Chapter 1. FUNDAMENTALS OF COMPUTER

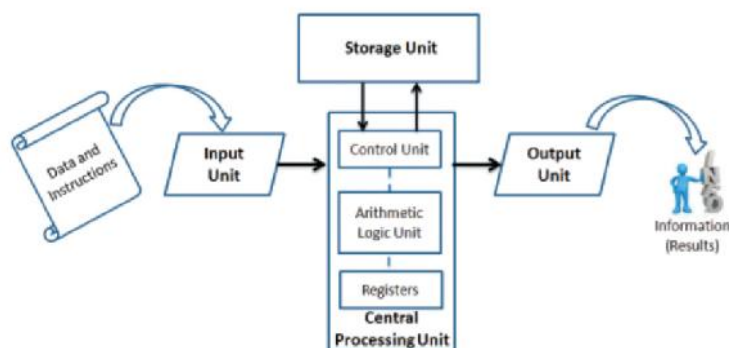| Data	Information
• Raw facts and figures	• Processed data
• Similar to raw material	• Similar to the finished product
• Cannot be directly used	• Adds to knowledge and helps in taking decisions
• Does not give precise and clear sense	• Clear and meaningful

Functional units of a computer:

Fig. 1.7 : Functional units of a computer

1.Input unit: Data and programs in to the computer system is entered through Input Unit.
   1. Accepts instructions and data from the outside world.
   2. Converts these instructions and data to a form acceptable to the computer.
   3. Supplies the converted instructions and data to the computer for processing.

2. Central Processing Unit (CPU): All major computations and comparisons are made inside the CPU. It is also responsible for activating and controlling the operations of other units of the computer.

3. Storage unit:functions of storage unit are to hold or store:
   1. data and instructions required for processing.
   2. intermediate results for ongoing processing.
   3. final results of processing, before releasing to the output unit.

4. Output unit: It supplies information and results of computation to the outside world.
   1. Receives the results produced by the CPU in coded form.
   2. Converts these coded results to human-readable form.
   3. Supplies the results to the outside world.

Computer and its Characteristics.

Computer 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 computers:

Speed: A computer can perform millions of operations in a second or in fraction of second. It can do in a minute,as much work as a man do taking months and years.

Accuracy: A computer can perform arithmetic operations with a very high degree of accuracy. By accuracy, we mean fewer errors in the output and precision with which computations are performed.

Diligence: Since computer is a machine, it can operate for long hours untiringly. Unlike human beings, it will not show any emotion or disobey you. Hence computers are best suited for routine jobs.

Versatility: Computer can be used to perform many beings. different kinds of processing tasks. It is a general purpose data processing machine.

Huge memory: Computer has enormous memory capacity. Huge volume of data can be stored in its memory for processing. The storage capacity can also be increased as per requirement.

Limitations:

Lack of IQ: A computer does not have natural intelligence as humans have.

Lack of decision making: power: Computer cannot decide on its own and it does not possess intuitive capabilities like human

Number conversions: to convert the numbers of one base to the equivalent numbers in other bases.

Decimal to Binary : Repeated division by 2 and grouping the remainders

Find binary equivalent of decimal number 25.

2	25	Remainders	
2	12	1	LSB
2	6	0	
2	3	0	
2	1	1	
	0	1	MSB

$(25)_{10} = (11001)_2$

Decimal to Octal: Repeated division by 8 and grouping the remainders

Example: Find octal equivalent of decimal number 125.

8	125	Remainders	
8	15	5	LSD
8	1	7	
	0	1	MSD

$(125)_{10} = (157)_8$

Decimal to Hexadecimal: Repeated division by 16 and grouping the remainders

Example: Find hexadecimal equivalent of 380.

16	380	Remainders
16	23	12 (C)
16	1	7
	0	1

$(380)_{10} = (17C)_{16}$

Binary to Decimal: Multiply binary digit by place value(power of 2) and find their sum

Example: Convert $(11011)_2$ to decimal.

$$(11011)_2 = 1\times2^4 + 1\times2^3 + 0\times2^2 + 1\times2^1 + 1\times2^0$$
$$= 16 + 8 + 2 + 1$$
$$= 27$$

$(11011)_2 = (27)_{10}$

Octal to Decimal : Multiply octal digit by place value (power of 8) and find their sum

Example: Convert $(1005)_8$ to decimal.

$$(1005)_8 = 1\times8^3 + 0\times8^2 + 0\times8^1 + 5\times8^0$$
$$= 512+5$$
$$= 517$$

$$(1005)_8=(517)_{10}$$

Hexadecimal to Decimal : Multiply hexadecimal digit by place value (power of 16) and find their sum

Example: Convert $(2D5)_{16}$ to decimal.

$$(2D5)_{16} = 2\times16^2+13\times16^1+5\times16^0$$
$$= 512+208+5$$
$$= 725$$

$$(2D5)_{16}=(725)_{10}$$

Short Cut Method of Convertions:
Octal to binary conversion:

Example: Convert $(437)_8$ to binary.

