First Year
Computer Application (Commerce)
Focus Area Based Notes

Chapter 1 : Fundamentals of Computer

Data And Information

Data denotes raw facts and figures such as numbers, words, amount, quantity etc. It does not give a complete meaning.
Information 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	• Clear and meaningful

Functional Units of a Computer

- A computer has four basic functional units. They are
- ➢ Input unit
- ➢ Central processing unit
- ➢ Storage unit
- ➢ Output Unit

John Von Nuemann(1903 – 1957) proposed the model of basic organization of Computer .
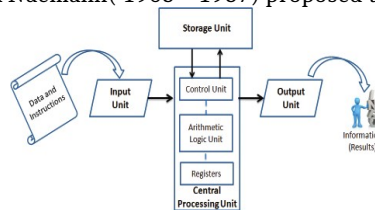
- **Input Unit**: Used to enter collected data and instructions for processing into computer.Commonly used input devices are keyboard, mouse, microphone etc
- **CPU (Central Processing Unit)**:It is the brain of a computer.The functions of CPU are performed by three components - Arithmetic Logic Unit(ALU), Control Unit (CU) and Registers.
- **Storage Unit:** The storage units are of two types : Primary Storage and Secondary Storage
- **Output Unit**: The results produced by the CPU is given to the user. Commonly used output devices are Monitor, Printer, Speaker , Projector etc

Computer and its Characteristics:

- Computer is an electronic machine used to accept data and instructions, process the data according to a set of instructions and output the results or information.

- **Characteristics of a computer:**
  Speed:A computer can perform millions of operations in a second or in fraction of second
  Accuracy:A computer can perform arithmetic operations with a very high degree of accuracy.
  Diligence: Since computer is a machine, it can operate for long hours untiringly. Unlike human beings, it will not show any emotion.
  Versatility: Computer can be used to perform many different kinds of processing tasks. It is   a general purpose data processing machine.
   Huge memory: Computer has highest storage capacity. Large amount of data can be stored in its memory for processing.

  Limitations
  Lack of IQ:
  A computer does not have natural intelligence as humans have.
  Lack of decision making power
  A computer cannot take its own decision like human beings.

Number Conversions:

- A number system is a systematic way to represent numbers.
- Each number system has its own symbols and method for constructing a number.
- The number of symbols used in a number system is called base or radix of a number system.
- Various number systems are – Decimal, Binary, Octal and Hexa Decimal
- Decimal to Binary
  The decimal number is successively divided by 2   and its reminder is recorded.

Example:

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

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

Find binary equivalent of $(80)_{10}$.

2	80		Remainders	
2	40	0		LSB
2	20	0		
2	10	0		
2	5	0		
2	2	1		
2	1	0		
	0	1		MSB

$(80)_{10} = (1010000)_2$

- **Decimal to Octal** :The number is successively divided by 8 and the remainders are recorded.

  Example: Find octal equivalent of decimal number 125.

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

$(125)_{10} = (175)_8$

- **Decimal to Hexadecimal** : The number is successively divided by 16 and the remainders are recorded.

  Example: Find hexadecimal equivalent of decimal number 155.

16	155		Remainders	
16	9	11 (B)	→	LSD
	0	9	→	MSD

$(155)_{10} = (9B)_{16}$

  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**: A binary number can be converted to its decimal form by summing together the weights of the various positions in the binary number.

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

$(11011)_2$ = $1×2^4 + 1×2^3 + 0×2^2 + 1×2^1 + 1×2^0$

= $16 + 8 + 2 + 1$

= 27

Weight	2^4	2^3	2^2	2^1	2^0
Bit	1	1	0	1	1

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

- **Octal to Decimal:**
  An octal number can be converted into its decimal equivalent by summing up the product of each octal digit and its weight. Weights are some powers of 8 ($8^0\ 8^1\ 8^{2.......}$).

Example: Convert $(157)_8$ to decimal.

$(157)_8$ = $1×8^2 + 5×8^1 + 7×8^0$

= $64 + 40 + 7$

= 111

Weight	8^2	8^1	8^0
Octal digit	1	5	7

$(157)_8 = (111)_{10}$

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

$(1005)_8$ = $1×8^3 + 0×8^2 + 0×8^1 + 5×8^0$

= $512+5$

= 517

Weight	8^3	8^2	8^1	8^0
Octal digit	1	0	0	5

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

- **Hexadecimal to Decimal**
  An hexadecimal number can be converted into its decimal equivalent by summing up the product of each hexadecimal digit and its weight. Weights are powers of 16 (16^0, 16^1, 16^2, …).

