Chapter 01 : Basics of Information Technology

1.0 Overview

Q : 01-00-01 : What is a Global Village ? Define or Describe Global Village ?
Q : 01-00-01 : How the World has become a Global Village today ?
Answer :
Information is the key factor in this era and is the most precious commodity today. Everything evolves around information and communication which play key role in the functionality and existence of each system. Information Technology (IT) has virtually made one-community area "**Global Village**". The computer users are almost always sharing and exchanging their information in such a manner as if they are sitting in a drawing room **face to face**.

Q : 01-00-02 : What is Data ? Define or Describe Data ?
Answer :
The raw facts and figures, that are, not meaningful. These are used in processing to produce meaningful information.

Q : 01-00-03 : What is Information ? Define or Describe Information ?
Answer :
The facts and figures about anything i.e. The know-how about any object that exists and plays its role in any system. This must be meaningful.

Q : 01-00-04 : What is System ? Define or Describe System ?
Answer :
The system is any identified and known work that accepts data / information into itself, manipulates in the shape of certain output(s) and delivers so that it becomes useful and meaningful.

Q : 01-00-05 : What is Information Technology ? Define or Describe IT ?
Answer :
Information Technology or IT" merges computing with high speed communication links carrying data in the form of text, sound, images, video etc, from place to place over the World. The computer systems are networked in such a way that the data / information stored / processed on them is always available from anywhere, at any place, at any moment.

Q : 01-00-06 : What is Digital Convergence ? Define or Describe Digital Convergence ?
Answer :
The "**Digital Convergence**" is the technological merger of various industries / enterprises through some electronic gadgets that exchange information between them. It means that from a common electronic base, information can be communicated to any shape that the users are accustomed to see i.e. photographs, movies, audio, graphical shapes, text form, analog diagrams etc.

Q : 01-00-07 : What is The **Modern Scenario** of **IT** ? Define, Describe or Discuss Briefly The **Modern Scenario** of **IT** ?

Answer :

The impact of IT has broadened the base of computing and communication through satellite, fiber-optic, mobile phone, fax machine, multi- media / hyper-media, e-commerce, m-commerce etc. etc. Fantastic scenario of computer utilization is in the fields like :

a.   Artificial Intelligence
b.   Web-based Applications
c.   E-commerce, M-commerce (Mobile Commerce)
d.   Computer Animation
e.   Multi-media, Hyper-media
f.   Distributed Computing

1.01 Hardware and Software

Q   :   01-01-01   :   What is Hardware ? Define or Describe Hardware ?

Answer :

The physical parts of a machine or computer which we can see, touch or have weight. Input and output devices are part of the machine hardware.

Q   :   01-01-02   :   What is Machine ? Define or Describe Machine ?

Answer :

A "**MACHINE**" is hardware. It is an artifact (man made) used to accomplish a well defined task.

Q   :   01-01-03   :   What is Software ? Define or Describe Software ?

Answer :

A program is called software, it is not hardware, it has the instructions and data for processing in the computer.

Q   :   01-01-04   :   What is Computer System ? Define or Describe Computer System ?

Answer :

[A "COMPUTER" is a machine that can be programmed to accept data (input), process it into useful information (output), and store it away (in a secondary storage device) for safekeeping or later reuse]. Input and output devices are part of the machine that can be called "Complete Computer System".

The related important definitions are :

Input Devices : Accept data in a form that the computer can use, and then sends it to the processing unit.

CPU : The central processing Unit (CPU) or processor, has the electronic circuitry that manipulates (as ordered in program or instructions) input data into the form of useful information. The processor executes the instructions (Programs) in a logical sequence.

Output Devices : Show us the processed data i.e. information, in the shape we want it.

Primary Storage, Main Memory or Random Access Memory (RAM) : It can hold data and programs only temporarily. Data on RAM is lost when we shut down the computer.

Secondary Storage : Usually called storage, which consists of secondary storage devices, such as hard disk, floppy diskettes, CDs, DVDs etc which can store data and programs outside the computer

itself. This data persists between two sessions of computer (when we use computer after first shutting it down, the programs and data remain intact). These devices actually supplement main memory or RAM.

Q   :   01-01-05   :   Briefly Describe Software and give its classification ?

Answer :

Software : A program or instructions, it is not hardware, it has the instructions and data for processing in the computer.

System Software : Controls the usage and allocation of different hardware components / devices and enables the other (user) application programs to execute. Operating Systems, Utility Programs (Backup/Restore) or Drivers etc.

Application Software : A software that has been developed to solve a specific (user) problem.

    Custom-Built Software : This software is designed and developed for a particular customer.

    Packaged software : Off-the-shelf programs or components, developed for sale to the potential users for examples MS-Word, MS-Excel, Oracle etc.

1.02   Input and Output Devices

Q   :   01-02-01   :   What is Keyboard ? Define or Describe Keyboard ?

Answer :

The keyboard may look like a typewriter keypad to which some special keys have been added. The keys normally available on the keyboards are Numeric, Alphabetic, Function and additional Special-purpose keys.

Q   :   01-02-02   :   Briefly Describe Pointing Devices used for input ?

Answer :

[**Pointing devices control the position of the cursor or pointer on the screen**].

Mouse : It is an input device that looks a little bit like a mouse. It has a ball on its underside (now we have optical mouse which has optical censor underside) that is rolled on a flat surface or mouse-pad. The rolling movement causes a corresponding cursor movement on the screen. It also has buttons often used to click on icons to invoke the command.

Trackball : The trackball is a movable ball, on top of a stationary device (laptop), that is rotated with fingers or palm of the hand. It looks like the mouse turned upside down and has additional buttons for various functions.

Pointing Stick : It looks like a pencil eraser protruding from the keyboard between the G, H, and B keys. We move the pointing stick with our forefinger while using the thumb to press buttons located in front of the space bar.

Joystick : It consists of a vertical handle like a gearshift lever mounted on a base with one or two buttons. It is used in video games.

Touch Pad : It is a small, flat surface over which we slide our finger, using the same movements as we would with a mouse. As we move the finger, the cursor follows the movement. We "click" by tapping the finger on the pad's surface or by pressing button positioned close by the pad.

Touch Screen : A touch screen is a video display screen that is sensitized to receive input from simply touching our fingers onto it. It is covered with a plastic layer, behind which are invisible beams of infrared light. We simply touch the provided buttons or menus and get the information on

the display screen.

Light Pen : A light-sensitive Stylus, or pen-like device, connected by a wire to the computer terminal. The user brings the pen to a desired point on the display screen and presses the pen button, which identifies that screen location to the computer. Engineers, graphic designers, and illustrators use light pens.

Digitizing / Graphic Tablet : A tablet connected by a wire to a stylus or puck. A stylus is a pen-like device with which the user "sketches" an image. A puck is a copying device with which the user copies an image, such as an architectural drawing or a civil engineering map. A puck looks a bit like a mouse but has different types of buttons and a clear plastic section extending from one end with crosshairs printed on it. The intersection of the crosshairs points to a location on the graphics tablet, which in turn is mapped to a specific location on the screen.

Pen-Based Systems : These computers use a pen-like stylus to allow people to enter handwriting and marks onto a computer screen rather than typing on a keyboard. This system connects an instructor's electronic "whiteboard" on the classroom wall with student's pen computers, so that the students could receive notes directly, without having to write.

Q   :   01-02-03   :   Briefly Describe Scanning Devices ?

Answer :

[**Source Data-Entry Devices or Scanning Devices are used for direct data entry to the computer systems**]. Scanners use laser beams and reflected light to translate images of text, drawings, photos, and the like into digital form.

Bar-Code Reader : Bar-Codes are the vertical zebra-stripped marks on the manufactured products in the market. Bar-code system is also called "Universal Product Code". Bar-code readers (photoelectric scanners) read and translate the bar-code symbols into digital code, which is then fed to the computers for further processing.

Magnetic-Ink Character Recognition (MICR) : A method of machine-reading characters made of magnetized particles. MICR characters, which are printed with magnetized ink, are read by MICR equipment, producing a digitized signal, which goes to the computer as data for further processing.

Optical Mark-Recognition (OMR) : Optical recognition systems use a light beam to scan input data to convert it into electrical / digital signals, which are then sent to the computer for processing. SAT and GRE test marking (multiple choice questions).

Optical Character-Recognition (OCR) : It reads preprinted characters in a particular font and converts them to digital code. The common examples are some utility bills, and price tags in the departmental stores.

Magnetic-Strip Cards : It is a strip of magnetically encoded data on the back of card. These are used for personal identification during driving, in the stores, at public places etc.

Smart-Cards : It looks like a credit card but a microprocessor and memory chip have been added additionally. When inserted into a reader, it exchanges data with the corresponding information on a central computer. It can store some basic information. A Mobile-SIM card and an ATM card are good examples.

Fax Machine : The fax or facsimile transmission machine scans an image and sends it as electrical signals over telephone lines to a receiving fax machine, which re-creates the image on paper. Dedicated fax machines and fax modem cards.

Imaging System : Image scanner (graphic scanner) converts text, drawings, and photographs into digital form and stores it to the computer system for further processing. The system scans each image

with light and breaks the image into light and dark dots or color dots, which are then converted to digital form. Its called **raster graphics**.

Q   :   01-02-04   :   Briefly Describe Audio / Video Input Devices ?

Answer :

Audio-Input Device : It records analog sound and translates it for digital storage and processing. Sound (analog form) goes through a special circuit board (audio board), which converts analog sound to digital form and stores it for further processing. Microphone is an audio-input device.

Video-Input Device : Films and video images from VCR or camcorder are converted to digital form with the help of a special digitizing card (video-capture card).

> **Frame-Grabber Video Card** : It can capture and digitize only a single frame at a time.
> **Full-Motion Video card** : It can capture / convert analog to digital signals at the rate of 30 frames per second, like motion picture.

Digital Camera : A digital camera uses a light-sensitive processor chip to capture photographic images in digital form on a disk or flash-memory chips. The digital form is then uploaded to the computer for manipulation and printing.

Q   :   01-02-05   :   Briefly Describe Output Devices ?

Answer :

Output Device : The information processed by the computer is translated into a form that we understand, and displayed by these machines. The examples are printouts (text or graphics), sound, video etc.

Display Screens : CRTs (Cathode Ray Tube), Monitors, or simply screens, differ in size, color, resolution, and video display adapter card.

> **Size** : Monitors come in different sizes, from small screen built into palmtops and laptop to extra large monitors used for special purposes.
> **Color** : Many monitors display color. These Red, Green, and Blue (RGB) displays can create *256* colors and several thousand variations on them by blending shades of RGB. Monochrome displays show information using a single foreground color on a contrasting background color.
> **Resolution** : All the characters and images on a monitor are made up of dot patterns (pixels); the number of pixels per inch determines resolution, or the sharpness of the image. A higher number of pixels means a shaper and better image.

Video Display Adapters : Video display adapter or card is a circuit board that determines the resolution, number of colors, and speed with which images appear on the display screen.

> **VGA (Video Graphics Array)** : Supports 16-256 colors, depending on screen resolution. 16 colors at 320 x 200 pixels, and 256 colors at 640 x 480 pixels. It is called 4-bit color.
> **SVGA (Super Video Graphics Array)** : Supports 256 colors at higher resolution than VGA. It has two graphics modes : 800 x 600 pixels and 1024 x 768 pixels. It is called 8-bit color.
> **XGA (Extended Graphics Array)** : Supports up to 16.7 million colors at a resolution of 1024 x 768 pixels. It can support 256, 65536, or 16,777,216 colors. It is called 24-bit color or True color. Now it is available in 32-bits or higher colors also.

Q   :   01-02-06   :   Briefly Describe Types of Screens ?

Answer :

CRT (Cathode-Ray Tubes) : [**A Cathode-Ray tube is a vacuum tube used as a display screen in a computer or video display terminal. A stream of bits defining the image is sent from the**

computer (CPU) to the CRT's electron gun, where the bits are converted to electrons. The inside of the front of the CRT screen is coated with phosphor. When a beam of electrons from the electron gun (deflected through a yoke) hits the phosphor, it lights up selected pixels to generate an image on the screen].

It is found in computer screens, television sets and flight information monitors on airport.
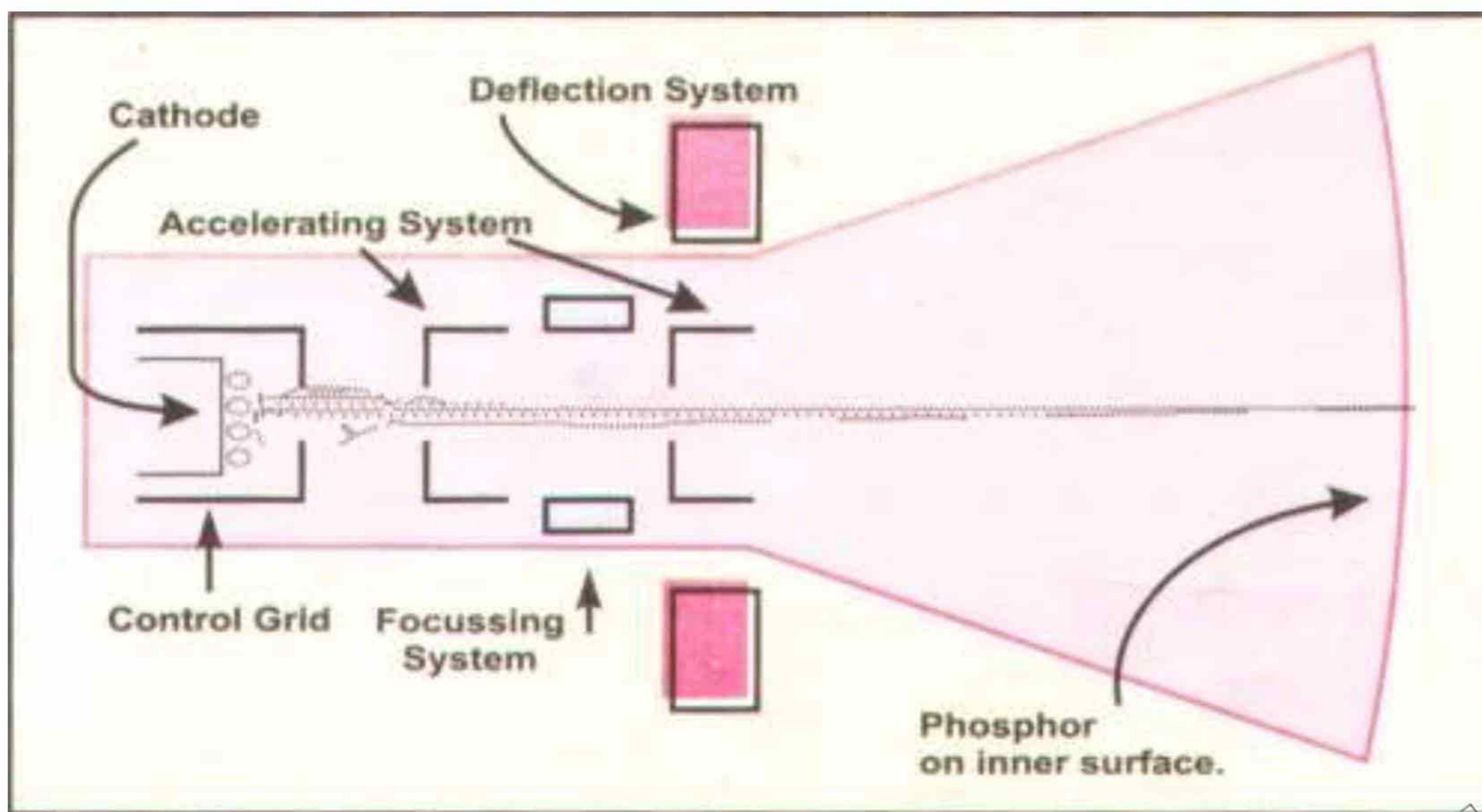
Flat-Panel Displays : The flat-panel displays are thinner, lighter, and consume less power than CRT, and hence better for portable computers. [Flat-panel displays are made up of two plates of glass with a substance in between them, which is activated in different ways.]

LCD (Liquid-Crystal Display) has liquid crystal, the molecules line up in a way that lighting behind the screen is blocked or allowed through to create an image.

EL (Electro- Luminescent Display) contains a substance that glows when it is charged by an electric current.

Gas-Plasma display is like a neon bulb, in which the display uses a gas that emits light in the presence of an electric current.

Q : 01-02-07 : Briefly Describe Various Types of Printers and Plotters ?

Answer :

Printers : Printers are used to print characters, symbols, and graphics on paper.

Impact Printers : An impact printer forms characters or images by striking a hammer or wheel against an inked ribbon.

Dot-Matrix Printer : It contains a print head of small pins, which strike inked ribbon against paper, forming characters or images. Print heads are available with 9, 18, or 24 pins.

Daisy-Wheel Printer : A series of petals arranged on a petal wheel; having a character at the end of each petal. A character comes into a print position by wheel rotation and an image is formed by the hammer strike on the desired character. It is slower than dot-matrix printer but better in quality of print.

Line Printer : It prints a whole line of characters at once rather than a single character at a time. Some of these can print up to 3000 lines per minute.

Non-Impact Printers : Print characters or images without making direct physical contact between printing mechanism and paper.

Laser Printer : The images are created on a drum, treated with a magnetically charged ink-like toner (powder), and then transferred from drum to paper. The laser printer can produce high quality images of both text and graphics (ranging from 300 dpi to 1200 dpi – dpi means dots per inch).

Ink-Jet Printer : Ink-Jet printer sprays small, electrically charged droplets of ink from four nozzles through holes in a matrix at high speed on to paper. It is cheaper compared to laser printer but lower in resolution (300- 720 dpi) and is slower also (1-6) text-only pages per minute. It has another type of printer i.e. Bubble-Jet Printer, which uses miniature heating elements to force specially formulated inks through print heads with 128 tiny nozzles.

Thermal Printer : Thermal printer uses colored waxes and heat to produce images by burning dots on to special paper. It produces a high quality printout but is quite expensive.

Plotters : A plotter is used to produce high-quality graphics in many colors and used for specialized applications i.e. architectural drawings, maps, graphs, and charts. Plotters are of two basic kinds.

Flatbed Plotter : A flatbed plotter is the one, which has a paper lying flat on a table-like surface. One to four color pens move across the paper and the images are printed by the computer.

Drum Plotter : Paper is mounted over a drum, enabling a continuous output. A typical usage is to track earthquake readings.

Q   :   01-02-08   :   Briefly Describe Sound Output ?

Answer :

Speakers are used to get audio output as microphone is used to input audio data to the computer.

1.03   System Software vs Application Software

Q   :   01-03-01   :   Describe or Differentiate between System and Application Software?

Answer :

System Software vs Application Software

The System Software : It manages hardware and software resources of the whole computer system i.e. Operating system, Backup and Restore utility program, drivers etc.

Application Software (Computer Programs) : Programs used to accomplish a given task (of a user). It is designed and implemented by the computer professionals. It has many forms / categories i.e. Commercial software, Scientific software, Financial packages, Games etc.

1.04   Basic Units Of Data Storage

Q   :   01-04-01   :   What is Computer Memory ? How various types of data are represented in the memory ?

