BCS-011 COMPUTER BASICS AND PC SOFTWARE

June 2023

1. (a) Write short notes on the following   10

(i) Cache Memory

Ans: Cache memory: Cache memory is a 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. It 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. Because of its very high cost, the capacity of the cache memory deployed is 2 to 3 percent of that of the main memory.

Data in primary memory can be accessed faster than secondary memory but still, access times of primary memory are generally in a few microseconds, whereas the CPU is capable of performing operations in nanoseconds. Due to the time lag between accessing data and acting on data performance of the system decreases as the CPU is not utilized properly. To reduce the idle time of the CPU and increase the speed of processing, a fast memory can be used. A faster and smaller segments of memory known as cache memory is used.

(ii) PROM

Ans: PROM stands for Programmable Read Only Memory. A variation of ROM chip is programmable read only memory (PROM). A PROM is a memory chip on which data can be written only once. PROM is manufactured as blank memory. PROM is programmed into them after manufacture. PROM can be programmed by the user. A user can customize a system by storing own program in a PROM chip. PROM allows you to write data to it a single time. I.e, once a program has been written on to a PROM chip, the recorded information cannot be changed i.e., the PROM becomes a ROM and it is only possible to read the stored information. PROM is also a non-volatile memory i.e. the stored information remains even if power is switched off.

To write data on a PROM chip, we need a special device called a PROM programmer or a PROM burner. The process of programming a PROM is sometimes called burning the PROM.
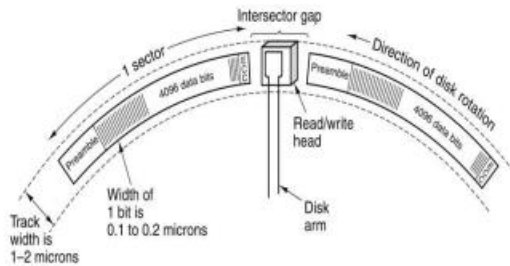
(iii) Winchester Disk

Ans: Winchester disk is another name for "hard disk drive". Two reasons why hard disk drive is called "Winchester disk":

- the disk was developed at IBM"s facility at Winchester, New York State; that had 30MB of fixed storage and 30MB of removable storage;

- the first model number was given as 3030, which is also the model number of the well-known Winchester Rifle popular in the Wild West.

Winchester disk is a sealed "hard disk" having rotation speed typically 7200 rpm. A disk has 5000 to 10,000 concentric tracks per centimeter and about 100,000 bits per centimeter around circumference.

Winchester disk- a portion of disk track

HDD is an elector-mechanical storage device. It uses magnetic storage for storing and retrieving the digital data. It is a non-volatile storage device. Hard disks are online storage devices. Online storage means that hard disk is permanently connected to the computer system and when the computer is on, the device (hard-disk) is available to store information or to retrieve information. HDD stores programs, data, operating system, compiler, assemblers, application programs etc.

The read/write head reads data from the disk and writes data to the disk. A disk is mounted (or stacked) on the disk drive, which has the motor that rotates it. Hard disks together with read/write heads, access mechanism and driving motor constitute a unit called hard-disk-drive (HDD) unit.

(iv) WORM

Ans: WORM stands for Write Once Read Many. WORM is also known as CD-R (Compact Disc-Recordable). CD-R is an optical disk technology. The user can record (write) their own data once on a CD with a CD-R disk drive unit. After this recording user can read the data as many times as desired. Once it has been written, the data cannot be changed or deleted.

The user can store permanent data, information, and files for maintaining records. CD-R is mainly used for storing music files, videos, photos and software applications. CD-R is compatible with most standard CD drives.

Advantages of CD-R :

- High storage capacity.
- Better reliability
- It is less costly.
- CD-R has a longer lifespan because it is not susceptible to physical damages and accidental overwriting.

(v) WIKI

Ans: Wiki stands for "What I Know Is". 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 is one of the best-known wiki's. It contains very large number of articles – all created and moderated by the community. Ward Cunningham developed the first wiki software - WikiWikiWeb in 1995.

 Characteristics of Wiki are:

* A wiki invites all registered users to edit any page or to create new pages within the wiki Website.

* Wiki promotes meaningful topic associations between different pages by making page link creation very easy.

* Wiki promotes discussion and also keeps the history of changes of a document.

Documents can be written using a markup language. We can see a wiki page using web browser. Wiki pages are connected through hyperlinks. Therefore, a wiki is database for creating, editing, browsing, and searching through information.

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.

Wikis promote content creation by providing a collaborative environment, user-friendly tools, version control features, community engagement and global participation all of which contribute to the development of content.

Wiki platforms have a wide global reach, attracting contributors from around the world.

(b) Describe the need and working of any two input devices. 4

Ans:

Need of Keyboard: It is the most common input device used for entering data and information into the computer system. This is the standard input device attached to all computers. The keyboard is a primary device for inputting text by pressing a set of keys. The layout of keyboard is just like the traditional typewriter of the type QWERTY. Keyboard devices can be classified into two types general purpose keyboards and special purpose keyboards. General purpose keyboard are standard keyboards used with most computer system. They are called general purpose because

that have enough keys to make them useful for any type of application. Keyboards contains a total of 101 to 104 keys.

Working of keyboard:

The User can enter data into the computer by pressing a set of keys on the keyboard. A Computer keyboard includes control circuitry which converts the key pressed by the user into key codes so that the computer can understand it. The computer can recognize the electrical signals corresponding to the correct key combination and processing is done accordingly.

