

## QUESTION NO. 1

## DIFFERENCES BETWEEN ANALOG AND DIGITAL COMPUTERS

Analog	Digital
Analog computer works with continuous values.	Digital computer works with discrete values. It can work only with digits.
It has very limited memory.	It can store large amount of data.
It has no state.	It has two states ON and OFF
It can perform certain types of calculations.	Its speed of calculation is very high.
It is difficult to use.	It is easy to use.
Analog computer is used in engineering and scientific applications.	Digital computer is widely used in almost all fields of life.
Analog computer is used for calculations and measurements of physical quantities such as weight, height, temperature and speed.	Digital computer is used to calculate mathematical and logical operations.
Its accuracy is high.	Its accuracy is comparatively low.
Its readability is low.	Its readability is high.
Examples of analog computers are thermometer, analog clock, and older weighing machines.	Examples of digital computers are digital watches, digital weighing machines, mini computers, microcomputers, mainframe and supercomputers.

## QUESTION NO. 2

**BASIC ARCHITECTURE OF COMPUTER SYSTEM**

Different computers have different architecture. However the basic organization remains the same for all computer systems. The Central Processing Unit (CPU) used in microcomputers is also called microprocessor. Main memory and CPU are mounted on a single board called the motherboard. There are basically three parts of a digital computer named CPU, Memory and Input / Output Devices.

**MICROPROCESSOR:**

CPU stands for central processing unit. It is the brain of computer. It is also called processor. A computer cannot work without CPU. Each CPU has a set of pins through which all its communication takes place with the other devices. Some pins are used to carry the output signals from the CPU and others accept signals from the outside world. CPU consists of two units named ALU (Arithmetic and Logic Unit) and CU (Control Unit). CPU is located on the motherboard.

**(1) Arithmetic and Logic Unit (ALU):**

It is the part of CPU all types of data is processed. All arithmetic and logical operations are performed in arithmetic and logic unit. Arithmetic operations such as addition, subtraction, multiplication, division and logical operations such as less than,



greater than and equality are performed in the ALU. Apart from the numeric data alphabetic data can also be compared according to an assigned sequence. When data is transferred using input devices to the primary storage, it will be there in primary storage until it is needed to the ALU where processing takes place. No processing occurs in primary storage. Intermediate results generated in the ALU are temporarily transferred back to the primary storage until needed at a later time. Data may thus move from primary storage to ALU and back again to storage many times before the processing is finished. Once complete, the final results are released to an output storage section and from there to an output device. The engineering design of ALU determines the type and number of operation that it can perform.

### (2) Control Unit (CU):

It is an important component of CPU. It acts as a supervisor of the computer. By selecting, interpreting and seeing to the execution of program instructions the control unit of the CPU maintains order and directs the operation of the entire system. It provides the clock pulses that are used to control and manage the system. Although the control unit doesn't process data, it acts as a central nervous system for the other data manipulating components of the computer.

At the beginning of processing the first program instruction is selected and fed into the control unit from the program storage area. There it is interpreted, and then from there signals are sent to other components to execute the necessary action. Further program instructions are selected and executed one after another until the processing is complete.

### (3) Memory Unit (MU):

CPU has its own memory to store data. Instructions are also stored in this memory. This memory area is called MU (memory unit) or CPU Registers. These are the fastest storage area in a computer. Few most commonly used registers of a CPU are AX, BX, CX and DX. These registers are available in different sizes like 16, 32 and 64 bits.

### Memory:

Memory can be classified into two types:

- Random Access Memory (RAM)
- Read Only Memory (ROM)

### Random Access Memory (RAM):

Modern types of writable RAM generally store a bit of data in either the state of a flip-flop, as in SRAM (static RAM), or as a charge in a capacitor (or transistor gate), as in DRAM (dynamic RAM). Some types have circuitry to detect and/or correct random faults called memory errors in the stored data, using parity bits or error correction codes. RAM of the read-only type, ROM, instead uses a metal mask to permanently enable/disable selected transistors, instead of storing a charge in them.

SRAM and DRAM are volatile, other forms of computer storage, such as disks and magnetic tapes, have been used as persistent storage in traditional computers. Many newer products instead rely on flash memory to maintain data when not in use, such as PDAs or small music players. Certain personal computers, such as many rugged computers and notebooks, have also replaced magnetic disks with flash drives.