Answer :

[The memory (main or primary) is composed of an electronic circuitry, which is a combination of "ON" and "OFF" switches. This On / Off state has been conceived by the computer's manufacturers as the numbers "1" and "0", as the circuit can show 1 (ON state) or 0 (OFF state) at a given time.] Based on these binary numbers, the computer can construct sophisticated ways of representing data

in the memory. [Converting the numbers, alphabets, and characters (and their combinations) into binary digits enable us to represent them in the computer memory.]

Binary Digit (BIT) : The binary number 1 or 0 is called a **BIT** (binary digit), which is the basic unit for storing data in the computer memory.

BYTE : A byte is a combination of 8-bits, that can store a single character of data (a letter, numeral or special character). The capacity of the memory or the storage is expressed in terms of number of bytes it can hold or store.

Unit	Bytes		Bits		Pronounced
BIT			2^0	1	Bit
Byte	2^0	1	2^3	8	Byte
Kilobyte-KB	2^{10}	1024	2^{13}	8096	Thousand Bytes
Megabyte-MB	2^{20}	1048576	2^{23}	8388608	Million Bytes
Gigabyte–GB	2^{30}	1073741824	2^{33}	8589934592	Billion Bytes
Terabyte–GB	2^{40}	1099511627776	2^{43}	8796093022208	Trillion Bytes
Petabyte-PB	2^{50}	1125899906842624	2^{53}	9007199254740992	Quadrillion Bytes
Exabyte-EB	2^{60}	1152921504606846976	2^{63}	9223372036854775808	Quintillion Bytes
Zettabyte-ZB	2^{70}	1180591620717411303424	2^{73}	9444732965739290427392	Sextillion Bytes
Yottabyte–YB	2^{80}	1208925819614629174706176	2^{83}	9671406556917033397649408	Septillion Bytes

Reference Table for Calculations

Prefix	Symbol(s)	Power of 10	Power of 2
yocto-	Y	10^{-24}	--
zepto-	Z	10^{-21}	--
atto-	A	10^{-18}	--
femto-	F	10^{-15}	--
pico-	P	10^{-12}	--
nano-	N	10^{-9}	--
micro-	μ	10^{-6}	--
milli-	M	10^{-3}	--
centi-	C	10^{-2}	--
deci-	D	10^{-1}	--
(none)	--	10^0	2^0
deka-	D	10^1	--
hecto-	H	10^2	--
kilo-	k or K *	10^3	2^{10}
mega-	M	10^6	2^{20}
giga-	G	10^9	2^{30}
tera-	T	10^{12}	2^{40}
peta-	P	10^{15}	2^{50}
exa-	E	10^{18}	2^{60}
zetta-	Z	10^{21}	2^{70}
yotta-	Y	10^{24}	2^{80}
* k = 10^3 Communication and K = 2^{10} used in Data Storage			

Example : Convert 133 TB of memory in Gigabytes, Megabytes, Kilobytes, Bytes and Bits ?
133 TB = 133 X 2^{10} GB = 133 X 2^{20} MB = 133 X 2^{30} KB = 133 X 2^{40} Bytes = 133 X 8 X 2^{43} Bits.

Q   :   01-04-02   :   What is Computer Word ? Explain word sizes ?

Answer :

Computer Word : The size of a CPU register, is defined as number of bits that constitute a common unit of data, as defined by the computer system. The larger the word, the more powerful is the computer.

Bytes Per Word	Bits	Era Of Computer
One Byte	8	Early Computer
Two Byte	16	Micro Computer
Single Word	32	Mainframe and some Mini-Computer
Double Word (DW)	64	Super Computing

Note : **An 8-bit machine could handle only one-byte (a character) at a time, whereas a 64-bit machine handles two words or 8 bytes at a time, making its processing speed eight times faster (in the same interval of time).**

Q   :   01-04-03   :   What is System ? What does it comprise of ?

Answer :

System : [**A combination of some related components that interact with each other to perform some specific tasks**]. It comprises of Hardware, Software, People / Users, Data / Information and Communication Setup.

1.05   System (Software) Development Life Cycle - SDLC

Q   :   01-05-01   :   Define SDLC ? Give SDLC Diagram including various phases ?

Answer :

SDLC : [**SDLC (System / Software Development Life Cycle) is an organized way to develop a successful system**]. It involved seven phases.
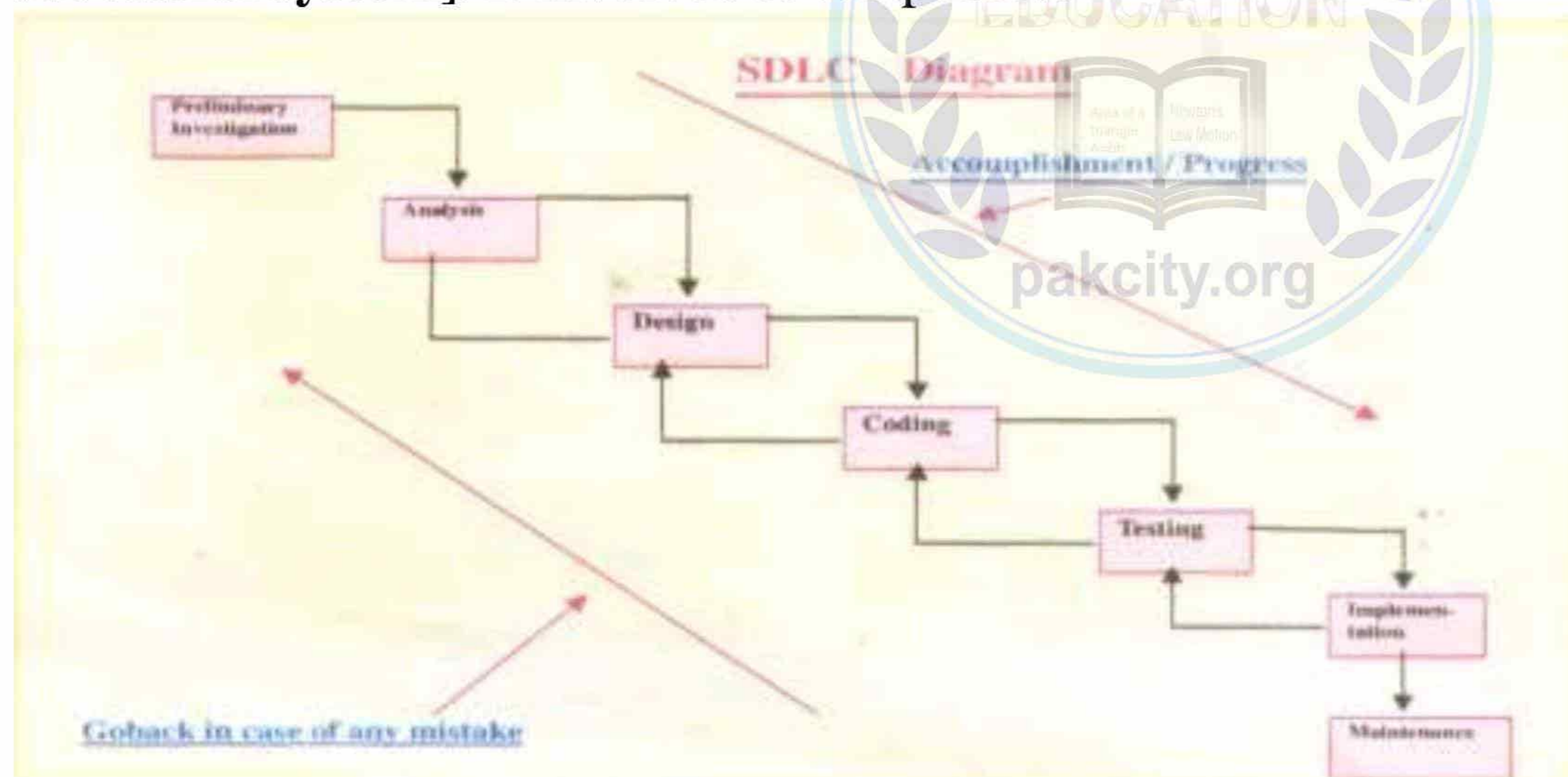
Preliminary Investigation
        System Identification
        System Scope
        Alternate Solutions

Feasibility Study
Preliminary Plan

System Analysis
Needs Analysis
Data Gathering
Written Documents
Interviews
Questionnaires
Observations
Sampling
Data Analysis
Analysis Report

Design
Logical Design
Physical Design
Report

Coding

Testing
Unit-Testing
System-Testing

Implementation
Direct Implementation
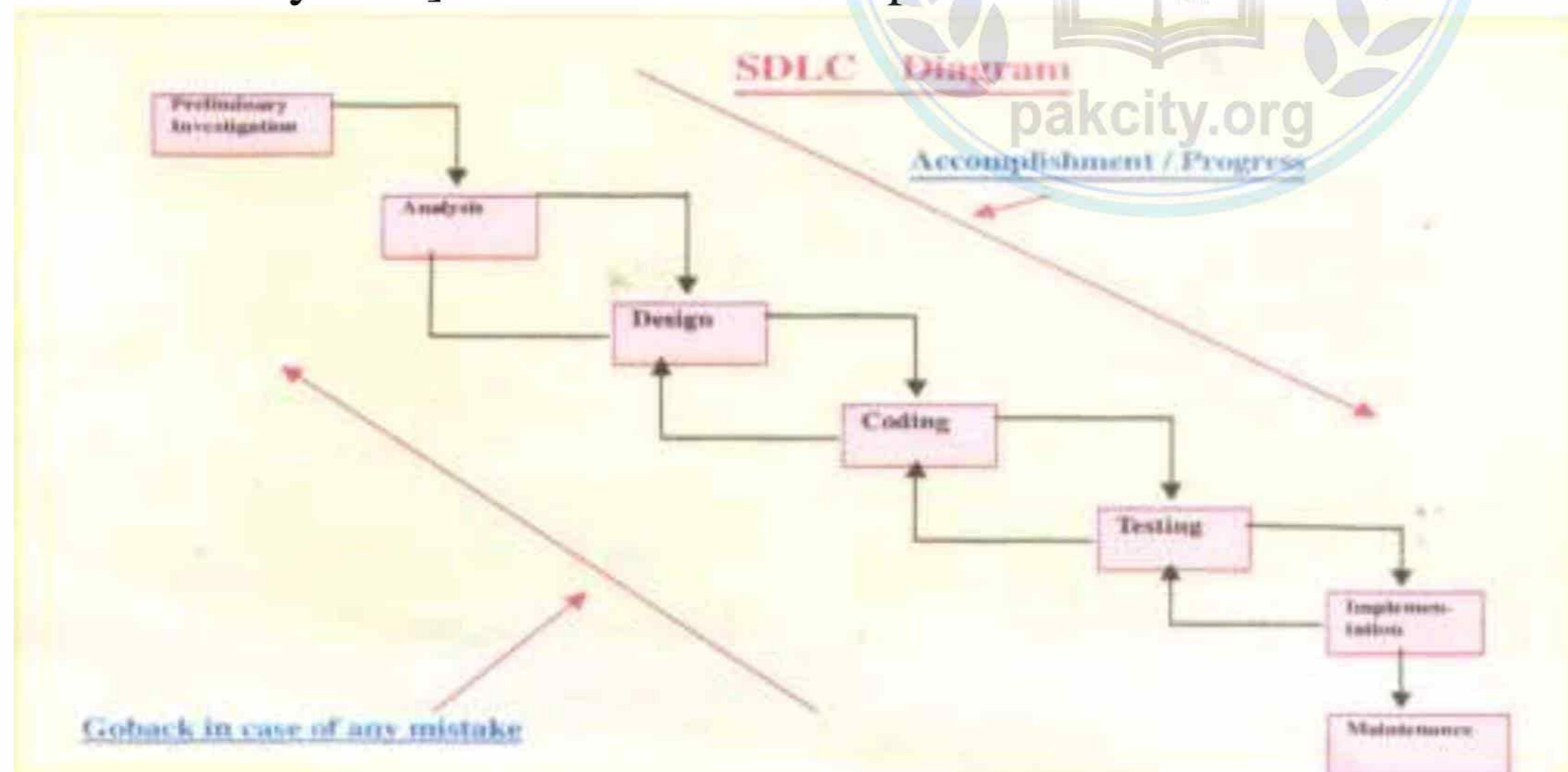Parallel Implementation
Phased Implementation
Pilot Implementation
User Training

Maintenance

Q   :   01-05-02   :   Define SDLC ? Explain SDLC with Diagram of various phases ?

Answer :

SDLC : [SDLC (System / Software Development Life Cycle) is an organized way to develop a successful system]. It involved seven phases.

The detailed breakdown of these phases :

Preliminary Investigation : The objective is to conduct an initial analysis and findings of the system.

> **System Identification** : The system is to be identified at this stage. Everything done in future will depend on the basis of this definition.
>
> **System Scope** : The scope of the system is established at this stage. Sometimes, it becomes necessary to curtail the projects to certain limits due to financial, political, or time constraints.
>
> **Alternate Solutions** : There may be alternate solutions to develop the system. Identify all those and choose the best one. The best strategy in this regard would be to interview the concerned people inside the organization, clients or customers of the system, suppliers and consultants. What the competitors are doing for the same type of systems ?
>
> **Feasibility Study** : We have to see the financial, political, and time-frame viabilities to go ahead for the system. There may be some social and technical constraints to be considered.
>
> **Preliminary Plan** : Wind up all findings and submit as a written document for approval. The readers of this document (also known as feasibility report) are top managers who will then decide about the future actions to be taken, based on this report. They might like to make few amendments in the project or shelve it.

System Analysis : Analyst will conduct following activities :

> **Needs Analysis** : It is also called Requirements Analysis. Analyst would sum up the requirements of the system from the users and the managers. The developed system should satisfy these requirements during testing phase.
>
> **Data Gathering** : Systems analyst uses different tools and methods for data gathering.
>
> > **Written Documents** : Handful information can be obtained from documents. These are reports, forms, memos, business plans, policy statements, organizational charts etc.
> >
> > **Interviews** : Interviewing the managers, users. clients, suppliers, competitors will help the analysts / designers to gain more knowledge about the system. The precise and relevant questions should be asked.
> >
> > **Questionnaires** : It may be **difficult to** interview many people, so it is **better to** design some questionnaires to collect the information *from* as **many** people as we like. This is very convenient and inexpensive method to collect data.
> >
> > **Observations** : The analyst or his team may go and watch the working, behavior, and similar things to know more about the similar systems around. He may be a participant or non-participant observer.
> >
> > **Sampling** : If there were a large number of people or events involved in the system, it would be better to work on a portion of all of them to save time.
>
> **Data Analysis** : Data must be accurate, complete, and readily available in the systems we design. We have many tools available. For example: DFDs (Data Flow Diagrams), System Flowcharts, Connectivity Diagrams, Grid Charts, and Decision Tables etc.
>
> **Analysis Report** : We document analysis work in a presentable form to the higher management for their review and approval of the project. This report should have three parts : First, it should explain how the current system (manual or automated if exists) works. Second, it should explain the problems in the existing system, and finally it should describe the requirements for the new system and make recommendations for future.

Design : Analyst works on the preliminary (Logical) design, detail (Physical) design, and then writes a detailed report.

Logical Design : It describes the general functional capabilities of a proposed system. It reviews the system requirements and considers the major system components. MS-Project, Gantt chart, PERT chart etc may be used to accomplish this.

Physical Design : It describes how a proposed system will deliver the general capabilities described in the Logical design. It will address output requirements, input requirements, storage requirements, processing requirements, and system control and backup / recovery.

Report : A detailed report on logical and physical design is to be submitted to the higher management along with some sort of presentation, explaining the proposed system.

Coding : Writing the segments and programs, which will be coupled together in the shape of a complete system. It needs a lot of time, effort and budget to acquire a workable system. The program specifications, algorithms, flowcharts are given to the programmers / software engineers to code the required programs. Off-the-Shelf-Components (already written programs) can also be used.

Testing : Having proper hardware acquired, the programs can be tested :

Unit-Testing : It is also called modular testing where individual modules, programs can be tested using test (sample) data.

System-Testing : Parts or modules are linked together to test their workability as a one system. Actual data may be used to do the system testing and erroneous data can be used to check whether the system fails or not.

Note : If the system passes all the tests, we can implement the servers, so that the organization and other clients can use it.

Implementation : This activity consists of transferring the hardware, software and data (files, database etc) to the new working environment (server). Users of the system are also trained in this phase. It includes:

Direct Implementation : Users start using the new system and stop working on the old one.

Parallel Implementation : New and old systems are used side by side until satisfied.

Phased Implementation : Parts of the system are implemented from time to time, until the whole system is implemented.

Pilot Implementation : Implement the complete system but to a selected group of users or selected department(s).

User Training : Involve the users in the SDLC process from the beginning and ensure their proper training is essential throughout the system design activity. A variety of methods / tools are used to do so i.e. Instruction Manual, Videotapes/CDs, and Lectures etc.

Comment : In general, the pilot and phased implementation are the most favored and popular approaches to implement the systems. Phased approach is preferable for organizations where different types of functions are carried out whereas Pilot approach is preferred where almost same type of work is going on in the organization.

Maintenance : The last phase adjusts and improves the system by considering the users evaluation, feedback, and enhancements based on their due recommendations. In this phase, due maintenance and help is also provided to the users against their queries, problems, and ambiguities.

Chapter 02 :   Information Networks

2.0   Overview

Q   :   02-00-01   :   What are Information / Computer Networks ?
Q   :   02-00-01   :   Define Information / Computer Networks ?

Answer :
Information networks (computer networks), are at the convergence of two important technologies : computing and telecommunications. This convergence has resulted in local area networks (LANs), metropolitan networks (MANs), wide-area networks (WANs), and the Internet.
A network is a large circulatory system, through which information continuously flows.

2.1   Workgroup Computing

Q   :   02-01-01   :   Define or Describe Workgroup Computing ?

Answer :
Workgroup computing is highly important aspect of modern World computing in today's business, academic, technological, and research oriented atmosphere. It is also known as collaborative computing and it enables the individuals and teams of certain projects to use computer networks for the purpose cooperation, consultation, and information sharing.

2.2   E-mail and Its Benefits

Q   :   02-02-01   :   Define E-mail and Describe its Benefits ?
Q   :   02-02-01   :   What are Benefits of E-mail ?

Answer :
E-mail : Electronic mail, is the process of sending messages directly from one computer to another (linked through wired or wireless connections).
Benefits of E-mail :
 Distance : We can communicate with anyone, anywhere. Distance or size of email does not matter. E-mail usually reaches its destination in a matter of minutes or seconds.
 The Cost of Message : It is cost-effective way to communicate with friends, colleagues, or business associates regardless of where they are physically located.
 The Content : We can send letters, notes, files, data, or reports all using the same techniques.
 No Interruption To Recipient : The recipient, working on the computer, is not interrupted by the arrival of the e-mail. It is put in his mail box (on the server) and can be seen and worked upon later, using the e-mail program.
 The User's Computers May Be Off : when the mails arrive (all will stay in the server) and can be read anytime (later).
 E-mails Are Not Anonymous : They always carry an address of the originator. Therefore, we are always sure about where it is coming from and where it is going to.

2.3   Internet

Q   :   02-03-01   :   Define Internet and Describe its History ?
Q   :   02-03-01   :   How and where was Internet Born ?

