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Focus Area Notes

Computer Applications

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Computer Applications
Focus Area

1. Fundamentals of Computer	Data and information, Functional units of computer, Computer and its characteristics, Number conversions - Decimal to non-decimal and reverse, Shortcut methods (avoid fractional conversion), Representation of integers (Sign & Magnitude, 1's and 2's compliments) and characters (ASCII & Unicode).
2. Components of the Computer System	Primary memory (RAM and measuring units), Input - Output devices, e-Waste and disposal methods, System software (OS, Language processors compiler and interpreter), Free and open source software.
3. Principles of Programming and Problem Solving	Phases in programming (Listing only), Debugging (Types of errors), Development of algorithms and flowcharts to solve simple problems only (except looping).
4. Getting started with C++	Tokens and classification with examples
5. Data Types and Operators	Fundamental data types, Variables, Operators and classifications, Types of expressions, Types of statements.
6. Introduction to Programming	Structure of C++ program, Variable initialization, Arithmetic assignment operators, Increment - decrement operators, Type conversion. (No programming).
7. Control Statements	Decision making statements (if, if-else, if-else if, switch), Iteration statements (while, for, do-while) - syntax and working, (No programming). (Nesting not required)
8. Computer Networks	Advantages of network, Key terms (Bandwidth, noise, node), Data communication devices(switch, router,

15.06.2021	gateway, bridge, modem), Types of network (PAN, LAN, MAN, WAN), Network topologies, Identification of computers over network (MAC, IP)
9. Internet	Services on Internet (Working procedure is not required), Cyber security (Computer virus, Trojan horse, hacking, phishing).
10. IT Application	e-Governance (Types, infrastructure), e-Business, e Learning (Including benefits and challenges)

Chapter 1

Fundamentals of Computer

> Focus Area: Data and information, Functional units of computer, Computer and its characteristics, Number conversions - Decimal to non-decimal and reverse, Shortcut methods (avoid fractional conversion), Representation of integers (Sign & Magnitude, 1's and 2's compliments) and characters (ASCII & Unicode).

Data

Data denotes raw facts and figures that can be processed or manipulated.

E.g. Babu, 20

Information

Information is the meaningful and processed form of data. It is generated by performing some operations on data.
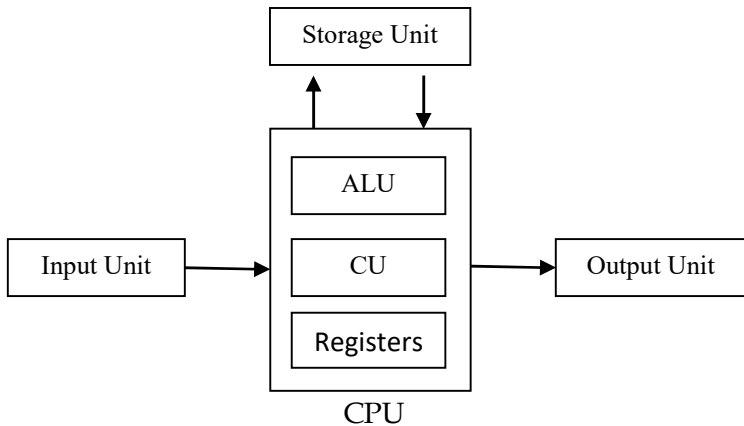
E.g. Babu is 20 years old

Difference between Data and Information

Data	Information
Raw facts and figures	Processed data
Similar to raw material	Similar to the finished product
Cannot be directly used	Helps in taking decisions
No precise and clear sense	Clear and meaningful

Functional Units of a Computer

John Von Neumann proposed the stored program concept of a computer with the following classification. The functional units of a computer are input unit, CPU, output unit and storage unit. CPU contains ALU, CU and registers.

```
        ┌──────────────┐
        │ Storage Unit │
        └──────────────┘
          ↑        ↓
     ┌────────────────────┐
     │   ┌────────────┐   │
     │   │    ALU     │   │
     │   └────────────┘   │
→ Input Unit → │   │    CU      │ → Output Unit
     │   └────────────┘   │
     │   ┌────────────┐   │
     │   │ Registers  │   │
     │   └────────────┘   │
     └────────────────────┘
            CPU
```

Input Unit

The data and instructions are entered to the computer through this unit. Keyboard and mouse are examples of input devices.

CPU (Central Processing Unit)

It is the most important unit of a computer. CPU is known as the brain of the computer. CPU contains three units, ALU (Arithmetic and Logic Unit), Control Unit (CU) and Registers.

ALU is responsible for all arithmetic operations such as addition, subtraction, multiplication, division etc. ALU is also responsible for logical operations such as comparison.

CU controls and coordinates all operations. Registers are high speed and volatile temporary storage units.

Output Unit

The output (information) is obtained from the computer through this unit. Monitor and printer are examples of output devices.

Storage Unit (Memory Unit)

Data, instructions and information are stored in this unit. Two types of memory units are **primary memory** and **secondary memory**. Primary

memorycontains RAM and ROM. Secondary memories are used for permanent storage.

Number System

There are four types of number systems namely **Decimal, Binary, Octal and Hexadecimal.** The number of symbols (digits) used in a number system is called the **base** (radix) of the number system. We normally use decimal number system in our daily life. Computer uses Binary for processing. Each digit of a binary number is called a **bit** (binary digit). Octal and Hexadecimal systems are used to save memory and easier conversion to and from binary.

The table below shows the base and the digits used in each number system

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

Number conversions
I. Decimal to Other Number system conversion

For converting a decimal number to other number system, divide the number continuously with the base of the number system and then take the reminders in reverse order.

1. Decimal to Binary

a. Convert 100 to binary

2	100	
2	50	0
2	25	0
2	12	1
2	6	0
2	3	0
	1	1

$100 = 1100100_2$

2. Decimal to Octal

b. Convert 1000 to octal

8	1000	
8	125	0
8	15	5
	1	7

$1000 = 1750_8$

3. Decimal to Hexadecimal

c. Convert 1000 to hexadecimal

16	1000	
16	62	8
	3	14 (E)

$1000 = 3E8_{16}$

II. Other Number system to Decimal conversion

To convert from other system to binary, multiply each digit by place value (power of base) and find the sum.

1. Binary to Decimal

a. Convert 111011_2 to decimal
    Its positional weight is

1	1	1	0	1	1
2^5	2^4	2^3	2^2	2^1	2^0

$$= 1 \times 2^0 + 1 \times 2^1 + 0 \times 2^2 + 1 \times 2^3 + 1 \times 2^4 + 1 \times 2^5$$
$$= 1 \times 1 + 1 \times 2 + 0 + 1 \times 8 + 1 \times 16 + 1 \times 32$$
$$= 1 + 2 + 0 + 8 + 16 + 32$$
$$= 59 = 59_{10}$$

2. Octal to Decimal

b. Convert 756 to Decimal

$$= 6 \times 8^0 + 5 \times 8^1 + 7 \times 8^2$$
$$= 6 \times 1 + 5 \times 8 + 7 \times 64$$
$$= 6 + 40 + 448$$
$$= 494_{10}$$

3. Hexadecimal to Decimal

c. Convert 9BA to Decimal

$$= 10 \times 16^0 + 11 \times 16^1 + 9 \times 16^2$$
$$= 10 \times 1 + 11 \times 16 + 9 \times 256$$
$$= 10 + 176 + 2304$$
$$= 2490_{10}$$

Number Representation

For representing positive and negative numbers in a computer, three methods are used. Those are

1. Sign and magnitude
2. 1's complement
3. 2's complement

1. Sign and magnitude

In this method, the left most bit is used for sign (+ve or -ve). If the left most bit is zero, then the number is positive. If the left most bit is one, then the number is negative.

