ICIT

A Computer is a machine that can be instructed to carry out sequences of arithmetic or logical operations automatically via computer programming. Computers are capable of performing generalized sets of operations called programs. These programs enable a computer to perform a wide range of tasks simultaneously.The various characteristics of CPU Registers are as follows:-

1) A computer is known for its automatic operations.
2) Speed is another well-known feature of the computer.
3) A computer can work tirelessly.
4) A computer has a wide range of use in our life.
5) Computer needs commands to work accordingly.

REGISTER: It is a quickly accessible location available to CPU. Register consist of small amount of fast storage.

Registers are a type of computer memory used to quickly accept, store, and transfer data and instructions that are being used immediately by the CPU. The registers used by the CPU are often termed as Processor registers.

Type of Register

1) Memory address register
2) Memory buffer register
3) I/O address register
4) I/O buffer register
5) Instruction Register
6) Accumulator register
7) Stack control register
8) Flag register

(d) Differentiate between multi programming and time-sharing operating system.

Time Sharing System	Multi-Programming
It is the sharing of computing resources among several users at the same time.	It is the allocation of more than one concurrent program on a computer system and its resources.
Time Sharing focuses on maximizing Response time.	Multi-programming makes sure that the CPU always has something to execute, thus increases the CPU utilization.
Cost effective	Usually costly

Multi Programming vs Time Sharing system

(e) What is an instruction set? Explain various types of addressing modes.

Answer :- **INSTRUCTION SET-** The instruction set, also called ISA (instruction set architecture),is a group of commands for a CPU in machine language. The size or length of an instruction varies widely from as little as 4-bits to multiples of a bytes.

Type of Addressing Modes

1) Register indirect mode.
2) Auto increment mode
3) Direct addressing mode
4) Indirect addressing mode.
5) Displacement addressing mode.
6) Relative addressing mode.
7) Base register addressing mode.

What is generation in Computer terminology? List various computer generations along with the key characteristics of hardware and software technologies in each generation.

Answer :- Generation in computer terminology is a change in technology a computer is being used. initially generation word is used to distinguish between varying hardware generation including both hardware and software.

Characteristics

First Generation(1940-56)

- Vacuum tubes are used.
- Input was based on punch cards.
- Computers are very large in size.
- Costly
- Consume lots of electricity
- Need of AC

Second Generation(1956-63)

- Speed was faster than first generation computer
- Use of Transistors
- Smaller in size than first generations
- FOR-TAN and COBOL was introduced.
- Assembly language was used.
- Need of AC

Third Generation (1964-71)

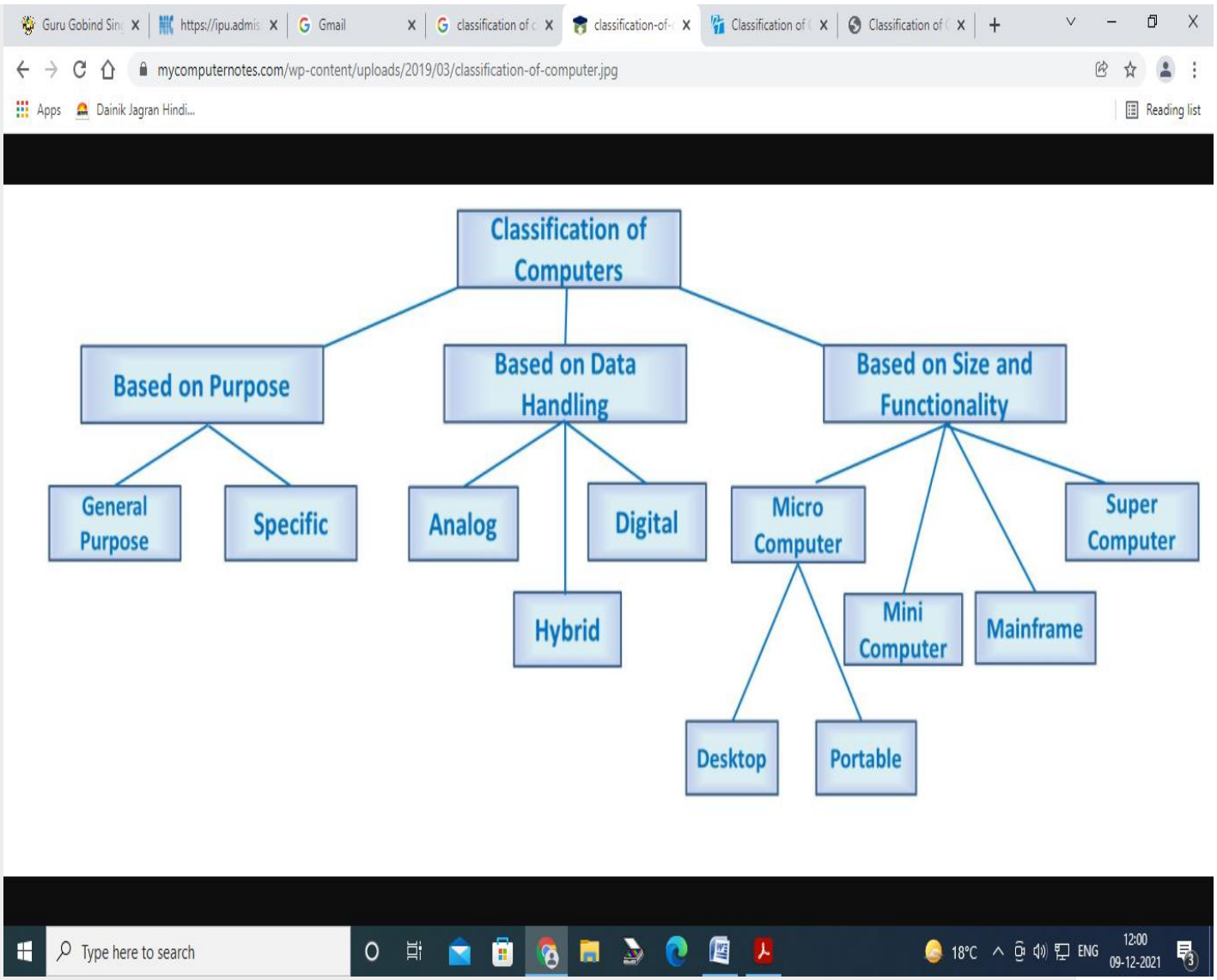
- Computers used integrated circuit also called IC chips.
- IC chips improved the speed and memory of the computer.
- Keyboard and Mouse were used.
- Computers support multitasking.
- Smaller in Size
- Supported High level language

