DIT NOTES

ICT
INFORMATION & COMMUNICATION TECHNOLOGY

Prepared by: Engr. Syed Kumail Shah

New & Updated Book

ICT- Technical Board

Course Title: Information & Communication Technology ICT

Objectives

The course outline has been described in detail and in appropriate way covering different areas of Information and Communication Technology. Some topics have been restructured and added to the course outline which is needed for computer applications.

Course Duration	Theory	100 hours	3 hours per week
	Practical	0 hours	No practical needed

Assessment Approach: Total assessment based on final examination

Theory   100 Marks

Reference Books
Introduction to Computer (Peter Norton 7th Edition)
Understanding Computer: Today and Tomorrow Comprehensive (Deborah Morely 14th Edition)

Course Outline of ICT

Information and Communication Technology

Topics:

- ***Introduction to Computers (IT)***
- Computer Technology
- History of Computers
- Types of Computers
- Generations of Computers
- Hardware/Software
- ***Data & Information***
- Data Processing
- Classification of Data
- System Unit
- How CPU works?
- ***Number System***
- Binary Number System
- Octal Number System
- Decimal Number System
- Inter Conversions
- Addition/Subtraction
- ***Different Computer Parts***
- Input & Output Devices
- Keyboard
- Mouse
- Monitor
- RAM
- ROM
- CPU
- ***Storage***
- Overview
- Types of Storage
- Hard Drives
- Optical Drives
- Flash Drives
- Other Types of Storage
- ***Software***
- System Software

- Operating System
- Types of OS
- Application Software
- Basics of Application Software
- Word Processing
- Spreadsheets
- Database Concepts
- Graphics & Multimedia Concepts
- Other types of Application Software
- ***Impact of Computer over Society***
- Virus
- Antivirus
- Malware
- ***Computer Network***
- What is a network?
- Communication Protocols
- Network Standards
- Data Transmission
- TCPIP
- OSI Model
- ***Internet***
- Evolution of Internet
- Getting setup to use internet
- Browsing and Email
- Search the Internet
- ***Future Trends in IT***
- E-commerce
- Business Models
- Security
- Artificial Intelligence
- Cloud Computing
- CAD/CAM
- Robotics

INFORMATION & COMMUNICATION TECHNOLOGY (ICT)

**PREPARED BY: Engr. Syed Kumail Hassan Shah (Kumail.pk).
GREEN INSTITUTE OF TECHNOLOGY GIT KARACHI.**

Introduction to information technology

DEFINITION OF INFORMATION TECHNOLOGY

Information Technology:

The combination (merging) of computer and communication is called Information Technology. Information Technology is the technology that uses computing with high speed communication links to spread information from one place to another. The interconnection of computer enables people to send and receive information. The communication links also are used to interact with different people in the world. Computer is an important component of information technology. It makes possible to use information technology for solving problems. The world has become a global village due to advancement in information technology. It means that people living in the world know one another as if they are living in a village. Information can be transferred from one place to another place easily and quickly. It manages a network of computers for creating WEB Pages, producing videos digitally, selling, buying, and any type of business on the Internet. For example, telephone and radio equipments and switches used for voice communication.

A computer and communication system is made up six elements.

I) People 2) Procedure 3) Data/Information 4) Hardware 5) Software 6) Communication

1-   PEOPLES

It means the users or people who runs and execute the entire data processing task and computer installations or the people who works in the data processing environment'. The personnel include System Analysts. Programmers, Data entry operators, and Data processing officers.

2-   PROCEDURE

Procedures are rules, policies, and methods for operating computers. The operation of a data processing system requires procedures for use in obtaining and preparing data in order to operate the computer and for distributing the output from the computer. This procedure includes control steps such a's actions to be taken to show errors in the data and malfunctioning of the equipment etc.

3-   DATA

Fact and figure is called data. Data is raw material of IS. Data can take many forms, including .Text data. Audio data, video data, voice data graphics and image data.

4-   HARDWARE

Physical parts of computer system. For example input devices, output devices and CPU such as keyboard, Mouse, motherboard, CD-ROM etc.

5-   SOFTWARE

The Software consists of programs whose purpose is to< communicate with computer. The Software includes operating system i.e. MS- DOS. PC-DOS. UNIX. .XENIX, and Linux etc. General purpose programs i.e. database packages like FoxPro, Dbase, Java etc.

6-   COMMUNICATION

Data Communication/Telecommunication technologies' and network like the internet which is necessary for all types of organization and their computer-based data processing. Telecommunication network consist of computers, communications processor and other device interconnected by communication media and control by communication soft ware.

COMPUTER AND HISTORY OF COMPUTER

Q. Define Computer?

Ans. Computer:

Computer is an electronic device, which can accept the input data. process the data, and gives the result of the process data according to instruction.

A computer is a system, of an interrelated, interacting components that performs the basic function of input, processing, output, storage, and control. There are three basic component of computer that is Input. CPU. And Output.

Q). Explain History of Computer?

History of Computers:

The history of Computer is very old; i.e. it goes back to some 500 years BC. The first computing machine was used by the Chinese before 15th century .The name of this machine was Abacus. '

However in 1812 an English mathematician from Cambridge University. Mr. Charles Babbage designed a machine called DIFFERENCE ENGINE. This, machine was capable of calculating powers of numbers. Babbage also gave the idea of an ANAEYTICAE ENGINE, which was supported to be general-purpose machine having the ability to calculate various arithmetic and/or algebraic formulas.

Store data and print results. He died soon and never converted his dreams into reality. The analytical engine was not a successful machine but it gave birth to the research in the field of computers.

In 1946, John MaUchly and J,P. Eckert developed an Electronic, Numerical Integrator and Computer (ENIAC) at the Moore school of Engineering and Technology, Pennsylvania USA. This was the first truly successful computer after Mark-I and Mark-II developed at Manchester University. There were three main drawbacks in the ENIAC as follows:

1. It used serial lines for processing.
2. Mo storage facility was available.
3. It used decimal numbers instead of binary number system.

These problems were successfully overcome with the development of John V.on Neumann's Electronic Discrete Variable Automatic Computer (EDVAC) developed in 1950. It was the first computer capable of doing non-scientific work. Besides, most of today's computers are based on the working of EDVAC. The development of these machines materialized the existence of computers and they became a commercial entity used in many government organizations. As EDVAC was the first machine that was used by the people for solving their problems, but still it was not a useful machine because it could not solve all the problems of that time. Therefore, efforts were rode to develop such a machine, which can solve all our problems. In this connection, the scientists make developments from time to time and improve the previous machine into a latest one. Due to these improvements, we have now Computers, which can solve all types of problems.

ADVANTAGES OF COMPUTERS

The use of computer was not so common several years ago as it is today.

The following are advantage s/important of computer

1. Speed:-Computer works at a very high speed and are much faster than humans. A computer can perform billions of calculations in a second. The time used by a computer to perform an operation is called the processing speed. Computer speed is measured in Mega Hertz (MHz)

2. Storage:-A computer can store large amount of data permanently user can use this data at any time.

3. Processing:-A computer can process the given instruction. It can perform different type of processing like addition, subtract, division etc.

4. Accuracy:-Accuracy means to provide result without any error. Computer can process large amount of data and generate accurate result.

5. Communication:-Most computers today have the capability of communicating with other computer. We can connect two or more computer by communication device such as modem, NIC card.

6. **Versatile:-**A computer can perform different type of task. We can use computer in hospital, bank. Office or at home etc.

7. **Cost reduction:-**We can perform a difficult task in less time and less cost. For example we have hire many people to handle an office. The same work can be performed by a single person.

Types of Computer (w.r.t. internal structure)

There are three type of Computer
a) Digital Computers. b) Analog Computers, c) Hybrid Computers,

a. Digital Computers:

In these Computers, information is represented by variables which having discrete values, i.e. il operates on the inputs that are ON-OFF switching. Digital computers process data. Which is in the form of digits? In these Computers all operations take place at a very high speed and produce very accurate and precise results, e.g. Digital computer. .Calculators. Digital Watches, etc.

a) Analog Computers:-

These machines process information, which is of, continues nature and which is not discrete or separate. An Analog computer is used for measurement. The speed of analog is fast but not so accurate. Analog computer measure Temperature, Pressure. Current Voltage and Depth etc. These quantities continue in nature and have millions of varieties. OR in other words we can say that in these Computers, information is represented in continues form. e.g..
Automobile Speed Meter, Current, Analog watch, etc.
Differentiate between Analog and Digital Computers: - Analog Computers measure while Digital Computers count. Analog Computers are fast but not so accurate, while Digital Computers are fast as well as more accurate..

b) Hybrid Computer:-

Hybrid Computers combine the properties of both Digital Computers and Analog Computers for solving the problems e.g. Hybrid Computers have the speed of Analog Computers and accuracy of Digital Computers. These Computers are used in some specialized applications, e.g. Flight Radar System, National Defense, Hybrid Watches, digital petrol pumps etc.

Types Of Computer W.R.T Size

a) Mainframe Computers:
These are the most expensive, largest and fastest Computers, used in large Organizations. Mainframes have the facilities to communicate with large amount of data and support several input and output devices. The cost of typical mainframe is in million rupees and can serve as much as 150 users. . '
These Computers have Memory of several hundred Mbs, and operate at a speed of measure in nanoseconds, e.g. IBM/360, IBM/3090, etc. **b) Mini Computers:**
These Computers are larger than PCs, both in size and other facilities such as,,speed, storage capacity, etc. These Computers have the capabilities to serve many Users at one time. They are costly as compared to PCs. Their speeds are rated between 1 and 50 MIPS. E.g. Vax/11730. IBM/8370, etc. **c) Micro Computers:**
These are also called Personal Computers (PC). These are the most popular digital Computers used in all fields of life. These are small in memory and have less processing capability. These are also called Chip Computers, because its entire circuitry is fabricated on a single chip, the microcomputer of today is equivalent to the main frame of tomorrow, e.g 1BM-PC, XT. A 1. Compatibles, 286. 386.486, 586, P-l. P-H, P-1II, P-IV etc.
d) Super Computers: -

Super Computers are also called "Number Crunchers‖ because, they are specialized Computers for dealing with numbers, i.e. they are capable of performing over 10 Mega flops (i.e. millions floating point operations per second). These Computers are very much expansive. Two families of commercially available Super Computers are the GRAY-I and Cyber205 built by 111iac-iv. These are specially used in Atomic reactor, defense system of NASA. (USA)

Super computer is mostly used for weather predication, weapon design, preparing model of chemical and biological system, and studying the neural network of brain. These are specially used in Atomic reactor.

Super computer is also used in business and industries field.

Generations Of Computer

GENERATION OF COMPUTER

Although, the development of Computers is a continuous process, however, it can be categorized into the following generations based on the technology used for the Computer systems.

1. **First Generation (1942-1955):-**

All the Computers developed in this generation were based on Vacuum-Tubes technology. For example. EN1AC (Electronic Numerical Integrator and Computer), Mark-1. Mark-11 ets.

Advantage
* Vacuum tube technology made possible to make electronic digital computers.
* These computer could calculate data in millisecond.

Disadvantage
* These were very large.
* Consumed a large amount of energy.
* Very slow
* Expensive.
* Use machine language only
* Heated very soon due to thousands of vacuum tubes.

2. Second Generation (1955-1964):-

The Computers of this generation were based on Transistor technology (Vacuum tube replace by transistor) and they opened tlie gateway fO the commercial development for sale of computers. The trahsistors-were small in size, fast in operation and less expensive than vacuum tubes, e.g. . EDVAC, IBM-1401 **Advantages**

Smaller in size as compared to first generation computers.
* Less energy used • Produce less heat
* Less costly.
* Speed of these Computers was high.
* Use of assembly language instead of machine language

3. **Third   Generation(l 964-1975)**

The Computers of this generation were based on integrated circuits (ICs) technology (transistor replace by ICs). In early 1960 the electronic technology of solid-state was introduced. The development of integrated circuits (ICs) is called solid-state technology or Small Scale Integration (SSI). The integrated circuits (ICs) are the collection of many electronic devices like transistors on a single chip of silicon. This technology enabled the computers to enter into electronic revolution. IBM-360 etc.

Advantages
* Smaller in size as compared to previous generation
* Less energy used
* Produce less heat
* More good speed, calculate data in nano seconds.
* Less expensive
* Could be use high ievcl language **Disadvantage**
* Air condition was required
* High technology required for the manufacture of IC Chips.

4. Fourth Generation Computer(1975-Present)

In this generation, microprocessors where used. Microprocessor is small chip containing thousands of ICs on it. It greatly reduced the size of computer.

In this generation Microprocessor was introduced, due to which microcomputers were made. For example, IBM-PC etc.

Advantage

- Very small in size
- Less power consumption
- Less heat generated
- Best speed
- General purpose
- Commercial production Disadvantage
- High advance technology required for manufacturing microprocessor

5.   Fifth Generation(AI)(1980-1990)

The rapid progress in computer technology is still continued and active research is going on in different fields of computer technology but there is no well-defined categorization after fourth generation. The reason may be that now the developments are taking place in a variety of fields of computer hardware and software as compared to the previous developments, which mostly took place in the fields of electronics.

Hence the Computers of this generation were based on the principles of AI and also in this generation, Software development, was give more importance than Hardware, as a result of which Artificial Intelligence was introduced, e.g. Robotics, Computer Vision etc.

6.   Sixth Generation(ANN'S)(Since 1990):-

The Computers of this generation are based on the principles of **Artificial Neural Network System** (ANNS). As a result, now the Computers can think and decide for solving different problems, e.g. Character recognition etc.

DATA, INFORMATION AND THE DIFFERENCE B/W DATA AND INFORMATION

Q. What is Data? Explain different types of data.

A. Data is a plural form of the Latin word Datum. The collection of fact an Figure is called Data OR any thing in raw form. Data cannot be used for decision making or action taking. e.g. Name, Address, Number, Phone Number, Roll No etc. **Types of data:**

There are different types of data

i. **Alphabetic data type**:-It consist letter from A-Z, capital or from a-z small letter, e.g Abid

Peshawar, Pakistan, Khan ii. **Numeric datatype**;- It consist of digit from 0-9 e.g 123, 567 etc

iii. **Alphanumeric data type**:- It consist alphabetic letter as well as numeric digit. Street no A/10 etc

iv. **Graphic data**: It consists tables, charts, graphics and statements v. **Audio data**: It consists only sounds. For example radio news.

vi. **Video data**: It consists photos, image .and moving picture. Such as TV news. vii. **Mixed data**: It consists more than one type of data. Such as the combination of audio and video.

Q. What is Information?

A. To organize the Data iri meaningful form upon which people can take necessary decision is called Information, e.g. 2,1,5.4 when sorted it become 1,2,4,5 which is information. Information is the meaningful, processed data, which is relevant and accurate and there by can be used in decision-making. Examples are voucher, bills, fee registration cards or library cards.

Differentiate between Data and Information

DATA	INFORMATION
Data is a set of raw facts.	Information is processed form of data.
Data is used as input in the computer	Information is the output of computer
Data is not meaningful	Information is meaningful
Data is asset of organization and is not available to people for sale.	Information is normally available available for sale.
Data is an independent entity	Information depend on data
Data is not used in decision-making	Information is very important for decision-making
Data is use rarely	Information is use frequently

EDP AND MDP

DATA PROCESSING CYCLE

Data processing life cycle is a collection of steps required to convert data into information. Different steps of data processing life cycle are as follows.

INPUT: in this steps, dala is collected and given to the computer for Processing.
PROCESS: In this steps, computer processes data to generate _ information.
OUTPUT: In this step, the information is given to the user as output. STORAGE: In this steps, the information is stored in the computer for' future use. This steps is optional,

CLASSIFICATION OF DATA PROCESSING SYSTEM MANUAL/CONVENTIONAL DATA PROCESSING.

The Conventional Data Processing/Traditional Data Processing system is the manual method of transforming data into information. The human beings themselves collect data, classify and arrange the data, perform manual calculation and hence produce the required output result.' It is very simple and inexpensive: Upto the 20'" century almost all data processing was done manually. Clerical persons used-paper, pen, and pencil to maintain recocds in offices. Such data processing caused frequently clerical mistakes and hence due to these miss-recorded transactions, the Company record was to be misrepresented. Information was often received too late to serve the organization purposes.