0	+ve
1	-ve

E.g. Represent 5 and -5 using sign and magnitude method using 4 bits

$5 = 0101$

$-5 = 1101$

In this method we have two representations for zero, 0000 and 1000 (With 4 bits)

If there are n bits, then we can represent numbers from

$$- (2^{n-1} - 1) \text{ to } +(2^{n-1} - 1)$$

ie., with 4 bits we can represent -7 to +7 $(2^{4-1} - 1 = 8-1=7)$

2. 1's Complement

In this method numbers are represented as

Positive numbers - As it is (No change)

Negative numbers - Complement of the respective positive number

(Complement of 1 is 0 and complement of 0 is 1)

E.g. Represent +19 and -19 in 1's complement using 8 bits

+19 = 00010011

- 19 = 11101100

In this method also there are two representations for zero.

If there are n bits, then we can represent numbers from

$$- (2^{n-1} - 1) \text{ to } +(2^{n-1} - 1)$$

3. 2's Complement

In 2's complement method, numbers are represented as

Positive numbers - As it is (No change)

Negative numbers - Adding 1 to the 1's complement of that number

E.g. Represent +19 and -19 in 1's complement using 8 bits

+19 = 00010011

- 19 = 11101101 (11101100 + 1)

In 2's complement there is only one representation for zero.

If there are n bits, then we can represent numbers from

$$- (2^{n-1}) \text{ to } +(2^{n-1} - 1)$$

Comparison between different methods (Assume 8 bits are used)

	Sign and Magnitude	1's complement	2's complement
Range	-127 to +127	-127 to + 127	-128 to +127
Representation for zero	2	2	1
Total numbers	255	255	256
For representing positive number	As it is	As it is	As it is
For representing negative number	Left most bit 1 and the rest is same	Complement of +ve number	1's complement +1

Representation of Characters

Different methods are used for character representation. Those are ASCII, EBCDIC, ISCII and Unicode.

1. ASCII

ASCII stands for American Standard Code for Information Interchange. It uses 7 bits for representation. A unique number binary number is assigned to each character in this method.

E.g. ASCII code of A = 1000001

Another version of ASCII is ASCII-8 which uses 8 bits. It can represent 256 characters.

2. Unicode

It is developed by Unicode consortium. It is basically a 16 bit code. Nowadays Unicode uses more than 16 bits. It can represent all written languages in the world.

EXCERCISES

1 Score Questions

1. Processed form of data is known as ……

2. CPU stands for ………

3. The base of octal number system is …….

4. How many different digits does the Hexadecimal number system contain?

5. ASCII stands for …………

6. Which number representation can represent all written languages in the world?

2 Score Questions

1. Represent -25 in 2's complement method.

2. Explain sign and magnitude method.

3. 63_{10} = ------- $_2$.

4. 10110110_2 = -------- $_8$

5. Explain Unicode.

3 Score Questions

1. Convert the decimal number 42.125 to binary.

2. 123_8 = ------ $_{16}$

3. Explain the functional units of a computer.

Chapter 2

Components of the Computer System

> Focus Area: Primary memory (RAM and measuring units), Input - Output devices, e-Waste and disposal methods, System software (OS, Language processors compiler and interpreter), Free and open source software.

Hardware

Hardware is the tangible and visible parts of a computer.
E.g. Processor, motherboard etc.

Software

Software is a set of programs which helps to use the computer system efficiently and effectively.
E.g. Operating System, MS Office, Antivirus etc.

Memory

Memory is used to store data and instructions temporarily or permanently. Memory measuring units are given below

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

Memory can be classified in to two, primary memory and secondary memory.

Primary Memory

Primary memory holds data and results temporarily. It is semiconductor memory. It is directly accessed by the CPU. It can send and receive high speed data. Three types of primary memory are RAM,ROM and cache.

   i.   **RAM**

RAM (Random Access Memory) is used directly by the CPU. Data can be stored and retrieved anywhere from RAM with the same speed. RAM is volatile (Contents will be lost when power is off). Capacity of RAM is 2GB, 4GB, 8GB etc.

   ii.   **ROM**

ROM(Read Only Memory) is a permanent memory. It can only be used for read operations. ROM is non-volatile. It is used to store boot-up program called BIOS. It is slower than RAM.

Difference between RAM and ROM

RAM	ROM
It is faster than ROM	Slower
It stores OS, programs and data	It stores boot programs
It allows reading and writing	Allows reading only
It is volatile	Non-volatile

Input Devices

a) **Keyboard:** It is used to input alphabets, numbers and other characters. Keyboard detects the key pressed and generates the corresponding ASCII code which can be recognized by the computer. Usually it consists of 101 to 105 keys.

b) **Mouse:** It is a pointing device to point and select objects from the screen. It is also used to draws pictures. Various types are ball, optical and laser.

c) **Optical Mark Reader (OMR):** OMR scans and detects marks made by a dark pencil or pen on a special pre-printed form. They are used in, objective type exam and surveys.

d) **Magnetic Ink Character Reader (MICR):** It can recognize human readable characters printed on documents with magnetic ink and special font. It is used in bank cheques to print cheque number. It helps to manipulate the cheques very fast with high accuracy.

e) **Bar Code Reader/Quick response Reader:** It converts a pattern of printed bars (a sequence of black and white lines of different widths) in to a number. It is used to identify products, books, certificates etc. A QR code is similar to barcodes but a QR code can hold more information than a barcode. Barcodes are single dimensional whereas QR codes are two dimensional.

f) **Scanner:** They are used to scan and digitalize images, documents etc. Here a light source moves to and fro to read the document and the detector converts the document to digital image.

g) Digital Camera: A digital camera allows taking pictures and videos and converting them into digital format.

h) Web Camera: Web camera is a compact and less expensive version of a digital camera. It is used in computers for video calling, video chatting, etc. It does not have an internal memory.

i) Microphone: They help us to input sound to the computer. It translates the vibration in the air in to electric pulse. The sound can store and reuse for voice recognition applications.

j) Joystick: It is a pointing device used to select and move objects on the screen. They are mainly used to play games and controlling robots

k) Track Ball: It is also a pointing device like mouse. It has a ball which can rotate to control the cursor movements.

l) Light Pen: Light pen is a pointing device. It is used to draw pictures, design objects and also to put digital signatures directly on the screen. It is used by artist, designers etc.

m) Touch Screen: It enable the user to input data by touching the screen. So key board, mouse etc can be avoided and it made the interface user friendly.

n) Touch Pad: A touchpad is a pointing device found on the portable computers (laptops) and some external keyboards. It allows moving the mouse pointer without the need of an external mouse. It is operated by using finger and dragging it across the flat surface.

o) Graphic Tablet: A graphics tablet consists of an electronic writing area and a special pressure sensitive "pen" that works with it. It allows artists to create graphical images

p) Biometric Sensor: A biometric sensor is a device that identifies unique human physical features like fingerprints, retina, iris patterns, etc. with high accuracy.

q) **Smart Card Reader**: Smart card readers are used to access data in a smart card. It can be contact type or contactless.

r) **Optical Character Reader (OCR):** An OCR is a device that can read characters printed with a predefined font.

Output Devices

Output devices are devices that produce hard copy (permanent copy on a paper) or soft copy outputs (electronic and are available in a digital form). Different types of output devices are VDU, printers and plotter.

I. Visual Display Unit

It is a standard and soft copy output device of the computer. Information shown on a display device is called softcopy because the information exists electronically and is displayed for a temporary period of time. Different VDU are CRT monitor, Flat panel monitor and LCD projector.

a. CRT Monitor (Cathode Ray Tube)

It is like old television set.

