

INFORMATION TECHNOLOGY

What is Information Technology?

Information Technology is a combination of computer based systems with high speed telecommunication lines.

Computer Based Systems + Telecommunication = IT

Information technology (IT) is "the study, design, development, application, implementation, support or management of computer-based information systems, particularly software applications and computer hardware", according to the Information Technology Association of America (ITAA). IT deals with the use of electronic computers and computer software to securely convert, store, protect, process, transmit, input, output, and retrieve information.

Examples of IT

Radio, TV, Internet, Mobile communication etc...

What is Data and Information? What is Difference between Data and Information?

DATA:

The collection of raw facts and figure is called data.

OR

Raw facts and figures are called data.

Example:

Ali, Islamabad, books etc are data.

TYPES OF DATA:

There are three basic types in computer system.

- Numeric
- Alphabetic
- Alphanumeric

1. Numeric:

It is that type of data that can store numbers. It consist of digit from 0-9 e.g. 132,689.

2. Alphabetic:

In this type of data it is possible to store any combination of alphabets (a-z) both in upper and lower case e.g. Anila, Pakistan, Ali.

3. Alphanumeric:

This is a type of data that can store any combination of numbers, alphabets and special characters. It can not be used in any kind of numeric calculation. Information:

The meaningful form of data is called information.

OR

The organized form of data is called information.

Example:

I am a student of Abacus Computer College, Haripur
There are 100 books of information technology in computer library.

Technology:

Technology is the usage and knowledge of tools, techniques, crafts, systems or methods of organization.

DIFFERENCE BETWEEN DATA AND INFORMATION

S.#	DATA	S.#	INFORMATION
1.	Data is a set of raw facts.	1.	Information is a processed form of data.
2.	Data is not meaningful.	2.	Information is meaningful.
3.	Data is used rarely.	3.	Information is used frequently.
4.	Data is the asset of organization and is not available for sale.	4.	Information is normally available for sale.
5.	Data is an independent entity.	5.	Information depends on data.
6.	Data is not used in decision making.	6.	Information is very important for decision making.
7.	Data is used as input in computer.	7.	Information is the output of computer.
8.	Data is normally huge in its volume.	8.	Information is normally short in its volume.

What is Data Processing? What is Difference between electronic and manual data processing?

DATA PROCESSING:

“The process of converting data into information is called data processing.”

Data processing is an important function that converts our data into meaningful information. The data processing systems are used for performing this important function. In recent time, most of data processing is done using computers. Before computers, data processing was done by simple machine like calculators. Everything was done by human beings manually before calculators.

There is two type of data processing.

- Manual data processing
- Electronic data processing

Manual data processing:

In manual data processing all work is done by hands.

Electronic data processing:

In electronic data processing all work is done by computer.

DIFFERENCE BETWEEN MANUAL & ELECTRONIC DATA PROCESSING:

<i>MANUAL DATA PROCESSING</i>	<i>ELECTRONIC DATA PROCESSING</i>
<i>1. Processing is performed by hand.</i>	1. Processing is performed by computers.
<i>2. It is slow processing system.</i>	2. It is fast processing system.
<i>3. It requires more people.</i>	3. It requires few people.
<i>4. It is less reliable.</i>	4. It is more reliable.
<i>5. There are more chances of errors.</i>	5. There are fewer chances of errors.
<i>6. It provides less flexibility.</i>	6. It provides more flexibility.
<i>7. Reprocessing is very difficult and time consuming.</i>	7. Reprocessing is very easy and less time consuming.
<i>8. It provides limited ways to represent information.</i>	8. It provides a variety of ways to represent information.
<i>9. It becomes complex when data increase.</i>	9. It remains easy even if data increase.

INTRODUCTION TO COMPUTER:

COMPUTER:

DEFINITION:

Computer is an electronic machine that receives input (data), perform processing and produce output.

OR

Computer is an electronic data processing machine, which takes the input, stores the data in its memory then processes it with the help of arithmetic logic unit (A.L.U) under the supervision of control unit (C.U) and then give us the output according to the instructions.

EXPLANATION:

Nowadays computer is essential in every field of life we can say that we are living in computer era. Computer can solve any problem of life. For example: problem of

documentation, problems of calculation and problems of communication etc. Actually a computer is a data processing machine so it can produce the information in the result of processing and information is asset of any organization. We can get accurate and on time information due to computer.

What are different Elements of Information Technology?

ELEMENTS OF Information Technology:

There are six elements of IT.

- People
- Procedure
- Data information
- Software
- Hardware
- Communication

What are advantages of using computers?

ADVANTAGES OF COMPUTER:

SPEED:

Computer can perform calculation faster as compared to the human being.

ACCURACY:

Computer can process large amount of data and generates error free result.

STORAGE:

Computer stores massive amount of information. Then this information can be used and re-used for years.

RELAIBILITY:

The high reliability of the components enables the computer to produce consistence results.

COMMUNICATION:

Most computers today have the capability to communicate with other computers. We can connect two or more computers by a devise namely called modem. A collection of connected computers is called network. We can communicate with other people in world via network like internet.

GENERATIONS OR HISTORY OF COMPUTERS

"Generation" in computer talk is a step in technology. It provides a framework for the growth of the computer industry. Originally, the term generation was used to distinguish between varying hardware technologies. But nowadays, it has been extended to include both the hardware and the software, which together make up an entire computer system.

The custom of referring to the computer era in terms of generations came into wide use only after 1964. There are totally five computer generations known till today. Each generation has been discussed below in detail along with their advantages and disadvantages. Although there is a certain amount of overlapping between the generations, the approximate dates shown against each are normally accepted.

FIRST GENERATION (1942 - 1955)

we have already discussed about some of the early computer - ENIAC, EDVAC, EDSAC, etc. These machines and other of their time were made possible by the invention of "vacuum tube", which was a fragile glass device that could control and amplify electronic signals. These vacuum tube computers are referred to as first-generation computers.

Advantages

1. Vacuum tubes were the only electronic components available during those days.
2. Vacuum tube technology made possible the advent of electronic digital computers.
3. These computers were the fastest calculating devices of their time. They could perform computations in milliseconds.

Disadvantages

1. Too bulky in size.
2. Unreliable.
3. Thousands of vacuum tubes that were used emitted large amount of heat and burnt out frequently
4. Air conditioning required.
5. Prone to frequent hardware failures.
6. Constant maintenance required.
7. No portable.
8. Manual assembly of individual components into functioning unit required.
9. Commercial production was difficult and costly.

SECOND GENERATION (1955 - 1964):

The transistor, a smaller and more reliable successor to the vacuum tube, was invented in 1947. However, computers that used were not produced in quantity until over a decade later. The second generation emerged with transistors being the brain of the computer.

With both the first and the second-generation computers, the basic component was a discrete or separate entity. The many thousands of individual components had to be assembled by hand into functioning circuits. The manual assembly of individual components and the cost of labor involved at this assembly stage made the commercial production of these computers difficult and costly.

Advantages

1. Smaller in size as compared to first generation computers.
2. More reliable.
3. Less heat generated.
4. These computers were able to reduce computational times from milliseconds to microseconds.
5. Less prone to hardware failures.