**Features:**

The features of RAM are:

- It is volatile.
- It is costly.
- It is temporary in nature.
- It has unique addresses to store data.
- It stores data in the form of 0's and 1's.
- It is available in larger size.
- It is available in different sizes and speeds.
- It is easier to replace in a computer.

**Read Only Memory (ROM):**

Pronounced ROM, acronym for read-only memory, computer memory on which data has been prerecorded. Once data has been written onto a ROM chip, it cannot be removed and can only be read.

Unlike main memory (RAM), ROM retains its contents even when the computer is turned off. ROM is referred to as being nonvolatile, whereas RAM is volatile. Most personal computers contain a small amount of ROM that stores critical programs such as the program that boots the computer. In addition, ROMs are used extensively in calculators and peripheral devices such as laser printers, whose fonts are often stored in ROMs.

**COMPUTER BUS:**

A collection of wires through which data is transmitted from one part of a computer to another. You can think of a bus as a highway on which data travels within a computer. When used in reference to personal computers, the term bus usually refers to internal bus. This is a bus that connects all the internal computer components to the CPU and main memory. There's also an expansion bus that enables expansion boards to access the CPU and memory.

The size of a bus, known as its width, is important because it determines how much data can be transmitted at one time. For example, a 16-bit bus can transmit 16 bits of data, whereas a 32-bit bus can transmit 32 bits of data.

**INPUT / OUTPUT DEVICES**

The devices used in computer system to enter data into a computer or extract data from a computer are known as I/O (Input / Output) devices respectively. Here are some of the most commonly used I/O devices.

**INPUT DEVICES:**

The device used to enter data into the computer system is called input device. Following are few examples of input devices.

**Keyboard:**

The set of typewriter-like keys that enables you to enter data into a computer. Computer keyboards are similar to electric-typewriter keyboards but contain additional keys.



**Mouse:**

The mouse is a small device that when moved across a desktop, moves the graphics cursor accordingly. The graphics cursor which can be positioned anywhere on the screen is displayed as a bracket, an arrow, a crosshair or a variety of other symbols. Depending on the application, the text and graphics cursors may be displayed on the screen at the same time. The graphics cursor is used to point and draw.

The mouse is either attached to the computer by a cable or linked via wireless remote connection. All movements of the mouse are reproduced by the graphics cursor on the screen. For example when you move a mouse up and to the right the graphics cursor moves toward the top right hand corner of the screen. Use the mouse for quickly positioning the graphics cursor.

There are three basic types of mouse:

- **Mechanical:** It has a rubber or metal ball on its underside that can roll in all directions. Mechanical sensors within the mouse detect the direction the ball is rolling and move the screen pointer accordingly.
- **Optical:** It uses a laser to detect the mouse's movement. You must move the mouse along a special mat with a grid so that the optical mechanism has a frame of reference. Optical mice have no mechanical moving parts. They respond more quickly and precisely than mechanical mouse, but they are also more expensive.

**OUTPUT DEVICES:****Printers:**

Printer is a peripheral device used to produce a hard copy of documents stored in electronic form, usually on physical print media such as paper or transparencies. Many printers are primarily used as local peripherals, and are attached by a printer cable. In most new printers, a USB cable is used to attach it to the computer.

There are two broad categories of printers, impact and non-impact printers. In impact printers printing is achieved by pressing the solid characters against a ribbon, which in turn prints the impression on paper almost like a typewriter. A line of print is achieved by moving a print head across the page. Here are some types of commonly used printers.

**Monitors:**

A monitor or display (sometimes called a visual display unit) is an electronic visual display for computers. The monitor comprises the display device, circuitry, and an enclosure. The size of a display is usually given as the distance between two opposite screen corners. Display screen varies in size from 5 to 30 inches. Output on a monitor is soft copy, which means it is temporary and available to the end user only until another display is requested.

**STORAGE DEVICES:**

The devices used for storage and retrieval of data for the later use, are called storage devices. These devices keep the data intact even when we turn off our computer. Storage devices are commonly classified into two categories:

- Primary Storage
- Secondary Storage



### Primary Storage:

Primary storage usually refers to a form of semiconductor storage known as random access memory (RAM) and sometimes other forms of fast but temporary storage. To manipulate data within a computer system, we must have a way of storing and retrieving it. Data and instructions are stored temporarily during processing in Random Access Memory (RAM). RAM is also known as Primary Storage.

