

MANIDHANAHEYAM FREE IAS ACADEMY – TNPSC GROUP II & IIA
UNIT – I-SCIENCE & TECHNOLOGY, COMPUTER SCIENCE & ADVANCEMENT
COMPUTER SCIENCE AND APPLICATIONS

1. Generations of Computers

Growth in the computers is determined by the development in technology. Based on various stages of development, computers can be categorized into different generations.

S.No	Generation	Period	Main Component used	Merits/Demerits
1	First Generation	1942-1955	Vacuum tubes	<ul style="list-style-type: none"> • Big in size • Consumed more power • Malfunction due to overheat • Machine Language was used
First Generation Computers - ENIAC, EDVAC, UNIVAC 1 ENIAC weighed about 27 tons, size 8 feet × 100 feet × 3 feet and consumed around 150 watts of power				
2	Second Generation	1955-1964	Transistors	<ul style="list-style-type: none"> • Smaller compared to First Generation • Generated Less Heat • Consumed less power compared to first generation • Punched cards were used • First operating system was developed - Batch Processing and Multiprogramming Operating System • Machine language as well as Assembly language was used.

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Second Generation Computers IBM 1401, IBM 1620, UNIVAC 1108				
3	Third Generation	1964 - 1975	Integrated Circuits (IC)	<ul style="list-style-type: none"> • Computers were smaller, faster and more reliable • Consumed less power • High Level Languages were used
Third Generation Computers IBM 360 series, Honeywell 6000 series				
4	Fourth Generation	1975-1980	Microprocessor Very Large Scale Integrated Circuits (VLSI)	<ul style="list-style-type: none"> • Smaller and Faster • Microcomputer series such as IBM and APPLE were developed • Portable Computers were introduced.
5	Fifth Generation	1980 - till date	Ultra Large Scale Integration (ULSI)	<ul style="list-style-type: none"> • Parallel Processing • Super conductors • Computers size was drastically reduced. • Can recognize Images and Graphics • Introduction of Artificial Intelligence and Expert Systems • Able to solve high complex problems including decision

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				making and logical reasoning
6	Sixth Generation	In future		<ul style="list-style-type: none"> • Parallel and Distributed computing • Computers have become smarter, faster and smaller • Development of robotics • Natural Language Processing • Development of Voice Recognition Software

Sixth Generation Computing

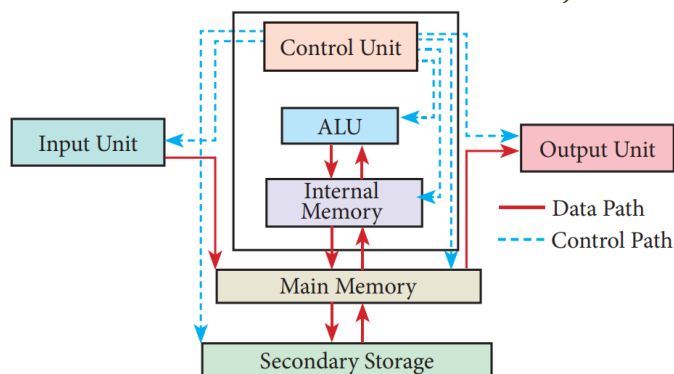
In the Sixth Generation, computers could be defined as the era of intelligent computers, based on Artificial Neural Networks. One of the most dramatic changes in the sixth generation will be the explosive growth of Wide Area Networking. Natural Language Processing (NLP) is a component of Artificial Intelligence (AI). It provides the ability to develop the computer program to understand human language.

2. Components of a Computer

The computer is the combination of hardware and software. Hardware is the physical component of a computer like motherboard, memory devices, monitor, keyboard etc., while software is the set of programs or instructions. Both hardware and software together make the computer system to function.

Let us first have a look at the functional components of a computer. Every task given to a computer follows an Input- Process- Output Cycle (IPO cycle). It needs certain input, processes that input and produces the desired output. The input unit takes the input, the central processing unit does the processing of data and the output unit produces the output. The memory unit holds the data and instructions during the processing.

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Input Unit

Input unit is used to feed any form of data to the computer, which can be stored in the memory unit for further processing. Example: Keyboard, mouse, etc.

Central Processing Unit

CPU is the major component which interprets and executes software instructions. It also control the operation of all other components such as memory, input and output units. It accepts binary data as input, process the data according to the instructions and provide the result as output.

The CPU has three components which are Control unit, Arithmetic and logic unit (ALU) and Memory unit.

Arithmetic and Logic Unit

The ALU is a part of the CPU where various computing functions are performed on data. The ALU performs arithmetic operations such as addition, subtraction, multiplication, division and logical operations. The result of an operation is stored in internal memory of CPU. The logical operations of ALU promote the decision-making ability of a computer.

Control Unit

The control unit controls the flow of data between the CPU, memory and I/O devices. It also controls the entire operation of a computer.

Output Unit

An Output Unit is any hardware component that conveys information to users in an understandable form. Example: Monitor, Printer etc.

Memory Unit

The Memory Unit is of two types which are primary memory and secondary memory. The primary memory is used to temporarily store the programs and data when the instructions are ready to execute. The secondary memory is used to store the data permanently.

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The Primary Memory is volatile, that is, the content is lost when the power supply is switched off. The Random Access Memory (RAM) is an example of a main memory. The Secondary memory is non volatile, that is, the content is available even after the power supply is switched off. Hard disk, CD-ROM and DVD ROM are examples of secondary memory.

3. Input and Output Devices

Input Devices:

- (1) Keyboard: Keyboard (wired / wireless, virtual) is the most common input device used today. The individual keys for letters, numbers and special characters are collectively known as character keys. This keyboard layout is derived from the keyboard of original typewriter. The data and instructions are given as input to the computer by typing on the keyboard. Apart from alphabet and numeric keys, it also has Function keys for performing different functions. There are different set of keys available in the keyboard such as character keys, modifier keys, system and GUI keys, enter and editing keys, function keys, navigation keys, numeric keypad and lock keys.
- (2) Mouse: Mouse (wired/wireless) is a pointing device used to control the movement of the cursor on the display screen. It can be used to select icons, menus, command buttons or activate something on a computer. Some mouse actions are move, click, double click, right click, drag and drop.

Different types of mouse available are: Mechanical Mouse, Optical, Laser Mouse, Air Mouse, 3D Mouse, Tactile Mouse, Ergonomic Mouse and Gaming Mouse.

MOST COMMONLY USED MOUSE			
S.No	Type of Mouse	Mechanism	Developed and Introduced
1	Mechanical Mouse	<ul style="list-style-type: none"> • A small ball is kept inside and touches the pad through a hole at the bottom of the mouse. • When the mouse is moved, the ball rolls. • This movement of the ball is converted into signals and sent to the computer. 	Telefunken, German Company, 02/10/1968

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2	Optical Mouse	<ul style="list-style-type: none"> • Measures the motion and acceleration of pointer. • It uses light source instead of ball to judge the motion of the pointer. • Optical mouse has three buttons. • Optical mouse is less sensitive towards surface. 	In 1988, Richard Lyon, Steve Krish independently invented different versions of Optical Mouse.
3	Laser Mouse	<ul style="list-style-type: none"> • Measures the motion and acceleration of pointer. • Laser Mouse uses Laser Light • Laser Mouse is highly sensitive and able to work on any hard surface. 	

- (3) Scanner: Scanners are used to enter the information directly into the computer's memory. This device works like a Xerox machine. The scanner converts any type of printed or written information including photographs into a digital format, which can be manipulated by the computer.
- (4) (4)Fingerprint Scanner: Finger print Scanner is a fingerprint recognition device used for computer security, equipped with the fingerprint recognition feature that uses biometric technology. Fingerprint Reader / Scanner is a very safe and convenient device for security instead of using passwords, which is vulnerable to fraud and is hard to remember.
- (5) Track Ball: Track ball is similar to the upside- down design of the mouse. The user moves the ball directly, while the device itself remains stationary. The user spins the ball in various directions to navigate the screen movements.
- (6) Retinal Scanner: This performs a retinal scan which is a biometric technique that uses unique patterns on a person's retinal blood vessels.
- (7) Light Pen: A light pen is a pointing device shaped like a pen and is connected to a monitor. The tip of the light pen contains a light-sensitive element which detects the light from the screen enabling the computer to identify the location of the pen on the screen. Light pens have the advantage of 'drawing' directly onto the screen, but this becomes hard to use, and is also not accurate.
- (8) Optical Character Reader: It is a device which detects characters printed or written on a paper with OCR, a user can scan a page from a book. The Computer will recognize

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the characters in the page as letters and punctuation marks and stores. The Scanned document can be edited using a wordprocessor.

- (9) Bar Code / QR Code Reader: A Bar code is a pattern printed in lines of different thickness. The Bar code reader scans the information on the bar codes transmits to the Computer for further processing. The system gives fast and error free entry of information into the computer. QR (Quick response) Code: The QR code is the two dimension bar code which can be read by a camera and processed to interpret the image
- (10) Voice Input Systems: Microphone serves as a voice Input device. It captures the voice data and send it to the Computer. Using the microphone along with speech recognition software can offer a completely new approach to input information into the Computer.
- (11) Digital Camera: It captures images / videos directly in the digital form. It uses a CCD (Charge Coupled Device) electronic chip. When light falls on the chip through the lens, it converts light rays into digital format.
- (12) Touch Screen: A touch screen is a display device that allows the user to interact with a computer by using the finger. It can be quite useful as an alternative to a mouse or keyboard for navigating a Graphical User Interface (GUI). Touch screens are used on a wide variety of devices such as computers, laptops, monitors, smart phones, tablets, cash registers and information kiosks. Some touch screens use a grid of infrared beams to sense the presence of a finger instead of utilizing touch-sensitive input.
- (13) Keyer: A Keyer is a device for signaling by hand, by way of pressing one or more switches. Modern keyers have a large number of switches but not as many as a full size keyboard. Typically, this number is between 4 and 50. A keyer differs from a keyboard, which has "no board", but the keys are arranged in a cluster.

Output Devices:

- (1) Monitor: Monitor is the most commonly used output device to display the information. It looks like a TV. Pictures on a monitor are formed with picture elements called PIXELS. Monitors may either be Monochrome which display text or images in Black and White or can be color, which display results in multiple colors. There are many types of monitors available such as CRT (Cathode Ray Tube), LCD (Liquid Crystal Display) and LED (Light Emitting Diodes). The monitor works with the VGA (Video Graphics Array) card. The video graphics card helps the keyboard to communicate with the screen. It acts as an interface between the computer and display monitor. Usually the recent motherboards incorporate built-in video card.

The first computer monitor was part of the Xerox Alto computer system, which was released on March 1, 1973.