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

$(AB)_{16}$ = $10×16^1 + 11×16^0$

= $160 + 11$

= 171

Weight	16^1	16^0
Hexadecimal digit	A	B

A = 10   B = 11

$(AB)_{16} = (171)_{10}$

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

$(2D5)_{16}$ = $2×16^2 + 13×16^1 + 5×16^0$

= $512+208+5$

= 725

Weight	16^2	16^1	16^0
Hexadecimal digit	2	D	5

D = 13

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

Shortcut Method for Converting

1.Binary To Octal

A binary number can be converted into its octal equivalent by grouping binary digits to group of 3 bits and then each group is converted to its octal equivalent. Start grouping from right to left.

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

$(101100111)_2 = (547)_8$

Example: Convert $(10011000011)_2$ to octal.

We can group the given binary number 10011000011 from right as shown below.

> After grouping, if the left most group does not have 3 bits, then add leading zeros to form 3 bit binary.

010	011	000	011
↓	↓	↓	↓
2	3	0	3

$(10011000011)_2 = (2303)_8$

2. Octal to Binary

An octal number can be **converted** into **binary** by converting each octal digit to its 3 bit binary equivalent.

Octal digit	0	1	2	3	4	5	6	7
Binary equivalent	000	001	010	011	100	101	110	111

Binary equivalent of octal digit

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

3-bit binary equivalent of each octal digits are

4	3	7
↓	↓	↓
100	011	111

$(437)_8 = (100011111)_2$

3. Binary To Hexadecimal

A **binary number can be converted into its hexadecimal** equivalent by grouping binary digits to group of 4 bits and then each group is converted to its hexadecimal equivalent. Start grouping from right to left.

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

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

Example: Convert $(110111100001100)_2$ to hexadecimal.

We can group the given binary number 110111100001100 from right as shown below.

After grouping, if the left most group does not have 4 bits, then add leading zeros to form 4 bit binary.

0110	1111	0000	1100
↓	↓	↓	↓
6	F	0	C

$(110111100001100)_2 = (6F0C)_{16}$

4. Hexadecimal to Binary

A hexadecimal number can be converted into binary by converting each hexadecimal digit to its 4 bit binary equivalent.

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

4-bit binary equivalent of each hexadecimal digits are

A	B
↓	↓
1010	1011

$(AB)_{16} = (10101011)_2$

Hexa decimal	Binary equivalent
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

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a)Representation of 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.

Number is positive, so first bit (MSB) is 0.

7 bit binary equivalent of $23 = (0010111)_2$

So + 23 can be represented as $(00010111)_2$

Sign	←		Magnitude			→	
0	0	0	1	0	1	1	1

Example: Represent -105 in sign and magnitude form.

Number is negative, so first bit(MSB) is 1.

7 bit binary equivalent of $105 = (1101001)_2$

So -105 can be represented as $(11101001)_2$

Sign	←		Magnitude			→	
1	1	1	0	1	0	0	1

ii.1's complement representation:

In this method, first find binary equivalent of absolute value of integer. If number of digits in binary equivalent is less than 8, provide zero(s) at the left to make it 8-bit form. 1's complement of a binary number is obtained by replacing every 0 with 1 and every 1 with 0.

Example: Represent -119 in 1's complement form.

$$\text{Binary of } 119 \text{ in 8-bit form} = (01110111)_2$$
$$-119 \text{ in 1's complement form} = (10001000)_2$$

Example: Represent +119 in 1's complement form.

$$\text{Binary of } 119 \text{ in 8-bit form} = (01110111)_2$$
$$+119 \text{ in 1's complement form} = (01110111)_2$$

(No need to find 1's complement, since the number is positive)

iii.2's complement representation:

In this method, first find binary equivalent of absolute value of integer and write it in 8- bit form. If the number is negative it is represented as 2's complement of 8-bit form binary. 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.

$$\text{Binary of 38 in 8-bit form} = (00100110)_2$$
$$-38 \text{ in 2's complement form} = 11011001 +$$
$$1$$
$$= (11011010)_2$$

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

$$\text{Binary of 38 in 8-bit form} = (00100110)_2$$
$$+38 \text{ in 2's complement form} = (00100110)_2$$

(No need to find 2's complement)

Representation of characters:

ASCII : The code called ASCII (pronounced "AS-key"), which stands for American Standard Code for Information Interchange, uses 7 bits to represent each character in computer memory.

Eg: ASCII code of A is 65, its binary equivalent in 7-bit is 1000001.

UNICODE: Represent all characters of written languages of the world and other symbols.

It provides a unique number for every character, no matter what the language and platform be. Unicode originally used 16 bits which can represent up to 65,536 characters.

CHAPTER 2 : COMPONENTS OF THE COMPUTER SYSTEM

Primary memory

It is a semiconductor memory that is accessed directly by the CPU. It is capable of sending and receiving data at high speed. **Random Access Memory(RAM)** is a primary memory.

- RAM stores the operating system,application programs and data when the computer is functioning.
- RAM allows reading and writing.
- It is volatile,ie it contents are lost when the device is powered off.