3-bit binary equivalent of each octal digits are

4	3	7
↓	↓	↓
100	011	111

$$(437)_8=(100011111)_2$$

Example: Convert $(7201)_8$ to binary.

Hexadecimal to binary conversion:

Example: Convert $(2F15)_{16}$ to binary.

4-bit binary equivalent of each hexadecimal digits are

2	F	1	5
↓	↓	↓	↓
0010	1111	0001	0101

$$(2F15)_{16} = (10111100010101)_2$$

Binary to octal conversion:

Example: Convert $(101100111)_2$ to octal.

We can group the given binary number 101100111 from right as shown below.

101	100	111
↓	↓	↓
5	4	7

$$(101100111)_2 = (547)_8$$

Binary to hexadecimal conversion:

Example: Convert $(101100111010)_2$ to hexadecimal.

We can group the given binary number 101100111010 from right as shown below.

1011	0011	1010
↓	↓	↓
B	3	A

$$(101100111010)_2 = (B3A)_{16}$$

Representation of numbers(integers):

(i) Sign and magnitude representation: In this method, first bit from left (MSB) is used for representing sign of integer and remaining 7-bits are used for representing magnitude of integer. For negative integers sign bit is 1 and for positive integers sign bit is 0.

Example: Represent + 23 in sign and magnitude form

Sign ← Magnitude →
↑

0	0	0	1	0	1	1	1

Example: Represent -- 23 in sign and magnitude form
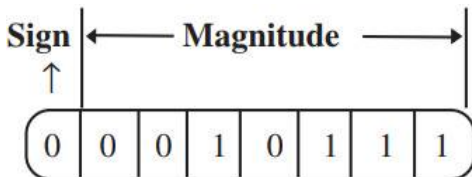
Sign ← Magnitude →
↑
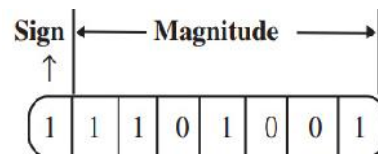
1	1	1	0	1	0	0	1

(ii) 1's complement representation : 1's complement of a binary number is obtained by replacing every 0 with 1 and every 1 with 0.

Binary Number	1's Complement
11001	00110
10101	01010

(iii) 2's complement representation: If the number is positive 8-bit form binary itself is the representation. 2's complement of a binary number is calculated by adding 1 to its 1's complement.

Example: Represent -38 in 2's complement form.

Binary of 38 in 8-bit form $= (00100110)_2$

-38 in 2's complement form $=$ 11011001+

$$1$$

$$= (11011010)_2$$

Example: Represent +38 in 2's complement form.

Binary of 38 in 8-bit form $= (00100110)_2$

+38 in 2's complement form $= (00100110)_2$

(No need to find 2's compleme

Representation of characters:

ASCII: American Standard Code for Information Interchange uses 7 bits to represent each character in computer memory

UNICODE: It is a 16 bit or 32 bit code It is used to represent all the characters used in the written languages in the world.

Chapter 2-COMPONENTS OF COMPUTER SYSTEM

Primary Memory: Primary memory holds data, intermediate results and results of ongoing jobs temporarily.

Random Access Memory (RAM): RAM is a volatile memory. Data or instructions to be processed by the CPU must be placed in the RAM.

Memory measuring units.

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: device is used to feed data into a computer.

Keyboard: Allows the user to input text data consisting of alphabets, numbers and other characters. It is the standard input device. Also known as QWERT keyboard based in the layout.

Mouse: A small handheld device used to position the cursor or move the pointer on the computer screen by rolling it over a mouse pad / flat surface.

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.

Graphic tablet: Consists of an electronic writing area and a special 'pen' that works with it. Allows artists to create graphical images with actions similar to traditional drawing tools.

Touchpad: A touch pad is a pointing device found on the portable computers and some external keyboard. It allows moving the mouse pointer without external mouse.

Joystick: Used to play video games, control training simulators and robots. Can move the cursor and select object.

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

Scanner: Allows capturing of information, like pictures or text and converting it into a digital format that can be edited using a computer.

OMR: Scanning device that reads predefined positions and records where marks are made on the printed form. It is useful for applications such as objective type tests and questionnaires.

Bar Code Reader: A bar code is a set of vertical lines of different thicknesses and spacing that represent a number. Barcode readers are used to input data from such set of 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. to identify, verify and authenticate the identity of the user.