Disadvantages of CRT Monitors**:** They are heavy, Bulky in size, High power consuming, not portable and it will make eyestrain.

b. Flat panel Monitors

i) LCD (Liquid Crystal Display): They are made up of special kind of liquid crystals, placed between two plates. When electricity passed through it, crystal liquid become solid and blocks the light. Advantages of LCD Monitors: They are weightless, Slim in size, Low power consuming, Portable and they do not make eye strain.

ii) LED (Light Emitting Diode) Screen: It is also like LCD, but light source is an array of LEDs. It will create more clear pictures than LCD. Its advantages are better color quality, clarity and power savings.

iii) Plasma Monitors: Plasma monitors provide high resolution display but are expensive.

iv) Organic Light Emitting Diode (OLED) Monitors: OLED screens are thinner and lighter than LCDs and LEDs. It produce high quality images, consume less power but very expensive. They can produce better quality images and have a better viewing angle.

c. LCD Projector

Projector is used to display images, videos and slides to a large screen. It is connected to a computer and the display of the computer is exactly shown in the projected surface.

II. Printer

Printers are used to produce hardcopy output. Two types of printers are impact printers and non-impact printers. **Impact printers** directly contact with the paper. Its mechanism is like typewriting. It produces noise and it is slow. E.g. Dot matrix printer. **Non-impact printers** do not touch the paper. E.g. inkjet, laser and thermal printers. The quality of a printer is determined by its resolution (DPI) and speed (Character per second/ lines per minute).

a. Dot Matrix Printer

It uses small pins in the head and inked ribbon to produce images by impact. These printers are slow and noisy. But its cost is very low and carbon copies can be taken.

b. Inkjet Printer

The print head sprays tiny droplets of ink on the page. The printer needs several colors of ink. The printer is inexpensive but the cost of cartridges is high.

c. Laser Printer

It produces quality images. The image is transferred to a drum using laser beam. The **toner** powder is sprayed on the drum and it is transferred to a paper by rolling the paper over drum. Through heating the powder is fused on to the paper. Monochrome and color laser printers are available. It is fast and noiseless.

d. Thermal Printer

It uses heat sensitive thermal paper. The paper is selectively heating when it passes over the print head. The coating turns black where it is heated, producing the image. It is faster, smaller, lighter, and consume less power. It is ideal as portable printers. It is used by conductors, used at restaurants etc.

III. Plotter

It is an output device used to produce hard copies of graphs and designs. It is used to produce construction maps, engineering drawing and big posters. Two types of plotters are Drum plotters and Flatbed plotters

a. Drum plotter

It is also known as roller plotter. It consists of a rotating drum and a drawing arm with coloured ink pens. The drawing arm moves side to side and the paper is rolled back and forth.

b. Flatbed plotter

It is also known as table plotter. The paper is fixed over a rectangular flatbed table. It uses two drawing arms with coloured ink pens. The drawing arm moves over the paper and draws the graph. It is very slow.

IV. 3D Printer

It is a new generation output device used to print 3D objects. It can print anything like plastic toys, machine parts, chocolate cakes etc. Printing is done bottom to top layer by layer.

V. Audio output device

Speakers are the output device which produces sound. It is connected through the audio ports of a computer

E-waste

E-waste refers to electronic products nearing the end of their 'useful life'. It can be discarded computers, electronics, mobile phones,

television sets and refrigerators. This e-waste contains toxic materials which cause cancer, reproductive disorders and many health problems.

E-waste disposal methods

1. Reuse

It refers to second-hand use or usage after the equipment is modified. Used equipments are passed to relatives or exchanging for money or passed on to charity institutes.

2. Incineration

It is a complete combustion process. The waste is burned in specially designed incinerators at a high temperature in the range of 900 to 1000 degree Celsius.

3. Recycling

It is the process of making new products from old products. Monitors, keyboards, hard drivers, CDs, mobiles, printers, CPUs, memory chips etc. can be recycled.

4. Land filling

It is one of the most widely used methods. In this method soil is excavated and waste material is buried in it, which is covered by a thick layer of soil.

Software

Software is a set of programs that help to use computer system efficiently and effectively. The two types of software are system software and application software.

System Software

System softwares are programs designed to control the operations of a computer. It controls the operation of hardware. Also it gives services to application softwares. System softwares include Operating System and Language processors.

1. Operating System (OS)

It is the most important software in a computer. OS is an interface between user and hardware. The OS makes the system convenient to use. OS controls and co-ordinates the operations of a computer.

E.g. Windows 15.06.2024 7, Ubuntu, DOS etc.

Functions of OS

   a. Process management

     Process is a program in execution. OS allocates, de-allocates and schedules processes

   b. Memory management

     OS keeps track of all memory location. It allocates and de-allocates memory

   c. File management

     OS does the file management activities such as organizing, naming, storing, retrieving, protection, recovery etc.

   d. Device management

     OS controls peripheral devices using device driver softwares.

2. Language processors

Language processor converts the programming language, into machine language. Three language processors are assembler, interpreter and compiler

   a. Interpreter

     Interpreter converts High level program to machine language line by line. If there is an error in one line, it reports the error and stops execution. E.g. The programming language BASIC is interpreted.

   b. Compiler

     Compiler converts high level program to machine language. It compiles the entire program and reports, the list of errors. E.g. The programming language C++ has many compilers.

Free and Open source software

Free and open source software gives the user the freedom to use, copy, change and distribute the software. Nowadays free and open source software is widely used throughout the world. Four freedoms are

Freedom 0 - Freedom to run

Freedom 1 - Freedom to change and adapt

Freedom 2 - Freedom to distribute copies
Freedom 3 - Freedom to improve and release to public

Example for free and open source software are GNU/Linux (Operating System), GIMP (GNU Image Manipulation Program), Mozilla Firefox (browser), Openoffice.org (Office suite - writer, calc, impress)

Freeware and Shareware
Difference between freeware and shareware is given below

Freeware	Shareware
Freely available	Only trial version is available for free
All the features are free	All the features are not available before purchase
Can distribute	Permission is needed to distribute

EXCERCISES

1 Score Questions

1. Set of programs which helps to use the computer efficiently is known as ….

2. ……software is the most important software in a computer.

3. Joystick is a/an …………. device.

4. The process of burning e-waste in high temperature is known as ….

5. …. printer need heat sensitive paper for printing.

6. ……. Converts high level language to machine language line by line.

7. C++ is an example for ……. language in a computer.

2 Score Questions

1. What is a port? Write an example for a port.

2. What is an operating system?

3. What is a 3D printer?

4. Explain different freedoms related with open source software.

3 Score Questions

1. Explain any three ports in a computer.

2. Explain different E-waste disposal methods.

3. Explain the following

   a. Interpreter   b. Compiler
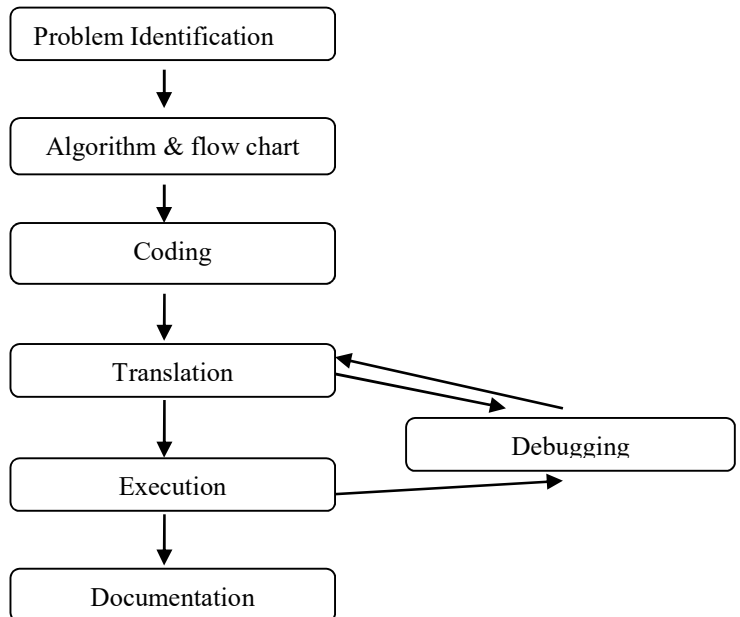
Chapter 3

Principles of Programming and Problem Solving

Focus Area: Phases in programming (Listing only), Debugging (Types of errors), Development of algorithms and flowcharts to solve simple problems only (except looping).

