BCS-011 : COMPU TER BASICS AND PC SOFTWARE

June 2018

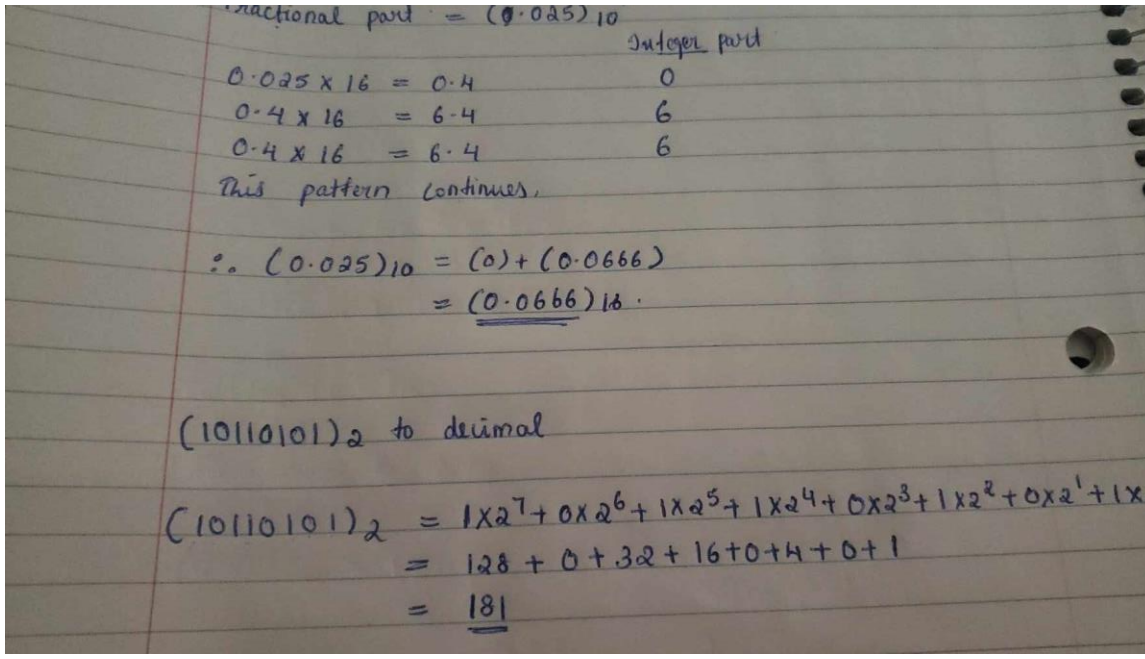
1.

(a) Convert the following binary numbers to equivalent decimal and hexadecimal numbers : 4

(i) (1011 0101) 2 (ii) (0010 1110)2

(i)

Ans:



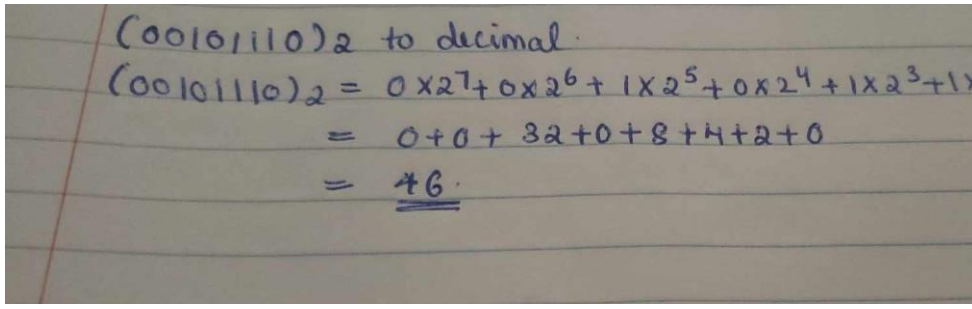
(10110101)2 to hexadecimal

10110101 = 1011 0101

B 5

(10110101) = B5

(ii)



(00101110) 2 = 0010 1110

2 E

(00101110)2= (2E)16

(b) Explain static RAM and dynamic RAM. How are they different from each other ? 5

Ans:

Static RAM: It is a form of a semiconductor. It is widely used in microprocessors, general computing applications and electronic devices. SRAM is volatile in nature. Static RAMs retain stored information only as long as the power supply is on. SRAM is comprised of flip flops. It consists of 6 transistors. SRAM is called static as refreshing is not needed to keep the data intact. It is used in cache memories.

Dynamic RAM : DRAM is non volatile in nature. It stores information as long as the power is supplied or a few milliseconds when the power is switched off. Dynamic RAMs required fewer transistors per memory cell. DRAM is called dynamic as refreshing is needed to keep the data intact. It is used in main memory.

Static RAM vs Dynamic RAM:

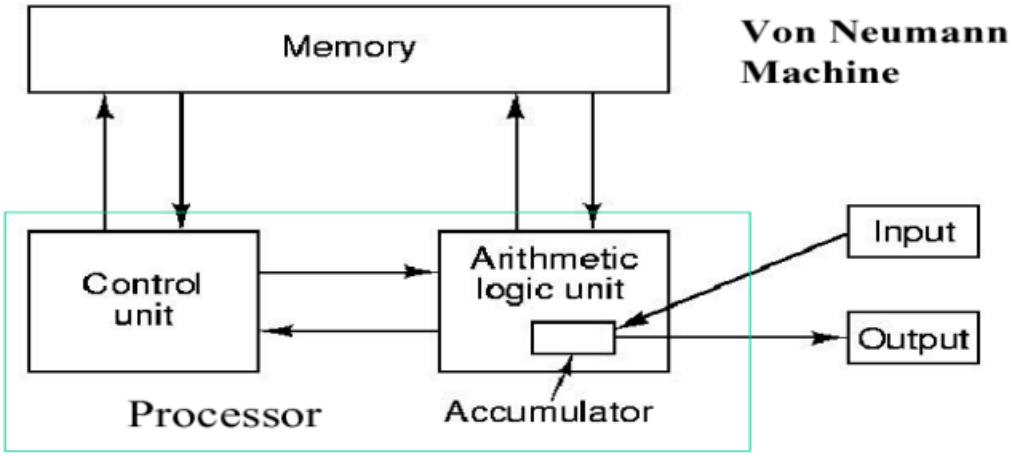
Static RAM	Dynamic RAM
Static RAMs retain stored information only as long as the power supply is on.	It stores information as long as the power is supplied or a few milliseconds when the power is switched off.
Six (6) transistors are needed per memory cell in a static RAM.	Dynamic RAMs required fewer transistors per memory cell.
These are expensive.	These are cheaper.
Consumes less power.	Consumes more power.
SRAM is faster compared to DRAM.	DRAM is slower when compared to SRAM.
These are used in cache memory.	These are used in main memory.
SRAM does not need to be refreshed.	DRAM requires the data to be refreshed periodically in order to retain the data.