6. Better portability.
7. Wider commercial use.

Disadvantages

1. Air-conditioning required.
2. Frequent maintenance required.
3. Manual assembly of individual components into a functioning unit was required.
4. Commercial production was difficult and costly.

THIRD GENERATION (1964 - 1975)

Advances in electronics technology continued and the advent of "microelectronics" technology made it possible to integrate large number of circuit elements into very small (less than 5 mm square) surface of silicon known as "chips". This new technology was called "integrated circuits" (ICs). The third generation was based on IC technology and the computers that were designed with the use of integrated circuits were called third generation computers.

Advantages

1. Smaller in size as compared to previous generation computers.
2. Even more reliable than second-generation computers.
3. Even lower heat generated than second generation computers.
4. These computers were able to reduce computational times from microseconds to nanoseconds.
5. Maintenance cost is low because hardware failures are rare.
6. Easily portable.
7. Totally general purpose. Widely used for various commercial applications all over the world.
8. Less power requirement than previous generation computers.
9. Manual assembly of individual components into a functioning unit not required. So human labor and cost involved at assembly stage reduced drastically.
10. Commercial production was easier and cheaper.

Disadvantages

1. Air-conditioning required in many cases.
2. Highly sophisticated technology required for the manufacture of IC chips.

FOURTH GENERATION (1975 ONWARDS):

Initially, the integrated circuits contained only about ten to twenty components. This technology was named small scale integration (SSI). Latter, with the advancement in technology for manufacturing ICs, it became possible to integrate up to a hundred components on a single chip. This technology came to be known as medium scale integration (MSI). Then came the era of large scale integration (LSI) when it was possible to integrate over 30,000 components onto a single chip. Effort is still on for further miniaturization and it is expected that more than one million components will be integrated on a single chip known as very large scale integration (VLSI).

A fourth generation computer, which is what we have now, has LSI chips as its brain. It is LSI technology, which has led to the development of very small but extremely powerful

computers. It was the start of a social revolution. A whole computer circuit was soon available on a single chip, the size of a postage stamp. Overnight computers became incredibly compact. They became inexpensive to make and suddenly it became possible for anyone and every one to own a computer.

Advantages

1. Smallest in size because of high component density.
2. Very reliable.
3. Heat generated is negligible.
4. No air conditioning required in most cases.
5. Much faster in computation than previous generations.
6. Hardware failure is negligible and hence minimal maintenance is required.
7. Easily portable because of their small size.
8. Totally general purpose.
9. Minimal labor and cost involved at assembly stage.
10. Cheapest among all generations.

Disadvantages

1. Highly sophisticated technology required for the manufacture of LSI chips.

FIFTH GENERATION (YET TO COME)

Scientists are now at work on the fifth generation computers - a promise, but not yet a reality. They aim to bring us machines with genuine I.Q., the ability to reason logically, and with real knowledge of the world. Thus, unlike the last four generations that naturally followed its predecessor, the fifth generation will be totally different, totally novel, and totally new.

In structure it will be parallel (the present ones are serial) and will be able to do multiple tasks simultaneously. In functions, it will not be algorithmic (step by step, with one step at a time). In nature, it will not do just data processing (number crunching) but knowledge processing. In inference, it will not be merely deductive, but also inductive. In application, it will behave like an expert. In programming, it will interact with humans in ordinary language (unlike BASIC, COBOL, FORTRAN, etc. which present computers need). And in architecture, it will have KIPS (Knowledge Information Processing System) rather than the present DIPS/LIPS (Data/Logic Information Processing System).

The odds of coming out with a fifth generation computer are heaviest for Japan. They have already started work in this direction few years back. Japan has chosen the PROLOG (Programming in Logic) language as its operating software and plans to have the final machine talk with human beings, see and deliver pictures and hear the normal, natural language.

What are different types OF COMPUTER?

Types of computer according to purpose:

There are two types of computer according to purpose.

Special purpose computer:

Special purpose computer are designed to solve scientific problems. These are use to perform singular jobs such as airline reservation and stock reports. These are more efficient computers. They are widely used in industrialist robotics.

General purpose computer:

General purpose computer are designed to solve large variety of problems. They are used in business, military, education, manufacturing and science etc. they can store large amount of data and perform complex mathematical and engineering formulas.

Types of computer according to function:

DIGITAL COMPUTERS:

Digital computers are use to process digital data. In these computers information is represented by variable. The digit 1 shows on state and 0 shows off state. Digital computer process data which is in the form of digit. In these computers all operations take place at a very high speed and produce very accurate results e.g. calculators, digital clock, digital computers.

ANALOG COMPUTERS:

These computer processed information. It is used for measurement. The speed of analog computer is too fast but not accurate. Analog computer measure temperature, pressure, and voltage etc. on the other hand we can say that in these computers information is represented in continues form e.g. automobile speedometer, current and analog watch.

HYBRID COMPUTER:

Hybrid computers combine the properties of both digital and analog computers for solving the problems. For example: hybrid computer have the speed of analog computers and accuracy of digital computers. These computers are used in some specialized application. For example: flight radar system, national defense, hybrid watches and digital petrol pump.

CLASSIFICATION OF COMPUTERS W.R.T SIZE:

- MICRO COMPUTERS
- MINI COMPUTERS
- MAINFRAME COMPUTERS
- SUPER COMPUTERS
- NOTEBOOK COMPUTERS

MICRO COMPUTERS:

These computers are also called personal computers. These are the most popular digital computers used in all field of life. These are small in size and have less processing capability. These are also called chip computers.

MINI COMPUTERS:

These computers are large than personal computer both in size and the other facilities. Such as speed, storage and capacity etc. these computers have the capabilities to serve many users at a time. They are costly compare to pc.

MAINFRAME COMPUTERS:

These are the most expensive, largest and fastest computers used in large organization. Mainframes have the facilities to communicate with large amount of data and support several input and output devices. The cost of mainframe is in million rupees and can serve as much as users. These computers have the memory of several hundred Mbps.

SUPER COMPUTERS:

Super computers are also called number crunches. These computers are very much expensive and fastest computers. These computers are used for video making, weather prediction, atomic reactor, defense system and for other purposes.

Notebook computers

Having a small size and low weight the notebook is easy to carry to anywhere. A student can take it with him/her to his/her school in his/her bag with his/her book. This is easy to carry around and preferred by students and business people to meet their assignments and other necessary tasks.