Need of Mouse: A Mouse is a handy device which can be moved on a smooth surface to cause the movement of a cursor on the screen. It is a pointing device which is used to input data and information into the computer system by pointing on it. A mouse contains a small case, held under one of the user's hands with one or more buttons. For GUI-based systems a mouse is an essential pointing-device. The cursor of the mouse moves in the same direction in which the mouse ball rolls. Different types of mouse are: mechanical mouse, optical mouse, cordless mouse.

Working of mouse:

The cursor of the mouse moves in the same direction in which the mouse ball rolls. A Mouse rolls on a small ball and has two or three buttons on the top. When you roll the mouse across a flat surface on the screen, sensors sense the mouse in the direction of mouse movement. The cursor moves very fast with a mouse giving you more freedom to work in any direction.

(c) What are Operating Systems ? Explain any four operating system services. 6

Ans:

Ans: An operating system is system software which may be viewed as an organized collection of software consisting of procedures for operating a computer and providing an environment for execution of programs. It acts as an interface between users and the hardware of a computer system. Operating system is the software that manages all the computers' resources to optimize its performance provides common services for efficient execution of various application software and acts as an interpreter between the hardware, application programs and the user.

An operating system is essential for any computer to be useful to us. Operating systems performs basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk and controlling peripheral devices.

The basic objectives of an operating system are to make the computer system convenient to use and to utilize computer hardware in an efficient manner.

Operating system is a large collection of software, which manages the resources of the computer system, such as memory, processor, file system and input/output devices. It keeps track of the status of each resource and decides which will have control over computer resources, for how long and when.

Five facilities that are provided by an operating system to a user or to a program are:

• Command processor and user interface

• File management system

• Input/output control system

• Process management

• Memory management

1. Command processor and user interface: To the user, the most important and visible services provided by the OS is the user interface and the capabilities that it provides to execute commands which may not be a part of OS.

These systems consider the user interface as a separate shell that is Operating Sytem provided with the operating system and that interacts with the kernel to provide the necessary-user command capabilities. In UNIX, three different shells, the C shell, the Bourne shell, and the Korn shell are in common use, and many other shells for UNIX are available. Each of these shells provides different command structures and different capabilities.

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. UNIX allows certain class of users called superusers to use some kind of commands for changing the platform or access rights.

2.File Management: The concept of a file is central to the effective use of a computer system. A file is generally loosely defined as a collection of related information such as students records employee database. It might contain graphical usage. A file may be organized internally into records or it may simply be a stream of bytes. A file constitutes a logical unit of storage, that is, logical to the person or program using the file.

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. The user and the user's program need not be aware of the underlying physical storage issues.

The file management system allows the retrieval and storage of files by name, keeps track of the mappings, allocates and frees space, allows the mounting and unmounting of file structures, and provides other functions required to maintain the structures of the file system.

Directory structures for each I/O device in the system and tools to access and move around these structures. The directory structure provisions are made to move easily from one structure to another.

It also protects files and limit file access to authorized users.

File management systems are particularly important in systems in which secondary storage devices are shared in common by multiple users, since they provide a directory system that assures that there is no duplicate use of physical storage.

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. Devices drivers for newly installed devices are added and integrated into the operating systems. In Windows, this capability is known as plug-and play.

4. 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.

In multiprogramming operating system there are many programs residing in the Operating System memory simultaneously in the memory.

The memory management system has three primary tasks. It attempts to perform these tasks in a way that is fair and efficient to the programs that must be loaded and executed.

1. It keeps track of which parts of the memory are currently being used and by which process into memory together with the space being used and also keeps track of available space.

2. It maintains one or more queues of programs waiting to be loaded into memory as space becomes available, based on such program criteria as priority and memory requirements.

3. When space is available, it allocates memory to the programs that are next to be loaded. It also de-allocates a program's memory space when it completes execution. The deallocated space is made available for other programs.

(d) Explain the differences between wired and wireless communication. 5

Ans:

Wired communication	Wireless communication
Wired communication is also known as guided transmission channel.	Wireless communication is also known as unguided transmission channel.
It provides a physical connection between two devices.	It is used for transmitting the signal without any physical media.

Twisted pair cable, coaxial cable and optical fiber are examples.	Microwaves, infrared waves and radio waves are examples.
It is also known as wired communication.	It is also known as wireless communication.
The signal energy propagates through wires in guided media.	The signal energy propagates through the air in unguided media.
It is used for point-to-point communication.	It is generally used for radio broadcasting in all directions.
It is cost-effective.	It is expensive.
For a shorter distance, this is the best option.	For longer distances, this method is used.
By adding more wires, the transmission capacity can be increased in guided media.	It is not possible to obtain additional capacity in unguided media.
Less susceptible to interference	More susceptible to interference.

(e) What is the need of MS-Excel Software ? List any four features of this software. 5

Ans:

MS-Excel is one of the widely used spreadsheet software is MS-Excel. It enables users to format, organize and calculate data in a spreadsheet. Excel allows users to perform various tasks like calculations, data analysis, charting and more within a single platform.

Few features of spreadsheets are:

1. Cells and Grinds: Spreadsheets are made up of cells organized in rows and columns. Each cell can hold data such as numbers, text, or formulas.

2. Formulae and function: Spreadsheets allow users to perform calculations using formulas. Formulas can be simple addition or complex functions involving multiple cells. Spreadsheets come with built-in functions for SUM, AVERAGE and COUNT. These functions can automate data analysis and calculations. There are different categories of functions that can be incorporated in the sheets like Date & Time, Mathematical, Statistical, Logical, Text functions etc.