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- (2) Plotter: Plotter is an output device that is used to produce graphical output on papers. It uses single color or multi color pens to draw pictures.
- (3) Printers: Printers are used to print the information on papers. Printers are divided into two main categories:

Impact Printers

These printers print with striking of hammers or pins on ribbon. These printers can print on multi-part (using carbon papers) by using mechanical pressure. For example, Dot Matrix printers and Line matrix printers are impact printers.

A Dot matrix printer that prints using a fixed number of pins or wires. Each dot is produced by a tiny metal rod, also called a “wire” or “pin”, which works by the power of a tiny electromagnet or solenoid, either directly or through a set of small levers. It generally prints one line of text at a time. The printing speed of these printers varies from 30 to 1550 CPS (Character per Second).

Line matrix printers use a fixed print head for printing. Basically, it prints a page-wide line of dots. But it builds up a line of text by printing lines of dots. Line printers are capable of printing much more than 1000 Lines per Minute, resulting in thousands of pages per hour. These printers also uses mechanical pressure to print on multi-part (using carbon papers).

Non-Impact Printers

These printers do not use striking mechanism for printing. They use electrostatic or laser technology. Quality and speed of these printers are better than Impact printers. For example, Laser printers and Inkjet printers are non-impact printers.

Laser Printers

Laser printers mostly work with similar technology used by photocopiers. It makes a laser beam scan back and forth across a drum inside the printer, building up a pattern. It can produce very good quality of graphic images. One of the chief characteristics of laser printer is their resolution – how many Dots per inch (DPI). The available resolution range around 1200 dpi. Approximately it can print 100 pages per minute (PPM)

Inkjet Printers: Inkjet Printers use colour cartridges which combined Magenta, Yellow and Cyan inks to create color tones. A black cartridge is also used for monochrome output. Inkjet printers work by spraying ionised ink at a sheet of paper. The speed of Inkjet printer’s generally range from 1-20 PPM (Page per Minute).

They use the technology of firing ink by heating it so that it explodes towards the paper in bubbles or by using piezoelectricity in which tiny electric currents controlled by electronic

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circuits are used inside the printer to spread ink in jet speed. An Inkjet printer can spread millions of dots of ink at the paper every single second.

Speakers: Speakers produce voice output (audio). Using speaker along with speech synthesize software, the computer can provide voice output. This has become very common in places like airlines, schools, banks, railway stations, etc.

Multimedia Projectors: Multimedia projectors are used to produce computer output on a big screen. These are used to display presentations in meeting halls or in classrooms.

4. Booting of computer

An Operating system (OS) is a basic software that makes the computer to work. When a computer is switched on, there is no information in its RAM. At the same time, in ROM, the pre-written program called POST (Power on Self Test) will be executed first. This program checks if the devices like RAM, keyboard, etc., are connected properly and ready to operate. If these devices are ready, then the BIOS (Basic Input Output System) gets executed. This process is called Booting. Thereafter, a program called “Bootstrap Loader” transfers OS from hard disk into main memory. Now the OS gets loaded (Windows/Linux, etc.,) and will get executed. Booting process is of two types.

1) Cold Booting

When the system starts from initial state i.e. it is switched on, we call it cold booting or Hard Booting. When the user presses the Power button, the instructions are read from the ROM to initiate the booting process.

2) Warm Booting

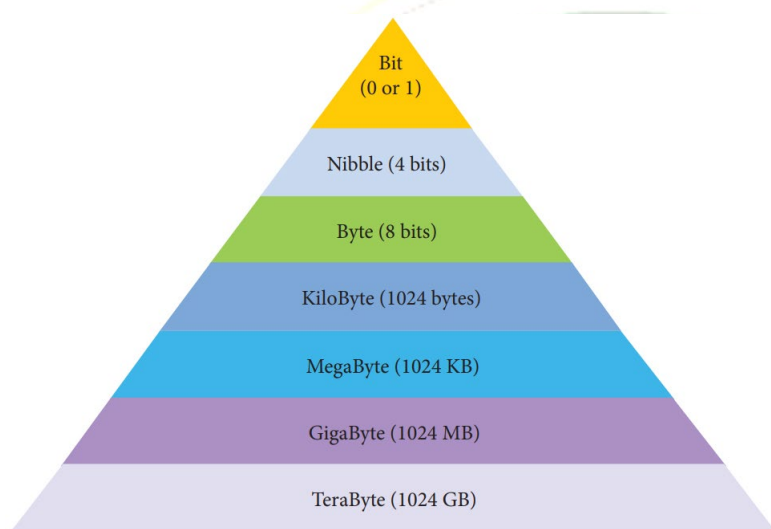
When the system restarts or when reset button is pressed, we call it Warm Booting or Soft Booting. The system does not start from initial state and so all diagnostic tests need not be carried out in this case. There are chances of data loss and system damage as the data might not have been stored properly.

Memory Size (Read 2^{10} as 2 power 10)

Name	Abbr.	Size
Kilo	K	$2^{10} = 1,024$
Mega	M	$2^{20} = 1,048,576$
Giga	G	$2^{30} = 1,073,741,824$

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Tera	T	$2^{40} = 1,099,511,627,776$
Peta	P	$2^{50} = 1,125,899,906,842,624$
Exa	E	$2^{60} = 1,152,921,504,606,846,976$
Zetta	Z	$2^{70} = 1,180,591,620,717,411,303,424$
Yotta	Y	$2^{80} = 1,208,925,819,614,629,174,706,173$

**Example**

$$\begin{aligned}(123)_{10} &= 1 \times 10^2 + 2 \times 10^1 + 3 \times 10^0 \\ &= 100 + 20 + 3 \\ &= (123)_{10}\end{aligned}$$

Example

The binary sequence $(1101)_2$ has the decimal equivalent:

$$\begin{aligned}(1101)_2 &= 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 \\ &= 8 + 4 + 0 + 1 \\ &= (13)_{10}\end{aligned}$$

Example

The Octal sequence $(547)_8$ has the decimal equivalent:

$$(547)_8 = 5 \times 8^2 + 4 \times 8^1 + 7 \times 8^0$$

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$$= 5 \times 64 + 4 \times 8 + 7 \times 1$$

$$= 320 + 32 + 7$$

$$= (359)_{10}$$

Example

The hexadecimal sequence $(25)_{16}$ has the decimal equivalent:

$$(25)_{16} = 2 \times 16^1 + 5 \times 16^0$$

$$= 32 + 5 = (37)_{10}$$

Example

Convert $(65)_{10}$ into its equivalent binary number

2	65	
2	32 - 1	← LSB
2	16 - 0	
2	8 - 0	
2	4 - 0	
2	2 - 0	
1	1 - 0	← MSB

Remainder

Note :

$65/2 = 32 + 1$

$32/2 = 16 + 0$

$16/2 = 8 + 0$

$8/2 = 4 + 0$

$4/2 = 2 + 0$

$2/2 = 1 + 0$

$$(65)_{10} = (1000001)_2$$

Example

The conversion steps can be given as follows:

Given Number: 65

Equivalent or value less than power of 2 is: 64

$$(1) 65 - 64 = 1 \quad (2) 1 - 1 = 0$$

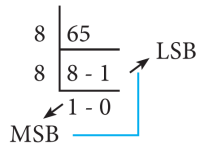
Power's of 2	64	32	16	8	4	2	1
Binary Number	1	0	0	0	0	0	1

$$65_{10} = (1000001)_2$$

Example

Convert $(65)_{10}$ into its equivalent Octal number

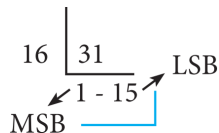
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$$(65)_{10} = (101)_8$$

Example

Convert $(31)_{10}$ into its equivalent hexadecimal number.



$$(31)_{10} = (1F)_{16}$$

Example

Convert $(111011)_2$ into its equivalent decimal number

Weight	32	16	8	4	2	1
Positional Notation	2^5	2^4	2^3	2^2	2^1	2^0
Given number	1	1	1	0	1	1

$$32+16+8+0+2+1 = (59)_{10}$$

$$(111011)_2 = (59)_{10}$$

Example

Convert $(11010110)_2$ into octal equivalent number

Step 1: Group the given number into 3 bits from right to left.

011 010 110

Note: The left most groups have less than 3 bits, so 0 is added to its left to make a group of 3 bits.

Step-2: Find octal equivalent of each group

011	010	110
⏟	⏟	⏟
3	2	6

$$(11010110)_2 = (326)_8$$

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Example

Convert $(1111010110)_2$ into Hexadecimal number

Step 1: Group the given number into 4 bits from right to left.

0011 1101 0110

Note: 0's are added to the left most group to make it a group of 4 bits

0011	1101	0110
⏟	⏟	⏟
3	D	6

$$(1111010110)_2 = (3D6)_{16}$$

Example

Convert the given Binary number $(11.011)_2$ into its decimal equivalent Integer part $(11)_2 = 3$

2^1	2^0	.	2^{-1}	2^{-2}	2^{-3}
↑	↑		↑	↑	↑
1	1		0	1	1

$$3 + . (0 \times 0.5 + 1 \times 0.25 + 1 \times 0.125)$$

$$= 3.375$$

$$(11.011)_2 = (3.375)_{10}$$

Example

Convert $(1265)_8$ to equivalent Decimal number

Weight	512	64	8	1
Positional Notation	8^3	8^2	8^1	8^0
Given number	1	2	6	5

$$(1265)_8 = 512 \times 1 + 64 \times 2 + 8 \times 6 + 1 \times 5$$

$$= 512 + 128 + 48 + 5$$

$$(1265)_8 = (693)_{10}$$

Example

Convert $(6213)_8$ to equivalent Binary number

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6	2	1	3
↓	↓	↓	↓
110	010	001	011

$$(6213)_8 = (110010001011)_2$$

Example

Convert $(25F)_{16}$ into its equivalent Decimal number.

Weight	256	16	1
Positional Notation	16^2	16^1	16^0
Given number	2	5	F(15)

$$(25F)_{16} = 2 \times 256 + 5 \times 16 + 15 \times 1$$

$$= 512 + 80 + 15$$

$$(25F)_{16} = (607)_{10}$$

Example

Convert $(8BC)_{16}$ into equivalent Binary number

8	B	C
↓	↓	↓
1000	1011	1100

$$(8BC)_{16} = (100010111100)_2$$

Example

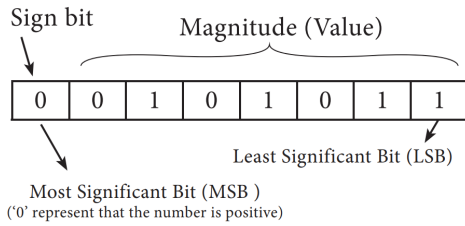
+43 or 43 is a positive number

–43 is a negative number

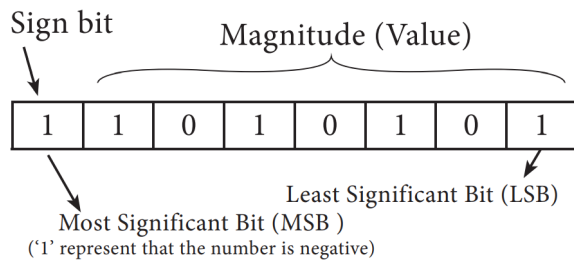
In signed binary representation, the left most bit is considered as sign bit. If this bit is 0, it is a positive number and if it 1, it is a negative number. Therefore a signed binary number has 8 bits, only 7 bits used for storing values (magnitude) and the 1 bit is used for sign.