Forth Generation (1971- present)

- Computers used VLSI, SSI, LSI.
- GUI introduced in these computers.
- Programming languages like Java, Python used in computers.
- Pipeline processing
- No AC required
- Concept of internet was introduced
- Great developments in the fields of networks
- Computers became easily available

Fifth Generation (Present and beyond)

- Computer devices started to learn by themselves.
- More user-friendly interfaces with multimedia features
- Availability of very powerful and compact computers at cheaper rates
- Aim of this generation is to eliminate the need of programming.
- The devices can have human like traits.
- Fifth generation computer is referred as artificial intelligence



- Classification of Computers Computers can be classified many different ways -- by size, by function, or by processing capacity. Functionality wise 4 types

  a) Micro computer

  b) Mini Computer

  c) Mainframe Computer

  d) Super Computer

- **Microcomputers** :

  Microcomputers are connected to networks of other computers. The price of a microcomputer varies from each other depending on the capacity and features of the computer. Microcomputers make up the vast majority of computers. Single user can interact with this computer at a time. It is a small and general purpose computer.¬

- **Mini Computer**

  Mini Computer is a small and general purpose computer. It is more expensive than a micro computer. It has more storage capacity and speed. It designed to simultaneously handle the needs of multiple users.

- **Mainframe Computer**

  Large computers are called Mainframes. Mainframe computers process data at very high rates of speed, measured in the millions of instructions per second. They are very expensive than micro computer and mini computer. Mainframes are designed for multiple users and process vast amounts of data quickly. Examples: - Banks, insurance companies, manufacturers, mail-order companies, and airlines are typical users.

- **Super Computers**

  The largest computers are Super Computers. They are the most powerful, the most expensive, and the fastest. They are capable of processing trillions of instructions per second.o It uses governmental agencies, such as:- Chemical analysis in laboratory• Space exploration• National Defense Agency• National Weather Service• Bio-Medical research• Design of many other machines•

- Limitations of Computer Computer cannot take over all activities simply because they are less flexible than humans. It does not hold intelligence of its own. Its IQ level is zero, till date. They have to be told what to do. It has to be instructed on what it must do and in what sequence. A Computer cannot take decisions on its own. Human beings can make certain judgments in our day to day life based on our feelings, taste, knowledge and experience. It also lack of emotions, so it will not make certain judgments like human. They cannot perform anything outside the defined scope. If any unexpected situation arise, computer will either produce erroneous

Digital Computers

Memory Size: All digital computers use the binary system, i.e. 0's and 1's.

Each character or a number is represented by an 8-bit code. The set of 8 bits is called a byte.

A character occupies 1-byte space.

A numeric occupies 2-byte space. Byte is the space occupied in the memory.

The size of the primary storage is specified in KB (Kilobytes) or MB (Megabyte). One KB is equal to 1024 bytes and one MB is equal to 1000KB.

The size of the primary storage in a typical PC usually starts at 16MB. PCs having 32 MB, 48MB, 128 MB, 256MB,512MB,1GB memory .

Computer Block Diagram System:

Mainly computer system consists of three parts that are central processing unit (CPU), Input Devices, and Output Devices.

The Central Processing Unit (CPU) is divided into two parts again: arithmetic logic unit (ALU) and the control unit (CU). The set of instruction is in the form of raw data.
A large amount of data is stored in the computer memory with the help of primary and secondary storage devices. The CPU is like the heart/brain of the computer. The user does not get the desired output, without the necessary option taken by the CPU. The Central processing unit (CPU) is responsible for the processing of all the instructions which are given by the user to the computer system.

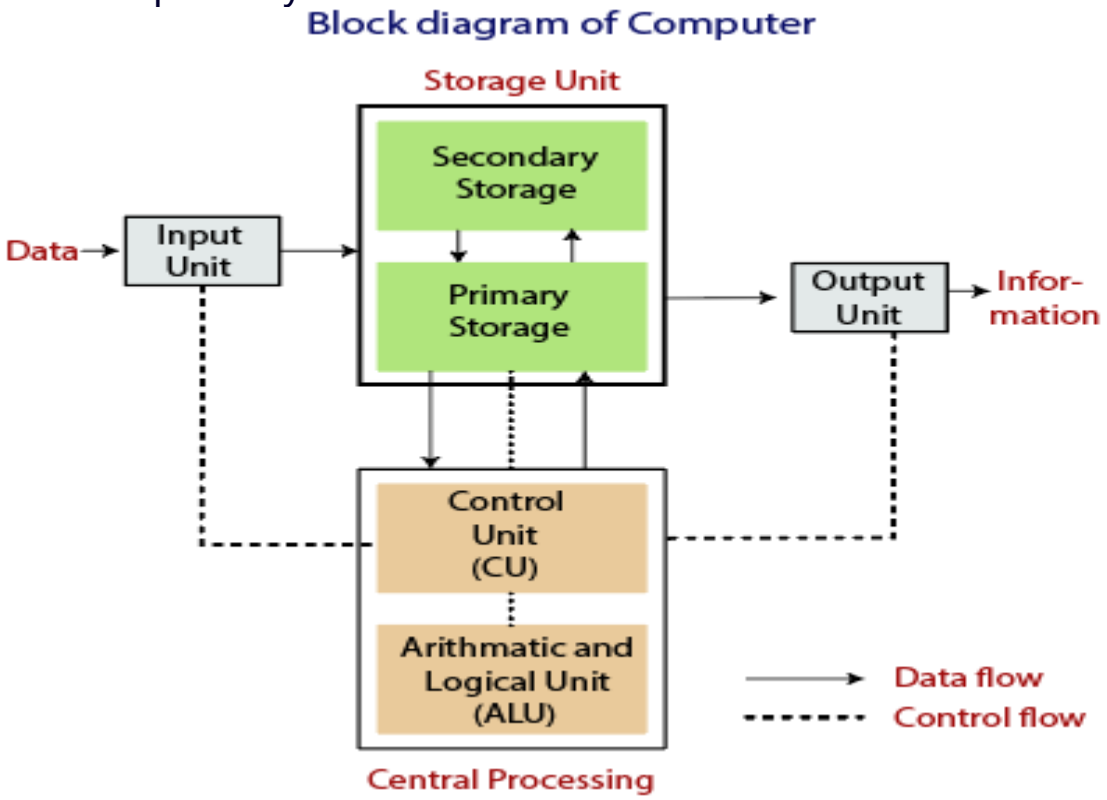


Fig: Block Diagram of the computer.