The different categories of functions are:

 Date and Time: MONTH - Converts a serial number to a month

NOW - Returns the serial number of the current date and time

Math and Statistical:

SUM – Adds its arguments

COUNTIF - Counts the number of cells within a range that meet the given criteria

Logical:

IF - Specifies a logical test to perform

AND - Returns TRUE if all of its arguments are TRUE

3. Charts and Graphs: Spreadsheets have charting and graphing tools that allow users to create visual representations of data such as bar graphs, pie chart etc. Charts and Graphs can be created based on data in the sheets. To create a chart to represent data graphically:

1. Select the data

2. Go to Insert

3. Select the chart type from the options available like Bar, Line, Pie, Scatter etc.

4. The chart will get automatically populated with the selected data on which the chart is to be based.
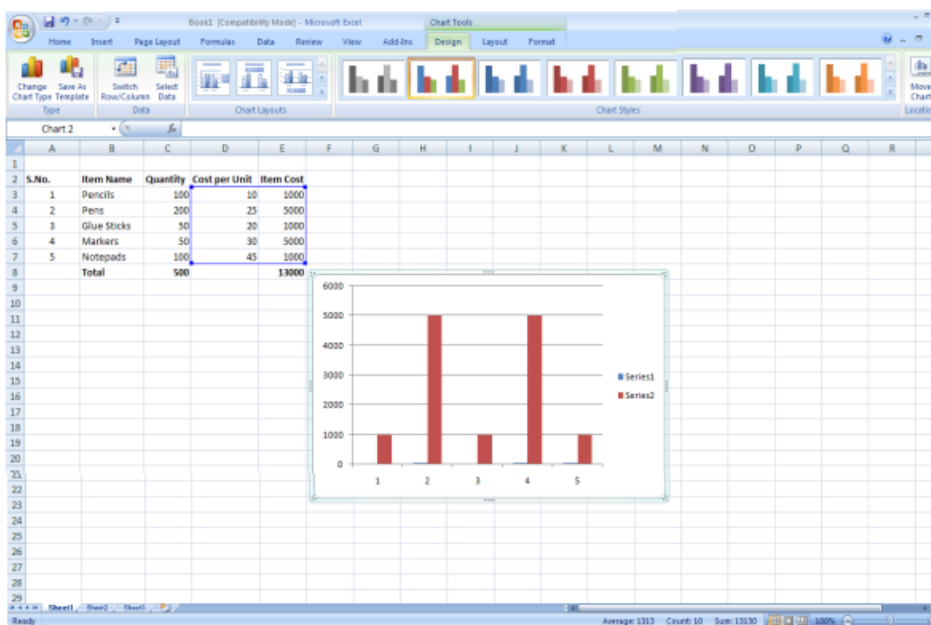
4. Macros

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.

The Macro has to be recorded as follows:

1. Go to the Tools menu, go to —"macro" and then —"Record New Macro"

2. Assign a name to your macro if you'd like, as well as type a short description.

3. You can also assign a keyboard shortcut to it (so you can press a sequence of keys to run the macro).

4. Now click on OK. You'll be returned to Excel.

5. Simply perform the actions you want the macro to do.

6. Once you're done recording your macro, press the Stop button which should now be visible on your screen.

Once the Macro is recorded it can be executed in the following ways:

1. Run a macro by using the menu command

2. By pressing a CTRL combination shortcut key

3. Clicking a toolbar button or an area on an object, graphic, or control

4. Run a macro automatically when the workbook is opened.

(f) What are Network Topologies ? Explain Star and Bus topologies with the help of a diagram. 6

Ans: Network Topology is the study of the arrangement or mapping of the elements (links, nodes, etc.) of a network interconnection between the nodes. It also determines the strategy for physically expanding the network, in future. Topologies can be physical or logical. Physical Topology means the physical design of a network including the devices, location and cable installation. Logical Topology refers to the fact that data transfers in a network as opposed to its design. There are different types of the topologies like bus, ring, tree, mesh etc.

Bus topology:

All of the devices in a bus topology network are linked together by a single cable, which is referred to as a bus and the cable is known as backbone cable. It has a single length of cable with a terminator at each end as shown in the figure.
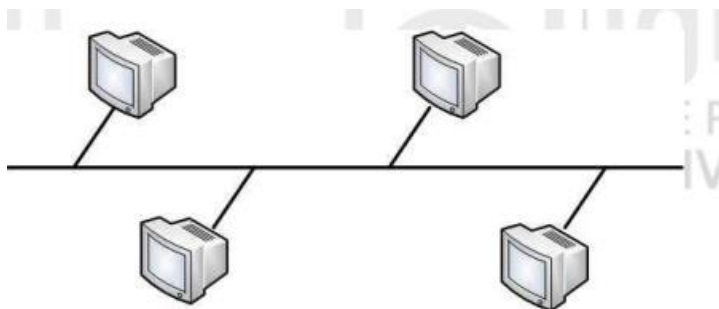
It is a passive topology which means only one computer at a time can send a message. Hence, the number of computers attached to a bus network can significantly affect the speed of the network. A computer must wait until the bus is free before it can transmit. Each node is connected to others

nodes. The network operating system keeps track of a unique address of each node and manages the flow of data between machines.

Advantages of bus topology:

 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.

d) If one computer on the bus fails, it does not affect the rest of the traffic on the bus.

Disadvantages of bus topology:

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.

c) Performance degrades as additional computers are added.

d) Terminators are required at both ends of the cable.

Star topology:

Star topology is a LAN topology in which all the nodes are individually connected to a central connection point called hub (also known as concentrator). When any node wants to transmit data to another node it first transmits data to the hub that re-sends the message either to all the computers or only to the destination computer.