+43 is represented in memory as follows:

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-43 can be represented in memory as follows.



Example

Find 1's complement for $(-24)_{10}$

Given Number	Binary Number	1's Compliment
$(-24)_{10}$	00011000	11100111

Example

2's Complement represent of $(-24)_{10}$

Binary equivalent of +24:	11000
8bit format:	00011000
1's complement:	11100111
Add 1 to LSB:	+1
2's complement of -24:	11101000

Example

Add: $1011_2 + 1001_2$

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(Carry Bit)→

	1	1	1	1	1
	1	0	1	1	1
+	1	0	0	1	1
	1	0	1	0	0

} 10

$$1011_2 + 1001_2 = 10100_2$$

Example

Perform Binary addition for the following: $23_{10} + 12_{10}$

Step 1: Convert 23 and 12 into binary form

a) 23_{10}

2's power	16	8	4	2	1
Binary Number	1	0	1	1	1

$$23_{10} = 00010111_2$$

b) 12_{10}

2's power	8	4	2	1
Binary Number	1	1	0	0

$$12_{10} = 00001100_2$$

Step 2: Binary addition of 23 and 12:

Carry Bit →			1	1			
$23_{10} = 0$	0	0	1	0	1	1	1
$12_{10} = 0$	0	0	0	1	1	0	0
$35_{10} = 0$	0	1	0	0	0	1	1

Example

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 Subtract $1001010_2 - 10100_2$

$$\begin{array}{r}
 \\
 \\
 (-) \\
 \hline
 \\
 \hline

 \end{array}$$

Example

Perform binary addition for the following: $(-21)_{10} + (5)_{10}$

Step 1: Change -21 and 5 into binary form

a) 21_{10}

2's power	16	8	4	2	1
Binary Number	1	0	1	0	1

$$21_{10} = 00010101_2$$

b) 5_{10}

2's power	4	2	1
Binary Number	1	0	1

$$5_{10} = 00000101_2$$

Step 2:

21_{10}	0	0	0	1	0	1	0	1
1's Complement	1	1	1	0	1	0	1	0
2's Complement	1	1	1	0	1	0	1	1

Step 3:

Binary Addition of -21 and 5:

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Carry bit				1	1	1	1	
-21_{10}	1	1	1	0	1	0	1	1
5_{10}	0	0	0	0	0	1	0	1
-16_{10} (Result)	1	1	1	1	0	0	0	0

- BCD – Binary Coded Decimal
- EBCDIC – Extended Binary Coded Decimal Interchange Code
- ASCII – American Standard Code for Information Interchange
- Unicode
- ISCII - Indian Standard Code for Information Interchange

Binary Coded Decimal (BCD)

This encoding system is not in the practice right now. This is 2^6 bit encoding system. This can handle $2^6 = 64$ characters only.

American Standard Code for Information Interchange (ASCII)

This is the most popular encoding system recognized by United States. Most of the computers use this system. Remember this encoding system can handle English characters only. This can handle 2^7 bit which means 128 characters.

In this system, each character has individual number. The new edition (version) ASCII -8, has 2^8 bits and can handle 256 characters are represented from 0 to 255 unique numbers.

The ASCII code equivalent to the uppercase letter 'A' is 65. The binary representation of ASCII (7 bit) value is 1000001. Also 01000001 in ASCII-8 bit.

Extended Binary Coded Decimal Interchange Code (EBCDIC)

This is similar to ASCII Code with 8 bit representation. This coding system is formulated by International Business Machine (IBM). The coding system can handle 256 characters. The input code in ASCII can be converted to EBCDIC system and vice - versa.

Indian Standard Code for Information Interchange (ISCII)

ISCII is the system of handling the character of Indian local languages. This as a 8-bit coding system. Therefore it can handle 256 (2^8) characters. This system is formulated by the department of Electronics in India in the year 1986- 88 and recognized by Bureau of Indian Standards (BIS). Now this coding system is integrated with Unicode.


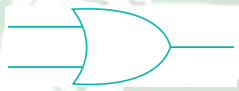
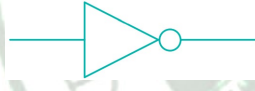
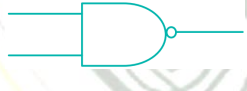
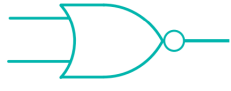
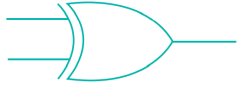
5. Basic Logic Gates:

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A gate is a basic electronic circuit which operates on one or more signals to produce an output signal. There are three fundamental gates namely AND, OR and NOT. The other logic gates like NAND, NOR, XOR and XNOR are derived gates which are derived from the fundamental gates. NAND and NOR gates are called Universal gates, because the fundamental logic gates can be realized through them.

Logic Gates and their corresponding Truth Tables

Logical Gates	Symbol	Truth Table															
AND		<table border="1"> <thead> <tr> <th>A</th> <th>B</th> <th>AB</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> </tr> </tbody> </table>	A	B	AB	0	0	0	0	1	0	1	0	0	1	1	1
A	B	AB															
0	0	0															
0	1	0															
1	0	0															
1	1	1															
OR		<table border="1"> <thead> <tr> <th>A</th> <th>B</th> <th>A + B</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> </tr> </tbody> </table>	A	B	A + B	0	0	0	0	1	1	1	0	1	1	1	1
A	B	A + B															
0	0	0															
0	1	1															
1	0	1															
1	1	1															
NOT		<table border="1"> <thead> <tr> <th>A</th> <th>\overline{A}</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1</td> </tr> <tr> <td>1</td> <td>0</td> </tr> </tbody> </table>	A	\overline{A}	0	1	1	0									
A	\overline{A}																
0	1																
1	0																
NAND		<table border="1"> <thead> <tr> <th>A</th> <th>B</th> <th>\overline{AB}</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>1</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> </tr> </tbody> </table>	A	B	\overline{AB}	0	0	1	0	1	1	1	0	1	1	1	0
A	B	\overline{AB}															
0	0	1															
0	1	1															
1	0	1															
1	1	0															
NOR		<table border="1"> <thead> <tr> <th>A</th> <th>B</th> <th>$\overline{A + B}$</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>1</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> </tr> </tbody> </table>	A	B	$\overline{A + B}$	0	0	1	0	1	0	1	0	0	1	1	0
A	B	$\overline{A + B}$															
0	0	1															
0	1	0															
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XOR		<table border="1"> <thead> <tr> <th>A</th> <th>B</th> <th>$A \oplus B$</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> </tr> </tbody> </table>	A	B	$A \oplus B$	0	0	0	0	1	1	1	0	1	1	1	0
A	B	$A \oplus B$															
0	0	0															
0	1	1															
1	0	1															
1	1	0															

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XNOR		A	B	$\overline{A \oplus B}$
		0	0	1
		0	1	0
		1	0	0
		1	1	1

6. Theorems of Boolean Algebra

Identity

$$A + 0 = A$$

$$A \cdot 1 = A$$

Complement

$$A + \overline{A} = 1$$

$$A \cdot \overline{A} = 0$$

Commutative

$$A + B = B + A$$

$$A \cdot B = B \cdot A$$

Associative

$$A + (B + C) = (A + B) + C$$

$$A \cdot (B \cdot C) = (A \cdot B) \cdot C$$

Distributive

$$A \cdot (B + C) = A \cdot B + A \cdot C$$

$$A + (B \cdot C) = (A + B) \cdot (A + C)$$

Null Element

$$A + 1 = 1$$

$$A \cdot 0 = 0$$

Involution

$$\overline{(\overline{A})} = A$$

Idempotence

$$A + A = A$$

$$A \cdot A = A$$

Absorption

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$$A + (A \cdot B) = A$$

$$A \cdot (A + B) = A$$

3rd Distributive

$$A + \overline{A} \cdot B = A + B$$

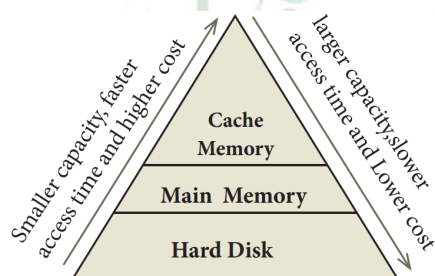
De Morgan's

$$\overline{A + B} = \overline{A} \cdot \overline{B}$$

$$\overline{(A \cdot B)} = \overline{A} + \overline{B}$$

7. Memory Devices

A memory is just like a human brain. It is used to store data and instructions. Computer memory is the storage space in the computer, where data and instructions are stored. There are two types of accessing methods to access (read or write) the memory. They are sequential access and random access. In sequential access, the memory is accessed in an orderly manner from starting to end. But, in random access, any byte of memory can be accessed directly without navigating through previous bytes. Different memory devices are arranged according to the capacity, speed and cost.



8. Random-Access Memory (RAM)

The main memory is otherwise called as Random Access Memory. This is available in computers in the form of Integrated Circuits (ICs). It is the place in a computer where the Operating System, Application Programs and the data in current use are kept temporarily so that they can be accessed by the computer's processor. The smallest unit of information that can be stored in the memory is called as a bit. The memory can be accessed by a collection of 8 bits which is called as a byte. The bytes are referred by 'B'. If a computer has 1 megabyte of memory, then it can store 10,48,576 bytes (or characters) of information. [Hence 1MB is 1024KB and 1 KB is 1024 Bytes, So $1024 \times 1024 = 10,48,576$ Bytes]

RAM is a volatile memory, which means that the information stored in it is not permanent. As soon as the power is turned off, whatever data that resides in RAM is lost. It allows both read and write operations.

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Types of RAM

There are two basic types of RAM

- Dynamic RAM (DRAM)
- Static RAM (SRAM)

These two types differ in the technology they use to hold data. Dynamic RAM being a common type needs to be refreshed frequently. Static RAM needs to be refreshed less often, which makes it faster. Hence, Static RAM is more expensive than Dynamic RAM.

Read Only Memory (ROM)

Read Only Memory refers to special memory in a computer with pre-recorded data at manufacturing time which cannot be modified. The stored programs that start the computer and perform diagnostics are available in ROMs. ROM stores critical programs such as the program that boots the computer. Once the data has been written onto a ROM chip, it cannot be modified or removed and can only be read. ROM retains its contents even when the computer is turned off. So, ROM is called as a non-volatile memory.