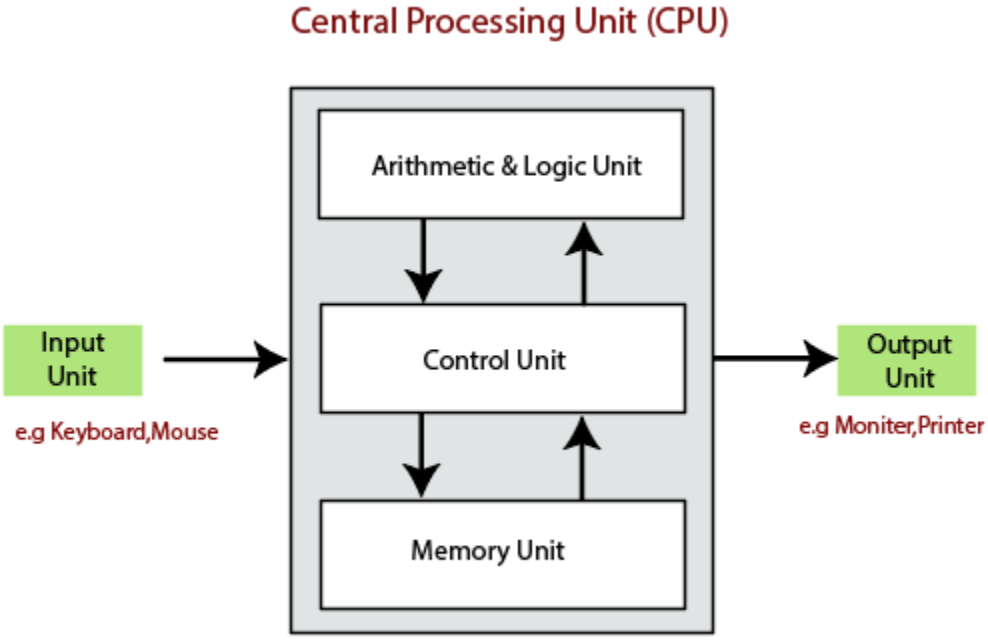
The data is entered through input devices such as the keyboard, mouse, etc. This set of instruction is processed by the CPU after

getting the input by the user, and then the computer system produces the output. The computer can show the output with the help of output devices to the user, such as monitor, printer, etc.

1. CPU (Central Processing Unit)
2. ALU(Arithmetic Logic Unit)
3. Control Unit
4. Storage Unit

Central Processing Unit (CPU)

The computer system is nothing without the Central processing Unit so, it is also known as the brain or heart of computer. The CPU is an electronic hardware device which can perform different types of operations such as arithmetic and logical operation.



The CPU contains two parts: the arithmetic logic unit and control unit. We have discussed briefly the arithmetic unit, logical unit, and control unit which are given below:

Control Unit

The control unit (CU) controls all the activities or operations which are performed inside the computer system. It receives instructions or information directly from the main memory of the computer.
When the control unit receives an instruction set or information, it converts the instruction set to control signals then; these signals are sent to the central processor for further processing. The control unit understands which operation to execute, accurately, and in which order.

Arithmetic and Logical Unit

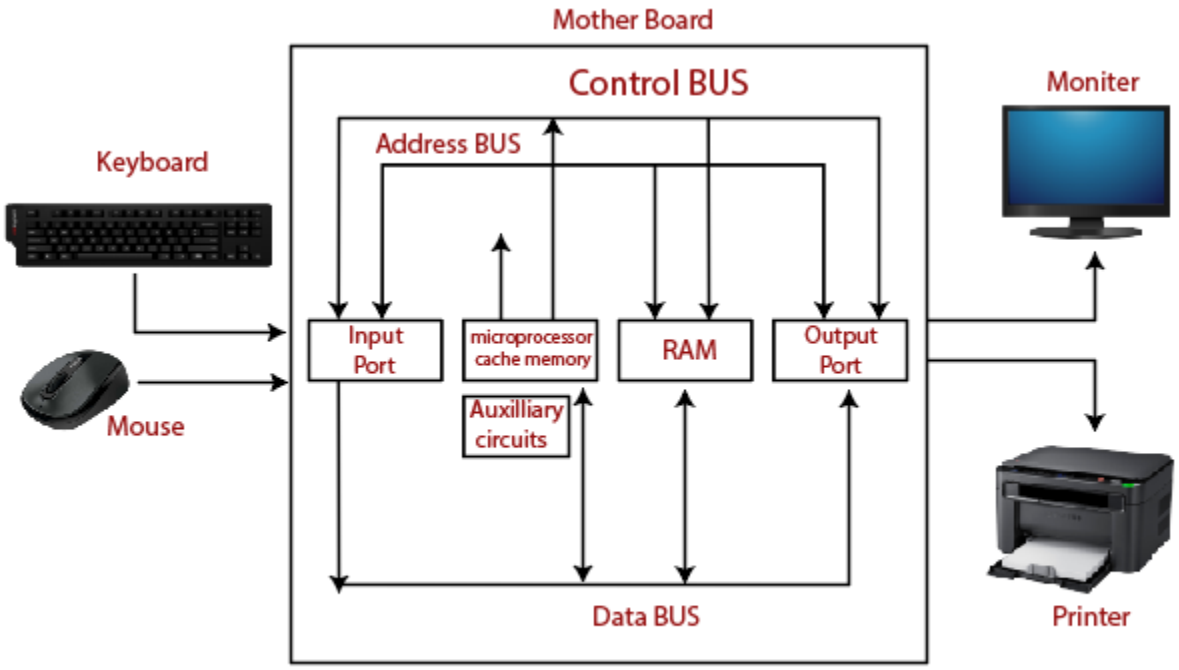
The arithmetic and logical unit is the combinational digital electronic circuit that can perform arithmetic operations on integer binary numbers.It presents the arithmetic and logical operation. The outputs of ALU will change asynchronously in response to the input. The basic arithmetic and bitwise logic functions are supported by ALU.

