

Chapter 1: Fundamentals of Computer

Data: It denotes raw facts and figures such as numbers, words, amount, quantity etc. that can be processed or manipulated.

Information: It is a meaningful and processed form of data.

Data	Information
• Raw facts and figures	• Processed data
• Similar to raw material	• Similar to the finished product
• Cannot be directly used	• Adds to knowledge and helps in taking decisions
• Does not give precise and clear sense	• Is clear and meaningful

Functional units of a computer: Input Unit, Central Processing Unit (CPU), Storage Unit and Output Unit.

Input unit: It accepts instructions and data. Supplies the converted instructions and data to the computer for processing.

CPU: It is the brain of the computer. The functions of CPU are performed by three components - Arithmetic Logic Unit (ALU), Control Unit (CU) and registers. ALU performs calculations and logical operations such as comparisons and decision making. CU manages and co-ordinates all other units of the computer. Registers are temporary storage elements that facilitate the functions of CPU.

Storage unit: It stores data and instructions required for processing, intermediate results for ongoing processing and final results of processing.

Output unit: It receives the results produced by the CPU, converts them to human-readable form and supplies the results to the outside world.

Computer: It may be defined as an electronic machine designed to accept the data and instructions, performs arithmetic and logical operations on the data according to a set of instructions and output the results or information.

Characteristics of computer: Speed, accuracy, diligence, lack of IQ, lack of decision making.

Different Number Systems:

Number System	Base	Symbols used
Binary	2	0, 1
Octal	8	0, 1, 2, 3, 4, 5, 6, 7
Decimal	10	0, 1, 2, 3, 4, 5, 6, 7, 8, 9
Hexadecimal	16	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F

Number representation methods: (i) Sign and magnitude representation (ii) 1's complement representation (iii) 2's complement representation.

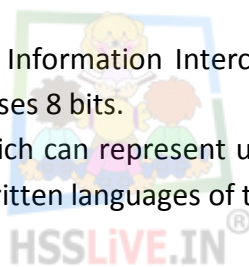
Number Conversion procedure:

Conversion	Procedure
Decimal to Binary	Repeated division by 2 and grouping the remainders
Decimal to Octal	Repeated division by 8 and grouping the remainders
Decimal to Hexadecimal	Repeated division by 16 and grouping the remainders
Binary to Decimal	Multiply binary digit by place value (power of 2) and find their sum
Octal to Decimal	Multiply octal digit by place value (power of 8) and find their sum
Hexadecimal to Decimal	Multiply hexadecimal digit by place value (power of 16) and find their sum
Octal to Binary	Converting each octal digit to its 3 bit binary equivalent
Hexadecimal to Binary	Converting each hexadecimal digit to its 4 bit binary equivalent
Binary to Octal	Grouping binary digits to group of 3 bits from right to left
Binary to Hexadecimal	Grouping binary digits to group of 4 bits from right to left
Octal to Hexadecimal	Convert octal to binary and then binary to hexadecimal
Hexadecimal to Octal	Convert hexadecimal to binary and then binary to octal

Character Representations

ASCII: American Standard Code for Information Interchange. It uses 7 bits to represent a character. Another version ASCII-8 uses 8 bits.

Unicode: Originally used 16 bits which can represent up to 65,536 characters. Unicode can represent characters in almost all written languages of the world.

**Chapter 2: Components of Computer System**

RAM: Random Access Memory, Volatile, CPU can directly access it.

Measuring units of memory:

Binary Digit = 1 Bit	1 MB (Mega Byte) = 1024 KB
1 Nibble = 4 Bits	1 GB (Giga Byte) = 1024 MB
1 Byte = 8 Bits	1 TB (Tera Byte) = 1024 GB
1 KB (Kilo Byte) = 1024 Bytes	1 PB (Peta Byte) = 1024 TB

Input devices: Feed data and instructions from the user into the computer.

Output devices: Gives information from a computer system to the user.

Keyboard: Allows the user to input text data.

Mouse: A device used to position the cursor or move the pointer on the computer screen.

Light pen: A pointing device shaped like a pen. Has the advantage of 'drawing' directly onto the screen.