(c) Explain the concept of von Neumann architecture with the help of a diagram. 5

Ans: Von- Neuman architecture:

Von-Neuman architecture was first conceived by John von Neumann in 1945. It is based on the stored-program concept, where instruction and data both are stored in the memory. 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.

Based on Von Neumann Architecture, the basic components of a computer are : memory, an I/O system, arithmetic logic unit (ALU) and control unit (CU).



Memory: It is an important component of a computer where all the data and information are stored in the form of binary digits. 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. Two major types of memories are used in computer systems:

1. RAM (Random Access Memory)
2. ROM (Read Only Memory)

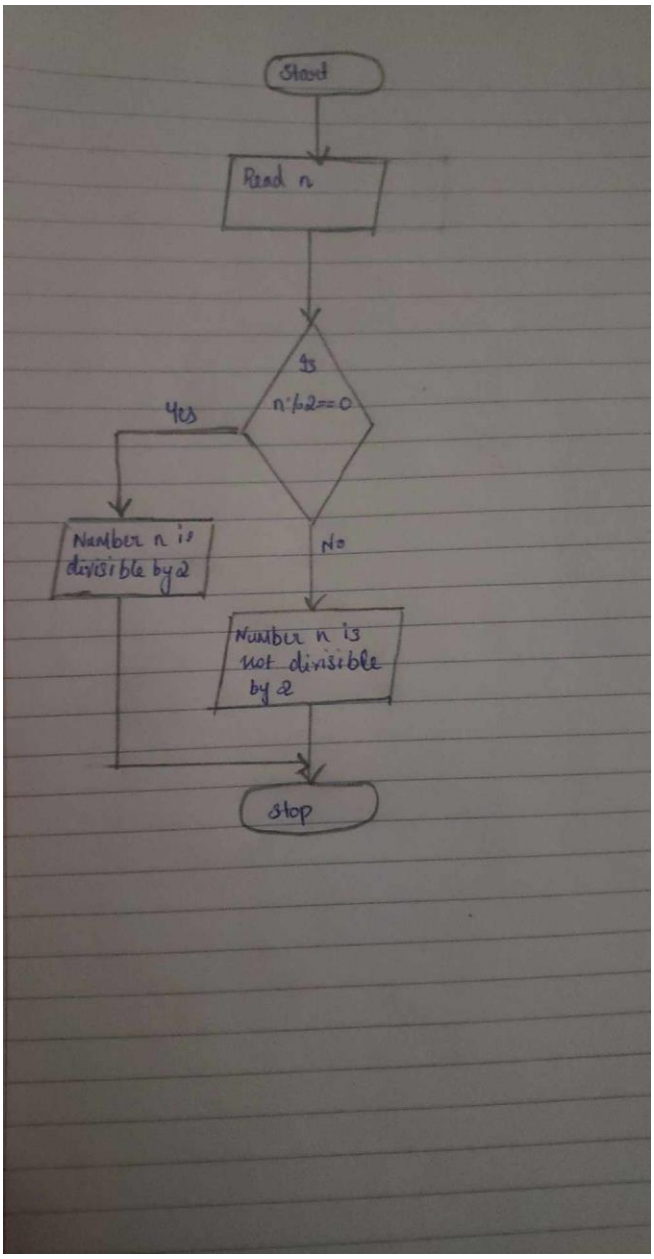
I/o system: Under the control of CPU input instructions, the program or the data is read into the main memory from the secondary storage or the input device. The data from a computer is output using output devices. If some results are evaluated by the computer and it is stored in the computer, then with the help of output devices, we can present them to the user.

Arithmetic Logic Unit (ALU): The ALU is an important component which carry the actual extension of the instructions. The processing of the data and instruction are performed by the ALU. The Arithmetic and Logic Unit performs the required micro-operations for executing the instructions. ALU allows arithmetic (add, subtract, divide, multiply) and logical operations (AND, OR, NOT etc.) operations to be carried out.

Control Unit: The control unit controls the operation of the computer's ALU, memory and input/output devices. The control unit consists of a program counter that contains the address of the instructions to be fetched and an instruction register into which instructions are fetched from memory for execution. It also provides the timing and control signals required by other computer components. The control unit determines the sequence in which computer programs and instructions are executed.

(d) Draw the flow chart to find if a given number is divisible by 2 or not. 6

Ans:

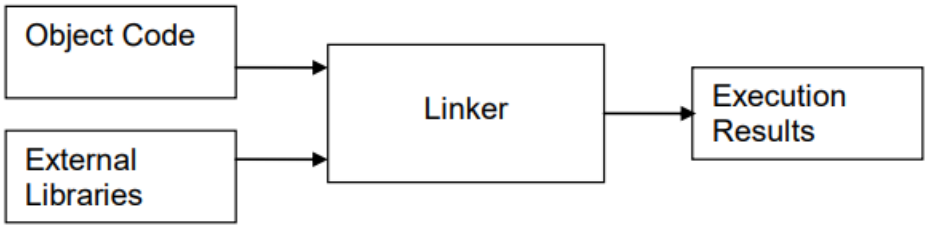


(e) Explain the role of a linker and text editor software. 4

Ans: Linkers: A linker is a program that takes one or more Object file codes generated by a compiler and combine them into a single executable program. Linker is a program in a system which helps to link object modules of a program into a single object file. Linkers are also called as link editors.