Answer :
Internet : [**The Internet is a huge network of connected computers that provide us a facility of exchanging data, messages, and files with other computers that are connected to the Internet**]. Internet has brought the world nations to the realization of a **"Global Village",** in which we feel, everyone as close as our neighbor.

History or The Birth of Internet :
During late l960s, it was designed as **ARPANET** (**Advanced Research Project Agency NETwork**) by the US Department of Defense - DARPA, in collaboration with other universities and research organizations. In the beginning, ARPANET was used mainly for communication technology research and development, with scientists at various sites connected through a network, to share the information.

Later, throughout l970s and 1980s, ARPANET evolved into several other networks dedicated mostly to military use. In 1989, all the previous networks, created for military use, were abandoned and replaced by **National Science Foundation's NSFNET**. The Internet has grown rapidly since 1990. According to the Internet Society (the monitoring organization), the number of computer networks in the Internet is more than Two Million and the number of computers that connect to these networks is more than Hundred Million.

Q   :   02-03-02   :   Define or Describe or Explain Components of Internet ?
Answer :
Components of Internet : World Wide Web is popular but actually, the Internet has many more components :

World Wide Web (www) : www is a collection of millions of uploading web pages / web sites. It organizes the Internet-related resources so that we can easily access the information available on the Internet.

Electronic mail (e-mail) : It is the process of sending and receiving messages and files among the Internet users.

Telnet : It is the software tool that allows one computer to connect to another computer and make use of the other computer's information.

File Transfer Protocol (FTP) : It is also an Internet software tool for transferring files from one computer to another. The process of transferring a file from a remote computer to our local computer is called **downloading**. The process of transferring a file from our own computer to the remote computer (on the Internet) is called **uploading**.

Gopher : It is an access and retrieval system covering a wide range of information, from reference materials to magazine articles to government documents and speeches.

Chat Groups : The Internet users with similar interests, form up their forums, to have online real-time discussions over the Internet.

Intranet : It is a privately owned, secure, business network based on Internet technology, although not necessarily connected to the Internet.

Extranet : An "extranet" is two or more intranets connected in such a way that they enable collaboration among the companies that own the separate intranets.

2.4   Components of Network

Q   :   02-04-01   :   Define or Describe Components of Network ?

Answer :

Components of Network : LANs do not use the telephone network. Its networks are constructed with standard set of components :

Local Area Network (LAN)
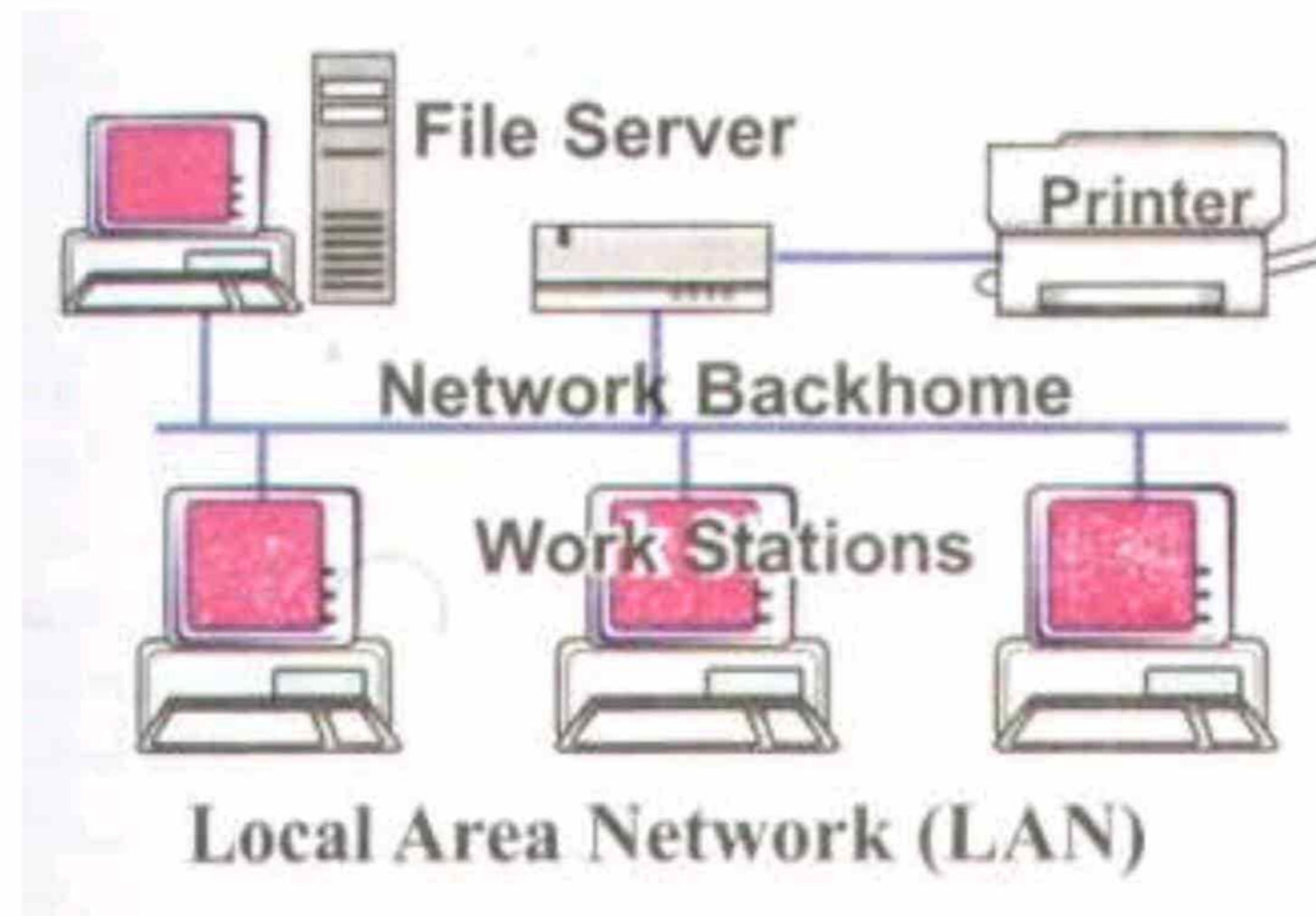
Connection Cables : Low-cost LANs are connected with twisted wire pairs, but many LANs use coaxial cable or fiber optic cable, which are both more expensive and faster. Some LANs are wireless, using infrared or radio wave transmissions instead of cables.

Network-Interface-Card (NIC) : Connects each computer to the wiring in the network. NIC is a circuit board that fits in one of the computer's internal expansion slots (on the mother board). Some computers have built in NIC (on board).

Bridge : Similar networks can be connected by a bridge, which recognizes the messages on a network and passes on those to addressed nodes in the other network.

Gateway : Gateway is a collection of hardware and software resources that lets a node communicate with a computer on another different network.

Router : Router is a device that connects two or more networks, it consist of combination of hardware and software. The hardware can be a network server, a separate computer, or a special black box device. The hardware includes the physical interfaces to the various networks in the internet.

Q   :   02-04-02   :   Define or Describe LAN's Protocol? List commonly used Protocols?
Answer :

LAN's Protocol : Networks have certain rules, called Protocols, to send and receive data, and it is defined in the network software. The most common are :

Ethernet
Token Ring
ARCNet
TCP/IP (Transmission Control Protocol / Internet Protocol)
ISDN (Integrated Series Digital Network) and DSL (Digital Subscriber Line)

Q   :   02-04-03   :   Explain Commonly used Protocols for LAN ?
Answer :

LAN's Protocol : Networks have certain rules, called Protocols, to send and receive data, and it is defined in the network software. The most common are :

Ethernet : Currently, it is the most commonly used protocol. It uses high-speed network cable and bus topology, so it is relatively simple and cheaper. Since all the nodes (computers) use the same cable to send and receive data, they must follow a set of rules about when to communicate otherwise, two or more computers could transmit at the same time causing lost messages. Before transmitting the data, a node listens" to find out if the cable is in use. If so, the node must wait. When the cable is

free from other transmission, the node can begin transmitting immediately This process is also known as **CSMA/CD (Carrier Sense Multiple Access with Collision Detection)**.

If two nodes transmit data at the same time, the messages collide. When a collision occurs, a special message, lasting a fraction of second, is sent out over the network to indicate that it is jammed. Each node stops transmitting, waits a random period of time, and then transmits again. Since the wait period for each node is random, it is unlikely that they will begin transmitting at the same time again.

Token Ring : It is closely associated with IBM, works on the concept of a ring network topology and a token (a kind of electronic signal). The method of controlling access to the shared network cable is called token passing. Only one token is available on the network. When a node on the network wishes to transmit, it first captures the token, only then it can transmit data. When the node has sent its message, it releases the token back to the network. Since only one token is circulating around the network, only one device is able to access the network at a time. Thus no collision occurs but the only disadvantage is its **slow data transfer rate**.

ARCNet : The ARCnet (**Attached Resource Computer network**) has both a topology and networking technology all its own. It uses either twisted-pair wire or coaxial cable, and the star topology is informed with hubs attached to the network. The original ARCnet protocol was very slow, but it became popular because it was inexpensive, reliable, and easy to set up or expand. Fast ARCnet increased the transmission rate to **100 Mbits Per Second** and includes the capability to use fiber optic cable.

TCP/IP (Transmission Control Protocol / Internet Protocol) : [**TCP/IP (Transmission Control Protocol / Internet Protocol): TCP/IP is the protocol used by every computer on the Internet. A protocol is a set of rules and procedures that defines how computer receive and transmit data over the network**]. Every computer on the Internet must have TCP/IP configured. TCP/IP ensures a reliable connection between the computers communicating over the Internet. It also defines a mechanism through which every computer on the Internet is identified separately. TCP/IP software differs for different computers but it always presents the same interface to the network. It does not matter if the system on the other end is a supercomputer, a mainframe, mini computer or a microcomputer; as long as it is using TCP/IP, it can send and receive data through the Internet.

ISDN (Integrated Series Digital Network) : ISDN is a set of international communication standards for software control of transmitting voice, video, and data simultaneously as digital signals over twisted-pair telephone lines. ISDN provides better quality than analog connections and more reliable digital connections at higher speeds than those offered by analog connections.

DSL (Digital Subscriber Line) : DSL provides high speed, digital data transmission from homes and businesses over existing telephone lines. The exiting lines are analog and the transmission is digital, so modems are necessary with DSL technology. DSL is a popular alternative to ISDN.

2.5   LAN VS WAN

Q   :   02-05-01   :   Explain LAN, WAN and MAN ?

Answer :

LAN (Local Area Network) : It is a collection of computers, usually micro computers, that share hardware, software, and In simple terms, LAN hook personal computers together through communications media so that each computer can share the resources with others. As the name implies, LANs cover short distances, usually one office or building or a group of buildings that are close to each other.

WAN (Wide Area Network) : A wide area network is a network of geographically distant computer terminals. WAN is two or more LANs connected together across a wide geographical area using the connectivity mentioned above. The Internet is the ultimate WAN that connects thousands of computers and LANs around the world, ultimately making it as www (World Wide Web).

MAN (Metropolitan Area Network) : A metropolitan area network (MAN) is a communications network covering a geographical area the size of a city. MAN bypasses local telephone companies when accessing long distance services. Mobile phones (Cellular) systems are often MANs.

2.6   Networking Concepts

Q   :   02-06-01   :   Explain the Concept of a Network ?
Answer :
Networking Concept : [**It is a way to connect computers together so that they can communicate, exchange information and pool / share their resources amongst each other**].
In business or education, scientific or technological research, institutes or office atmosphere, networks have revolutionized the use of computer technology. A lot of information is virtually on our table, using the smart powers of browsing and surfing the resources Internet.

Q   :   02-06-02   :   Describe Uses of Network ?
Answer :
Uses of Networks : Networks allow users to :
        Simultaneous access to shared programs and data.
        Share peripheral devices, such as printers and hard disks.
        Send e-mail along with big attachments (files etc).
        Communicate by providing tools for teleconferencing and videoconferencing.

Q   :   02-06-03   :   Explain Network Models ?
Answer :
Network Models : Basically two types (models) of Network :
        Client / Server (Dedicated Server Network) : This arrangement involves a **SERVER**, which is a computer that controls the network. A server has the hard disks holding shared files / databases and often shared quality printer which can be used by all nodes. (Resources are controlled by the file server in a client / server network).
        Peer-To-Peer : All computers in a peer-to-peer arrangement have equal status. No one has control over others. With all files and peripheral devices distributed across several computers, users share each other's data devices as needed. The main disadvantages are lack of speed and security. (Resources are shared among equals in a peer-to-peer network).
        Hybrid : Many networks are hybrid i.e. combination of both client / server and peer-to-peer approaches. This approach takes the advantages of both models.

Q   :   02-06-03   :   Explain Network Standards ?
Answer :
Network Standards : [The standards are the precise documents containing technical and physical specifications about the network being designed]. By following worldwide acceptable standards, the networks can be reliable, efficient and trustworthy.

De-Facto Standard : De Facto "By Tradition" or "By Facts". These standards are most commonly used by the organizations worldwide.

De-Jure Standard : De-Jure means "According To Law or Regulation". The networks governing bodies have properly approved these standards.

American National Standard Institute (**ANSI**).

The Institute of Electrical and Electronics Engineers (**IEEE**).

The International Standard Organization (**ISO**).

The International Telecommunications Union-Telecommunication Standards Sector (**ITU-T**, formally **CCITT**) Consulate Committee International on telegraph and telephone.

The Electronic Industries Association (**EIA**).

Telcordia.

Q   :   02-06-04   :   Explain Network Topologies ?

Answer :

Network Topology : [Topology refers to the layout of connected devices on network. One can think of a topology as a network's "shape"].

Bus : Bus networks (not to be confused with the system bus of a computer) use a common backbone to connect all devices. A single cable, the backbone functions as a shared communication medium, that devices attach or tap into with an interface connector. Ethernet bus topologies are relatively easy to install and don't require much cabling compared to the alternatives. 10Base-2 ("ThinNet") and 10Base-5 ("ThickNet") were popular Ethernet cabling options. Disadvantage is that, if the backbone cable fails, the entire network becomes unusable.

CSMA/CD (Carrier Sense Multiple Access/Collision Detection) : It is a local area network access method in which contention between two or more stations is resolved by collision detection. When two stations transmit at the same time, they both stop and signal a collision has occurred. Each then tries again after waiting a predetermined time period. To avoid another collision, the stations involved each choose a random time interval to schedule the re-transmission of the collided frame.

CSMA/CS (Carrier Sense Multiple Access/Carrier Sense) : A node listens to the bus for a predetermined amount of time before transmitting and waits until the talking node has completed transmission.

CSMA/CR (Carrier Sense Multiple Access/Collision Resolution) : It allows multiple devices to talk at once, a protocol determines which device receives priority.

Ring : In a ring network, every device has exactly two neighbors for communication purposes. All messages travel through a ring in the same direction (effectively either "Clockwise' or Counter clockwise"). A failure in any cable or device breaks the loop and can take down the entire network. Token passing scheme is used in this topology.

Star : Many home networks use the star topology. A star network features a central connection point called a "hub" that maybe an actual hub or a switch. Devices typically connect to the hub with Unshielded Twisted Pair (UTP) Ethernet. Compared to the bus topology, a star network generally requires more cable, but a failure in any star network cable will only take down one computer's network access and not the entire LAN. If the hub fails, however, the entire network also fails.

Tree : Tree topologies integrate multiple star topologies together onto a bus. In its simplest form, only hub devices connect directly to the tree bus, and each hub functions as the root of a tree of devices. This bus / star hybrid approach supports future expandability of the network much better

than a bus were (limited in the number of devices due to the broadcast traffic it generates) or a star (limited by the number of hub ports) alone.

Mesh : Mesh topologies involve the concept of routes. Unlike each of the previous topologies, messages sent on a mesh network can take any of several possible paths from source to destination. (Recall that in a ring, although two cable paths exist, messages can only travel in one direction.) Some WANs, like the Internet, employ mesh routing. A mesh offers several advantages over other network topologies.

Fault Tolerance : Mesh network has high fault tolerance due to multiple links.

Under Load : Due to multiple links mesh network can work fine even under severe loads.

Troubleshooting : Troubleshooting of mesh network is easy as compared to other networks. If data is not communicated between any two computers then it means that there is some fault in direct links between them.

Disadvantages : These include the difficulty of installation reconfiguration, as well as the cost of maintaining redundant links.

Q   :   02-06-05   :   Define Open Systems Interconnection(OSI)Model and Explain it layers ?

Answer :

The Open Systems Interconnection (OSI) : This model was created by **International Organization for Standardization (ISO)** to provide a logical framework for how data communication processes should interact across networks. Standards were created for the computer industry allowing different networks to work together efficiently.

The OSI model has the upper layers and lower layers. The upper layers focus on user applications and how files are represented on the computers prior to transport. It's the lower layers that concentrate on how the communication across a network actual occurs.

Application Layer : Provides network services to user applications. It responsible for exchanging information between programs running on the machine, such as an e-mail program, and other services running on a network such as a print server or another computers' application.

Presentation Layer : Concerned with how data is converted and formatted for data transfer. Examples of format conversions include ASCII text for documents and .gif and JPG for images. This layer performs code conversion, data translation, compression and encryption.

Session Layer : Determines how two devices establish, maintain and manage a connection - how they talk to each other. These connections are called sessions.

Transport Layer : Responsible for breaking the data into segment, establishing an end-to-end logical connection between machines, and providing for error handling.

Network Layer : Responsible for determining addressing on the network determining the routes that information will take on its journey, and managing network traffic congestion. Data at this level is packaged into packets.

Data Link Layer : Provides the link for how data, packaged into frames is communicated through hardware to be transported across a medium. It communicates with network cards, manages physical layer communication between connecting systems and handles error notification.

Physical Layer : Specifies how data is processed into bits physically transferred over medium, such as cables. Its responsible for activating and maintaining the physical link between systems.

Chapter 03 :   Data Communication

3.0 / 3.1   Overview / Components of Data Communication

Q   :   03-01-01   :   Define Data Communication and Describe its Five Components ?

Answer :

Data Communication : [Movement of encoded information by means of electrical transmission systems from one computer or device to the other].

Five Components of Data Communication :

Message : The message is the information (data) to be communicated. It may consist of text, numbers, pictures, sound, video or any combination of these.

Sender : It is the device that sends the data. It can be computer, workstation, telephone, video camera and so on.

Receiver : It is the device that receives the data. It may be computer, workstation, telephone, television and so on.

Communication Channel : It is the physical path by which a data travels from sender to receiver. It cab be a twisted pair wire, coaxial cable, fiber optic cable, or microwave etc.

Encoder and Decoder : The encoder converts digital signals to a form which can pass through transmission medium and decoder again coverts signal from encoded form into digital form, which is understandable for receiver.

3.2   Signals

Q   :   03-02-01   :   Define Signal, explain Analog and Digital Signals ?

Answer :

Signals : [The electromagnetic or light waves representing data are called signals]. These are used to transfer data from one device to another device through a communication medium.