### Secondary Storage:

Secondary storage also called auxiliary storage or mass storage holds data, instructions and information for future use. Secondary storage (or external memory) differs from primary storage in that it is not directly accessible by the CPU. The computer usually uses its input/output channels to access secondary storage and transfers the desired data. Secondary storage does not lose the data when the device is powered off. It is non volatile.

Here are a few examples of secondary storage devices, which are magnetic disks, compact disks and magnetic tape etc.

### Magnetic Disks:

Magnetic storage uses different patterns of magnetization on a magnetically coated surface to store information. Magnetic storage is non-volatile. The information is accessed using one or more read/write heads which may contain one or more recording transducers. A read/write head only covers a part of the surface so that the head or medium or both must be moved relative to another in order to access data. In early computers, magnetic storage was also used for primary storage in a form of magnetic drum, or core memory. In modern computers, magnetic storage takes these forms:

- Floppy Disk
- Hard Disk Drive
- Magnetic Tape

### Floppy Disks:

A floppy disk is a data storage medium that is composed of a disk of thin, flexible magnetic storage medium enclosed in a square or rectangular plastic shell.

Floppy disks are read and written by a floppy disk drive (FDD). The floppy disk was actually invented by IBM for recording maintenance information about its mainframes for the service staff. It was later used by personal computer manufacturers as a convenient way to distribute software for sale. The 3 1/2 inch diskette comes in two capacities 720 KB and 1.44 MB. The two diskettes are the same size but have different disk densities. Disk density refers to the number of bits that can be stored per unit of area on the disk face surface.

### Hard Disk:

A hard disk is part of a unit, often called a "disk drive," "hard drive," or "hard disk drive," that store and provides relatively quick access to large amounts of data on an electromagnetically charged surface or set of surfaces. Today's computers typically come with a hard disk that contains several billion bytes (gigabytes) of storage.



A hard disk is really a set of stacked "disks," each of which, like phonograph records, has data recorded electromagnetically in concentric circles or "tracks" on the disk. A "head" (something like a phonograph arm but in a relatively fixed position) records (writes) or reads the information on the tracks. Two heads, one on each side of a disk, read or write the data as the disk spins. Each read or write operation requires that data be located, which is an operation called a "seek".

A hard disk/drive unit has rotation speed varying from 4500 to 7200 rpm. Hard disk manufacturers are working continuously to achieve two objectives, to put more information in less disk space and to enable a more rapid transfer of that information to and from RAM. Generally the 1 to 5 1/4 inch permanent hard disks have storage capacities from 240 MB to 200 GB.

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### **INPUT DEVICES:**

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#### **Keyboard:**

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There are few types of keyboards discussed below.

#### **Ergonomic Keyboards:**

The ergonomic keyboards are designed considering the ergonomic aspect of the keyboards. It is specially designed as per the comfort of the hands and wrist of the keyboard user. The ergonomic keyboards are designed to prevent the carpal tunnel syndrome, which causes numbness and tingling sensation in hands and fingers after typing for a long duration. These keyboards also help the keyboard user maintain a comfortable position.

#### **Compact Keyboard:**

The size of keyboard goes on increasing, especially, those of the ergonomic keyboards. The ergonomic keyboards are designed bigger to accommodate many keys that perform special functions. The compact keyboards are slim and usually do not have the numeric keypad that is present on the right side of the other keyboards. Some compact keyboards even include a rubber pad that can be used instead of the mice. These keyboards are not very small in size, but offer portability during travel and storage.

#### **Internet Keyboards:**

The internet keyboards are designed to increase the comfort level of the internet user. The internet keyboards have hot-keys for the home page of the web browser, inbox and the favorites menu on your computer.



### **Multimedia and Gaming Keyboards:**

The multimedia and gaming keyboards are designed for playing audio and has hot-keys for volume control, play, stop and mute operations. The gaming keyboards are designed for the convenience of the gamers and these types of keyboards provide the required controls on the keyboards like backlighting.

### **Virtual Keyboards:**

The virtual keyboards are not actually physical keyboards, but they are simulated using software. Usually, the virtual keyboards are used in the PDA.