Memory measuring units are given below.
- 1 bit – 1 or 0(Binary Digit)
- 4 bits – 1 Nibble
- 8 bits – 1 Byte
- 1024 Bytes – 1 KB(KiloByte)
- 1024 KB – 1 MB(Mega Byte)
- 1024 MB – 1 GB(Giga Byte)
- 1024 GB – 1 TB(Tera Byte)
- 1024 TB – 1 PB(Peta Byte)

Input devices:

Input devices : An input device is used to enter data into a computer. It provides communication between the user and the computer.

➢ **Keyboard :** It is the standard and most commonly used input device. It allows the user to input alphabets, numbers and other characters.

➢ **Mouse** : It is a small hand-held device used to indicate the position of a cursor or its movement on a computer display screen by rolling it over a mouse pad / flat surface. The different types of mouse are ball, optical and laser mouse.

➢ **Light pen:** It is a pointing device shaped like a pen. Light pens have the advantage of 'drawing' directly onto the screen. They are used by engineers, artists, fashion designers for Computer Aided Designing (CAD) and drawing purposes.

➢ **Touch screen**: It is an input device that allows the user to operate by simply touching on the display screen. Some computers, tablets, smart phones, etc. have touch sensitive display screens.

➢ **Graphic tablet:** A graphics tablet consists of an electronic writing area and a special "pen" that works with it. Graphic tablet allows artists to create graphical images with motions and actions similar to traditional drawing tools.

➢ **Touchpad** : Touchpad is a pointing device found on the portable computers and some external keyboards. Touchpad is operated by using finger and dragging it across the flat surface.

➢ **Joystick :** It is an input device used for playing video games, controlling training simulators and robots. Used as a pointing device.

➢ **Microphone**: Attached to a computer to input sound. It accepts sound in analog format and converts it to digital.

➢ **Scanner**: Scanners can capture information, like pictures or text, and convert it into a digital format that can be edited using a computer. The quality of the image depends on the resolution of the scanner.

➢ **Optical Character Recognition (OCR)** software is used to recognize the printed text in an image scanned and convert it into proper text format, which can be edited by a text editor.

➢ **Optical Mark Reader (OMR)** :OMR technology is useful for applications in which large number of hand-filled forms need to be processed quickly with great accuracy, such as objective type tests and questionnaires.

➢ **Biometric sensor :**A biometric sensor is a device used to read human physical features like fingerprints, retina, iris patterns, etc.

➢ **Smart card reader :**A smart card is a plastic card that stores and transacts data. The data card may contain a memory or a microprocessor. The smart card is used in most banking, healthcare, telephone calling, electronic cash payments and other applications.

➢ **Digital camera :** A digital camera can take pictures and videos and convert them into digital format.

Output Devices:

Devices that print/display output from a computer. Outputs are of two types **hardcopy output** and **softcopy output**.

Output devices that produce hardcopy outputs are printers and plotters.

Softcopy outputs are electronic and are available on the screen in a digital form. A common softcopy output device is the Visual Display Unit (VDU).

Visual Display devices include Cathode Ray Tube (CRT) monitors, Liquid Crystal Display (LCD) monitors, Thin Film Transistor (TFT) monitors, Light Emitting Diode (LED) monitors, gas plasma monitors,OLED Monitors

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

Printers:
Different types of printers **impact** and **non-impact** printers. In Impact printers there is a contact between print head and paper. Eg: DotMatrix Printer.
Non-impact printers do not touch the paper while printing.Eg:Inkjet Printer,Laser Printer,Thermal Printer.

Plotter
A plotter is an output device used to produce hardcopies of large-format graphs and designs, construction maps, engineering drawings and big posters on the paper. Plotters are of two types: **Drum plotters** and **Flatbed plotters.**

Three dimensional (3D) printer
A 3D printer is a new generation output device used to print 3D objects.

Audio output device
The audio output is the ability of the computer to produce sound. Speakers are the output device that produces sound. It is connected to the computer through audio ports.

Electronic Waste(E-waste):

The used electronics which are destined for reuse, resale, salvage, recycling or disposal are also considered as e-Waste.

e-Waste disposal methods:
The following disposal methods can be used for disposing e-Waste.
- ► **Reuse**: It refers to second-hand use or usage after the equipment has been upgraded or modified.
- ► **Incineration**: It is the process of burning e Waste at high temperature in the range of 900 to 1000 degree Celsius.
- ► **Recycling of e-Waste**: It is the process of making new products from this e-Waste.
- ► **Land filling:** It is one of the most widely used, but not recommended methods for disposal of e-Waste.

Software:
Software is a set of programs that help us to use computer system and other electronic devices efficiently and effectively.
There are two types of software:
- ► **System software** And **Application software**

System Software:
It is a set of programs designed for controlling the operations, move data into and out of a computer system and to do all the steps in executing application programs.