Storage Unit

The information or set of guidelines are stored in the storage unit of the computer system. The storage unit provides the space to store the data or instruction of processed data. The information or data is saved or hold in computer memory or storage device. The data storage is the core function and fundamental of the computer components.

Components of Computer System

The hardware and software exist on the computer. The information which is stored through the device is known as computer software. The hardware components of the computer system are related to electronic and mechanical parts, and the software component is related to data and computer programs. Many elements are connected to the main circuit board of the computer system called a “motherboard.”



Components of a Computer System

Processor.
Main Memory.
Secondary Memory.
Input Devices.
Output Devices.
These are mainly five components of the computer system. The computer hardware, computer software, and liveware exist in the element of the computer system.

Processor

The processor is an electric circuitry within the computer system. The Central processing unit is the central processor or main processor of the computer system. The processor carries out the instructions of the computer program with the help of basic arithmetic and logic, input/output operations.

Main Memory

The Random Access Memory is the main memory of the computer system, which is known as RAM. The main memory can store the operating system software, application software, and other information. The Ram is one of the fastest memory, and it allows the data to be readable and writeable.

Secondary memory

We can store the data and programs on a long-term basis in the secondary memory. The hard disks and the optical disks are the common secondary devices. It is slow and cheap memory as compare to primary memory. This memory is not connected to the processor directly.

It has a large capacity to store the data. The hard disk has a capacity of 500 gigabytes. The data and programs on the hard disk are organized into files, and the file is the collection of data on the disk. The secondary storage is direct access by the CPU; that's why it is different from the primary storage.

The hard disk is about 100 times the capacity of the main memory. The main difference between primary and secondary storage is speed and capacity. There are several large blocks of data which are copied from the hard disk into the main memory.

Input Devices

The user provides the set of instruction or information to the computer system with the help of input devices such as the

keyboard, mouse, scanner, etc. The data representation to the computer system is in the form of binary language after that the processor processes the converted data. The input unit implements the data which is instructed by the user to the system. We can enter the data from the outside world into the primary storage as the input through input devices. The input devices are the medium of communication between the outside world and the computer system.

INPUT and OUTPUT DEVICES

An input device sends data, information or control signals to a computer system for processing. An output device displays the result of that processing.

KEYBOARD: It is a type-writer style device which uses an arrangement of buttons or keys to act as electronic switches. Keyboard became the main input method for computers.

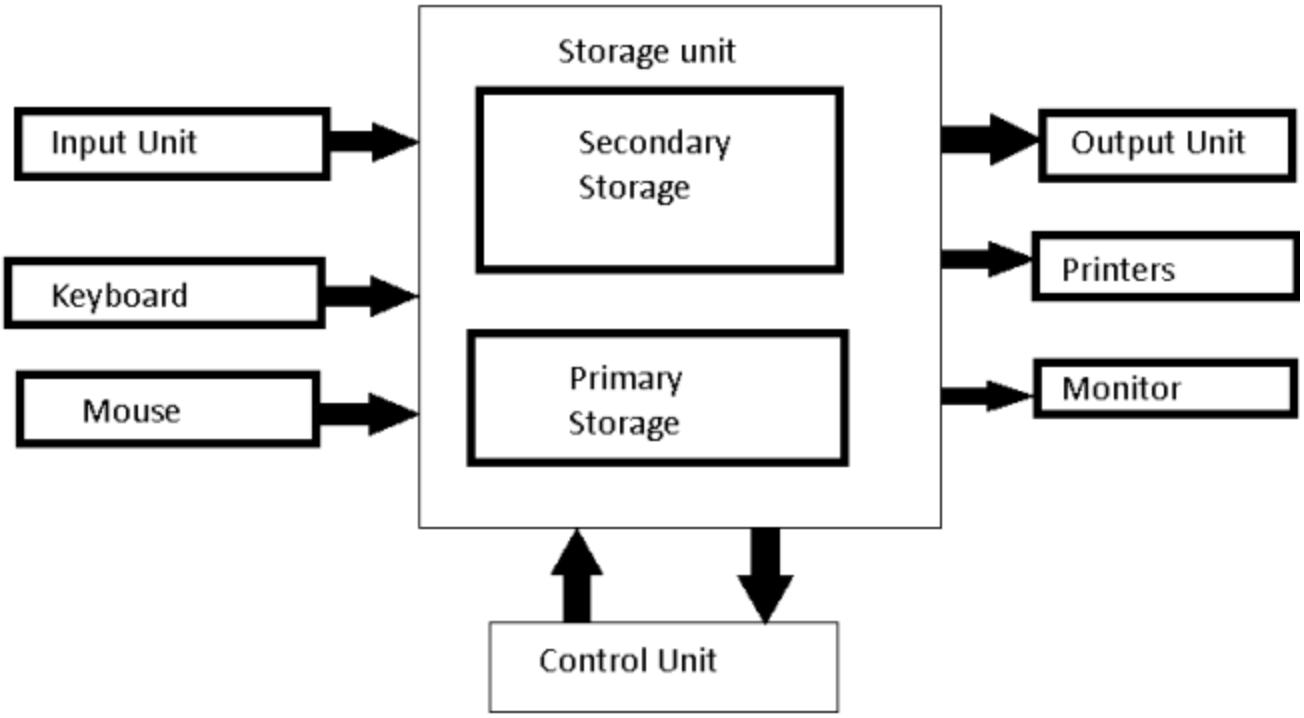
PRINTER : A printer is an external hardware output device that takes the electronic data stored on a computer or other device and generates a hard copy of it.

PROJECTOR: It is an optical device that projects the image onto a surface, commonly a projection screen most projectors creates an image by shining a light through a small transparent lens.

(a)What do you mean by computer organization? Explain the basic organization of a computer system with the help of a block diagram.

Computer Organization: It refers to the level of abstraction above the digital logic level, but below the operating system level. Computer architecture emphasizes the engineering decision and trade offs that must be made in order to produce a good design.

Basic Organization of Computer System by Block Diagram-



Computer Organization

Computer system consists of three parts CPU, Input Devices and Output Devices. CPU consists arithmetic logic unit and control unit.