Program

Sequence of instructions written in a computer language is known as computer program.

Phases in Programming

The phases in programming are

```
┌─────────────────────────┐
│  Problem Identification  │
└─────────────────────────┘
            ↓
┌─────────────────────────┐
│  Algorithm & flow chart  │
└─────────────────────────┘
            ↓
┌─────────────────────────┐
│         Coding           │
└─────────────────────────┘
            ↓
┌─────────────────────────┐
│       Translation        │ ←──────┐
└─────────────────────────┘        │
            ↓              ┌──────────────────┐
┌─────────────────────────┐│    Debugging     │
│       Execution          │└──────────────────┘
└─────────────────────────┘        ↑
            ↓          ─────────────┘
┌─────────────────────────┐
│      Documentation       │
└─────────────────────────┘
```
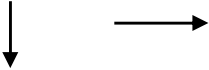
1. Algorithm and flowchart

Algorithm

Algorithm is the step-by-step procedure to solve a problem. Arab mathematician Al-Khowarizmi is the father of the modern algorithm.

Flowchart

The pictorial representation of an algorithm is known as flowchart. A flowchart uses specific symbols and arrows for showing the sequence of operations. The symbols used are

1. Terminal (START/STOP) Symbol – Ellipse	
2. Input/Output Symbol – Parallelogram	
3. Process Symbol – Rectangle	
4. Decision Symbol – Rhombus	
5. Flow lines Symbol – Arrows	
6. Connector Symbol - Circle with a letter	

Advantages of Flowchart

    a. Better communication :- program logic can be explained easily

    b. Effective analysis:- Analyzing the program is easy

    c. Effective synthesis:- Synthesis is easy

    d. Efficient coding:- Coding is easy if a flowchart is prepared.

Limitations of Flowchart

    a. Time consuming

    b. Changing the logic may require complete redrawing

c. No standards available

Debugging

Debugging is the process of detecting and correcting errors (bugs).

There are three types of errors

a. Syntax errors :- Syntax errors occur when the rules (syntax) of the language are not followed. E.g. Not using semicolon at the end, incorrect word, undefined term etc.

b. **Logical errors :-** These errors occur when the programmer makes a logical mistake. Logical errors may not be detected by the compiler. E.g. placing + symbol instead of * symbol.

c. Run-time errors :- These errors are detected only during the execution. E.g. Try to divide a number by zero.

Questions

1. Write an algorithm and draw a flowchart to find the area and perimeter of a rectangle

Let L, B, P, A are the variables for length, breadth, perimeter and area
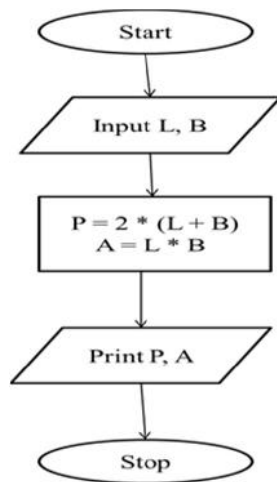
Step 1: Start

Step 2: Input L, B

Step 3: P = 2 * (L + B)

Step 4: A = L * B

Step 5: Print P, A

Step 6: stop

2. Write an algorithm and draw a flowchart to find the height of the taller one among two students

Let H1, H2 are the variables for height of the two students
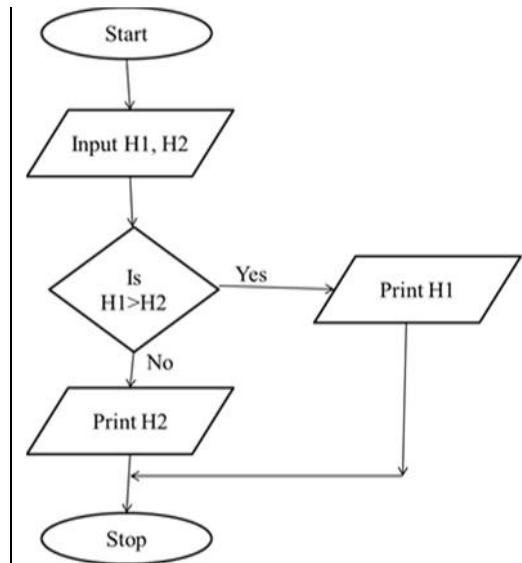
Step 1: Start

Step 2: Input H1, H2

Step 3: If H1 > H2 Then

Step 4:   Print H1

Step 5: Else

Step 6:   Print H2

Step 7: Stop

1 Score Questions

1. Rectangle symbol in flowchart is used for …………
2. What is a bug?
3. What is the next step after coding in a program?

2 Score Questions

1. Define program.
2. What is algorithm?
3. What is syntax error?

3 Score Questions

1. Explain phases in programming.
2. Explain three types of errors in programming.
3. Draw a flow chart to find the greatest number among two given numbers.

Chapter 4

Getting started with C++

Focus Area: Tokens and classification with examples

C++ is a powerful object oriented language. It is developed by Bjarne Stroustrup.

Character set

C++ character set includes Letters (A B C D …., a b c d …), Digits (0 1 2 …), Special characters (* # ; & { ' % ….), white spaces and other characters.

Tokens

Tokens are the fundamental building blocks of the program. C++ has five types of tokens. Those are keywords, identifiers, literals, punctuators and operators.

1. Keywords

Keywords are reserved words. It is also known as pre-defined words. Keywords have special meaning and it cannot be changed.
E.g. break, case, char, const, continue, do, double, else, for, goto, if, int, long, return, short, signed, sizeof, switch, unsigned, void, while etc.

2. Identifiers

Identifiers are user-defined words. It is used to name different program elements. Name of memory location, name of function, name of object etc. are identifiers. The rules for making identifiers are

  a. Use letters, digits and underscore(_) only

  b. The first character must be a letter or underscore

  c. White spaces and special characters are not allowed

  d. Keywords cannot be used

e. Identifiers are case sensitive. (Upper case letters and lower case letters are different)

E.g. for identifiers are- rank, a, sum, _num1, COUNT, product etc.

3. Literals

Literals are constants that never change their value during program run. Four types of literals are integer literals, floating point literals, character literals and string literals.

i. Integer literals

Integer Literals or integer constants are constructed only by digits without decimal point. It can have + (positive) or - (negative) symbol. Octal numbers are represented by starting with O.
Hexadecimal numbers are represented by starting with OX.
E.g. 5000, 25, -5465, -190, O546 (Octal number), OX435 (Hexadecimal number)

ii. Floating point literals

These are numbers having fractional part. Exponential form is represented using E.
2.5 can also be written as $0.25 \times 10^{1.}$ which is represented as 0.25E1
E.g. 1.25, -724.786, 45.2E6, 75.E-3, 2.25E07

iii. Character literals

A single character enclosed in single quotes is known as character literals or character constants.
E.g. 'y', 'P'
Non-graphic symbols are represented by using **escape sequences (\\).** Some non-graphic symbols represented as character constants are listed below

Character constant	Used for
\n	New line
\t	Tab (Horizontal)
\0	Null character
\a	Audible bell
\'	Single quote
\"	Double quote

iv. String literals

A sequence of one or more characters enclosed in double quotes in known as string literals.
E.g. "Hello", "123", "C++"

4. Punctuators

Punctuators are special symbols used in the program.

 E.g. * # ( ) { } [ ] ; : ' " & < >

5. Operators

Operators are used to represent some operations. The operators are applied on **operands**.

E.g. + - * / %

Symbol	Name	Symbol	Name	Symbol	Name
*	Star	#	Hash	( )	Parenthesis
{ }	Braces	[ ]	Square bracket	;	Semi colon
:	Colon	' '	Single quotes	" "	Double quotes
< >	Angle bracket	/	Forward slash	\	Backward slash

If a + b is the operation, then a and b are operands and + is the operator.