A hub expands one network connection into many. A single hub is sufficient for a small network; however large networks require multiple hubs. But it increases hardware and cabling costs.

Advantages:

a) It is very reliable- if one cable or device 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) It is high-performing as no data collisions can occur.

Disadvantages:

a) It is expensive to install as it requires more cable, it costs more to cable a star network because all network cables must be pulled to one central point, requiring more cable length than other networking topologies.

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.

(g) What are IP Addresses ? Describe the components of an IPv4 Address. 4

Ans:

An IP address is a unique address that identifies a device on the internet or a local network. Every device, computer, printer or peripheral connected to a TCP/IP network must have its own IP address. IP stands for "Internet Protocol", which is the set of rules governing the format of data sent via the internet or local network.

To have uniform addressing for computers over the Internet, IP defines an IP address, which is a logical address. IP address is a 32 bits number, can be represented in decimal e.g., 192.168.32.10.

IPV4 is short for Internet Protocol version 4. An IPV4 address is a 32-bit address that identifies a device on a network. It is made of 4 groups of numbers(octets) with upto 3 numbers each separated by dots. The four numbers ranges between 0 and 255. The IPV4 will identify the network and the individual host on the network.

Eg: 185.107.80.231

Some addresses of IPv4 are not used at all due to certain restrictions. In addition, some addresses are reserved, for example; the IP address 255.255.255.255 is used for broadcasts.

Each 32 bit IP address consists of two components:

* Network Identifier (Net ID) – which identifies one of the Networks that is a part of Internet. A Net ID may be of 8 to 24 bits long. It is also known as network bits.

* Device Identifier (Device ID) – which identifies a specific device within the identified Net-ID. It is also known as host bits.

A Net ID may be of 8 to 24 bits long. By using a subnet mask in combination with their own IP address, you can determine the destination address of the devices is remote or local. For example, consider the IP address 192.168.1.35, having 24 bits Net ID. The remaining 8 bits of this address specifies the device ID. The subnet mask for this network should be 255.255.255.0. This subnet mask is used to identify the IP address of the network.

2.

(a) List the key features of the technologies used in the five generations of computer evolution. 5

Ans: s. This period, during which the evolution of computer took place, can be divided into five distinct phases known as Generations of Computers. These Generations are:

- First Generation Computers (1940-1956)
- Second Generation Computers (1956-1963)

- Third Generation Computers (1964-1971)
- Fourth Generation Computers (1971-Present)
- Fifth Generation Computers (Present and Beyond)

First Generation Computers:

First generation computers are characterized by the use of vacuum tube. A vacuum tube was a fragile glass device, which used filaments as a source of electronics. It could control and amplify electronic signals. These vacuum tubes were used for calculation as well as storage and control.

Second Generation Computers: Second generation computers are characterized by the use of transistors. Transistor is a device composed of semiconductor material that amplifies a signal or opens or closes a circuit. Invented in Bell Labs, transistors have become the key ingredient of all digital circuits, including computers. Transistor replaced the bulky electric tubes in the first-generation computer. Transistors perform the same functions as a vacuum tube, except that electrons move through solid materials instead of through a vacuum. Transistors were made of a semiconducting material and controlled the flow of electricity through the circuit. They also allowed computers to become smaller and more powerful and faster at the same time. They are also less expensive, required less electricity and emitted less heat than vacuum tubes. Manufacturing cost was also very low.

Third Generation Computers : Third generation computers are characterized by the use of integrated circuits (ICs). Transistors were miniaturized and placed on silicon chips, called semiconductors, which drastically increased the speed and efficiency of computers. They used Integrated Circuits (ICs). These ICs are popularly known as chips. A single IC, has many transistors, registers and capacitors built on a single thin slice of silicon. The use of ICs in computers made them faster and helped reduce the size of computers in comparison with second generation computers. The use of ICs also enhances the performance of the computer.

Fourth Generation Computers : Fourth generation computers are characterized by the use of microprocessor. Fourth generation computers started around 1971 by using large scale of integration (LSI) in the construction of computing elements. LSI circuits built on a single silicon chip called microprocessors. A microprocessor contains all the circuits required to perform arithmetic, logic and control functions on a single chip. Because of microprocessors, the fourth generation includes more data processing capacity than equivalent-sized third generation computers. Due to the development of microprocessor, it is possible to place computer's central processing unit (CPU) on single chip. Its heat generated is negligible and required less maintenance.

Fifth Generation Computers: Fifth generation computers are based on Artificial Intelligence. Artificial Intelligence is the branch of computer science concerned with making computers behave like humans and allow the computer to take its own decision. In this generation, VLSI technology was replaced by ULSI (Ultra Large Scale Integration). The use of AI, which helps to make computers more powerful. AI technology made these computers to understand human language as well as recognize graphs and pictures.

(b) What is Data Communication ? Draw and explain various components of a simple data communication system. 7

Ans: Data communication is the process of transferring data from one place to another or between two locations. It allows electronic and digital data to move between two networks. The most important factors affecting the transfer of a signal over a medium are noise and attenuation. Noise is the external disturbances whereas attenuation is defined as degeneration of the signal. It is a process in which more than one computer transfers information, instructions to each other and for sharing resources.

Various components of a communication system are:

1. Source
2. Encoder
3. Channel
4. Decoder
5. Destination

Source: Source produces a message or sequence of messages to be communicated to the receiver. The source output may be in many different forms such as a waveform, a sequence of binary digits, and a set of output from sensors in a space probe, or many other similar forms. The node can be a computer, mobile device, telephone, laptop, video camera, workstation, etc..