Components of system software are:

- ► Operating system
- ► Language processors

  ➢ **Operating system** is a set of programs that acts as an interface between the user and computer hardware.
- • **Major functions of an operating system are:**
  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.
  Examples of operating systems are **DOS, Windows, Unix, Linux, Mac OS**, etc.

> **Language processors** are used to convert High Level Language programs to machine language.
Language processors are:
Compiler: Compiler converts high level language into machine language. It scans the entire program in a single run.
Eg: C, C++, Pascal, etc uses compilers.
Interpreter: It converts high level language program in to line by 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 .
Freedom 1 - The freedom to study how the program works .
Freedom 2 - The freedom to distribute .
Freedom 3 - The freedom to improve the program .

Chapter 3 : Principles of Programming

Phases of Programming
1) Problem identification:
2) Algorithm and Flowchart:
3) Coding the program:
4) Translation:
5) Debugging:
6) Execution and testing
7) Documentation

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

Different ypes of errors -
Syntax error : error in program writing rule
Logical error: error in program logic
Runtime error: unexpected errors occurring in runtime

Algorithm : Finite sequence of instructions or step by step procedure to solve a problem.
Development of Algorithms:
1) Algorithm should begin with instruction(s) to accept inputs.
2) Variables must be used for inputting data and assigning values or results.
3) All instructios should be precise and unambiguous.
4) After performing the instructions given in the algorithm, the desired results (out-puts) must be obtained.

Flowchart:
The pictorial representation of an algorithm with specific symbols for instructions and arrows showing the sequence of operations.
Flowchart Symbols:

Symbol	Name	Denotes
	Terminator	START/STOP
	Parelellogram	Input/Output
	Rectangle	Process (Arithmatic operations)
	Rhombus	Decision making (Logical operations)
	Arrows	Flow direction
	Circle	Connectors

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1. Algorithm and Flowchart for finding the average of three numbers

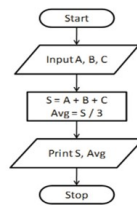Step 1: Start

Step 2: Input A, B,C

Step 3: S =A + B + C

Step 4: Avg = S/3

Step 5: Print S, Avg

Step 6: Stop

2.Find the height of the taller one among two students

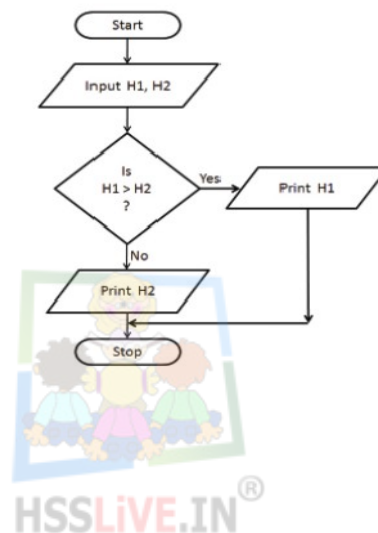Step 1: Start

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

Chapter 4 : Getting Started with C++:

Tokens

Tokens are Fundamental Building Blocks of the Program. They are also known as Lexical Units.
Tokens in C++ are:
1. Keywords
2. Identifiers
3. Literals
4. Punctuators
5. Operators

1) **Keywords :** The words (tokens) that convey a specific meaning to the Language compiler are called keywords. These are also known as reserved words.
Eg:int,char,void,for,if etc.

2) **Identifiers :** User-defin ed words that are used to name different program elements such as memory locations, statements, functions, objects, classes etc. The identifiers of memory locations are called variables.
Eg:rollno,ph_no,_adm123 etc.

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Rules for naming identifiers
- Identifier is an arbitrary long sequence of letters, digits and underscores (_).
- The first character must be a letter or underscore (_).
- White space and special characters are not allowed.
- Keywords cannot be used as identifiers.
- Upper and lower case letters are treated differently, i.e. C++ is case sensitive.

Eg of some valid identifiers : **name, ca_mark, _abc123** etc
Eg of some invalid identifiers : **123abc, switch, mark$ca** etc

3) **Literals**:
Represent data items that never change their value during the program run.
They are often referred to as constants.
Literals are of four types:

1. **Integer literals:** whole numbers without fractional part. (**eg : 100, -50, 256 etc**)
2. **Floating point literals:**A number with fractional part.(**eg :25.36, 0.001, 3.14, -32.5 etc**)
3. **Character literals:**A valid C++ character within single quotes. (**eg: 'a', '9' , '#' et**c)
4. **String literals:**One or more characters enclosed within double quotes.(**eg : "ahss", "c2a" etc**)

4) **Punctuators :**
Special symbols that have syntactic or semantic meaning to the compiler.
Eg: **#** ; ' " ( ) [ ] { }

5) **Operators:**
Symbols that tells the compiler about a specific operation. Different types of operators are arithmetic, relational, logical, assignment, conditional, etc. The operator is applied on a set of data called operands.
Eg : **+** **-** ***** **/** **%** **!** **&&** **||**

Chapter 5 : Data types and Operators:

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

1. **int** data type (for integer numbers)
Integers are whole numbers without a fractional part. GCC allows **4 bytes** of memory.