Smart card reader: These are used to access data in a smart card. Smart card is a plastic card that stores and transacts data. Used in banking, healthcare, telephonecalling, electronic cash payments and other applications.

Digital camera: Takes pictures and videos and converts it to the digital format. Web camera is a compact and less expensive version of a digital camera. Web camera is also a type of digital camera.

Output devices: Output devices are devices that print/display output from a computer.

Visual Display Unit (VDU): [Monitor]Display devices include CRT monitors, LCD(Liquid Crystal Display) monitors, TFT monitors, LED (Light Emitting Diode)monitors, Gas plasma monitors, Organic Light Emitting Diode (OLED) Monitors, etc.

CRT Monitor :- Resembles Television set type. Two types- Monochrome displays character and images in a single colour in black background. Colour monitors displays different colours using three basic colours, red, green and Blue.

LCD(Liquid crystal Display) : Uses Liquid crystal sandwiched between two plastic plates. These crystals rearrange to form an image when an electric current is passed through them. Light source from behind the plates makes the picture visible

LED: - LED monitors use LED directly behind the liquid crystal display in order to light up screen. Which provides better colour quality, Clarity, wider viewing angle, faster refresh rates and power saving

Plasma Monitors : A flat-panel display consists of sandwiching neon/Xenon gas between sealed glass plates with parallel electrodes deposited on their surface. When a voltage pulse is passed between two electrodes, the gas lights up as different colour. It produce high quality display but expensive.

Organic Light Emitting Diode : made up of millions of tiny LED. In OLED there is carbon in the light emitting layer. They produce high quality image with better viewing angle and consume less power but very expensive.

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. The output printed on paper is known as hardcopy. Classified as Impact or Non-impact printers.

Dot-matrix uses impact mechanism. It can print carbon copies with less printing cost. These printers are slow and noisy. Dot matrix printer uses small electromagnetically activated pins in the print head and inked ribbon, to produce images by impact.

Inkjet printers are non-impact printers that form the image on the page by spraying tiny droplets of ink from the print head. Ink jet printers are inexpensive, but the cost of ink cartridges makes them costly. Ink jet printers can produce multicolour print.

Laser printers are non-impact printers that produce good quality images. Monochrome and colour laser printers are available. Laser printers are faster and their speed is rated in pages per minute (ppm).

Thermal printer is a non-impact printer that produces a printed image by selectively heating heat sensitive thermal paper when it passes over the thermal print head. It is popular as a portable printer. Quality of the print is less and it will fade and curl with days.

Plotter: A plotter is an output device used to produce hardcopies of graphs and designs on the paper. They are of two type Drum Plotter and Flat bed Plotter.

Drum Plotter/Roller Plotter : It consists of a drum or roller on which paper is laced and it can move back and forth. A drawing arm with a pen moves side to side to create an image

Flatbed Plotter/Table plotter : Here paper is placed on a flat surface and has two drawing arms with pens. The drawing arms moves over the paper to produce images .it is more complicated and slower.

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.

Audio output: Audio output devices produce sound as output. Eg: Speakers and Head phones.

e-Waste: e-Waste refers to electronic products nearing the end of their "useful life".

e-Waste disposal methods:

a)Reuse: It refers to second-hand use or usage after the equipment has been upgraded or modified.

b)Incineration: It is a controlled and complete combustion process in which the waste is burned in specially designed incinerators at a high temperature

c)Recycling of e-Waste: Recycling is the process of making or manufacturing new products from a product that has originally served its purpose.

d)Land filling: e-Waste material is buried in soil making deep pits.

Software: A general term used to denote a set of programs that help us to use the computer system. Two types - system software, application software.

System software: is a set of system programs which aids in the execution of a general user's computational requirements on a computer system.

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

Major functions of an operating system

i. Process management: It takes care of the allocation, de-allocation and scheduling of system processes.

ii. Memory management: It takes care of allocation and de allocation of memory.

iii. File management: It takes care of file related activities such as organising, naming, storing, retrieving, sharing, protection and recovery.

iv. Device management: It handles the devices connected to the computer by combining both hardware and software techniques.

Eg of operating systems are DOS, Windows, Unix, Linux, Mac OS, etc.

Language processors: Language processors are the system programs that translate programs written in high level language or assembly language into its equivalent machine language.

Types of language processors:

Assembler: Translates the program code written in assembly language to machine language

Compiler: Translates a program written in high level language into machine language.

Interpreter: Converts a HLL program into machine language line by line

Free and open source software: Free and open source software gives the user the freedom to use, copy, distribute, examine, change and improve the software.

The Free Software Foundation (FSF) defines the four freedoms for free and open source software:

Freedom 0 - The freedom to run program for any purpose.