ELECTRONIC DATA PROCESSING (COMPUTER BASED DATA PROCESSING SYSTEM)

An Information System that uses Computer and'their hardware and software is called Electronic data processing, Computer-Based Data processing or Computer Based Information System. Electronic Data Processing or Computer Based Information System uses Computer hardware, and software, the internet and other telecommunication system, network, Computer based data resource management technique and many other information technologies to transform data resources into information products for consumers and business professionals. Electronic computers complete all data manipulation and file updating electronically rather than mechanically! This increased data processing productivity and reduced its cost. The speed, accuracy and reliability of computers are more than Traditional data processing.

DATA PROCESSING SYSTEM:-

The system that process data and produce information is called Data processing system or Information processing system. The diagrammatic representation of DPS is given below.
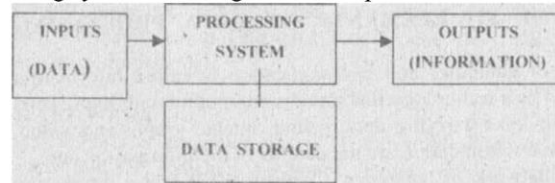
MODEL OF DATA PROCESSING SYSTEM.
There are mainly two of data processing systems which are discuss in previous topics.

ADNANTAGES OF ELECTRONIC DATA PROCESSING

Electronic data processing reshaping the basics of business. Now a day customer service, operation, products and marketing strategic and distribution dependent on electronic data processing. Electronic data processing system perform three important roles in any type of organization.

1. Support of business operations.
2. Support of managerial decision making 3. Support of strategic competitive dvantage.

In to day business and every field of life electronic data processing is important component. Through electronic data processing it is possible to become a global enterprise. Electronic data processing is used to restructure work by transforming business process.

Electronic data processing is used to simplified complex process. Receiving, recording, processing and retrieval of record in second. It is

Possible to access the desired record in second . Electronic data processing permits the organization to create, develop, and maintain database. Using electronic data processing to send, receive email and faxes. Access to internet and remote computer is possible through, it. EDP process thousand of transaction in second and the processing speed is very high. Electronic data processing process the transaction with high accuracy.

INTRODUCTION OF NUMBER SYSTEM AND THEIR CONVERSION

Number System- A number system defines a set of values to represent quantity. We talk about the number of people attending a class, the number of modules taken by each student and use numbers to represent grade. Number System can be categorized in two systems:- **(a) Non-Positional Number System**
(b) Positional Number System

Non-Positional Number System- In ancient times, people used to count on fingers, when the fingers became insufficient for counting, stones, pebbles or sticks were used to indicate values. But it was very difficult to perform arithmetic with such a number system as there is no symbol for zero.

Positional Number System- In this system the value of each digit is defined not by the symbol but also by the symbol position. Positional Number System is used to perform arithmetic. Existing Positional number system is decimal number system. Apart from the decimal number system, there are binary number system, octal number system and hexadecimal number system.

Base (Radix)- In the number system the base or radix tells the number of symbols used in the system. In the earlier days, different civilisations were using different radixes. The Egyptian used the radix 2, the Babylonians used the radix 60 and Mayans used 18 and 20.

The base of a number system is indicated by a subscript (decimal number) and this will be followed by the value of the number. For example $(952)_{10}$, $(456)_8$, $(314)_{16}$

Number System that are used by the computers- **Decimal System**

Binary System

Octal System

Hexadecimal System

Decimal System- The decimal system is the system which we use in everyday counting. The number system includes the ten digits from 0 through 9. These digits are recognized as the symbols of the decimal system. Each digit in a base ten number represents units ten times the units of the digit to its right.

For example-

$9542 = 9000 + 500 + 40 + 2 = (9 \times 10^3) + (5 \times 10^2) + (4 \times 10) + (2 \times 10^0)$ **Binary System -** Computers do not use the decimal system for counting and arithmetic. Their CPU and memory are made up of millions of tiny switches that can be either in ON and OFF states. **0** represents OFF and **1** represents ON. In this way we use binary system.

Binary system has two numbers 0 and 1. Binary system has base 2 therefore the weight of n_{th} bit of the number from Right Hand Side is n_{th} bit $\times 2_{n-1}$.

Octal System- The octal system is commonly used with computers. The octal number system with its 8 digit 0,1,2,3,4,5,6, and 7 has base 8. The octal system uses a power of 8 to determine the digit of a number's position.

Hexadecimal System- Hexadecimal is another number system that works exactly like the decimal, binary and octal number systems, except that the base is 16. Each hexadecimal represents a power of 16. The system uses 0 to 9 numbers and A to F characters to represent 10 to 15 respectively.

Conversions- Any number in one number system can be converted into any other number system. There are the various methods that are used in converting numbers from one base to another.

Conversions of Decimal to Binary- The method that is used for converting of decimals into binary is known as the remainder method. We use the following steps in getting the binary number- (a) Divide the decimal number by 2.

(b) Write the remainder (which is either 0 or 1) at the right most position. (c) Repeat the process of dividing by 2 until the quotient is 0 and keep writing the remainder after each step of division.

(d) Write the remainders in reverse order.

Example- Convert $(45)_{10}$ into binary number system.

2	45	Remainder
2	22	1
2	11	0
2	5	1
2	2	1
2	1	0
	0	1

Thus $(45)_{10} = (101101)_2$

Note- In every number system-

(a) The first bit from the right is referred as LSB (Least Significant Bit)

(b) The first bit from the left is referred as MSB (Most Significant Bit) **Conversions of Decimal Fractions to Binary Fractions-** For converting decimal fractions into binary fractions, we use multiplication. Instead of looking for a remainder we look for an integer. The following steps are used in getting the binary fractions- (a) Multiply the decimal fraction by 2.

(b) If a non-zero integer is generated, record the non-zero integer otherwise record 0.

(c) Remove the non-zero integer and repeat the above steps till the fraction value becomes 0.

(d) Write down the number according to the occurrence.

Example- Find the binary equivalent of $(0.75)_{10}$.

Number (to be recorded)

$0.75 \times 2 = 1.50$ 1

$0.50 \times 2 = 1.00$ 1 Thus

$(0.75)_{10} = (0.11)_2$.

Moreover, we can write $(45.75)_{10} = (101101.11)_2$.

Remark- If the conversion is not ended and still continuing; we write the approximation in 16 bits.

Example- Find the binary equivalent of $(0.9)_{10}$.

Number (to be recorded)

$0.9 \times 2 = 1.8$ 1

$0.8 \times 2 = 1.6$ 1

$0.6 \times 2 = 1.2$ 1

$0.2 \times 2 = 0.4$ 0 0.4

$\times 2 = 0.8$ 0

$0.8 \times 2 = 1.6$ 1

$0.6 \times 2 = 1.2$ 1

$0.2 \times 2 = 0.4$ 0

$0.4 \times 2 = 0.8$ 0 0.8

$\times 2 = 1.6$ 1

$0.6 \times 2 = 1.2$ 1

$0.2 \times 2 = 0.4$ 0

$0.4 \times 2 = 0.8 \quad 0$
$0.8 \times 2 = 1.6 \quad 1 \quad 0.6$
$\times 2 = 1.2 \quad 1$
$0.2 \times 2 = 0.4 \quad 0$
$0.4 \times 2 = 0.8 \quad 0$
$0.8 \times 2 = 1.6 \quad 1$
Thus $(0.9)_{10} = (0.1110011001100110011001)_2$.

Conversion of Decimal to Octal- In converting decimal to octal, we follow the same process of converting decimal to binary. Instead of dividing the number by 2, we divide the number by 8.

Example- Convert $(45)_{10}$ into octal number system.

8	45	Remainder
8	5	5
8	0	5

Thus $(45)_{10} = (55)_8$.

Conversions of Decimal Fractions to Octal Fractions – We follow the same steps of conversions of decimal fractions to binary fractions. Here we multiply the fraction by 8 instead of 2.

Example- Find the octal equivalent of $(0.75)_{10}$.

Number (to be recorded)

$0.75 \times 8 = 6.00 \quad 6$ Thus
$(0.75)_{10} = (0.6)_8$.
And $(45.75)_{10} = (55.6)_8$.

Conversion of Decimal to Hexadecimal – We divide by 16 instead of 2 or 8. If the remainder is in between 10 to 16, then the number is represented by A to F respectively.

Example- Convert $(45)_{10}$ into hexadecimal.

16	45	Remainder
16	2	D
16	0	2

Thus $(45)_{10} = (2D)_{16}$.

Conversions of Decimal Fractions to Hexadecimal Fractions – Here we multiply the fraction by 16 instead of 2 or 8. If the non-zero integer is in between 10 to 16, then the number is represented by A to F respectively. **Example-** Find the hexadecimal equivalent of $(0.75)_{10}$.

Number (to be recorded)

$0.75 \times 16 = 12.00 \quad C \ (12 = C)$
Thus $(0.75)_{10} = (0.C)_{16}$.
And $(45.75)_{10} = (2D.C)_{16}$.

Conversions of Binary to Decimal – In converting binary to decimal, we use the following steps-

(a) Write the weight of each bit.
(b) Get the weighted value by multiplying the weighted position with the respective bit.
(c) Add all the weighted value to get the decimal number.

Example- Convert $(101101)_2$ into decimal number system.

Binary Number	1	0	1	1	0	1
Wt. of each bit	2^5	2^4	2^3	2^2	2^1	2^0
Weighted Value	1×2^5	0×2^4	1×2^3	1×2^2	0×2	1×2^0
Solved Multiplication	32	0	8	4	0	1

$$\text{Thus } (101101)_2 = 1 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 0 \times 2 + 1 \times 2^0.$$
$$= 32 + 0 + 8 + 4 + 0 + 1$$
$$= 45$$

Conversions of Binary Fractions to Decimal Fractions – The conversions of binary fractions to the decimal fractions is similar to conversion of binary numbers to decimal numbers. Here, instead of a decimal point we have a binary point. The exponential expressions (or weight of the bits) of each fractional placeholder is 2_{-1}, 2_{-2} ………
Example- Convert $(101101.11)_2$ into decimal number system.

Binary Number	1	0	1	1	0	1	1	1
Wt. of each bit	2^5	2^4	2^3	2^2	2^1	2^0	2^{-1}	2^{-2}
Weighted Value	1×2^5	0×2^4	1×2^3	1×2^2	0×2	1×2^0	1×2^{-1}	1×2^{-2}
Solved Multiplication	32	0	8	4	0	1	0.5	0.25

$$\text{Thus } (101101.11)_2 = 32 + 0 + 8 + 4 + 0 + 1 + 0.5 + 0.25 = 45.75$$

Conversions of Binary to Octal- We use the following steps in converting binary to octal-
(a) Break the number into 3-bit sections starting from LSB to MSB. (b) If we do not have sufficient bits in grouping of 3-bits, we add zeros to the left of MSB so that all the groups have proper 3-bit number.
(c) Write the 3-bit binary number to its octal equivalent. **Example-**
    Convert $(101101)_2$ into octal.

Binary Number	101	101
Octal Number	5	5

Thus $(101101)_2 = (55)_8$.

Example- Convert $(1101101)_2$ into octal.

Binary Number	001	101	101
Octal Number	1	5	5

Thus $(1101101)_2 = (155)_8$.

Conversions of Binary Fractions to Octal Fractions- We use the following steps in converting binary fractions to octal fractions-
(d) Break the fraction into 3-bit sections starting from MSB to LSB.

(e) In order to get a complete grouping of 3 bits, we add trailing zeros in LSB.

(f) Write the 3-bit binary number to its octal equivalent. **Example-** Convert $(101101.11)_2$ into octal.

Binary Number	101	101	110
Octal Number	5	5	6

Thus $(101101)_2 = (55.6)_8$.

Conversions of Binary to Hexadecimal- We convert binary to hexadecimal in the similar manner as we have converted binary to octal. The only difference is that here, we form the group of 4 –bits.

Example- Convert $(101101)_2$ into hexadecimal.

Binary Number	0010	1101
Decimal Number	2	13
Hexadecimal Number	2	D

Thus $(101101)_2 = (2D)_{16}$.

Conversions of Binary Fractions to Hexadecimal Fractions - We convert binary fractions to hexadecimal fractions in the similar manner as we have converted binary fractions to octal fractions. The only difference is that here we form the group of 4 – bits.

Example- Convert $(101101.11)_2$ into hexadecimal.

Binary Number	0010	1101	1100
Decimal Number	2	13	12
Hexadecimal Number	2	D	C

Thus $(101101.11)_2 = (2D.C)_{16}$.

Conversions of Octal to Decimal- We follow the same steps of conversion of binary to decimal. The only difference is that here weight of n_{th} bit is 8_{n-1} instead of 2_{n-1}.

Example- Convert $(55)_8$ into decimal number system.

Octal Number	5	5
Wt. of each bit	8^1	8^0
Weighted Value	5×8	5×8^0
Solved Multiplication	40	5

Thus $(55)_8 = 40 + 5$.
$= 45$

Conversions of Octal Fractions to Decimal Fractions- The weight of the bit of the fraction placeholder is $8^{-1}, 8^{-2}$………. We follow the same steps of conversion of binary fractions to decimal fractions.

Example- Convert $(55.6)_8$ into decimal number system.

Octal Number	5	5	6
Wt. of each bit	8^1	8^0	8^{-1}
Weighted Value	5×8	5×8^0	6×8^{-1}
Solved Multiplication	40	5	0.75

Thus $(55.6)_8 = 40 + 5 + 0.75 = 45.75$

Conversions of Octal to Binary- We use the following steps in converting octal to binary-
(a) Convert each octal digit into 3-bit binary equivalent.
(b) Combine the 3-bit section by removing the spaces to get the binary number.

Example- Convert $(55)_8$ into binary.

Octal Number	5	5
Binary Number	101	101

Thus $(55)_8 = (101101)_2$.

Example- Convert $(456)_8$ into binary.

Octal Number	4	5	6
Binary Number	100	101	110

Thus $(456)_8 = (100101110)_2$.

Conversions of Octal Fractions to Binary Fractions- We follow the same steps of conversion of octal to binary.

Example- Convert $(55.6)_8$ into binary.

Octal Number	5	5	6
Binary Number	101	101	110

Thus $(55.6)_8 = (101101.11)_2$.

Conversions of Octal to Hexadecimal- The conversion involves the following steps-
(a) Convert each octal digit to 3 –bit binary form.
(b) Combine all the 3-bit binary numbers.
(c) Group them in 4-bit binary form by starting from MSB to LSB.
(d) Convert these 4-bit blocks into their hexadecimal symbols. **Example-** Convert $(55)_8$ into hexadecimal.

Octal Number	5	5
Binary Number	101	101

Combining the 3-bit binary block, we have 101101.
Grouping them in 4 bit binary form-

Binary Number	0010	1101
Hexadecimal Symbol	2	D

Thus $(55)_8 = (2D)_{16}$.

Conversions of Octal Fractions to Hexadecimal Fractions- The method of conversion is based on the same procedure that we have discussed in conversions of octal to hexadecimal.

Example- Convert $(55.6)_8$ into hexadecimal.

Octal Number	5	5	6
Binary Number	101	101	110

Combining the 3-bit binary block, we have 101101.110.
Grouping them in 4 bit binary form-

Binary Number	0010	1101	1100
Hexadecimal Symbol	2	D	C

Thus $(55)_8 = (2D.C)_{16}$.

Conversions of Hexadecimal to Decimal- We do the conversion of hexadecimal to decimal as we have done the conversion of binary to decimal. Here weight of n_{th} bit is 16_{n-1} instead of 2_{n-1}.

Example- Convert $(2D)_{16}$ into decimal.

Hexadecimal Number	2	D(=13)
Wt. of each bit	16^1	16^0
Weighted Value	2×16	13×16^0
Solved Multiplication	32	13

Thus $(2D)_{16} = 32 + 13 = 45$.

Conversions of Hexadecimal Fractions to Decimal Fractions- We do the conversion of hexadecimal fractions to decimal fractions in the similar manner as we have done the conversion of binary fractions to decimal fractions. Here weight of bit is 16_{-1}, 16_{-2}.......

Example- Convert $(2D.C)_{16}$ into decimal.

Hexadecimal Number	2	D(=13)	C(=12)
Wt. of each bit	16^1	16^0	16^{-1}
Weighted Value	2×16	13×16^0	13×16^{-1}
Solved Multiplication	32	13	0.75

Thus $(2D.C)_{16} = 32 + 13 + 0.75 = 45.75$.

Conversions of Hexadecimal to Binary-We use the following steps- (a) Convert each hexadecimal digit to its 4-bit binary equivalent.
(b) Combine all the binary numbers.
Example- Convert $(2D)_{16}$ into binary.