2. **char** data type (for character constants)
All letters, digits, special symbols, punctuations, etc. come under this category. When these characters are used as data they are considered as char type data in C++. Each char type data is allowed **one byte** of memory. The data items 'A', '+', '\t', '0', etc. belong to char data type.

3. **float** data type (for floating point numbers)
Numbers with a fractional part are called floating point numbers. GCC allows **4 bytes** of memory.

4. **double** data type (for double precision floating point numbers):
Floating point numbers with more precision. Such numbers are represented by double data type. GCC reserves **8 bytes** for storing a double precision value.

5. **void** data type (for null or empty set of values):
The data type void is a keyword and it indicates an empty set of data. Obviously it does not require any memory space(**0 byte**).

Name	Description	Size	Range
char	Character	1 byte	-128 to 127
int	Integer	4 bytes	-2147483648 to +2147483647
float	Floating point number	4 bytes	$-3.4 \times 10^{+/-38}$ to $+3.4 \times 10^{+/-38}$ with approximately 7 significant digits
double	Double precision floating point number	8 bytes	$-1.7 \times 10^{+/-308}$ to $+1.7 \times 10^{+/-308}$ with approximately 15 significant digits
void	Null data	0 bytes	Empty set

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Variables:

Variables are used to store data in memory locations.

i.**Variable name**

It is a symbolic name (identifier) given to the memory location .

ii. **Memory address**

The memmory location allotted for the variable is known as its memory address. The address is also called the L-value of a variable.

iii. **Content**

The value stored in the location is called content of the variable. This is also called the R-value of the variable. e.

Operators are predefined symbols that can carry out operations. The participants of an operation are called operands.operators are classified into three.

They are **Unary Operator, Binary Operator, Ternary Operator.**

Unary operators:

A unary operator operates on a single operand. Commonly used unary operators are unary+ (positive) and unary- (negative).

Variable	Unary +	Unary-
x	+x	-x
8	8	-8
0	0	0
-9	-9	9

Binary operators : Binary operators operate on two operands. **Arithmetic operators, relational operators, logical operators** etc. are the commonly used binary operators.

● **Arithmetic operator**s are defined to perform basic arithmetic operations such as addition(+), subtraction(-), multiplication(*) and division(/).

Variable x	Variable y	Addition x + y	Subtraction x − y	Multiplication x * y	Division x / y
10	5	15	5	50	2
−11	3	−8	−14	−33	−3.66667
11	−3	8	14	−33	−3.66667
−50	−10	−60	−40	500	5

● **Relational operators** are used for comparing numeric data. These are binary operators.The result of any

m	n	m<n	m>n	m<=n	m>=n	m!=n	m==n
12	5	0	1	0	1	1	0
−7	2	1	0	1	0	1	0
4	4	0	0	1	1	0	1

relational operation will be either True(1) or False(0).

● **Logical operators** are used for combining relational operations.The output of Logical operations are either True(1) Or False(0)

The Logical Operators are:

Name	Symbol
Logical AND	&&
Logical OR	||
Logical NOT	!

If two relational expressions E1 and E2 are combined using logical AND (&&) the result will be True(1) only if both E1 and E2 are True(1). In all other cases the result will be False(0).

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E1	E2	E1&&E2
0	0	0
0	1	0
1	0	0
1	1	1

If two relational expressions E1 and E2 are combined using logical OR (||) the result will be False(0) only if both E1 and E2 are False(0). In all other cases the result will be True(1).

E1	E2	E1 || E2
0	0	0
0	1	1
1	0	1
1	1	1

This operator is used to negate the result of a relational expression. This is a unary operation.
If the input is TRUE(1) output will be FALSE(0) and vice versa.

E1	!E1
0	1
1	0

Ternary operator
Ternary operator operates on three operands. The typical example is the conditional operator (?:)

Types of Expressions:
- An expression contains operators and operands.They are classified into **Arithmetic,Relational And Logical Expressions**
- **Arithmetic expressions** :Contains only arithmetic operators. The operands and results will be numeric values. Arithmetic expressions are classified into Integer,Floating Point(real) and Constant expressions.
  Integer expressions contains only integers as operands. The result also will be an integer.
  Floating Point Or Real expressions contains only floating point as operands. The result also will be a floating point.
- **Relational expressions**
  When relational operators are used in an expression, it is called relational expression and it produces Boolean type results like True (1) or False (0).
- **Logical expressions:C**ombine two or more relational expressions with logical operators and produce either True or False as the result. A logical expression may contain constants,variables, logical operators and relational operators.