Freedom 1 - The freedom to study how the program works and adapt it to your needs. Access to source code should be provided.

Freedom 2 - The freedom to distribute copies of the software.

Freedom 3 - The freedom to improve the program and release your improvements to the public, so that the whole community benefits.

Chapter 3 : Principles of Programming

Phases in programming
1. Problem identification
2. Preparing algorithms and flow charts
3. Coding the program using programming language
4. Translation
5. Debugging
6. Execution and testing
7. Documentation

Debugging: programming errors are known as 'bugs' and the process of detecting and correcting these errors is called debugging.

1)Syntax errors : When the rules or syntax of the programming language are not followed. Such program errors typically involve incorrect punctuation, incorrect word sequence, undefined term, or illegal use of terms or constructs. the syntax errors will be detected and displayed during execution.

**2)Logical error:** is due to improper planning of the program's logic.

3)Run-time error: due to the inappropriate data that is encountered in an operation causes interruption in execution.

Algorithm: an algorithm may be defined as a finite sequence of instructions to solve a problem.

Flowchart: pictorial representation of an algorithm

Flow Chart Symbols:
1. Terminal:-indicate start and stop
2. Input/output: denotes input/output functions
3. Process: represents processing steps
4. Decision:indicate the point decisions have to be made
5. Flow lines: indicate the flow of operation
6. Connector:Used to join flow of lines
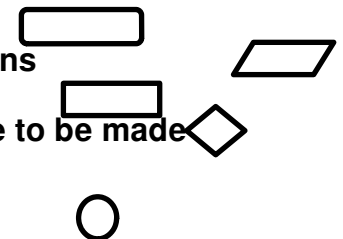
Example 3.2: To find the area and perimeter of a rectangle

We know that this problem can be solved, if the length and breadth of the rectangle are given. The result can be obtained by using the following formula:

$$\text{Perimeter} = 2\,(\text{Length} + \text{Breadth}), \quad \text{Area} = \text{Length} \times \text{Breadth}$$

Let L and B be variables for length and breadth; and P, A be variables for perimeter and area.

Step 1: Start
Step 2: Input L, B
Step 3: P = 2 * (L + B)
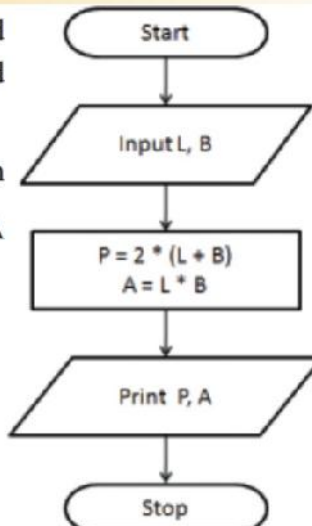Step 4: A = L * B
Step 5: Print P, A
Step 6: Stop

Fig. 3.6 : Flow chart for Area and Perimeter

Eg.Algorithm and Flow Chart to find biggest of two

Step 1: Start
Step 2: Input H1, H2
Step 3: If H1 > H2 Then
Step 4:   Print H1
Step 5: Else
Step 6:   Print H2
Step 7: End of If
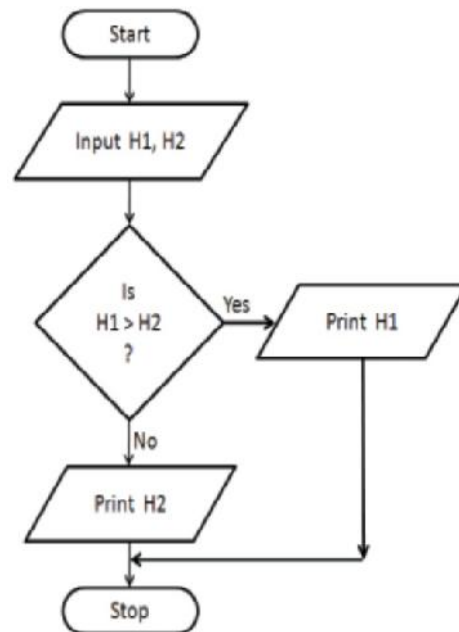Step 8: Stop

Fig. 3.8 : Flowchart to find larger value

Chapter 4 :Getting Started with C++

Tokens: The fundamental building blocks of the program.

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

eg.asm ,continue ,float ,new ,signed.

b)Identifiers: Identifiers are the user-defined words that are used to name different program elements such as memory locations, statements, functions, objects, classes etc.**eg.**Count, Sumof2numbers, _1stRank,Main, Average_Height, FOR.