An Encoder: Encoder represents any processing of the source messages/ signals prior to transmission. The processing might include, for example, any combination of modulation, data reduction and insertion of redundancy to combat the channel noise.

Channel: Channel is the medium for transmitting signals from transmitter to receiver.It acts as a bridge between sender and receiver. The transmission is the physical path from the sender to the recipient where the information or message passes. It may be a telephone line, a high frequency radio link, a space communication link or a storage medium. A channel is usually subject to various types of noise disturbances, which on telephone line, for example, might take the form of a time-varying frequency response, crosstalk from other lines, thermal noise, and impulsive switching noise. A channel subject to noise is called noisy channel. An error-correcting code corrects errors due to noise. The examples of transmission medium are twisted pair cable, fibre optic cable, radio waves, microwaves, etc. The transmission medium could be guided (with wires) or unguided (without wires).

The Decoder: A decoder represents the processing of a channel output received from the channel to produce an accepted replica of the input at the destination.

The Destination: Destination is the receiver. It may be the person or object for whom the message is intended. The receiver is in the form of a computer, cell phone, workstation, etc., identical to the sender.

(c) What are cookies ? Are they dangerous for your system ? List some tips to avoid cookies. 5

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. Web browsers store the cookies they receive for a predetermined period of time, or for the length of a user's session on a website. They attach the relevant cookies to any future requests the user makes of the web server. The cookie is used to send information back to the Web Server each time the browser requests a page from the server.

For example, a website may ask you to fill up a form with the information about your name and interests. This information is packaged by the server into a cookie and sent to your Web browser which stores it for later use. The next time, you go to the same Website, your browser will send the stored cookie to the Web server along with the request for a web page. This way, server will be able to remember you and send you only that information that you had desired earlier.

Are they dangerous for your system?

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 and they 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.

Tips to avoid cookies :

 * Do not click all the links without considering the risks of your actions. Some web page addresses may be disguised and may be very close to address of a site you want to visit but they may take you to an unexpected site.

* You must use the latest versions of browsers and please do not configure them to have decreased security.

 * Do not download or install plug-in from the unknown party such tendencies may put your computer to additional risk.

* Do not visit unsolicited websites, those add to your computer vulnerabilities.

* Third-party software may not have a mechanism for receiving security updates.

* Do not login to a critical application if it does not have https://.

(d) Write a short note on Proxy Servers. 3

Ans: Proxy server is a server which acts as an intermediary between the client application and the Web server. Proxy server is used in a computer network. 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.

Suppose two users access the web through proxy server. If user X requests a webpage, say page 1. Sometime later if user Y requests the same page then this request will not forwarded to the web server. Proxy server simply returns the same page which it has access for user X, thus saving lot of time.
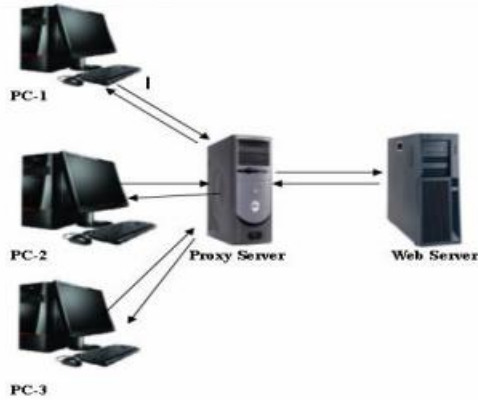
3.

(a) What is seek time ? How is it different from latency time ? 5

Ans: Seek time :

The time required to position the read/write head over proper track is called the seek time. 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. For a fixed-head system, it is always 0 because there is a head for each track and no head movement is required for accessing a particular track.

Difference between seek time and latency time:

The time required to position the read/write head over proper track is called the seek time. Whereas, latency time is the time required to bring the needed data (i.e. starting position of the addressed sector) under the read/write head is called the latency time. Seek time varies depending on the position of the arm assembly when a read/write command is received. On the other hand, latency time depends on the Distance of the desired data from the initial position of the head on the specified track and Rotational speed of the disk. Seek time relates to the physical movement of the read/write head. In contrast, latency time relates to the time it takes for the disk to spin to the right position.

(b) Describe the storage organization of a Hard Disk Drive with the help of a diagram. 8

Storage organization in HDD:

HDD contains magnetic disks, access arms and read/write heads into a sealed, air filtered enclosure. This technique is known as Winchester technique. Thus Winchester disk is a sealed

"hard disk" having rotation speed typically 7200 rpm. A disk has 5000 to 10,000 concentric tracks per centimeter and about 100,000 bits per centimeter around circumference.
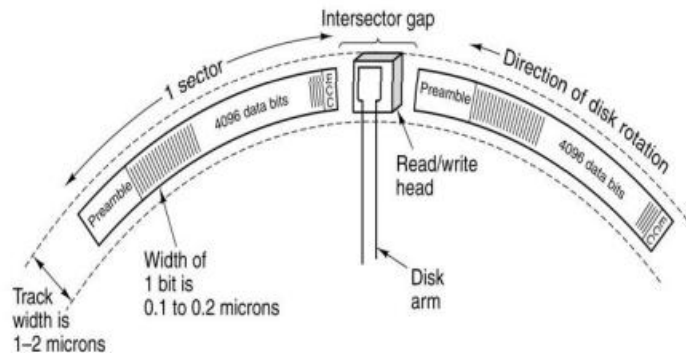
The read/write head reads data from the disk and writes data to the disk. A disk is mounted (or stacked) on the disk drive, which has the motor that rotates it. Hard disks together with read/write heads, access mechanism and driving motor constitute a unit called hard-disk-drive (HDD) unit. The whole unit is fixed.