Programmable Read Only Memory (PROM)

Programmable read only memory is also a non-volatile memory on which data can be written only once. Once a program has been written onto a PROM, it remains there forever. Unlike the main memory, PROMs retain their contents even when the computer is turned off.

The PROM differs from ROM. PROM is manufactured as a blank memory, whereas a ROM is programmed during the manufacturing process itself. PROM programmer or a PROM burner is used to write data to a PROM chip. The process of programming a PROM is called burning the PROM.

Erasable Programmable Read Only Memory (EPROM)

Erasable Programmable Read Only Memory is a special type of memory which serves as a PROM, but the content can be erased using ultraviolet rays. EPROM retains its contents until it is exposed to ultraviolet light. The ultraviolet light clears its contents, making it possible to reprogram the memory.

An EPROM differs from a PROM, PROM can be written only once and cannot be erased. EPROMs are used widely in personal computers because they enable the manufacturer to change the contents of the PROM to replace with updated versions or erase the contents before the computer is delivered.

Electrically Erasable Programmable Read Only Memory (EEPROM)

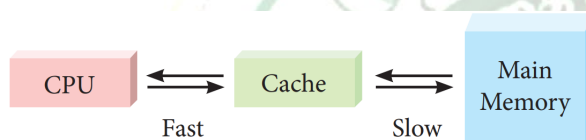
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Electrically Erasable Programmable Read Only Memory is a special type of PROM that can be erased by exposing it to an electrical charge. Like other types of PROM, EEPROM retains its contents even when the power is turned off. Comparing with all other types of ROM, EEPROM is slower in performance.

Cache Memory

The cache memory is a very high speed and expensive memory, which is used to speed up the memory retrieval process. Due to its higher cost, the CPU comes with a smaller size of cache memory compared with the size of the main memory. Without cache memory, every time the CPU requests the data, it has to be fetched from the main memory which will consume more time. The idea of introducing a cache is that, this extremely fast memory would store data that is frequently accessed and if possible, the data that is closer to it. This helps to achieve the fast response time, Where response Time, (Access Time) refers to how quickly the memory can respond to a read / write request.



9. Secondary Storage Devices

A computer generally has limited amount of main memory which is expensive and volatile. To store data and programs permanently, secondary storage devices are used. Secondary storage devices serve as a supportive storage to main memory and they are non-volatile in nature, secondary storage is also called as Backup storage.

Hard Disks

Hard disk is a magnetic disk on which you can store data. The hard disk has the stacked arrangement of disks accessed by a pair of heads for each of the disks. The hard disks come with a single or double sided disk.

Compact Disc (CD)

A CD or CD-ROM is made from 1.2 millimeters thick, polycarbonate plastic material. A thin layer of aluminum or gold is applied to the surface. CD data is represented as tiny indentations known as "pits", encoded in a spiral track moulded into the top of the polycarbonate layer. The areas between pits are known as "lands". A motor within the CD player rotates the disk. The capacity of an ordinary CDROM is 700MB.

Digital Versatile Disc (DVD)

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A DVD (Digital Versatile Disc or Digital Video Disc) is an optical disc capable of storing up to 4.7 GB of data, more than six times what a CD can hold. DVDs are often used to store movies at a better quality. Like CDs, DVDs are read with a laser.

The disc can have one or two sides, and one or two layers of data per side; the number of sides and layers determines how much it can hold. A 12 cm diameter disc with single sided, single layer has 4.7 GB capacity, whereas the single sided, double layer has 8.5 GB capacity. The 8 cm DVD has 1.5 GB capacity. The capacity of a DVD-ROM can be visually determined by noting the number of data sides of the disc. Double-layered sides are usually gold-coloured, while single-layered sides are usually silver-coloured, like a CD.

Flash Memory Devices

Flash memory is an electronic (solid-state) non-volatile computer storage medium that can be electrically erased and reprogrammed. They are either EEPROM or EPROM. Examples for Flash memories are pendrives, memory cards etc. Flash memories can be used in personal computers, Personal Digital Assistants (PDA), digital audio players, digital cameras and mobile phones. Flash memory offers fast access times. The time taken to read or write a character in memory is called access time. The capacity of the flash memories vary from 1 Gigabytes (GB) to 2 Terabytes (TB).

Blu-Ray Disc

Blu-Ray Disc is a high-density optical disc similar to DVD. Blu-ray is the type of disc used for PlayStation games and for playing High-Definition (HD) movies. A double-layer Blu-Ray disc can store up to 50GB (gigabytes) of data. This is more than 5 times the capacity of a DVD, and above 70 times of a CD. The format was developed to enable recording, rewriting and playback of high-definition video, as well as storing large amount of data. DVD uses a red laser to read and write data. But, Blu-ray uses a blue-violet laser to write. Hence, it is called as Blu-Ray.

10. Ports and Interfaces

The Motherboard of a computer has many I/O sockets that are connected to the ports and interfaces found on the rear side of a computer. The external devices can be connected to the ports and interfaces. The various types of ports are given below:

Serial Port: To connect the external devices, found in old computers.

Parallel Port: To connect the printers, found in old computers.

USB Ports: To connect external devices like cameras, scanners, mobile phones, external hard disks and printers to the computer.

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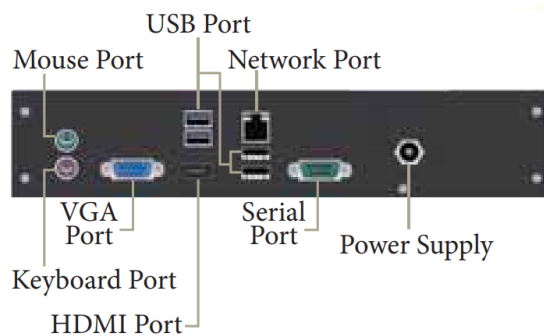
USB 3.0 is the third major version of the Universal Serial Bus (USB) standard to connect computers with other electronic gadgets. USB 3.0 can transfer data up to 5 Giga byte/second. USB3.1 and USB 3.2 are also released.

VGA Connector: To connect a monitor or any display device like LCD projector.

Audio Plugs: To connect sound speakers, microphone and headphones.

PS/2 Port: To connect mouse and keyboard to PC.

SCSI Port: To connect the hard disk drives and network connectors.



High Definition Multimedia Interface (HDMI)

High-Definition Multimedia Interface is an audio/video interface which transfers the uncompressed video and audio data from a video controller, to a compatible computer monitor, LCD projector, digital television etc.

11. Introduction to Software

A software is set of instructions that perform specific task. It interacts basically with the hardware to generate the desired output.

Types of Software

Software is classified into two types:

- 1) Application Software
- 2) System Software

Application software

Application software is a set of programs to perform specific task. For example MS-word is an application software to create text document and VLC player is familiar application software to play audio, video files and many more.

System Software:

System software is a type of computer program that is designed to run the computer's hardware and application programs. For example Operating System and Language Processor

12. Introduction to Operating System (OS):

An Operating System (OS) is a system software which serves as an interface between a user and a computer.

This controls input, output and other peripheral devices such as disk drives, printers and electronic gadgets. The functions of an Operating System include file management, memory management, process management and device management and many more.

UNIX

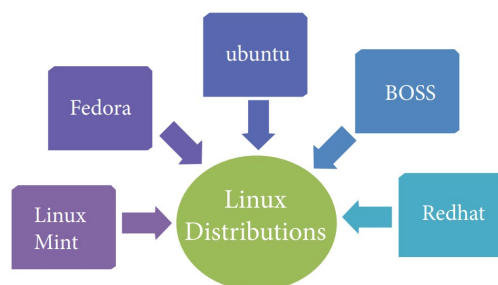
UNIX is a family of multitasking, multi-user operating systems that derive originally from AT&T Bell Labs, where the development began in the 1970s by Ken Thompson and Dennis Ritchie.

Linux

Linux is a family of open-source operating systems. It can be modified and distributed by anyone around the world. This is different from proprietary software like Windows, which can only be modified by the company that owns it. The main advantage of Linux operating system is that it is open source. There are many versions and their updates. Most of the servers run on Linux because it is easy to customize.

There are a few different distributions of Linux, like Ubuntu, Mint, Fedora, RedHat, Debian, Google's Android, Chrome OS, and Chromium OS which are popular among users.

The Linux operating system was originated in 1991, as a project of "Linus Torvalds" from a university student of Finland. He posted information about his project on a news group for computer students and programmers. He received support and assistance from a large pool of volunteers who succeeded in creating a complete and functional Operating System. Linux is similar to the UNIX operating system.



Microsoft Windows

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Microsoft Windows is a family of proprietary operating systems designed by Microsoft Corporation and primarily targeted to Intel and AMD architecture based computers.

Operating systems for mobile devices

Mobile devices such as phones, tablets and MP3 players are different from desktop and laptop computers and hence they need special Operating Systems. Examples of mobile Operating Systems are Apple iOS and Google Android.

Operating systems for mobile devices generally are not as fully featured as those made for desktop and laptop computers and they are not able to run all software.

Android

Android is a mobile operating system developed by Google, based on Linux and designed primarily for touch screen mobile devices such as smart phones and tablets. Google has further developed Android TV for televisions, Android Auto for cars and Android Wear for wrist watches, each with a specialized user interface. Variants of Android are also used on game consoles, digital cameras, PCs and other electronic gadgets.

iOS - iPhone OS

iOS (formerly iPhone OS) is a mobile Operating System created and developed by Apple Inc., exclusively for its hardware. It is the Operating System that presently powers many of the company's mobile devices, including the iPhone, iPad and iPod Touch. It is the second most popular mobile Operating System globally after Android.

Types of Network

Depending upon geographical area covered by a network, it is classified as:

1. LAN – LOCAL AREA NETWORK

Range : Upto 10 Km

Location : Refers to same office, same building, same company and in same schools

Speed : Upto 10-100 Mbps

Advantages : Low Cost, Resource Sharing, Security

Disadvantages : Area Covered Limited When number of nodes increases, performance Decreases

2. MAN – Metropolitan Area Network

Range : 10 to 15 Miles

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Location : MAN is a network designed to extend over an entire city

Speed : Upto 5 – 10 Mbps

Advantages : Wider than LAN

Disadvantages : Data rate is slow compared to LAN Cost higher than LAN

3. WAN – WideArea Network

Range : Above 1000 Kms

Location : It Span entire countries and continents

Speed : Upto 256 Kbps to 2 Mbps

Advantages : Large geographical Area

Disadvantages : Complicated and Complex.High Cost. Requires high Performance.Devices.