The rules for naming identifiers:
- The name cannot start with a letter. It can start with underscore (_).
- Keywords cannot be used as identifier.
- White spaces and special symbols are not allowed, except underscore(_).
- Upper case and lower case letters are treated differently ie, case sensitive

c)Literals:the type of tokens called literals to represent data items that never change their value during the program run. They are often referred to as constants. Literals can be divided into four types as follows:

  1. **Integer literals** :are whole numbers without fractional part eg: 9856, 569…

  2. **Floating point literals:**numbers having fractional parts eg 3.14, 7.06

  3. **Character literals:**single characters enclosed within single quotes eg:'A', 'y'

  4. **String literals:**enclosed in double quotes eg:"A", "Hello"

d)Punctuators: Special symbols that have syntactic or semantic meaning to the compiler. These are called punctuators. **Examples** are: # ; ' " ( ) [ ] { }

e)Operators: An operator is a symbol that tells the compiler about a specific operation. T C++ provides different types of operators like arithmetic, relational, logical, assignment, conditional, etc.

Chapter 5 : Datatypes and Operators.

Fundamental data types: Fundamental data types are defined in C++ compiler. They are also known as built-in data types. .The five fundamental data types in C++ are char , int , float , double and void .

a)int data type: `to store integer numbers, occupies 4 bytes in memory`

b) char data type: `to store characters, occupies 1 bytes in memory`

c) float data type: `for storing fractional numbers, occupies 4 bytes in memory`

d) double data type: `for storing double precision floating point numbers. It takes 8 bytes of memory`

e) void data type: `specifies an empty set of data, occupies no memory (0 bytes).`

Variables: Variables are the names given to memory locations. There are three important aspects for a variable.

i. Variable name: It is a symbolic name (identifier) given to the memory location through which the content of the location is referred to.

ii. Memory address: All the variables are connected to one or more memory locations in RAM. The base address of a variable is the starting address of the allocated memory space. The address is also called the L-value of a variable.

iii. Content of a Variable: The value stored in the location is called content of the variable. This is also called the R-value of the variable.

Operators: An operator is a symbol used to perform an operation.

    i)   **Operator Classification based on number of operands**

Unary operator: Unary operator functions on a single operand eg: a++, -b, d—

Binary operator: Binary operator acts on two operands. eg a+b, c/q

Ternary operator: A Ternary operator (?:) acts on three operands.

    ii)   **Operator Classification based on its Use**

Arithmetic operators: Arithmetic operator are used for arithmetic operations (+,-,*,/,%)

Relational operators: Relational operators are used to compare values.(<,>,<=,>=)

Logical operator: Logical operators allows us to combine two or more conditions.(&&,||,!)

Input operators: The >> operator is called extraction or get from operator. Used to store data from keyboard in a memory location. Eg: cin>>num;

Output operators: The operator << is called insertion or put to operator. Used for output operations eg: cout<<num;

Cascading of I/O operators: `The multiple use of input or output operators in a single statement is called cascading of I/O operators. Eg: cin>>a>>b>>c;` `cout<<a<<b<<c;`

Assignment operator (=): to store a value in a variable assignment operator(=) is used. Eg: num=50;

=	==
Assignment Operator	Equal to Operator
Used to assign a value to a variable	Used for Equality checking
As result value is stored in variables memory location	The result will be either true or false
eg: a=10;	eg: a==10

Expressions:
An expression is composed of operators and operands which returns a result.

Integer expressions : All operands in the expressions are integers returns an integer as result. eg: 5+x/y

Floating point expression /Real expression: An arithmetic expression composed of only floating point data and it returns a floating point result. Eg: 10.3+a+b

Relational expression: The relational expression consists of relational operators.eg a>b, c==d.

Logical expression: combine two or more relational expressions with logical operators and produce either True or False result.

Statements:
are the smallest executable unit of a programming language.

i)Declaration Statements: to tell the compiler about the type of data that will be stored in it.
 Eg: int admno;   float avg,per;

ii)Assignment Statement: to assign a value to a variable using assignment operator eg: a=50;

iii)Input Statement: Allow user to store data in memory eg: cin>>num;

iV)Output Statement: Makes results available to users through any output devices. Eg: cout<<num;

Control 6. Introduction to Programming

Structure of a C++ program
    #include<header file>
    using namespace identifier;
    int main()
    {
    Statements;
       ;
       ;
    return 0;
    }

eg:

    #include<iostream>
    using namespace std;
    int main()
    {
    cout<<"My Program";

    return 0;
    }

Pre-processor directive: Pre-processor directives are compiler directive which instructs the compiler to process information before actual compilation. Pre-processor directives begins with # (hash) symbol. Eg:-#define, #undef, #include..