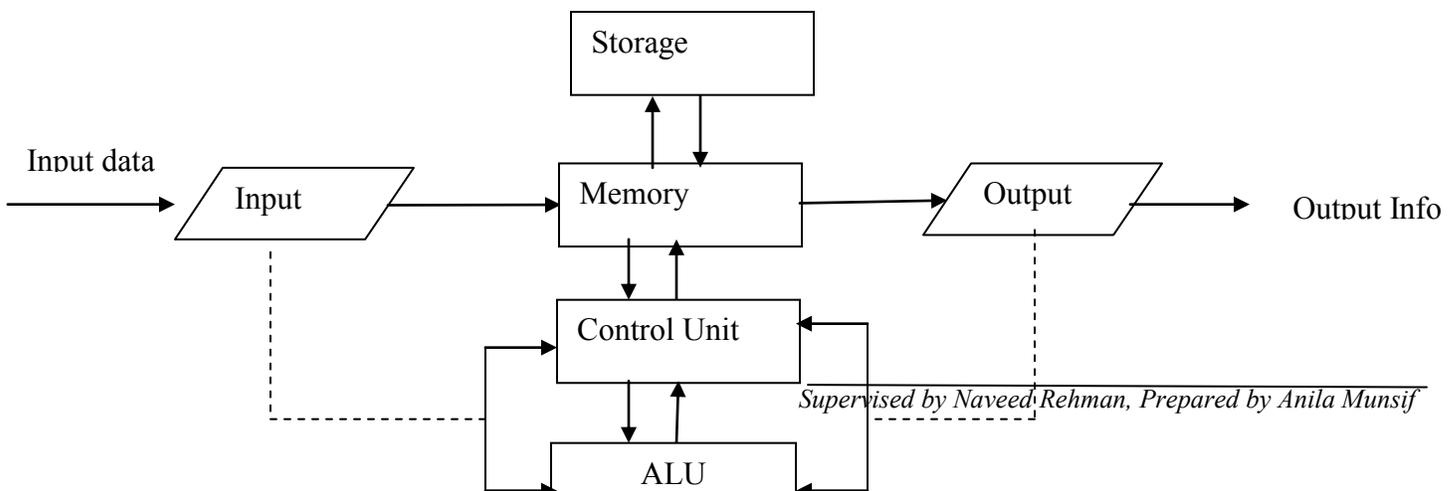
The approach of this computer is also the same as the Personal computer. It can store the same amount of data and having a memory of the same size as that of a personal computer. One can say that it is the replacement of personal desktop computer.

BASIC COMPONENTS OF COMPUTER:

Computer has four components.

- Input unit
- Output unit
- Memory unit
- Central processing unit

Block Diagram of Computer



INPUT UNIT:

The input unit receives data and instruction from an input device and converts it into a machine-readable form. After converting it sends data and instruction to main memory for further processing. Commonly used input devices are keyboard, mouse, and scanner.

CENTRAL PROCESSING UNIT:

The heart and the brain of a computer is the CPU. It can perform any kind of logical and arithmetical calculation. The CPU consists of these sub-units.

CONTROL UNIT (C.U)

The control unit controls the entire operation of the computer like processing, input, output, and memory operations and devices as well. The control unit does not perform actual processing. By reading and interpreting the instructions contained in the program, the control unit directs other units to execute programs in proper manners.

ARITHMETIC AND LOGIC UNIT (A.L.U)

The arithmetic and logic unit performs all the arithmetic and logical calculations on data. The control unit controls and directs data to the arithmetic and logic unit, and the arithmetic and logic unit perform the required operations on data. So, the arithmetic and logic unit is the actual processing unit of a computer.

MEMORY UNIT

The memory unit of a computer is the place where the program and the data are stored during processing. All the data to be processed and instructions required for processing are kept in memory. There are two types of memory: RAM and ROM.

RANDOM ACCESS MEMORY (RAM)

It is used to store programs and data during computer operations. Information can be read as well as written to this type of memory. It is volatile memory; the information it contains is lost as soon as the system turns off unless the user has saved it.

READ ONLY MEMORY (ROM)

It is basically used to store permanent programs. The read-only memory contains information that can only be read. You cannot write on this memory. It is non-volatile or permanent memory. The information it contains is not lost if the computer is so turned off.

OUTPUT UNIT

The output unit takes the processed information and converts it to a human-readable form. The output unit sends information outside the computer through output devices. Commonly used output devices are monitor, printer, and speakers.

HARDWARE:

The physical components of a computer that we can touch, handle, or see physically are called hardware.

Hardware is tangible parts. Hardware is the electronic and mechanical components. It consist of all mechanical, electrical and electronic devices like CPU, disk, disk drive, monitor, keyboard, mouse, Ram, Rom and cable etc.

INPUT AND OUTPUT DEVICES

Input/output (I/O)

Hard disk drives are common storage devices used with computers.

I/O is the means by which a computer exchanges information with the outside world. Devices that provide input or output to the computer are called peripherals. On a typical personal computer, peripherals include input devices like the keyboard and mouse, and output devices such as the display and printer. Hard disk drives, floppy disk drives and optical disc drives serve as both input and output devices. Computer networking is another form of I/O.

Often, I/O devices are complex computers in their own right with their own CPU and memory. A graphics processing unit might contain fifty or more tiny computers that perform the calculations necessary to display 3D graphics[citation needed]. Modern desktop computers contain many smaller computers that assist the main CPU in performing I/O.

Quincy Center for Technical Education Computer Technology

Typical Computer Input/Output and Storage Devices

Input / Output and Storage Devices		
Input	Output	Storage
Keyboard	Monitor	Floppy Disk
Mouse	Printers (all types)	Diskette
Trackballs	Audio Card	Hard Disk
Touchpad	Plotters	Disk Cartridge
Pointing Sticks	LCD Projection Panels	CD-ROM
Joysticks	Computer Output Microfilm (COM)	Optical Disk
Pen Input	Facsimile (FAX)	Magnetic Tape
Touch Screen	Speaker(s)	Cartridge Tape

Light Pen		Reel Tape
Digitizer	.	PC Card
Graphics Tablet	.	*RAID
Scanner	.	*Memory Button
Microphone	.	*Smart Card
Electronic Whiteboard	.	*Optical Memory Card
Video Cards	.	
Audio Cards	.	

INPUT DEVICES

The devices used to enter data and instructions into the computer are called input devices

Common input devices are following.

KEYBORED

Keyboard is most commonly used input device. It is the main input device for entering text and numbers. Slandered contains over hundred keys. There are five groups that is numeric key pad, function keys, the arrow keys, special purpose keys and the alpha numeric keys.

MOUSE

A mouse is a small input device it is also called pointing device. Mouse is moved on a flat surface to control the moment of the pointer on a screen. The mouse usually has two or three buttons. These buttons are used to perform different task.

DIGITAL SCANNER

It is an input device. It is used to read the pictures. And other printed material placed on its glass. It reads the picture, translated in digital form and stores it in the computer. A digital scanner uses laser technology to read images.

MICROPHONE

Microphones are the devices used to record that voice data in computer. Microphones are becoming increasingly important as input devices to record speech and to give commands to computer.

DIGITAL CAMERA

Digital camera captures images and films, convert them to digital form and can store it in a computer. No chemical-based film is used.

OUTPUT DEVICES

The data has been processed into useful information is called output.

MONITOR:

Monitor is the most common output device. The output displayed by monitor is called soft copy. No function of the computer can be achieved without the help of monitor. People often form an opinion about a computer just by looking at the monitor. The monitor is looks like television and also works in the same principle.

PRINTER

For the hard copy output we need a printer as out put device. Printers are used to print characters or images on the paper. There are two types if printers.