Low security. Cost higher than LAN

4. PAN – Personal Area Network

Range :Upto 100 meters

Location : Used for shorter distance, controlled by a single person within a single building

Speed : up to 250 Kbps

Advantages : Efficient, Cost effective and convenient. Controlled by a single person Hotspot may connect upto 8 devices

Disadvantages : Shorter distance upto 10 meters only. Data rate is low compared to other network

5. CAN – CampusArea Network

Range : Upto 5 Kms

Location : Larger than LAN, but smaller than MAN. University, school or small business, enterprise

Speed : 40 KB/s TO 1 MB/s

Advantages : Cost eff ective ,Wired or Wired Network, High BandwithMulti-departmental Network access

Disadvantages : Difficult to manage

6. WLAN – Wireless Local Area Network

Range : Upto 50 Kms

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Location : Ranges from a single room to an entire campus Uses Wifi or Bluetooth, Radio waves

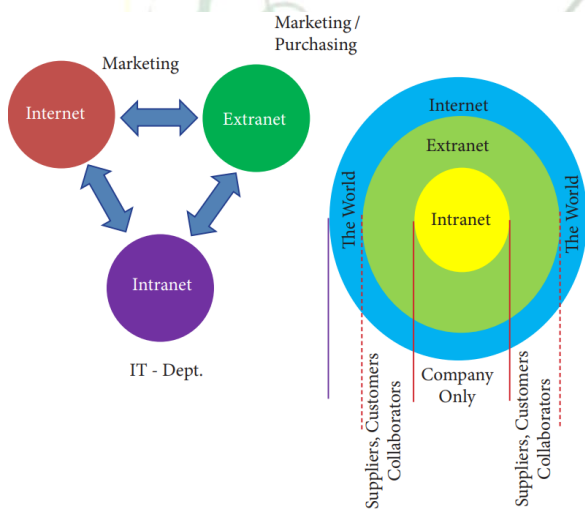
Speed : 1 Mbps to 54 Mbps

Advantages : Portable Installation is quick and easy

Disadvantages : Low Bandwidth due to interference

13. INTERNET and WWW

Several networks, small and big all over the world, are connected together to form a Global network called the internet. The internet uses TCP/IP (Transmission Control Protocol/ Internet Protocol) to transmit data via various types of media. TCP/IP is not a single networking protocol – it is a suite of protocols named after the two most important protocols or layers within it – TCP and IP. As with any form of communication, two things are needed: a message to transmit and the means to reliably transmit the message. The internet protocol (IP) addressing system is used to keep track of the millions of users. Each computer on net is called as host. The internet is the most cost-effective method of communications in the world. Examples of few services available are:



- Email
- Web-enabled audio/video conferencing services
- Online movies and gaming
- Data transfer/file-sharing, often through File Transfer Protocol (FTP)
- Instant messaging
- Internet forums
- Social networking
- Online shopping
- Financial services

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Domain Name

It is a name or an identity which become a online identity and can be access by the web browser when connected to internet.

Generic Domain Name	Description
.com	Commercial Organisation
.gov	Government institution
.org	Non-profit Organisation
.net	Network Support Group
.edu	Educational Institution

Country Level Domain Name	Description
.in	India
.au	Australia
.us	United States of America
.jp	Japan
.ru	Russia
.sg	Singapore

What is URL?

Every server on the internet has an IP number, a unique number consisting of four parts separated by dots. The IP number is the server's address

165.113.245.2

128.143.22.55

At times the number keeps changing hence it is harder for people to remember number than to remember word combinations. So, addresses are given “word-based” addresses called URL. The URL and the IP number are one and the same.

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Who Governs the Internet?

One of the most frequently asked questions about the internet is, “Who runs it?” The truth is that no centralized management of the internet exists.

The internet as a whole does not have a single controller. But the internet society, which is a voluntary membership organization, takes the responsibility to promote global information exchange through the internet technology. Internet Corporation for Assigned Names and Numbers (ICANN) administers the domain name registration. It helps to avoid a name which is already registered.

What is W3C?

W3C stands for "World Wide Web Consortium." The W3C is an international community that includes a full-time staff, industry experts, and several member organizations. These groups work together to develop standards for the World Wide Web.

The World Wide Web Consortium (W3C) is an international organization committed to improving the web. It is made up of several hundred member organizations from a variety of related IT industries. W3C sets standards for the World Wide Web (WWW) to facilitate better communication ability and cooperation among all web stakeholders. It was established in 1994 by the creator of the WWW, Tim Berners-Lee.

Types of Internet Service

Here are some common types of Internet service.

Wireless

Radio frequency bands are used in place of telephone or cable networks. One of the greatest advantages of wireless Internet connections is the "always-on" connection that can be accessed from any location that falls within network coverage. Wireless connections are made possible through the use of a modem, which picks up Internet signals and sends them to other devices.

Mobile

Many cell phone and smartphone providers offer voice plans with Internet access. Mobile Internet connections provide good speeds and allow you to access the Internet.

Hotspots

Hotspots are sites that offer Internet access over a wireless local area network (WLAN) by way of a router that then connects to an Internet service provider. Hotspots utilize Wi-Fi technology, which allows electronic devices to connect to the Internet or exchange data

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wirelessly through radio waves. Hotspots can be phone-based or free-standing, commercial or free to the public.

Broadband

This high-speed Internet connection is provided through either cable or telephone companies. One of the fastest options available, broadband Internet uses multiple data channels to send large quantities of information. The term broadband is shorthand for broad bandwidth. Broadband Internet connections such as DSL and cable are considered highbandwidth connections. Although many DSL connections can be considered broadband, not all broadband connections are DSL.

DSL

DSL, which stands for Digital Subscriber Line, uses existing 2-wire copper telephone line connected to one's home so service is delivered at the same time as landline telephone service. Customers can still place calls while surfing the Internet.

Cable

Cable Internet connection is a form of broadband access. Through use of a cable modem, users can access the Internet over cable TV lines. Cable modems can provide extremely fast access to the Internet.

Satellite

In certain areas where broadband connection is not yet offered, a satellite Internet option may be available. Similar to wireless access, satellite connection utilizes a modem.

ISDN

ISDN (Integrated Services Digital Network) allows users to send data, voice and video content over digital telephone lines or standard telephone wires. The installation of an ISDN adapter is required at both ends of the transmission—on the part of the user as well as the Internet access provider.

Dongles / Data Card

Today, many dongles provide wireless capabilities. For example, USB Wi-Fi adapters are often called dongles. Since most computers now have built-in Wi-Fi chips, mobi data adapters, such as 3G and 4G dongles, are more prevalent. These types of dongles allows to connect to the Internet even when Wi-Fi is not available.

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Comparison between Data Card and Dongle

Dongle	Data Card
<p>Refers to any removable component used for enabling extra security. USB Dongles can be divided into</p> <ul style="list-style-type: none"> • WiFi Dongles • BlueTooth Dongle • Memory Dongle 	<p>It is a removable electronic card which is used for storing for data. Types of datacard are</p> <ul style="list-style-type: none"> • Expansion Card • Memory Card or Flash Card • Identification Card

14. Internet Connection and Access Methods

There are several ways or methods of connecting to the Internet. There are two access methods direct and Indirect and these can be either fixed or mobile.

Indirect Access

This is most common method used in home and office networks.

The device e.g. computer connects to a network using Ethernet or WiFi and the network connects to the Internet using Asymmetric digital subscriber lineADSL (cable or fibre.)

Direct Access

This is most common method used when travelling.

The device e.g. smart phone connects directly to the Internet using 3G/4G mobile networks or public Wi-Fi.

There are two ways to look for the information on the web.

1. If the URL of the website is known, enter it on the address bar.
2. If is the URL is not known, then “Search Engines” will help us to get the information.

A search engine is a software system that is designed to search for information on the World Wide Web.

Examples of popular search engines are Yahoo, Lycos, Altavista, Hotbot, Google and Askjeeves.

1. A browser is used to access websites and web pages whereas a search engine is used to search for particular information.

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2. Internet Explorer, Chrome, Firefox, Safari, and are the most popular web browsers while Google and Yahoo are the most popular search engines.
3. A browser is used to access the Internet whereas in order to open a search engine you need a browser.

The list of content returned via a search engine to a user is known as a search engine results page (SERP).

15. Internet Applications

1. Internet telephony

Internet telephony (e.g. Skype) is another common communications service made possible by the creation of the Internet. VoIP stands for Voice-over-Internet Protocol, referring to the protocol that underlies all Internet communication.

2. Job search

Nowadays, many people search for their jobs online as it is quicker and there is a larger variety of job vacancies present. People can publish resume online for prospective job. Some of the web sites providing this service are naukri.com, monster.com, summerjob.com, recruitmentindia.com etc.

3. Online Shopping

The internet has also facilitated the introduction of a new market concept consisting of virtual shops. They provide information about products or services for sale through www servers. Using the internet services customers can submit specific product queries and request specific sales quotes. For example amazon.com is a www based bookshop on the internet where information on all types of international books can be found and books can be ordered online.

4. Stock market updates

Selling or buying shares sitting on computer through internet. Several websites like ndtvprofit.com, moneypore.com, provide information regarding investment.

5. Travel:

One can use internet to gather information about various tourist place .it can be used for booking Holiday tours, hotels, train, bus, flights and cabs. Some of the web sites providing this service are goibibo.com, makemytrip.com, olacabs.com.

6. Research

Research papers are present online which helps in the researcher doing aliterature review.

7. Video conferencing

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It enables direct face-to-face communication across networks via web cameras, microphones, and other communication tools. Video conferencing can enable individuals in distant locations to participate in meetings on short notice, with time and money savings. The technology is also used for telecommuting, in which employees work from home. When video Conferencing is used in education, it is easier to have interactive classes between teacher to teacher, teacher to classroom, or classroom to classroom with students in different places.

8. e-commerce

E-commerce (electronic commerce or EC) is the buying and selling of goods and services, or the transmitting of funds or data, over an electronic network, primarily the Internet. These business transactions occur either business-to-business, business-to-consumer, consumer-to-consumer or consumer-to-business. Largest e-commerce companies in India are Flipkart, Snapdeal, Amazon India, and Paytm.

9. Online payments

The rising boom of online payments in India has given way to many new entrants in the industry such as Paytm etc who are majorly wallet driven payment companies. This growth has been driven by rapid adoption led by the increasing use of smartphones, tablets and speedy access to internet through broadband, 4G etc.

10. Social Networking

Social networking is the use of internet-based social media programs to make connections with friends, family, classmates, customers and clients. Social networking can be done for social purposes, business purposes or both. The programs show the associations between individuals and facilitate the acquisition of new contacts. Examples of social networking includes Facebook.

11. Voicemail

Voicemail is a system of sending messages over the phone. Calls are answered by a machine which connects you to the person you want to leave a message for, and they can listen to their messages later.

12. Chatting

On the Internet, chatting is talking to other people who are using the Internet at the same time you are. Usually, this "talking" is the exchange of typed-in messages and a group of users who take part from anywhere on the Internet. Chats can be ongoing or scheduled for a particular time and duration. Most chats are focused on a particular topic of interest and some involve

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guest experts or famous people who "talk" to anyone joining the chat. Transcripts of a chat can be archived for later reference.