Concept of namespace: Different identifiers are associated to a particular namespace. It is a group name in which each item is unique in its name.

Header files: Header files contain the information about functions, objects and predefined derived data types that are available along with compiler eg: #include<iostream>

The main() function: The execution of a C++ program starts and ends within main().

Variables in C++:
Variables are named memory locations used for storing data. There are three aspects for a variable, its name, L –value and R–value.

Variable Initialisation: Supplying value to a variable at the time of its declaration Eg: int admno = 5475;

Arithmetic Assignment Operator: condensed form of arithmetic & assignment operator(+=,-=,*=, /=,%=)

Increment (++) and Decrement(--) operators: The

increment operator increases the value by one and the decrement operator decreases the value by one.

Prefix increment and decrement operator: Here incremented or decremented is done first and value is used, this method is called change then use method.eg: a=++n; b=--x;

Postfix increment and decrement operator. Here value is used first and increment or decrement is done this method is called use then change method.eg: a=n++;b=x--;

Type conversion: converting one data type to another data type. There are two types of type conversion

i)Implicit type conversion (Type promotion) : is performed by C++ compiler internally. C++ converts the lower sized operands to the data type of highest sized operand. eg: float x; x= 5/2;

ii) Explicit type conversion(Type casting): Programmer explicitly casts to the desired type. eg: x=(float)p/q;

Chapter 7. Control Statements.

Statements used for altering the default flow of execution.
(i) Decision making / selection statements: statements for the selected execution based on a condition.
if statement: used to select a set of statements for execution based on a condition
Syntax: eg:
if (test expression)   if (score >= 18)
{   cout << "You have Passed";
statement block;
}

if...else statement: used to select a set of statements for execution when a condition is true and some actions when the condition becomes False.
Syntax: eg:
if (test expression)   if (score >= 18)
{   cout << "Passed";
statement block 1;   else
}   cout << "Failed";
else
{
statement block 2;
}
Switch Statement:

Eg: switch (day)
            {
            case 1: cout << "Sunday";break;
            case 2: cout << "Monday";break;
            case 3: cout << "Tuesday";break;
            default: cout << "Wrong input";
            }

`switch statement`	`else  if ladder`
Permits multiple branching.	Permits multiple branching.
Evaluates conditions with equality operator only.	Evaluate any relational or logical expression.
Case constant must be an integer or a character type value.	Condition may include range of values and floating point constants.
When no match is found, default statement is executed.	When no expression evaluates to True,else block is executed.
break statement is required for exit from the switch statement.	Program control automatically goes out after the completion of a block.
More efficient when the same variable or expression is compared against a set of values for equality.	More flexible and versatile compared to switch.

`else  if ladder :` It is used in programs when multiple branching is required. Different conditions will be given and each condition will decide which statement is to be selected for execution.
eg:
if (score >= 80)
        cout<<"A Grade";
              else if (score >= 60)
                    cout<<"B Grade ";
                        else if (score >= 40)
                              cout<<"C grade";
                                  else if (score >= 30)
                                      cout<<"D grade";
                                            else
                                      cout<<"E Grade";

ii)Iteration statements or Looping statements: to perform the repeated execution of one or more statements. A variable like the counter will be used to construct a loop. This variable is generally known as *loop control variable* because it actually controls the execution of the loop

Four elements of a loop:

Initialisation: Before entering a loop, its control variable must be initialised. The initialization statement is executed only once, at the beginning of the loop.

Test expression: It is a relational or logical expression whose value is either True or False.

Update statement: The update statement modifies the loop control variable by changing its value.

Body of the loop: The statements that need to be executed repeatedly constitute the body of the loop. It may be a simple statement or a compound statement

`while statement:`
Syntax:
```
    initialisation of loop control variable;
    while(test expression)
    {
    body of the loop;
    Updation of loop control variable;
    }
```

```
Eg:    int n = 1;
            while(n <= 10)
            {
            cout << n << " ";
            ++n;
            }
```

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

Eg:for (n=1; n<=10; ++n)
     cout << n << " ";

for loop	while loop	do..while loop
Entry controlled loop	Entry controlled loop	Exit controlled loop
Initialisation along with loop definition	Initialisation before loop definition	Initialisation before loop definition
No guarantee to execute the loop body at least once	No guarantee to execute the loop body at least once	Will execute the loop body at least once even though the condition is False

do...while statement:
Syntax:
```
initialisation of loop control variable;
do
{
body of the loop;
Updation of loop control variable;
} while(test expression);
```

Eg:

```
do
    {
    cout << k << '\t';
    ++k;
    } while(k<=3);
```

Chapter 8 Computer Networks

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

Advantages of computer Networks
Resource sharing: The sharing of available hardware and software resources in a computer network is called resource sharing

Price-performance ratio: Since resources can be shared the cost purchasing licensed software for each computer can be reduced by purchasing networked version of such resources

Communication: Computer network helps users to communicate with any other uses of that network through its services like-mail, chatting, video conferencing etc

Reliability: it is possible to replicate or backup data/ information in multiple computers using the network. This helps user to retrieve date in the case of failures in accessing of data.