### **Point and Draw Devices:**

The effectiveness of Graphical User Interface (GUI) depends on the user's ability to make a rapid selection from a screen full of graphic icons or menus. In these instances the mouse can position the pointer over an icon quickly and efficiently. Computer artists use mouse to create images. Engineers use them to draw lines that connect points on a graph.

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### **Joystick:**

A joystick is mostly used in computer games where we are able to move the cursor from place to place, and to change our view. It is seldom used for office work and normal programs.

### **Trackball:**

Trackball is a pointing device that looks like a mouse lying on its back. To move the pointer, you rotate the ball with your thumb, your fingers, or the palm of your hand. There are usually one to three buttons next to the ball, which you use just like mouse buttons.



The advantage of trackballs over mice is that the trackball is stationary so it does not require much space to use it. In addition, you can place a trackball on any type of surface, including your lap. For both these reasons, trackballs are popular pointing devices for portable computers.

### Mouse Pen:

Mouse pen is a computer input device that helps to draw images and graphics, similar to the way one draws images with a pencil and paper. These tablets may also be used to capture data or handwritten signatures. It consists of a flat surface upon which the user may "draw" an image using an attached stylus, a pen-like drawing apparatus.

### Track Pads:

The track pad has no moving parts. Simply move your finger about a touch sensitive pad to move the graphics cursor. It is usually used in laptops.

### Image Scanner:

An image scanner is a device which scans pictures, text or objects and converts them to digital images. The basic types of image scanners are flatbed, hand held, film and drum scanners. In flatbed scanners we place an object or document on a glass pane and an opaque cover is lowered over it. A sensor and light moves along the pane, reflecting off the image placed on the glass. The cover prevents other light from interfering and the image becomes visible to the detector.

### Digital Camera:

A digital camera is a camera that takes video or still photographs, or both, digitally by recording images via an electronic image sensor.

Digital cameras can do things film cameras cannot do. Digital camera can display images on a screen immediately after they are recorded. It can store thousands of images on a single small memory chip. We can also record video with sound, and deleting images to free storage space. Some can crop pictures and perform other elementary image editing. Fundamentally they operate in the same manner as film cameras.

Digital cameras are incorporated into many devices ranging from PDAs and mobile phones (called camera phones) to vehicles. The Hubble Space Telescope and other astronomical devices are essentially specialized digital cameras.

## OUTPUT DEVICES:

### Printers:

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There are two broad categories of printers, impact and non-impact printers. In impact printers printing is achieved by pressing the solid characters against a ribbon, which in turn prints the impression on paper almost like a typewriter. A line of print is achieved by moving a print head across the page. Here are some types of commonly used printers.

### Dot Matrix Printers:

A dot matrix printer is an impact printer. It is a type of computer printer with a print head that runs back and forth, or in an up and down motion, on the page and prints by impact, striking an ink-soaked cloth ribbon against the paper, much like the print mechanism



on a typewriter. Each dot is produced by a tiny metal rod, also called a "wire" or "pin", which is driven forward by the power of a tiny electromagnet or solenoid. The moving portion of the printer is called the print head. Most dot matrix printers have a single vertical line of dot making equipment on their print heads; others have a few interleaved rows in order to improve dot density. Print heads may have 9 to 24 pins. These pins are activated independently to form a dotted character image as the print head moves horizontally across the paper. The quality of the printed output increases with the number of dots in the letter matrix.

### **Ink-Jet Printers:**

A type of printer that works by spraying ionized ink at a sheet of paper. Magnetized plates in the ink's path direct the ink onto the paper in the desired shapes. A typical ink-jet printer provides a resolution of 300 dots per inch, although some newer models offer higher resolutions.

In general, the price of ink-jet printers is lower than that of laser printers. However, they are also considerably slower. Another drawback of ink-jet printers is that they require a special type of ink that does not smudge on inexpensive copier paper.

Because ink-jet printers require smaller mechanical parts than laser printers, they are especially popular as portable printers. In addition, color ink-jet printers provide an inexpensive way to print full-color documents.

### **Laser Printers:**

A type of printer that utilizes a laser beam to produce an image on a drum. The light of the laser alters the electrical charge on the drum wherever it hits. The drum is then rolled through a reservoir of toner, which is picked up by the charged portions of the drum. Finally, the toner is transferred to the paper through a combination of heat and pressure. This is also the way copy machines work. Because an entire page is transmitted to a drum before the toner is applied, laser printers are sometimes called page printers. One of the main characteristics of laser printers is their resolution (how many dots per inch they can print). The available resolutions range from 300 dpi at the low end to 1,200 dpi at the high end.