Hexadecimal Number	2	D(=13)
Binary Number	0010	1101

Thus $(2D)_{16} = (00101101)_2 = (101101)_2$.

Conversions of Hexadecimal Fractions to Binary Fractions -We use the same steps of hexadecimal to binary conversion.

Example- Convert $(2D.C)_{16}$ into binary.

Hexadecimal Number	2	D(=13)	C(=12)
Binary Number	0010	1101	1100

Thus $(2D)_{16} = (00101101.1100)_2 = (101101.11)_2$.

Conversions of Hexadecimal to Octal- We convert each hexadecimal digit in binary. Combine all the binary numbers. Again group them into 3-bit form. Convert the 3-bit block in octal.
Example- Convert $(2D)_{16}$ into octal.

Hexadecimal Number	2	D(=13)
Binary Number	0010	1101

Combining the binary number, we get 00101101=101101
Grouping the binary number in 3-bit

Binary Number	101	101
Octal Number	5	5

Thus $(2D)_{16} = (55)_8$.

Conversions of Hexadecimal Fractions to Octal Fractions – We follow the same steps of hexadecimal to octal conversion.

Example- Convert $(2D.C)_{16}$ into octal.

Hexadecimal Number	2	D(=13)	C(=12)
Binary Number	0010	1101	1100

Combining the binary number, we get 00101101.1100=101101.11
Grouping the binary number in 3-bit

Binary Number	101	101	110
Octal Number	5	5	6

Thus $(2D.C)_{16} = (55.6)_8$.

Different Computer Parts

BASIC COMPONENETS OF COMPUTER

SYSTEM UNIT DIAGRAM
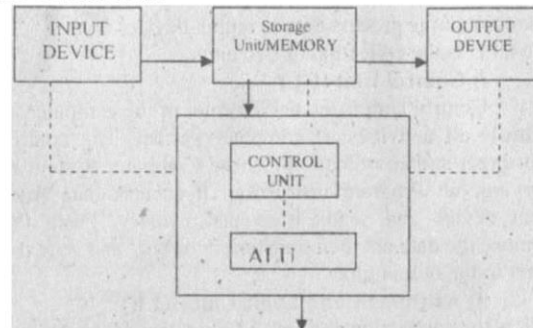
Central Processing Unit (CPU) (Block Diagram of computer)

FUNCTIONAL UNIT DIAGRAM

There are three basic Functional Unit/elements of a computer.

1 Input Unit 2-Processing Unit (CPU) 3-Output Unit

1-   Input Unit

The devices through which we enter data and instructions (Programs) into computer is called input devices, e.g. keyboard. Mouse, Scanner, digital camera etc

2-   Central Processing Unit (CPU) -

Central Processing Unit (CPU) is the administrator section of computer. It is the brain of computer. CPU is located on motherboard. Data passes, through CPU continually. Data-come from RAM and other unit such as keyboard and drivers. CPU processes the data and sends it back to RAM and other units. CPU is connected to all input, output and storage devices and controls all the functions of these devices. CPU receives the data from input .device; perform processing on data: and then sends the result of the process data to output dev ices.

The CPU is the collection of two units. **i)**

Control Unit (CU)

Control Unit is the nerve center of the computer. It controls all activities of computer system. The control unit direct and coordinate the entire Computer System in carrying out Program instruction. It accepts data from input device and sends it to the memory. From the memory the data are then transferred to ALU and. send the result to the output unit.

ii)   Arithmetic and Logic Unit (ALU)

This is the calculation section of Computer. All arithmetic operation like addition subtraction, multiplication and division as well as some logical operation are performed in this section. It consists of two units, a- Arithmetic Unit b- Logic unit

a- Arithmetic Unit

Arithmetic unit of the ALU performs basic arithmetic function as addition such as addition, subtraction, multiplication and division. **b- Logic Unit**

Logic unit of the ALU performs logical operations like comparing two data items to find which data item is greater than, equal to, or less than the other.

3) Storage Unit (Primary Memory)

This memory is the place where the computer program and data are stored during processing. This memory is temporary storage unit for data, instructions.

and information. The storage unit is often called either main storage or internal storage or primary storage. There is usually two type's primary storage.

RAM:-

It stands for Random-Access-Memory or read/write Memory because information can either be read from or written to the RAM. RAM is called volatile or semiconductor memory. This is the memory whose information can be erased or changed. It is temporary memory. Any thing stored in RAM is lost when Computer is switched off.

ROM:-

It stands for Read-Only-Memory. Information can be read from ROM but we cannot write information to it. This is the memory whose information can be not changed. The information stored in it cannot be lost if we turn off the Computer. ROM is used to store permanent program. This information is available on small pieces of the memory called chips. It is also called non-volatile memory or semi-conductor memory:

4. Output Unit

The device used to display information to the user is called output device. An output device can be used to store, display or print the information, e.g. monitor, printer, speaker etc

INPUT AND OUTPUT DEVICES INPUT DEVICES

The device through which we enter data and instruction into computer is called input device. There are many devices for input. These devices of a digital Computer are responsible for accepting programs and data from the outside world, feeding it to the Computer, and storing it into the Computer memory. These devices work under the control of Microprocessor. Some of the famous Input devices are as below Keyboards, mouse, scanners, microphone, video camera, touch screen, and optical scanning.

KEYBOARD:-

lt is a very common input device that helps in keying-in the required information into the Computer. Keyboard can be used effectively to communicate with the Computers but it is very slow input device. The keyboard is just like a typical typewriter in shape but enhanced than that. It consists of normal Alphabetic, numeric, functions, and other special characters or control keys, which are not available in a typewriter.

POINTING DEVICES

An input device used to control a pointer on the screen is called pointing devices. A pointer is a small symbol that appears on the screen in graphical user interface. Some example of pointing devices is Mouse, Track ball, Joy stick etc.

a) MOUSE:-

A Mouse is a quick input device and is very small in size. Mouse is moved on a flat surface to control the movement of the cursor (pointer) on a screen. A mouse usually has two or three buttons. These buttons are used to perform different task.

b) THE TRACKBALL

Track Ball is pointing devices most often used in the place of the mouse. A trackball is a stationary (motionless) device related to the mouse. It has a ball on the top and you can roll the ball directly with your hand. The trackball is used in laptop computer. There is no need of mouse pad for track ball.

TOUCH SENSITIVE SCREENS

Touch screen is a video display screen that receives input from the touch of finger. The screen is covered with a plastic layer. There are invisible beam of infrared light behind the screen. The user enters data by touching icons or menus on the screen.

Most touch screen computer use sensor to detect touch of a finger.

PEN-BASED COMPUTING (LIGHT PEN)

The pen-based devices use photoelectric circuitry to enter data into the computer through a video screen. A user can write on the video display, the light-sensitive pen sends information to the computer when user touches the pen on certain areas of a specially designed screen. Light pen is usually used by engineer, graphic designer, and illustrator.

VOICE   RECOGNITION

Voice recognition device is used- to directly i convert spoken data into electronic form into a computer system. Voices recognition and voice response is the easiest method for data entry and conversational. The microphone is attached to the computer with the help of sound card. The capability of a computer to distinguish spoken words is called voice recognition or speech recognition. Voice input is faster way of entering data. Many word processing applications provide the facility of voice input. The user speaks in microphone and the application software writes the spoken words as a text. Speech microprocessors can be found in toys, calculators, appliances, automobiles, and a variety of other consumer, commercial, and industrial products.

SCANNER

Scanner is Optical character recognition equipment that can read special-purpose characters and codes. Scanner provides a method of direct input of data from sources documents into a computer system. There are many type of optical reader, but they all use photoelectric devices to scan the characters being read. Reflected light pattern of the data are

converted into electronic impulses, which are then accepted as input into the computer system. OCR-based optical scanning systems are used extensively in the credit card billing operations of credit' card companies, bank, and oil companies.

MICROPHONE

It is an input device that is used for the input of voice in place of using the keyboard and mouse. Special software is used to convert voice into text. This- requires fast processing and a lot of memory and will become more common as the tec lino logy improves. The microphone converts audio signals into digital form.

VIDEO CAMERAS

Video cameras are an input device that is able to capture images of any type data.

Most scanners incorporate a special sort of camera made up of Charged-Coupled Devices (CCDs). Each CCD receives light from the image and the light generates an electrical charge. This means that light areas or dots of the image are represented by charged cells and dark areas by uncharged cells. **9-DIGITAL CAMERA.** Digital Camera is used to take and store picture in digital form. It does not use traditional camera film. It save money and the photos can be customizing using different application-software.

Digital Camera store image using different techniques like floppy disk. SuperDisk. PC Card. Compact flash card, memory stick. mini-CD and micro drive. Digital camera can be connected to a computer easily through USB port.

OUTPUT DEVICES:

The device through which the process information comes to outside world is called output devices. An output device can be used to store, display or print the information, (e.g. monitor, printer, plotter, speaker etc)

MONITORS

A TV-like device that is used by the Computer for displaying the information to the outside world is known as CRT or VDU or more simply a Computer Screen. The Monitor mainly consists of glass cone, which uses special electron guns to hit the Screen from back towards the cone and thus producing text or graphs with various colors. Monitors/Screens can be selected on the basis of user requirements. The different types of Monitors are the following.

MONOCHROME MONITOR:-

Monochrome means one color. Monochrome monitors display images in a single color usually white- or blue. Normally Monochrome is any monitor that can not display colors'. They can be black and white type but they are often available in green colors because green color is easier to eyes. A Monochrome monitor usually cannot display graphics. But later on some techniques were developed to have the graphics capability in the Monitors.

COLOR   MONITOR:

Color monitor display output in different color. Graphics, picture and colorful images are best viewed in color monitor.

FLAT PANEL or LCD MONITORS:

Laptop PCs use flat-panel monitors. These monitors take less space. Flat panel monitor use a variety of technologies. The most common is LCD (Liquid Crystal Display). LCD monitor use much less power than manual monitor.

LCD monitors creates images with a special type of liquid crystal that is normally transparent but becomes solid when charged with electricity.

PRINTERS

Printer is an output device that prints character, symbols, and graphics on paper. The printed output is called hard copy. Print resolution is commonly measured in dots per inch (dpi). There are many types of Printers varying in speed and quality. Different types of printers as follows.

i- Impact   ii-Non-impact IMPACT

PRINTER :

Impact printer works like a typewriter. It prints character or images by striking a print hammer or wheel against an inked ribbon. Impact printers are the following

DOT-MATRIX PRINTER

Dot Matrix printer produces printed images when tin) pins on a print head strikes an inked ribbon. When the ribbon presses against the paper, it creates dots that form characters and graphics. The dot matrix printer head contain nine U> 24 pins. This number of pins depends on the manufacture and printer model. A higher number of pins print more dots that produce higher quality. Cheaper dot matrix printer uses 100 to 150 DPI. Their speed is from 200 to 300

characters per minute. The expensive printer use 300 DPI and a speed of 3000 to 1000 character per minute.

DAISY-WHEEL PRINTERS

Daisy wheel is similar to type writer. They produce rather excellent letter-quality printout as compared the dot matrix printer. They work just like the typewriter and use a hammer and a wheel to print something on paper. But they are very much noisy and hence are not so popular. Printers other than Impact are called Non-Impact Printers.

NON IMPACT PRINTER

Non-impact printer produces character without striking devices on paper. They are much quieter than impact printer. The following are the non-impact printer.

LASER PRINTERS

The most expansive and quality bearer printers are the Laser printers, which produce high-quality printout and are used for desktop publishing and graphics. A laser printer works on the principles of a Photocopier. Simply a metal drum called **TONER** is filled with special ink which, just sprinkle ink onto the paper and thus prints the character. They are very fast and use multiple fonts for text and graphics. Besides'them now- there are color printers available in dot matrix as well as Laser printers and all others as well,

INK-JET

It prints character and graphics by spraying tins drops of liquid, ink on paper. These printers can produce text and graphics in both black-and-white and color. Inkjet printer is slower than laser printers. They can print 1 to 6 pages per minute. Its print quality is higher than dot matrix printer. Most inkjet printer has usually two print cartridges: one containing black ink and other containing color.

PLOTTERS

A plotter is an output device that is used to produce image-quality graphics in a variety of colors. Plotters works by drawing lines on paper using pens .held in a mechanical arm. They are mostly used for Engineering and Maps drawing purposes.

SPEAKER and HEADSET

Speaker is an output device that produces audio output. These devices produce music, speech, or other sounds like beep etc. Speaker and Headsets are two commonly used audio output devices. It produces softcopy output. We use speaker to hear any type of sound.

Storage in Computer

STORAGE DEVICES

The device in which we store the data and information is called storage devices. **There are two types of storage devices a) Main/Primary Storage Devices b) Secondary Storage devices**

Main or Primary Memory or Internal Memory'

The Main memory (Primary Memory) of CPU is the place where the computer program and data are stored during processing. This storage unit is often called either main storage or internal storage or primary storage.

There is usually two types primary storage.

i)   **RAM:-**

It stands for Random-Access-Memory or read/write Memory because information can either be read from or written to the RAM. This is the memory whose information can Be erased or changed. It is temporary memory. Any thing stored in RAM is lost when computer is switched off.

ii)   **ROM:-**

It stands for Read-Only-Memory. Information can be read from ROM but we can't write information to it. This is the memory whose information cannot be changed. The information stored in it can't be lost if we turn off the Computer. ROM is used to store permanent program.. This information is available on small pieces of the memory called chips.

Secondary/Auxiliary/External Memory (Storage)

The devices of a computer that store information such as software and data permanently are called secondary storage. Disk is a secondary storage device where we can store a large amount of data and from where it can be retrieved. It has different types e.g. Hard Disk, Floppy Disk, CD-ROM, Magnetic Tape, Magnetic Drum. Following are secondary storage devices.

Magnetic Disk

The magnetic Disk is made up of one or more rotating platters, on which data is stored magnetically. It is made up of plastic, coated on both sides with a special magnetic object that is iron oxide. There are two main types of magnetic Disks, i.e. **Floppy Disk and Hard Disk**.

Hard Disk

It made up of one or more rotating Platter, which is encoded with magnetically object that is iron oxide. It is circular metallic plate comparatively thick in size and permanently sealed in completely enclosed. Data are recorded on magnetic
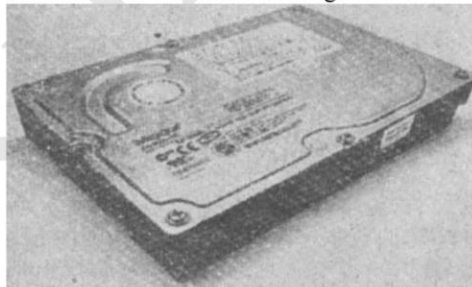
Floppy Disk

It is a removable plastic Disk. It is not fixed in the computer. It is encoded with magnetically object that is iron oxide. It has less storage capacity than a hard disk. To use a floppy Disk you mu5;t have a floppy Disk drive.

Size	Density	Capacity V
5.25 '•	Double	360 Kilobytes.
5.25 —	High	1.22 Megabytes
3.5 —	Double	720 Kilobytes
3.5 "	High	1.44Megabyteʳ,

OPTICAL DISK STORAGE

Optical Disk is the fast growing storage medium. CD ROM is optical disk.- CDROM stands for Compact Disk Read Only Memory. CD-ROM technology uses 12- centimeter (4.7 inch) compact disk similar to those used in stereo music systems. ' It is the latest invention. It is so called CD-RQM because information can be read only from it but not written to it. A CD-ROM can store up to 840 megabytes of data. Letter CD is usually used for CD-ROM drive. To use a CD- ROM you must have a **CD-ROM drive.**

Other optical disk technology produces WORM (write once read many) and CD-R (CD recordable) disks. The major limitation of CD-ROM, CD-R, and WORM disk is that recorded data cannot be erased. However erasable optical disk system are also available (CD-RW).CD-RW provides full rewritable capability This technology record and erases data by using a laser to heat a microscopic point of the disk surface, in some version, a magnetic coil changes the spot reflective propcrtj lroni one direction to an other, thus recording a binary one or zero (1 or 0), a laser device can then read the binary code on the disk by sensing the direction of reflected light. The newest optical disk is, digital video disc(DVD) or digital versatile disk provide to large amount of data and transferring data on higher speed(up to 12mbps).Digital video disks are designed to work with a video player and television.
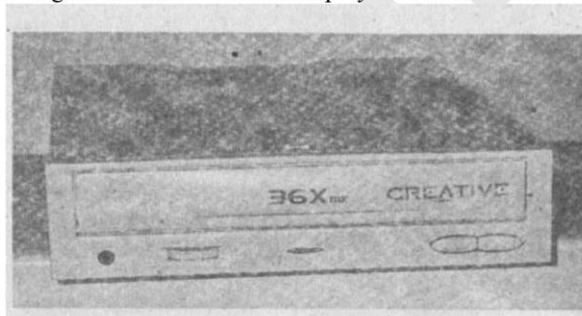
Magnetic Tape

Magnetic tape is a flexible plastic tape, coated on one side with magnetic iron oxide material. It is used when large amount of data are to be processed sequentially. An advantage of magnetic tape is that it is very cheap and economical storage medium hut very slow in processing.