Scalability: Computing capacity can be increased or decreased easily by adding or removing computers to the network.

Some key terms
Bandwidth : bandwidth measures the amount of data that can be send over a specific connection in a given amount of time.

Noise: Noise is unwanted electric or electromagnetic energy that lowers the quantity of data signals.

Node: Any device which is directly connected to a network is called a node.

Data communication devices:
Switch : Like hub Switch is also used to connect computers on a network. But it an intelligent device and transmits the received data to the destination only. A switch performs better than in a bust network, since it generate less network traffic. Expensive than hub.

Repeater : Repeater is a device that regenerates incoming, electrical, wireless or optical devices through communication medium.

Bridge : A bridge is a device used to segmentise a network. When a data packet reaches the bridge it find out the receiver if it is addressed to node at the other side, will be allowed to pass the bridge.

Router : A device that can interconnect two networks of the same type using the same protocol. It is more intelligent than bridge. It can find the optimal path for data packets to travel and reduce the amount of traffic in the network.

Gateway : A gateway is a device that can interconnect two different networks having different protocol. It can translate one protocol to another. It can also find the optimal path.

Data Terminal Equipments:

Data terminal equipment is a device the flow to or from a computer.

Modem : A modem is a device used to for communication between computer through telephone lines

Network topologies

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

Bus topology: In bus topology all the nodes are connected to a main cable called bus. A small device called terminator is attached each end of the bus. If a node has to send data to another node, it sends to the bus. The signal travels through the bus and each node check the address and
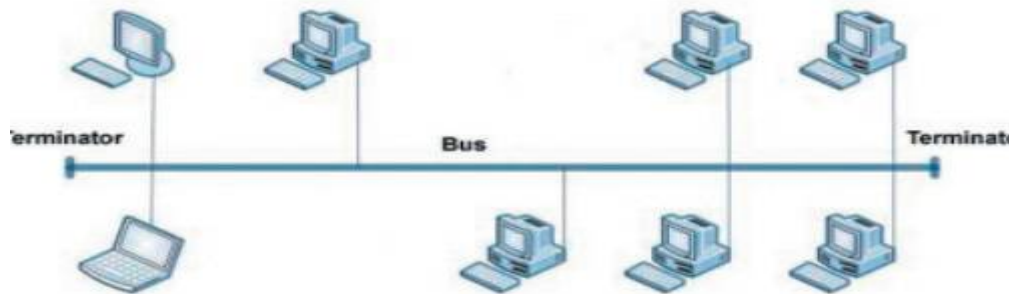
Fig. 8.23 : Bus topology

intended node will accept the data. When the signal reaches the end of the bus terminator removes the data from the bus.

Star topology: In star topology each node is connected a hub/ switch. If a node has to send some information to any other node, it sends the signal to the switch or hub. Signal then broadcasted to all other nodes in the case of hub and forwarded to intended node in the case of switch
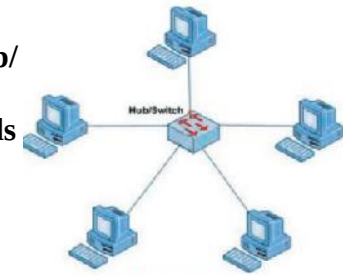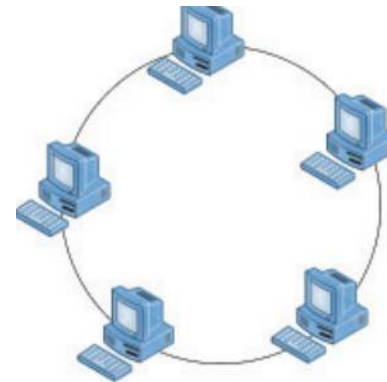
Fig. 8.24 : Star topology

Ring topology: in ring topology all nodes are connected using a cable that loops the ring or circle. A ring topology forms a ring.Data travels only in one direction in a ring. Each node regenerates the signal and pass to next node until it reaches the intended node reaches.

Fig. 8.25 : Ring topology

Mesh topology : In mesh topology, every node is connected to other nodes, So there will be more than one path between two nodes. Network will not fail even if one path between the nodes fails.

Fig. 8.26 : Meshopology

On the basis of the area covered, computer networks are classified as:

PAN (Personal Area Network): PAN is a network of communicating devices in the proximity of a individual

LAN (Local Area Network): LAN is a network of computing and communicating devices in a room building or campus. It can cover an area of few meters to few kilometres.