### **Plotters:**

A device that draws pictures on paper based on commands from a computer. Plotters differ from printers. Plotters draw lines using a pen. As a result, they can produce continuous lines, whereas printers can only simulate lines by printing a closely spaced series of dots. Multicolor plotters use different-colored pens to draw different colors. In general, plotters are considerably more expensive than printers. They are used in engineering applications where precision is mandatory.

### **Monitors:**

A monitor or display (sometimes called a visual display unit) is an electronic visual display for computers. The monitor comprises the display device, circuitry, and an enclosure. The size of a display is usually given as the distance between two opposite screen corners. Display screen varies in size from 5 to 30 inches. Output on a monitor is soft copy, which means it is temporary and available to the end user only until another display is requested.

### **Monochrome Monitors:**

Monochrome monitor is a type of computer display which was very common in the early days of computing, from the 1960s through the 1980s, before the color monitors became popular. They are still used today in some computerized cash register systems, amongst other select applications.



Unlike color monitors, which display text and graphics in multiple colors monochrome monitors have only one color of phosphor (mono = one, chrome = color). All text and graphics are displayed in that color.

### **Color Monitors:**

A display monitor that is capable of displaying many colors. In contrast, a monochrome monitor can display only two colors one for the background and one for the foreground. Color monitors implement the RGB color model by using three different phosphors that appear red, green, and blue when activated. By placing the phosphors directly next to each other, and activating them with different intensities, color monitors can create an unlimited number of colors. In practice, however, the real number of colors that any monitor can display is controlled by the video adapter.

### **Flat Panel Monitors:**

A flat panel monitor can refer to either a computer or television monitor that does not use cathode ray tube (CRT) technology, but commonly LCD or plasma technology. This allows the monitor to have a thin profile, which is how the flat panel monitor gets its name. Because of its light weight, clarity and digital technology, the flat panel monitor has become the monitor of choice.

Laptop PCs use space saving flat-panel monitors some less than 1/2 inches thick. Flat panel monitors use a variety of technologies, the most common being Liquid Crystal Display (LCD) and Thin Filament Technology (TFT). LCD displays are more expensive than passive matrix displays therefore active matrix LCD displays are usually associated with high-end notebook PCs.

### **Touch Screen Monitors:**

A touch screen is an electronic visual display that can detect the presence and location of a touch within the display area. The term generally refers to touch or contact to the display of the device by a finger or hand. Touch screens can also sense other passive objects, such as a pen. However, if the object sensed is active, as with a light pen, the term touch screen is generally not applicable. The ability to interact physically with what is shown on a display (a form of "direct manipulation") typically indicates the presence of a touch screen.

The touch screen has two main attributes. First, it enables one to interact with what is displayed directly on the screen, where it is displayed, rather than indirectly with a mouse or touchpad. Secondly, it lets one do so without requiring any intermediate device, again, such as a stylus that needs to be held in the hand. Such displays can be attached to computers or, as terminals, to networks. They also play a prominent role in the design of digital appliances such as the personal digital assistant (PDA), satellite navigation devices, mobile phones, and video games.

### **Speaker:**

Speakers are also part of output devices. These help user to get the audio output. Computer speakers range widely in quality and in price. The computer speakers typically packaged with computer systems are small plastic boxes. Some of the slightly better computer speakers have equalization features such as bass and treble controls, improving their sound quality somewhat.



**Projector:**

A video projector takes a video signal and projects the corresponding image on a projection screen using a lens system. All video projectors use a very bright light to project the image, and most modern ones can correct any curves, blurriness, and other inconsistencies through manual settings. Video projectors are widely used for conference room presentations, classroom training, home theatre and live events applications. Projectors are widely used in many schools and other educational institutes, connected to an interactive white board to interactively teach pupils.

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**QUESTION NO. 4**

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Microsoft Office Word helps 2007 is beautiful application software provided by Microsoft Corporation helps you produce professional-looking documents by providing a comprehensive set of tools for creating and formatting your document in a new interface. Advanced data integration ensures that documents stay connected to important sources of business information.