When large software, involving many programmers is to be developed, then the modular approach is adapted. The software is divided into functional modules and separate source programs are written for each module. Each of these source files can then be compiled independent of each

other to create a corresponding object file. Eventually, linker is used to combine all the object files and convert them into a final executable program.



Linker

Editors: Editors are also known as text editors. Editors are software programs that enable the user to create and edit text files. To write a program in any of the programming languages requires an editor. While saving the program, filename and extension as per programming language is required to be given e.g in C programming language f1.c, in C++ f1.cpp or f1.C, in Java f1.java etc. The extension may also depend on the conventions of the operating system used, for instance, in unix the extension for a C++ program is .C while for Windows it would be .cpp. There are different types of editors. Some of the programming languages have some specific built in editors. Some types of editors are : line editor, stream editors, screen editors.

f) Explain the purpose of timesheet management in the context of project management software. 3

Ans: A good timesheet management system is essential both for the customer projects as well as internal activities within the organization. Timesheets not only help the Project Manager in managing the project in a better manner but is also useful for maintaining employee records for payroll calculations as well as helps in improving the overall productivity of the organization.

A timesheet is a record of the number of hours an employee spends in completing a certain task. This task could be associated with a customer project or with internal business activities. The timesheet not only provides the number of actual hours that the employee may have spend on the task but also mentions details of the task involved and the kind of operations that the task involved completing. Another benefit of a good timesheet management system is that it can help management track the efficiency of employees and find ways in which they can improve the productivity in various areas.

Timesheet management systems can also help employees evaluate their own performances and understand how they can perform their tasks better.

(g) Define the term Search Engine in the context of Internet. Explain spidering and indexing actions performed by a search engine. 5

Ans: A search engine can be defined as a tool to search diverse and disorganized sources of information available on the Internet. It is a software program that helps people find the

information they are looking for online using keywords or phrases. Search engines have some automated programs that need to continuously keep visiting the web pages about the content they have and organize the information about web pages in some format. These programs are called spiders, robots, crawlers, wanderers and worms. Search engines finds, classifies and stores information about the contents of various websites on the Internet.

Search engines are very useful to find information about anything quickly and easily. Using more keywords or different keywords improves the results of searches.

Spidering: Spidering is also known as web crawling. Spider or Web crawler is a computer program that browses the web pages of WWW in a systematic, automated manner. They may do this every few days, so it is possible for content to be out-of-date until they crawl your website again. Search Engines use spider for getting up-to-date data on web sites. They are used to create a copy of the pages visited by them for later processing to create Index. These programs are also useful in validating HTML code to a particular standard like XHTML or checking or validating the hyperlinks.

Indexing: Once, the spiders have completed the task of finding information about Web pages, the search engine must store the information in such a way that you are able to use it. The search engine may provide some information relating to relevance of information may be in the form of Ranking. The search engine will try to understand and categorize the content on a web page through keywords. Thus, a search engine may store the keywords of a web page, the number of times that word appeared on the page, the URL of the page. A weighting factor that gives more weightage in case a word is found at the top of the document. Each commercial search engine uses a different formula for assigning weight to the keywords in its index. This is one of the reasons that a search for the same word on different search engines will produce different results. Since the data that is to be stored for indexing is large, therefore, search engine may encode it. The Index is created with the sole purpose, that is, it allows you to find information on the Internet quickly. In general, Index uses hashing.

(h) Explain the uses of radio waves and micro-waves for data transmission. 4

Ans: Uses of radio waves transmission: Radio waves are easy to generate and can travel long distances and can penetrate buildings easily, therefore widely used for communication. Radio signals have been used for a long time to transmit analog information. They are particularly attractive for long distance communication over difficult terrain or across the oceans, where the cost of installing cables can be too prohibitive. Radio waves have the highest wavelength among all electromagnetic waves and they can easily penetrate the atmosphere and over difficult terrain or across the oceans.

An increasingly-popular form of radio is cellular radio, which is currently being used by carriers for providing mobile telephone networks. These operate in the VHF (Very High Frequency) band and subdivide their coverage area into conceptual cells, where each cell represents a limited area which is served by a low-power transmitter and receiver station.

Radio waves are very useful in multicasting and hence used in AM and FM radios, cordless phones and paging. Multicast is when a source transmits a signal for some specific group of destinations which may be more than one.

Bluetooth is a very popular application of short wave length radio transmission in the frequency band of 2400 to 2480 MHz. It is a proprietary wireless technology standard used for exchanging data over short distances in mobile phones and other related devices.

Uses of micro waves transmission: Microwave is by far the most widely used form of radio transmission. Telecommunication carriers and TV stations are the primary users of microwave transmission. An important form of microwave system is a satellite system, which is essentially a microwave system plus a large repeater in the sky. The signals transmitted by earth stations are received, amplified, and retransmitted to other earth stations by the satellite. Like other microwave systems, the bandwidth is subdivided into channels of 10s of MHz each, providing data rates in order of 100s of mbps. Because of their high bandwidths, satellites are capable of supporting an enormous number and variety of channels, including TV, telephone, and data.

(i) Explain the purpose of any four folders used in an email account. 4

Ans: An email account has the following folders:

I) Inbox: Inbox is the main folder in your email account. It contains all the e-mails that have arrived in your e-mail account. You can click on inbox to see the mails that you have not read (shown in bold) as well as the mails that you have already read (in normal font).

II) Sent Mail: It shows all the e-mails sent by you from your e-mail account

III) Drafts: This folder stores those messages that you have created but have not been sent by you so far. These messages are saved by you for more work.

IV) Spam: Spam is unsolicited e-mails or junk mails. It is generally e-mail advertising sent to groups of people. Spam can also be termed as unwanted e-mails. Spam mail is also a big cause of computer viruses. Spam mails are identified by the mail services and placed in this folder. These spam mails are automatically deleted after a few days.