Integrated Development Environment (IDE)

IDE provide environment for program development. Some compilers which provide IDE are Turbo C++, Geany, Borland C++ etc. C++ programs are saved with the extension **.cpp**

EXCERCISES

1 Score Questions

1. C++ is developed by ……….
2. Define tokens in C++.
3. Non graphic symbols are represented by using ……..
4. The character '\n' is used for …..
5. IDE stands for ……..

2 Score Questions

1. What is a keyword? Write an example for keyword.
2. What are the rules to be followed for making identifiers?
3. Which of the following are identifiers? Justify your answer.
   a. Num1   b. _first   c. my name   d. 1paper
4. What is operator? How is it related with operand?
5. What is punctuator? Write some examples.
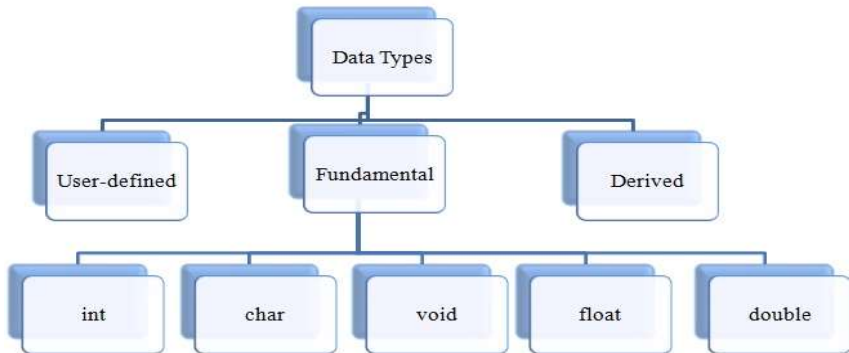
3 Score Questions

1. Explain any three tokens used in C++.
2. Explain different types of literals used in C++.

Chapter 5

Data Types and Operators

> Focus Area: Fundamental data types, Variables, Operators and classifications, Types of expressions, Types of statements.

I. Data Types

Data types are used to specify the type of the data. Data types are classified in to three, Fundamental data types, user defined data types and derived data types.

```
                        Data Types
                            |
        ------------------------------------------
        |                   |                    |
   User-defined        Fundamental           Derived
                            |
   ------------------------------------------------------
   |          |            |           |             |
  int        char        void        float        double
```

1. Fundamental data types (Built-in data types)

It is also known as pre-defined data types or built-in data types. The five fundamental data types are int, char, void, float and double.

i. int

The keyword *int* is used to represent integer numbers. Compiler allocates 4 bytes of memory for *int* data type.

ii.char

The keyword *char* is used to represent a character. The *char* data type is internally treated as integers (ASCII code of characters). Compiler allocates 1 byte of memory for char.

iii. float

The keyword *float* is used to represent floating point numbers (numbers with fractional part). Floating point numbers are stored as scientific notation. The number $1234.56 = 0.1234 \times 10^4 = 0.1234E4$.

 0.1234 is called the mantissa and 4 is the exponent. Compiler allocates 4 bytes of memory for float.

iv. double

The keyword *double* is used to represent large precision fractional numbers. Compiler allocates 8 bytes of memory for *double*.

v. void

The keyword *void* is used to represent empty data. Compiler does not allocate any bytes for void.

2. User-defined data types

It is the data type defined by users. E.g. struct, enum, class etc.

3. Derived data types

Derived data types are constructed using fundamental data types. E.g. Array, pointer, function etc.
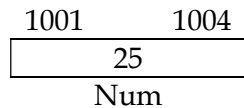
II. Variables

Variables are the names given to memory locations. These are identifiers. Every variable has an address (L-value) in memory. The starting address is called as base address. The value stored in the variable is called as the content.

E.g. int Num = 25 ;
Here the variable is Num.
The content of the variable is 25.
The base address of the variable is 1001.   .

1001	1004
25	

Num

III. Operators

Operators are the symbols used to represent some operations.

Unary operator: - If the operator is applied on a single operand, then it is known as unary operator.
Binary operator: - If the operator is applied on two operands then it is known as binary operator.
Ternary operator: - If the operator is applied on three operands then it is known as ternary operator.
Operators can be classified in to arithmetic operators, relational operators, logical operators, input/output operators and assignment operators.

1. Arithmetic operators

The operators + (addition), - (subtraction), * (multiplication), / (division), % (modulus) are arithmetic operators.

The **modulus operator (%)** gives the remainder value of division. E.g. 10%3 = 1, 11%3=2, 12%3=0

2. Relational operators

The operators < (less than), > (greater than), <= (less than or equal to), >= (greater than or equal to), == (equal to) and != (not equal to) are relational operators. These are binary operators. The result of any relational operator will be either **True** or **False**.

3. Logical operators

The operators **&&** (logical AND), **||** (logical OR) and **!** (logical NOT) are logical operators. ! is a unary operator.

A	B	A&&B	A||B	!A
0	0	0	0	1
0	1	0	1	1
1	0	0	1	0
1	1	1	1	0

4. Input/output operators

The **extraction** operator **>>** is the input operator. It is also known as **get from** operator

The **insertion** operator **<<** is the output operator. It is also known as **put to** operator.

5. Assignment operator

The operator = is the assignment operator. This is a binary operator. The first operand should be a variable.
E.g. a = b;   Here the value of b is stored in a.

6. Arithmetic assignment operators

Arithmetic assignment operators are used to write expressions in short form. The arithmetic assignment operators are +=, -=, *=, /= and %=. These are also known as C++ short-hands. Using short-hands makes the operations faster.

E.g. x+=10 is equivalent to x= x+10, x-=10 is equivalent to x=x-10, x*=10 is equivalent to x=x*10 etc.

7. Increment (++) and decrement (--) operators

Increment operator (++) is used to increment the integer by one.

Decrement operator (--) is used to decrement the integer by one.

8. Conditional operator

It is a ternary operator. It requires three operands. It can be used as an alternative to if-else statement. The general form is

Test expression **?** True_case code **:** False_case code **;**

E.g. if a, b and big are integers, then,

        big = (a > b) ? a : b ;

        Now big has the biggest value among a and b.

9. sizeof operator

sizeof is a unary operator which returns the amount of memory allocated in bytes for the operand. The syntax is

sizeof(data type) or sizeof(variable name) or sizeof(constant)

E.g. sizeof(int)

IV. Expressions

An expression is composed of operators and operands.

Arithmetic expression: - If an expression contains only arithmetic operators, then it is known as arithmetic expression

Relational expression: - If an expression uses relational operators, then it is known as relational expression

Logical expression: - Logical operation combine two or more relational expression with logical operators.

V. Statements

Statements are the smallest executable unit of a programming language. Statements end with the semicolon (;). Different types of statements are

1. Declaration statements

Declaration statement is used to specify the type of the variables. The syntax for declaration statement is

data_type varibale1, variable2, variable3 ….. ;

E.g. int a,b ; // Here a and b are declared as integer type variables.

2. Assignment statements

When the assignment operator is used to assign a value to a variable, it forms an assignment statement. The syntax is

variable = constant/variable2/expression ;

E.g. a = 5; b = a, c = a + b;

3. Input statements

An input statement contains the extraction operator (>>) and the keyword **cin**. The syntax is
cin >> variable1 ;
E.g. cin >> a ;

4. Output statements

An output statement contains the insertion operator (<<) and the keyword **cout**. The syntax is

cout << variable1 ; or   cout << "Any string" ;

E.g. cout << a ;   or   cout << "Hai" ;

EXCERCISES

1 Score Questions
1. Compiler allocates ……. byte/bytes of memory for *char* data type.
2. The operator << is known as ………. operator.
3. …… is the assignment operator.
4. The keyword used for input operation is ……….
5. 15 % 4 = ……….