MAN (Metropolitan Area Network): MAN is a network of computing and communication devices within a city. It can cover an area few kilometres to a few hundred kilometres radius. MAN is usually formed by interconnecting a number of LANs and individual computers

WAN (Wide Area Network): WAN is a network of computing and communicating devices crossing the limits of a city, country or continent.

Identification of Computers on a network

Media Access Control (MAC) address: A universally unique address (12 digit hexadecimal number) assigned to each NIC (Network Interface Card) by its manufacturer. First Six digit for the ID number of the manufacturer and remaining serial number of adapter.
MM : MM : MM : SS : SS : SS or MM – MM – MM – SS – SS – SS
eg. 00:A0:C9 : 14:C8:35

IP address: An IP address is a group of four bytes (or 32 bits) each of which can be a number from 0 to 255. IP address is provided to each machine by the network administrator or by the Internet service provider.
eg.168 . 20 . 1 . 2

Chapter 9 Internet

Services on Internet

www   Search engines   E-mail   Social media

WWW:WWW is a client- server system, which consists of millions of clients and servers connected together accessed using a URL(Uniform Resource Locator).

Browser: It is software that helps to view a webpage. A browser can display text, images, videos, hyperlinks etc of a webpage. Eg Google Chrome, Internet Explorer, Mozila Firefox, Opera, Safari etc

Web Browsing: Web Browsing is the process of visiting the web site of various companies, organizations for any kind of information.

Search Engines: Search engine programs search documents available on World Wide Web for specified keywords and return a list of the documents/web pages matching the keywords. Search engine web sites use programs called web crawlers or spiders or robots to search the web. Eg:. For search engine are Google, Yahoo Search, Bing, Ask etc

Email (Electronic Mail): It is an electronic message send from one computer to another through the internet.

Cyber security:

Computer Virus:
It is computer program that attachés itself to another program or file to spread from one computer to another and can cause damages to your computer, delete files etc.

Trojan horse: Trojan Horse appear to be useful s/w but will actually do damage once you installed on the computer. A Trojan horse can delete files, destroy information on the system.

Hacking: It is the process of gain unauthorized access to data in a system or computer. The person who involved in hacking is called Hacker.

Phishing: Phishing is an attempt to acquire information such as usernames, passwords, and credit card details of a person by using a fake website in the place of original website of a bank/financial organization.

Chapter 10 – IT APPLICATIONS

E-Governance: It is use of ICT for delivering govt. services to citizens in an efficient and transparent manner. The objective of E-Governance is to ensure that govt. services reach the public effectively.

Types of interactions in E-governance

Government to Government (G2G): It is the sharing of data/information between govt. agencies, depts.. etc.

Government to Citizens (G2C): Here citizens can enjoy various public services. It also improves the quality of service

Government to Business (G2B): Here the business community can interact with govt. and hence to cut red tapism, save time ,reduce cost.

Government to Employees(G2E): It helps for the interaction between govt and the employees working in govt. Departments.

E-Governance Infrastructure: The E-governance infrastructure consists the following.

1.State Data Centre(SDC): SDC keeps the central data repository (storage area) of the state. It keeps the data of citizens collected for various purpose, securing of data storage, on line delivery services, citizen information/services portal, state intranet services, disaster recovery etc.

2.Kerala State Wide Area Network(KSWAN): It act as a backbone for the e-governance infrastructure. It connects TVM, Kochi and Kozhikkode as its hubs and extends to all 14 districts connecting all the block panchayaths.

3. Common Service Center (CSC): They are the front end delivery points of the government, private services to people. Eg Akshaya centres

E-Business: E-business is the sharing of business information, conducting business transactions, marketing etc by using ICT application. It helps for reduce communication and travels cost through on line meeting.

E-Learning: The use of electronic media and ICT tools for learning purpose is called e learning.

E Learning Tools: There are many tools for e learning process. They are

- Electronic books reader (e-Books)
- e-Text
- On line chat
- E- Content:
- Educational TV channels.

Advantages of E learning(Benefits)

e-learning has the ability to offer courses Cost of e learning is less. It saves your money, time & journey People with limited financial resource can use the lower cost of e learning. People can do on line courses from various nationally/internationally reputed institutions E learning offers courses on variety of subjects. Time and place is not a constraint for e learning.

Challenges to e Learning:

Face to face contact between students and teachers is not possible
Proper interaction among teacher and student are often limited.
For e learning computer and high speed internet connection is required
Real time Laboratory experiments cannot be performed in e learning.
Learners who need constant motivation may not be serviced properly.

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