V) Trash: Deleted mail is put in the Trash folder. Trash folder allows you to get back an e-mail which has been deleted within a few days of deletion. After a few days, the mail is permanently deleted from the trash folder.

2.

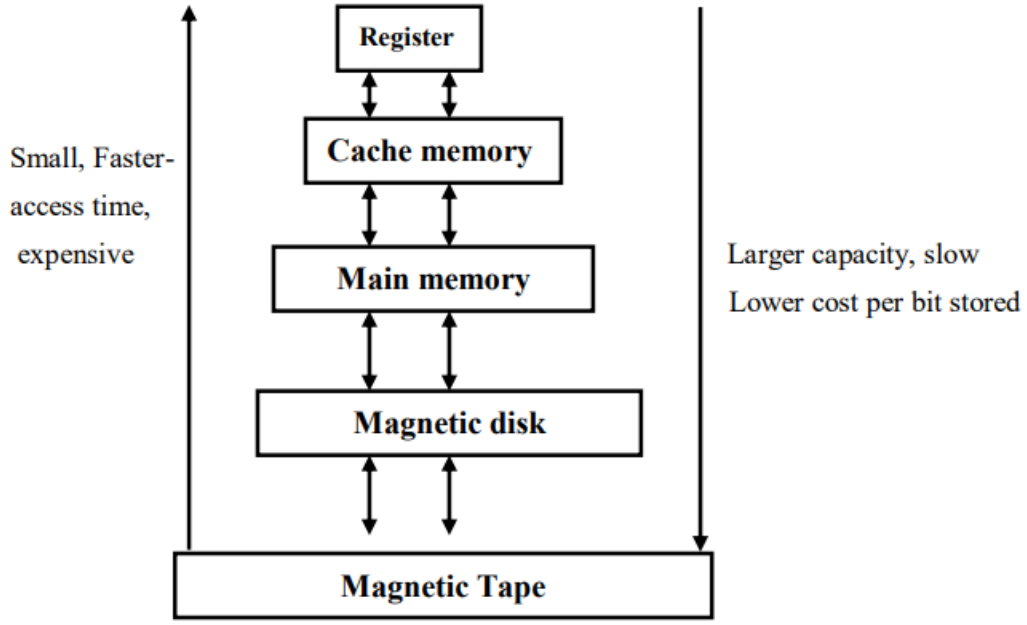
(a) Explain the need of memory hierarchy with the help of an example. Explain the advantages and disadvantages of using CD-ROM as a secondary storage device.

Ans:

Most computer systems make use of a hierarchy of memory technologies, this hierarchy is known as the memory hierarchy. Memory hierarchy helps in organizing the memory in a way that it can minimize the access time. The memory hierarchy in OS is an essential concept in computer science.

The overall goal of Memory Hierarchy is to obtain the highest possible access speed while minimizing the total cost of the memory system.

A computer system uses a variety of devices for storing the instructions and data. A storage devices (or units) may vary according to the access time, storage capacity, and cost-per-bit of storage. CPU registers hold the most frequently used data. Small, fast cache memories nearby the CPU act as staging areas for a subset of the data and instructions stored in the relatively slow main memory. The main memory stages data stored on large, slow disks, which in turn often serve as staging areas for data stored on the disks or tapes of other machines connected by networks.



Memory hierarchy

As we move up the storage hierarchy we have faster access time, less capacity and higher cost per bit stored. When we move down, we have a larger storage capacity, slower access time and lower cost per bit stored.

Thus, CPU storage components generally have the fastest access time, the smallest storage capacity and the highest cost per bit stored. The cache memory which is placed in between the CPU and the main memory is a very high speed semiconductor memory used to enhance the speed of main memory. The main (primary) memory falls next in the memory hierarchy list. Secondary storage media such as hard-disk/magnetic disk memories make up the level of hierarchy just

below the main memory. Secondary storage devices are at the bottom of the memory hierarchy. Secondary storage devices such as magnetic tapes are used for archival storage. They are very cost effective and so are used for mass storage of data, when fast access time is not required.

Need for Memory hierarchy based on access time and cost balance: The main reason for using a memory hierarchy is to balance access time and cost. Less access time means more cost. Like registers are the smallest of all, their access time (time to fetch the data) will be faster, and their cost will be expensive. In the same way, secondary memory is the largest, so the access time will be more, but the cost will be less than other memories. In a nutshell, as the size increase, the access time also increases but the cost decreases.

Need for memory hierarchy based on Speed of communication: The CPU is responsible for fetching instructions, executing them, storing data, and controlling all other devices in the computer system. The speed at which the CPU can process data and execute instructions is much higher than the input rate of data from a hard disk. To solve this, computer system designers came up with a mechanism called a memory hierarchy that allows the CPU to get instructions and data from fast memory like registers and cache and process them at a higher speed so that the CPU can keep up with the data rate.

Memory hierarchy based on capacity: It is the volume of information the memory can store. As we move from top to bottom in the hierarchy, the capacity increases.

Performance: Increases when users need to access lower memory hierarchy levels less frequently. Without the memory hierarchy, a speed gap exists between the main memory and CPU registers.

Advantages of CD-ROM :

* Portability: CDs are compact and lightweight, making them easy to transport and store. This portability allows for convenient access to data on the go.

* Durability: CDs are relatively durable and resistant to scratches and dust compared to other storage options like floppy disks. This durability ensures the safety of data stored on CDs.

* Low cost: CDs are cost-effective storage solutions, especially when bought in bulk. They provide a budget-friendly option for storing large amounts of data. Cost per bit of storage is cheaper than the other types of memory devices.

Disadvantages of CD-ROM:

* Limited storage capacity: CDs have limited storage capacity compared to other storage devices like external hard drives or USB flash drives. This limitation can be a drawback when dealing with large files or collections of data.

* Compatibility issues: Some older computers may not have CD drives , making it challenging to access data stored on CDs. Additionally, not all devices can read or write to CDs, leading to compatibility issues.

* Longer access time as compared to that of magnetic hard disk (because locating a desired address involves first moving the head to the specific area then adjusting the rotating speed and then reading the address, and then to find and anness the specific sector).