2 Score Questions
1. What do you mean by data types? Name different types.
2. What is a variable?
3. What is a statement?
4. What is declaration?
5. Write the three logical operators in C++.

3 Score Questions
1. Explain any three fundamental data types.
2. Explain different types of operators.
3. Explain different types of statements.

Chapter 6

Introduction to Programming

> Focus Area: Structure of C++ program, Variable initialization, Arithmetic assignment operators, Increment - decrement operators, Type conversion. (No programming).

Structure of a C++ program

The basic structure of a C++ program is

```
#include<iostream>
using namespace std;
int main ( )
{
    Statememts;
        :
        :
    return 0;
}
```

The first line is called pre-processor directive. *iostream* is the header file Second line is the namespace statement. *std* is the namespace identifier. Third line onwards is the main function, which is must in every program.

Pre-processor directive

Pre-processor directives are lines included in a program that begin with the symbol # (hash). They are instructions to process some programs <u>before compilation</u>. A C++ program starts with the pre-processor directive.

E.g. #include, #define. (#include is used to link the header files in C++)

Header files

Files which contain definitions of functions, data types, objects etc. with the extension **.h** is known as header files.

E.g. iostream.h (iostream.h contains the information about the objects cin and cout etc.)

The main ( ) function

Every C++ program contains a function named as main ( ). Program execution starts and ends within the main ( ) function. A data type (int or void) precedes the main ( ). The syntax of main ( ) function is

int main ( )

{

    statement block;

}

Variable initialization

Giving value to a variable at the time of its declaration is called as variable initialization. The assignment operator is used for variable initialization.

E.g. int x = 10;

More Operators

1. Arithmetic assignment operators

Arithmetic assignment operators are used to write expressions in short form. The arithmetic assignment operators are +=, -=, *=, /= and %=. These are also known as C++ short-hands. Using short-hands makes the operations faster.

E.g. x+=10 is equivalent to x= x+10, x-=10 is equivalent to x=x-10, x*=10 is equivalent to x=x*10 etc.

2. Increment (++) and decrement (--) operators

Increment operator (++) is used to increment the integer by one.

Decrement operator (--) is used to decrement the integer by one.

Prefix form: - If the increment/decrement operator is used before the variable, then it is the prefix form. It is known as **change, then use** method. The value gets changed before usage.

Postfix form.- If the increment/decrement operator is used after the variable, then it is the postfix form. It is known as **use, then change** method. The value gets changed after its usage.

E.g. If a and b are variables with a=5. Then the operation b = ++a; makes a and b as 6. Here a is changed first and then used to assign to b.

If a and b are variables with a=5. Then the operation b = a++; makes b=5 and a= 6. Here a is used first and then changed.

Type conversion

Changing the data type of one operand to another data type is known as type conversion. Two types of type conversions are implicit type conversion and explicit type conversion.

1. Implicit type conversion

Implicit type conversion is performed by the compiler. C++ converts lower type to higher type automatically. This is also known as **type promotion**.

E.g. int n = 1;

   char c = 'A';

   cout << n + c; //Here c is automatically converted to int for addition. Output is 66 (ASCII value of 'A' is 65)

2. Explicit type conversion

Explicit type conversion is performed explicitly by the programmer. It is also known as **type casting**.

E.g. int a=1;

   float b=2.2;

   cout << int (a+b); //Here a+b is explicitly converted to int. Output is 3

Programs

1. To find the simple interest

```cpp
#include<iostream>
using namespace std;
int main( )
{
        float p,n,r,si ;
        cout << "Enter the principal amount: ";
        cin >> p ;
        cout << "Enter the number of years: ";
        cin >> n ;
        cout << "Enter the rate of interest: ";
        cin >> r ;
        si = p * n * r / 100 ;
        cout << "The simple interest is = "<< si;
        return 0;
}
```

EXCERCISES

1 Score Questions

1. Every C++ program contains ……… function.

2. Program execution starts and ends in ……..

3. What is type casting?

2 Score Questions

1. What do you mean by preprocessor directive?

2. What is a header file?

3. Write differences between prefix form and postfix form of increment operation.

3 Score Questions

1. Explain implicit and explicit type conversion with example.

2. Explain the basic structure of a C++ program with an example.

Chapter 7

Control statements

Focus Area: Decision making statements (if, if-else, if-else if, switch), Iteration statements (while, for, do-while) - syntax and working, (No programming). (Nesting not required)

Control statements are used to control the flow of program execution. They include decision making statements and loops.

Decision making statements

Two types of decision making statements (Selection statements) are **if** and **switch**. **if** has four variants such as- if, if else, nested if and else if ladder

1. if statement

It is used to select a set of statements based on a condition. The syntax (general form) and flow chart of *if* is

Syntax	Example

if (test expression)
{
    statement block;
}
	if (score >= 18)
	    cout<< "Passed" ;

The test expression is a condition which can be relational or logical expression. The statement block is executed only if the test expression is True. If there is only a single statement in *if,* then the braces { } are not necessary.

2. if-else statement

This statement is used to include statement block for true part as well as false part. The syntax and flow chart of if else is

Syntax	Example

if (test expression)
{
    statement block1;
}
else
{
    statement block2;
}
	if (score >= 18)
	
	 cout<< "Passed";
	
	else
	
	 cout<< "Failed";

3. The else-if ladder

It is used for multiple branching. It is also known as else if stair case. The syntax is

Syntax	Example

if (test expression 1)
  statement block 1 ;
    else if (test expression 2)
      statement block 2 ;
       else if (test expression 3)
        statement block 3 ;
       ………
        else
         statement block n ;
	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" ;

Switch

switch is also used for multiple branching. Its syntax is

```
switch (expression)
{
        case constant1  : statement block 1 ;
                          break;
        case constant2  : statement block 2 ;
                          break ;
                          :
```

:

      default   **:** statement block n ;

}

A program to display the day of the week, using switch statement.

```cpp
# include <iostream>
using namespace std ;
int main ( )
{
        int day;
        cout << "Enter a number 1-7 " ;
        cin >> day;
        switch (day)
        {
                case 1 : cout << "Sunday" ;
                        break ;
                case 2 : cout << "Monday" ;
                        break ;
                case 3 : cout << "Tuesday" ;
                        break ;
                case 4 : cout << "Wednesday" ;
                        break ;
                case 5 : cout << "Thursday" ;
                        break ;
                case 6 : cout << "Friday" ;
                        break ;
                case 7 : cout << "Saturday" ;
                        break ;
                default : cout << "Invalid Choice" ;
        }
         return 0;
    }
```

The difference between switch and else-if ladder

Switch	else if ladder
Evaluates condition with equality operator only	Evaluate any relational or logical expression
Case constants must be an integer or character	Condition may include a range and float values
When no match is found, then default is executed.	When no match is found, else block is executed
break statement is required for exit from switch	Program control automatically goes out
Efficient when same variable is compared against a set of values	More flexible and versatile compared to switch.

Iteration statements (Loops)

Iteration (Looping) statements are used to execute a set of statements repeatedly. Four elements of a loop are

i.   Initialization (Variables are initialized with first value of the loop),
ii. Test expression (It is the checking of the loop),
iii. Update statement (It modifies loop control variable) and
iv. Body of the loop (The statements to be executed repeatedly)
Three loop statements are **for**, **while** and **do-while**. for and while are entry controlled loops and do-while is exit controlled loop.