- IMPACT PRINTER
- NON-IMPACT PRINTER

Impact printer creates a character or image by processing an inked ribbon against the paper, using pins or hammers to shape the character or image.

Non impact printer use other means to create an image like ink jet printers use nozzles to spray tiny droplets of ink on to paper.

PLOTTER

Plotter is also the hardcopy output device that is to produces images quality graphics and charts. A plotter works by drawing lines on paper using pens held in a mechanical arm.

SPEAKERS AND HEADSETS

Some devices produce audio output. There devices produce music speech or other sounds like beep etc. speakers and headsets are two commonly used audio output devices.

Projector

Projectors are display devices that project a computer created image. The computer sends the image data to the video card which then sends the video image to the projector. They are typically used for presentations or for viewing videos.

Magnetic Ink Character Recognition or MICR

Is a character recognition technology used primarily by the banking industry to facilitate the processing of cheques. The technology allows computers to read information (such as account numbers) off of printed documents. Unlike barcodes or similar technologies, however, MICR codes can be easily read by humans.

MICR characters are printed in special typefaces with a magnetic ink or toner, usually containing iron oxide. As a machine decodes the MICR text, it first magnetizes the characters in the plane of the paper. Then the characters are passed over a MICR read

head, a device similar to the playback head of a tape recorder. As each character passes over the head it produces a unique waveform that can be easily identified by the system.

Optical character recognition,

Usually abbreviated to **OCR**, is the mechanical or electronic translation of scanned images of handwritten, typewritten or printed text into machine-encoded text. It is widely used to convert books and documents into electronic files, to computerize a record-keeping system in an office, or to publish the text on a website. OCR makes it possible to edit the text, search for a word or phrase, store it more compactly, display or print a copy free of scanning artifacts, and apply techniques such as machine translation, text-to-speech and text mining to it. OCR is a field of research in pattern recognition, artificial intelligence and computer vision.

OCR systems require calibration to read a specific font; early versions needed to be programmed with images of each character, and worked on one font at a time. "Intelligent" systems with a high degree of recognition accuracy for most fonts are now common. Some systems are capable of reproducing formatted output that closely approximates the original scanned page including images, columns and other non-textual components.

STORAGE DEVICES:

Storage devices are used to store data in computer either permanently or temporarily there are two types of storage devices, Primary storage and secondary storage devices

RANDOM ACCESS MEMORY (RAM):

It used to store programs and data during computer operation. Information can be read as well as written to this type of memory. Three basic functions of RAM:

- It holds data for processing.
- It holds instructions for data processing.
- It holds processed data (information)

READ ONLY MEMORY (ROM):

It is basically used to store permanent programs. The read only memory contains information that can only be read. You cannot write on this memory. There are three basic types of ROM these are as follow:

- PROM (programmable read only memory)
- EPROM(erasable programmable read only memory)
- EEPROM(electronically erasable programmable read only memory)

SECONDARY STORAGE DEVICES (secondary memory):

When the amount of data is too large and we want to store it permanently, then secondary storage devices are used. Storage devices are also called backing storage

devices, secondary storage devices, or auxiliary storage devices. There are two basic Medias are used for storage.

- Magnetic media
- Optical media

MAGENETIC MEDIA:

There are two kinds of devices used as magnetic media such as

- Magnetic
- Magnetic disk

MAGENETIC TAPE:

Magnetic tape is flexible plastic tape coated with magnetic material. It is widely used when large amount of data is to be processed sequentially. An advantage of magnetic tape is that it is very cheap and economical storage medium. Its major disadvantage is that it is very slow and it is only sequential.

HARD DISKS

Hard disk is a type of magnetic disk. It is used to store large amount of data permanently. Hard disks hold more data hold and are faster then floppy disks. Hard disks can more then 80 GB of data. Hard disks are fixed in the system and so are not easily portable. Most important of hard disks is to store program files. Some important characteristics of hard disks are as follow:

- The storage capacity of hard disk is very large from 2 GB to 80GB and more.
- It is much faster and reliable then floppy.
- It is the primary media for storing data and programs.

FLOPPY DISK OR DISKETTE

Floppy disk is a soft magnetic disk. Floppy disk is portable because we can remove them from a disk drive. Floppy disks are slower to access then hard disks and have less storage device capacity 1.44MB.

OPTICAL MEDIA OR OPTICAL DISK

This uses laser technology to read and write data. The laser stands for light Amplification through stimulated of radiation.

Optimal disks storage capacity is from 600 MB to over 1GB.

Categories of Optimal laser disks

- CD-ROM
- DVD-ROM

COMPACT DISKS READ ONLY MEMORY

The data stored in CD ROM can only be read. It cannot be deleted or changed. It is portable storage device. The data can be transferred easily by using CD ROM. It can store about 650MB of data.

DIGITAL VIDEO DISKS

DVD is similar to CD Rom. It uses a laser beam with short wave length. The short wave length reads smaller holes on disk data storage capacity of DVD is much more then CD ROM. It can store 17 GB of data.

SOFTWARE:

DEFINITION:

Software is a set of instruction or programs that tell the computer what to do.

OR

The untouchable part of the computer is called software.

Software is a written computer program or a series of instruction. Software is a program that allows to hardware to perform a useful work. Without software hardware is quite useless. Software is the communication between user and computer. Software is needed to complete the input, processing output

TYPES OF SOFTWARE:

There are two main types of software. System software and Application software.

SYSTEM SOFTWARE:

System software is the set of one or more programs that control the operations of computer system. System software is concerned with the running of application programs through the computer hardware. System software also control all of the operation required to move data into and out of the computer system.

Categories of system software are as follow:

- Operation System
- Utility Programs
- Device drivers

Operating System:

An **operating system (OS)** is a software, consisting of programs and data, that runs on computers and manages the computer hardware and provides common services for efficient execution of various application software.

For hardware functions such as input and output and memory allocation, the operating system acts as an intermediary between application programs and the computer hardware.

although the application code is usually executed directly by the hardware, but will frequently call the OS or be interrupted by it. Operating systems are found on almost any device that contains a computer—from cellular phones and video game consoles to supercomputers and web servers.

Examples of popular modern operating systems for personal computers are Microsoft Windows, Mac OS X, and Linux..

Utility Programs:

Utility software is a kind of system software designed to help analyze, configure, optimize and maintain the computer. A single piece of utility software is usually called a **utility** (*abbr. util*) or **tool**.

Utility software should be contrasted with application software, which allows users to do things like creating text documents, playing games, listening to music or surfing the web. Rather than providing these kinds of user-oriented or output-oriented functionality, utility software usually focuses on *how* the computer infrastructure (including the computer hardware, operating system, application software and data storage) operates. Due to this focus, utilities are often rather technical and targeted at people with an advanced level of computer knowledge.

Most utilities are highly specialized and designed to perform only a single task or a small range of tasks. However, there are also some utility suites that combine several features in one piece of software.

Most major operating systems come with several pre-installed utilities.