Analog Signal : The analogue data signals are continuous electrical signal in the form of wave. This wave is called a carrier wave. Two characteristics of analogue carrier waves that can be altered are frequency and amplitude. [**Frequency** is the number of times a wave repeats during a specific time interval]. [**Amplitude** is the height of wave within a given period of time].
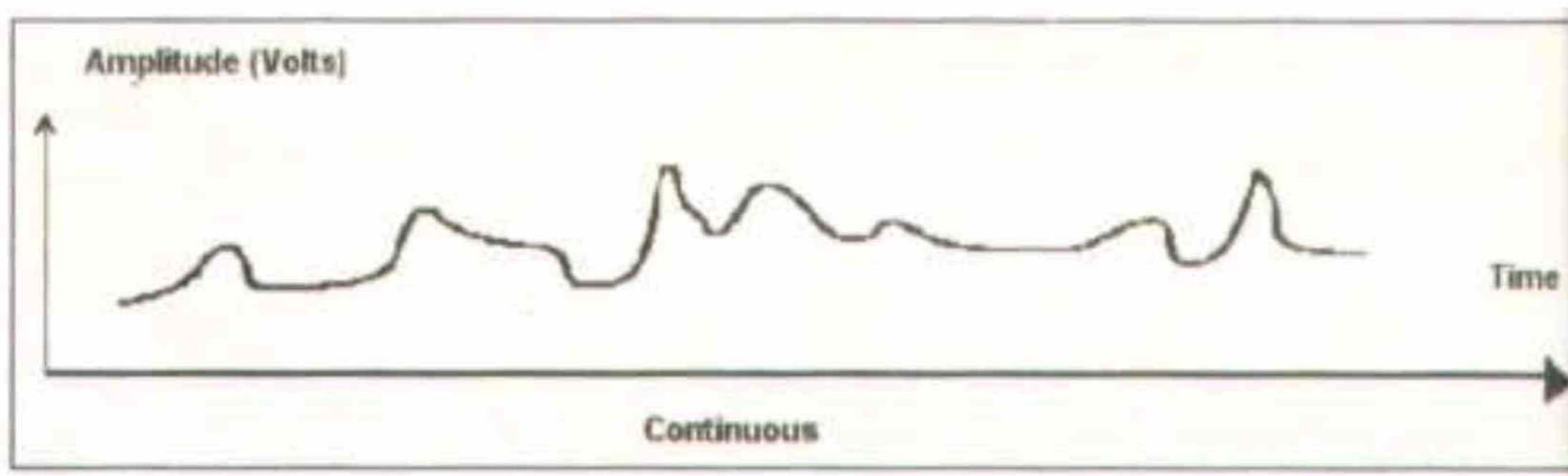
Digital Signal : A digital signal uses on-off electrical pulses in discontinuous, or discrete form. Most computers are digital in nature, represent data as patterns of binary numbers.
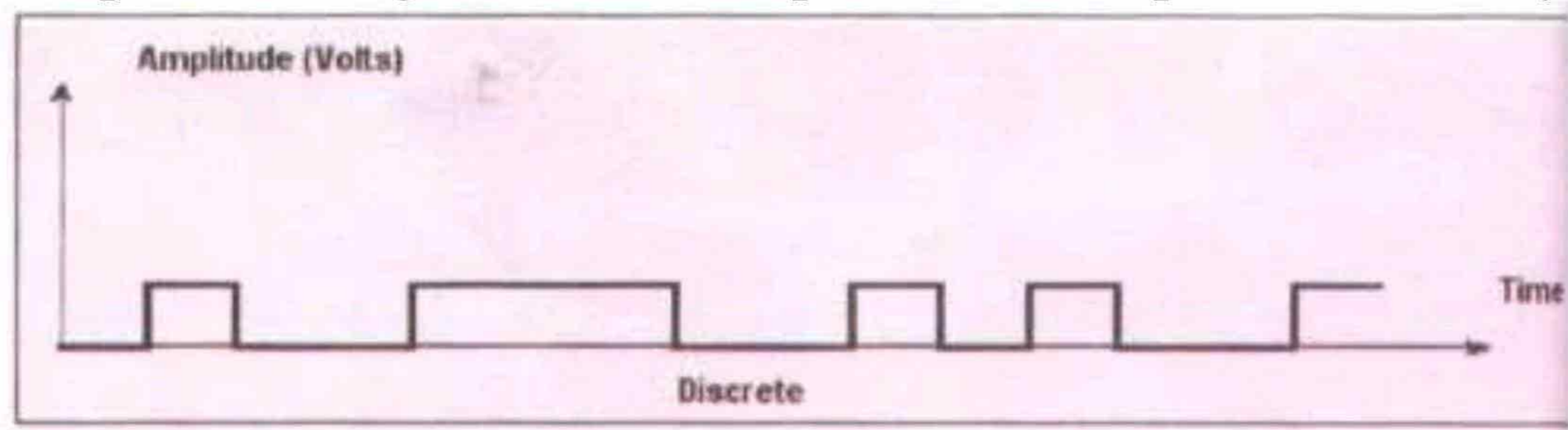
3.3   Types of Data

Q   :   03-03-01   :   Describe FIVE Types of Data ?

Answer :
Text : The text consists of words, sentences, and paragraphs. Text processing refers to the ability to manipulate words, lines, and pages. Typically, the term text refers to text stored as ASCII codes that is, without any formatting. Objects that are not text include graphics, numbers and program code.
Numeric : Numeric data consist of digits from 0 to 9, + (positive) or - (negatives) signs and a decimal point. It can be integer type or real type.
Image : This type of data includes chart, graph, pictures and freehand drawings. The information in this form is more comprehensive. The data are sent as contiguous bits, which, for transfer, are packed into the 8-bit transfer bytes. The receiving site must store the data as contiguous bits.
Audio : Sound is a representation of audio. It is converted into digital code by sampling the sound waves 44,056 times per second and converting each sample into a 16- hit number.
Video : Video can be produced either as a continuous entity (by a camera), or it can be a combination of images, each one a discrete entity, arranged to convey the idea of motion. Video creates actions and movements.

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Q   :   03-03-01   :   Describe Data Representation ?
Answer :
Data Representation : The computer works with binary numbers, binary means two digits. These are 0 and 1. An electrical pulse inside the computer represents each binary number. 1 is represented by a pulse of electrical inside the computer and 0 by an absence of a pulse. Each binary digit is called bit and it is the smallest element of data.

3.4   Encoding of Data

Q   :   03-04-01   :   Define Data Encoding ? Describe Five Data Encoding Schemes ?
Answer :

Data Encoding : The computer works with binary digits only. Therefore, all data, numeric or non-numeric, must be converted into binary digits before the computer can understand it. Computers transmit data in the form of binary codes. Both sender and receiver of the data should have same standard rules for both to understand it. Some coding schemes to represent data are :

BCD Code : (Binary Coded Decimal) is 4 bits code. A few early computers processed BCD numbers but were slower and more complicated than a modern computer, which are able to process alphanumeric (alphabet letters, numbers and other symbols).

EBCIDIC Code : Extended Binary Coded Decimal Interchange Code is an 8-bit code primarily used by International Business Machine (IBM). This type is intended for efficient transfer between hosts, which use EBCDIC for their internal character representation. For transmission, the data are represented as 8-bit EBCDIC characters. The character code is the only difference between the functional specifications of EBCDIC and ASCII types.

ASCII Code (American Standard Code for Information ¶ Interchange) : It is a 7-bit code and makes 128 character combinations, whereas an 8-bit can make 256 combinations. It was developed by American National Standards Institute (ANSI) and can handle alphanumeric data. It is intended primarily for the transfer of text files, except when both hosts would find the EBCDIC type more convenient.

Unicode (Universal Code) : It is a 16-bit code and can represent up to 65,536 symbols. Unicode has started to replace ASCII at all levels. It supports a comprehensive set of mathematical and technical symbols to simplify scientific information. With the UTF-8 (Unicode Transformation Format-8) encoding, Unicode can be used in a convenient and backwards compatible way in environments that were designed entirely around ASCII.

3.5   Modes of Data Communication

Q   :   03-05-01   :   Describe THREE Modes of Data Communication ?

Answer :

Modes of Data Communication : When data is transmitted between two pieces of equipment, three types of data transmission modes can be used :

Simplex : [Simplex is a mode in which data flows in one direction only.] This is not popular as it once was. However, it is used in point-of-sale terminals, radio and T.V transmissions.

Simplex Channel Operation

one way only
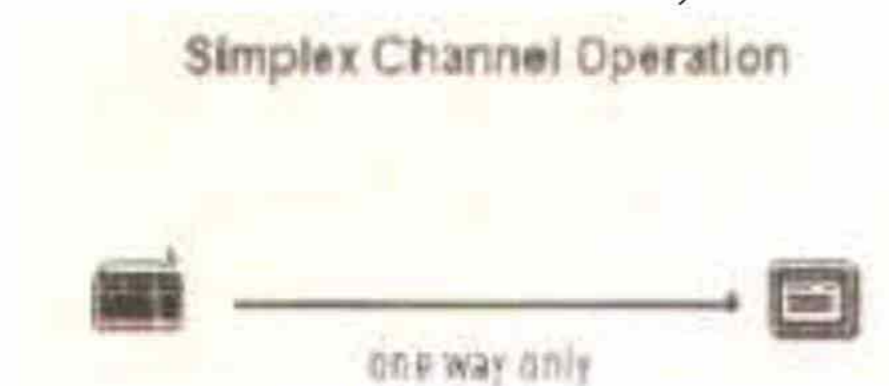
Half-Duplex : [In Half-Duplex transmission, data can be sent and received in both directions, but not at the same time.] It's like a one-lane bridge where two-way traffic must give way in order to cross. Only one end transmits at a time, the other end receives. It is possible to perform error detection.

Half Duplex Operation

TWO WAY BUT NOT AT

THE SAME TIME
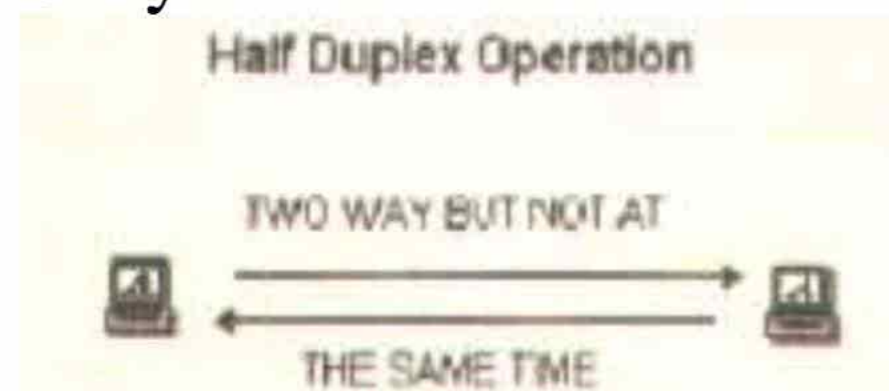
Full-Duplex : [The bidirectional mode of communication is Full-Duplex.] Data is transmitted in both directions simultaneously on the same channel. Full-duplex communication is made possible by devices called multiplexers.

Full Duplex Operation
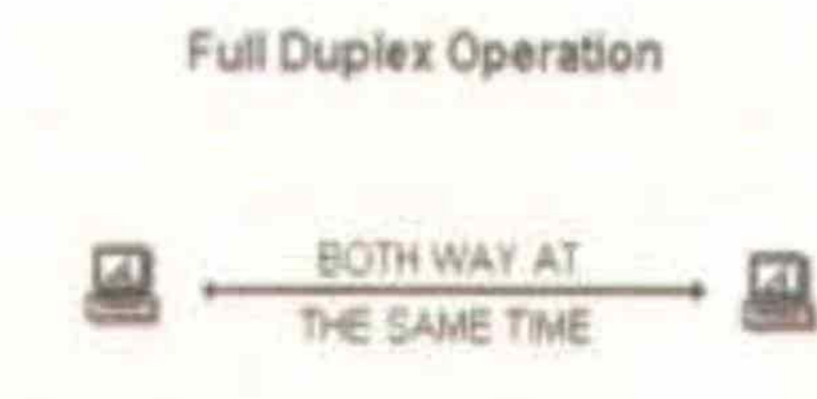
3.6 Types of Data Transmission

Q : 03-06-01 : Explain Types of Data Transmission ?

Answer :
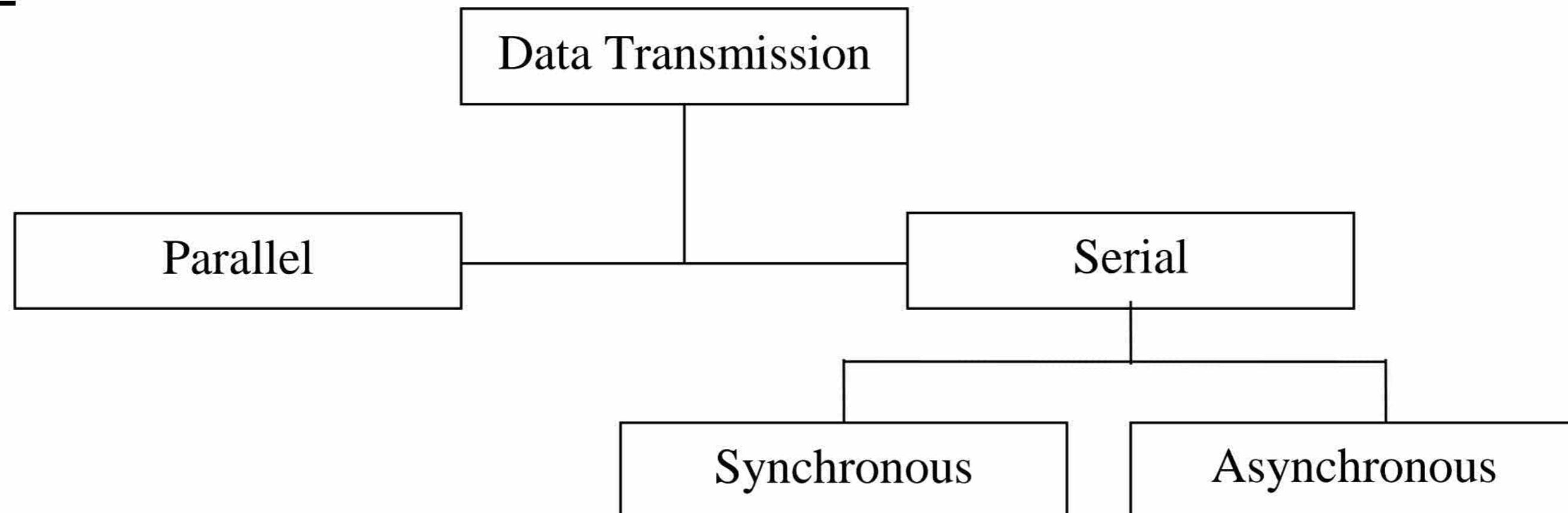
Parallel Data Transmission : [Concurrent flow of bits of data through separate communications lines.] This pattern resembles the flow of automobile traffic on a multilane highway. Parallel data transmission is commonly used for interactions between a computer and its printer.

Serial Data Transmission : [Each individual bit of information travels along its own communications path; the bits flow in a continuous stream along the communications channel.] Pattern is analogous to the flow of traffic in one-lane street. Serial transmission is typically slower than parallel transmission, because data are sent sequentially in a bit-by-bit fashion.

    Asynchronous Transmission : [A type of communication that sends data using flow control rather than a clock to synchronize data between the source and destination.] When asynchronous transmission (also called start / stop transmission) is used, a special start signal is transmitted at the beginning of each group of message bits.

    Synchronous Transmission : [A type of transmission that uses a clock to control the timing of bits being sent.] Large volumes of information can be transmitted at a single time with synchronous transmission. This type of transmission involves the simultaneous flow of several bytes of data.

Q : 03-06-02 : Define Bandwidth ? Describe Two Types of Bandwidth ?

Answer :

Bandwidth : Each type of communications media has different transmission speed. [The bandwidth is a measure of the transmission rate of communications channels].

Baseband : Digital signals are commonly called baseband signal. [Baseband is a communications technique in which digital signals are placed on to the transmission line without change in modulation.] It transmits up to a couple of miles, and does not require the complex modems. Typical Token Ring and Ethernet use baseband signals.

Broadband : [Broadband is a technique for transmitting large amounts of data, voice and video over long distances simultaneously by modulating each signal onto a different frequency.] Using the FDM

(Frequency Division Multiplexing) technique, several streams of data can be transmitted simultaneously. This bandwidth includes microwave, satellite, coaxial cable and fiber-optic media.

Q   :   03-06-03   :   Define and Classify Communication Media ?

Answer :

Communication Media : [For data to be transmitted from one location to another, pathway or medium must be used. These pathways are called communication channels]. The communication channels can be divided into two types of media :

Guided Media : Channels that allow transmission of data through a physical media i.e. twisted pair wire, coaxial cable or fiber-optic cable. These are also called bounded media.

   Twisted Pair : The telephone lines used to carry most of the voice and data communications consist of a pair of thin-diameter insulated copper wires (called twisted pairs).

   Coaxial Cable : Coaxial cable can be used for telephone lines for transmission at a high frequency. Coaxial cable consists of a sing core of solid copper. A coaxial cable can handle 80 times as many telephone transmissions as twisted pair media. Many computers in local area networks are linked by coaxial cables.

   A Fiber-Optic Cable : A fiber-optic cable consists of tubes of glass through which data are transmitted as pulses of light. Optical fiber consists of thin glass fibers that can carry information at frequencies in the visible light spectrum and beyond. The typical optical fiber consists of a very narrow strand of glass called the core.

Unguided Media : Those channels that transmit data and information in the form of wave. Unguided transmission media consists of a means for the data signals to travel but nothing to guide them along a specific path. The atmosphere and the space are examples of unguided media such as microwave, or satellite.

   Microwave : Microwave data transmission differs from the previously mentioned communications channels in that data is transmitted through the air instead of through cables or wires. Microwaves are high-frequency radio waves that can only be directed in straight lines. Consequently, microwave transmission is usually limited to communications occurring within the limits of a particular city or community usually twenty to thirty miles apart.

   Satellites : Instead of antennas, satellites can also be used to transmit microwave messages from one location to another. Satellites rotate approximately 23,300 miles above the earth in precise locations / orbits. Satellite transmission stations that can both send and receive messages are known as "Earth Stations". A major advantage of satellite transmission is that large volumes of data can be communicated once. A particular drawback is bad weather can severely affect quality of satellite transmissions. This wide range broadcasting ability has given rise to a multitude of different satellites carrying all kinds of information such as telephone calls, television channels, internet traffic, military communications, weather data, and even radio stations.

   Mobile Communications : It is radio-based networks that transmit data to and from mobile computers. Computer can be connected to the network through wired ports or through wireless connections.

3.7   Modem

Q   :   03-07-01   :   Define Modem ? Describe Transmission Rate and Speed ?

Answer :

Modem : Modem (Modulate / Demodulate) is a device that converts digital signals into analog form (modulation process) to send over phone lines, a receiving Modem at the other end of phone line then converts the analog signal back to a digital signal (demodulation process). It enables users to transmit data from one computer to another by using standard telephone lines and analogue signal.

Transmission Rate : Modems as high-speed or low speed to indicate how many bits per second a specific device is capable of transmitting or receiving.

Speeds : The specific techniques used to encode the digital bits into analog signals are called modulation process. The various modulation standards define the exact methods of encoding and the data transfer speed. The raw speed (the speed without data compression) of a modem is determined by the modulation standards.

Q   :   03-07-01   :   Describe Various Types of Modems ?