Statements :
These are the smallest executable unit of a programming language. It ends with a semi colon(;). Different types of statements used in C++ are **declaration statements, assignment statements, input statements, output statements, control statements** etc.

1.Declaration statements: All the user defined words must be declared before it is used in the program.
Synatx of variable declaration:
data_type <variable1>[, <variable2>, <variable3>, …] ;
Eg:
int rollnumber;
2.Assignment Statement: When the assignment operator (=) is used to assign a value to a variable, it forms an assignment statement.
Syntax of assignment statement:
variable = constant;
Eg: A=15;
3.Input statement : used to read and store data in memory during execution of the program.cin is used to identify the.
 standard input stream device, keyboard.**getfrom or Extraction operator(>>) i**s used to extract data from the input stream.
Syntax of input statement:
streamobject >> variable;
Eg: cin >> num;

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4.Output statements make the results available to the users through any output device.The **put to or insertion operator (<<)** is used . The object named cout is used to identify the standard output device, monitor.

Syntax of Output Statement

streamobject << data;

Eg: cout << num;

Chapter 6 : Introduction to Programming

Structure of C++ Program:

```
#include <headerfile>
using namespace identifier;
int main()
{
    statements;
     :
     :
     :
    return 0;
}
```

```
#include<iostream> 1
using namespace std; 2
int main() 3
{ 4
    cout<<"Hello, Welcome to C++" 5
    return 0; 6
} 7
```

1) Preprocessor directive
2) Namespace statement
3) Header of main ( ) function
4) Opening brace – start of program
5) Output statement
6) Return statement
7) Closing brace – end of program

Variable initialisation: Storing value to a variable at the time of declaration.

Eg: **int X=120;**Here the OS allocates 4 bytes memory for the variable X and it stores a value 120.

Arithmetic assignment operator

Arithmetic assigment operation	Equivalent arithmetic operation
x += 10	x = x + 10
x -= 10	x = x - 10
x *= 10	x = x * 10
x /= 10	x = x / 10
x %= 10	x = x % 10

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

a.Increment (++) operator is used to increment the content of the variable by 1.

Example :   num=9; num++; (value of num becomes 10)

b. Decrement(--) operator is used to decrement the content of the variable by 1.

Example :   num=9; num--; (value of num becomes 8)

Prefix form : The operator is placed before the operand and the increment/decrement operation is carried out first. This method is often called change, then use method. Eg: --a, ++num

Postfix form : The operator is placed after the operand. The current value of the variable is used for the remaining operation and after that the increment/decrement operation is carried out.

Eg: a++, num--

Type conversion means converting the data type of one operand into another.Type conversion can be done in two ways.

1. **Implicit type conversion (Type promotion)**

In expressions where different types of data are involv, C++ converts the lower sized operands to the data type of highest. Ok aanu

2.**Explicit type conversion (Type casting)**

Programer can decide the data type of the result of evaluation by specifying the data type.

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Chapter 7 : Control Statements

Decision-making statements:
if statement:
Syntax: if (condition)
{
Statement block;
}
First, the condition is evaluated if it is true the statement block will be executed otherwise nothing will happen.

if… else statement:
Syntax: if (condition)
{
Statement block1;
}
else
{
Statement block2;
}

The else if ladder: The syntax will be given below
if (expression 1)
{
statement block 1;
}
else if (expression 2)
{
statement block 2;
}
else if (expression 3)
{
statement block 3;
}
else
{
statement block n;
}
Here firstly, expression 1 will be evaluated if it is true only the statement block1 will be executed otherwise expression 2 will be evaluated if it is true only the statement block 2 will be executed and so on. If all the expression evaluated is false then only statement block n will be executed

switch statement:
It is a multiple branch statement. Its syntax is given below.
switch(expression)
{
case value: statements;break;
case value: statements;break;
case value: statements;break;
case value: statements;break;
case value: statements;break;
…………..
default: statements;
}
First expression evaluated and selects the statements with matched case value. If all values are not matched the default statement will be executed.
Iteration statements: If we have to execute a block of statements more than once then iteration statements are used.

while statement
It is an entry controlled loop. An entry controlled loop first checks the condition and execute(or enters in to) the body of

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loop only if it is true. The syntax is given below
Loop variable initialised
while(expression)
{
Body of the loop;
Update loop variable;
}
Here the loop variable must be initialised before the while loop. Then the expression is evaluated if it is true then only the body of the loop will be executed and the loop variable must be updated inside the body. The body of the loop will be executed until the expression becomes false.
or statement

for loop
The syntax of for loop is
for(initialization; checking ; update loop variable)
{
Body of loop;
}
First part, initialization is executed once, then checking is carried out if it is true the body of the for loop is executed. Then loop variable is updated and again checking is carried Out this process continues until the checking becomes false. It is an entry controlled loop.

do – while statement: It is an exit controlled loop. Exit control loop first execute the body of the loop once even if the condition is false then check the condition.
do
{
Statements
} while(expression);
Here the body executes at least once even if the condition is false. After executing the body it checks the expression if it false it quits the body otherwise the process will continue.