Hard disk is also known as platter. It cannot be removed or inserted into a HDD unit. Some disks have a single platter e.g. floppy disk. To increase the storage capacity several hard-disks (platters) are mounted (stacked) vertically, normally at a distance of an inch. This is known as disk pack or multi-platter configuration.

A set of corresponding tracks in all surfaces of a disk pack (i.e. the tracks with the same diameter on the various surfaces) is called a cylinder. Cylinder is very important because data stored on the same cylinder can be retrieved much faster than if it were distributed among different cylinders.

Surface 0

Read/write hea

(One per surface)
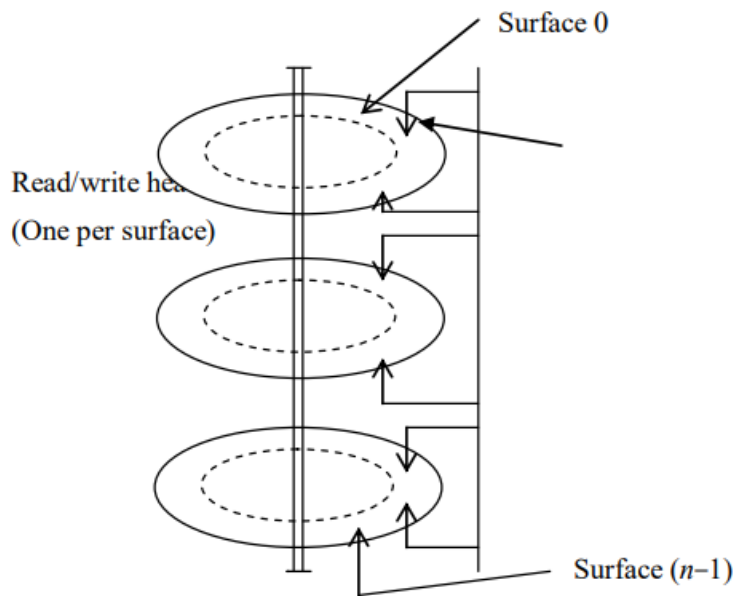
Surface (n–1)

A disk having n platters (0 to n-1 plates). A set of corresponding tracks on all the (n-1) Surfaces, at a given radial distance, is called a cylinder.

(c) What is Open Source Software ? Explain the main features of the Open Source Development Model. 7

Ans: Open Source Software is a computer software which is available along with the source code and software license that permits the code to be studied, modified and improved. It is often developed in public and collaborative manner. Open source development, follows the model of the bazaar. In an open source development model, roles are not clearly defined. The best features and functionality evolve into popular use much as good ideas evolve into popular use in the marketplace of ideas. Development is a collaborative process, resources are not scarce, and no one person or organization directs the project. The users are treated like co-developers and so they should have access to the source code of the software.

There are two competing definitions.

The Free software definition is based on the following four freedoms:

1. The freedom to run the program, for any purpose.

2. The freedom to study how the program works, and adapt it to your needs.

3. The freedom to redistribute copies so you can help your neighbor.

4. The freedom to improve the program, and release your improvements to the public, so that the whole community benefits.

The other definition is the Open source definition promulgated by OSI. This broader definition includes permissive software licenses.

The elements are:

• Free redistribution

• Source code available

• Derivative works permitted

• Integrity of the author's source

• No discrimination against persons or groups

• No discrimination against fields of endeavor

• Distribution of license with derivative works

• License must not be specific to a product

• License must not restrict use of other software

• License must be Technological-natural

Features of open source development model are:

* Users should be treated as co-developers. The users are treated like co-developers and so they should have access to the source code of the software.

* Early releases The first version of the software should be released as early as possible so as to increase one's chances of finding co-developers early.

* High modularization: The general structure of the software should be modular allowing for parallel development on independent components.

* Several versions: There should be at least two versions of the software. There should be a buggier version with more features and a more stable version with fewer features. The buggy version (also called the development version) is for users who want the immediate use of the latest features and are willing to accept the risk of using code that is not yet thoroughly tested. The users can then act as co-developers, reporting bugs and providing bug fixes.

* Dynamic decision making structure There is a need for a decision making structure, whether formal or informal, that makes strategic decisions depending on changing user requirements and other factors.

4.

(a) Differentiate between CRT, LCD and LED monitors. 6

Ans:

CRT Monitors	LCD Monitors	LED Monitors
CRT stands for Cathode Ray Tube.	LCD stands for Liquid Crystal Displays.	LED stands for Light Emitting Diodes.
CRT monitor produces an image by using an electron beam.	LCD monitor produces an image on the screen using liquid crystal display.	LED monitor uses a series of small light emitting diode to produce an image on the screen.
CRT monitors produce poor quality images.	Images produced by these monitors are of better quality than that of CRT monitors.	LED monitors produce images of high quality as compared to CRT monitors.
These older monitors are bulky and require a lot of space for installation.	These are light weight monitors.	LED is light weight monitors and compact in size.
CRT monitors produce more heat while operating.	LCD monitors emit less radiation than CRT monitors.	LED monitors produce less heat than CRT monitors.
They consume more electric power.	It consumes less electricity than CRT monitors.	LED monitors consume very less electricity when compared to CRT monitors and more electric power than LCD monitors.
Image flickering is there in CRT monitors.	Image flickering is not there in LCD monitors.	LED monitors have flicker free screen.
The cost of CRT monitor is less than LCD monitor.	LCD monitors are costly than CRT monitors.	LED monitors are more expensive due to newer technology.