1.   while

It is an entry controlled loop. The body of the loop will be executed only if the condition is true. The syntax is

Syntax	Example

variable initialization;
while (testing)
{
  body of the loop;
  variable updation;
}
	int n = 1 ;
	while (n < = 10)
	{
	 cout << n << " ";
	 n++ ;
	}

2. for ^{15.06.2021}

It is an entry controlled loop. All loop elements (initialization, test expression and update statement) are placed together in *for* statement. The syntax is

Syntax	Example

for(initialization;test;update)
  {
     body of the loop ;
  }
	for (n=1; n < =10; n++)
	{
	  cout << n << " " ;
	}

3. do-while

It is an <u>exit controlled</u> loop. The body of do-while will be executed at least once. Testing is done after the first execution. Its syntax is

Syntax	Example

variable initialization
do
{
  loop body;
  variable updation;
}while(testing);
	int n = 1 ;
	do
	{
	  cout << n << " ";
	  n++ ;
	} while (n < = 10);

Comparison among the loops

For	While	do-while
Entry controlled	Entry controlled	Exit controlled
Initialisation with loop definition	Initialisation before loop definition	Initialisation before loop definition
Updation with loop definition	Updation inside loop body	Updation inside loop body
No guarantee to execute at least once	No guarantee to execute at least once	Execute at least once

EXCERCISES

1 Score Questions

1. ……. is an exit controlled loop.
2. *while, do while* and …… are the three loops.
3. ……. loop will be executed at least once.

2 Score Questions

1. What are the different variants of *if* statement?
2. Write the syntax of a switch statement.
3. How many different loops are there? What are they?
4. Write the syntax of for loop.

3 Score Questions

1. What are the differences between *switch* and *else if* ladder?
2. What is a loop? What are the four elements of a loop?
3. Write differences between *for* loop *while* loop and *do while* loop.

Chapter 8

Computer Networks

Focus Area: Advantages of network, Key terms (Bandwidth, noise, node), Data communication devices(switch, router, gateway, bridge, modem), Types of network (PAN, LAN, MAN, WAN), Network topologies, Identification of computers over network (MAC, IP)

Computer Network is a group of computers and other devices connected together through a communication medium. In a computer network computers can communicate, and share data and resources.

Advantages of network

1. Resource sharing

Resources can be shared using network. Resources may be hardware (hard disk, printer, scanner etc.) or software (application software, anti-virus etc.).

2. Price-performance ratio

Cost of software will be reduced by sharing software without affecting performance.

3. Communication

Communication is easy and faster using networks. E-mail, chat, video conference etc. are examples.

4. Reliability

Information can be backed up in multiple computers using network. It improves reliability.

5. Scalability

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

Some network terms

1. Bandwidth:^{15.06.2021} - It means the amount of data that can be sent over a specific connection in a given amount of time. It is measured in bits per second (bps).

2. Noise: - Unwanted electrical or electromagnetic energy that lowers the quality of data signals is called noise.

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

Data communication devices

1. Network Interface Card (NIC)

It is the hardware interface between a computer and a network. It can be a separate circuit board or integrated with the motherboard. NIC can transfer data at a speed of 1 Gbps.

2. Hub

It is a small, simple, passive and inexpensive device used to connect computers of the same network. Hub transmits data packets to all other computers connected to it (Broadcasting). So it increases the network traffic and reduces effective bandwidth.

3. Switch

Switch is an intelligent device which transmits the data only to the intended node. Switch performs better than a hub since it generates less traffic.

4. Repeater

A repeater is used to <u>regenerate</u> incoming electrical, wireless or optical signals through a communication medium. It strengthens the incoming signal and retransmit them to the destination.

5. Bridge

Bridge is used to connect different segments of a network. A network can be split into different segments and can be interconnected with a bridge. This reduces network traffic.

6. Router

Router is an intelligent device used to interconnect two networks of the same type using the same protocol. It can find the best path for data packets to travel and reduces network traffic.

7. Gateway

Gateway is used to interconnect two different networks having different protocols. Its operations are similar to a router. It can find the best path for packets reach to the destination.

8. Modem

Modem is used to connect a computer to the telephone line. Modem performs modulation and demodulation. It converts the digital signals received from a computer to analog signals (modulation). It also converts the analog signals from telephone lines to digital signals (demodulation).

Network topologies

The way in which the nodes are connected to form a network is called a topology. Four types of topologies are

1. Bus

In bus topology, all the nodes are connected to a main cable called bus. A small device called terminator is attached at each end of the bus. Characteristics of a bus are

- Easy to install

- Requires less cable length

- Inexpensive

- Failure of node does not affect the network
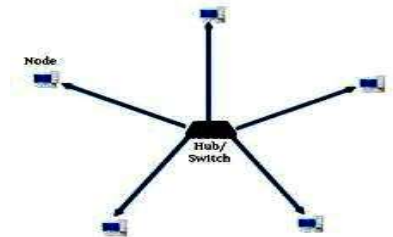
- Failure of bus leads to network break down
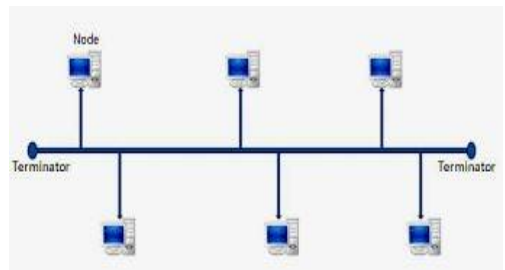
- Only one node can transmit
  data at a time

2. Star

In star topology each node is directly connected to a hub or switch. The message is passing to the hub and it broadcast the message. Its characteristics are

- More efficient compared to bus

- Easy to install

- Requires more cable length

- Failure of node does not affect the network

- Failure of hub leads to network break down

- Easy to expand

3. Ring

In ring topology all nodes are connected to a cable ring. Data travels only in one direction. Its characteristics are

- Requires less cable length

- Inexpensive

- Failure of a node leads to network break down

- Addition of nodes is difficult

- No signal amplification is required
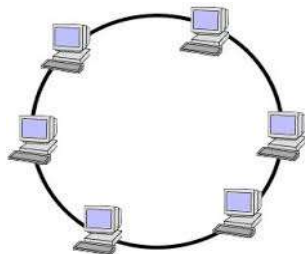
4. Mesh

In mesh topology every node is connected to all other nodes. So there are multiple path between nodes. Its characteristics are

- Most reliable network topology

- Network will not fail, when one path fails

- Requires more cable length

- Expensive and difficult to manage
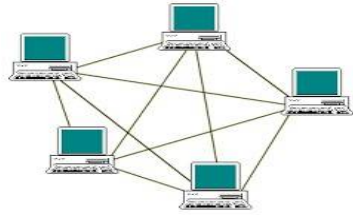
Types of networks

On the basis of area covered, networks are classified in to PAN, LAN, MAN and WAN. Guided or unguided media are used for connecting devices in all types of network.

1. PAN (Personal Area Network)

PAN is a network of computing and communicating devices (computer, mobile, tablet etc.) within the range of an individual. It may cover up to 10 meters.

2. LAN (Local Area Network)

LAN is a network of computing and communicating devices in a room, building or campus. It may cover a few meters to 10 Km. LAN is owned and managed by a single person or an organization.

3. MAN (Metropolitan Area Network)

MAN is a network of computing and communicating devices within a city. It can cover up to 100 Km. MAN is owned and managed by a government or a large corporation.

4. WAN (Wide Area Network)

WAN is a network of computing and communicating devices within a country or continent. WAN usually contain many LANs, MANs and

WANs. The best example of a WAN is the Internet. Internet is the largest WAN.

	PAN	LAN	MAN	WAN
Area Covered	Up to 10 m	Up to 10 Km	Up to 100 Km	Worldwide
Speed	High	High	Moderate	Low
Cost	Negligible	Inexpensive	Moderate	Expensive

Identification of computers over a network

MAC address and IP address are used to identify the nodes in a network

1. MAC address

MAC (Media Access Control) address is a unique 12 digit hexadecimal address assigned to each NIC. MAC addresses are usually written in the format MM : MM : MM : SS : SS : SS . The first half contains the ID number of the manufacturer and the second half represents the serial number of the NIC.

2. IP address

IP address is a unique 4 part numeric address assigned to each node on a network for identification. IP addresses are represented as dotted decimal number. E.g. 192.168.1.1 (Each number can be between 0 and 255). The two versions for IP addresses are IPv4 and IPv6. IPv4 uses 32 bit and IPv6 uses 128 bit.