(b) Differentiate the following: (1) Static and Dynamic RAM (2) Magnetic Disk and Magnetic Tape (3) PROM and EPROM

Answer :-

(1)

Static RAM	**Dynamic RAM**
Lower Access time, hence faster than Dynamic RAM	Higher access time , Hence Slower
It is costlier	Costs less compared to Static RAM
Consumes more power	Consumes Less power
Made of Flip flops	Made up of Capacitors

Static RAM	Dynamic RAM
Data stored in form of voltage	Data stored in form of Charge
Low Storage capacity	High Storage Capacity

Static RAM vs Dynamic RAM

(2)

Magnetic Tape	Magnetic Disk
The cost of magnetic tape is less.	The cost of magnetic disk is high.
Access time for magnetic tape is more.	Access time for magnetic disk is less.
Data transfer rate for magnetic tape is comparatively less.	Data transfer rate for magnetic disk is more.
Magnetic tape is used for backups.	Magnetic disk is used as a secondary storage
In magnetic tape data can’t be updated after fed-up of data.	In magnetic disk data can be updated.
Magnetic tape is more portable.	Magnetic disk is less portable
Reliability of magnetic tape is less.	Reliability of magnetic disk is more.

Magnetic tape vs Magnetic Disk

(3)

PROM	EPROM
Programmable Read Only Memory	Erasable Programmable Read Only Memory
User can store program only once	User can store many times.
Inexpensive	Costly as compared to PROM.
Less usablity	More Usablity

PROM vs EPROM

Memory is primarily of three types −

- Cache Memory
- Primary Memory/Main Memory
- Secondary Memory

Cache Memory

Cache memory is a very high speed semiconductor memory which can speed up the CPU. It acts as a buffer between the CPU and the main memory. It is used to hold those parts of data and program which are most frequently used by the CPU. The parts of data and programs are transferred from the disk to cache memory by the operating system, from where the CPU can access them.

Advantages

The advantages of cache memory are as follows −

- Cache memory is faster than main memory.
- It consumes less access time as compared to main memory.
- It stores the program that can be executed within a short period of time.
- It stores data for temporary use.

Disadvantages

The disadvantages of cache memory are as follows −

- Cache memory has limited capacity.
- It is very expensive.

Primary Memory (Main Memory)

Primary memory holds only those data and instructions on which the computer is currently working. It has a limited capacity and data is lost when power is switched off. It is generally made up of semiconductor device. These memories are not as fast as registers. The data and instruction required to be processed resides in the main memory. It is divided into two subcategories RAM and ROM.

Characteristics of Main Memory

- These are semiconductor memories.
- It is known as the main memory.
- Usually volatile memory.
- Data is lost in case power is switched off.
- It is the working memory of the computer.
- Faster than secondary memories.
- A computer cannot run without the primary memory.

Secondary Memory

This type of memory is also known as external memory or non-volatile. It is slower than the main memory. These are used for storing data/information permanently. CPU directly does not access these memories, instead they are accessed via input-output routines. The contents of secondary memories are first transferred to the main memory, and then the CPU can access it. For example, disk, CD-ROM, DVD, etc.

Characteristics of Secondary Memory

- These are magnetic and optical memories.
- It is known as the backup memory.
- It is a non-volatile memory.
- Data is permanently stored even if power is switched off.
- It is used for storage of data in a computer.
- Computer may run without the secondary memory.
- Slower than primary memories.

Hard Disk Drive (HDD)

What is a hard disk drive?

Hard disk drives are non-volatile magnetic storage devices capable of remembering vast amounts of data.

An electromagnet in the read/write head charges the disk's surface with either a positive or negative charge, this is how binary 1 or 0 is represented.

The read/write head is then capable of detecting the magnetic charges left on the disk's surface, this is how data is read.

The disk surface is divided into concentric circles (tracks) and sectors (wedges). Dividing the surface in this way provides physical addresses to remember where data is saved.

A circuit board carefully co-ordinates the rotating disk and swinging actuator arm to allow the read/write head to access any location very quickly.

Typical HDD capacities are measured in Terabytes (TB).

They can be installed inside a computer or purchased in a portable (external) format.

Typical applications for hard disk drives

- Desktop computers
- Laptop computers
- TV and satellite recorders
- Servers and mainframes
- Portable (external) drives are sometimes used to backup home computers or transfer large files

Benefits of hard disk drives

- Capable of holding vast amounts of data at affordable prices
- Fast read and write speeds
- Reliable technology
- Relatively small in size

Drawbacks of hard disk drives

- Due to the nature of its moving parts, they will eventually wear and break
- Although very fast, waiting for the moving parts means it will never perform as fast as solid state drives
- More fragile and less robust than a solid state drive
- Higher power consumption than a SSD
- Some noise is created by the moving parts

Solid State Drive (SSD)

What is a solid state drive?

Solid state drives are non-volatile storage devices capable of holding large amounts of data.

They use NAND flash memories (millions of transistors wired in a series on a circuit board), giving them the advantage of having no mechanical moving parts and therefore immediate access to the data.

Solid state drives perform faster then traditional hard disk drives, however they are significantly more expensive.

This expense means that typical capacities are usually measured in Gigabytes (GB).

They can be installed inside a computer or purchased in a portable (external) format.

Until we reach a point were large capacity SSDs are affordable, a compromise is to run two disk drives inside a computer. An SSD as the primary drive for your important programs and operating system, and a traditional HDD to store music, documents and pictures (which don't need the faster access times).

The lack of moving parts in an SSD makes it very robust and reliable, ideal for a portable device.

Typical applications for solid state drives

- Smartphones
- Tablet computers
- High-end laptops
- Two drive desktop solutions
- Portable drives are sometimes used in HD video cameras

Benefits of solid state drives

- Extremely fast read/write speeds
- Small in physical size and very light, ideal for portable devices
- No moving parts to wear, fail or get damaged – ideal for making portable computers and devices more reliable and durable
- Uses less power than a HDD, increasing battery life time
- Very quiet

- Generates less heat

Drawbacks of solid state drives

- Expensive to buy (per GB)
- Limited in capacity due to the expense
- Limited amount of writes

CD, DVD and Blu-Ray Discs

What are optical storage discs?

CD, DVD and Blu-Ray drives are optical storage devices.