Touch screen: Allows the user to operate/make selections by simply touching on the display screen.

Joystick: Used to play video games, control training simulators and robots.

Microphone: Accepts sound in analogue nature as input and converts it to digital format.

Scanner: Allows inputs like pictures or printed text.

OMR: Useful for evaluating objective type tests and questionnaires.

Bar Code Reader: Used to input data from barcodes. QR (Quick Response) code is similar to barcodes. Barcodes are single dimensional where as QR codes are two dimensional.

Biometric sensor: Identifies unique human physical features like fingerprints, retina, iris patterns, etc.

Monitor: Display devices include CRT monitors, LCD monitors, TFT monitors, LED monitors, gas plasma monitors, Organic Light Emitting Diode (OLED) Monitors, etc.

LCD projector: An LCD projector is a type of video projector for displaying video, images or computer data on a large screen or other flat surface.

Printer: Used to produce hardcopy output. Classified as Impact or Non-impact printers. Dot-matrix uses impact mechanism. It can print carbon copies with less printing cost. Inkjet printers are non-impact printers and are inexpensive, but the cost of ink cartridges makes them costly. Laser printers are non-impact printers that produce good quality images. Laser printers are faster.

Plotter: A plotter is an output device used to produce hardcopies of graphs and designs on the paper.

3D printer: A 3D printer is an output device used to print 3D objects. It can produce different kinds of objects, in different materials, using the same printer.

e-Waste: Electronic waste may be defined as discarded computers, office electronic equipment, entertainment devices, mobile phones, television sets and refrigerators.

e-Waste disposal methods: Re-use, incineration (combustion process in which the waste is burned in incinerators at a high temperature), recycling, (the process of making new products from a product that has originally served its purpose) and land filling.

System software: The components of system software are Operating system, Language processors and Utility software.

Operating system (OS): A set of programs that acts as an interface between the user and computer hardware. It controls and co-ordinates the operations of a computer.

Function of OS: Process management, memory management, file management, device management, security management and command interpretation.

Language processors: These are the system programs that translate programs written in high level language into machine language. Eg: Interpreter (converts a HLL program into machine language line by line) and Compiler (translates a program written in high level language into machine language).

Free and Open source software: Gives the user the freedom to use, copy, distribute, examine, change, and improve the software. GNU/Linux is a free and open source operating system. Firefox, Libre Office are also examples.

Four freedoms for free and open source software:

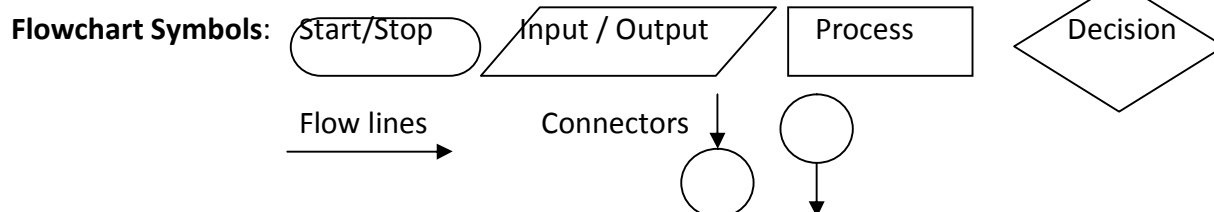
Freedom 0, Freedom 1, Freedom 2, Freedom 3

Chapter 3 – Principles of Programming and Problem Solving

Stages of problem solving: (i) Problem identification (ii) Preparing algorithms and flowcharts (iii) Coding the program using programming language (iv) Translation (v) Debugging (vi) Execution and Testing and (vii) Documentation

Algorithm: It is a step-by-step procedure to solve a problem.

Flowchart: The pictorial representation of an algorithm.



Debugging: The process of detecting and correcting the errors in a program. The following types of errors are corrected.

Syntax errors: The errors occur when the rules or syntax of the programming language are not followed.

Logical error: It is due to improper planning of the program's logic.

Run time error: These errors occur unexpectedly when computer becomes unable to process some improper data.