Answer :

Types of Modems : In terms of physical size and shape, modems can be divided into :

 External : External modem is attached to the system unit as an external device by means of a telephone cable. It is connected to the telephone wall jack by another cable. The modem is a self contained unit which is connected to the PC using a serial cable to the COM1, COM2 port or USB port. It needs an external power supply and is easy to setup.

 Internal Card : An internal modem is a circuit board (a modem card) that can be added to the system unit through an expansion slot. This can not be moved easily from one computer and is more difficult to setup.

 Wireless Modem : Wireless (radio frequency) modems transmit data signals through air instead of a cable. This type of modem is designed to work with cellular technology, and wireless local area networks.

Chapter 04 :   Applications and Uses of Computer

4.1   Uses of Computers in Different Fields

Q   :   04-01-01   :   Describe Uses of Computers in Business ?

Answer :

Uses of Computers in Business : The computer technology is vital for every functional area of an organization and IT systems are integral to every functional area.

Marketing : Marketing applications provide information about organization's products, its distribution system, its advertising and personal selling activities, and its pricing strategies. Marketing applications help managers to develop strategies that combine the four major elements of marketing: Product. Promotion, Place, and Price.

Stock Exchanges : Stock markets around the world are in transition. The papers and trading floor itself is disappearing because many stock markets launched the computerized system for online trading.

Banks : Computerized banking have provided several benefits. The cheques are read by MICR (Magnetic Ink Character Reader). Banks use mainframe computer / server to maintain their customer accounts, withdrawals and deposits. Networks of ATMs (Automated Teller Machine) provide 24 hour services. Credit card number eases the shoppers.

Departmental Store : Point of sale terminal with bar-code readers speeds the sales. The prices of items are set in the server and accessible to all sale clerks. Record of sales can be used for accounting restocking store inventory. Security VCR (video cassette recorder) is widely used in departmental stores to record the activities of visitors

Office Automation : Office Automation (OA) refers to the movement towards automating office tasks. An office where workers perform different tasks. The categories of activities in an office are decision-making, data manipulation, document handling, communication, and storage.

Document Management Systems (DM5) : DMS include word processing, desktop publishing, reprographic, image processing, am archival storage applications.

Word processing enable documents to be created and edited electronically.

Desktop publishing enables to make documents in attractive form by the use of photos artwork, graphical illustrations etc.

Spreadsheet is used to create a table of columns and rows used by people responsible for tracking revenues, expenses, profits, loses, statistical, mathematical and logical processing etc.

Reprographics is the process of reproducing multiple copies of a document.

Image processing allows documents to be scanned and stored in image oriented databases.

Message-handling systems : It enables to send messages or documents from one location to other location through facsimile (Fax), electronic mail (e-mail), Voice Mail etc.

Office Support Systems : It enables to coordinate and manage the activities of a work group. Groupware and desktop organizers are some examples of office support systems.

Q   :   04-01-02   :   Explain E-Commerce ?

Answer :

E-Commerce : Electronic-Commerce describes the buying, selling, and exchanging of products, services, and information via computer network (e-commerce is describe as transactions conducted between business partners via computers). Application of e-commerce are home, banking, shopping in electronic malls, buying stocks, finding a job, conducting an auction etc. E-Commerce services frequently used in e-business are :

Electronic Mail (E-mail) : It is a service that transports text messages (includes voice messages) from a sender to one or more receivers via computer.

Video Conferencing : It is a type of conferencing in which video cameras and microphones capture sight and sound for transmission over networks. It is advance form of teleconferencing. It provides complete simulation of a normal meeting environment, enabling both parties to see, hear and present material, just as if they were in the same room. This saves cost of travel and time.

Electronic-Shopping (E-Shopping) : Online shopping from home, work or cyber cafe is possible from anywhere in the world 24 hours a day.

Electronic Banking : Electronic / cyber / online banking includes various banking activities conducted from home, business, or on the road instead of a physical bank location.

Q   :   04-01-03   :   Describe Use of Computers in Industry ?

Answer :

Use of Computers in Industry : Computers are used to control manufacturing system and continuous running of the machinery. These also help in monitoring temperature, pressure, check the quality and accuracy and measure in the manufacturing process.

Robots : A robot is an automatic programmable machine that moves and performs mechanical tasks. Robots are used for assembling and spray-painting cars, carrying maintenance on overhead power cables, to test blood samples, out space experimental programs, artificial satellites, and radioactive environments etc. Robots can work in environment that are hazardous for humans, can perform repetitive and boring task continuously at high level of accuracy.

Q   :   04-01-04   :   Describe Computer Aided Design (CAD) and Computer Aided Manufacture (CAM) ?

Answer :

Computer Aided Design (CAD) : CAD are used for display designs and build production prototypes in software, test them as a computer object according to given parameters :
Compile parts and quantities lists.
Outline production and assembly procedures.
Transmit the final design directly to machines.
CAD has many different applications like designing new car or aircraft, bridge and building. CAD is capable of displaying three-dimensional object and speedily rotating it.

Computer Aided Manufacture (CAM) : CAM is used to control manufacturing process. CAM software uses digital design output to directly control production machinery. CAM systems can manufacture accurately and consistently, round the clock and cheaper.

Q   :   04-01-05   :   Describe Computer Simulation ?

Answer :

Computer Simulation : Computer model which recreates a system that might exist outside the computer. Simulations are often used to train people how to deal with expensive or dangerous situations, to recreate and practice for real. Flight simulation is used to train pilots to deal with situation that would be expensive and dangerous to practice using a real aircraft.

Q   :   04-01-06   :   Describe Use of Computers in Medical Field ?

Answer :

Use of Computers in Medical Field : The computers are used in medical laboratories, researches, scanning, monitoring, pharmacy etc.

 Patient Monitoring : To monitor critically ill patients in intensive care units. The patients have sensors attached to them, which detect changes in heart rate, pulse rate, blood pressure, breathing and brain activity. Computer activates alarming device to sound and alerts the medical staff if needed.

 Patient Records : Computerized databases store information about patients, doctors, medicines, chemicals and equipments. Storing information in proper order and organized records saves time and effort.

 Diagnosis : One common use of computer is to scan the body of the patient. A scanner sends electromagnetic rays through a patient's body and sensors detect patient's body affected by cancer. CAT scanner passes rays over the patient; displays images that enable physicians to look beneath the patient's skin. As scanner passes over the patient, it displays an image of bone and tissue structure on a computer screen.

Q   :   04-01-07   :   Describe Use of Computers in Airline System ?

Answer :

Use of Computers in Airline System : Computers are used to control passenger aircrafts and vehicles. Electronic signals from the cockpit are sent that adjust the flight surfaces. Computer is embedded in the pilot's or driver's controls. It is linked up among different cities and gives full information about its flight and seat reservation.

Q   :   04-01-08   :   Describe Use of Computers in Education and Explain Computer Based Training (CBT) ?

Answer :

Use of Computers in Education : Computers are used in many colleges to provide the methods of teaching in different ways. The computer education is very familiar and rapidly increasing the graph of computer students. Many computer-based educational program software are available, which students can learn to read, count, or speak a foreign language. Software that combines the thrills of games with real information content is becoming more popular. Organizations are using information technology in their employee training programs.

Q   :   04-01-10   :   Describe or Explain Computer Aided Learning (CAL) ?

Answer :

Computer Aided Learning (CAL) : CAL is the use of information technology to assist in the teaching and enhance learning process. Information Technology may be able to aid us in reducing the time spent on creation and maintenance of teaching materials (one document for lecture materials / reference notes / study aids). It is also reducing the administrative load associated with teaching and research.

Q   :   04-01-11   :   Describe or Explain Computer Based Training (CBT) ?

Answer :

Computer-Based Training (CBT) : [An interactive learning experience between the learner and computer in which the computer provides the majority of the stimulus, the learner must respond, and the computer analyzes the response and provides feedback to the learner]. It can bring many additional benefits to any organization, their training department and their students :

Students can readily acquire new skills at their own pace and at times.

Training times can usually be reduced.

Retention of course material is usually greater.

Interactive, visually stimulating, easily absorbed and available material encourages students to undertake training.

Planning and time tabling problems can he reduced or eliminated.

Essential skills can be taught and refreshed whenever and wherever needed.

The quality and consistency of the training material is maintained throughout.

It is a highly cost-effective way to train large number of students locally or at remote places.

Timely and high-quality training on demand leads to increased efficiency.

Students absorb study material faster and retain more of information they are taught.

Q   :   04-01-12   :   Describe or Explain Use of Computer in Weather Forecasting ?

Answer :

Use of Computer in Weather Forecasting : Computer based weather forecasting depends on accurate collection of data from weather stations, airports, satellites, different sensitive devices (which are situated on huge towers and buildings etc.) all around the world. The data is collected on atmospheric phenomena over a region. The computer then generates a forecast of how the air will change. SPARCO Weather forecasting department offers analysis of live weather data, and provide help to make business decisions based on weather forecasting.

Q   :   04-01-13   :   Describe or Explain Use of Computer at Homes ?

Answer :

Use of Computer at Homes : Children play games, keep track of the stamp collections, draw pictures, play music, view movies and do some sort of reading and writing according to their needs. People can utilize computers for keeping records, making home budgets, using electronic mail and Internet services to learn and increase their knowledge. The uses of microprocessor technology in manufacturing of electronic home appliances air-conditioning, washing machine, sewing machine etc., have completely changed our way of life.

Q   :   04-01-14   :   Describe or Explain The Assistance Computers provide us to simplify our work practices ?

Answer :

Computer Assistance Simplifying Our Work Practices : Reasons for using computers are :

Computers can work faster than human's work.

Computers never get tired / bored or need rest.

Computers can do jobs that are dangerous for human to do.

Computers can store large amounts of information.

Computers can retrieve information very quickly.

Computers never loose or misplace information.

Q   :   04-01-15   :   Describe or Explain The Major Personal or Business Benefits provided to users by Computers ?
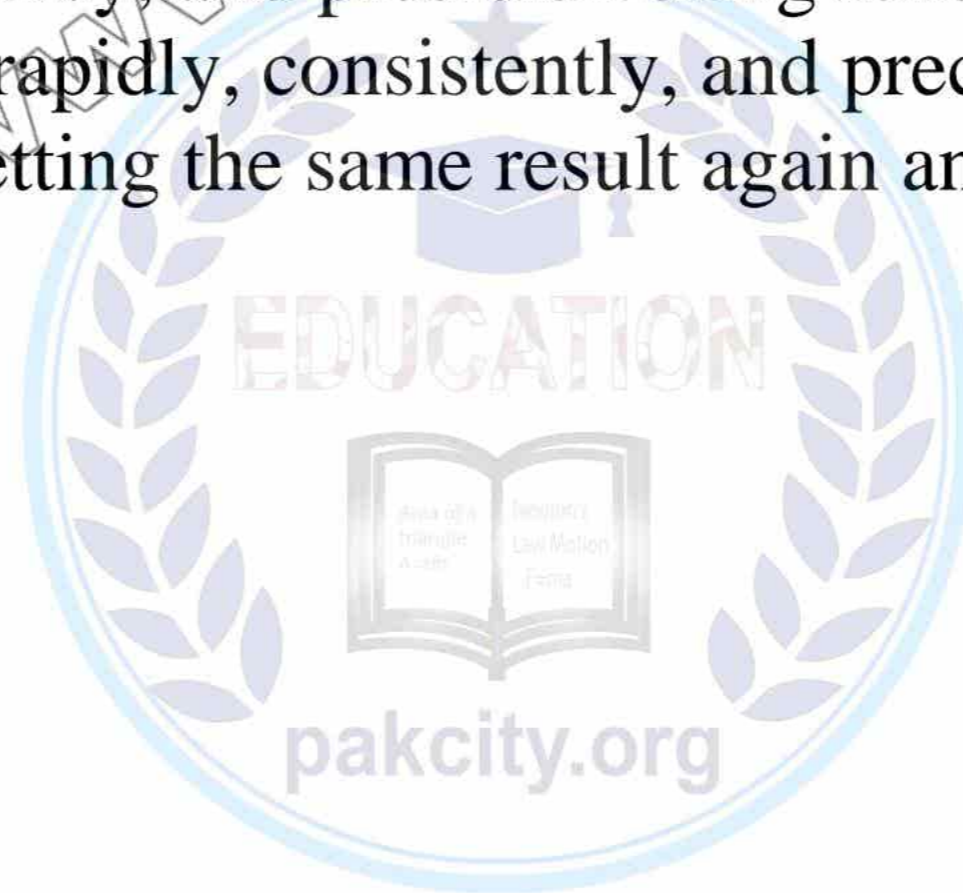
Answer :

Benefits To Computer Users : Computers linked through communications systems offer major personal and business benefit to users :

Speed : Computer can perform calculations or process at a very high speed in nano second or pico second. Computer can perform complex calculations, recall stored information, transmit information from one location to another and move objects around on a computer screen.

Consistency : People often have difficulty repeating their actions. Computer excels at repeating actions consistently. Whether using a spell checker built into a word processor or playing multimedia animation for training purposes, a computer will carry out the activity the same way every time.

Precision : Computers are extremely precise and can detect minute differences that people cannot. Computers excel in managing the smallest differences in being precise.

Reliability : Speed, consistency, and precision bring reliability. When we know that the same procedure will be followed rapidly, consistently, and precisely, we can expect reliability of result. We can depend on getting the same result again and again without any error.

Chapter 05 :   Computer Architecture

5.0   Overview

Q   :   05-00-01   :   Describe Van Neumann's Stored Program Computer ?

Answer :

Van Neumann's Stored Program Computer : [A sequence of instructions (Program) and the data are stored in the memory of the machine. The machine reads the instructions one by one and executes these instructions accordingly.] In 1951, Van Neumann designed this stored program computer. This simple design proved to be powerful and general purpose. It is the basis of modern day computers.

Q   :   05-00-02   :   Describe most important components of modern stored program machine ?

Answer :

Control Unit (CU) : The control unit reads the instructions from the memory and decodes these instructions. This unit uses other components of the computer to execute the instructions given to the computer.

Arithmetic and Logical Unit (ALU) : General-purpose computer can perform different arithmetic operations on the data so it has a special unit that has electronic circuits to perform the basic arithmetic and logical operations on the data.

Main Memory : It is used to store program and data during execution. We call it working area of the computer or Primary Memory also.

I/O Unit : This handles the processor's communication with the peripherals (Disc drive, monitor, printer etc). There are registers to hold the data incoming or outgoing. Data and instructions should be in the memory before the computer can start executing, stored program computer uses I/O devices.

Bus Interconnection : The communication lines / channel used to connect different parts of the computer together.

The CPU : Central Processing Unit is the brain of the computer and is centrally located on the motherboard. The data come from the RAM (Random Access Memory) and the units (keyboard, drives etc.). After processing, the data is sent back to RAM and the units. The work consists mostly of calculations and data transport. Two typical components of a CPU are :

> **The Arithmetic Logic Unit (ALU)** : The ALU is the part of computer that performs all arithmetic computations, such as addition and multiplication, and all comparison operations. The ALU is one component of the CPU.

> **The Control Unit (CU)** : Which extracts instruction from memory, decodes and executes them, calling on the ALU when necessary.

Main Memory : A computer executes a program in its main memory. A computer cannot work without main memory in it. Mostly the modern computer memory is built in the form of a chip of a semi conductor material. It is built in the form of thousands or even millions of cells each capable of storing a bit i.e. 0 or 1. These cells are logically organized into group of 8 bits called a byte. Each byte in the memory has a unique number assigned, which is called the address of that byte. A memory is a sequence of bytes. CPU or any other component of the computer can access any byte from the main memory by specifying its address. Different bytes of the main memory can be accessed directly at random and very fast. There are two types of main memory :

RAM (Random Access Memory) : It is usually build by using two different technologies.

DRAM (Dynamic RAM) : Dynamic Random Access Memory, a type of memory used in most computers and needs an electric current to maintain electrical state.

SRAM (Static RAM) : In SRAM technology, the memory cells are made form digital gates and each cell can hold its value without any need to refresh the data as long as the power is supplied to it. As no refreshing is required by SRAM, these chips are faster than the DRAM chips and utilize less power. Its design is more complex and is more expensive. This memory is known as the cache memory and has a very small size. It increase the performance of a computer system and is volatile (unstable , the contents of the memory are lost as soon as the electricity supply is cut-off).

ROM (Read Only Memory) : It can be read but new data can not be written onto it so it is read only. The manufacturer of the ROM writes the data and programs permanently onto it and this data and programs cannot be changed afterwards. ROM contains frequently used instructions and data.

PROM (Programmable Read Only Memory) : Initially blank and the user or manufacturer can write data onto it by using special devices. Once the program / data is written onto PROM it can not be changed or altered.

EPROM (Erasable Programmable Read Only Memory) : Initially blank, programs and data can be written on it by the manufacturer or by the used by using special devices. Unlike PROM, the data written on it can be erased by using special devices (i.e. ultraviolet rays). So data / program written on it can be changed and new data can also be added on this form of ROM.

EEPROM (Electrically Erasable Programmable Read Only Memory) : This kind of ROM can be re-written by using electrical devices and so data stored on this ROM can be easily modified.

Important Note : All the forms of ROM are non-volatile so the data stored on these chips is not lost when electricity is cut-off. RAM is volatile i.e. when electricity is cut-off, all the data is lost.

5.1   Bus Interconnection

Q   :   05-01-01   :   Describe Bus Interconnection and explain three types of bus ?

Answer :

Bus Interconnection : [These components are interconnected by using a set of parallel (Conducting Wires).] Each of these lines can be used to transfer a sequence of bits from one component of the computer to the other component. This set of parallel lines is called BUS. The system bus is divided in three main categories :

Control Bus : [These lines are used to transmit different commands from one component to the other.]

Data Bus : [On the system bus 32 or 64 lines are reserved to transfer data from one component to the other.] A 64-line data bus can transfer 64-bits of data simultaneously so it is not difficult to see that the width of the data bus has a direct impact on the performance of the computer.

Address Bus : It is important to assign a unique ID (address) to each component. Not only the address is used to identify different components of a system but it is also used to specify different memory locations within the main memory.

Expansion Bus : As the number of components connected to the system bus increases, more components will be trying to use the system bus simultaneously. This will slow-down the computer as components will have to wait longer to get access to the bus. To solve this problem only the major components of the computer are connected to the system bus and remaining components are connected to another bus called expansion bus. The expansion bus is connected to the system bus.

5.2   The I/O Unit

Q   :   05-02-01   :   Describe I/O Unit ?

Answer :

The I/O Unit : We have many input / output devices like keyboard, mouse, disks etc. All these devices are very different from one another, can handle different data-transfer rates and support different data formats. It is impractical to connect all these devices directly to the system bus as these will take a lot of CPU time. A special hardware component I/O unit is used. Only the I/O unit is connected to the bus and the devices are connected to it. The I/O unit is responsible for keeping the track of states of different devices attached with it. It is also responsible for compensating the speed difference between the processor and the I/O devices.

Q   :   05-02-02   :   Explain the TWO ways / methods of transferring data from the peripherals into the computer ?

Answer :

Interrupts : The processor issues command to the I/O devices. When the devices get ready, these generate an interrupt signal for the processor. On sensing this signal, the processor suspends all other processing and performs the I/O operation. The disadvantage of this scheme is that it reduces the over all performance of the processor.