Binary data is stored as changes to the texture of the disc's surface, sometimes thought of as microscopic pits and bumps.

These 'bumps' are located on a continuous spiral track, starting at the centre of the disc.

Whilst the disc is rotating at a constant speed, a laser is pointed at the spiral track of 'bumps'.

The laser will reflect/bounce off the disc surface in different directions depending upon whether a 1 or 0 has been read.

Disc capacities

In the pursuit of larger optical storage capacities, DVDs were created, followed by Blu-Ray.

CD	DVD	Blu-Ray
700 MB	4.7 GB	25 GB – 128 GB

Typical applications for optical media

- CD – Audio and small amounts of data
- DVD – Standard definition movies and data
- Blu-Ray – HD video and large amounts of data

DVD

Despite being the same physical size, a DVD can hold more data than a CD.

To achieve this, a more tightly packed spiral track is used to store the data on the disc.

To accurately access the smaller ‘bumps’, a finer red laser is used in a DVD drive than that found in a standard CD drive.

To increase capacity further, DVDs are also capable of dual layering.

Blu-Ray

Blu-Ray technology squashes even more data into the same size disc as a CD or DVD.

The spiral data tracks on a Blu-Ray disc are so small a special blue (violet) laser has to be used to read the ‘bumps’.

Like a DVD, Blu-Ray discs are capable of storing data on multiple layers.

Recordable Optical Media

CD-ROM, DVD-ROM, Blu-Ray-ROM

Read only – the data is permanently written to the disc at the point of manufacture.

CD-R, DVD-R, BD-R

Recordable – blank discs that can be burnt (written to) once.

CD-RW, DVD-RW, BD-RE

Re-writable – blank discs that can be burnt (written to) over and over again (can be erased and reused many times).

DVD-RAM

What is DVD-RAM?

DVD-RAM is an optical media storage device.

It differs from a traditional DVD in that data is stored in concentric tracks (like a HDD) which allows read and write operations to be carried out at the same time.

This means, for example, that when used in a personal video recorder you can record one television programme whilst watching a recording of another. This allows handy features such as 'time slip' to be possible.

When used within a CCTV system you could review footage whilst still recording your cameras.

The capacity of DVD-RAM is 4.7 GB, or 9.4 GB for double-sided discs.

Typical applications for DVD-RAM

- Personal and digital video recorders
- High-end CCTV

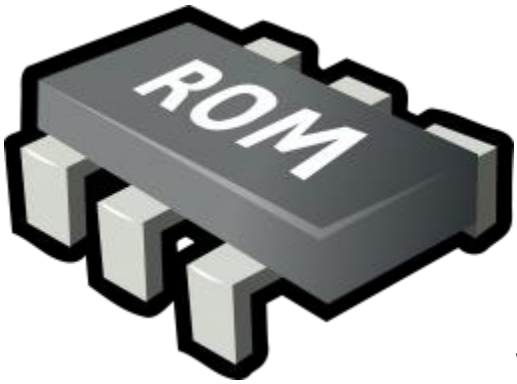
Benefits of DVD-RAM

- Read and write at the same time
- Can be rewritten to many more times than a traditional DVD-RW
- Has write-protect tabs to prevent accidental deletion when used in an optional cartridge
- Data is retained for an estimated 30 years. This long life is great for archiving data
- Reliable writing of discs because the verification done by the hardware, not by software

Drawbacks of DVD-RAM

- Disc speeds higher than 5x are less common
- Less compatibility than DVD-RW

ROM



What is ROM?

ROM is a non-volatile memory chip whose contents cannot be altered.

It is often used to store the start up routines in a computer (e.g. the BIOS).

Typical applications for ROM

- Storing the computer's start up routine

USB(Universal Serial Bus) Flash Memory

What is USB Flash Memory?

Flash are non-volatile solid state storage devices which use NAND flash memories to store data (millions of transistors).

USB refers to the USB connection that allows users to plug the device into the USB port of a computer.

Other types of flash storage include the memory cards used in digital cameras.

Flash memory comes in a variety of capacities to suit most budgets and requirements.

Typical applications for flash memory

- USB memory sticks – saving and transferring documents etc
- Memory cards in digital cameras

Benefits of flash memory

- Portable, small and lightweight
- Durability, flash has no moving parts to damage
- Range of capacities available
- Fast speeds, with no moving parts of boot up time

Drawbacks of flash memory

- Limited (but huge) number of write cycles possible
- Really high capacities are uncommon
- In relative terms, an expensive storage option compared to a HDD

UNIT-II

Compiler,Interpreter,Linker,Loader

Regardless of what language you use, you eventually need to convert your program into a language that the computer can understand Two ways for doing that: compile the program or interpret the program A compiler is a computer program that

translates a program in a source language into an equivalent program in a target language. or Compilers: Translate a source (human-writable) program to an executable (machine-readable) program Source code Input data Compiler Executable Executable Output data

Translate the entire program.

Convert the entire program to machine code, when the syntax errors are removed then converted into the object code

Requires more main memory Neither source nor the compiler are required for execution. Slow for debugging and testing.
Execution time is less.

Security of source code .

Interpreter is a program that executes instructions written in a high-level language or Interpreters:

Convert a source program and execute it at Source code Input data Interpreter the same time. Output data

Translate the program line by line.

each time the program is executed ,every line is checked for syntax error & then converted to equivalent machine code directly.
Requires less main memory

Source program and the interpreter are required for execution.
Good for fast debugging and testing.

Execution time is more.

No Security of source code .SourceCompilerSourceObject CodeCompilerObject CodeSourceCompilerObject Code Executable File / LoadLINKERObject CodeFileObject CodeFileObject CodeObject CodeLibrariesLOADERA program that takes as input the object files

of one or more separately compiled program modules, and links them together into a complete executable program, resolving reference from one module to another.

- A program that takes an input an executable program, loads it into main memory, and causes execution to being by loading the correct starting address into the computer register.

- When the program finished, control must somehow be returned to the operating system.

- A single object file might contain machine code for only one procedure or a set of procedures.

- An executable file must contain all the machine code needed for a particular program; it must contain the address of the first instruction to be executed.

I. Absolute loader: absolute loader is a primitive type of loader which does only the loading function. It does not perform linking and program relocation.