Magnetic Drum

It is a rotate able cylinder whose surface is coated with a magnetically sensitive iron oxide compound. The surface is divided into a number of tracks, each track having one or more fixed reading and recording heads. Magnetic Drums are commonly used when very fast access and transfer speeds are required. They have one disadvantage that is they cannot be removed from a unit.

FLASH MEMORY

Now a day the latest and modern storage device is Flash memory or USB is used as a secondary storage device. It is semiconductor memory. It is same like RAM, ROM in circuitry. It is used as a secondary storage for moving data.

SOFTWARE

Software is a set of instruction that tells a computer what to do. Software is a written computer program or a series of instructions. Software is program that allows the 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, and storage and control activity of information System. There are two type of Software 1) System software 2) Application Software.(Over view of software)

1 SYSTEM SOFTWARE

System Software is a group of program that controls all the operation of computer. It controls the usage and allocation of different hardware components. It enables other application program to execute properly. System Software consists of programs that manage and support a computer system and its information processing activities. System software is the type of software, which makes better & effective utilization of the entire computer System, It controls all the operations of computer system. System Software serves as interface between systems, network, hardware and the application programs of end users. The manufacturers provide it. The person preparing system software is called System Programmer the process is called System Programming. The development of Compiler, Operating System, and HighLevel Languages come under this category. For example. Operating System, utilities, device drivers and Network Management Programs.

There are three types of System Software
1:-System Management programs 2: System Support program 3:- System development programs.

a-System Management Programs

It manages the hardware, software, networks and data resources of a computer system during its operation. Examples of system management

programs are operating system, network management program, monitor performance program, database management program.

b-System Support Program:

Program that supports the operations and management of computer system by providing a variety of support services. For example system utilities and security monitors program. **c-System Development Program:**

Program that helps users in developing programs and procedures and prepare users programs for computer processing. For example language translator, programming editor, debuggers, code generator and CASE tools.

2-Application Software.

Application Software is a type of software that is used to perform .specific task for users. St is used to perform different task such as word processor, a spreadsheet or database etc- An application is the job or task a user wants the computer to do. Application software enables you to perform specific task, solve problem, and perform work.

The person preparing application software is called application programmer. For example software developed for the PAYROLL of employees and program for maintain of personal record come under this category.

There are two type of application Software I -General Purpose Program 2- Application Specific Program'

1-   **General   Purpose Program**

General-Purpose application programs are programs that perform common information processing jobs for end user. General Purpose software has enough features to accomplish a wide variety of task. For •example, word processing programs, spreadsheet programs, database management programs (Ms-Access, Oracle), and graphics programs are popular with microcomputer users for home, education, business, and scientific etc.

2–   **Application Specific Program/Special purpose program**

Specific Application Program support specific application of end users. Specific software performs a specific task and cannot he changed or programmed to perform a different task.. Some major categories are Business application program are program that are develop for important business functions or industry requirements. For example program for accounting, marketing, finance, and employee etc. Scientific, application programs are program that are,, develop for scientific and engineering purpose. for example program for scientific analysis, engineering design, and monitor of experiment.

Other application programs are other than business and scientific. For example computer application in education, entertainment, music, art. law.-and medicine, video-game program, entertainment program, etc.

PROGRAM TOOLS:

Following are the programming tools for the programmer with the help of Which the programmer can write a perfect program. These are I - Algorithm **2-** Flow Chart

ALGORITHM

An algorithm is a finite set of instructions, which accomplishes a particular task. An algorithm is a finite step-by-step list of well-defined instructions for solving a particular problem.

ALGORITHM NOTATION

The algorithm is a base of not only effective data structure but it is also the base of good programming. Therefore, it is necessary' that each algorithm should be written clearly. A complete algorithmic notation is given below.

3.   Name of algorithm:

Every algorithm is given a-name, written in capital letters.

Introductory Comments.

The algorithm name is followed by a brief description of the tasks the algorithm performs. This description gives the name and types of variables used in the algorithm.

Steps:

The algorithm is made of a sequence of numbered steps. Each beginning with a phrase enclosed in square brackets which gives an abbreviated, description of that step. Following this phrase is an ordered sequence of statements which describe the actions to be executed, or tasks to be performed.

Comments:

An algorithm step .may terminates with a comment enclosed in round parenthesis, which is used to help the reader better understand that step. Comments specify no action and arc enclosed only for clarity. Example of algorithm:

   Algorithm C'RADES(V!1,M2, M3.M4.Average)   .

This algorithm reads tour marks denoted by Ml. M2, M3, M.4 and compute the average grade,

Al! Variables' are assumed to be real]

(1)   [Input   individual   marks]

      Read (MLM2.M3, M4)

4.   [Compute average grade]

      .Averages (M l-+'M2+M3+M4)/4

5.   [Output Result)

      Write ("Final grade is" , average)

 (4) (Finish]   '

      Exit

FLOWCHART

Charting:

Charting is a graphical or pictorial means of presenting data. Charting takes the flow of work and makes a picture of it. Charts can be used to illustrate statistical' data, locations of desks or equipment, relationships between people and jobs, sequences. Of events, work flow; organizational structure and planning or implementation schedules.

T he primary use of charting is for communication and documentation of the system. Charting is also used during feasibility studies, problems definition understanding the existing system, defining new systems requirements,. Design, cost comparisons, final report, and implementation.

For example Flow chart. Bubble chart or data flow diagram, Grind' chart etc. **Flow charts**

A flowchart is a. pictorial/graphical presentation of flow of data to solving the problem. A flowchart is a diagrammatic representation of

the logic or sequence of steps that solve a problem. Flowchart is tools for the programmer to analyze, organize, and solve a problem. A number of pictorial figures are used to help draw the flow charts... Finally the instructions are coded in one of the programming languages, called a program. The person who writes program are called, programmer.

When developing a flow chart the systems analyst (or programmer) should observe the following guidelines:

Flow charts are drawn from the top of a page to the bottom and from left to right.

The activity being flow-charted should be. Carefully defined and this definition made, clear to the reader. Where the activity starts and where it end should be determined.

Each step of the activity should be describes one-verb descriptions, e.g. prepare statement or file customer statement.

Each step of the activity should keep in its proper sequence.

The scope or range of the activity being flowcharted should be carefully observed. Any branches that leave the activity being charted should not be drawn on that flow chart. A connection symbol should be used and that branched put on separate pages or omitted entirely if it does not pertain to the system.

Use the standard flow-charting symbols.

Type of flowcharts:

The most important types of flowcharts are:

System flowchart. Program flowchart System Flowchart

A system how chart show the overall work flow of the system. It is a pictorial description of the sequence of the combined procedures that makes up the system. A system flowchart shows the sequence of physical devices used to solve that problem. Input/ output symbol

Processing symbol

Flow lines

 Off page connector

Documents (hard copy) Display symbol

Manual input symbol online storage symbol
Disk storage symbol

Off 'page connector

Program Flowchart
This is the pictorial representation of the logic of the program, showing different steps to solve a problem.
Program flowchart symbols
 Description   Symbols

Off page connector

Pre-defined process

 EXAMPLE

The XYZ Company has found that it can purchase a raw material at a cost of $40.00 per order. The company has a 10% carrying charge on average inventory. They expect to -use $20,000 of the raw material within the next year. To determine the economic order quantity **(EOQ)** by using the formula: **EOQ** = 2AP/RC Where: A=Annul Cost P=Annual Usage Reprise per order C= Carriage Charges Draw its system Flowchart and program flowchart.

Two very simple program flowcharts are shown in below figure. The one on the left is program flow chart prepared by a systems analyst to show the detail of procedural operation. The one on ht eight is a programmer to show details of computer program operation. It is noted that the systems analyst into a program flowchart as in below left side figures further expands the systems flowchart in above example. Programmer when expands the detail into program flowchart shown in the below

PRODUCTIVE ENHANCEMENT SOFTWARE PACKAGES Q)
What are WORD PROCESSING PACKAGES?

A Word processing program is used to produce letters, applications and other documents. Word processing is used in business to generate different documents. Word-Processing package provide tool bar which, display shortcut button to make editing. These packages provide word wrap, justification function. In. word processing packages we can bold, underline the text. Text can be inserted or deleted. Block-editing tools can be used to move a block of text from one point to another point. Program search function can be used to find user specified word. Default format values are often supplied by the package, but they are easily changed. A word processing package may also include a spelling checker, thesaurus and mail merge.

Word processing packages are Ms-Word, Lotus WordPro, Word Star, Word Pad and Word Perfect These packages can convert all documents to HTML format for publication as Web pages. End-users and organization can use desktop publishing (DTP) software to produce their own printed material that looks professionally published. That is they can design and print their own newsletters, brochures, manuals, and book with several styles, graphics, photo, and colors on each page. Word processing packages and desktop publishing packages like Adobe PageMaker is used to do desktop publishing.

DIFFERENCE BETWEEN MANUAL AND ELECTRONIC WORD PROCESSING.

ANUAL WORD PROCESSING	• ELECTRONIC WORD PROCESSING
YTYPE WRITER IS USED IN MANUAL word processing	Computer is used in electronic word processing
Text once write cannot be change.	Text can be change.
Text cannot be formatted	Text can be formatted

Component of Computer based spread sheet.

.Following are the components

A micro processor computer with sufficient RAM in primary memory storage.

Spread sheet software (Ms-Excel)

Secondary storage devices like Hard disk. CD-ROM etc

 Printer

Q) WHAT IS ELECTRONIC SPREADSHEETS?

Ans: Electronic spreadsheet software are application. program used for calculation. Think of them is multipurpose calculator. Electronic Spreadsheet is used for mathematical, statistical, scientific, graphics, tabulation, database and accounting purpose. It consists of row and column. For example Lotus 1-2-3, Microsoft Excel, and Quattro Pro.

DIFFERENCE BETWEEN MANUAL AND ELECTRONIC (COMPUTER) SPREADSHEET

Electronic (Computer Spreadsheet) are far better than manual Spreadsheet in ali most all aspect. We will discuss only some of the benefits of using a Electronic spreadsheet VP-Electronic spreadsheets work thousand of times faster than the manual spreadsheet. Your work in an electronic spreadsheet is better, faster and precise than manual spreadsheet.

In the manual spreadsheet, if you find an error after making it, you have to erase it or you will have to make the whole worksheet again. Where as in electronic worksheet, you can check and correct your worksheet before printing.

You can copy the formula once you made to all other amounts in the Worksheet, while in the manual worksheet you are to calculate the formula for every amount. You can make your worksheet more beautiful and smart by adding charts and graphical objects, while the manual worksheet is a dumb- looking piece of white paper. No charm, no glamour.

The electronic worksheet is much bigger than the manual worksheet. Saving your worksheets a big problem you can have with the manual work. Every time you make a worksheet for one purpose, you are to save it in a different file.- Also you are to store the previous worksheets to keep track of what going on. In the electronic work, you can save them on your disk, which saves the loss of paper and you can move many worksheets on one floppy disk in your pocket. Other way, you would have to pick a bundle of papers with you.

Other benefits contain the tools for spell-checking, built-in formula list, different fonts and sizes, automatic alignment, copying and pasting, linking and many more which are difficult to be listed here. However, once you get started with a electronic worksheet, it looks damn difficult to go back to the manual method. **Q) WHAT IS DATABASE MANAGEMENT PACKAGE.?**

Ans: A set of computer programs that control the creation maintenance and utilization of the databases of an organization‖. The DBMS provides concurrent access to multiple database users and the DBMS must be able, to recover and restored a damage database from backup copies.

Database Management software manage and supports the maintenance and retrieval of data store in data base e.g. Ms-Access, Dbase, and Oracle allow you to setup and manage database on your PC, network server, or the World Wide Web.

Databases management packages perform four tasks.

Database development. Define and organize the content, relationships, and structure of the data needed to build a database.

Database interrogation. Access the data in database to display information in a variety of formats. End users can selectively retrieve and display information and produce forms, reports.

Database maintenance. Add, delete, update, and correct the data in a database, **Application development.** Develop prototypes of data entry screen, Web pages, queries, forms, reports, and labels for a proposed business application. Or use a built-in 4GL or application generator to program the application.

IMPACT OF COMPUTER ON SOCIETY

The Computer and Society:- Computers increasingly affect our lives in many, ways , which benefit individual and society as a whole. In medicine, computerized databases, networks, diagnostic devices, and monitoring systems helps doctors and hospital personnel to save lives. Computers in laboratory speed up the progress of medical research. In education, computer-aided instruction helps students to learn basic skills through practice tutorials and to carry out advanced experiments in natural sciences and the social sciences through computer simulation. In business and in professional offices, computerized databases, and accounting programs, and word-processing programs make administrative and clerical work easier; computer simulations help businesses to run more efficiently and profitably. In science and engineering, computers are used to process large quantities of statistics; furthermore, computer simulation eliminates the need for costly scale models.

Teams of computer scientists are studying the workings of the human brain. One object of this research is to make better artificial replacements of lost human parts; another is to make more intelligent computers and more capable robots. In some ways computers are not beneficial for our society. Displacement, or the elimination of jobs by computers and computerized devices, is one of the most pressing problems facing the society today. Another problem is preserving the privacy of' confidential information when large data banks are linked by networks. The trend toward increasing general use of computer networks, a new application of computer technology , has great potential for the transformation of society. The Social Impact of Computer age:

The Computer is one of the most powerful forces in society today. It is being put to use everywhere, it seems in homes and in organizations of all sizes and no one can doubt that this usage is having a strong impact on the people. But the Computer is the driving force behind the information revolution, and as in any revolution some innocent people may be harmed. Hence there are basically two types of impacts of computers on people:

1-Positive Impacts.
2-Negative Impacts.

1. Positive Impact:- Many people enjoy challenging careers in Computers departments as managers, system designers , programmers, and computer operators. But we all benefit in other -ways from computer usage. We benefit as consumers of the goods and services provided by computer-using organizations. And we benefit at home by using personal computers. For work and for play.

Employment benefits:- Each day, computers help millions of people to do their jobs more efficiently, but employment benefits certainly are not restricted to managers. Health care researchers and other scientists now use computers to control research into complex problem areas that could not otherwise be studied. Layers use online legal data banks to locate cases in order to serve clients better. And the job duties of some office and' factory workers have changed from routine, repetitive operations to more varied and appealing tasks through computer usage. For example, office workers who understand text processing, computing and data communications usually have vital role and are given crucial office functions to perform.

Greater efficiency:- Business have always avoided the wastage of time Therefore computer is such a machine which has increased their efficiency and have reduce their time wastage. In minimum time, we cjin take a lot of work from it because in business time is money and money is power.

Higher quality products:- Computers may also help to improve the quality of products and services we receive nowadays. For example, Microcomputers installed in cars now provider more efficient means of controlling the engine's fuel mixture, ignition timing, etc.

Aid to the handicapped:- Microcomputers can control devices that allow severally handicapped persons to feed themselves even though they have no upper limb responses.

Improved Safety:- Computer usage contributes to personal safety in many ways. For example. Computer-controlled antilock bricking systems in aircraft and cars to help in preventing from dangerous.

Better information retrieval:- Most information retrieval tasks obviously do not involve life-or-death decisions, but quick computer assisted retrieval saves time of people.

Entertainment and hobby benefits:- A computer can entertain people with hundreds of challenging games. And computer users can compose . paint pictures, store and maintain stamp and coin collection records, and polish their foreign language skills.

Educational Benefits:- Programs can be educational as well as entertaining . Educators agree that the computer can be a powerful motivating and learning tool. Thousands, of educational programs are available in such categories as reading languages, Science, Mathematics, social studies and art and. music.

Personal Finance benefits:- A pc can help a person in budgeting and balancing his checkbooks, control his installment purchases, control his home's energy use, and analyze his investments.