13. e-banking

E-banking (Online banking), also known as internet banking, it is an electronic payment system that enables customers of a bank or other financial institution to conduct a range of financial transactions through the financial institution's website. The online banking system will typically connect to or be part of the core banking system operated by a bank and is in contrast to branch banking which was the traditional way customers accessed banking services.

14. e-learning

E-Learning are courses that are specifically delivered via the internet to somewhere other than the classroom where the professor is teaching. It is not a course delivered via a DVD or CD-ROM, video tape or over a television channel.

E-learning is utilizing electronic technologies to access educational curriculum outside of a traditional classroom. It is a program delivered completely online. E-learning is interactive in that you can also communicate with teachers, professors or other students in a class. Sometimes it is delivered live, where you can “electronically” raise your hand and interact in real time and sometimes it is a lecture that is prerecorded. There is always a teacher/ professor interacting/ communicating, grading participation, giving assignments and conducting tests.

16. Email

Electronic mail or email is information stored on a computer that is exchanged between two users over telecommunications. Email is a message that may contain text, files, images or any other attachments sent through a network to a specified individual or group of individuals.

Structure of email

Click the Compose button and then writing an e-mail contents. When sending an e-mail message, several fields are required to be filled:

- The To field is where you type the e-mail address of the person who is the recipient of your message.
- The From field should contain your e-mail address.
- If you are replying to a message, the To and From fields are automatically filled out; if it's a new message, you'll need to enter them manually.
- The Subject should consist of a few words describing the e-mail's contents. The Subject lets the recipient see what the e-mail is about, without opening and reading the full e-mail. This field is optional.

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- The CC (Carbon Copy) field allows you to specify recipients who are not direct addressees (listed in the "To" field). This field is optional.
- The BCC (Blind Carbon Copy) field is similar to CC, except the recipients are secret. Each BCC recipient will receive the e-mail, but will not see who else received a copy. The addressees (anyone listed in the "To" field) remain visible to all recipients. This field is optional.
- Finally, the Message Body is the location you type your main message. It often contains your signature at the bottom; similar to a hand-written letter.

Advantages of email

- Free delivery - Sending an e-mail is virtually free, outside the cost of Internet service. There is no need to buy a postage stamp to send a letter.
- Global delivery - E-mail can be sent to nearly anywhere around the world, to any country.
- Instant delivery - An e-mail can be instantly sent and received by the recipient over the Internet.
- File attachment - An e-mail can include one or more file attachments, allowing a person to send documents, pictures, or other files with an e-mail.
- Long-term storage - E-mails are stored electronically, which allows for storage and archival over long periods of time.
- Environmentally friendly - Sending an e-mail does not require paper (Paperless), cardboard, or packing tape, conserving paper resources.

What is sent in an email?

In addition to text messages being sent over e-mail, it is also possible to attach a file or other data in an e-mail. For example, an attachment could be a picture, PDF, word processor document, or any file stored on the computer.

17. Internet Threat

It's a dangerous world out there in the World Wide Web. Just as your mother may have told you to never talk to strangers, the same advice holds true for the virtual world. You may know to be wary of giving strangers your business bank account details. But can you be sure the website you're logging into is that of your bank and not a forgery created by a cybercriminal? Cybercriminals use many different methods to lure you into parting with your confidential personal or business information. Hence you ought to be aware of the issues and be extra vigilant when online and offline.

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Computer virus: A computer virus is a small piece of software that can spread from one infected computer to another. The virus could corrupt, steal, or delete data on your computer— even erasing everything on your hard drive. A virus could also use other programs like your email program to spread itself to other computers.

Malware: Malware is short for “malicious software.” Malware is used to mean a “variety of forms of hostile, intrusive, or annoying software or program code.” Malware could be computer viruses, worms, Trojan horses, dishonest spyware, and malicious rootkits—all of which are defined below.

Trojan horse: Users can infect their computers with Trojan horse software simply by downloading an application they thought was legitimate but was in fact malicious. Once it enters inside the computer, a Trojan horse can do anything from recording your passwords by logging its keystrokes, hijacking your webcam to watch and record every movement.

Malicious spyware: Malicious spyware is used to describe the Trojan application that was created by cybercriminals to spy on their victims. An example would be keylogger software that records a victim’s every keystroke on his or her keyboard. The recorded information is periodically sent back to the originating cybercriminal over the Internet. Keylogging software is widely available and is marketed to parents or businesses that want to monitor their kids’ or employees’ Internet usage.

Computer worm: A computer worm is a software program that can copy itself from one computer to another, without human interaction. Worms can replicate in great volume and with great speed. For example, a worm can send copies of itself to every contact in your email address book and then send itself to all the contacts in your contacts’ address books.

Because of their speed of infection, worms often gain notoriety overnight infecting computers across the globe as quickly as victims around the world and switch them on to open their email.

Botnet: A botnet is a group of computers connected to the Internet that have been compromised by a hacker using a computer virus or Trojan horse. An individual computer in the group is known as a “zombie” computer.

Spam: Spam in the security context is primarily used to describe email spam. Unwanted messages in your email inbox. Spam, or electronic junk mail, is a nuisance as it can clutter your mailbox as well as potentially take up space on your mail server. However, spam messages can contain links that when clicked on could go to a website that installs malicious software onto your computer.

Phishing: Phishing scams are fraudulent attempts by cybercriminals to obtain private information. Phishing scams often appear in the guise of email messages designed to appear as

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though they are from legitimate sources. For example, the message would try to lure you into giving your personal information by pretending that your bank or email service provider is updating its website and that you must click on the link in the email to verify your account information and password details.

Rootkit: A rootkit is a collection of tools that are used to obtain administrator-level access to a computer or a network of computers. A rootkit could be installed on your computer by a cybercriminal exploiting a vulnerability or security hole in a legitimate application on your PC and may contain spyware that monitors and records keystrokes.

18. Browsers

Looking for information on the internet is called surfing or browsing. To browse the internet, a software called the web browser or browser is used.

E-commerce, social media, and many other things we take for granted today would be impossible without internet browsers. Web browsers translate HTML documents of the website and allow to view it on the screen.

Familiar Internet Browser

1. Google Chrome is a freeware familiar web browser developed by Google Inc. It is best for its speed, simplicity, security, privacy and customization features. Google Chrome supports on Android 4.0 or higher, iOS 6.0 or higher, Mac OSX 10.6 or higher and Windows (XP sp2 or higher) and Linux system.
2. Mozilla Firefox is a free and open source web browser developed by Mozilla Foundation and Mozilla Corporation. Firefox is default browser in Ubuntu. It supports Windows, Mac OS X, Linux and Android system.
3. Internet Explorer commonly known as Microsoft Internet Explorer or Windows Internet Explorer is the first or default browser for a Windows PC. It is developed by Microsoft.
4. Safari is a web browser developed by Apple Inc. and comes with OS X and iOS. Some version of safari browser also supports in Windows Operating System. Exclusively used in Apple Mac system.

Difference between Webpage and Website

Webpage	Website
Consists of a Single document displayed by a browser	A collection of multiple documents displayable by a browser
Shares a unique domain name	Has its own unique domain name
Makes up a website	Contains one or more webpages

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19. Web –Applications

E-commerce is the activity of buying or selling of products on online services or over the Internet. Electronic commerce draws on technologies such as mobile commerce, electronic funds transfer, supply chain management, Internet marketing, online transaction processing, electronic data interchange (EDI), inventory management systems, and automated data collection systems.

E-commerce

Classifying ecommerce according to the parties involved

1. Business to consumer (B2C) – Transactions happen between businesses and consumers. In B2C ecommerce, businesses are the ones selling products or services to end-users (i.e. consumers).
2. Business to business (B2B) – As its name states, B2B ecommerce pertains to transactions conducted between two businesses. Any company whose customers are other businesses operate on a B2B model.
3. Consumer to business (C2B) – Consumer to business ecommerce happens when a consumer sells or contributes monetary value to a business. Many crowdsourcing campaigns fall under C2B ecommerce.
4. Consumer to consumer (C2C) – As you might have guessed, C2C ecommerce happens when something is bought and sold between two consumers. C2C commonly takes place on online marketplaces such as eBay, in which one individual sells a product or service to another.
5. Government to business (G2B) – G2C transactions take place when a company pays for government goods, services, or fees online. Examples could be a business paying for taxes using the Internet.
6. Business to government (B2G) – When a government entity uses the Internet to purchases goods or services from a business, the transaction may fall under B2G ecommerce. Let's say a city or town hires a web design firm to update its website. This type of deal may be considered a form of B2G.
7. Consumer to government (G2C) – Consumers can also engage in B2C ecommerce. People paying for traffic tickets or paying for their car registration renewals online may fall under this category.

E-governance

Electronic governance or e-governance is the application of information and communication technology (ICT) for delivering government services.

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Benefits of E-governance

- Reduced corruption
- High transparency
- Increased convenience
- Reduction in overall cost.
- Expanded reach of government

Types of Interactions in e-Governance

1. G2G (Government to Government): When the exchange of information and services is within the periphery of the government, is termed as G2G interaction. This can be both horizontal, i.e. among various government entities and vertical, i.e. between national, state and local government entities and within different levels of the entity.
2. G2C (Government to Citizen): The interaction amidst the government and general public is G2C interaction. Here an interface is set up between government and citizens, which enables citizens to get access to wide variety of public services. The citizens has the freedom to share their views and grievances on government policies anytime, anywhere.
3. G2B (Government to Business): In this case, the e-governance helps the business class to interact with the government seamlessly. It aims at eliminating red-tapism, saving time, cost and establish transparency in the business environment, while interacting with government.
4. G2E (Government to Employees): The government of any country is the biggest employer and so it also deals with employees on a regular basis, as other employers do. ICT helps in making the interaction between government and employees fast and efficient, along with raising their level of satisfaction by providing perquisites and add-on benefits.

E-governance has a great role to play, that improves and supports all tasks performed by the government department and agencies, because it simplifies the task on the one hand and increases the quality of work on the other.

20. COMPUTER ETHICS

With the help of internet, world has now become a global village. Internet has been proven to be a boon to individuals as well as various organizations and businesses. e-Commerce is becoming very popular among businesses as it helps them to reach a wide range of customers faster than any other means.

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Computer ethics deals with the procedures, values and practices that govern the process of consuming computer technology and its related disciplines without damaging or violating the moral values and beliefs of any individual, organization or entity.