(b) What is the role of Operating System of a computer ? Define the term "Kernel" of an operating system. What are the uses of GUI and Input/Output control system for an operating system user ? 8

Ans: An operating system (OS) is a system software that manages computer hardware and software resources and provides common services for computer programs. An operating system is an essential software component of a computer system.

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. It 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.

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 operating system is used everywhere today, such as banks, schools, hospitals, companies, mobiles, etc. No device can operate without an operating system because it controls all the user's commands.

Most operating systems perform the functions given below:

- Process Management
- Memory Management
- File Management
- Security
- Command interpretations

Process Management: It allocates the program to the processor (CPU) and also deallocates it when a program runs out of the CPU needs. In a multi-programming environment, the OS decides the order in which the processes have access to the processor, and how much processing time each process has. This function of OS is called Process Scheduling.

Memory Management: The operating system manages the Primary Memory or Main Memory. 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. An operating system manages the allocation and deallocation of memory to various processes and ensures that the other process does not consume the memory allocated to one process.

File Management: A file is a collection of related information. A file system is organized into directories for efficient or easy navigation and usage. 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.

Security: It prevents unauthorized access to any program. The operating system provides passwords and other technologies which assure the integrity and confidentiality of user data.

Command interpretations: The user interacts with the computer system through the operating system. OS acts as an interface between the user and the computer hardware.

Kernel: It is an important part of an operating system.The memory resident components of an operating system are commonly known as the kernel of the operating system. Kernal is central component of an operating system that manages operations of computer and hardware. It manages the operations of memory and CPU time. It is core component of an operating system. Kernel acts as a bridge between applications and data processing performed at hardware level using inter-process communication and system calls. It acts as a bridge between the hardware and software. Kernel loads first into the memory when an operating system is loaded and remains into memory until operating system is shut down again. It is responsible for various tasks such as disk management, task management and memory management. It manages system resources such as memory, CPU and input/output devices and provides a layer of abstraction between the hardware and higher-level software components.

Uses of GUI: A graphical user interface (GUI) is a computer program that enables a person to communicate with a computer through the use of symbols, visual metaphors and pointing devices. It accepts commands primarily in the form of drop-down menus, mouse movements and mouse clicks. It is a way to communicate what you want to a computer application using graphical symbols rather than typing the instructions in it.

Uses of Input/Output Control system: It is also known as I/O control system. It manages the input and output operations of an operating system. It provides an interface between the computer hardware and software, facilitating data transfer between the two.

(c) How can Moodle be used for e-learning ? List the advantages and disadvantages of e-learning. 6

Role of MOODLE in e-learning:

Moodle is a free, online Learning Management system enabling educators to create their own private website filled with dynamic courses that extend learning, any time anywhere. Moodle meets the needs of a teacher, student or administrator. Learners can access course materials and complete assignments with ease while instructors can create and manage courses, deliver content ,set up assessments and track student progress. It provides a single robust, secure and integrated system to create personalized learning environments. Moodle can be used as a tool for delivering content to students and can be used to build rich collaborative learning communities.

Moodle is an open-source software platform that serves as a Learning Management System (LMS) widely used in educational institutions. Designed to facilitate online learning and communication. It supports various interactive activities such as forums, quizzes, and assignments making it a two-way communication tool that actively engages students.

Advantages of E-learning:

- Affordability: The cost of e-learning is one of its main advantages.
- It improves the IT skills of individuals and may improve their time management skills.
- Flexibility: Users are able to access educational content from anywhere with an internet connection. This means that students can continue their learning even if they are traveling or living in remote locations. The level of participation of student in learning may improve as it provides anytime, anywhere learning.
- Self-placed learning: E-learning gives students and workers the freedom to learn at their own pace, which can be useful for those who have varied learning preferences or have difficulty with a specific subject. Students can access educational materials and complete assignments via eLearning at their convenience and on their own timetable. Students can tailor their learning around their work and other responsibilities.
- It promotes active and independent learning.
- Through discussion boards and chats, one can interact with everyone online and also clear your doubts if any.
- The video instructions that are provided for audio and video learning can be rewound and seen and heard again and again if we do not happen to understand the topic.

Disadvantages of e-learning:

* The authenticity of a particular student's work is also a problem as online just about anyone can do a project rather than the actual student itself.

* The face-to-face learning experience is missing in e-learning. This can be a problem for those who learn better when they can work together with other students on the same subject.

* The interactive support that requires teacher at the other end may still be available in slotted time only. In traditional method, trainees can ask their trainers lots of questions and get immediate answers. On the other hand, in case of e-learning, the trainers usually work within their working

hours and those trainees who learn out of these working hours may not be able to get an immediate response to their questions.

* E-learning requires reliable internet access and electronic devices which can be a challenge for some learners.

3. Compare and contrast any five of the following : 5x4=20

(a) Ring topology and Star topology

Ans:

Ring topology	Star topology
Every node is connected in the form of a ring or loop in a network.	The nodes are connected to the central hub or concentrator.
The cost of ring topology is low.	The cost of star topology is high.
The message travels from node to node in a ring manner in one direction.	The message travels from the central hub either to all the computers or only to the destination computer.
It is used for Wide Area Network.	It is used for Local Area Network.
Adding a new node or modifying any existing node is difficult i.e., flexibility is very low.	Adding a new node or modifying any existing node is easier without disturbing the network, i.e., flexibility is very high.
Cabling cost is very high as n cables are required to connect n nodes.	Cabling cost is high because in this n-1 cables are required to connect n nodes.
The transmission of the signal is only in one direction.	The transmission of the signal is both directional.
It is relatively difficult to reconfigure and troubleshoot.	It is easy to configure and troubleshoot.
Installation and maintenance is difficult as compared to star topology in a network.	Installation and maintenance is easy.

(b) Social networking and Blogging

Ans:

Social networking	Blogging
A social network is a network of individuals which have some sort of interdependence on each other.	Blog is a website where entries are written as information or news on a particular subject.
The main purpose of social networking is to connect people and create relationships.	The main focus is to share information, opinion or stories on a particular topic.
Some of the popular social networking services are – Orkut, Facebook, Twitter, Linkedln, MySpace, Friend Finder, Yahoo! 360, Classmates and many more.	Some of the blogging service providers are LiveJournal, Blogger, WordPress etc..