Negative Impact

In spite of the many benefits of computer age , there are also some potential dangers and problems. Computer usage sometimes produces displacement and unemployment. Unemployment refers to the total . number of people, which are out of work. Displacement occurs when technological change eliminates jobs. If displacement workers cannot find similar jobs elsewhere or if they cannot find other work, then there is indeed an increase in unemployment. Another problem is preserving the privacy of confidential information when large data banks are linked by networks, etc.

Importance and Applications of Computers

Not too many years ago, the computer was so inconspicuous that most people were seldom aware of its existence. We knew that similar

Machines guided missiles and satellites and controlled space flights. We knew they sent out our bank statements and calculated our payments. They made our airline reservations, and they saw to it that our plane did not collide with another. We knew there were tiny special-purpose computers in our pocket calculators, and our digital watches. Things are different now. Suddenly we are all aware of the computer as a force in our lives. We are in the midst of the computer revolution; we live in the computer age.

The computer is reshaping our world and will go on reshaping it. The Word computer is not new to us. Today's world is world of computers, we can say that this is IT/computer age because computer are playing a role of growing importance in our lives less than fifty year back there was no computer and no body new about it. Since then, there have rapid change in the .computer Technology/IT which continuous to progress computer performs a given complex task in a very short period or does calculation very quickly and accurately. Computers are useful to a wide range of pupils because they can serve many purposes.

Application of computer (USES) Computer in offices.

In many offices computer are used for word processing instead of using typewriters. The key punch operator type the letter, report or documents. Once changes are made in the existing documents, store in the computer instead of retyping the whole thing again: The printer can immediately produce as many copies as required.

Computer in the Banks

Banks keep most of the record and data on computer, bank account are maintained on Computer to avoid duplication are any chance of error. The cheese are read by MICR (Magnetic ink readers a device used to allow the data on cheese to be read by machine). The number in special character along the bottom of each cheese or printed in Magnetic ink so they can read by MIRC. In this way computer are used the keep track of customer accounts, deposit, withdrawal, loan, interest.

Computer in the Industries

Computer is used to control manufacturing systems and continuous running of the machinery. These are also helpful in monitoring temperature and pressure measurements in the manufacturing process. In many industry computers are used in the form of robot.

Computer in Education

Computer is used in schools in many different ways. They are used to help Montessori children learn different skills such as to distinguish between shapes, colors etc. college students can take advantage of making graphs and charts and do calculations of their mathematical and scientific assignments.

Computer simulation for training

Computer models can be used to train people such as pilots. A working model of an airplane cockpit is built, with a large screen in front of it. On the screen a computer show picture of the view that a pilots would see from a real cockpit.

Computer aided Design

Computer is proved to be an assisting machine or designing tool for engineers, architects and designer to perform their large, and complex job in a very short period.

Example of such designing project of car making, designing, office building, and shaping plaza.

Computer in Health Care

Doctor diagnoses illness by entering patients, symptoms in computer and prescribe medicines accordingly. The doctor mistakes the final decision but the computer speedup the process. It also keeps record of the patient's appointment and bills etc.

Computer and law

In law chambers, computers are used to store a data bank of all those cases that have been priory solved or decided. This enables the lawyer to study any case that helps him deal with his current case.

Computer in Police Department

The Police used the computer to help them catch criminals. Data about criminals and suspects can be stored on computer. All the information about a crime can be fed into a computer, which can search through its tore and checks facts. **Computer in the Home**

Now day the computer become a necessity of home like other electrical appliances. Children play game 'on it keeps track of the stamp collections, draw pictures, play music view movies and do some sort of reading and writing according to the needs. Father can write his reports and make calculation while mother can play nutritional meals, make budget etc. they can use computer for electronic mail and inter net services.

Word Processing applications: -Word processing or the use of computer as a typewriter is one of the most widely appreciated functions of the modem computers. Anyone who deals in words finds it useful: i.e. secretaries, newspaper reporters, scholars, novelist, and other writers: With a word processor, a user can type out a report, a letter, a story, or whatever is desired, and see it on the computer screen. Revision is easy, Words, phrases, or paragraphs can be inserted or deleted or moved to a different part of the document. The computer can check the spellings, and finally it is copied on the paper using a printer. Science and Technology: - All of us know that large computers can do millions of engineering calculations per second, can rapidly process the results of hundreds of thousands of experiments it the physics laboratory, and are a crucial too for the modern designer of cars, airplanes and most importantly the microelectronic parts of computers. In science and technology, the computer is useful not only as a number cruncher but also for its capabilities in the techniques of simulation. Simulation exploits the computer's graphics and numerical capabilities to construct model objects and model worlds. Computer simulation has been especially useful in space exploration. Computer simulation is also useful for Weather prediction and earthquake prediction.

MISUSES OF COMPUTER

Hacking

Hacking is one of the most important disadvantages of Internet. The hackers access the data stored on the computers across the Internet.

They can use this data illegally or even destroy it.

Immorality

Internet contains a large number of immoral websites. These websites contains such material that is against the moral values of our society. These websites are damaging character of young people.

Security Problems

Internet has created many security problems. Important data can be hacked on Internet. Hackers also damage different websites and delete their contents. They also retrieve critical data of different organizations and governments.

Viruses:

Internet is the most important source of spreading computer viruses. Peoples spread viruses using Internet and emails. Many websites also contain different viruses that are copied to the computers when the users download date from these websites.

Wastage of Time

Many people use Internet without any positive purpose. The young people waste their time in chatting. It affects their performance and makes them inefficient.

Cyber Crime

Internet is a source of many cybercrimes. People use Internet for negative activities. They hacks the credit card numbers of the-j people and use them for shopping. Some use Internet to spread illegal and immoral material. Many

Government are introducing laws to stop cybercrimes **Others are** The excessive use of computer damage eye sight.

The people uses computer for playing movies.

Mostly the students and teenage uses it for playing different games.

COMPUTER VIRUSES:

What is Virus?

Biologically, a Virus is defined as a tiny scrap of genetic code that attacks a living cell and produces replications of itself.

What is Computer Virus?

Computer Virus is a small program that attaches itself to another program and often attacks software by making copies of itself. Like biological viruses, it can also be spread from one Computer system to another while swapping disks or via Computer networks. A Computer Virus is a program that replicates itself by attaching itself to another program. The latest count includes thousands of Viruses, which have infected the Computers.

A Virus program often small i.e. consists of a few lines of programming code that can be easily hidden in another healthy program. They may infect Microcomputers, mini Computers and even main frame Computers.

Computer Virus can be created in any microcomputer and are transmitted to other when an infected disk is used. Computer Viruses may be harmless and do nothing more than to display a short message or they may be malignant which destroy or alter data.

ANTI-VIRUS SOFTWARE:-

There are many companies in the US that sell computer software to protect computer systems from Virus infections. These includes programs with names like Toolkit, Virus-Scan, Vaccine, etc. Anti- Virus programs use Virus signatures to detect know computer Viruses. A Virus signature is a series of hexadecimal codes that uniquely identify a Virus. By updating signature file, we can enable Anti-Virus to detect new Viruses.

COMPUTER CRIME

Computer crime can be defined as any crime that is committed by means of the special knowledge or expert use of computer technology. Computer crime became a serious problem in the late 20th century. Since the first reported case of computer crime in 1958. Computer have been involved in most types of crimes, including theft, burglary, larceny, fraud, embezzlement, extortion, sabotage, espionage, kidnapping and murder. Computer system themselves can be targets of attack, as when a computer virus is secretly introduced into a system to alter or destroy data. Breaking into private computer system to destroy, steal or alter information became easier once moderns were introduced in the 1960s. Technology expert computer hobbyist who uses personal computer and modems to break into computer system are known as —Hackers‖. Most serious computer crimes are committed in the banking and

financial service industries where money, credit and other financial assets are recorded in electronic databases and are transmitted as signals over telephone lines. Persons with access to such .system may use these records for their own purposes by illegally transferring money balances to their own accounts.

For example, one employee programmed a computer to pay vast sums of money into a fictitious bank amount. He also programmed it to return the money to its owner every time there was an audit (account check). All he stole was the interest. Sometimes banks steal money held in dormant accounts. This is where someone, has died and the account still has some money in it. There is no customer around to con. Plain and people have got away with large amounts of money with the help of computer. Quite often, the person who is caught is only dismissed and those who are prosecuted only received comparatively light sentences.

What is Virus Hoax?

Virus hoaxes are false reports about non-existent viruses, often claiming to do impossible things. Some recipients occasionally believe a hoax to be a true virus warning and may take drastic action such as shutting down their network.

Hoaxes are E-Mails, which describe a dangerous new undetectable virus, usually using bogus technical terms. Hoaxes often ask you to avoid reading or downloading E-mails that have a particular subject line. For instance, the Good Times hoax claims to put your computer's CPU in "_an complexity infinite binary loop which can severely damage the processor‖. The hoax warns you not to read or download anything the subject —Good Times‖ because the message is a virus. It then urges you to forward the warning to as many people as possible.

Sometimes hoaxes can cost you even more than a genuine virus incident. After all no anti-virus will detect hoaxes because they are not viruses. Some companies panic when they receive a hoax virus warning and assume the worst, making the situation much worse.

NETWORK AND TYPES OF NETWORK

A Computer network links two or more computers so that they can exchange data and share resources such as printer etc.

There are three types of computer network

Local-Area-Network (LAN): LAN connects computer and other devices within a limited physical area, such as in office, a building, or a campus. It use direct cable or localized wireless radio or infrared signals to link computer with the small geographic area. LANs use a variety of telecommunications media, such as ordinary telephone wiring, coaxial cable, or even wireless radio systems to interconnect microcomputer workstation and computer peripherals. LANs allow end users in a work group to communicate electronically; share hardware, software, and data resources.

Metropolitan area Network (MAN): A Telecommunications network covering a large city is called MAN. It uses high-speed fiber optics lines to connect computer located at various places at city. It is greater than LAN such as the networks in different town in cities.

Wide area Network (WAN): Telecommunications networks covering a large geographic area are called remote networks, long-distance networks, or, wide area networks it uses long distance transmission media including telecommunication networks to link computer separated by a few miles or even thousands of miles. WAN are used by manufacturing firms, bank, retailers, distributors, transportation companies, and government agencies to transmit and receive information among their employees, customers, suppliers, and organizations across cities, regions, countries, or the world.
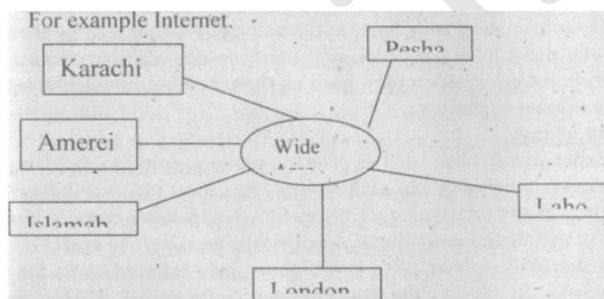
DEDICATED SERVER NETWORKS

In many computer networks, there is a clear distinction between server computers and client computers. Each computer on the network acts as either a server or a client. This type of network is called a dedicated server network and each server computer on the network is called a dedicated server. Servers are not used as client computers.

PEER-TO-PEER NETWORKS

Some networks don't distinguish between servers and clients at all. In these networks, every computer is capable of playing the role of client. Server or both at the same time. This type of network is called peer-to- peer network, each computer on the network is referred to as peer. In a peer-to-peer network, a peer computer acts as both a server and a client at the same time. So the peer computer on your desktop can share files and printers with other computers and it can simultaneously access other shared resources on the network.

BENEFITS OF NETWORKING

The benefits of networking in organizations include increased productivity, lowered costs, smaller storage requirements and reduced efforts.

Increasing Productivity

Just as standalone PCs can increase user productivity, networks of PCs enhance that productivity even further. Users can share, access, view and modify information anywhere on the network without leaving their desks. Users don't have carry floppy disks from one place to another, wait to print out information they want to share and become distracted from their normal workflow'.

Saving Money

Sharing expensive devices such as printers, plotters, scanners and large hard disks over a network can save money. This most obvious thing of these savings is the total purchase price. Fewer expensive devices also mean fewer maintenance contracts, service calls and upgrade costs. Longer distances involved, WANs are sometimes referred to as long haul networks. In theory, the concepts and purposes of WANs are identical to those of LANs. In practice WANs typically rely on slower long distance connections sites and use leased lirtes or even- satellite links. _

A WAN is often made up of two or more LANs connected together. For example, you might have LAN at each site of your organization and each of those LANs might be connected together to form a WAN.

PURPOSE OF NETWORKS

File sharing:-

The most important use of networks is sharing data files. One approach to sharing files involves placing the file in a shared. Location on one computer and making it available to other computers. Other users who want access to the file can either open the shared copy directly or copy it over the network to their own local hard disks.

Printer Sharing

High-end printers are relatively expensive devices. As a result, sharing printers became a primary use of networks. To share a printer, you physically connect the printer to a computer acting as a server. Using the NOS, you share the printer over the network; users can then printer to your shared printer as easily as if the printer were directly connected to their own local PCs.

Hard disk sharing

When large hard disks are relatively expensive devices, network users attached them to servers and shared them over the networks. Users could access the contents of one or more hard disks or store and retrieve their own data in a directory on the server's hard disk. A simple. Hard disk might accommodate many users, each with his own private directory. This approach kept the cost of individual PCs lower and the extra cost of server hardware was spread across many users.

Saving Disk Space

Sharing software applications can generate savings in several ways. Perhaps the most obvious is in the cost of the software itself. Most networked versions of applications cost less per user than purchasing individual copies for each user. You can also realize savings in your total disk space requirements. If nearly everyone in your organization uses a world-processing program, you may not have to consume all that space on every computer. Instead, install the software only once on a "server computer and let everyone accesses that single copy.

Saving Efforts

Another benefit of application sharing involves the time saved during software installation and configuration. If you install the software only once on a server and configure it in a standard way, you will spend much less time than if you had to install it on multiple client computers.

Workgroup computing and groupware

A workgroup is a collection of individuals working on a task. Workgroup computing occurs when al! The individuals .have computers connected to a network that allows them to send email to one another, share data files and schedule meetings.

Groupware is the software 'hat supports Workgroup computing, it provides facilities to collaborate among users on both local area and wide area networks. Groupware includes, following types of software E-mail: After basic printer and tile sharing, electronic messaging: s the networking product that people encounter and increasing rely on. Modern email programs do more than simply transmit formatted voice, annotations, animations and other attachments. Email or Groupware application is a database that manages users, file and an internal messaging facilities that lets application components communicate with one another. Groupware applications is used to work smoothly in a collaborative environment, they should all support the same messaging and directory standards.

Scheduling and contact management groupware enable users to share and update group schedules across networks.

Document sharing and document management groupware involve the online creation, sharing, editing, and distribution of documents, from letters to business forms. These programs lei you easily see changes made by others and some groupware allows two or more people, to work on the same document at the same time.

Teleconferencing software combines audio, video application sharing and shared electronic chalkboards in collaborative computing.

Network protocols:

Protocols: Protocols are the ways that computers exchange information. Networks are full of protocols. A computer needs to know exactly how messages will arrive from the network so it can make sure the message gets to the right place. it needs to know how the network expects the message to be formatted (i.e. which part of the message is the data and which one is the address) so that the network can convey the data to its destination.

For example, consider the road-traffic protocols as follow Green—Go or
Yellow -Slow Down or Red—-Stop or If it is green, I can go or
If it is red, i must stop.

Types of Protocols: There are many levels of protocols in a network.. Protocols can he broadly divided into hardware and software categories'

Hardware Protocols:
Hardware protocols define how hardware devices operate and work together. The 10 base T Ethernet protocol is a hardware protocol specifying exactly how two 1ObaseT Ethernet devices will exchange information and what will it do if it is improperly transmitted. It determines such things as voltage levels and which pairs of wires will be used for transmission arid reception. There is 110 program involved, it is all done with circuitry.

Software Protocols:-
Programs communicate with each other by software protocol. Network client computer and server both have protocol packages that must be loaded to allow them to talk to other computer. These packages contain the protocol the computer needs to access a certain network device or service. There are different protocol packages for different network and different server on the same network. MS Windows-NT Server. MS- Windows-95 comes with a large no of network protocol that can be used with a network.

Telecommunications processors (Network connectivity devices)

Telecommunications processors perform a variety of support functions-, between the terminals and computers (Server) in a telecommunications network.

Telecommunication processors are the following

1. Modems

Modem is an electronic device that performs a modulation demodulation process that converts digital signals to analog and back.