II. Bootstrap loader: when the computer is turned on absolute loader is executed. this loader is responsible for loading the operating system and transferring control to it. This loader is present in the ROM area of main memory.

III. Relocateabel loader: this loader is responsible for relocation and loading.

IV. Linking loader: this linker performs all the linking and relocation operations and load the linked program directly into the main memory. Linkage editor: this linker produces a linked version of the program called as a load module or an executable image.

Dynamic linker: this. Scheme postpone the linking function until execution time. Any subroutine is loaded and linked to the rest of program when it is first called.

What is software? Computer Instructions or data, anything that can be stored electronically is Software.

Types of Software System

APPLICATION SOFTWARE

SYSTEM SOFTWARE

UTILITY SOFTWARE

System Software includes the Operating System and all the utilities that enable the computer to function. System software is a term referring to any computer software which manages and controls the hardware so that application software can perform a task. Example:

Operating Systems, Compiler, Loader, Linker, Interpreter.This is a general purpose program or acollection of program written by the user to solve a particular problem. Application Software includes programs that do real work for user. Example: Payroll systems, Inventory Control, Manage student database, Word Processor, Spreadsheet and Database Management System etc.,these are readymade routines that are incorporated into the computer utility software are generally called as application oriented readymade system programs Example: Soundblaster , sidekick etc.

(a) Define Operating System. Discuss two primary objectives of an Operating System. Explain various functions provided by most of the operating system.

Answer :- **Operating System** : An operating system is a system software that manages computer hardware, software resources and provides common services for computer programs.

Two primary objectives of operating system

1) Making a computer system convenient to use i.e, hides details of hardware resources from the programmer and provides him with a convenient interface of using computer system.

2) Managing computer resources this involves performing such task as keeping track of who is using such resources, granting source requests.

Function of Operating System

Security: Operating system uses password protection to protect user data.
Control over system performance: Monitors overall system health to help improve performance.
Job accounting: Operating system constantly monitors the system to detect errors and avoid malfunctioning of computer.
Memory Management: The operating system manages the primary memory or main memory.
Processor Management: Operating system perform the following activities for processor management.
Device Management: It performs the following activities for device management.
File Management:A file system is organized into directories for efficient or easy navigation and usage.

(b) Define Algorithm with characteristics. Write an algorithm using flowchart and Pseudocode to find the maximum of N numbers.

Answer :- **Algorithm and its characteristics**

Algorithm is a step by step procedure which define a set of instructions to be executed in a certain order to get the desired output. Algorithms are generally created independent of underlying languages.

Characteristics

1) They are clear and unambiguous.

2) They contain 0 or more well-defined inputs.
3) Terminate after a finite number of steps.
4) It is feasible with the available resources.
5) It updates on an existing item in a data structure.
6) delete an existing item in a data structure.

Q5 Write short notes for the following

Types of Operating System

Answer: 1) Batch Operating System: This type of operating system does not interact with the computer directly. Operating System collects the programs and data together in a batch before processing starts. It is the responsibility of operators to sort jobs with similar needs.

2) Time-sharing operating system: Each task is given some time to execute so that all the tasks work smoothly. Each user gets the time of CPU as they use a single system. These systems are also known as multitasking systems these tasks can be from a single user or from a different user.

3) Distributed operating system: These type of operating system is a recent advancement in the world of computer technology.

4) Network operating system: These systems run on a server and provide the capability to manage data, users, groups, and security. The basic purpose of the network operating system is to allow shared file and printer access among multiple computers in a network, typically a local area network (LAN), a private network, or to other networks, these computers are popularly known as **tightly coupled systems**.

Loader And Linker

A loader loads the program into the main memory from the storage device. It also plays a key role in the execution of a program.

Linker links and combine objects generated by a compiler into a single executable. Linker is also responsible to link and combine all modules of performance.

Process Control Block

A process control block is a data structure used by computer operating system to store all the information about a process it is also known as process descriptor. When a process is created, the operating system creates a corresponding process control block.

Flowchart and Pseudo code

Flowcharts are written with program flow from the top of the page to the bottom. Each command is placed in a boy of the appropriate shape, and arrows are based to direct program flow.

Pseudo Code is a method of describing computer algorithms using a combination of natural language and programming language.

Multiprocessor operating system and its advantages

It refers to the use of two or more central processing units within a single computer system. These systems have multiple processors working in parallel that share the computer clock, memory, bus, peripheral devices, etc. These multiplies CPU are in close combination sharing the computer bus, memory, and other peripheral devices.

Advantages:

1) Increased throughput.
2) More Reliable System
3) By increasing the number of processors, more work can be completed.
4) It saves money as compared to multiple single systems.

Q6

(a)What is the significance of Base in number system? Distinguish among binary, octal and hexadecimal number system with examples.

Answer : **Base numbers** can mean the **number** of different **numbers** we use when expressing a digit in math. For example the decimal number system having radix, r=10, uses 0 to 9 number.

Binary	Octal	Hexadecimal
Only two possible values for each digit in zero or one	Represent any number using 8 digits [0–7]	Represent any number using 10 digits a 6 characters [0–9, A, B, C, D, E, F]

Binary	Octal	Hexadecimal
The **radix** or **base** for hexadecimal numbers is 2.	The **radix** or **base** for hexadecimal numbers is 8.	The **radix** or **base** for hexadecimal numbers is 16.

Difference between Binary, Octal and Hexadecimal

(b) Perform the following operations. For subtraction use complement's method:

- **$(1100011)_2 – (10111)_2$**
- **$(11001)_2 – (11110)_2$**
- **$(36)_{10} – (87)_{10}$**
- **$(110011)_2 + (11111)_2$**

Answer :-

- $(1100011)_2 – (10111)_2=(1001100)_2$
- $(11001)_2 – (11110)_2 = (-00101)_2$
- $(36)_{10} – (87)_{10}=(-51)_{10}$
- $(110011)_2 + (11111)_2 = (1010010)_2$

Q7

(a) Explain the following with example 1) ASC2 Code 2)Unicode 3) BCD 4) Grade code

Answer:

ASCII CODE: ASCII stands for American Standard Code for Information Interchange. It is a code for representing 128 English characters as a number with each letter assigned a number from 0 to 127

Example- ASCII Code for uppercase M is 77

UNICODE: A code point takes the form of U+ (hex-code), ranging from U+0000 to U+10FFF Unicode defined different character encodings.