(b) What is Client/Server Architecture ? Explain the three-tier client/server architectures with the help of a diagram. 7

Ans: Client-Server Architecture is a computing model where tasks are divided between clients and servers. The need to share the processing demands between the host server and the client workstation is increased because of the improved capacity and power of personal computers.

In client/server architecture, the tasks or workloads are divided into:

* server programs-server programs are providers of a resource or service. They respond to client requests, process data and send back the results.

* client programs- client programs are requester of a resource or service. They initiate communication with servers to access data, files or perform tasks.

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. Client-server architecture enables efficient sharing of resources and centralized management of data and applications.

The client/ server system may be two-tiered, three-tiered or n-tiered.

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. In three-tier architecture, the application logic or process lives in the middle-tier, it is separated from the data and the user interface.

The separation of the application into three distinct layers enhances the organization, scalability and maintainability of applications.
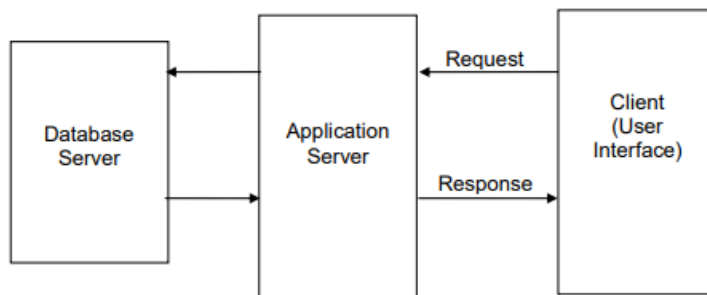
Three tier client server architecture

The three tiers are:

Client tier: This is the top layer where user interacts with the application. It is also known as presentation layer. This layer consists of the user interface that allows users to input data and receive output.

Application tier: This is the middle layer where the application logic or process resides. This tier receives the requests from the client tier, processes the data and sends the result back to the client tier.

Data tier: This is the lowest layer where the data is stored and managed.

One of the advantages of 3-tier client server architecture is that, each layer can be developed, updated and maintained independently. This helps in faster development of the application.

An important disadvantage of 3-tier client server architecture is that, lacks some critical features such as reusability of application logic code and scalability.

(c) Describe the OSI reference model with the help of a diagram. 7

Ans: OSI stands for Open Systems Interconnection. It was developed by ISO (International Organization for Standardization) in 1984. 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 specify how the different parties may communicate. It is a seven-layer architecture with each layer having specific functionality to perform. All these 7 layers work together to transmit data from one person to another across the globe. It is also referred to as the OSI Seven Layer Model.

A layer is a collection of conceptually similar functions that provide services to the layer above it and receives service from the layer below it. On each layer an instance provides services to the instances at the layer above and requests service from the layer below

The following are the layers of OSI model:
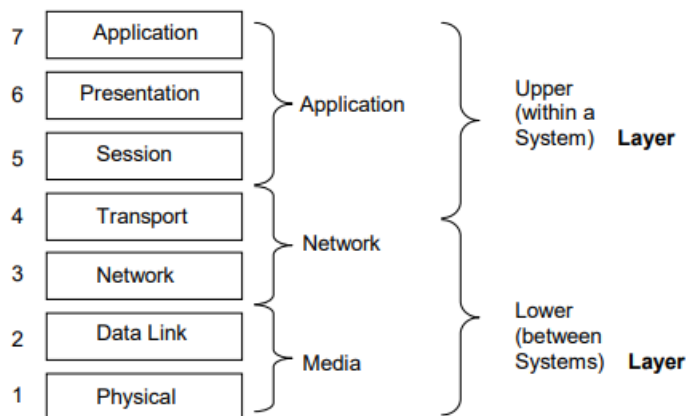
The OSI model is divided into two layers: upper layers and lower layers.

The upper layer of the OSI model mainly deals with the application related issues, and they are implemented only in the software. The application layer is closest to the end user. Both the end user and the application layer interact with the software applications.

The lower layer of the OSI model deals with the data transport issues. The data link layer and the physical layer are implemented in hardware and software. The physical layer is the lowest layer of the OSI model and is closest to the physical medium. The physical layer is mainly responsible for placing the information on the physical medium.

In its most basic form, it divides network architecture into seven layers which from top to bottom are the Application, Presentation, Session, Transport, Network, Data Link, and Physical Layers. In transmission side data flows from layer 7 to layer 1, then to cabling or suitable medium. When data reaches the reception side, it flows from layer 1 to layer 7.

Application Layer: It is the top-most layer of the OSI reference model. 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. This layer is responsible for the establishment of connection, maintenance of sessions, and authentication and ensures security.

Transport Layer: The transport layer provides services to the application layer and takes services from the network layer. This layer converts data into segments and reassembles the data stream. TCP and UDP are the protocols used in this layer. In this layer, data is converted into so called segments. It is responsible for the end-to-end delivery of the complete message. The transport layer also provides the acknowledgement of the successful data transmission and re-transmits the data if an error is found.

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. The data link layer is responsible for the node-to-node delivery of the message. The main function of this layer is to make sure data transfer is error-free from one node to another, over the physical layer. It adds source and destination address to packets and convert them into frames. This is the layer that provides error free transmission.

Physical Layer: The lowest layer of the OSI reference model is the physical layer. This layer provides the functional requirements for activating a physical link. In this layer, data is carried from one device to another.

5.

(a) Why does software need licence ? Explain the evolution of software licencing and the different types of software licences. 9

Ans:

Need for software licences :

It prevents the exploitation of the code. If no licence is provided then the restrictions come from copyright law which varies from place to place. It is a legal agreement that defines the terms of usage and provides the right to one or more copies of software to end users.