Chapter 4: Getting Started with C++

Tokens: The fundamental building blocks of the program. Five types of tokens – Keywords, Identifiers, Literals, Punctuators and Operators.

Keywords: The words (tokens) that convey a specific meaning to the language compiler.

Identifiers: These are the user-defined words. Variables, labels, function names are identifiers.

Rules for naming identifiers: The first character must be a letter or underscore (_). White space and special characters are not allowed. Keywords cannot be used. Eg: Num, a2b, _var

Literals: Four types – Integer literals, Floating point literals, Character literals and String literals.

String constant: A sequence of one or more characters enclosed within a pair of double quotes is called. Eg: "Hello friends", "123" etc.

Punctuators: Some special symbols that have syntactic or semantic meaning to the compiler.

Operator: A symbol that tells the compiler about a specific operation.

Chapter 5: Data Types and Operators

Fundamental data types: Also known as basic data types. Five fundamental data types - char, int, float, double and void.

Variable: Identifier of memory location.

Operators: The tokens or symbols that trigger computer to carry out operations. Classified into three – unary, binary and ternary.

Arithmetic operators (+, -, *, /, %), Relational operators (<, <=, >, >=, ==, !=), Logical operators (&&, ||, !), Assignment operator (=), Input operator (>>), Output operator (<<).

Modulus operator (%): Also called as mod operator. It gives the remainder value during arithmetic division.

Expressions: Combination of operators and operands. Each expression returns a value. Three types of expressions – arithmetic, relational and logical.

Statements: Declaration statement, input statement, output statement.

Cascading of I/O operators: Multiple use of input or output operators in a single statement.

Eg: `cin>>a>>b;` `cout<<a<<b;`

Chapter 6: Introduction to Programming

Structure of C++ program:

<code>#include<iostream.h></code>	→ Pre processor directive to include header file
<code>using namespace <std></code>	→ To use cin and cout independently
<code>int main()</code>	→ Essential function in C++ program
{	
statements;	→ Program statements
return 0;	→ To end the program
}	

Variable declaration and initialisation:

Syntax for declaration: `data_type variable;`

Eg: `int a; float b;`

Example for variable initialisation: `int n=10;`

Variable has two values: l- value (memory address), r-value (content).

Arithmetic assignment operators: +=, -=, *=, /=, %=

`a+=b;` is equivalent to `a= a+ b;`

Increment – decrement operators: ++ and --

`a++;` or `++a;` is equivalent to `a=a+1;`

`a--;` or `--a;` is equivalent to `a=a-1;`

Type conversion: Conversion of the data type of an operand into another type. Done in two ways: implicitly and explicitly.

Type promotion: It is the implicit type conversion is performed by C++ compiler internally.

Type casting: It is the explicit type conversion and is done by the programmer.

Chapter 7: Control Statements

<p>if statement</p> <p>Syntax:</p> <pre>if (test expression) { statement block; }</pre> <p>Here the test expression represents a condition. If the test expression is, a statement or a block of statements associated with if is executed.</p>	<p>if - else statement</p> <p>Syntax:</p> <pre>if (test expression) { statement block 1; } else { statement block 2; }</pre> <p>If the test expression evaluates to True, only the statement block 1 is executed. If the test expression evaluates to False statement block 2 is executed.</p>
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When we write an if statement inside another if block, it is called **nesting**.

else if ladder

Syntax:

```
if (test expression1)
    statement block 1;
else if (test expression2)
    statement block 2;
.....
else
    statement N;
```



switch statement

Syntax:

```
switch(expression)
{
    case constant_1 : statement block 1;
                    break;
    case constant_2 : statement block 2;
                    break;
                    :
                    :
    case constant_n-1 : statement block n-1;
                     break;
    default : statement block n;
}
```

Looping (Iteration) Statements

Four elements of a loop: Initialisation, Test expression, Update statement, Body of the loop

while statement

It is an entry-controlled loop. The condition is checked first and if it is True the body of the loop will be executed. The syntax of **while** loop is:

```
initialisation of loop control variable;
while(test expression)
{
    body of the loop;
    updation of loop control variable;
}
```

for statement

It is also an entry-controlled loop in C++. All the three loop elements (initialisation, test expression and update statement) are placed together in **for** statement. The syntax is:

```
for (initialisation; test expression; update statement)
{
    body-of-the-loop;
}
```

do...while statement

In the case of **for** loop and **while** loop, the test expression is evaluated before executing the body of the loop. Its syntax is :

```
initialisation of loop control variable;
do
{
    body of the loop;
    updation of loop control variable;
} while(test expression);
```

Chapter 8: Computer Networks

Computer network is a group of computers and other computing hardware devices.