Contents are short and casual. Users post quick updates, images and videos.	Contents are longer, more structured which includes articles, essays and tutorials.
The audience is broader which includes friends, acquaintances and strangers. Social network platforms have a wider, more diverse audience.	The audience is more niche and targeted.
Social network is more general.	Blogs are typically more focused on a particular topic.
Social network is used to connect with others, share experiences and promote oneself or business.	Blogging is used to share information, provide insights and build a community around a particular topic.
Social network contents are time-sensitive.	Blog content is permanent and not time-sensitive.

(c) Macro and Functions in the context of spreadsheets.

Ans:

Macro	Functions
Macros are used to automate tasks and execute complex actions.	Functions are used to perform specific calculations and operations on data within a spreadsheet.
Macros are sequences of commands and actions that can be recorded and executed to automate repetitive tasks.	Functions are predefined formulas that perform specific calculations or operations on data in a spreadsheet.
Speed of execution using macro is faster	Speed of execution using function is slower
Macros are useful when small code is repeated many times.	Functions are useful when large code is to be written.
Macros do not return values	Functions can return values.
A macro does not require the user to pass any arguments.	Functions allow the user to pass any argument.

(d) Compiler and Assembler

Ans:

Compiler	Assembler
It is used to convert high-level programming language code into machine language code.	It converts assembly level language code into machine language code.
Compiler considers the entire code as one and converts it at the same time.	Assembler does not convert the entire code at the same time. It converts the code line by line.
It inputs source code(high level language).	It inputs assembly level code.
The output is a mnemonic version of machine code.	The output is binary code.
It takes less execution time compared to an assembler.	It takes more time than a compiler.

C,C++,Java and C# are examples of compiled languages.	GAS,GNU is an example of an assembler.

(e) Laser printing and Inkjet printing

Laser printer	Ink-jet printer
It is expensive than ink-jet printers.	It is cheap in price.
They do not have nozzle.	They have nozzle from which ink is sprayed on to paper and it gets printed.
Ink is in the form of toner powder, it does not dries up even if you don't use it for a long time.	Ink in the cartridges is in liquid form, which dries if not used for a long time.
A printer that uses laser and dry ink to print the information onto paper is called laser printer.	A printer that uses wet ink and nozzle assembly to produce the output onto paper is called the inkjet printer.
Laser printers can handle high-volume printing.	Ink-jet printers cannot handle high-volume printing.
The efficiency of laser printer is relatively high.	Ink-jet printers are less efficient than laser printers.
Laser printers are generally larger in size.	The size of inkjet printers is relatively smaller.

(f) Mouse and Graphics tablet

Ans:

Mouse	Graphic Tablet
A mouse is a pointing device that is moved across a surface to control the cursor on a computer screen.	A graphic tablet is also known a drawing tablet. It is an input device that has a flat surface that allows one to hand-draw images and graphics.
A mouse is less precise and sensitive when compared with a graphic tablet.	A graphic tablet is highly precise and sensitive when compared to a mouse.
A mouse is useful for computer navigation, clicking, dragging and scrolling tasks.	It is useful for drawing, sketching, painting and graphic design tasks.
A mouse can be carried with us but need a hard surface to use the mouse on.	It is more potable than a mouse as it can be carried around and used anywhere. We can place it on your lap, table, bed etc..
A mouse may cause strain or discomfort with long time use.	A graphic tablet is more ergonomic than a mouse. It is more comfortable for prolonged use.
It is more suitable for general computer usage. Computer mice are very useful in designing	These are used by architects, engineers and designers in Computer Aided Design (CAD) for

pictures and graphs and computer and video games by multimedia designers	designing purposes, such as buildings, cars, mechanical parts, robots etc.

4.

(a) How do you define the access time on a magnetic disk ? Explain with the help of an example. Why is access time of magnetic tape higher than magnetic disk ? Explain. 6

Ans:

Ans: Access time on a magnetic disk refers to the total time it takes for the disk to locate and transfer data. A track on a disk is selected in random fashion, but data is written to or read from a sector in serial fashion. In order to access information from a disk, the disk address of the desired data has to be specified. The disk address is specified in terms of track number, surface number and the sector number. Information is always written from the beginning of a sector and can be read only from the track beginning. A track on a disk is selected in random fashion, but data is written to or read from a sector in serial fashion. In order to access information from a disk, the disk address of the desired data has to be specified. The disk address is specified in terms of track number, surface number and the sector number. Information is always written from the beginning of a sector and can be read only from the track beginning.

It involves the seek time and latency 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.

Once the heads are positioned on the desired track, the head on the specified surface is activated. Since the disk is continuously rotating, this head should wait for the desired data (specified sector) to come under this head. This rotational waiting time i.e. 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. Latency time is also a variable and depends on the following two parameters:

* Distance of the desired data from the initial position of the head on the specified track. * Rotational speed of the disk

The total access time for a disk is equal to the seek time plus the latency time.

Access time = Seek time + Latency time

The average access time for most disk systems is usually between 10 to 100 milliseconds.

Example:

Consider a hard disk with: 4 surfaces

64 tracks/surface

128 sectors/track

256 bytes/sector

The disk is rotating at 3600 RPM

Since seek time is not given we consider it as 0.

Latency time => 60 sec -> 3600 rotations

1 sec -> 60 rotations

Latency time= (1/60) sec = 16.67 msec.

Average Rotational latency time = (16.67)/2 = 8.33 msec.

Average Access time = Seek time+ latency time

=0+8.33 msec.

=8.33msec

Access time of magnetic tape higher than magnetic disk:

Magnetic tapes are sequential access storage media, which means that data can only be accessed in a fixed sequential order, starting from the beginning of the tape. It has no addressing mechanism. Data access is far slower than random access devices such as magnetic disks. To find a specific block of data in magnetic tape, all data blocks before it need to be accessed first. On the other hand, magnetic disks provide random access which allows data to be accessed in any order, regardless of its location on the disk. Hence, the access time of magnetic tape is higher than magnetic disk.