In this section you are reminded of how to start Word, create a new file, and open existing files. You can also reference common word processing tasks such as indenting, navigating in the document, selecting information, and moving and copying text. Special features help you create documents and enter information more quickly, such as the Letter Wizard, templates, AutoComplete, AutoCorrect, and AutoText.

**MAIN FEATURES OF MICROSOFT WORD:**

Microsoft Word 2007 is the most powerful and useful word processing tool. The salient features of Microsoft Word are as follows:

- (1) It helps us to maintain our documents in presentable formats.
- (2) It provides us a wide range of fonts and formats for characters, paragraphs, borders and lines etc.
- (3) User can make their custom format styles instead of using the built-in styles.
- (4) It provides us the track of all the activities, which we perform here. This option helps the user to cancel or repeat any specific action performed.
- (5) Microsoft Word provides us Spelling and Grammar option in order to avoid spelling and grammatical mistakes in any document.
- (6) User can arrange the data in tabular or sequential form by using the Table option.
- (7) It is highly compatible with all other office application software.
- (8) It facilitates the user to import and export the information to and from the Internet.
- (9) User can avail the facility of adding pictures and other graphical images to enhance the outlook of any document.
- (10) User can work on more than one document simultaneously.

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**QUESTION NO. 5**

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See Paper 2014 Question No. 8



## QUESTION NO. 6

**NETWORK TOPOLOGIES:**

"The physical layout of a Network is called Network Topology". The Topology of a network refers to the configuration of cables, computers, and other peripherals.

**TYPES OF NETWORK TOPOLOGIES**

- ◆ Bus or Linear Topology
- ◆ Ring or Token Topology
- ◆ Star Topology
- ◆ Tree Topology
- ◆ Mesh Topology
- ◆ Hybrid Topology

**➤ Bus or Linear Topology:**

Bus consists of a single linear cable called a trunk. Data is sent to all computers on the trunks. Each computer examines every data packet on the wire to determine either this packet is for it or not, and accepts only messages addressed to them. Performance degrades when computers are added to the bus. Signal bounce is eliminated by an end terminator at each end of the bus.

**(ADVANTAGES)**

- ◆ Easy to connect to a computer or peripheral.
- ◆ Requires less cable length.
- ◆ Inexpensive hardware.
- ◆ Adding additional nodes is easy.

**(DISADVANTAGES)**

- ◆ Entire network shuts down if there is a break in the main cable.
- ◆ Terminators are required at both ends.
- ◆ Difficult to identify the problem if the entire network is shuts down.

**➤ Ring or Token Topology:**

In a ring topology, computers are connected on a single circle of cable. Each computer repeats and keeps the signal strong. No terminator is required. Each node must determine whether or not any received data is for its use and if not, it passes the data on to its neighbor.

**(ADVANTAGES)**

- ◆ All connected computers have equal access and has the same opportunity to transmit.
- ◆ Adding additional nodes is easy.

**(DISADVANTAGES)**

- ◆ It is difficult to configure.
- ◆ Media failure can stop all communication.
- ◆ Problem detection and solving is difficult.



### > Star Topology:

A star topology is designed with each node (file server, workstations, and peripherals) connected directly to a central network hub or switch (also called Concentrator). Data on a star network passes through the hub or concentrator before continuing to its destination. The hub or switch manages and controls all function of the network.

#### (ADVANTAGES)

- ◆ Easy to install and wire.
- ◆ No problem to the network then connecting or removing devices.
- ◆ Easy to detect fault and remove parts.

#### (DISADVANTAGES)

- ◆ Requires more cable length than a linear topology.
- ◆ If the hub or concentrator fails, nodes attached are disabled.
- ◆ More expensive than linear bus topologies because of the cost of the concentrators.

### > Tree Topology:

Basically the tree topology integrates multiple star topologies together onto a bus. In its simplest form, only hubs of different star networks are connected to together. Each hub acts as a branch of central tree. This type of network has combined features of bus and star network. Tree topology is used for the expansion of an existing network. The bus works as the backbone cable for the network.

#### (ADVANTAGES)

- ◆ Point-to-point wiring for individual segments.
- ◆ Supported by many hardware and software producers.

#### (DISADVANTAGES)

- ◆ Wiring and configuration is more difficult as compare to other topologies.
- ◆ If the backbone (central cable) breaks down, then the whole network breaks down.
- ◆ Overall length of each section is limited by the type of wiring used.

