routes and delivers data across similar networks or completely different networks. The Network layer is responsible for end to end packet delivery while maintaining routing, flow control, and error control functions. **Transport Layer:** This layer categorizes end to end message transmissions or connecting applications as either Transmission Control Protocol (TCP) or User Datagram Protocol (UDP). TCP is a connection-oriented protocol which is considered to provide a reliable byte stream. Some characteristics of TCP are traffic congestion control, data arrives in order, data has minimal error, and duplicate data is discarded. **Application layer:** The top layer of the TCP/IP model is the Application layer which is used for network communication. Ports are used by programs to transfer data through this layer. For example, the File Transfer Protocol uses port 21 by default while the Hypertext Transfer Protocol uses port 80.

**Browser Cookies :-** A cookie is a small message sent by the Web server to a your web client. This message is stored by the browser as a text file. The basic purpose of cookie is to store information needed by a server at the user end only. The cookie is used to send information back to the Web Server each time the browser requests a page from the server. **Are cookies bad?:** Cookies are merely text files that can be deleted at any time - they are not malicious nor are they programs. Cookies cannot be used to spread viruses andthey cannot take control of your hard drive. However, they contain important information about you, so they may be threat to your privacy and anonymity on the Internet.

**Q. What is a Search Engine? How does it work?:**-Search engines are special sites on the Web that helps you to find information stored on other sites. There are differences in the ways various search engines work. But there are three basic steps which most search engine perform: a. Web Crawling b. Indexing c. Searching  
a) **Web Crawling :** To find information on the hundreds of millions of Web pages that exist, a search engine employs special software robots, called spiders, to build lists of the words found on Web sites. Process of building list by spiders is called crawling.  
b) **Indexing :** Once the list of information on Web pages is made, the search engine stores the information in a way that it can be searched on words and list related URLs.  
c) **Searching :** Searching through the index involves a user building a query and submitting it through the search engine.

**Firewall:** Internet has many security problems like hacking, Trojan Horse, Virus, etc. There are various tools to provide protection against unwanted access of your computer by anyone else, but the most popular among all security measures is the firewall. Firewall is software that works on some set of rules and instructions given by you. A firewall helps to keep your computer more secure.

**Internet:-** Internet is a global connection of networks. The Internet is basically built up of multiple smaller networks called the subnets. Each computer systems on a subnet must have a *unique address*. All these subnets are connected together with network devices called routers, and each subnet may also contain its own subnets.