Modem is the most common type of communications processor. They convert the digital signal from a computer or transmission terminal at one end of a communications link into analog frequencies, which' can be transmitted over ordinary telephone lines. A modem at the other end- of the communications line converts the transmitted data back into digital form at a receiving terminal. This process is known modulation and demodulation and the word modem is a combined abbreviation of these two words.

A modem is a device that makes it possible for computers to communicate over a telephone line.

Digital Pulse Modem

g over   Frequencies
                                        Communications
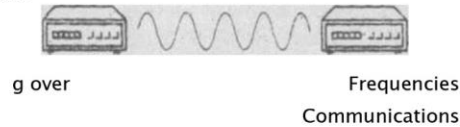
Three types of modems are generally used for preparing data for transmission over telephone lines.

I - External Direct connect modems 1-
Internal Direct connect modems c)
Acoustic coupler modems

t

6) External Direct connect modems:- are housed in separate external
Cabinets

7) Internal Direct connect modems are paced on circuit boards and plugged into expansion slots inside a PC. Since internal modems draws its power from the PC and needs fewer cables, it's a less expensive and neater alternative. Both types of modems are equipped with microprocessor, storage chips and specialized communications perform dial inn, answering and disconnecting functions. Acoustic coupler modem differs from the above two types of direct connect modes in that it is be used with a standard telephone receiver. The receiver of the telephone is placed on two cups built into the mode:

The digital pulses produced by the terminal are converted into audible tones that are picked up by the handset receiver. The signals modem converts them back to digital pulses.

2. Multiplexer

Multiplexer is an electronic device that allow a single communication channel to carry simultaneous data transmissions from many terminals. Thus, a single communications line can be shared by several terminals. A multiplexer merges the transmissions, of several terminals at one end of a communications channel, while a similar unit separates the individual transmissions at the receiving end. This is s is accomplished in two basic ways. In *frequency* division multiplexing (FDM), a multiplexer effectively divides a high-speed channel into multiple slow speed channels. In time division *multiplexing* (TDM), the multiplexer divides the time each terminal can use the high-speed line into very short time slots, or time frames. The most advanced and popular type of multiplexer is the time division multiplexer

3- Network Interface Card (NIC)
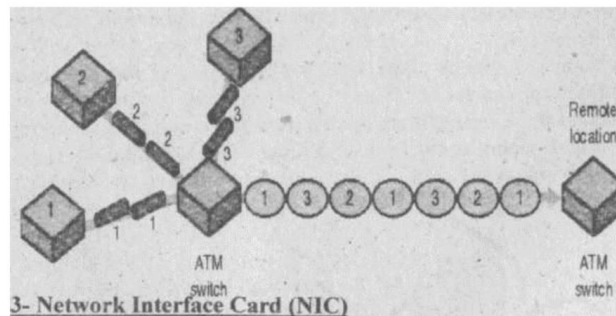
3. Network Interface Card (NIC)

To connect to a LAN, a computer must be available with special hardware and software. In hardware category, a computer needs a network interface card (NIC) to work with a LAN. Some NICs are designed to work with a specific type of LAN cabling and protocol, but others work with more than one type. **4. Internetwork processors**

These are the communication processor used by local area network to interconnect them with other local area and wide area networks .example of network processor are bridges, routers, hubs, or gateways.

5. BRIDGE:-

A device used to connect the same type network. Bridge can be used to increase the length or number of nodes for ‖a network. The Bridge makes connections at the data-link la>er of the OS1 reference model.

Bridges connect network segments. The use of a bridge increases the maximum size of your network. Unlike a repeater, which simply passes on all the signals it receives, a bridge selectively determines the' appropriate segment to which it should pass a signal. It does this by reading the address of all the signals it receives The Bridge reads the physical location of the source and destination computers from this address.

This process acts like this

A bridge receives all the signals from both segment A and segment B. The bridge reads the addresses and discards (filters) ail signals from segment A that are addressed to segment A, because they do not need to cross the bridge.

Signals from segment an addressed to a computer on segment B are retransmitted to segment B.   •

The signals form segment B are treated in the same way.

Note: Bridges operate at the Data Link layer of the OSI model. **Bridge network.** A network that is connected by Bridge.
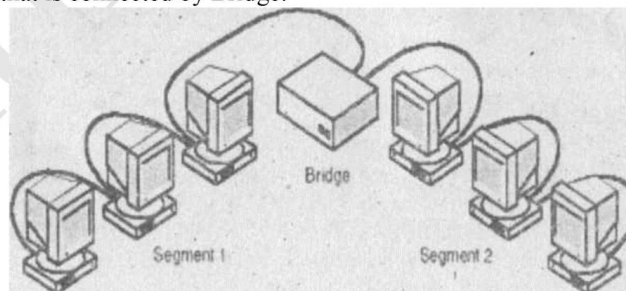
6. ROUTER:-

A device used to connect networks of different types, such as those using different architectures and protocols. Router is a special computer that directs communicating messages when several networks are connected together. Router work at the network layer of the OS1 reference model. This means they can switch and route packets across* multiple networks which they do by exchanging protocol specific information between separate networks Router determines the best path for sending data and filter broadcast traffic to the local segment.

They consist of a combination of hardware and software. The hardware can be a. network server, a separate compute-, or a special black box device. The two main pieces of software in a router are the operating system and the routing protocol Management software cart be another software component of a router.-

Routers use logical and physical addressing to connect two or more logically separate networks. The network address allows routers to more accurately and efficiently calculate the

optimal path to a .workstation or computer. Routers perform a function similar to that of a bridge, but routers keep the network separate. Because they must check both the device address and the network address, router processing is generally slower than the bridge processing. However, routers are more —intelligent' than the bridges because they use algorithms to determine the best path to send a packet to a network.

7. GATEWAY:-

A Gateway is a device, permitting communication between dissimilar networks. For example between a **LAN and a WAN** or between two LAN based on different network operating system or different layout.
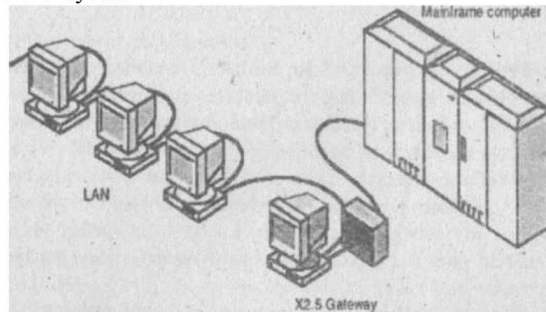
8. Repeater:

All transmission media attenuate (weaken) the electromagnetic waves that travel through them. Attenuation therefore limits the distance any medium can carry data. Adding a device that amplifies the signal can allow the signal to travel farther and thus increases the size of the network. Such devices that are used to amplify the signals are known as Repeaters Types of repeaters:

There are two types of Repeaters.

(i) Amplifiers (ii) Signal-Regenerating Repeaters Amplifiers simply amplify the entire incoming signal. Unfortunately, they amplify both signal and the noise. Signal-Regenerating Repeaters create an exact duplicate of incoming data by identifying it among the noise, reconstructing it, and retransmitting only the desired information. This reduces the noise. Note: As Repeaters simply deal with the actual, physical signals on a network, they operate at the physical layer of the OSI model.

WHAT IS TOPOLOGIES? Explain its types

TOPOLOGIES
The physical layout of a local area network is called topologies. Or the wiring scheme of a local area network is called topologies.
The term topology, or more specifically, network topology, refers to the arrangement or physical
Layout of computers, cables, and other components on the network. The two
simplest are point-to-point lines and multi drop lines.

Point-to-point
Point-to-Point lines are used, when each terminal is connected by its own line to a computer system.

Multidrop
Lines are used, when several terminals share each data communications line to a computer. Point-to-point lines are more expensive than multidrop lines: All of the communications capacity and equipment of a communications line is being used by a single terminal. Therefore, point-to-point are used only if there will be continuous communications between a computer a terminal or other computer system, A multidrop line decreases communication costs, because each line is shared by many terminals. Communications processor such as multiplexers and concentrators help many terminals share the same line.

TYPES OF TOPOLOGIES
There are four types of topology
1 .Bus Topology 2.Star Topology 3.Ring Topology 4-Mesh- 1**. Bus topology**

Bus Topology: - A topology that connects each computer, or station, to a single cable. At each end of the cable is a terminator. A transmission is passed back and forth along the cable, past the stations and between the two terminators, carrying a message from one end of the network to the other As the message passes each station, the station checks the message's destination address. If the address in the message matches the station's address, the station receives the message. If the addresses do not match, the bus carries the message to the next station, and so on.
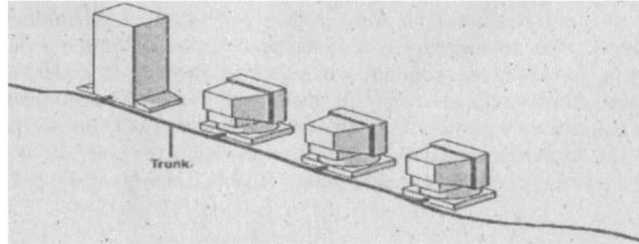
2. Star Topology

In the star topology, cable segments from each computer arc connected to a centralized component called a *hub*. Figure, 1.21 shows four computers and a hub connected in a star topology Signals are transmitted - from tile sending computer through the hub ta ail computers on the network. This topology originated in the early days of Computing when computers were connected to a centralized mainframe computer
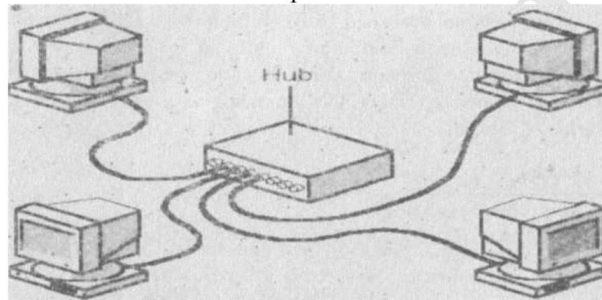
3. Ring Topology: The ring topology connects computers on a single circle of cable.

Unlike the bus topology, there are no terminated ends. The signals travel around the loop in one direction and pass through each computer, which can act as a repeater to boost the signal and send it on to the next computer. The failure of one computer can have an impact on the entire network - Star, ring, and bus networks differ in their performances, reliabilities, and costs. A pure star network is considered less reliable than a ring
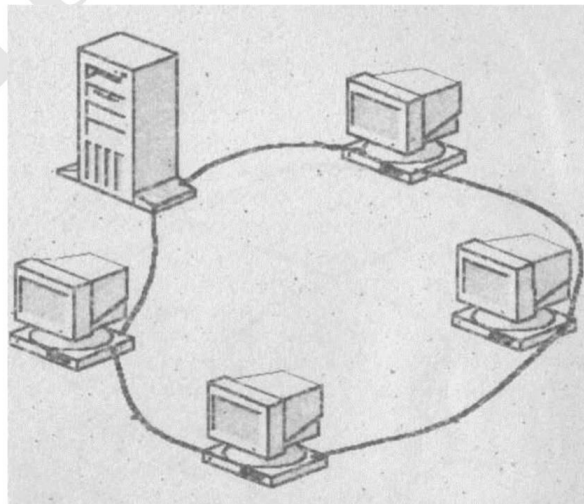
Network, since the other computers in the star are heavily dependent on the central host computer, if it fails, there is no backup processing and communications capability and the local computers will be cut off from the corporate headquarters and from each other. Therefore, it is essential that the host computer be highly reliable. Having some type of

Multiprocessor *architecture* to provide a *fault tolerant* capability is a common solution.

Star network variations are common because they can support the chain of *command* and hierarchical structures of most organizations. Ring and bus network are most common in local area networks. Ring networks are considered more reliable and less costly for the type of

communications in such networks. If one computer in the ring goes down, the other computers can continue to process their own work as well as to communicate with each other.

4. MESH (Multi point)

In a mesh topology, each computer is connected to every other computer by separate cabling. This configuration provides redundant paths throughout the network so that if one cable fails, another will take over the traffic. While ease of troubleshooting and increased reliability are definite pluses, these networks are expensive to install because they use a lot of cabling. Often, a mesh topology will be used in conjunction with other topology to form a hybrid topology.
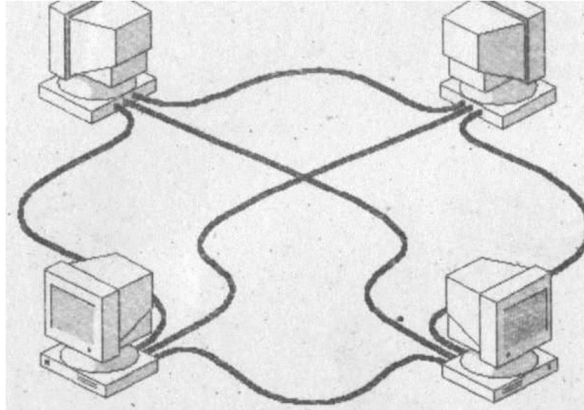
Network Architectures and Protocols

Computer manufacturers and national and international organizations have developed standards called protocol and master plans called network architectures to support the development of advanced data communications networks.

A protocol is a standard set of rules and procedures for the control of communication in a network. One example of a protocol is standardization, for the physical characteristics of the cables and connectors between terminals, computers, modems, and communications lines.

Network architectures

The goal of network architectures is to promote an open, simple, flexible, and efficient telecommunications environment. This is accomplished by the use of standard protocols, standard communications hardware and software interfaces, and the design of a standard multilevel interface between end users and computer system. The International Standards Organization (ISO) has developed a seven- layer open Systems Interconnection (OSI) model to serve as a standard model for network architectures.

DISCUSS TELECOMMUNICATIONS NETWORK MODEL (Component of networking)

A *communication* network *is* any arrangement where a *sender* transmits a *message* to a receiver over a *channel* (medium).

The below figure illustrates a simple conceptual model of a telecommunications network, which shows that it consist of five basic categories of components: **Terminals:-** Any input/output device that uses telecommunications networks to transmit or receive data is called terminal. For example telephones, office equipment, networked microcomputer workstations or video terminals.

Telecommunications processors (TP):- The devices which perform a variety of control and support functions which support data transmission and reception between terminals and computers in a telecommunications network. For example, they convert data from digital to analog and back, code and decode data, and control the accuracy and efficiency of the communications flow between computers and terminals in a telecommunications network. For example Modem Card, Hub, Bridge, router etc.

Telecommunications channels and media:- The media/channel over which data are transmitted and received. Telecommunications channels/media/medium is copper wires, coaxial cables, fiber optic cables, microwave systems, and…….

Computers:

Computers of all sizes and types are interconnected by telecommunication networks for example, mainframe, mini, and microcomputers.

Telecommunications control software:-

These are programs that control telecommunications activities and manage the functions of telecommunication networks. For examples telecommunications monitors, network operating systems, and communications packages.

The OSI MODEL

The. International organization for standardization (ISO) began developing open system interconnection (OSI) reference model in 1977. It has since become the most widely excepted model for understanding network communication.

The OSI model is nothing tangible; it is simply a conceptual framework you can use to better understand the complex interactions taking place among the various devices on a network. The OSI model doesn't perform any function in the communication process.

The actual work is done by the appropriate software and hardware. The OSI model simple defines which tasks need to be done and which protocols will handle those tasks at each of the seven layers of the OSI model.

Layers of OSI model

OSI model consist of seven layers

1 Physical 2.Data link 3.Network 4.Transport 5.Session 6, Presentation 7. Application

7. Application layer

6. Presentation layer

5. Session layer

4. Transport layer

3. Network layer

2. Data-link layer

1. Physical layer

1. Physical Layer.

The physical layer is simply responsible for sending bits from one computer to antler. The physical layer is not concerned with the meaning of the bits; instead it deals with the physical connection to the network and with transmission and reception of signals.

This level defines physical and electrical details, such as what will represent a 1 or a 0, how many pins a network connector will have, how data will be synchronized, and when the network adapter may or may not transmit the data.

Note: - Passive hubs, simple active hubs, terminators, couplers, cables and cabling connector's repeaters, multiplexers, transmitters, receivers, and transceivers are devices associated with the physical layer. **2. Data Link Layer; -**

The data link layer is responsible for the flow of data over a single link from one device to another. It accepts packets from the network layer and packages the information into data units called frames to be presented to the physical layer for transmission. The data link layer adds control information, such as frame type, routing, and segmentation information, to the data being sent.