Utility software categories

- **Disk storage** utilities
- **Disk defragmenters** can detect computer files whose contents are broken across several locations on the hard disk, and move the fragments to one location to increase efficiency.
- **Disk checkers** can scan the contents of a hard disk to find files or areas that are corrupted in some way, or were not correctly saved, and eliminate them for a more efficiently operating hard drive.
- **Disk cleaners** can find files that are unnecessary to computer operation, or take up considerable amounts of space. Disk cleaner helps the user to decide what to delete when their hard disk is full.
- **Disk space analyzers** for the visualization of disk space usage by getting the size for each folder (including sub folders) & files in folder or drive. showing the distribution of the used space.
- **Disk partitions** can divide an individual drive into multiple logical drives, each with its own file system which can be mounted by the operating system and treated as an individual drive.
- **Backup** utilities can make a copy of all information stored on a disk, and restore either the entire disk (e.g. in an event of disk failure) or selected files (e.g. in an event of accidental deletion).
- **Disk compression** utilities can transparently compress/uncompress the contents of a disk, increasing the capacity of the disk.

Device Drivers:

In computing, a **device driver** or **software driver** is a computer program allowing higher-level computer programs to interact with a hardware device.

A driver typically communicates with the device through the computer bus or communications subsystem to which the hardware connects. When a calling program invokes a routine in the driver, the driver issues commands to the device. Once the device sends data back to the driver, the driver may invoke routines in the original calling program. Drivers are hardware-dependent and operating-system-specific. They usually provide the interrupt handling required for any necessary asynchronous time-dependent hardware interface. Examples: Printer, VGA, sound card, LAN card etc...

APPLICATION SOFTWARE:

Application software is a program needed to perform various applications on the computer by users. It helps a computer user to solve specific problems. The application software uses the operating system in order to function. The operating system is the base software. The application software runs on top of the operating system software. Application software is a program to do a practically specific job such as word processing, accounting etc.

Different Types of Application Software

Word Processing Software: This software enables the users to create and edit documents. The most popular examples of this type of software are MS-Word, WordPad, Notepad and some other text editors.

Database Software: Database is a structured collection of data. A computer database relies on database software to organize the data and enable the database users to achieve database operations. Database software allows the users to store and retrieve data from databases. Examples are Oracle, MSAccess, etc.

Spreadsheet Software: Excel, Lotus 1-2-3 and Apple Numbers are some examples of spreadsheet software. Spreadsheet software allows users to perform calculations. They simulate paper worksheets by displaying multiple cells that make up a grid.

Multimedia Software: They allow the users to create and play audio and video media. They are capable of playing media files. Audio converters, players, burners, video encoders and decoders are some forms of multimedia software. Examples of this type of software include Real Player and Media Player.

Presentation Software: The software that is used to display information in the form of a slide show is known as presentation software. This type of software includes three functions, namely, editing that allows insertion and formatting of text, methods to include graphics in the text and a functionality of executing the slide shows. Microsoft PowerPoint is the best example of presentation software.

Examples of Application Software

Enterprise Software: It deals with the needs of organization processes and data flow. The customer relationship management or the financial processes in an organization are carried out by means of enterprise software.

Information Worker Software: Individual projects within a department and individual needs of creation and management of information are handled by information worker software. Documentation tools, resource management tools and personal management systems fall under the category of this form of application software.

Educational Software: It has the capabilities of running tests and tracking progress. It also has the capabilities of collaborative software. It is often used in teaching and self-learning.

Simulation Software: Used to simulate physical or abstract systems, simulation software finds applications in both, research and entertainment. Flight simulators and scientific simulators find a place in the list of simulation software.

Content Access Software: It is used to access content without editing. The common examples of content access software are web browsers and media players.

What is flowchart? Types of flowcharts? Advantages & disadvantages:

FLOWCHARTS:

A flow chart is a graphical or symbolic representation of a process. Each step in the process represented by a different symbol and contains a short description of the process step. The flowchart symbols are linked together with arrows showing the process flow direction.

Types of Flow chat:

- *Document flowcharts*, showing controls over a document-flow through a system
- *Data flowcharts*, showing controls over a data flows in a system
- *System flowcharts* showing controls at a physical or resource level
- *Program flowchart*, showing the controls in a program within a system

A note on flowchart symbol:

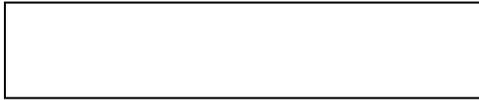
- **Terminator:**

An oval flowchart shape indicating start and end of the process.



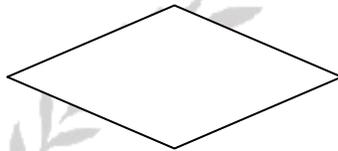
- **Process**

A rectangular flowchart shape indicating a normal process of flowchart.



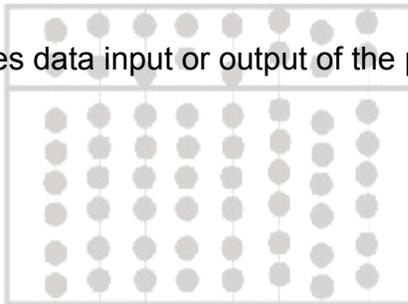
- **Condition**

A diamond flowchart shape indicating a branch in the process of flow.



- **Data**

A parallelogram that indicates data input or output of the process.



- **Document**

It is used to indicate a document or report.



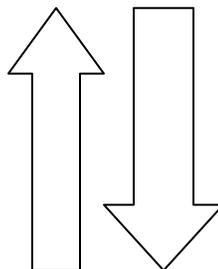
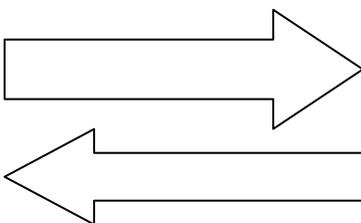
- **Connector**

It is used to indicate that one symbol is connected to another.



- **Flow lines**

It is used to connect the symbols and indicates the direction.



Advantages and disadvantages of flow charts:

The benefits of flowcharts are as follows:

1. Communication: Flowcharts are better way of communicating the logic of a system to all concerned.
2. Effective analysis: With the help of flowchart, problem can be analysed in more effective way.
3. Proper documentation: Program flowcharts serve as a good program documentation, which is needed for various purposes.
4. Efficient Coding: The flowcharts act as a guide or blueprint during the systems analysis and program development phase.
5. Proper Debugging: The flowchart helps in debugging process.
6. Efficient Program Maintenance: The maintenance of operating program becomes easy with the help of flowchart. It helps the programmer to put efforts more efficiently on that part.

Limitations of using flowcharts

1. Complex logic: Sometimes, the program logic is quite complicated. In that case, flowchart becomes complex and clumsy.
2. Alterations and Modifications: If alterations are required the flowchart may require re-drawing completely.
3. Reproduction: As the flowchart symbols cannot be typed, reproduction of flowchart becomes a problem.
4. The essentials of what is done can easily be lost in the technical details of how it is done.

What is Programming Language? What are different types of Programming Languages?

Programming Languages:

Computer Program is a way of communicating with the computer, that's how we give instructions to computer hardware to act accordingly, all types of software are developed used computer languages.

Machine Language is the only language the computer understands. Under it instructions are written as strings of binary 1s and 0s.