DMA (Direct Memory Access) : The processor issues I/O command and gets busy in other useful tasks. The special hardware gets the data from the I/O device and uses the system bus to place it in the main memory. When data is transferred, the processor does not need the system bus. So, the processor does not have to wait for the I/O operation to complete. The disadvantage of this scheme is that it is more complex and extensive and more hardware is needed.

Q   :   05-02-03   :   Explain CPU Registers ?

Answer :

CPU Registers : The program is stored in the main memory of the computer on contiguous (continuous) memory locations. Data is loaded into computer's memory before the processing starts and the control is given to the CPU. The CPU needs storage areas where data can be stored temporarily. As used frequently, so temporary storage areas are provided within the CPU for enhancing the performance efficiency of the CPU. These special purpose storage areas are called registers.

The Most Commonly Used CPU Registers

PC (Program Counter) : This register holds the address of the next instruction to be fetched for execution. As soon this instruction is fetched, its value is incremented so that it still has the address of next instruction.

IR (Instruction Register) : Once the instruction is fetched it is stored in the IR where this instruction is decoded.

MAR (Memory Address Register) : When the CPU wants to store some data in the memory or reads the data from the memory, it places address of the required memory location in MAR.

MBR (Memory Buffer Register) : The CPU uses this register to store data coming from the memory or going to the memory.

SP (Stack Pointer) : To understand the purpose of this register it is important to understand a very important data structure (Arrangement of Data) called Stack. This structure is an arranged storage in LIFO (Last in First Out) order.

GPR (General Purpose Registers) : These resisters are called EAX, EBX, ECX, EDX and can be used for any mathematical or logical operations. They are used for arithmetic and data movement purposes. Each can be divided in an upper and lower byte called AH, AL, BH, BL, CH, CL, DH, DI respectively. A stands for Accumulator, B for Base, C for Count and D for Data. Each of these registers can alternately be used as one byte, two byte or four byte registers, AH (1 byte), AX (2 bytes), EAX (4 bytes).

AX (Accumulator Register) : Used for arithmetic and data operations.

BX (Base Register) : Used for arithmetic and data movement and special addressing abilities.

CX (Counter Register) : Used for counting purpose. Acts as a counter for repeating or looping.

DX (Data) : Has special role in division and multiplication.

Address or Segment Registers : It is a group of 4, some times registers named CS, DS, ES and SS. The segment register is used as base location for program instructions, data, and the stack.

CS (Code Segment) : The CS register holds the base location of all executable instructions (code) in the program.

DS (Data Segment) : The DS register is the defaults base location for memory variables. The CPU calculates the offsets of variables using the current value of DS.

ES (Extra Segment) : The ES register is an additional base location for the memory variables.

SS (Stack Segment) : The SS register contains the base location of the current program stack.

Important Note : Each of the above registers has 2-bytes. These registers called segment register and are used in conjunction with either the IP register or two index registers DI and SI to address various areas of computer memory CS is the primary register or two index registers used to fetch instruction in conjunction with the IP register. DS is the primary register, used to point out data in the computer memory along with the DI or SI registers.

5.3 Computer Operations

Q : 05-03-01 : Explain different types of operations performed by computer ?

Answer :

Computer Operations : Different types of operations performed by the computer are :

Data Transfer Instructions : All CPUs provide different instructions for the transfer of data from and to the memory. A programmer can use these instructions to bring data into the CPU and copy data from the CPU to the main memory. Instructions have the following format.

Arithmetic and Logical Instructions : Another important category of operations, a CPU can do is Arithmetic and Logical Operations. Most CPU provides the basic arithmetic operations of add, subtract, multiply and divide for signed numbers and floating point numbers. Logical operations of comparing two numbers, performing XOR of number, shifting and rotating a number are some common form of logical operations provided by the CPU.

I/O Instructions : Every CPU provides its users with the operations of reading data from a peripheral device and writing data to a peripheral device. To use these operations a programmer may use input and print commands provided by the CPU.

Control Transfer : In all real world programs, given to the CPU must be repeated a number of times. To support such operations, all CPUs provide its programmers with control flow operations some examples of these operations are : Jump, Jumpz (Jump if zero) etc.

Instruction set : Each CPU provides its users with a number of instructions so that the users can perform different operation supported by the CPU. The set of all instructions provided by a CPU is commonly known as the instruction set of that CPU.

5.4 The Instruction Format

Q : 05-04-01 : Define Instruction Format ? Explain various Instruction Code Formats in use ?

Answer :

The Instruction Format : A computer will usually have a variety of instruction code formats. It is the function of the control unit within the, CPU to interpret each instruction code and provide the necessary control functions needed to process the instruction. Each instruction for the CPU is specified by giving : "A Code For the Instruction (opcode)" and "Addresses of the Operands".

Zero-Address Instruction Format : The name "Zero-Address" is given to this type of computer because of the absence of an address field in the computational instructions. A stack-organized computer does not use an address field for the instructions ADD and MUL. The PUSH and POP instruction, however need an address field to specify the operand that communicates with the stack.

One-Address Instruction Format : One-address instructions use an implied accumulator (AC) register for all data manipulation. For multiplication and division there is a need for a second register.

Two-Address Instruction Format : For two address instructions, each address field can again specify either a possible register or a memory address. Two-address instructions are the most common in commercial computers. Examples of such instructions are MOV, ADD, CMP and BIS.

Three Address Instruction : Computer with three-address instruction formats can use each address field to specify either a processor register or memory operand. The advantage of the three-address format is that it results in short programs when evaluating arithmetic expression. The disadvantage is that the binary-coded instructions require too many bits to specify three addresses.) The instruction formats in the computer are restricted to either three register address fields or two register address fields and one memory address field.

Q   :   05-04-02   :   Explain Fetch-Decode-Execute Cycle with diagram ?

Answer :

Fetch-Decode-Execute Cycle : When we want to execute a sequence of instructions (program) those instructions / data are first of all loaded into the main memory of the computer by using some I/O device. Once these instructions have been loaded into main memory, the address of the first instruction is copied into the program counter and the control is given to the CPU. The CPU performs the following steps :

Fetch Instruction : The CPU reads the value of PC and the instruction pointed to by PC into the instruction register. This instruction involves the following steps :
    Copy the contents of PC into the MAR and request a memory read.
    Copy the data read from the memory into MBR and instruction in the IR. Increment PC, so
    that it points to the next instruction.

Decode Instruction : Once the fetching of instruction is complete the CU decodes the instruction by analyzing the opcode of the instruction. It also reads the values of operands specified in the instruction. Decoding means activating the appropriate circuit to execute the instruction.

Execute Instruction : After decoding the instruction (the processor executes the instruction by using the activated circuit. Then the results of the execution are written back to registers and memory.

Figure 5.11: Fetch-Decode-Execute
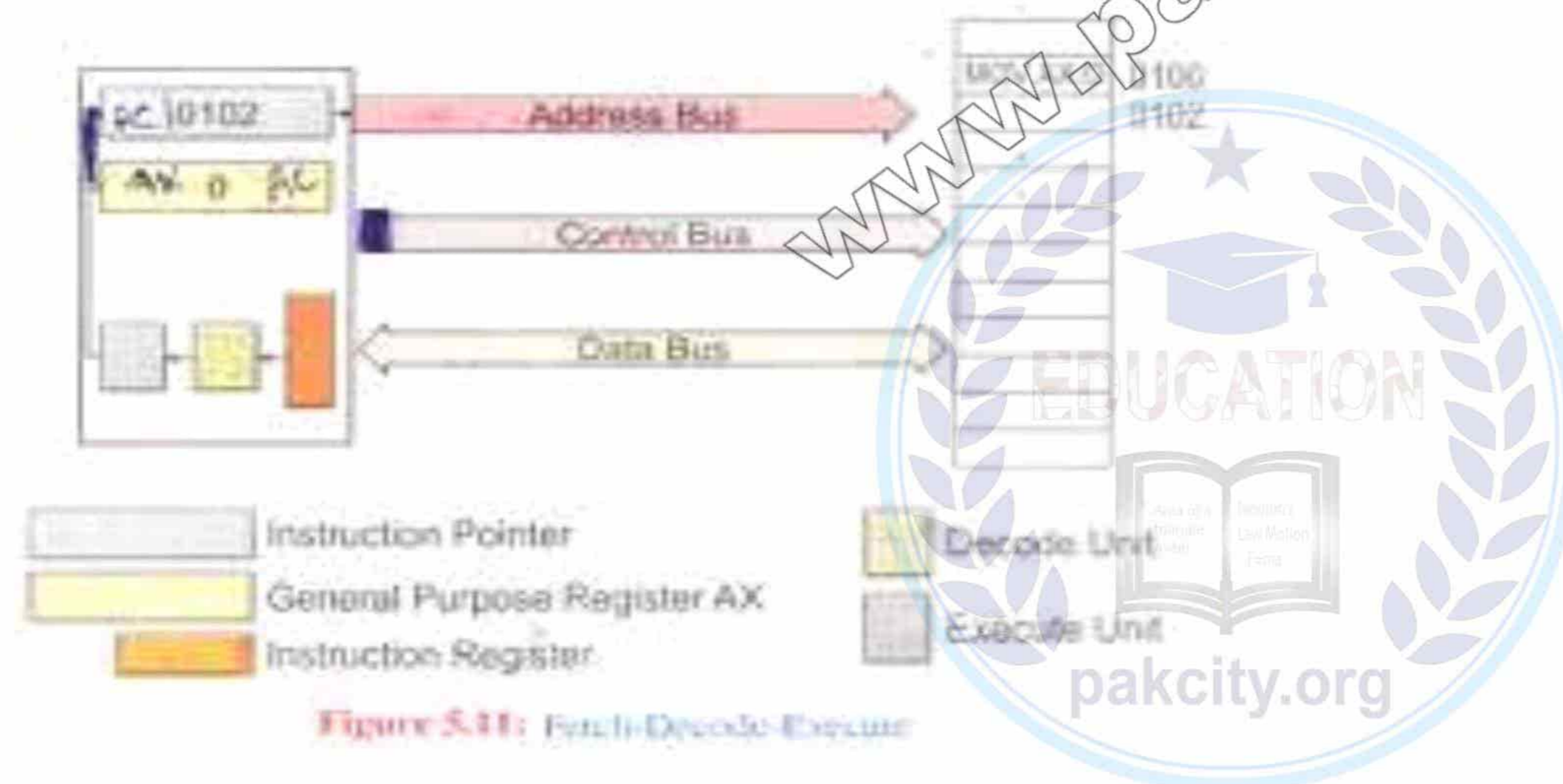
5.5   Software

Q   :   05-05-01   :   Define Software ? Differentiate between Application Software and System Software ?

Answer :

Software : The term software is used for [a sequence of instructions given to the computer to perform a specific task]. Software consists of the Step-By-Step instructions that tell the computer what to do.

Application Software : Software that can perform useful work on general purpose tasks. It may be either customized (special order) or packaged (ready made).

Customized Software : It is a software designed for a particular customer. The program can be developed by a single computer professional programmer or by a team of programmers depending upon the requirements.

Package Software : It is the kind of, Off-The-Shelf (ready made) program developed for sale to the general public. Package software includes word processing, spreadsheet, database manager, graphics, and communications programs.

System Software : System software, which includes operating system and device drivers, enables application software to interact with the computer.

Operating Systems : It is obvious that to solve some problem on a computer a programmer will write instructions. But other than writing instructions for solving the problem every programmer will also have to write instructions for the following tasks :

Read data from the input devices and show results on the output devices.

Perform memory management tasks (more details latter).

Organize data on the storage devices.

These tasks are very complex and only expert programmers can write these instructions. OS [a set of programs running in the background on a computer system and providing an environment in which other programs can be executed and the computer system can be used efficiently.]

Q : 05-05-02 : Explain Main Functions of Operating System ?

Answer :

Main Functions of Operating System

Manage Hardware Resources : The operating system must provide programmer for managing the hardware resources of the computer like disks, memory, and CPU.

Memory Management : Every program is to be loaded into the computer's main memory during the execution. If there are several programs simultaneously loaded in the main memory, as is the case when time-sharing is used, the program and its data must be protected from the actions of other programs.

Load and Execute Programs : A program has to be loaded into the main memory before the processor can execute it. The OS provides the facility of easily loading a program into memory and starts its execution.

Data Security : The OS must also protect the user data against illegal access and modification.

Providing Interface to The Users : The OS must provide an interface between the user and the computer and also between software and the computer. Types of interfaces :

Command Prompt : Users communicate with the operating system by typed commands using a keyboard. Each command given to the OS activates one of the many programs in the OS.

Graphical User Interface (GUI) : The GUI interface consists of Window, Menus, Icons and pointers. The user of the system communicates with the OS by selecting commands from the menus or by selecting different icons with the pointing devices.

5.6   The Translators and Their Functions - Interpreters and Compilers

Q   :   05-06-01   :   Describe Machine Code, Assembler, Assembly Language, Compiler, Source Code and Object Code and Interpreter ?

Answer :

Machine Code : [The machine code instructions are the instructions provided as the instruction set of the machine and these codes are represented by a binary pattern in the computer]. To write a program the programmer had to write the instructions in binary. This was a very complex task and even writing very simple programs took a long time. It was very difficult to produce correct programs as detecting errors in the programs and correcting these errors (Debugging the program) was very difficult.

Assembler : [A program that produces the binary instruction for a given assembly language program is called an Assembler].

Assembly Language : Assembly is a low level language, which provides instruction set for a particular machine. Each assembly instruction maps to a single machine instruction so it is very easy to translate a program written in assembly language to machine code. Writing programs in assembly language is very easy but is still a tedious work and took a long time.

Compiler : [The program that translates a high-level language program into machine language is called a Compiler]. A more appropriate definition of a compiler is that [it is a program that takes as input a high-level language program and generates an object program]. This object program may or may not be the absolute (final) machine code.

Source Code and Object Code : Once a program has been translated into machine code it can then be loaded into the main memory and executed by the CPU. [The high-level language version of the program is usually called the Source Code and the resulting machine code program is called the Object Code].

Interpreter : Another useful translator is an interpreter. An interpreter takes as input a high-level language program and performs the following actions :
It repeatedly reads instructions (one at a time) and translates it to machine code.
It then executes the instruction.

Q   :   05-06-02   :   Differentiate between Compiler and Interpreter ?

Answer :

Difference Between Compiler and Interpreter : One difference between a compiler and an interpreter is that a compiler converts each instruction only once but an interpreter may translate an instruction several times. Clearly if an instruction has some error an interpreter can easily identify it. Also an interpreted program runs slower than a compiled program as once a program is compiled it does not need any further translation but the original program has to be translated every time it is executed by an interpreter. And some instructions will be translated several times.

Chapter 06 :   Security, Copyright and The Law

6.0   Overview

Q   :   06-00-01   :   Define Security ? Describe the means to give access to authorized persons ?

Answer :

Security : Security is a system of safeguards designed to protect a computer system and data from intentional, accidental damage or unauthorized access.

Authorized Access : Authorized persons can access using four approaches :

What you have ? : *You may have a key, badge, token, or plastic card to give you physical access to the locked-up server room or computer building.*

What you know ? : *Standard user-IDs and Passwords or some special combination of numbers are given to the users to logon the machine.*

What you do ? : *Normally, the users put their signatures on the documents to confirm their legitimacy as an authorized user.*

What You are ? : *Biometrics - biological means of identification i.e. fingerprints, voice recognition, eye retina etc.*

Important Note : Loss of hardware and software are not critical. The actual problem lies in the damage / loss of data. It is difficult (though not impossible) to recover it in time in case of transactions based computer systems.

6.1   Virus and Antivirus Issues

Q   :   06-01-01   :   Define Virus or Worm ? Describe its propagation ?

Answer :

Virus (Worm) : [A virus is a program that attaches itself with other executable files by modifying them so that the virus program is also loaded and executed with the execution of these programs]. A virus usually performs destructive operation by deleting or modifying data stored on the storage devices attached to the computer. A virus is a set of instructions so it cannot physically destroy hardware (common misconception). A virus is "**A destructive program containing code that can generate copies of itself and attaches itself with other program so that it is automatically executed when those programs are executed**".

Q   :   06-01-02   :   Describe the means through which virus propagates (reaches from one computer to the other) ?

Answer :

Email : Now a days, most of the virus programs spread by attaching themselves with emails. When a user opens such an infected message, virus is loaded into the computers memory and attaches copies with many files. This continues and virus reaches thousands of computers.

Networks : When we download or share files on internet or other networks, the infected files infect the computers.

Removable Storage Media : When we copy data from one computer to another by using a removable media, the infected files are transferred.

Pirated Software :Companies intentionally put some virus program into their software. This program will only activate when it does not find some special files like license files on your computer.

Q   :   06-01-03   :   Describe important types of viruses ?

Answer :

Boot Sector Virus : The disk is divided into tracks and sectors. Operating system disk has a special program in its first sector called the boot sector. When the computer is turned on, the program in the boot sector is automatically loaded into the memory. The boot sector virus modifies the program in the boot sector and is loaded into memory whenever computer is turned on. The virus is attached with the executable files i.e. .exe, .com an .dll files. When the user uses these executable files, the virus infects other files and performs destructive commands.

Chernobal Virus : The famous chernobal virus deletes all the Microsoft Office files and also the partition information form the disk hence causing a major loss of data.

Logic bomb : Logic bomb, differ From other viruses in that they are set to go off at a certain date and time.

Trojan Horse : The Trojan Horse covertly places illegal, instructions in the middle of a legitimate program. Once you run the program, the Trojan horse goes to work, doing its damage while you are blissfully unaware. An example of a Trojan horse is FormatC.

Redlof : The Redlof virus is a polymorphic virus, written in Visual Basic Script. The virus relies on the Microsoft ActiveX Component vulnerability to automatically execute itself. When executed the virus locates Folder.htt and infects that file.

Important Note

1 : Some viruses may make unnoticeable changes hence corrupting the data being used and some viruses may even make data unusable.

2 : A virus program may detect some special information like passwords, or any sensitive data and send it to some other user on a network.

3 : A virus may make resources and data unavailable to the users. For example, a virus after copying itself on all computers, will start sending data on the network so that other users cannot use the network.

Q   :   06-01-04   :   Describe the ways, How to safe guard against viruses ?

Answer :

Unknown Email Messages : Never open unknown email messages, and also scan (for virus) all email messages even if you know the sender of the message.

Data Transfer : Minimize the data transfer between computers through the use of floppy disks, flash drives and other removable media. Always scan removable media before using.

Internet : Do not download free-ware programs without first checking it for virus.

Antivirus Software : Always use a virus detecting software to detect and to delete the infected programs from your system. You should periodically update these programs.

Always Keep Backup : Another important way to save yourself from the destruction of virus attack is that you should always keep backup of your data. The backup will be useful if a virus attack deletes your data or modifies it.

6.2   Data Security

Q   :   06-02-01   :   Explain Data Security ?

Answer :

Data Security : The means of ensuring that data is kept safe from corruption and that access to it is suitably controlled. Thus data security helps to ensure privacy and protect personal data.
Offering protection from data theft and data loss.
Protecting data from deliberate or accidental access by unauthorized persons.

Q   :   06-02-02   :   Describe the ways the Data Security may be violated ?

Answer :

Data Security Violations :

Physically Breaking Into Computer Center / Room : Someone may break into the computer room and take away all storage devices housing the sensitive data.