(b) Explain the purpose of TCP/IP protocols. Also explain the concept of IP addresses and web addresses, with the help of an example of each. 7

Ans: Using the TCP/IP as the basic protocol Internet offers many services and application to it users like work wide web, Email, Chat, Social networking, collaboration etc.

TCP/IP allows communication between a number of computers (called hosts) connected on a network. Using the TCP/IP as the basic protocol Internet offers many services and application to its users like work wide web, Email, Chat, Social networking, collaboration etc.

TCP/IP was originally designed for the UNIX operating system; however, TCP/IP software is now available for every major operating system. In order to be compatible to the Internet, the computer must have TCP/IP compatible software. The major advantage of Internet is information sharing. Since in computers, bits and bytes are basic building blocks of information. Thus, one of the key aspects in network of many computers is to move bits between two specific computers. For such a communication, we require the address of the destination and a safe mean of moving data in the form of electronic signals. As far as safe movement of data is concerned, there exists a set of rules, which governs the sending, and receiving of data on the Internet. A stack of protocols called TCP/IP (Transmission Control Protocol/Internet Protocol) implements these rules. Its name reflects names of only two protocols called TCP and IP.

The TCP/IP model defines how devices should transmit data between them and enables communication over networks and large distances. The model represents how data is exchanged and organized over networks.

IP address and Web address :

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 address is a series of four numbers separated by dots (.). The four numbers ranges between 0 and 255. So IPv4 address takes only 4-bytes (or 32-bits) of computer memory. So, the full IP addressing range goes from 0.0.0.0 to 255.255.255.255.

Decimal	192		168		1		97	
Hexadecimal	C	0	A	8	0	1	6	1
Binary	1 1 0 0 0 0 0 0		1 0 1 0 1 0 0 0		0 0 0 0 0 0 0 1		0 1 1 0 0 0 0 1	

IP Address

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. * Device Identifier (Device ID) – which identifies a specific device within the identified Net- ID.

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.

Web Address:

A web address, or a Uniform Resource Locator (URL), is a unique reference that directs you to a specific page, file or photo on the internet. Without a web address, users cannot access a webpage. When you are viewing a Web page, the web address of the page appears in the Address bar in the browser. Since IP addresses are cumbersome to remember we want simpler textual domain addresses instead of complex IP addresses. To enable the use of simple textual address, you will require a service that will map these text based names to respective IP addresses automatically. Such a service was designed in 1983 by the University of Wisconsin with the name Domain Name System (DNS).

It can be the address of anything like the address of a particular file, directory, photo, video etc. Every web page on the internet has a unique web address, with the help of which the user accesses those web pages.

A web address is made up of three basic elements: the protocol, a domain name, and a path.

A typical URL could have the form http://www.example.com/index.html which indicates a protocol(http), a hostname (www.example.com), and a file name (index.html).

(c) Explain the concepts of one-dimensional array with the help of an example. 4

Ans: One dimensional array: A one-dimensional array is a structured collection of elements that can be accessed individually by specifying the position of a component with index/ subscript value. It is the simplest form of an array. They are very easy to define and use in the programs. The index would let us refer to the corresponding value. It is an array in which elements are stored one after the other.

Like a regular variable, an array must be declared before it is used. A typical declaration for an array in C++ is:

type name [elements];

where type is a valid data type (like int, float...), name is a valid identifier or variable name using which we can refer to it and the elements field (which is always enclosed in square brackets []), specifies how many of these elements the array will contain. Therefore, in order to declare an array named as marks, that will store marks for 5 students.

```
int marks[5];
```

marks [0]	marks[1]	marks[2]	marks[3]	marks[4]
50	70	80	90	63

It allows random access and all the elements can be accessed with the help of their index.

(d) Explain the conditional statement with the help of an example. 3

Ans: A statement that is of the form “If p, then q is a conditional statement”. An If statement is composed of three parts. The first part should be keyword w.r.t language to convey to the computer that it is if statement. And a Boolean expression. The second and third part can be a statement or group of statements as defined in rules of grammar of language.

Generally, an if statement is evaluated and executed in the following sequence: first it evaluates the Boolean expression. If the expression is true, the statements in the second part are executed. Otherwise, if it is false, the statements in the third part are executed. The third part is optional; if it is absent and the expression is false, then the program control simply moves on to the next statement in the sequence.

Example:

```
if (n %2 ==0)

(n %2 ==0)

 {

printf(“Number %d is even”,n);

}

Else

{

printf(“Number %d is odd”,n)

}
```

5.

(a) Uses of any two utility softwares

Ans: Disk Checkers are used to check the integrity of the hard disk and Pen Drive/ Flash Drive. CHKDSK is a command which is used for this purpose. This command can be used on a computer running Windows operating system. It fixes the logical file system errors found in the disk/drive. It is a command line tools which is used to check the volumes for any potential errors. This command can be used to repair the problems related to bad sectors, lost clusters, directory errors etc.

We can run CHKDSK command from either My computer or windows explorer and from command prompt.

Once CHKDSK finishes the checking, it returns exit codes whose description is as My Personal Computer below:

Exit Code	Description

0	No errors found
1	Errors found and corrected
2	Disk cleanup was performed or disk cleanup was not performed because /f was not specified
3	Could not check the disk, errors could not be corrected or errors were not corrected because /f was not specified.

Running CHKDSK from My Computer :

* Double-click my computer and then right-click the disk drive you want to check.

* Click properties there and then click Tools.

* Under Error-checking, click Check Now button. It will open a dialog-box which shows Check disk options.

Running CHKDSK from Command Prompt:

- Click Start and then click Run.
- In Open type cmd and then press enter key, then use one of the following options:

* If you want to run CHKDSK in read-only mode, type CHKDSK at command prompt and press enter.

*If you want to repairs the error without scanning the volumes for bad sectors, type CHKDSK volume:/f at command prompt and press enter.