- Difficult to write programs
- Difficult to understand programs
- Not portable
- Difficult to modify

Assembly language is one level above the machine language. It uses certain predefined symbolic codes instead of binary codes. These symbolic codes are called *mnemonics*. (Both Machine and Assembly language are considered low level language)

High-Level Language Overcomes the limitation of writing a program in Machine and Assembly language as it is difficult and time consuming. In High-Level Language, the programs can be written using simple English words. Examples of High-Level Language are BASIC, Fortran, COBOL, C, C++.

- Easy to write programs
- Portable and compatible
- Easy to modify and enhance programs

What are applications or uses of computers in today's world.

APPLICATION/USES OF COMPUTER:

There are different applications of computer. Some applications are

- Computer in home
- Computer in education
- Computer in police departments
- Computer in healthcare/medical
- Computer in science and technology
- Computer in offices
- Computer in industries

Computer in homes:

In the home we play games on computer, watch movies and listen audio CDS and get information from all over the world.

Computer in education:

We use computers to download notes from internet. We can also download books from different libraries all over the world. Online lecture are available so that students get education while sitting at home.

Computer in police department:

Computer is used also in police department to keep also in police department to keep the track records of criminals that are increasing day by day. This helps in finding the relation of previous criminals to the new one.

Computer in healthcare/medical:

Information technology plays an important role in medical. For example: a scanner takes a series of picture of the body by means of computerized axial topography (CAT) or magnetic resonance imaging (MRI). A computer then combines the pictures to produce detailed three-dimensional images of the body's organs in addition; the MRI produces images that show changes in body chemistry and blood flow.

Computer in science and technology:

Computer-aided design and computer aided manufacturing programs, often called CAD/CAM, have led to improved products in many fields, especially where designs tend to be very detailed. Computer programs make it possible for engineers to analyze designs of complex structures such as power plants and space stations

Computer in offices:

Computer is also used in all types of offices to keep record of the organization. For example: in college and universities computer is used to keep the records of students and teachers. Their salary means payroll system. In libraries, computer is used to keep the records of the books.

Computer in industries:

Computer is used in industries for keeping information about the inventory, work force, purchasing, sailing of machinery and supplying

What is Artificial Intelligence? What are different branches of AI?

ARTIFICIAL INTELLIGENCE (AI):

Artificial intelligence is a group of related technologies used for developing machines to emulate human qualities. Such as learning, reasoning, communicating, seeing and hearing.

OR

The science and engineering of making intelligent machine.

AI is the intelligence of machine and the branch of computer sciences that aims to create it.

There are many types of AI.

- Robotics
- expert system
- neural network
- pattern recognition
- natural language processing
- fuzzy logic

- genetic algorithm

Expert system:

Software which acts like human beings.

OR

Expert system or knowledge base system is a set of interactive computer programs that helps users solve problem that could require the assistance of human expert.

What Is Expert System?

Basically an expert system is a software which can also be considered as an artificial intelligence. It is a traditional application which attempts to create a process that can work like one or more human experts. There can be various ways to get an expert...

Why We Need Expert System?

Sometimes in the life we have so many problems, which are very easy to solve, but we can't solve it. So at that moment we take the help of a professional advisor or expert!

What Is The History Of Expert System?

Beginning in the mid 1960s, a new type of system, called an expert system, began to be developed to support management in the decision making process. The new type of system, which represents one of the first practical applications of artificial intelligence,...

What Are Components Of Expert System?

An expert system has four major components: 1. Natural (software) language interface for the user 2. Knowledge base (Like a database, where the facts are stored) 3. Inference machine (software that solves problems and makes logical inferences)

Neural networks:

Artificial neural networks are made up of interconnecting artificial neurons (programming constructs that mimic the properties of biological neurons). Artificial neural networks may either be used to gain an understanding of biological neural networks, or for solving artificial intelligence problems without necessarily creating a model of a real biological system. The real, biological nervous system is highly complex and includes some features that may seem superfluous based on an understanding of artificial networks.

Robotics:

Robotics is the engineering science and technology of robots, and their design, manufacture, application, and structural disposition. Robotics is related to electronics, mechanics, and software. Fully autonomous robots only appeared in the second half of

the 20th century. The first digitally operated and programmable robot, the Animate, was installed in 1961 to lift hot pieces of metal from a die casting machine and stack them.

Pattern recognition:

Pattern recognition is "the act of taking in raw data and taking an action based on the category of the pattern": Most research in pattern recognition is about methods for supervised learning and learning. Pattern recognition aims to classify data (patterns) based either on a priori knowledge or on statistical information extracted from the patterns. The patterns to be classified are usually groups of measurements or observations, defining points in an appropriate multidimensional space.

Natural language processing:

Natural Language processing (NLP) is a field of computer science and linguistics concerned with the interactions between computers and human (natural) languages.^[1] In theory, natural-language processing is a very attractive method of human-computer interaction. Natural-language understanding is sometimes referred to as an AI-complete problem, because natural-language recognition seems to require extensive knowledge about the outside world and the ability to manipulate it. NLP has significant overlap with the field of computational linguistics, and is often considered a sub-field of artificial intelligence.

Fuzzy logic:

Fuzzy logic is a form of multi-valued logic derived from fuzzy set theory to deal with reasoning that is approximate rather than precise. Fuzzy logic variables may have a truth value that ranges between 0 and 1 and is not constrained to the two truth values of classic propositional logic. Furthermore, when linguistic variables are used, these degrees may be managed by specific functions.

Genetic algorithm:

The genetic algorithm (GA) is a search heuristic that mimics the process of natural evolution. This heuristic is routinely used to generate useful solutions to optimization and search problems. Genetic algorithms belong to the larger class of evolutionary algorithms (EA), which generate solutions to optimization problems using techniques inspired by natural evolution, such as inheritance, mutation, selection, and crossover.

What is Difference between CAD and CAM?

COMPUTER AIDED DESIGN (CAD):

Computer-aided design (CAD), also known as computer-aided drafting and design (CADD), is the use of computer technology for the process of design and design-documentation. Computer Aided Drafting describes the process of drafting with a computer. CADD software, or environments, provides the user with input-tools for the

purpose of streamlining design processes; drafting, documentation, and manufacturing processes

CAD is an important industrial art extensively used in many applications, including automotive, shipbuilding, and aerospace industries, industrial and architectural design, prosthetics, and many more. CAD is also widely used to produce computer animation for special effects in movies, advertising and technical manuals. The modern ubiquity and power of computers means that even perfume bottles and shampoo dispensers are designed using techniques unheard of by engineers of the 1960s. Because of its enormous economic importance, CAD has been a major driving force for research in computational geometry, computer graphics (both hardware and software), and discrete differential geometry.^[2]

The design of geometric models for object shapes, in particular, is often called computer-aided geometric design

COMPUTER AIDED MANUFACTURING (CAM):

Computer-aided manufacturing (CAM) is the use of computer software to control machine tools and related machinery in the manufacturing of work pieces. This is not the only definition for CAM, but it is the most common; ^[1] CAM may also refer to the use of a computer to assist in all operations of a manufacturing plant, including planning, management, transportation and storage.^{[6][7]} Its primary purpose is to create a faster production process and components and tooling with more precise dimensions and material consistency, which in some cases, uses only the required amount of raw material (thus minimizing waste), while simultaneously reducing energy consumption.