Unauthorized Access : Unauthorized users may take access to personal data of someone and then use it to gain some advantage. By accessing credit card number, online shopping from others account.

Unauthorized User : Unauthorized user may use an online mail server, like mail.yahoo.com to view email messages of other users hence causing privacy issue.

Virus on Network : Someone can send a virus onto a network causing the network to become very slow or even unusable.

Unauthorized Access to Bank Accounts : Some users may gain unauthorized access to bank accounts and transfer of money from other accounts to their personal accounts.

Computer Becomes Unavailable to Authorized Users : A person may make a computer so busy by sending many requests so that the computer becomes unavailable to authorized users. Its called denial of service situation.

Q   :   06-02-03   :   Describe the main threats to Data Security ?

Answer :

Security Threats :

Unintentional Damage : Some authorized user of the data may unintentionally delete or change sensitive data. Assigning proper rights to users and periodical backup can minimize the loss.

Proper Password Protection : Proper password protection should be used to access any resource. A log file should also be maintained to keep track of all the activities on the data / files.

Encryption Algorithm : Encryption algorithm should be used, so that if someone gets access to the data, he / she should not be able to make any sense out of it.

Virus Scanning Software : Proper virus scanning software should be used to scan all data coming into the organization.

Safe Rooms : Computers and all hacking storage devices should be placed in locked rooms with only authorized access to these resources.

Periodically Change Passwords : Authorized users must he asked to change their passwords periodically.

Q   :   06-02-04   :   Describe Data Protection ?

Answer :

Data Protection :

Prevention of misuse of computer data; legal safeguards to prevent misuse of information stored on computers, particularly information about individual people.

Installation of safeguards for computer data: the adoption of administrative, technical, or physical deterrents to safeguard computer data.

Q   :   06-02-04   :   Describe Data Privacy Issue ?

Answer :

Data Privacy Issue :

Right to See Personal Data : An individual has a right to see the data kept about him.

Right to Stop the Processing : He has the right to stop the processing of his data by the organization.

Compensation for Discloser : He has the right to claim a compensation from the organization for any kind of disclosure of data disallowed by the law.

Discloser is a Crime : No worker of the organization is allowed to disclose or use the data kept by its organization, failing to abide by, is committing a crime.

Safeguard Against Crime : Data protection act tries to minimize the misuse of personal information to provide a safeguard against such crime.

Adequate / Necessary Data : An organization collecting data should collect only the data adequate and necessary for its working and should not collect un-necessary data.

Q   :   06-02-05   :   Describe the points necessary to ensure Individual's Privacy ?

Answer :

Individual's Privacy :

Responsibility : The organization is responsible for keeping the data updated.

Life of Data : The organization should keep data for the specified period of time only and can not keep it longer than necessary.

Rights of Individual : During the processing of data, the rights of the individual should not be violated.

Security of Data : The organization is responsible for all kinds of security of data.

6.3   Data Protection Legislation and Copyright Issues

Q   :   06-03-01   :   Define Data Protection Legislation ? And state principles of Data Protection Act ?

Answer :

Data Protection Legislation : [The data protection legislation defines the laws that ensure data protection]. Many countries have defined the data protection legislation and in some advanced western countries; this law is enforced properly as well.

The Principles of Data Protection Acts :

Purpose : The purpose of keeping and distributing personal data must be clearly defined by organization obtaining that data.

Identity of Keeping Organization : The individual must be informed about the identity of the organization / individual maintaining data.

Necessity : The processing is necessary to fulfill the contract between two parties.

Individual's Interest : The processing is required by law or is necessary to carry out interest of the individual.

6.4   Important Privacy Acts

Q   :   06-04-01   :   Describe various Important Privacy Acts ?

Answer :

The 1980 Privacy Protection Act : This prohibits agents of federal government from making unannounced, searches of press office if no one there is suspected of a crime.

The 1984 Cable Communications Policy Act : This restricts cable companies in the collection and sharing of information about their customers. The "Data Protection Act 1984" is intended to protect the individual from unauthorized use and disclosure of personal information held on a computer system.

It consists of eight principles :

> **Fair / Lawful Processing** : The information shall be obtained and the data shall be processed, fairly and lawfully.
> **Specified and Lawful Purpose** : Personal data shall be held only for one or more specified and lawful purposes.
> **Incompatible Use / Discloser** : Personal data held for any purpose shall not be used or disclosed in any manner incompatible with that purpose or those purposes.
> **Adequate / Relevant Holding** : Personal data held for any purpose shall be adequate, relevant and not excessive in relation to that purpose(s).
> **Accurate and Up To Date** : Personal data shall be accurate and kept up to date.
> **Duration** : Personal data held for any purpose(s) shall not be kept for longer than is necessary.
> **Entitlement** : An individual shall be entitled, at reasonable intervals and without undue delay or expense, to be informed by any data user whether he holds personal data of which that individual is the subject.
> **Security** : Appropriate security measures shall he taken against unauthorized access to, or alteration, disclosure, accidental loss, or destruction of personal data.

The 1987 Computer Security Act : It makes actions that affect the computer security files and telecommunication illegal.

The 1988 Video Privacy Protection Act 1988 : It prevents retailers from disclosing a person's video rental records without a court order; privacy supporters want the same rule for medical and insurance files.

Computer Matching and Privacy Protection Act of 1988 : It prevents the government from comparing certain records in an attempt to find a match. However, most comparisons are still unregulated.

The Computer Misuse Act 1990 : It makes provision for securing computer material against unauthorized access or modification; and for connected purposes. It was passed to deal with the problem of hacking of computer systems. This was introduced to recognize three key offences :

> Unauthorized access to computer material.
> Unauthorized access with intent to commit or facilitate commission of further offences.
> Unauthorized modification of computer material.

The 1998 Data Protection Act : It came into force early in 1999 and covers how information about living identifiable persons is used. The 1998 Act applies to :

> Computerized personal data.
> Personal data held in structured manual files.

It applies to anything at all done to personal data ("processing"), including collection, use, disclosure, destruction and merely holding personal data.

Chapter 07 :   Windows Operating System

7.0   Overview

Q   :   07-00-01   :   Define OS (Operating System) ?

Answer :

Operating System : [An operating system is system software that provides an interface for the user to interact with the computer]. Without an Operating System a computer would be useless. The purpose of an operating system is to organize and control hardware and software so that the devices it manages behave in a flexible but predictable way.

7.1   Types of Operating System

Q   :   07-01-01   :   Describe Types of OS (Operating System) on the basis of user interaction ?

Answer :

Types of Operating System : Operating systems are classified on the basis of various features such as user interaction, how many tasks they can perform at a time, and how many processors they can support etc. On the basis of user interaction there are two types of operating system :
GUI (Graphical User Interface) Operating system.
Command Line Operating System.

Graphical User Interface (GUI) Operating System : A GUI operating system provides a graphical user interface to establish the user communication with the computer. The user does not require memorizing commands to perform various tasks such as copying a file, opening a document, printing a spreadsheet etc. The user uses graphical objects (e.g. icon, windows, buttons etc) to perform different tasks. He/She **just** requires recognizing various graphical objects and tasks that can be performed with them. Examples of GUI operating system are Windows, Linux. and Solaris etc.

Command Line Operating System : A command line operating system provides a command prompt to the user for typing different commands to interact with the computer. The user needs to memorize commands to perform deferent tasks. Examples of Command line operating systems are DOS (Disk Operating System), Unix etc.

Q   :   07-01-02   :   Give a tabulated comparison between a Command Line OS and a GUI OS ?

Answer :

Command Line Interface OS Vs Graphical User Interface OS

Feature	Command Line OS	GUI OS
Ease	Because of the memorization and familiarity needed to operate a command line interface new users find it much more difficult to successfully navigate and operate a command line interface.	Although new users may have a difficult at time learning to use the mouse to operate and use a GUI most users pick up this interface much easier when compared to a command line interface.

Control	Users have much more control of their file system and operating system in a command line interface. For example users can easily copy a specific type of file from one location to another with a one-line command.	Although a GUI offers plenty of control of a file system and operating system, often advance users or users who need to do specific task may need to resort to a command line to complete that task
Multi-tasking	Although many command line environments are capable of multitasking they do not offer the same ease and ability to view multiple things at once on one screen.	GUI users have windows that enable a user to easily view, control, and manipulate multiple tasks at once and are commonly much faster.
Speed	Because command line users only need to use their keyboards to navigate a command line interface and often only need to execute a few lines to perform a task. An advanced command line interface user would be able to get something done faster.	A GUI may be easier to use because of the mouse. However using a mouse and / or keyboard to navigate and control your operating system for many tasks is going to be much slower in this case.
Scripting	A command line interface enables a user to easily script a sequence of commands to perform a task or execute a program.	Although a GUI enables a user to create shortcuts, tasks, or other similar actions to complete a task or run a program it doesn't even come close in comparison to what is available through a command line.

Q   :   07-01-03   :   Explain The Purpose of Operating System ?

Answer :

Purpose of Operating System : There are two basic purpose of an operating system :

Manage Resources : It manages the hardware and software resources of the system. These resources include the processor, memory, disk space, etc.

Interface : It provides a stable, consistent way for applications to deal with the hardware without having to know all the details of the hardware.

7.2   Starting to Use Windows Operating System

Q   :   07-02-01   :   Explain The Objects of MS Windows Operating System ?

Answer :

The Objects of MS Windows Operating System : Windows consists of number of graphical objects which act as interlace between user and the computer. It controls the overall working of the computer system, manages system resources, and provides a multitasking environment for the user to perform more than one task simultaneously. The basic components of MS Windows Operating System are :

Desktop : The on-screen work area on which windows, and dialog boxes appear is called desktop. The desktop is actually the entering point in Windows. The first object that you see on starting

windows is the desktop (screen). It contains icons (images) for working with different applications that you need to interact with on regular basis.

My Computer : On windows Desktop, you will see and icon captioned My computer. While installing windows, you divide the hard disk into multiple partitions; each one is referred to as a drive. When you double click the My Computer icon, it shows you all drives on your system including a floppy drive, and CD drive. These drives are represented as icons in a window

Recycle Bin : You may create new folders and files on any drive. It may be required to delete them. When you delete a file or folder, it does not remove from the hard disk permanently. Rather Windows maintain a storage area on the hard disk for storing the deleted items. This storage space is named as Recycle Bin. The deleted items are moved to Recycle Bin. You can permanently delete or restore them from Recycle Bin.

My Documents : It is a folder created by windows on installation time. It is the default folder for storing different kinds of documents. If you create a document in Microsoft Word or MS Excel and don't specify the location where it should he saved, then by default windows will save it in My Documents folder.

Windows Explorer : Windows Explorer acts as a directory browser and File Manager for Windows. It is an efficient way for locating and managing files on your computer. Using Explorer you can easily browse through all the drives and network resources available.

Internet Explorer : Internet Explorer is web browser that is launched with Microsoft Windows Operating system. It is used to surf Internet. It is powerful web browser providing advance features to work on WWW.

The Window : The most important feature of windows operating system is a window. This is the basic building block of all graphical objects in MS Windows. Windows view most of graphical objects as window. Different applications start in different window objects e.g. Internet explorer, windows explorer, MS Word, and MS Excel etc.

Control Panel : Control Panel is the place where you can perform system management tasks such as installing / uninstalling new hardware devices, managing system resources through administrative tools**,** sharing primers, and setting up date and time etc.

Start Button : Start button is the gateway of accessing most of the programs installed on the computer. You can start any program by just making a mouse click, can open or find documents, can change windows settings, can get Help, can manage files, can maintain system, and can do much more.

Q   :   07-02-02   :   Explain The Procedure for working with Mouse and Keyboard ?
Answer :
Working with Mouse and Keyboard : Mouse and keyboard are the basic input devices used with personal computers. Almost every operating system running on PCs provides interaction through these devices. Microsoft Windows captures different actions performed by the mouse and the keyboard. These actions are referred as events. Here we discuss some important mouse and keyboard events :

   Mouse Events : Mouse events are the actions that call he performed by using the mouse. Most common events triggered with a mouse are :

   Left Click : This event triggers when you press the left mouse button. Windows captures this event and performs certain tasks. Normally this event is used to select a graphical object such as a file icon or text in a document, or to press a button such as the start button and closing, opening or minimizing a window etc.

Right Click : This rent triggers when you press the right mouse button. Most of the time, this event is used to view the properties of an object such as tile,
folder, desktop etc.

Drag : This event triggers when you press the left mouse button and move the mouse while keeping the left mouse button pressed. This event is used to select more than one items at a time, or to drop an object into another application.

Keyboard Events : Keyboard events are the action that can be performed by using the keyboard. Different applications / programs perform different actions against these events. Most common events triggered with a keyboard are :

Key Up : This event triggers when you release an already pressed key of the keyboard.

Key Down : This event triggers when you press any of the keyboard's key.

Q   :   07-02-03   :   Explain The Features of MS Windows OS ?

Answer :

The Features of MS Windows OS : Microsoft Windows is a complete operating system. Their initial versions were lacking network support but almost all of the latest versions are providing networking features. We shall consider Windows 2000 while discussing features of Windows operating system :

Multitasking : The capability of an OS to load multiple programs into memory at one time and to perform two or more processes concurrently, such as printing a document while editing another is known as multitasking. Windows 2000 is a multitasking operating system. It let you execute multiple tasks at a time. And it responds to all tasks so quickly that it seems to be paying full attention to every task.

Multiprocessing : Windows 2000 provide multiprocessing capability. It is capable of supporting and utilizing two or more microprocessors in a computer. A big task is divided into a number of small independent components, and each processor is assigned a different component. The processors work on different component in parallel. As a result the assigned task is completed in considerably short interval of time as compared to a single processing environment.

Multi-User Operating System : Windows 2000 is a multi-user operating system. A multi-user Operating System allows for multiple users to use the same computer at the same time and / or different times.

Plug and Play : Plug and Play refers to a set of specifications that allow a computer to automatically detect and configure a device, and install the appropriate device drivers. Windows 2000 is equipped with this feature. It has a mechanism defined that automatically detects a new hardware device. There are number of device drivers launched with Windows 2000, so you don't need to install drivers for many devices, windows itself choose an appropriate one for you. However, sometimes you may need to install a driver for some devices if it is not available in the windows pack.

Networking : Windows 2000 is equipped with full networking support. Ii provides features for establishing, maintaining and troubleshooting a network.

7.3   Disk Management

Q   :   07-03-01   :   Explain Disk Management by MS Windows OS ?

Answer :

Disk Management : Windows has strong disk and file management capabilities. Before going into details of Windows disk and file management features, it is important to understand basic concepts about them. Prior to Windows installation on a computer, the disk is divided into multiple partitions. A partition is a portion of physical disk that functions as though it were a physically separate disk. Windows usually create two basic types of partitions :

Primary Partition : It can be used as the system partition. Windows 2000 and other operating systems can start from a primary partition. You can create up to four primary partitions on a basic disk, or three primary partitions and an extended partition. Primary partitions can be created only on basic disks and cannot be sub partitioned.

Extended Partition : Extended partition refers to a portion of a disk that can contain other partitions. Only one of the four partitions is allowed per physical disk can be an extended partition, and no primary partition needs to be present to create an extended partition.

Q   :   07-03-02   :   Explain Disk Management Utility ?
Answer :
Disk Management Utility : The Disk Management utility gives you a graphical interface for viewing and performing maintenance on all of the hard drives and CD drives in your computer / server. You can see immediately whether your drives (both physical and logical) are healthy or not. In this utility, you can find the size of the drive, its size and file system and status at a glance. Disk management also indicates which drive contains the system partition. There are several different messages you can receive as to the status of the disks, and those are at times dependant on what type of disk it is.

7.4   File Management

Q   :   07-04-01   :   Explain File Management ?
Answer :
File Management : Files are recognized by their extensions in Microsoft Windows. When you attempt to open a file, Windows checks the File extension against a database of registered file types (windows registry) to determine what action it should take. A registered file type can have multiple actions e.g. open and print etc. If windows does rot recognize the file type, it offers a dialog box and lets you choose the appropriate application to view the file.

Q   :   07-04-02   :   Explain Windows Explorer ?
Answer :
Windows Explorer : Windows Explorer acts as a file manager if Windows Operating System. You can manage tiles and folders on your computer through Windows Explorer. Files and folders are the basic file management units in Window. Windows explorer offers many actions that can he performed on files and folders. You can cut, copy, paste, rename or delete a tile or folder from windows explorer. It shows files and folders in a hierarchical way. It contains two panes; left pane displays folders, and drives on your computer in a tree view shape whereas the right pane shows the detailed view of folder or drivel selected in the left pane. With windows explorer, not only you can manage the local files, folders and drives but also the remote files and folders.

7.5   Control Printing Jobs

Q   :   07-05-01   :   Explain how Windows control printing jobs ?

Answer :

Control Printing Jobs : Windows have powerful features to control printing jobs. Windows maintains a print queue for the jobs to be printed. You can share a printer on a the network as well, so that the whole network can take advantage of the printer resource. You can add multiple printers to your computer. But at a time only one of them will be assigned a default status. All jobs are directed to default printer by default. If you want to direct a particular job to another printer, you may specify at the time of printing. The default printer can he changed at any time by just selecting printers from the setting submenu of the start menu, and then setting on the option "set as default printer".

Adding A New Printer : You can add a new printer to your computer by following these steps:
> Click Start button.
> Follow the settings submenu.
> Click printer.
> A window will appear, double click the icon captioned Add Printer.
> Follow the steps offered by the wizard to add a new printer.

Print Queue : Windows maintain a print queue for all ongoing printing jobs. You can manipulate a printing job in multiple ways by just double clicking the printer icon. You can follow the above-described steps to view the printer icon. You can cancel or stop a printing job at any time. Similarly many other printing options can be set such as changing the printing layout (landscape or portrait), and printing preferences e.g. effects and finishing etc.

Chapter 08 :   Word Processing

8.0   Overview

8.1   What is a Word Processor ?

Q   :   08-01-01   :   What is a Word Processor ?

Answer :

Word processing software is probably one of the most frequently used packages in any organization. People use it for everything from quick notes to complex, book-length documents. in fact, it has been estimated that more than 90 percent of all personal computers have a word processor installed. **Word processing** is more than just electronic typing. it involves creating, editing, formatting and inting documents in variety of form.

Hundreds of newspapers, magazines, letters and advertisements are all miracles of word processing software. Businesses, Government agencies, schools and individuals create thousands of documents for numerous purposes on daily basis.

Word processor is an application (software) that provides extensive tools for creating all kinds of text-based documents. Word processor can manipulate not only the text but also it enables you to add images, sounds, charts and graphics in your document. With some of advanced word processors you can embed video clips as well. Word processors can even create documents for publishing on the World Wide Web, complete with hyperlinked text and graphics.

8.2   A Simple Word Processor (Text Editor)

Q   :   08-02-01   :   What is a Simple Word Processor or Text Editor ?

Answer :

Word processors vary considerably, but all word processors support some basic features. Word processors that support only these basic features (and maybe a few others) are called text editors e.g. Word Pad, Note Pad etc. All word processors provide the following basic features:

Insert Text : Allows you to insert text anywhere in the document.

Delete Text : Allows you to erase characters, words, lines, or pages as easily as you can cross them out on paper.

Cut and Page : Allows you to remove (Cut) a section of text from one place in a document and insert (Paste) it somewhere else.