This layer provides error-free transfer of frames from one computer to. Another. A Cyclic Redundancy Check (CRC) added to the data frame can detect damaged frames, and the data link layer in the receiving computer can request that the information be present. The data link layer ear. Also detect when frames are lost and request that those frames be seni again.

Note: - The Bridges are working at this level of the OSI mode!.

3. Network Layer: -

The network layer makes routing decisions and forwards packets for devices that are farther away than a single link. In larger networks there may be intermediate systems between any two end systems, and the network layer makes it possible for the transport layer and layers. Above it to send packets without being concerned about whether the end system is immediately adjacent or not the network layer translates logical network addresses into physical machine addresses. This layer also determines the quality of services and the route a message will take if there is several ways a message can get to its destination.

The network layer also may break large packets into smaller chunks if the packets are larger than the largest data frame the data link layer will accept. The network reassembles the chunks into packets at the receiving end.

Note: - The Routers work at the network layer of OSI model.

4. Transport Layer: -

The transport layer ensures that packets are delivered error free, in sequence and with no losses or duplications. The transport layer breaks large messages from the session layer into packets to be sent to the destination computer and reassembles packets into messages to be presented to the session layer.

The transport layer typically sends an acknowledgment to the originator for messages received.

5. Session Layer: -

The session layer allows applications on separate computers to share a connection called a session. This layer provides services such as name lookup and security to allow two programs to find each other and establish the communications link. The session layer also provides for data synchronization and check pointing so that in the event of a network failure, only the data sent after the point of failure need be resent.

This layer also controls the dialog between two processes, determining who can transmit and who can receive at what point during the communication.

6. Presentation Layer: -

The presentation layer translates data between the formats the network requires and the formats the computer expects. The presentation layer does protocol conversion, data translation, compression and encryption, character set conversion, and the interpretation of graphics commands.

The network redirector operates at this level. I'he network redirector is what makes the files on a file server visible to the client computer. The network redirector also makes remote printers act as though they are attached to the local computer. The network redirector is an important part of networking. **7. Application Layer: -**

The application layer is the topmost layer of the OSI model, and it provides services that directly support user applications, such as database access, e-mail, and file transfers. It also allows applications to communicate with applications on other computers as though they were

on the same computer. When a programmer writes an application program that uses network services, this is the layer the application program will access.

DATA TRANSMISSION SPEED OF CHANNELS (COMMUNICATION HANNELS and characteristic)

The Data Transmission Channels or Highways are used to carry data from one point to another. Channels are data highways: carrying signals from source to destination along predefined routes.

Communications and Channel Characteristics

The communication capabilities of telecommunication channels can be classified by bandwidth. This is the frequency range of the. Channel, which determines the channel maximum transmission rate. Data transmission rates are typically measured in bits per second (BPS) . This is sometimes referred to as the baud rate, 'though baud is more correctly a measure of signal changes in a transmission line. , The following are the characteristic Transmission **Speed.**

The Data Transmission Channels or Highways are used to carry data from one point to another. Infect, channels are data highways: carrying signals from source to destination along predefined routes.

Channels are classified according to capacity or data transfer rate. Channels are classified into three categories.

a. Voice band b. Narrowband c.' Broadband Channels are classified according to Capacity or data transfer rate.

Channels are classified into three categories. **1.**

Voice band 2. Narrowband 3. Broadband Voice band:

Voice band channels handle moderate data transmission volumes between 300 and 9600 baud. They are so called because their major application is for ordinary telephone voice communication. They are also used for data transmission form card reader CPU or from CPU to line printer. Their major application is for telephone voice communication and hence the term voice band.

In addition to carrying a wide range of medium speed communications, voice band lines can also carry illustrations (figure or graph) and picture called facsimile transmission. (FAX). Although it may five minutes to transmit a drawing or other documents from one location to another, the type's transmission satisfied the need for the transmission of more than just characters.

Narrowband:

A sub voice channel has a slower transfer rate, also called narrowband channels. Data transmission rates are from 45 to 300 baud. Although they are slower than voice grade channels, they are appropriate for slower devices such as telegraph lines and low speed terminals. A Narrowband channel, such as telegraph line, transmits data rates of 45 to 90 bauds. The low speed devices might use narrowband communications. **Broadband:**

Broadband or wideband channels are used when large volumes of data are to be transmitted at high speed. These systems provide data transmission rates of 1 million baud or more. Coaxial cables, microwave circuits and communications satellites are commonly used to provide these channels. High-speed data analysis and satellite communications are examples of broadband communications systems.

INFORMATION SUPERHIGHWAY

Superhighway is the high-speed, digital networks with fiber optic and satellite links. In this concept, local, regional, nationwide, and global networks will be integrated into a vast "network of networks‖ also called Internet. The information superhighway system would connect individuals, households, businesses, government agencies, libraries, universities, and all other institutions and would support interactive voice; data, video, and multimedia communications. **Why build such a superhighway network?**

The information superhighway would create a national information infrastructure that would dramatically increase business efficiency and competitiveness by improving economic communications, collaboration, and information gathering.

For example, the information superhighway could use electronic mail, video conferencing and electronic databank services to enable businesses throughout the country to build products-faster through an electronic collaboration in the product design process Or the highway could support an interactive video home shopping and entertainment system that could revolutionize the retailing, and entertainment industries. In any event, the information superhighway promises to have a major impact on development in telecommunications and on our nation's economic and social life in years to come.

CLIENT

Client are the computer which use the network resources but they themselves do not provide these resources. Client run client operating system such as Ms-DOS, Windows 2000 Workstation. Client are also called the front-end that request services such as file storage, and printing.

SERVER

Server are the computer which provide network resources Server run server operating system such as Novel NetWare Server, Windows 2000 Server. Server are also called the back-end they provide different network resources to the client on the request of them. Server computer are more powerful than client.

CLIENT/SERVER COMPUTING

A computer environment where end user workstations (client) are connected to micro or mini LAN servers or to mainframe super server- Client/Server networks divide processing task between Client and Server. More and more, networked computer systems are taking the form of client/server networks. In a client/server network, end user microcomputer workstation is the client. They are connected by local area network and share application processing with LAN server, which also manage the network. These local area network may also be interconnected to other LANs and WIDE are'a networks of client workstation and server.

With client/server computing, end user at client LAN workstation can handle a large number of task. They can thus perform some or most of the processing of their business application. LAN server share applications, manage work. Group collaboration, and control common hardware, software, and database. " . <

NETWORK SECURITY

The security measures implemented in networks are design to prevent both accidental and intentional loss. All network operating system require a logon so that no access to the information is given without accountability. Windows NT and Windows 2000 provide the maximum level of network security to the user. In this operating system there are' network administrator, which defines and implement security policies that protect the unauthorized user from the computer. There are the following security measures

Encryption:- Encryption involve special code using special mathematical algorithms, or keys, to transform digital data into a scrambled code before' they are transmitted, and to decode the data when they are received.

Fire Walls:- A fire walls software serve as a ―gatekeeper‖, system that protect computer network from intrusion (interruption) by providing a filter and safe transfer point for access to find and from the Internet and other networks. It screen all network traffic for proper passwords or other security codes, and only allows authorized transmission in and out of the network.

E-Mails

Monitor: - E-mail system are one of the favorite avenues or attack by hackers for spreading computer viruses or breaking into networked companies. Don't open Email attachments unless you know the sources of the incoming message.

Virus Defenses: Companies are building defense against the spread of viruses by centralizing the distribution and updating of antivirus software as a responsibilities of information system department.

Other security Measures are Security codes, Backup files, security monitors, biometric security, disaster recovery, and computer failure controls. . **Kerberos:** Fire wall does not provide full security because if someone thief important information titan fire wall did not monitor it. Kerberos is used to encrypt data, which can only decrypt by a person who has the decrypt key information. **Biometrics:** It contain user personal information including user finger prints, eyeball, iris scan and face scan of user

Back-up policy: Simplest back-up policy is to leave a tape in the drive arid backup your system work but this is not a very good backup policy. A better backup policy is to set time every day or every night when the file server backup its data to the tape drive. After the backup, remove the tape and insert another.

PACKET SWITCHING:

Packet switching refers to protocols in which messages are broken up into small packets before they are sent. Each packet is transmitted individually across the net, and may even follow different routes to the destination. Thus, each packet has a header information about the source, destination, packet numbering, etc. At the destination the packets are reassembled into the original message. Most modern Wide Area Networks (WANs) protocols, such as TCP/IP. X.25 and Frame Relay, are based on packet switching technologies.

Two basic approaches are common to Packet Switching:

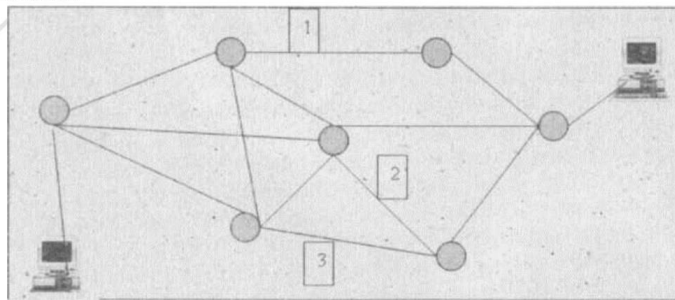Datagram Packet Switching Virtual Circuit Packet Switching

TYPES OF PACKET SWITCHING:
DATAGRAM PACKET SWITCHING:

Definition

In datagram packet switching, large messages are broken up into a stream of smaller messages. Each packet is treated as an independent message, and follows along it's own path through the internet work. Each packet contains its own independent addressing, and are kept small to allow for faster transfer across many possible network paths.

In datagram networks the 'packets are forwarded according to host destination address. In a datagram network, each packet traveling-on the network contains in its header the address of the packet's destination. When the packet arrives at a switch, the switch examines the header address. Each switch has indexed routing tables available to it. When it finds the appropriate address it finds the suitable outbound link and then the packet is routed to the next switch or destination terminal.

VIRTUAL CIRCUIT PACKET SWITCHING:

Definition: This type of packet switching is different from most of the methods, rather than creating a physical connection between computers, a virtual connection, or logical connection is made. This connection remains in place during the entire conversation, but does not dedicate a physical connection. TT^means that a single path is chosen for the

packets to travel, and all- packets travel down the same path, but other nodes may use the same physical wiring at the same time. Explanation:Virtual circuit packet switching is a packet switching technique which uses the advantages of both Datagram Packet switching and Circuit switching .No resources are dedicated for communication in this technique. Each packet carries a circuit identifier (also called virtual circuit number) which is local to a link and updated by each switch on the path of the packet from its source to its destination. Because every packet has different virtual circuit number on each link, each intermediate switch is supposed to replace the number with a new one on each link traversed. Each packet is to be routed to the destination depending on the location of the destination, but a virtual circuit, just as seen in Circuit switching is maintained.
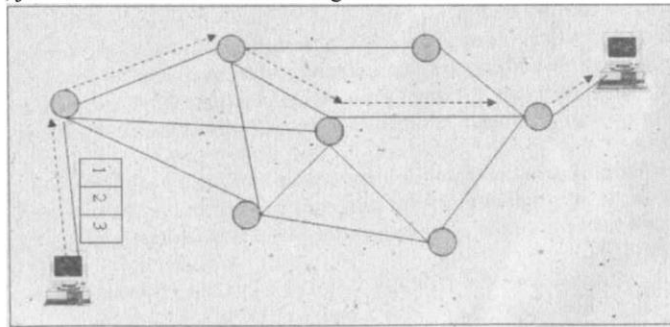
ISDN:

ISDN, stands for Integrated Services Digital Network. ISDN line provide faster transfer rates then dial up telephone line for small business and home user. It is set off standard for Digital transmission of data over standard copper telephone line. One telephone line can carry three or more signal at one time using the same line. ISDN require ISDN modem at both side. Voice conversion and video conference become clear with ISDN.

DATA COMMUNICATION:

The transmission of data from on location to another location is called Data Communication. A simple data communication system links I/O devices at remote location with one or more control processors, interface elements such as modem and front-end processors are used to bridge and control the different data communication environments. The entire data communications activity is controlled by program instructions stored in communication processors and/or central processors.

'Or communication also called Telecom refers to the electronic collection and transfer of, information from one location to another. The data being communicated may consist of voice, sound, text, video, graphics or all .of them. The electromagnetic instruments sending the data may be telegraph, telephone, cable, microwave, radio, or television. The distance may be as close as the next room or as far away as the outer edge of the solar system.

WHAT DATA COMMUNICATION (TELECOMMUNICATION) IS IMPORTANT?

Telecommunication is important because End users need to communicate electronically to succeed in today's global information society. Managers, end users/ and their organizations need ^ to electronically exchange data and information with other end users, customers, suppliers, and other organizations. Only through the use of telecommunications they can perform their tasks, manage organizational resources, and compete successfully in today's fast- 'changing global economy

Thus, many organizations today could not survive without interconnected *networks of* computers to service the information processing and communications needs of their end users.

Applications of Telecommunications

Telecommunications networks provide invaluable (very important) capabilities to an organization and its end users. For example, some networks enable work groups to

communicate electronically and share hardware, software, and data resources. Through networks company process sales transactions immediately from many remote locations, exchange business, documents electronically with its customers and suppliers, or remotely ₛ monitor and control production processes. Telecommunications networks can also interconnect the computer. Systems of a business so their computing power gain be shared by end users throughout an enterprise. Telecommunication networks enhance collaboration and communication among individuals both inside and outside an organization.

Data Communication Software:

Data Communication software manages the transmission of data between computer. They are special type software. These arc programs that control telecommunications activities and manage the functions of telecommunication networks. For examples telecommunications monitors for mainframe host computer, network operating systems for microcomputer network servers, and communications packages for microcomputers.

Elements of data communication:
There are three element of data-communication 1) Sender 2) Receiver 3) Channel

Sender   Receiver ⟶

Channel

(Transmission Medium)

Sender A device used to send the data. Receiver:- A device used to receive the message. Channel:- A medium over which the data is sent. A communication system may be simplex, half duplex and full duplex.

## What is Telecommunications Media/Channel. Discuss its different types.

Telecommunications Media/channels (also called communications lines or links) is the path that connects sender and receiver to transfer data between sending and receiving devices in a telecommunications network:
There are different types of telecommunication media/channel, which are the following.

BOUNDED/GUIDED MEDIA TWISTED PAIR CABLE:

Twisted pair wire consists of two strands of insulated copper wire, twisted around each other in pair. They are then covered by another layer of plastic insulation. Twisted pair cabling is the same type of cabling system used for home and office telephone system and local area networking. Advantage:- It is .inexpensive and easy to install.
Disadvantage:- It create noise and its transmission is easily interrupted by magnetic.
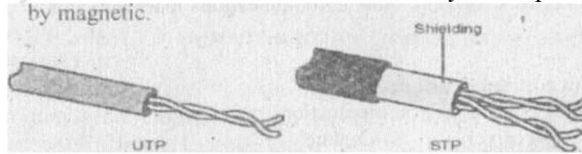
Unshielded twisted pair   shielded twisted pair

COAXIAL CABLE

Coaxial cable consists of insulated copper or aluminum wire covered by insulating material. The insulated copper wire is covered by copper mesh. It is widely used for cable television and local area network. Advantage:- The extra, insulation makes coaxial cable much better resisting noise than twisted pair wiring. These can transmit data much faster than twisted pairs.
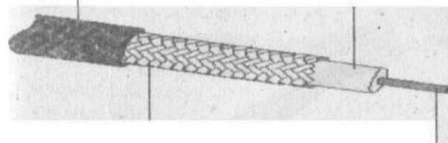
FIBER OPTIC CABLE

A fiber-optic cable consists of hundreds or thousands of thin strands of glass that transmit pulsating beams of light instead of electricity. It is thinner than a human hair. Data transfer rate of fiber optics is very fast. There is no chance of data loss. Light pulse is not affected by random electromagnetic interference in the environment. They have much lower error rates that normal telephone twisted pair or coaxial cable.

It is latest technology according to a research if half population of the world is on one side of a single fiber optics cable and the other half on the other side of the same fiber optics cable, then they can communicate with each other if proper multiplexing technique are used.

Advantage: -A final advantage is that it cannot be easily wiretapped or listened, so transmissions are more secure.