### > Mesh Topology:

Mesh topology is also called a completely connected network. It has a separate physical link for connecting each node to any other node. Thus each computer of such network has a direct dedicated link, called a point-to-point link with all other computers of the network. The control is distributed among each computer deciding its communication priorities.

#### (ADVANTAGES)

- ◆ This type of network is very reliable, as any line breakdown will affect only the point to point communication between the connected computers.
- ◆ Due to multiple links mesh network can work fine even under severe loads.
- ◆ Communication between two nodes is very fast.



**(DISADVANTAGES)**

- ◆ It is very expensive system from the point of view of line cost. If there are (k) nodes in the network, then  $k(k-1)/2$  links are required. That's why the cost of linking the system is very high.
- ◆ Mesh network is difficult to create and very difficult to maintain.
- ◆ Addition of new nodes in the network is very difficult.

**➤ Hybrid Topology:**

Different network configurations have their own advantages and disadvantages. Hence, in reality, a pure star or ring or mesh network is rarely used. Instead, an organization will use some sort of hybrid network, which is the combination of two or more different network topologies. The exact configuration of the network depends on the need and overall organizational structure of the company involved.

**QUESTION NO. 7****DATA PROCESSING:**

"Performing a series of actions, or operations on data to convert them into useful information".

**(OR)**

"The series of actions or operations that convert data into useful information is called data processing."

**Example:**

A shopkeeper applies different calculations on data to know his daily expenses and profit. And the process of applying calculations on data is called data processing.

**LEVELS OF DATA PROCESSING**

The data processing system is used to include the resources such as people, procedures, and devices that are used to achieve the processing of data for producing desirable output. According to resources data processing is divided in three levels, which are:

- ◆ Level 1 : Manual Data Processing
- ◆ Level 2 : Mechanical Data Processing
- ◆ Level 3 : Electrical Data Processing

Now we will describe each level of data processing:

**➤ Level 1 : Manual Data Processing:**

At the initial stage of data processing, data is collected manually. In collection of data normally men / women are involved and there is no involvement of machinery. In this level manual calculations on data are also involved.

**Example:**

Wages of laborers in a factory is collected manually and the wages paid to the Labour are collected at the end of month manually. Some people only use this level of processing to get output or information.



**Level 2 : Mechanical Data Processing:**

In mechanical data processing different machine are used by men for data processing. Normally calculators and small calculating machines are used at this level.

**Example:**

Average wages paid to laborers can be calculating by using calculators.

**Level 3 : Electrical Data Processing:**

The work carried out by a computer system is often known as Electronic Data Processing (EDP) which means the use of electronic machine to derive results by means of arithmetic and logic operations from the data entered in it.

The level of electronic data processing is normally used now a days to process data. Electronic data processing is based on computers. In this level computers are involved totally. Data is being input into computers and computers perform processing automatically. After processing they provide us information.

**Example:**

You often use ATM machines at banks to get money and these machines also inform you about your account balance. Computerized electronic machines do this whole work. In big industries or factories payroll systems, production and accounts system is controlled by electronic computerized machines.

**QUESTION NO. 8**

**(a) DATA COMMUNICATIONS:**

Communication means the exchange of information or messages. When we talk with each other, we are exchanging information. Data communication is the exchange of data between two devices (computers) via some form of transmission medium such as wire cable, wireless system, microwave system, satellite system etc. The communicating devices must be the part of a communication system. The communication system may consist of hardware and software. In data communication process data is transmitted electronically from one system to other system using standard methods.

The data transmitted from one place to another in form electromagnetic or light waves through communication medium. The electromagnetic or light waves representing data are called signals. Data communication signals can be in analog or digital form.

Therefore data transmission is divided into:

- (1) Analog Data Transmission
- (2) Digital Data Transmission

**(1) Analog Data Transmission:**

The transfer of data from one place to another in the form of analog signals or in the form of continuous waves is called analog data transmission. The analog signal consists of a continuous electrical wave. The light waves, sound waves or radio waves are examples of analog signals. The transmission through telephone line, microwave system or satellite is the example of analog data transmission. An analog signal is shown in figure below.

**(2) Digital Data Transmission:**

The transfer of data from one place to another in the form of digital signals is called digital data transmission: A digital signal consists of individual electrical pulses that represent bits grouped together into bytes. Computer accepts and processes data in the form