Copy : Allows you to duplicate a section of text.

Page Size and Margin : Allows you to define various page sizes and margins, and the word processor will automatically readjust the text so that it fits properly.

Search and Replace : Allows you to direct the word processor to search for a particular word or phrase. You can also direct the word processor to replace one group of characters with another everywhere that the first group appears.

Word Wrap : The word processor automatically moves to the next line when you have filled one line with text, and it wilt readjust text if you change the margins.

Print : Allows you to send a document to a printer to get hardcopy.

8.3   Full-Featured Word Processors

Q   :   08-03-01   :   Explain Full-Featured Word Processor ?

Answer :

Most word processors, however, support additional features that enable you to manipulate and format documents in more sophisticated ways. These more advanced word processors are sometimes called full-featured word processors. Full-featured word processors usually support the following features :

File Management : Many word processors contain file management capabilities that allow you to create, delete, move, and search for files.

Font Specifications : Allows you to change fonts within a document. For example, you can specify bold, italics, and underlining. Most word processors also let you change the font size and even the typeface.

Footnotes and Cross-References : Automates the numbering and placement of footnotes and enables you to easily cross-reference other sections of the document.

Graphics : Allows you to embed illustrations and graphs into a document. Some **word** processors let you create the illustrations within the word processor; others let you insert an illustration produced by a different program.

Headers, Footers, and Page Numbering : Allows you to specify customized headers and footers that the word processor will put at the top and bottom of every page. The word processor automatically keeps track of page numbers so that the correct number appears on each page. Layout: Allows you to specify different margins within a single document and to specify various methods for indenting paragraphs.

Macros : A macro is a character or word that represents a series of keystrokes. The keystrokes can represent text or commands. The ability to define macros allows you to save yourself a Jot of time by replacing common combinations of keystrokes.

Merges : Allows you to merge text from one tile into another file. This is particularly useful for generating many files that have the same format but different data. Generating mailing labels is the classic example of using merges.

Spell Checkers : A utility that allows you to check the spelling of words. ft will highlight any words that it does not recognize.

Tables of Contents and Indexes : Allows you to automatically create a table of contents and index based on special codes that you inscrt in the document.

Thesaurus : A built-in thesaurus that allows you to search for synonyms without leaving the word processor.

Document Windows : Allows you to edit two or more documents at the same time. Each document appears in a separate window. This is particularly valuable when working on a large project that consists of several different files.

WYSIWYG (What You See Is What You Get) : With WYSIWYG, a document appears on the display screen exactly as it will look when printed.

A full-featured word processor can even have many other features. Microsoft Word is one of the most popular full-featured word processors.

Chapter 09 : Spreadsheet Software

9.0   Overview
9.1   Features of Spreadsheet Software

Q : 09-01-01 : Describe Basic Features of Spreadsheet Software ?

Answer :

Basic Features of Spreadsheet Software

A Spreadsheet program is a software tool for entering, calculating, manipulating and analyzing sets of numbers. The specialty of spreadsheet software is working with numbers. This can hold large amount of data arranged in rows and columns. It can manipulate numbers and present information in numerous ways. Like Word Processors, the Spreadsheet software also varies significantly e.g. LOTUS 123, Quatro Pro and MS Excel etc. But all of them have following basic features :

The spreadsheet is a grid of rows and columns. Each row is assigned a number and each column a letter. The intersection of a row and a column forms a cell. Each cell has a reference number that is formed by combining the column number and row number e.g. A1, G18 etc. A cell contains labels or values. A label is a text entry such as "Gross Salary" whereas a value can be a number, a date, a formula or a formula's result.

Formulae : Formulas are used to express mathematical relationships between cells.
Functions : Functions are used to perform certain tasks.
Commands : Commands are used to manipulate the worksheet or its contents.
Text Manipulation : Some simple text manipulation can also be performed.
Print : Allows you to send a document to a printer to get a hardcopy.

9.4   Basics of Worksheet

Q : 09-04-01 : Describe Common Forms of Data Entered in a Cell ?

Answer :

Common Forms of Data Entered in a Cell

The data entered in a cell can take variety of forms but the most common of these are :

Labels (Simple Text) : Labels are used to identify a value or a series of values. Labels are helpful in making the worksheet meaningful. It is important to note that formulas can be applied only on values; these cannot be applied on labels.

Values (Numbers) : Values are just numbers that you enter in different cells of a worksheet. These can be whole numbers, decimals, negative numbers, currency and other types of values including scientific notations.

Formulas : Working with Formulas is the most powerful feature of a spreadsheet. Formula can be calculated on the basis of values or formulas in other cells. Formulas can involve basic arithmetic operators. More complex formulas can even evaluate logical conditions and perform certain calculations on the basis of the result of the evaluation. Conditions may evaluate to true or false.

Q : 09-04-02 : Describe Cell References and Ranges ?

Answer :

Cell References and Ranges

A cell reference tells formula to look up the contents of the referenced cell. This increases the flexibility of the formula. The change in the contents of the referenced cell is quickly reflected to the

result of the formula being calculated on the basis o this cell. The cell is referred to by its address such as AC5 and Y10 etc. The range is referenced as D5:Z5 (all cells from D5 to Z5).

Q   :   09-04-03   :   Describe Relative and Absolute Cell Referencing ?

Answer :

Relative and Absolute Cell Referencing

Relative Cell Referencing : Calling cells by just their addresses (such as "A1") is called relative referencing. When a formula contains relative referencing and it is copied from one cell to another, the spreadsheet does not create an exact copy of the formula. It will change cell addresses relative to the row and column they are moved to. If a simple addition formula in cell C1 i.e. =(Al+B1) is copied to cell C2 the formula would change to =(A2+B2) to reflect the new row.

Absolute Cell Referencing : To prevent this change, cells must he called by absolute referencing. This is accomplished by placing dollar signs "$" within the cell addresses in the formula. Like entering in C1, =(A1+B1). If the value of cell should be the sum of cells Al and B1. Both the column and row of both cells are absolute and will not change when copied to C2.

Q   :   09-04-04   :   Explain Named Ranges of Cells in MS Excel ?

Answer :

Named Ranges of Cells

Range names are names that you define to represent a cell or cell range on a worksheet. These range names can further be used in formulas instead of cell addresses or ranges. They also make it easier to use, maintain, and understand the formulas in the worksheet. e.g. the formula =C10 * 100 / C8 calculates the percentage of marks. After giving names to cells, this can be expressed as = Marks_Obtained * 100 / Total_Marks.

Defining Range Names

To define a name for a cell or range of cells select Insert from the menu bar. The following dialog box will appear.

Figure 9.2: Range names

We can give names to cells or cell ranges instead of using their address. After assigning names to cells or cell ranges you can use these names in formulas instead of the addresses.

Chapter 10 :   Fundamentals of Internet

10.0   Overview

Q   :   10-00-01   :   Describe brief early history of the Internet ?   pakcity.org

Answer :

Internet : In 1969, Advanced Research Project Agency (ARPA) established a small computer network among different universities and defense organizations. The goal was to establish a large computer network that could survive in war times. Initially ARPANET was a wide area network connecting a small number of users. There were only four hosts (A host is a computer that provide services to other computers of the network). But the network grew rapidly and spanned over countries. Meanwhile another research organization, National science foundation, joined the project. NSF established five supercomputing centers which were available to all researchers for academic purposes. To provide high speed access to supercomputers, NSF established a separate high speed network called NSFnet. During this period, some other small networks had also been established among various universities and organizations. The authorities decided to link ARPANET, NSFnet and other small networks so that they can communicate each other. This link among different networks is referred to as the Internet.

10.1   How the Internet Works ?

Q   :   10-01-01   :   Describe how Internet Works ?

Answer :

How the Internet Works ?

The Internet is a huge collection of millions of computers, all linked together on a computer network. The network allows all of the computers to communicate with one another. A home computer may be linked to the Internet using a phone-line modem, DSL or cable modem that communicates to an Internet Service Provider (ISP). A computer in a business or university will usually have a Network Interface Card (NIC) that directly connects it to a Local Area Network (LAN) inside the business. The business can then connect its LAN to an ISP using a high-speed phone line like a T1 line. A T1 line can handle approximately 1.5 million bits per second, while a normal phone line using a modem can typically handle 30,000 to 50,000 bits per second. ISPs then connect to larger ISPs, and the largest ISPs maintain Fiber-Optic "**backbones**" for an entire region. Backbones around the world are connected through fiber-optic lines, undersea cables or satellite links. In this way, every computer on the Internet is connected to every other computer on the Internet.

10.2   Addressing Schemes

Q   :   10-02-01   :   Describe Addressing Scheme ? Explain the two types of Addressing Schemes ?

Answer :

Addressing Scheme : The purpose of the Internet is to establish communication between widely spread computers. Computers can send and receive data to each other. Any computer may initiate a transaction at any time. For this reason the source machine (computer) must have a unique identification of the destination computer. On the Internet every computer has a unique address and can be contacted on this address. There are two types of addressing schemes recognized on the

Internet, these are :

IP Addressing : To keep all of these machines straight, each machine on the Internet is assigned a unique address called an IP address. IP stands for Internet Protocol, and these addresses are 32-bit numbers, normally expressed as four "octets" in a "dotted decimal number." A typical IP address looks like this : 216.27.61.137.

The four numbers in an IP address are called octets because they can have values between 0 and 255, which are 2^8 possibilities per octet. Every machine on the Internet has a unique IP address. A server has a static IP address that does not change very often. A home machine that is dialing up through a modem often has an IP address that is assigned by the ISP when the machine dials in. That IP address is unique for that session; it may be different the next time the machine dials in. This way, an ISP only needs one IP address for each modem it supports, rather than for each customer. As far as the Internet's machines are concerned, an IP address is all you need to talk to a server. For example, in your browser, you can type the URL **http:// 216.27.61.137** and arrive at the machine that contains the Web server for the specified IP-Address.

DNS Addressing : Because most people have trouble remembering the strings of numbers that make up TP addresses, and because IP addresses sometimes need to change, all servers on the Internet also have human-readable names, called domain names. For example, www.hotmail.com is a permanent, human- readable name. It is easier for most of us to remember it than it is to remember an IP Address. The name www.hotmail.com actually has two parts, a host name and domain. The domain represents the institution which uses the address. These domain names are called top-level domain. Following is a list of top level domains :

Domain	Type of Institution
.com	Business (Commercial)
.edu	Educational Institutes
.gov	Government Organizations
.mil	Military Organizations
.org	Other Organizations (non profitable)

Important Note : Some large organizations divide their top level domain into sub domains. This lets them organize their web references.

10.3   Web Browsing

Q   :   10-03-01   :   Explain Web Browsing ?

Answer :

Web Browsing : Searching information on the World Wide Web is referred to as Web browsing. A software known as Web browser is used to search and view web pages. Hundreds of thousands of web pages are available on the World Wide Web that covers information on almost every topic.

Q   :   10-03-02   :   Explain World Wide Web (WWW) ?

Answer :

World Wide Web (WWW) : The World Wide Web was launched in 1 989 at the European Particle Physics Laboratory in Geneva, for adding footnote, and cross references in hypertext documents. The www uses http (hyper text transfer protocol) to link hypertext documents (web pages) on the World Wide Web. A web page is a document that is written in HTML (Hypertext Markup Language), in addition to simple text certain tags of HTML are included in the document. The language allows embedding hyperlinks (or simply link) in the document. A hypertext document is also called a Web

Page. A collection of related web pages is called a Web site. Web sites are hosted on server computers on the Internet. These computers are called Web Servers. The process of launching web page is called publishing the page.

Q   :   10-03-02   :   Explain URL (Uniform Resource Locator) ?

Answer :

URL (Uniform Resource Locator) : Every page has a unique address on World Wide Web. This is called Uniform Resource Locator (URL). If you want to access a web page on the World Wide Web, **you** will have to specify the URL of the required page in the web browser. The general format of the URL is :

"type://address/path/"

The type specifies the type of the server on which the page is hosted, address specifies the address of the server and **path** is the path of the page on the disk of the server e.g. http://www.yahoo.com/ .

Q   :   10-03-02   :   Explain Search Engine ?

Answer :

Search Engine : A website that uses powerful data searching techniques to help the user locate web sites containing specific types of contents or information is known as a Search Engine e.g. google.com, ask.com, altavista.com etc. are very popular search engines. Search engines have become very popular all over the world. Millions of people use Search Engines to find out information on various topics. Search Engines maintain a list of billions of web pages containing information on variety of topics. Search engines ask you to enter some key words about the data or information you want to search on the Internet. On the basis of your provided information, search engine traverse the list of web pages it maintain, and finally display the links of the web pages containing required information.

10.4   Email

Q   :   10-04-01   :   Explain Email ? Describe Limitations of Email ?

Answer :

Email : Email is a system for delivering messages over the Internet. An e-mail sender or recipient can be anywhere in the world. E-mail is the first really popular Internet application; it allows people to hold discussions over great distances.

E-Mail can take as little as *few seconds* to go across a country, or even around the world.

It leaves a written record. You can keep copies of e-mail messages you send and receive, for your record.

To create, send and receive email you need email-program, also called email client. Once you send the message, your computer connects to your **email server** and transmits a copy of your message. Email Server is a host computer on the Internet which keeps track of information about millions of email account holders. The server checks the address you have typed and figures out where the recipient email server is. It connects to that server and transmits another copy of the message. Once the receiving email server has received the message, the recipient is able to retrieve the message when connected to the server. Attachment is a powerful feature of email, which enables you to enclosed additional files with your email. You can attach word processing documents, spreadsheets, programs, images, even audio, to your email messages when using email programs that support the Internet protocol for multimedia attachments i.e. MIME (Multipurpose Internet Mail Extension).

Most email clients allow you attach files to the message. In this way you can send and receive data as well as program files. Attachment size varies from one email service provider to the other e.g. for free email accounts, Yahoo allows a file of size up to 10MB to be attached. This limit varies for paid accounts.

Limitations on Email :

Email is Not Necessarily Private : Since messages are passed from one system another, and sometimes through several systems or networks, there are many opportunities for someone to intercept or read email. Many types of computer systems have protections built in to stop users from reading others email, but it is still possible for a system administrator to read the email on a system or for someone to bypass the security of a computer system.

Some Email Systems can Send or Receive Text Files Only : Even though you can send and receive images, programs, tiles produced by word processing programs, or multimedia messages, some individuals may not be able to properly view your message.

It is possible to Forge Email : This is not common, but it is possible to forge the address of the sender. You may want to take steps to confirm the source of some email you receive.

It is Difficult to Express Emotion Using Email : The recipient does not have the benefit of viewing your facial expressions or hearing your voice. You have to be careful with humor or irony, since it is easy for someone to take your message the wrong way.

You can Receive Too Much or Unwanted Emails : You can receive "junk" email in the same way you receive other types of junk mail. On the Internet, junk mail is called spam. You may have to take active steps to delete the email you receive and try to stop it from being sent to you in the first place.

You may not know about the person with whom you are Communicating : The communication is often in text and it is possible for us to get an incorrect impression of the person sending us email. Also, some people misrepresent themselves.

Q   :   10-04-02   :   Explain Email Address ?

Answer :

Email Address : To send and receive an email, you must have an email account on an email server. When you open an email account, you are assigned a unique email address. You receive all incoming emails on this account address and send email to others by specifying their email addresses. The general format of an email address is:

10.5 Newsgroups

Q   :   10-05-01   :   Explain Newsgroups ?

Answer :

Newsgroups : These are discussion groups on the Internet (not on the Web, which is only one area of the Internet). Newsgroups are classified by subject and do not necessarily deal with journalism or "news". Health, hobbies, celebrities, and cultural events are the subjects of many newsgroups. Participants in a newsgroup conduct discussions by posting messages for others to read, and responding to the messages posted by others. Because you have time to think of what to write in a newsgroup posting, the discussions in newsgroups tend to be of a more serious nature, though not necessarily less amusing. You need software to obtain articles from the news server. A news server is

a host computer that exchanges articles with other servers on the Internet. These servers use Network News Transfer Protocol (NNTP) to communicate. To view articles on a specific topic, you need to be subscribed on a news group.

List of ASCII Codes

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Code	Symbol	Code	Symbol	Code	Symbol	Code	Symbol	Code	Symbol	Code	Symbol	Code	Symbol
0	null	37	%	74	J	111	o	148	ö	185	╣	222	▮
1	start of heading	38	&	75	K	112	p	149	ò	186	║	223	▬
2	start of text	39	'	76	L	113	q	150	û	187	╗	224	α
3	end of text	40	(	77	M	114	r	151	ù	188	╝	225	ß
4	end of transmission	41	)	78	N	115	s	152	ÿ	189	╜	226	Γ
5	inquiry	42	*	79	O	116	t	153	Ö	190	╛	227	π
6	acknowledge	43	+	80	P	117	u	154	Ü	191	┐	228	Σ
7	bell	44	,	81	Q	118	v	155	¢	192	└	229	σ
8	backspace	45	-	82	R	119	w	156	£	193	┴	230	µ
9	horizontal tab	46	.	83	S	120	x	157	¥	194	┬	231	τ
10	line feed/new line	47	/	84	T	121	y	158	Pts	195	├	232	Φ
11	vertical tab	48	0	85	U	122	z	159	*f*	196	─	233	Θ
12	form feed/new page	49	1	86	V	123	{	160	á	197	┼	234	Ω
13	carriage return	50	2	87	w	124	|	161	í	198	╞	235	δ
14	shift out	51	3	88	X	125	}	162	ó	199	╟	236	∞
15	shift in	52	4	89	Y	126	~	163	ú	200	╚	237	φ
16	data link escape	53	5	90	Z	127	DEL	164	ñ	201	╔	238	ε
17	device control 1	54	6	91	[	128	Ç	165	Ñ	202	╩	239	∩
18	device control 2	55	7	92	\	129	ü	166	ª	203	╦	240	≡
19	device control 3	56	8	93	]	130	é	167	º	204	╠	241	±
20	device control 4	57	9	94	^	131	â	168	¿	205	═	242	≥
21	negative acknowledge	58	:	95	_	132	ä	169	⌐	206	╬	243	≤
22	synchronous idle	59	;	96	`	133	à	170	¬	207	╧	244	⌠
23	end of transmission block	60	<	97	a	134	å	171	½	208	╨	245	⌡
24	cancel	61	=	98	b	135	ç	172	¼	209	╤	246	÷
25	end of medium	62	>	99	c	136	ê	173	¡	210	╥	247	≈
26	substitute	63	?	100	d	137	ë	174	«	211	╙	248	≈
27	escape	64	@	101	e	138	è	175	»	212	Ô	249	·
28	file separator	65	A	102	f	139	ï	176	░	213	╒	250	·
29	group separator	66	B	103	g	140	î	177	▒	214	╓	251	√
30	record separator	67	C	104	h	141	ì	178	▓	215	╫	252	ⁿ
31	unit separator	68	D	105	i	142	Ä	179	│	216	╪	253	²
32	space	69	E	106	j	143	Å	180	┤	217	┘	254	■
33	!	70	F	107	k	144	É	181	╡	218	┌	255	□
34	"	71	G	108	l	145	æ	182	╢	219	█		
35	#	72	H	109	m	146	Æ	183	╖	220	▄		
36	$	73	I	110	n	147	ô	184	╕	221	▌		