Comparison of Loops:

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

Chapter 8 : Computer Networks

Need/Use of computer networks

- **Data communication is possible** : Computer network helps user to communicate with any other user of the network through its services like e-mail chatting etc.
- **Resource Sharing :** The sharing of available hardware and software resources (like programs,printers , hard disk etc..) in a computer network is called resource sharing.
- **Reliability:** A file can have copies in different computers. So breaking down of one system does not cause data loss.
- **Scalability** :Computing and storage capacity can be increased or decreased easily by adding/removing computer or storage devises to the network.
- **Price –Performance ratio:**The cost of purchasing licensed software for each computer can be reduced by purchasing networked version of such software without any compromises in performance.

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KeyTerms:
Bandwidth: The maximum amount of data that can be transmitted by the medium measured in Hertz.
Noise: It is the unwanted electrical or electromagnetic interferences that adversely affect the transmitted data signals.
Node: A computer or an I/O device connected to a network is called Node.

Data communication devices
Provides interface between computer and communication channel.Used to transmit, receive, amplify and route data signals

Switch:
- An intelligent device that connects several computers to form a network.
- Determines the destination and redirect the data only to the intended node generating less network traffic.
- Stores the addresses of all the devices connected to it in a table.

Bridge :
A bridge is a device used to segmentise a network ie a network can be split into different segments and can be interconnected using a bridge.This reduces the amount of traffic on a network.

Router:
It is similar to a bridge, but it can connect two networks with same protocols.

Gateway:
It is used to connect two different networks with different protocols.

Modem(Modulator Demodulator)
A modem is an electronic device used for communication between computers through telephone lines.
It converts digital signals received from a computer to analog signals for telephone lines and vice versa.

Network Topologies
The way in which the nodes are physically interconnected to form a network is called a Topology.
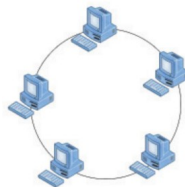
Bus topology : all the nodes are connected to a main cable called bus.
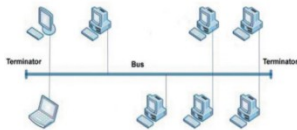
Star topology : In star topology each node is directly connected to a hub/switch. More efficient compared to bus topology.

Ring topology: All nodes are connected using a cable that loops in a ring or circle.

Mesh topology: Every node is connected to other nodes. There will be more than one path between two nodes. If one path fails, the data will take another path and reach the destination.

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Types of networks

The networks are classified into the following based upon the amount of geographical area that covers.

i) Personal Area Network(PAN): It is used to connect devices situated in a small radius by using guided media or unguided media

ii) Local Area Network (LAN): This is used to connect computers in a single room, rooms within a building, or buildings of one location by using twisted-pair wire or coaxial cable. Here the computers can share hardware and software. The data transfer rate is high and the error rate is less.

eg: The computers connected in a school lab.

iii) Metropolitan Area Network (MAN): A Metropolitan Area Network is a network spread over a city. For example a Cable TV network. MAN has a lesser speed than LAN and the error rate is less. The here optical fiber cable is used.

iv) Wide Area Network (WAN): This is used to connect computers over a large geographical area. It is a network of networks.

Here the computers are connected using telephone lines or Micro Wave stations or Satellites. Internet js an example for this. LAN and MAN are. owned by a single organization but WAN is owned by multiple organizations. The error rate in data transmission js high. ,

Media Access Control (MAC) address

A Media Access Control (MAC) address is a universally unique address (12 digit Hexa decimal number) (or 48 bit Binary) numbers. MAC address of an NIC(Network Interface Card) is permanent and never changes.

MM : MM : MM : SS : SS : SS or MM – MM – MM – SS – SS – SS

Internet Protocol (IP) Address

An IP address is a unique 4 part numeric address assigned to each node on a network, for their unique identification. An IP address is a group of four bytes (or 32 bits) each of which can be a number from 0 to 255.

Chapter 9 : Internet

Services on Internet:

World Wide Web (WWW) : WWW is a huge client-server system consisting of millions of clients and servers connected together.

Browser : A web browser is a software that we use to retrieve or present information and to navigate through web pages in the World Wide Web. Some common browsers are **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.** Some of the most popular web search engine sites are Google, Bing, Yahoo Search, Ask, etc.

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

The structure of an e-mail address is: **user name@domain name.**

An example of an e-mail address is scertkerala@gmail.com

Social media :

Social media refers to the use of mobile and web-based technologies through which individuals and communities can create, share, discuss and modify content.

Cyber security

It is the practice of defending computers and servers, mobile devices, electronic systems, networks and data from malicious attacks.