Advantages: Resource sharing, Price-performance ratio, Communication, Reliability, Scalability.

Bandwidth: The amount of data sent over a specific connection in a given amount of time. It is measured in bits per second (bps).

Noise: Unwanted electrical or electromagnetic energy that lowers the quality of data signal.

Node: Any device (computer, scanner, printer, etc.) which is directly connected to a computer network.

Communication devices: NIC, Hub, Switch, Repeater, Bridge, Router, Gateway.

Switch: An intelligent device that connects several computers to form a network.

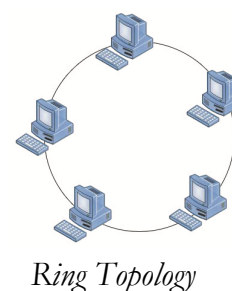
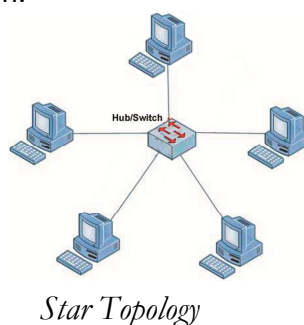
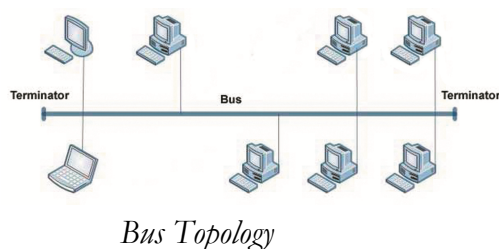
Bridge: A device used to split a network into different segments and interconnected.

Router: A device that can interconnect two networks of the same type using the same protocol. It is more intelligent than bridge.

Gateway: A device that interconnects two different networks having different protocols.

Modem: It converts digital signals to analog signals and converts the analog signals back to digital signals.

Topology: The way in which the nodes are physically interconnected to form a network. Major topologies are bus, star, ring and mesh.



IP Address: An IP address is a unique 4 part numeric address assigned to each node on a network for their unique identification. Each part is a number from 0 to 255.

Eg: 148.78.250.12

MAC Address: A Media Access Control (MAC) address is a universally unique address (12 digit hexadecimal number) assigned to each NIC (Network Interface Card) by its manufacturer.

Chapter 9 – Internet

Services on the Internet: Services like WWW, e-mail, search engines, social media, etc. are widely used throughout the globe.

Web browser: It is a software use to retrieve or present information and to navigate through web pages in the World Wide Web. Eg: Google Chrome, Internet Explorer, Mozilla Firefox, Opera, and Safari.

Search engines: Internet search engine websites are special programs that are designed to help people to find information available in World Wide Web. Search engine web sites use programs called web crawlers or spiders or robots to search the web.

Electronic mail or e-mail: It is a method of exchanging digital messages between computers over Internet.

Sections of e-mail: To (Recipient Address), Cc (Carbon copy to the secondary recipients), Bcc (Blind carbon copy to the tertiary recipients), Subject, Content, Attachments.

Advantages of e-mail: Speed, easy to use, provision of attachments, environment friendly, easy reply to an e-mail, cost-effective, available anywhere anytime.

Types of social media: Internet forums, social blogs, micro blogs, wikis, social networks, content communities and a lot more.

Internet forums: It is an online discussion website where people can engage in conversations in the form of posted messages. Eg: Ubuntu Forum

Social blogs: It is a discussion or informational website consisting of entries or posts displayed in the reverse chronological order i.e., the most recent post appears first. Eg: Blogger.com, Wordpress.com.