Example- U+0041 is an English letter A

BCD: Binary code decimal is a system of writing numerals that assign a four-digit decimal code to each digit 0 through 9 in the decimal numeral.

Example- for eg 25 have a BCD number is 00100101

Grade Code: A grade code is a technical specification that defines the parameters a facility connected to a public grid to ensure them.

Example- To find the grade of a student (A, A+, B, C)

(b) Convert the following

- Convert the following

- $(8B5A)_{16}$ = $(.....)_{10}$
- $(125.75)_{10}$ = $()_2$
- $(1765)_8$ = $(.....)_2$
- $(10111.101)_2$ = $(.....)_{10}$

Answer :-
(i) $(8B5A)_{16}$ = $(35674)_{10}$
(ii) $(125.75)_{10}$ = $(293.45703125)_2$
(iii) $(1765)_8$ = $(1111110101)_2$
(iv) $(10111.101)_2$ = $(23.625)_{10}$

Q8

(a) Explain various types of computer network topologies along with their advantages and disadvantages

Answer :- **Various types of computer network topologies**
Mapping of LAN design is called topology. There are four categories.

Star Topology: All computers and devices are connected to the main computer. The main system disburses the flow of data within the network. It is the common type of network and follows the Ethernet standard.

Advantages:

- This topology offers simple operation
- It also achieves isolation or each device in the network.
- Adding or removing a network node is easy.
- If one computer on the network fails, the rest of the network continues to function normally.

Disadvantage:

- The setup cost is quite high.
- The number of nodes depends on the capacity.
- Central hub failure leads to failing the entire network.

Bus Topology: In this arrangement, all the nodes are connected to a single linear cable. The cable to which the nodes connect is called a “backbone”.

Advantage:

- It is easy to set up, handle, and implement.
- It transmits data only in one direction.
- Every device is connected to a single cable
- It is the best suited for small networks.
- It costs very little.

Disadvantage

- Cables fail then the whole network fails.
- The cable length has limited this limits the number of the network nodes.
- when a high number of devices connected to bus topology efficiency decreases.
- It is heavily dependent on the central bus.

Ring Topology: Computers and devices are connected to a closed loop cable. It is called ring topology because it forms a ring as each computer is connected to another computer, Each computer functions as a repeater and charges the signal before sending it to the next station.

Advantage:

- The data being transmitted between two nodes passes through all the intermediate nodes.
- The data transmission is high speed.
- In comparison to the bus, a ring is better at handling load.
- The configuration makes it easy to identify faults in network nodes.
- Cheap to install and expand

Disadvantage:

- The failure of a single node in the network can cause the entire work to fail.
- Troubleshooting is difficult in a ring topology.
- Adding or deleting the computers disturbs the network activity.
- There is a heavy dependency on the wire connecting the network nodes.
- Transmission speed is dropped during an increase in the number of nodes.

Mesh Topology: A mesh topology is a local network topology in which the infrastructure nodes connect directly, dynamically, and non-dynamically to as many other nodes as possible and co-operate with one another to efficiently route data from/to clients. Mesh has `n(n-1)/2` physical channels to link `n` devices.

Advantage:

- The arrangement of the network node is such that it is possible to transmit data for one node to many nodes.
- The failure of the single node does not cause the entire network.
- It is robust.
- The fault is diagnosed easily.
- Provides security and privacy.
- Point to point contact between every pair of nodes makes it easy to identify faults.

Disadvantage:

- Cost in setting up and maintenance is too high
- The administration of a mesh network is difficult.
- Bulk wiring is required.

(b)Write short notes on the following.

FTP

Answer :- **FTP:** The file transfer protocol is a standard network protocol is used for the transfer of computer files between a client and server on a computer network. FTP is build on a client-server model architecture.

2)WWW

WWW: World Wide Web is a collection of all resources and users on the internet that are using the hypertext transfer protocol. The world wide web is the universe of network accessible information, an embodiment of human knowledge. Information can be accessed by Uniform Resource Locater (URL)

3) Client Server Architecture

Client Server Architecture: It is the model which shows us how a server provides resources and services to one or more clients. Server include web servers, mail servers, file servers.

4) Digital and Analog Signals

Digital and Analog Signals: An analog signal is any continuous signal for which the time varying feature of the signal is a representation of some other time varying quantity. A digital is a discrete wave that carries information in binary form digital signal carries data in the binary form.

Q9

(a) What are the main components of data communication system Explain different types of transmission media used in data communications along with their advantages and disadvantages

Answer :-

- There are five type of data communication system

Data: Communication of data means a message will me transmitted from one device and receive in the destination.

Sender: Data must have to be sent to a destination from a source this source is called sender

Receiver: the destination of the transmitted data as the receiver which will receive the data device that receives the data by the sender us called receiver.

Transmission medium: It is the physical path for the data to travel its destination.
Protocol: A protocol is nothing but a set of rules that applies on the full data communication procedure.
Transmission media used in data communication system
In data communication a transmission medium is a physical path for the sender and the receiver. Transmission medium is classified into two types:

1) Guided media

2) Unguided media

Guided Media: It is also referred as wired or bounded transmission media signals being transmitted are directed and confined in a narrow pathway by some physical links. High speed, secure, for comparatively shorter distances are the features of guided media.
There are three major types:

1) Twisted pair cable

2) Coaxial cable

3) Optical fiber cable

Unguided Media: It is also referred as wireless or unbounded transmission media. No physical medium is required for the transmission of electromagnetic signals.
1) Signals id broadcast through signals.

2) less secure

3) used for larger distances

This media is easy to generate and can penetrate through buildings.

There are three major types:

1) Radiowaves

2) Microwaves

3) Infrared

Advantages and disadvantages:
1) Guided and unguided media are higher bandwidth

2) They have immunity to electromagnetic interference

3) Less signal attenuation

4) Light weight

5) Resistance to corrosive materials

Disadvantages:
1) More difficult to install

2) Very costly

3) Bending is not east

4) Limited in distance

(b)Distinguish between Intranet and Extranet with example.

INTRANET	**EXTRANET**
Private	Extremely Private
Can have firewall	It has firewall
Only accessible only to people inside the organization	Partially accessible to People outside organization
Dependent on INTERNET	Dependent on INTERNET & INTRANET