Disadvantage: The main drawback until recently have been cost and the materials and inability to bend around tight covers.
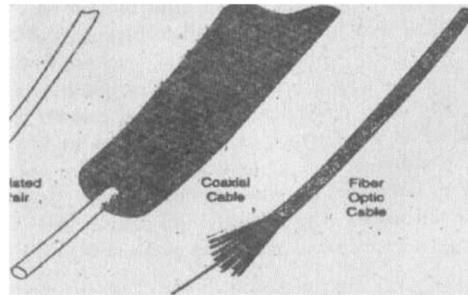
UNBOUNDED/UNGUIDED MEDIA OR WIRELESS MEDIA

Terrestrial Microwave or Microwave

Microwaves are radio waves that are used to provide high-speed •transmission. Microwave system transmit high-speed radio signals in a line-of-sight path between relay stations placed approximately 30 miles apart each other. Microwave antennas are usually placed on top of building, towers, hills, and mountain peaks. They are still a popular medium, for both long-distance and metropolitan area networks. There is no cable involve.

Communications Satellites

Communication satellite is a space station. It receive microwave signal from earth station. It amplifies the signal and retransmits them back to earth. Communication satellite is established in space about 23,300 miles above earth. The data transfer speed of communication satellite is very high. The transmission from earth station to satellite is called uplink. The transmission from satellite to earth station is called downlink. There is no insight path problem.

Cellular radio

Cellular radio is a broadcast radio used for mobile communications. It is specially used in wireless modems and cellular telephones. Cellular telephone is a telephone device that uses high frequency radio waves to transmit voice and. digital data.

Cellular radio has become an important communications medium for mobile voice and data communications. The integration of cellular and other mobile radio technology is expected to accelerate in the next few years.

Personal Communications Service (PCS) is set of technologies used for digital cellular devices. Handheld computer, cellular telephones, and fax machine use PCS.
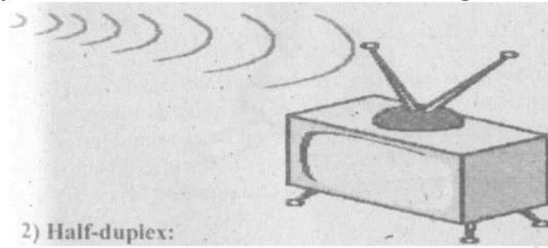
Data transmission modes

There are three types of transmission modes.

1) Simplex Transmission:

A simplex transmission circuit, permits data follow in only one direction. A terminal connected to such a circuit is either a send-only or a receive-only device e.g. Telegraph system

An example is a traditionally television broadcast, in which the signal s sent from the transmitter to your television antenna. There is no return signal.

2) Half-duplex:

In half-duplex transmission, data travels in both direction but only in one direction at a time. This arrangement resembles traffic on a one- lane bridge; the separate streams of cars heading in both directions must take turns. Half-duplex transmission is seen with CB or marine radios, in which both position must take turns or wireless system.

Sender ⟷ Receiver
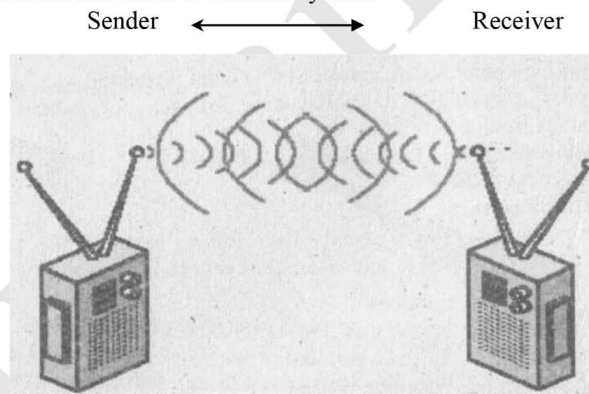
3. Full-duplex transmission

In Full-duplex transmission, data is transmitted back and forth at the same time. An example is two people on telephones talking and listening simultaneously.
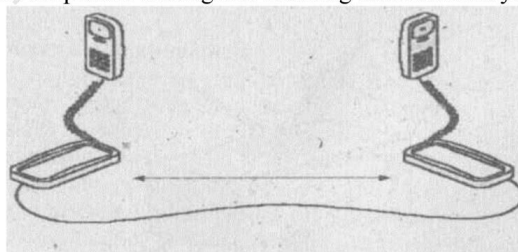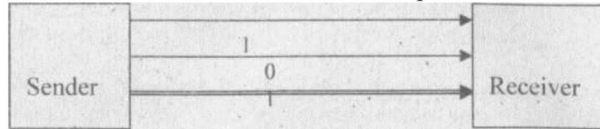
Types of communication:

There are two possible ways to transmit the data from sender to receiver.
Parallel transmission and 2) Serial transmission.

a) Parallel transmission

In parallel transmission mode each bit to be send on separate channel.

Here all the bits of the characters a*e transmitted simultaneously, thus the transmission is parallel by bit but Serial by character. It has transmitting speed but expensive because large number of channels are required. It is used for short distance communication.

b) Serial transmission

In Serial transmission each bit is transmit on single channel. It is shown
As

Sender ←——————→ Receiver
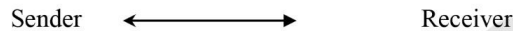
The character bit is transmitted one after another on single channel. The receiver resembles the incoming bits stream into character.
Serial transmission has the synchronization problem. Mean the receiver is unable when one character is ended and next is beginning. Therefore the serial transmission is divided into synchronous and asynchronous transmission.

c) Asynchronous transmission:

In this method transmission messages is send one character at a time. The character is headed with a start bit and is ended with one or more stop bit. The start and stop bits tell the receiving devices that character are coming and that the character has been sent. The receiving devices to verify that the data was received correctly use parity bits. As a result, asynchronous transmission is not used when great amounts of data. Must be sent rapidly. Its advantages are that the data can be transmitted where it is convenient for the sender.

d) Synchronous transmission:

Synchronous transmission sends data in blocks. Start and stop bit patterns, called synchronous byte, are transmitted at the beginning and end of the blocks .This method is rarely used with microwave computers because it is more complicated and more expensive than asynchronous transmission. It also requires careful timing between sending and receiving equipment. It is appropriate for computer systems that need to transmit great quantities of data quickly.
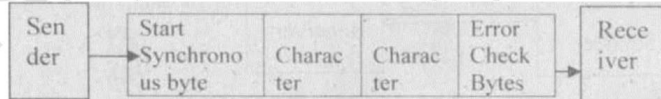
ARTIFICIAL INTELLIGENCE:

The term artificial intelligence was first coined in 1956, at Dartmouth conference. The advancement in the field of A.I has been slower than first estimated progress continuous to be made from its birth 4 decades ago. **Q: What is AI ?**

Artificial Intelligence is a group of related technologies that attempt to develop machine to emulate human-like qualities, such as learning, reasoning, communicating, seeing and hearing. The goal of AI is to develop computer that can think, as well as see. Hear, walk, talk, and feel. It is an attempt to convert the human information processing into computer-based system. Some scientists claim that development human like intelligence and capabilities (think, reasoning, decision, learning and responding) is not totally possible. But progress cantinas for this ambitions target is going on and only the time tell the truth. Some examples Of artificial intelligence technologies are;

1. Robotics 2. Chess playing machine 3. Expert system etc. **ROBOTICS-**

This technology produces computer-based machines which have computer-based intelligence and computer controlled human like capabilities. This area of knowledge produces machine to have touch, power of sight, visual perception and other human like system through the combination of hardware and software. The use of robotics in computer-aided manufacturing.

Most robots are unintelligent; that is, they are programmed to do specific tasks. An unintelligent robot cannot respond to a situation for which it has not been specifically programmed. Intelligence is provided either by a direct link to a compute or by on-board computers that reside in the robot. Most robots are use in factories, spray-painting, and welding. .Often these uses are functions that would be tedious or even dangerous for a human to perform. For example, with the help of a TV camera eye, a robot can see components to assemble. It is able to pick them up, rearrange them in the right order. There are some dangerous places inside a nuclear power plant, next to a suspected bomb, at the bottom of the sea, on the floor of a volcano, or in the middle of a chemical spill. But robots readily go to all those places. Another area of interest is the ―personal‖ robot, familiar to us from science fiction. Scientists believe that in just a few years we'll all have robots in our homes to do practical tasks.

EXPERT SYSTEM

What is Expert System?

A computer-based information system that uses its knowledge about a specific complex application area to act as an expert consultant to users. The system consists of a knowledge base and software modules that perform inferences on the knowledge and communicate answers to users questions.

Expert system can be used for either operational or management applications.

Expert systems are related to knowledge-based decision support systems.

Knowledge-based information system:

A knowledge-based information system is an expert system database of knowledge about a particular subject, including relevant facts, information, belief, assumptions, and procedure for solving problems. The basic unit of knowledge is expressed as an IF-THEN-ELSE rule.

Expert-Assisted IS:-

The integration of expert systems into decision support systems and other types of information systems is expected to become a major characteristic of a trend towards expert-assisted information systems. This integration adds expertise as well as a knowledge base to information systems. An important example is the integration of expert systems and decision support systems with executive information systems.

The expert system is MACSYMA for MATH and MYC1N for MEDICAL (blood oriented) PROSPECTOR for GEOLOGY (stone/dust/liquid)

Expert system is used to simulate human intelligence, simulate means (artificial representation of some natural phenomena).

NEURAL NETWORK

Computer processor or software whose architecture is based on the human brain‘s mesh like neuron structure. Neural networks can process many pieces of information simultaneously and

can learn to recognize patterns and program themselves to solve related problems their own. Neural networks can be implemented on microcomputers and other traditional computer systems by using software packages that simulate the activity of a neural networks. Specialized neural networks coprocessor circuit boards for PCs are also available that provide significantly greater processing power.

What is CAD/CAM

CAD (computer aided design):

Computer aided design is the integration of the computer and graphics to aid in the areas of design and drafting. Computer aided design and drafting software are design for mechanical designer and draftsmen, but also for the other fields.

Architectural firms use form of CAD. Use of CAD architecture can draw different design like room plan and different structural model. Computer aided design, or simply CAD, by definition is the combination of hardware and software components providing the tool of planning and designing and modeling. **History of CAD**:

The history of CAD began traced back to 1950. CAD was, initially used on mainframe computers in early 1980 Autodesk revolutionized CAD system by making AutoCAD, which could be run on a PC! **Uses/Application of CAD:**

The CAD is used in great number of professional application. This can be a category in three categories.

MCAD (mechanical CAD). Used by engineers to design complex parts of different machines.

AEC (architecture engineering and construction) used for creation of buildings and their system.

GIS (geographical information system) to generate maps from topographic data. Automobile designer at large auto manufacturing plants use cad to design many prototypes of different cars before creating solid models. CAM (computer aided manufacturing):

CAM is a form of automation where computers communicate work instructions directly to the manufacturing machinery. Today a single computer can control banks of robotics milling machine, lathes, and welding machine and other tools. The use of computer to control the factory machines in the manufacturing process is called computer aided manufacturing (CAM).

Computer Numerical Control (CMC): - is the system in which operator program computer that control the milling process apparatus. A human does not attend the actual machine. Unlike a human, a computer- controlled difficult tasks. CMC devices make a possible to cut more difficult parts with greater precision. Often a CNC machine a connected to a CAD workstation. By watching the monitor, the CNC operator can view the part as the machine is .making it.

Cloud Computing

What is cloud computing, in simple terms?

Cloud computing is the delivery of on-demand computing services -- from applications to storage and processing power -- typically over the internet and on a pay-as-you-go basis.

How does cloud computing work?

Rather than owning their own computing infrastructure or data centers, companies can rent access to anything from applications to storage from a cloud service provider.

One benefit of using cloud computing services is that firms can avoid the upfront cost and complexity of owning and maintaining their own IT infrastructure, and instead simply pay for what they use, when they use it.

In turn, providers of cloud computing services can benefit from significant economies of scale by delivering the same services to a wide range of customers.

What cloud computing services are available?
Cloud computing services cover a vast range of options now, from the basics of storage, networking, and processing power through to natural language processing and artificial intelligence as well as standard office applications. Pretty much any service that doesn't require you to be physically close to the computer hardware that you are using can now be delivered via the cloud.

What are examples of cloud computing?

Cloud computing underpins a vast number of services. That includes consumer services like Gmail or the cloud back-up of the photos on your smartphone, though to the services which allow large enterprises to host all their data and run all of their applications in the cloud. Netflix relies on cloud computing services to run its its video streaming service and its other business systems too, and have a number of other organisations.

Cloud computing is becoming the default option for many apps: software vendors are increasingly offering their applications as services over the internet rather than standalone products as they try to switch to a subscription model. However, there is a potential downside to cloud computing, in that it can also introduce new costs and new risks for companies using it.

Why is it called cloud computing?

A fundamental concept behind cloud computing is that the location of the service, and many of the details such as the hardware or operating system on which it is running, are largely irrelevant to the user. It's with this in mind that the metaphor of the cloud was borrowed from old telecoms network schematics, in which the public telephone network (and later the internet) was often represented as a cloud to denote that the just didn't matter -- it was just a cloud of stuff. This is an over-simplification of course; for many customers location of their services and data remains a key issue.

What is the history of cloud computing?

Cloud computing as a term has been around since the early 2000s, but the concept of computing-as-a-service has been around for much, much longer -- as far back as the 1960s,

when computer bureaus would allow companies to rent time on a mainframe, rather than have to buy one themselves.

These 'time-sharing' services were largely overtaken by the rise of the PC which made owning a computer much more affordable, and then in turn by the rise of corporate data centers where companies would store vast amounts of data.

But the concept of renting access to computing power has resurfaced again and again -- in the application service providers, utility computing, and grid computing of the late 1990s and early 2000s. This was followed by cloud computing, which really took hold with the emergence of software as a service and hyperscale cloud computing providers such as Amazon Web Services.

How important is the cloud?

Building the infrastructure to support cloud computing now accounts for more than a third of all IT spending worldwide, according to research from IDC. Meanwhile spending on traditional, in-house IT continues to slide as computing workloads continue to move to the cloud, whether that is public cloud services offered by vendors or private clouds built by enterprises themselves.

451 Research predicts that around one-third of enterprise IT spending will be on hosting and cloud services this year "indicating a growing reliance on external sources of infrastructure, application, management and security services". Analyst Gartner predicts that half of global enterprises using the cloud now will have gone all-in on it by 2021.

According to Gartner, global spending on cloud services will reach $260bn this year up from $219.6bn. It's also growing at a faster rate than the analysts expected. But it's not entirely clear how much of that demand is coming from businesses that actually want to move to the cloud and how much is being created by vendors who now only offer cloud versions of their products (often because they are keen to move to away from selling one-off licences to selling potentially more lucrative and predictable cloud subscriptions).

Robotics

What is Robotics?

Robotics is an academic discipline of science and technology related to all kinds of robots. Then, what is a robot? Unfortunately, there is no exact definition on robots, but by general agreement a robot is a programmable machine that imitates the actions or appearance of an intelligent creature, usually a human. Figure 1 shows examples of these robots similar to animals and humans.

Compared to other artifacts with single functions, robots are expected to perform a variety of tasks, among which communication has an important role. A typical example is a humanoid robot, the building of which has been regarded as the final target of robotics for many years, especially in Japan where many robotics researchers have been struggling with making humanoid robots work in our society. Regardless of such efforts, no definition of humanoid robots exists since "robot" itself has no clear definition. From the viewpoint of biology, human beings can be discriminated from other species by three distinctive features or capabilities. They are biped walking, use instrumentation, and have the invention/use of language.

The first two capabilities have been attacked by robotics researchers as challenges in locomotion and manipulation that are the main issues in robotics. The third capability has not been considered as within robotics but linguistics. It seems far away from robotics. However, recent progress of research activities developed by the idea of "embodiment" in behavior-based robotics proposed by Rod Brooks at the MIT AI laboratory in the late 1980s has caused more conceptual issues such as body scheme, body image, self, consciousness, theory of mind, communication, and the emergence of language. Although these issues have been attacked in the existing disciplines such as brain science, neuroscience, cognitive science, and developmental psychology, robotics may project a new light on understanding these issues by constructing artifacts similar to us.

Thus, robotics covers a broad range of disciplines; therefore it seems very difficult to find comprehensive textbooks to understand the area. Some textbooks focus on the fundamental issues on how to build robots while others focus on a limited area in robotics such as kinematics, dynamics, control, vision, or planning. Among them, Russell and Norvig's book from 1995 entitled Artificial Intelligence—A Modern Approach gave a good introduction to robotics from the viewpoint of AI. Pfeifer and Scheier's book from 1999 entitled Understanding Intelligence shows a constructive approach to understanding intelligence with a variety of robots from the viewpoint of embodied cognitive science. Readers can access resources on the recent activities of robotics around the world through the Web.