GUIDELINES OF ETHICS

Generally, the following guidelines should be observed by computer users:

1. **Honesty:** Users should be truthful while using the internet.
2. **Confidentiality:** Users should not share any important information with unauthorized people.
3. **Respect:** Each user should respect the privacy of other users.
4. **Professionalism:** Each user should maintain professional conduct.
5. **Obey The Law:** Users should strictly obey the cyber law in computer usage.
6. **Responsibility:** Each user should take ownership and responsibility for their actions

Crime	Function
Crime Function	Hacking, threats, and blackmailing towards a business or a person.
Cyber stalking	Harassing through online.
Malware	Malicious programs that can perform a variety of functions including stealing, encrypting or deleting sensitive data, altering or hijacking core computing functions and monitoring user's computer activity without their permission.
Denial of service attack	Overloading a system with fake requests so that it cannot serve normal legitimate requests.
Fraud	Manipulating data, for example changing the banking records to transfer money to an unauthorized account.
Harvesting	A person or program collects login and password information from a legitimate user to illegally gain access to others' account(s).
Identity theft	It is a crime where the criminals impersonate individuals, usually for financial gain.
Intellectual property theft	Stealing practical or conceptual information developed by another person or company.
Salami slicing	Stealing tiny amounts of money from each transaction.

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Scam	Tricking people into believing something that is not true.
Spam	Distribute unwanted e-mail to a large number of internet users.
Spoofing	It is a malicious practice in which communication is sent from unknown source disguised as a source known to the receiver.

20.20 Cyber Attacks and Functions

S.No.	Cyber Attack	Function
1.	Virus	A virus is a small piece of computer code that can repeat itself and spreads from one computer to another by attaching itself to another computer file. One of the most common virus is Trojan. Trojan A Trojan virus is a program that appears to perform one function (for example, virus removal) but actually performs malicious activity when executed.
2.	Spyware	Worms are self-repeating and do not require a computer program to attach themselves. Worms continually look for vulnerabilities and report back to the author of the worm when weaknesses are discovered.
3.	Worms	Spyware can be installed on the computer automatically when the attachments are open, by clicking on links or by downloading infected software.
4.	Ransomware	Ransomware is a type of malicious program that demands payment after launching a cyber-attack on a computer system. This type of malware has become increasingly popular among criminals and costs the organizations millions each year.

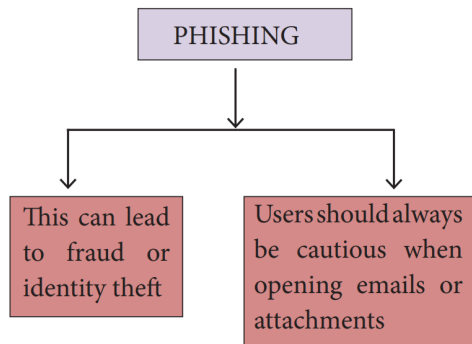
Social engineering

A misuse of an individual's weakness, achieved by making them to click malicious links, or by physically accessing the computer through tricks. Phishing and pharming are examples of social engineering.

Phishing

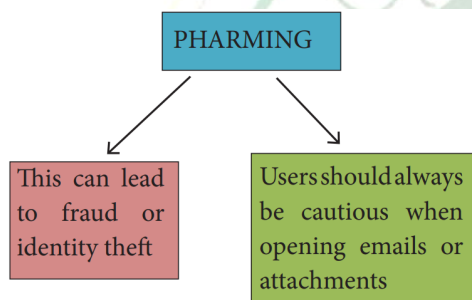
Phishing is a type of computer crime used to attack, steal user data, including login name, password and credit card numbers. It occurs when an attacker targets a victim into opening an e-mail or an instant text message. The attacker uses phishing to distribute malicious links or attachments that can perform a variety of functions, including the extraction of sensitive login credentials from victims.

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Pharming

Pharming is a scamming practice in which malicious code is installed on a personal computer or server, misdirecting users to fraudulent web sites without their knowledge or permission. Pharming has been called "phishing without a trap". It is another way hackers attempt to manipulate users on the Internet. It is a cyber-attack intended to redirect a website's traffic to a fake site.



Man In The Middle (MITM):

Man-in-the-middle attack (MITM; also Janus attack) is an attack where the attacker secretly relays and possibly alters the communication between two parties who believe they are directly communicating with each other.

Example: Suppose Alice wishes to communicate with Bob. Meanwhile, Mallory wishes to intercept the conversation to overhear and optionally to deliver a false message to Bob.

Cookies

A cookie (also called HTTP cookie, web cookie, Internet cookie, browser cookie, or simply cookie) is a small piece of data sent from a website and stored on the user's computer memory (Hard drive) by the user's web browser while the user is browsing internet. Cookies were designed to be a reliable mechanism for websites to remember stateful information (such as items added in the shopping cart in an online store) or to record the user's browsing activity (including clicking particular buttons, logging in etc.). They can also be used to remember arbitrary pieces of information that the user previously entered into form fields such as names, addresses, passwords, and credit card numbers. From the security point of view, if cookie data

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is not encrypted, any anonymous user (hacker) can access the cookie information and misuse it.

Web sites typically use cookies for the following reasons:

- To collect demographic information about who has visited the Web site.
- Sites often use this information to track how often visitors come to the site and how long they remain on the site.
- It helps to personalize the user's experience on the Web site.
- Cookies can help store personal information about users so that when a user subsequently returns to the site, a more personalized experience is provided.

If you ever returned to a site and have seen your name mysteriously appear on the screen, it is because on a previous visit, you gave your name to the site and it was stored in a cookie. A good example of this is the way some online shopping sites will make recommendations to users based on their previous purchases. It helps to monitor advertisements. Cookies do not act maliciously on computer system. They are merely text files that can be deleted at any time.

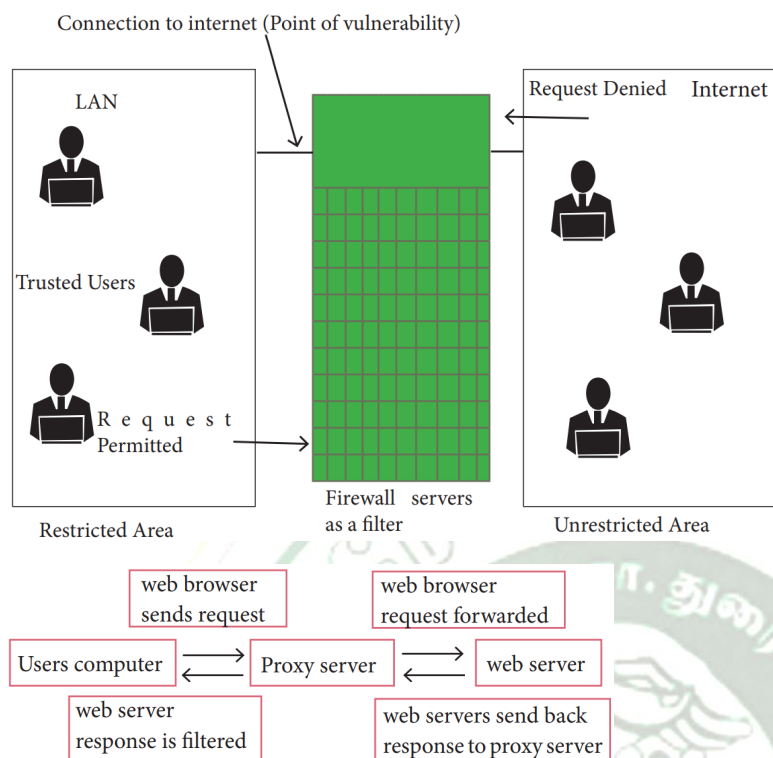
Cookies cannot be used to spread viruses and they cannot access your hard drive. However, any personal information that you provide to a Web site, including credit card information, will most likely be stored in a cookie unless the cookie feature is explicitly turned off in your browser. This is the way in which cookies threaten privacy.

Firewall and Proxy Servers

A firewall is a computer network security based system that monitors and controls incoming and outgoing network traffic based on predefined security rules. A firewall commonly establishes a block between a trusted internal computer network and entrusted computer outside the network. They are generally categorized as network-based or host-based. Network based firewalls are positioned on the gateway computers of LANs [local area Network], WANs [Wide Area Network] and intranets. Host-based firewalls are positioned on the network node itself. The host-based firewall may be a service as a part of the operating system or an agent application such as endpoint security or protection. Each has advantages and disadvantages. However, each has a role in layered security. Firewalls also vary in type depending on where communication originates, where it is intercepted, and the state of communication being traced.

A proxy server acts as an intermediary between the end users and a web server. A client connects to the proxy server, requesting some service, such as a file, connection, web page, or other resources available from a different server. The proxy server examines the request, checks

authenticity and grants the request based on that. Proxy servers typically keep the frequently visited site addresses in its cache which leads to improved response time.



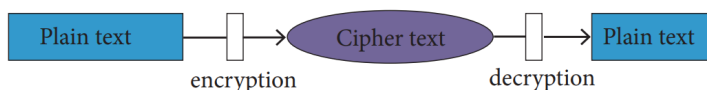
21. Encryption and Decryption

Encryption and decryption are processes that ensure confidentiality that only authorized persons can access the information.

Encryption is the process of translating the plain text data (plaintext) into random and mangled data (called cipher-text).

Decryption is the reverse process of converting the cipher-text back to plaintext. Encryption and decryption are done by cryptography. In cryptography a key is a piece of information (parameter) that determines the functional output of a cryptographic algorithm.

Basic Encryption & Decryption



Encryption has been used by militaries and governments to facilitate secret communication. It is now commonly used in protecting information within many kinds of civilian systems. It is also used to protect data in communication system, for example data being transferred via networks (e.g. the Internet, ecommerce), mobile telephones, wireless microphones, wireless intercom systems, Bluetooth devices and bank automatic teller machines. There have been numerous reports of data in communication being intercepted in recent years. Data should also

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be encrypted when transmitted across networks in order to protect against the network traffic by unauthorized users.

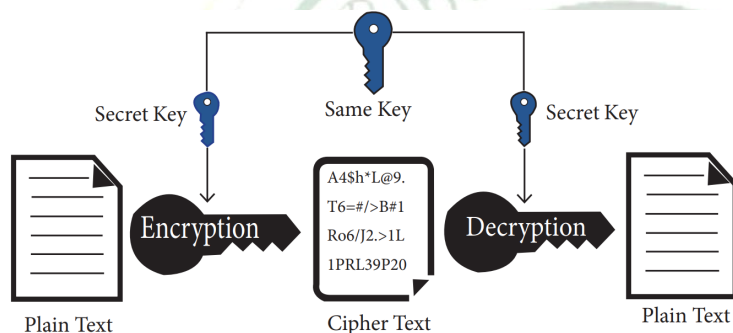
TYPES OF ENCRYPTION

There are two types of encryption schemes as listed below:

- Symmetric Key encryption
- Public Key encryption

SYMMETRIC KEY ENCRYPTION

Symmetric encryption is a technique to use the same key for both encryption and decryption. The main disadvantage of the symmetric key encryption is that all authorized persons involved, have to exchange the key used to encrypt the data before they can decrypt it. If anybody intercepts the key information, they may read all message.