CAM is a subsequent computer-aided process after computer-aided design (CAD) and sometimes computer-aided engineering (CAE), as the model generated in CAD and verified in CAE can be input into CAM software, which then controls the machine tool.

Write detail note on virus? Virus hoax and harm of virus for computers?

VIRUS:

A computer virus is a computer program that can copy itself and infect a computer. The term "virus" is also commonly but erroneously used to refer to other types of malware, including but not limited to adware and spy ware programs that do not have the reproductive ability. A true virus can spread from one computer to another (in some form of executable code) when its host is taken to the target computer; for instance because a user sent it over a network or the Internet, or carried it on a removable medium such as a floppy disk, CD, DVD, or USB drive.

What virus may do to a computer?

- Deleted files.

- Various messages in files or on programs.
- Changes volume label.
- Marks clusters as bad in the FAT.
- Randomly overwrites sectors on the hard disk.
- Replaces the MBR with own code.
- Creates more than one partition.
- Attempts to access the hard disk drive, which can result in error messages such as: invalid drive specification.
- Causes cross-linked files.
- Causes a “sector not found” error.
- Cause the system to run slow.
- Logical partition created, partitions decrease in size.
- A directory may be displayed as garbage.
- Directory order may be modified so files, such as COM files, will start at the beginning of the directory.
- Cause hardware problems such as keyboard keys not working, printer issues, modem issues etc.
- Disable ports such as LPT or COM ports.
- Cause keyboard keys to be remapped.
- Alter the system time/date.
- Cause system to hang or freeze randomly.
- Cause activity on HADD or FDD randomly.
- Increases file size.
- Increase or decrease memory size.
- Randomly change file or memory size.
- Extended boot times.
- Increase disk access times.
- Cause computer to make strange noises, make music, clicking noises or beeps.
- Display pictures.
- Different types of error messages.

Detecting viruses:

The recommended method of detecting and cleaning the computer from any computer viruses or other malware is an antivirus protection program. A listing of antivirus protection programs and what they help protect can be found on any website. Alternatively, a user can look at various aspects of the computer and detect possible signs indicating a virus is on the computer. While this method can be used to determine some viruses, it cannot clean or determine the exact virus you may or may not have and it is not recommended.

ANTIVIRUS:

Antivirus (or anti-virus) software is used to prevent, detect, and remove malware, including computer viruses, worms, and Trojan horses. Such programs may also prevent

and remove adware, spy ware, and other forms of malware. Antivirus software can degrade computer performance

Antivirus programs:

- Avira
- Norton
- PC-Cilin
- MC-café
- AVG

COMPUTER VIRUS HOAXES:

A computer virus hoax is a message warning the recipient of a non-existent computer virus threat. The message is usually a chain e-mail that tells the recipient to forward it to everyone they know.

Virus hoaxes are usually harmless and accomplish nothing more than annoying people who identify it as a hoax and waste the time of people who forward the message.

Hoaxes are distinct from computer pranks, which are harmless programs that perform unwanted and annoying actions on a computer, such as randomly moving the mouse, turning the screen display upside down, etc.

COMPUTER CRIME:

Computer crime, or cyber crime, refers to any crime that involves a computer and a network, where the computers may or may not have played an instrumental part in the commission of a crime. Net crime refers, more precisely, to criminal exploitation of the Internet. Issues surrounding this type of crime have become high-profile, particularly those surrounding hacking, copyright infringement, child pornography, and child grooming. There are also problems of privacy when confidential information is lost or intercepted, lawfully or otherwise.

On the global level, both governments and non-state actors continue to grow in importance, with the ability to engage in such activities as espionage, financial theft, and other cross-border crimes sometimes referred to as cyber warfare. The international legal system is attempting to hold actors accountable for their actions, with the International Criminal Court among the few addressing this threat.

Advantages of Computers:

Computers today are becoming as important part of our lives as pen and paper were about fifty years ago. There can be no denying that this is because of many benefits we get from using computers. The many advantages of computers include:

1. Computers have made lot of computational and clerical work easy.
2. Computers have made many tasks of modern life like buying and banking more convenient. We can shop and bank from our homes any time of the day and night.
3. A computer has given easy access to lot of useful information through the Internet.
4. Computers have made it easy for us to communicate and keep in touch with others.
5. Computers have made available to us many new form of entertainment like computer games.

Disadvantages of computer:

However use of computer has some disadvantages also. These include:

1. In spite of continuously reducing prices, computers are still costly as compared to the pen and pencil they replaced.
2. Use of computers requires additional efforts in form of developing software and learning to use computers.
3. Once an application on computer is developed and implemented, it becomes difficult to make even minor modification.
4. Excessive use of computer for communication and keeping in touch with others threatens to reduce the intensity of personal bond that often develops between people.

What are word processor programs? Write their features.

Word processor:

A word processor (more formally known as document preparation system) is a computer application used for the production (including composition, editing, formatting, and possibly printing) of any sort of printable material.

Word processor may also refer to a type of stand-alone office machine, popular in the 1970s and 1980s, combining the keyboard text-entry and printing functions of an electric typewriter with a dedicated processor (like a computer processor) for the editing of text. Although features and design varied between manufacturers and models, with new features added as technology advanced, word processors for several years usually featured a monochrome display and the ability to save documents on memory cards or diskettes. Later models introduced innovations such as spell-checking programs,

increased formatting options, and dot-matrix printing. As the more versatile combination of a personal computer and separate printer became commonplace, most business-machine companies stopped manufacturing the word processor as a stand-alone office machine. As of 2009 there were only two U.S. companies, Classic and Alpha Smart, which still made stand-alone word processors. Many older machines, however, remain in use.

Word processors are descended from early *text formatting* tools (sometimes called *text justification* tools, from their only real capability). Word processing was one of the earliest applications for the personal computer in office productivity.