Evolution of software licence:

Ans: Until early 1970's, sharing of software was the accepted norm. In late 1960's, the situation changed after the software cost increased and manufacturers started to unbundle the software and hardware. Copyright was used by companies to impose restrictions on programmers.

Software licensing governs the usage and redistribution of software. Software licensing is the underlying technology and process that enables software suppliers and device manufacturers to monetize and protect their products and services. A software license establishes rules of used and outlines any restrictions that may apply.

Types of software licenses :

Types of software licensing:

The licensing type generally depends on whether the software is open source software, is meant for individual use or enterprise wide commercial use:

Individual license: allows you to install the software only on a single stand alone machine. It may be a perpetual license or Subscription based. Perpetual license allows you to install and use the software indefinitely. Subscription based license allows you to use the license for the specified time, after which you may renew the subscription or remove the software.

Open Source License: It grants you the right to freely modify and redistribute the software.

Commercial License: These are mostly for the large enterprises that use software for commercial purposes.

(b) What are perverse software ? Explain any four perverse software and how can users counter and control such software in their systems. 6

Ans: 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. It is a type of software that is designed to secretly access a computer system, without the owner's consent, and damage the system. The impact can be as damaging as shutting down a business, pulling down computer network or significantly impacting regular use of individual computer systems etc. The damage done can vary from something as little as changing the author's name in a document to full control of one's machine without the ability to easily find out. 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. The impact can be as damaging as shutting down a business, pulling down computer network or significantly impacting regular use of individual computer systems etc. The damage done can vary from something as little as changing the author's name in a document to full control of one's machine without the ability to easily find out. These are destructive software meant for damaging the data or applications by some antisocial elements and enter in the system without the consent of the owner. Malware can harm the system badly by damaging the useful data and application software, even it does not spare the operating system of the computer.

Early infectious programs, such as Internet Worm and MS DOS viruses, were written as experiments and were largely harmless or at most annoying. With the spread of broadband Internet access, malicious software has been designed for a profit, for forced advertising. Here the malware keeps track of user's web browsing, and pushes related advertisements.

Typical types of malicious software are - Computer virus, Computer Worm, Trojan horse, Rootkits, Spyware etc.

Computer Virus: It is a small software program that is designed to enter a computer without users permission or knowledge, to interfere with computer operation and to spread from one computer to another. A computer virus needs to attach itself to a document or program to infect other computers or programs. There are various types of computer virus that can be classified by their origins, techniques of attack, modes of spreading, forms of infections, hiding locations and the kind of damage caused. Examples of computer viruses are: Randex, Melissa.A and Trj.Reboot.

Computer Worm: Computer Worm is a program that is very similar to a virus. It has ability to self replicate. It actively spreads itself over the network, copies itself from one disk drive to another or copies using email. It does not need user action to start it unlike virus. Examples of worms include: PSWBugbear.B, Lovgate.F, Trile.C, Sobig.D, Mapson.

Data-stealing This is a web threat that results in stealing of personal and proprietary information to be used for commercial gains either directly or via underground distribution. Some popular examples of recent data-stealing cases are – steal and sell large number of credit card numbers from businesses such as TJX, OfficeMax, Sports Authority etc.

Keystroke loggers: This is a program, once installed on the system, which intercepts the keys when entering the password or the Credit Card number while shopping online. This can be used for Credit Card fraud.

4 ways to counter perverse software are :

* Ensure that the operating system and any program one uses are up to date with updates. * Block unwanted email viruses by installing a spam filter and spam blocker.

* When browsing the internet, always watch what one clicks and installs. Do not simply click OK to dismiss pop-up windows.

* Install anti-virus software; scan and update regularly. It can, in most cases, remove and prevent viruses, worms, trojans, and (depending on the software) some spyware.

* Install anti-spyware/anti-adware; scan and update regularly. It will remove and (depending on the software) prevent future adware and spyware.

(c) What are collaboration tools and why are they needed ? Describe any two web based collaboration tools. 5

Ans: Collaboration is defined as an act or process of working together on a project or some intellectual activity. Collaboration involves both communication and sharing of ideas. Some of the important areas where collaboration is useful are physical science, high-energy physics, Health Science, environmental studies etc.

Most of the tools used on the internet can be used for some form of collaboration. For example, google docs is one such tool that may enable you to create a collaborative project report online. One can create a document using it and share it with your colleagues who in turn may be able to add content to it from anywhere, edit it and discuss about it using a discussion group.

Need for collaboration tools :

- Collaboration tools facilitate clear and efficient communication among team members, reducing misunderstandings and improving collaboration.
- 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.
- Collaboration tools allow teams to connect and collaborate from different locations, maintaining productivity regardless of physical distance.

Two web-based collaboration tools :

Zoho: Zoho is a division of ZOHO Corporation, a US-based Software Company. Zoho is a very good site for collaboration. It not only allows simple mundane tasks like group editing, document sharing, group chat, etc. but also provides some management tasks like milestone tracking, invoice creation, and other team tasks.

Volunteer Computing: Volunteer computing is a type of distributed computing in which computer owners can donate their spare computing resources (processing power, storage and Internet connection) to one or more research projects. It offers a cost-effective and scalable solution for computation resources. Volunteer computing can provide researchers with computing power that is not achievable any other way. A CPU generally uses more electricity when it is active compared to when it is idle. In order to participate by the PC may be left on overnight. If the computer cannot cool itself, the added load on the volunteer's CPU can cause it to overheat. If the volunteer computing application runs while the computer is in use, it may impact performance of the PC. This is due to increased usage of the CPU, CPU cache, local storage, and network connection.