- **Computer Virus:** A computer virus is a program that attaches itself to another program and interferes with the normal operation of a computer. A virus might corrupt or delete data on our computer.
- **Trojan Horse:** A Trojan horse can cause serious damage by deleting files and destroying information on the system.Unlike viruses and worms, Trojans do not reproduce by infecting files nor do they self-replicate.
- **Hacking:**Hacking is a technical effort to manipulate the normal behaviour of network connections and connected systems. Hacking is performed both by computer security experts and by computer criminals.
- **Phishing:** Phishing 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.

Chapter 10 : IT APPLICATIONS

E-Governance

The integration of computers and communication technology for the benefit of government functions to the public is termed as E-Governance.

Types of E-Governance:

- **Government to Government(G2G)**: Electronically exchanging data or information among Government agencies, departments, or organizations.
- **Government to Citizens(G2C):** Exchange information between Government and Citizens
- **Government to Business(G2B):** Interaction between the Government and Businessmen.
- **Government to Employees(G2E):** The exchange of information between the Government and its employees

E-Governance Infrastructure:

It consists of **State Data Centre(SDC),Kerala StateWide Area Network(KSWAN) and Common Service Centre(CSC).**

State Data Centre: For providing core infrastructure and storage.It minimizes the overal cost of data management ,resorce manage ment etc.

Kerala StateWide Area Network(KSWAN): It has been set up as a backbone of the State Information Infrastructure(SII).It connects all the 14 districts linking each of the 152 block panchayaths also connects various Govt.Departments.

CommonServiceCentre:

These are the delivery points of the Goverment,Private and service for the Rural Citizens in India.

CSC   services are :

• Agriculture services	• Education and training services
• Health services	• Rural banking and insurance services
• Entertainment services	• Commercial services

AKSHAYA CENTRE is an example of CSC.

State Date Centre (SDC)

State Wide Area Network (SWAN)

Common Service Centre (CSC)
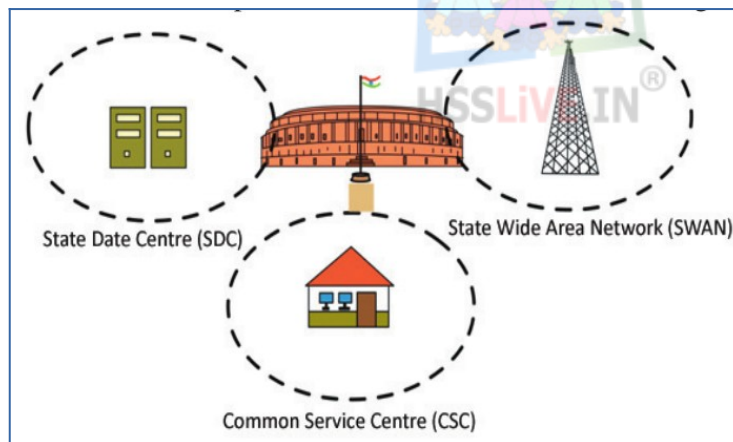
E-business(electronic Business)

Providing services or running a business through the internet is called E-business.

- e-commerce and e-business: Both are different. E-commerce means Electronic commerce. It includes the exchange of goods or services through the internet that involves the exchange of money whereas e-Business includes activities to run a business.

Advantages of e-business:

- It overcomes geographical limitations
- It reduces the operational cost
- It minimizes the time and cost
- It remains open all the time

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- We can locate the product faster from a wider range of choices

Challenges to E-business
- Peoples are unaware of IT applications and its uses
- Most peoples don't have plastic money(credit/debit card) and net banking
- It requires high-security measurements otherwise you may lose money
- We can't touch or smell products through online

e-Learning

The use of electronic media and ICT in education is termed e-Learning.E learning tools for E-Learning processes are:

e-Learning tools

•**Electronic books reader(eBooks):** With the help of a tablet or portable computer or any other device we can read digital files by using an s/w is called electronic books reader.

•**e-text**: The electronic format of textual data is called e-Text.

• Online chat: Real-time exchange of text or audio or video messages between two or more people over the Internet.

•**e-Content:** The data or information such as text, audio, video, presentations, images, animations etc, are stored in electronic format.

•**Educational TV channels:** TV channels dedicated only for the e-Learning purpose.

Eg. VICTERS (Virtual Classroom Technology on Edusat for Rural Schools OR Versatile ICT Enabled Resources for Students)

Advantages of E-Learning :
- It can offer a variety of courses to a large number of students from distant locations.
- It saves journey time and money, instructor fees, etc.
- People can enjoy e-Learning at a lower cost
- It enables people to do courses conducted by national or international institutions.

Challenges to e-Learning
- Face to face contact between student and teachers is not possible interaction is limited lack of infrastructure facilities
- Its implementation requires a computer and high-speed Internet
- The pupil may not get the proper motivationIt does not provide a real lab facility

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Thank You

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