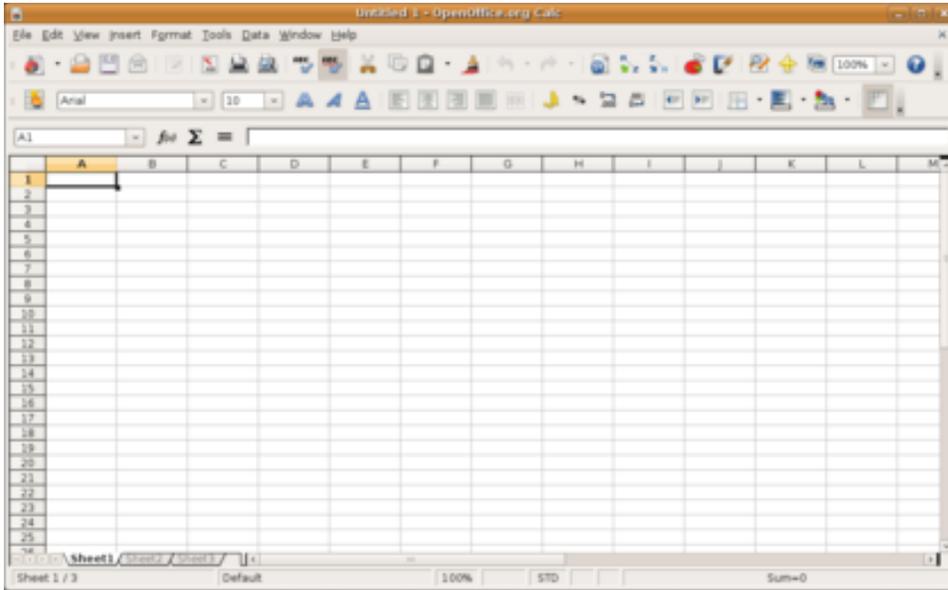
Microsoft Word is the most widely used word processing software. Microsoft estimates that over 500,000,000 people use the Microsoft Office suite, which includes Word. Many other word processing applications exist, including WordPerfect (which dominated the market from the mid-1980s to early-1990s on computers running Microsoft's MS-DOS operating system) and open source applications OpenOffice.org Writer, AbiWord, KWord, and LyX. Web-based word processors, such as Google Docs, are a relatively new category.

Write a detail note on spread sheet softwares.

Spreadsheet

A spreadsheet is a computer application that simulates a paper, accounting worksheet. It displays multiple cells that together make up a grid consisting of rows and columns, each cell containing alphanumeric text, numeric values or formulas. A formula defines how the content of that cell is to be calculated from the contents of any other cell (or combination of cells) each time any cell is updated. Spreadsheets are frequently used for financial information because of their ability to re-calculate the entire sheet automatically after a change to a single cell is made.

VisiCalc is usually considered the first electronic spreadsheet (although this has been challenged), and it helped turn the Apple II computer into a success and greatly assisted in their widespread application. Lotus 1-2-3 was the leading spreadsheet when DOS was the dominant operating system. Excel now has the largest market share on the Windows and Macintosh platforms.



Microsoft Excel

Microsoft had been developing Excel on the Macintosh platform for several years at this point, where it had developed into a fairly powerful system. A port of Excel to Windows 2.0 resulted in a fully functional Windows spreadsheet. The more robust Windows 3.x platforms of the early 1990s made it possible for Excel to take market share from Lotus. By the time Lotus responded with usable Windows products, Microsoft had started compiling their Office suite. Starting in the mid 1990s continuing through the present, Microsoft Excel has dominated the commercial electronic spreadsheet market.

Database:

The term 'database' is the combination of two words data and base. 'Data' means any information for computer processing such as numbers, text, images, names, IDs, addresses, phone numbers, etc. 'Base' here means collection or storage. So database means collection of data. Some definitions of database are given below

"Database can be defined as a collection of logically related data"

OR

"An organized body of related information."

OR

1) Reduction of redundancy:

As in database approach each data item is recorded in only one place. So in this case redundancy will be minimum. But we cannot say that in database approach redundancy is completely eliminated because multiple copies of same data are required to store to separately. However it can be controlled.

2) Consistency of data:

As in the database approach the data is stored centralized. Therefore the entire user can access or use the same data.

3) Integration of data:

The database approach also provides data integrity, which means that data is stored also in single logical structure. Therefore, the logical relationship mean user easily access and relate one data item to another.

4) Data Sharing:

As in database approach all the data is stored centralized. Then it is not the property of single user. Hence each user can access data according to there's own view. This required data can be accessed or shared by means of query language.

5) Reduction program Maintenance:

In DBMS system database is in depended of the application program so if we change the database then there is no changing require in application program. And all the input and output function, files type and data field s already defined by the DBMMS so less time requires developing the application program.

6) Data Security:

In this system database administrator is responsible for database security. When aver sensitive data can be accessed then the database approach completely provides the authority over the database administration.



NUMBER SYSTEM:

The system in which number are involved is called number system. There are four types of number system.

- Binary $(0,1)_2$
- Octal $(0,1,2,3,4,5,6,7)_8$
- Decimal $(0,1,2,3,4,5,6,7,8,9)_{10}$
- Hexa-decimal $(0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F)_{16}$

Binary to decimal:

Example:

$$(01101)_2 \longrightarrow (\quad)_{10}$$

$$= 0 \cdot 2^4 + 1 \cdot 2^3 + 1 \cdot 2^2 + 0 \cdot 2^1 + 1 \cdot 2^0$$

$$= 0 \cdot 16 + 1 \cdot 8 + 1 \cdot 4 + 0 \cdot 2 + 1 \cdot 1$$

$$= 0 + 8 + 4 + 0 + 1$$

$$= (13)_{10}$$

Decimal to binary:

Example:

$$(6213)_{10} \longrightarrow (\quad)_2$$

2	6213
2	3101-1
2	1550-0
2	775-0
2	387-1
2	193-1
2	96-1
2	48-0
2	24-0
2	12-0
2	6-0
2	3-0
2	1-1

$$\text{Ans} = (1100000111001)_2$$

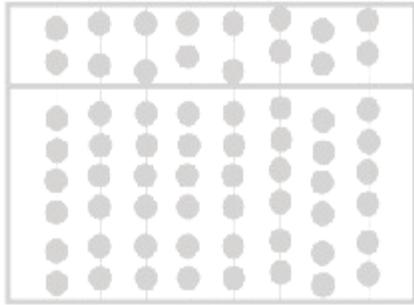
Decimal to octal:

Example:

$(6111)_{10} \longrightarrow (\quad)_8$

8	6111
8	768-3
8	95-6
8	11-7
	1-3

Ans= $(13763)_8$



Decimal to hexa:

Example:

$(92139)_{10} \longrightarrow (\quad)_{16}$

16	92139
16	5758-11
16	359-14
16	22-7
	1-6

Ans= $(167EB)_{16}$

Hexa to decimal:

Example:

$(A2FF)_{16} \longrightarrow (\quad)_{10}$

$= 16^3 \times 10 + 16^2 \times 2 + 16^1 \times 15 + 16^0 \times 15$

Ans= $(41617)_{10}$

Hexa to octal:

Example:

$(A2FF)_{16} \longrightarrow ()_8$

STEP 1. CONVERT HEXA NUMBER INTO DECIMAL FIRST AND THEN DECIMAL TO OCTAL.

Binary to decimal:

$(101.11)_2 \longrightarrow ()_{10}$

$$= 2^2 * 1 + 2^1 * 0 + 2^0 * 1 + 1 * 2^{-1} + 1 * 2^{-2}$$

$$= 4 + 2 + 0.1/2 + 1/4$$

$$= 6.0.5 + 0.25$$

$$= 6.75$$

Ans = $(6.75)_{10}$

Decimal to binary:

$(51.76)_{10} \longrightarrow ()_2$

2	51
2	25-1
2	12-1
2	6-0
2	3-0
	1-1

$(110011.)_2$

.76*2=	1	.52
.52*2=	1	.04
.04*2=	0	.08
.08*2=	0	.16

$(110011.1100)_2$