Microblogs: They allow users to exchange short sentences, individual images or video links. It offers a communication mode that is spontaneous and can influence public opinion. Twitter.com is a popular micro blogging site.

Wikis: Wikis allow people to add content or edit existing information in a web page, to form a community document. Wiki is a type of content management system. Eg: wikipedia.org.

Social networks: These sites allow people to build personal web pages and then connect with friends to communicate and share content. We can share text, pictures, videos, etc. and comment to the posts. Eg: facebook.com, linkedin.com.

Content communities: These are websites that organise and share contents like photos, videos, etc. Eg: Youtube.com, flickr.com.

Advantages of social media: Bring people together, help to plan and organise events, promoting business, enhance social skills.

Limitation of social media: Intrusion to privacy, addiction, spread rumours.

Computer virus: It is a program that attaches itself to another program or file enabling it to spread from one computer to another without our knowledge and interferes with the normal operation of a computer.

Trojan horse: It will appear to be a useful software but will actually do damage once installed or run on your computer.

Hacking: It is a technical effort to manipulate the normal behaviour of network connections and connected systems. Computer experts perform hacking to test the security and find the vulnerabilities in computer networks and computer systems. Such computer experts are often called '**white hats**' and such hacking is called ethical hacking. Computer criminals break into secure networks to destroy data or make the network unusable for those who are authorised to use the network. Such criminals are called '**black hats**'. There are '**grey hat hackers**', who sometimes act illegally, though with good intentions, to identify the vulnerabilities.

Phishing: It is an attempt to acquire information such as usernames, passwords and credit card details by posing as the original website, mostly that of banks and other financial institutions. Phishing websites have URLs and home pages similar to their original ones. The act of creating such a misleading website is called spoofing.

Chapter 10 – IT Applications

e-Governance

It is the application of ICT for delivering government services to the citizens in a convenient, efficient and transparent manner.

Types of interaction in e-Governance: G2G (Government to Government), G2C (Government to Citizens), G2B (Government to Business), G2E (Government to Employees).

e-Governance Infrastructure: It consists of State Data Centres, SWAN for connectivity and CSC (Common Service Centres) as service delivery points. Akshaya centres are example for CSC in Kerala.

Benefits of e-Governance

- Leads to automation of services.
- Strengthens the democracy.
- More transparency in the functioning.
- Saves unnecessary visits to offices.

Challenges to e-Governance

- Creates digital divide.
- Open to cyber-attacks.
- Leads to lack of privacy for civilians.

Examples: www.dhsekerala.gov.in, www.itmission.kerala.gov.in, www.edistrict.kerala.gov.in

e-Business

It is the sharing of business information, maintaining business relationships and conducting business transactions by means of the telecommunication networks.

e-Commerce and e-Business: e-Commerce covers business transaction that involve exchange of money, whereas e-Business includes all aspects of running a business such as marketing, obtaining raw materials or goods, customer education, looking for suppliers etc.

electronic payment system (EPS): A system of financial exchange between buyers and sellers in an online environment. The financial exchange is facilitated by a digital financial instrument such as credit/debit card, electronic cheque, or digital cash.

e-Banking or electronic banking: It is defined as the automated delivery of banking services directly to customers through electronic channel.

Advantages of e-Business

- Overcomes geographical limitations.
- e-Business cuts the cost.
- Eliminates travel time and cost.
- Remains open all the time.

Challenges to e-Business

- Poor knowledge and awareness.
- 'Touch and Feel' factors.

Examples: www.irctc.co.in, www.amazon.com, www.licindia.com

e-Learning

It is the use of electronic media and ICT (Information and Communication Technologies) in education.

e-Learning Tools: e-Book Reader, e-chat, Online chat, Videos and Channels (Victers channel)

Advantages of e-Learning

- Offers education to large number of students from distant location.
- Cost for learning is much less.
- Provides facility to do online courses from variety of institutions.
- Time and place is not a constraint for e-Learning.

Challenges to e-Learning

- Lack of face to face contact between students and teachers.
- Limited interaction may discourage the learner.
- Hands-on-lab work is difficult to simulate.

Examples: www.ignouonline.ac.in, www.nptel.iitm.ac.in

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