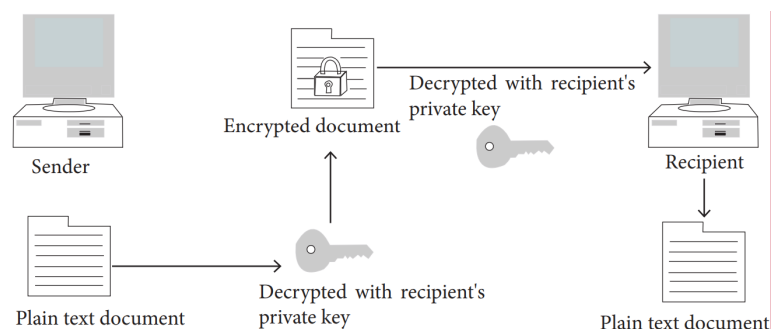


PUBLIC KEY ENCRYPTION

Public key encryption is also called Asymmetric encryption. It uses the concept of a key value pair, a different key is used for the encryption and decryption process. One of the keys is typically known as the private key and the other is known as the public key.

The private key is kept secret by the owner and the public key is either shared amongst authorized recipients or made available to the public at large.

The data encrypted with the recipient's public key can only be decrypted with the corresponding private key.



Asymmetric Encryption in Digital Certificates:

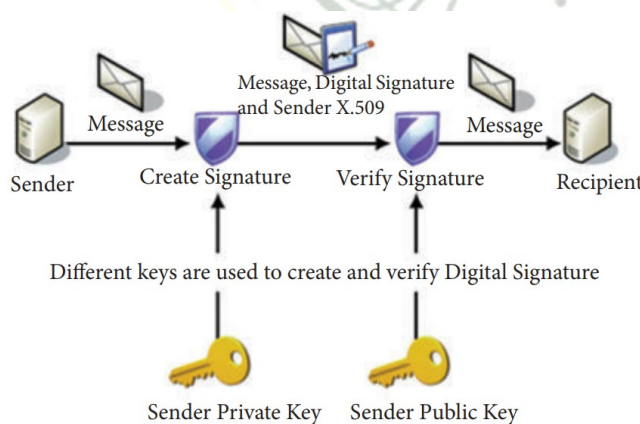
A digital certificate in a client-server model of communication is one of the example of Asymmetric Encryption. A certificate is a package of information that identifies a user and a server. It contains information such as an organization's name, the organization that issued the certificate, the users' email address and country, and user's public key.

When a server and a client require a secure encrypted communication, they send a query over the network to the other party, which sends back a copy of the certificate. The other party's public key can be extracted from the certificate. A certificate can also be used to uniquely identify the holder.

Digital Signature

Digital signatures are based on asymmetric cryptography and can provide assurances of evidence to origin, identity and status of an electronic document, transaction or message, as well as acknowledging informed by the signer.

To create a digital signature, signing software (email) creates a one-way hash of the electronic data to be signed. The user's private key to encrypt the hash, returning a value that is unique to the hashed data. The encrypted hash, along with other information such as the hashing algorithm, forms the digital signature. Any change in the data, even to a single bit, results in a different hash value. This attribute enables others to validate the integrity of the data by using the signer's public key to decrypt the hash. If the decrypted hash matches a second computed hash of the same data, it proves that the data hasn't changed since it was signed. If the two hashes don't match, the data has either been tampered with in some way (indicating a failure of integrity) or the signature was created with a private key that doesn't correspond to the public key presented by the signer (indicating a failure of authentication).

**22. INTRODUCTION TO INFORMATION TECHNOLOGY ACT**

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In the 21st century, Computer, Internet and ICT or e-revolution has changed the life style of the people. Today paper based communication has been substituted by e-communication. Accordingly we have new terminologies like cyber world, e-transaction, e-banking, e-return and e-contracts. Apart from positive side of e-revolution there is also negative side of computer, that is, the internet and ICT in the hands of criminals which has become a weapon of offence. Accordingly a new panel of members emerged to tackle the problems of cyber crimes in cyber space i.e. Cyber Law or Cyber Space Law or Information Technology Law or Internet Law.

In India Cyber law and IT Act 2000, modified in 2008 are being articulated to prevent computer crimes. IT Act 2000 is an act to provide legal recognition for transactions carried out by means of Electronic Data Interchange (EDI) and other means of electronic communication. It is the primary law in India dealing with cybercrime and electronic commerce (e-Commerce). E-Commerce is electronic data exchange or electronic filing of information.

PREVENTION

25% of cyber crime remains unsolved. To protect the information the following points to be noted:

- Complex password setting can make your surfing secured.
- When the internet is not in use, disconnect it.
- Do NOT open spam mail or emails that have an unfamiliar sender.
- When using anti-virus software, keep it up-to-date.

23. Tamil in Internet

We know that the internet today is a plays a vital role in every man's life. Internet is the best information technological device, through which we get know everything from Internet.

In 2017 a study conducted by KPMG a Singapore based organization along with google, reported that, Tamil topped the list, among the most widely used languages in India where 42% are using the Internet in Tamil.

Moreover in 2021 onwards, 74% of people in India will access internet using Tamil and it will be in the top usage of Internet in India.

Search Engines in Tamil

The “Search Engines” are used to search any information from the cyber space. Although there are many search engines, but only a few of them are frequently in use. In the top ten search engines, Google, Bing and Yahoo are takes first three places respectively. Google and Bing provide searching facilities in Tamil, which means you can search everything through Tamil. A Google search engine gives you an inbuilt Tamil virtual keyboard.

e – Governance:

Getting Government services through internet is known as e-Governance. Govt. of Tamilnadu has been giving its services through Internet. One can communicate with Govt. of Tamilnadu from any corner of the state. One can get important announcements, government orders, and government welfare schemes from the web portal of Govt. of Tamilnadu.

E-Library

E-Libraries are portal or website of collection of e-books. Tamil e-Library services provide thousands of Tamil Books as ebooks mostly at free of cost. It is the most useful service to Tamil people who live far away from their home land.

24. Tamil Typing and Interface software

Tamil is mostly used to type documents in word processors and search information from internet. Typing Tamil using Tamil interface software is the familiar one among the different methods of typing. This is the simplest method of typing Tamil in both Computer and Smart phones.

Familiar Tamil Keyboard Interface:

- NHM Writer, E-Kalappai and Lippikar – are familiar Tamil keyboard interfaces software that is used for Tamil typing which works on Tamil Unicode, using phonetics.
- Sellinam and Ponmadal – are familiar Tamil keyboard layouts that works on Android operating system in Smart phone using phonetics.

Tamil Office Automation Applications

Famous Office automation software like Microsoft Office, Open Office etc., provides complete Tamil interface facility. These softwares are downloadable and installed in your computer. After installation, your office automation software environment will completely changed to Tamil. Menu bars, names of icons, dialog boxes will be shown in Tamil. Moreover, you can save files with Tamil names and create folders with Tamil names.

Apart from that Tamil Libra Office, Tamil Open Office, Azhagi Unicode Editor, Ponmozhi, Menthamiz, Kamban, Vani are office automation software working exclusively for Tamil. You can these applications are designed to work completely in Tamil.

Tamil Translation Applications

Thamizpori (தமிழ்ப்பொறி) is a Tamil translation application having more than 30000 Tamil words equalent to English words. Using this application, we can transalte small english

sentences into Tamil. Google also gives an online translation facility, using this online facility we can translate from Tamil to any other language vice versa.

Tamil Programming Language

Programming languages to develop software to computers and smart phones are available only in English. Now, efforts are taken to develop programming languages in Tamil. Based on Python programming language, the first Tamil programming language “Ezhil” (எழில்) is designed. With the help of this programming language, you can write simple programs in Tamil.

25. Tamil Information Interchange Coding Systems

TSCII (Tamil Script Code for Information Interchange)

Computers handle data and information as binary system. Every data should be converted into binary while it is feed into a computer system. You learnt about all these things in the first unit of this text book. Computers use ASCII encoding system to handle data and information. The ASCII encoding system is applicable only for handling English language. Therefore, TSCII (Tamil Script Code for Information Interchange) is the first coding system to handle our Tamil language in an analysis of an encoding scheme that is easily handled in electronic devices, including non-English computers. This encoding scheme was registered in IANA (Internet Assigned Numbers Authority) unit of ICANN.

ISCII (Indian Script Code for Information Interchange)

This is one of the encoding schemes specially designed for Indian languages including Tamil. It was unified with Unicode.

Unicode:

Unicode is an encoding system, designed to handle various world languages, including Tamil. Its first version 1.0.0 was introduced on October 1991. While introduction of this scheme, can be able to handle nearly 23 languages including Tamil. Among the various encoding scheme, Unicode is the suitable to handle Tamil.

26. Tamil Operating System

An operating system is needed to access electronic systems such as computer and smart phone. Microsoft Windows is very popular operating system for personal computers. Linux is another popular open source operating system. Operating systems are used to access a computer easily. An operating system should be easy to work and its environment should be in understandable form. Thus, all operating systems used in computers and smart phones offered environment in Tamil.

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Windows Tamil Environment interface should be downloading and install from internet. It shows all windows elements such as Taskbar, desktop elements, names of icons, commands in Tamil.

Organisation and projects to develop Tamil

Tamil Virtual Academy:

With the objectives of spreading Tamil to the entire world through internet, Tamil Virtual University was established on 17th February 2001 by the Govt. of Tamilnadu. Now, this organisation functioning with the name “Tamil Virtual Academy”. This organisation offers different courses regarding Tamil language, Culture, heritage etc., from kindergarten to under graduation level.

Website: <http://www.tamilvu.org/index.php>

Tamil Language Council, Singapore

With the objectives of promoting the awareness and greater use of Tamil among the Singaporeans, in 2001 the council of Tamil Language was formed by the ministry of Information Communications and Arts, Govt. of Singapore. The council is called as “வளர்தமிழ் இயக்கம்”.

Website: <http://tamil.org.sg/ta>

Madurai Project

Project Madurai is an open and voluntary initiative to collect and publish free electronic editions of ancient Tamil literary classics. This means either typing-in or scanning old books and archiving the text in one of the most readily accessible formats for use on all popular computer platforms.

Since its launch in 1998, Project Madurai released in Tamil script form as per TSCII encoding. Since 2004 they started releasing ebooks in Tamil unicode as well.

Web Site: <http://www.projectmadurai.org/>

Tamil Wikipedia:

Wikipedia is an open source encyclopedia. Any person can write article about any subject. In Tamil Wikipedia has more than 1 lacks articles.

Web Site: <https://ta.wikipedia.org/>

In order to make Tamil as a living language, it is the duty every Tamilian to make participate Tamil in development of technology. Those who forgotten their values, they will be considered as “Nomads”. If we learn about how many great technologies we have to add Tamil as a symbol

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of our race. It is our duty to combine our world's first language and language for more than five thousand years with growing technology.