*If you want to repair errors, locate bad sectors, and recover readable information, type chkdsk volume:/r at command prompt and then press ENTER.

ii) Data Compression :

Data compression is the process of encoding, restructuring or otherwise modifying data in order to reduce its size. Data compression is the process in which information is encoded with lesser bits in compared to the original representation. Data compression is very useful, as it reduces the size of the file, so it consumes fewer resources like disk space. For this purpose, you can use zip/unzip utility.

Zipping a file creates the compressed version of the file which takes much less space than the original file. A zipped file has .zip file extension.

The main advantages of compression are reductions in storage space, data transmission time and communication bandwidth.

This can result in significant cost savings. Compressed files require significantly less storage capacity than uncompressed files, meaning a significant decrease in expenses for storage. A

compressed file also requires less time for transfer while consuming less network bandwidth. This can also help with costs and increases productivity.

Text files are generally reduced more than the graphics file after compression. Similarly after zipping a file you need to unzip it, in order to view its contents or get it into its originalD form.

Steps to zip a file:

1. Right- click on any file you want to zip
2. Click WinZip from the shortcut menu
3. Click add to zip file
4. It will create .zip file

Steps to unzip file:

1. Right- click on any .zip file you want to unzip
2. Click Extract from the shortcut menu.

(b) Configuration of a laptop computer

Ans: Laptop is also a personal computer but intended of using it at a single place , it is small size, portable and can be used anywhere. Portability is one of the main advantage of a Laptop over a table PC. Another advantage of a Laptops is that it contain batteries which are used for power supply. It make a laptop usable even if power is not available.

Laptops are much more power efficient than desktops. The major disadvantage of Laptop is that its upgradeability is limited as compared to desktops.

A Configuration of Laptop is given below:

Hard Disk- 320 GB SATA HDD

Processor – Intel Pentium processor P6200 (2.13 GHz, 3 MB) RAM-3 GB

Memory: 1 GB DDR3 RAM (DDR3 RAM can transfer data twice the rate, hence it has higher bandwidth than DDR2 RAM)

(c) Supercomputer

Ans: A supercomputer refers to a high-performance mainframe computer. It is a powerful, highly accurate machine known for processing massive sets of data and complex calculations at rapid speeds.

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. Super Computers are used for highly calculation-

intensive tasks such as molecular modeling, climate research, weather forecasting, quantum physics, physical simulations etc.

Supercomputers are machines that have speed in the 100-million-instructions-per-second range. Governments specially use this type of computer for their different calculations and heavy duty. Different industries also use this huge computer for designing their products. It is also used for animation purpose. The PARAM supercomputer is one of the supercomputer developed by India's Center for Development of Advanced Computing(C-DAC) and promises processing speeds of up to 1 trillions instructions per second. Since October 2010, the Tianhe-1A supercomputer is considered as the fastest supercomputer in the world which is located in China. Some of the examples of Supercomputer are: IBM Blue Gene/L, IBM Roadrunner, Cray Jaguar etc.

(d) Open source software

Ans: 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

Main features of open source software 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.

(e) Time-sharing system

Ans: It provide a mode in which the user interacts directly with the computer. This is required for jobs such as transaction processing. In time sharing system processor's time is shared among multiple users simultaneously. 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.

It allows the user to perform more than one task at a time, each task getting the same amount of time to execute. It is an extension of multiprogramming systems. All the tasks will run smoothly on the system. Hence, its name is also multitasking operating system. Multiple jobs are running at the CPU time and also, they use the CPU simultaneously.

Advantages of time sharing system:

- Response time of CPU reduces
- Idle time of CPU reduces
- Each task/ process gets an equal time slot to execute.
- User-friendly and simple to use.
- This type of operating system avoids duplication of software.

Disadvantages of Time Sharing system:

- It uses a lot of resources.
- It has problem of reliability.

Examples of time sharing system: MULTICS, LINUX

(f) Computer virus

Ans: 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.

Some viruses do little but replicate while others can cause severe harm or adversely effect program and performance of the system. They can destroy files, software, program applications, and cause the loss of data.

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.

(g) Firewall in the context of networking

Ans: 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 is a network security device designed to monitor, filter and control incoming and outgoing network traffic based on predetermined security rules. Firewall is software that works on some set of rules and instructions given by you.

A firewall helps to keep your computer more secure. 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.

The primary purpose of a firewall is to allow non-threatening traffic and prevent malicious or unwanted data traffic for protecting the computer from viruses and attacks.

A firewall is a security system that monitors and controls incoming and outgoing network traffic based on predetermined security rules. A firewall is a network security device or software that acts as a barrier between a trusted internal network and an untrusted external network, such as the internet.

One limitation of firewalls is that they cannot prevent all types of cyberattacks, including those exploiting known vulnerabilities and may not protect against threats originating from within the trusted network .

(h) Characteristics of Metropolitan Area Network (MAN)

Ans: Metropolitan area networks, or MANs, are large computer network that spans a metropolitan area or campus. Its geographic scope falls between a WAN and LAN. They typically use wireless infrastructure or Optical fiber connections to link their sites. It is a computer network that connects computers within a metropolitan area, which could be a single large city, multiple cities and towns,

or any given large area with multiple building. A MAN is larger than a local area network(LAN) but smaller than a wide area network(WAN). A MAN might be owned and operated by a single organization, but it usually will be used by many individuals and organizations. MANs might also be owned and operated as public utilities or privately owned. A MAN typically covers an area of between 5 and 50 km diameter. Many MANs cover an area the size of a city, although in some cases MANs may be as small as a group of buildings.

A MAN often acts as a high speed network to allow sharing of regional resources. It is also frequently used to provide a shared connection to other networks using a link to a WAN.

Characteristics of MAN:

1) It generally covers towns and cities (5 to 50 kms).

2) Communication medium used for MAN are optical fiber cables which results in high-speed connectivity, however it may use other media too.

3) Data rates range from moderate to high.

4) It allows for the sharing of regional resources.

5) They provide uplinks for connecting LANs to WANs and Internet.