<div align="center">

EXCERCISES

</div>

1 Score Questions

1. ……. is used to interconnect two different networks having different protocols.

2. HTTP stands for ……….

3. …….. topology is the most reliable topology.

2 Score Questions

1. What are the advantages of network?

2. What is the difference between hub and switch?

3. What is IP address?

4. Write a short note about MAC address.

5. What do you mean by a node in a network?

3 Score Questions

1. Explain different network topologies.

2. Explain the following

   a. Repeater   b. Bridge   c. Router

3. Explain different types of networks.

Chapter 9

Internet

> Focus Area: Services on Internet (Working procedure is not required), Cyber security (Computer virus, Trojan horse, hacking, phishing).

Internet

Internet is a global system of interconnected networks providing millions of computers worldwide to connect and exchange information. ARPANET is the first WAN (Wide Area Network). Vinton Gray Cerf is considered as the father of Internet. Tim Berners-Lee is the inventor of world wide web.

Services on Internet

1. World Wide Web (WWW)

World Wide Web is a system of interlinked hypertext documents which can be accessed through Internet using a URL.

Browser: - Browser is a software used to access the web pages in the World Wide Web. It is capable of displaying text, images, links, videos, sounds, scripts etc. Examples for browsers are Google Chrome, Internet Explorer, Mozilla Firefox, Opera, Safari etc.

Browsing: - Browsing is the process of accessing web pages.

2. Search engines

Search engine is a software system that search documents on the World Wide Web for specific keywords and returns a list of matching documents. Search engine uses web crawlers or spiders or robots to search the web. E.g. Google, Bing, Yahoo etc.

3. E-mail

E-mail or Electronic mail is a system of sending messages electronically from one computer to another via a network. An e-mail address consists of two parts separated by @ symbol. The first part is the username and the second part is the domain name of e-mail server. E.g. scertkerala@gmail.com

a. Sections of an e-mail

An e-mail has the following sections

To - Addresses of the recipients are specified here

Cc - Carbon copy is to provide address of the secondary recipients

Bcc - Blind carbon copy is to provide addresses of third recipients and the primary and secondary recipients cannot see the bcc addresses

Subject - It is to provide a meaningful subject/heading

Content - Messages are typed here

b. Advantages of using e-mail

Speed: - E-mail is delivered instantly to any location across the globe. E-mail can be sent to multiple users

Easy to use: - Organizing, saving and processing e-mails are very easy

Attaching is possible: - Pictures, files, documents etc. can be attached with e-mail

Environment friendly: - E-mails do not use paper and it save trees

Cost-effective: - Sending e-mail is inexpensive

Anywhere anytime availability: - E-mails are available from anywhere at any time.

4. Social media

a. Classification of social media

1. Internet forums: - It is online discussion websites where people can engage in conversations and find solutions in the form of messages. Each discussion on a topic is called a thread. E.g. Ubuntu forum

2. Social blogs: - A blog is a discussion or informational website consisting of posts in a topic and owned by an individual or a group of individuals. Websites like blogger.com offers blogging facility

3. Micro blogs: - It allows users to exchange short sentences, images or video links. It can be used for expressing personal opinion. E.g. Twitter.com

4. Wikis: - It allows people to add or edit content about a topic. It is a content management system. Editing done by users are monitored by other editors, so that errors can be removed immediately. E.g. Wikipedia.org

5. Social networks: - This allows people to connect with other people. It allows posting and sharing or texts, images, videos etc. It influences public opinion. E.g. facebook.com, linkedin.com

6. Content communities: - These are websites that organize and share contents like photos and videos. E.g. Youtube.com is a popular video sharing website.

b. Advantages of social media

- **Bring people together:** - Social media allows people to find lost childhood friends and also to make new friends

- **Plan and organize events:** - It help users to organize and participate in events

- **Business promotion:** - It allows businesses to connect with customers, make marketing campaigns, advertise etc.

- **Social skills:** - It allows people to express their views over a particular issue and become an agent for social change

c. Limitations of social media

- **Intrusion to privacy:** - The personal information like name, location, e-mail address and age of users can be used for illegal activities.

- **Addiction:** - Addiction to this sites wastes valuable time. It will negatively affect our mental states which may lead to depression. Students may lose concentration in studies.

- **Spread rumors:** - Social media spread the news quickly. A wrong information may spread quickly in this sites

d. Best practices for social media interaction

- Avoid unnecessary uploading of personal data like e-mail address, phone number, address, pictures etc.

- Set time schedule for using this websites

- Avoid posting wrong or misleading content on websites

- Set privacy levels (private, friends, public) such that you know exactly who can see your posts.

Cyber security

Security to the network is important because data can be lost, privacy can be violated and usual   work can be interrupted by threats. Some common threats of computer network is discussed below.

1. Virus

A virus is a program that attaches itself to another executable file. It spread from one computer to another without   users' knowledge. A virus may corrupt or delete data on the affected computer. Viruses spread through USB drives, file sharing, e-mail etc.

2. Worm

It is a standalone malware program that replicates itself. It spread from one computer to another on its own. A worm does not need another program to propagate.

3. Trojan horse

It will appear to be useful software, but will damage the computer by creating a backdoor on the computer. Trojans do not replicate.

4. Spams

These are junk mails indiscriminately sent to promote a product or service. Most email service providers provide email filters which separates spams from genuine mails.

5. Hacking

Hacking is a technical effort to compromise the security of a network. It is performed with good intention (white hats - ethical hacking) or bad intention (black hats)

6. Phishing

It is the process of stealing information (spoofing) by creating duplicate websites which looks almost exactly as the original web site.

EXCERCISES

1 Score Questions

1. Expand WWW.

2. Write the format of an email address.

2 Score Questions

1. What is internet?

2. What is phishing?

3. Write advantages and disadvantages of social media.

4. Write best practices for social media interaction.

3 Score Questions

1. What is email? What are the advantages of email?

2. Explain different classification of social media.

3. Explain the following

   a. Virus   b. Trojan horse   c. Hacking

Chapter 10

IT Applications

Focus Area: e-Governance (Types, infrastructure), e-Business, e Learning (Including benefits and challenges)

I. E-Governance

E-Governance is the application of ICT (Information and Communication Technology) for delivering government services to citizens in a convenient, efficient and transparent manner. IT helps the government to take quick decisions and it increases transparency and accountability in all government services. In Kerala many departments like Motor Vehicle, Education, and Revenue department implemented e-Governance.

1. Types of interactions in e-Governance

G2G (Government to Government): - It is the sharing data electronically among government departments or agencies.

G2C (Government to Citizens): The citizen utilizes government services electronically. It increases availability and accessibility of public services in a transparent manner.

G2B (Government to Business): The government interacts with business community through electronic modes. G2B reduces red-tapism, save time, reduce cost and ensure transparency

G2E (Government to Employees): The government interacts with employees using e-Governance services, which result in fast and efficient communication between government and employees.

2. e-Governance infrastructure

Three infrastructures are SDC, SWAN and CSC

a. SDC (State Data Center): - SDC supports e-Governance initiative by providing functions like, keep data repository of the state, secure data

storage, online delivery of services, state internet portal, disaster recovery etc.

b. **KSWAN (Kerala State Wide Area Network):** - This WAN acts as a backbone of the State Information Infrastructure. It connects Thiruvananthapuram, Kochi and Kozhikode as its hubs and extends to all 14 districts linking each of the 152 Block Panchayats.

c. **CSC (Common Service Centre):** - These are front-end delivery points of the government, private and social sector services for the rural citizens of India. It helps in telephone, electricity and water bill payments, online application, certificate distribution etc. In Kerala, Akshaya centers are working as CSCs. Akshaya centers provide services such as e-grantz, e-filing, e-district, e-ticketing, Aadhar enrolment, insurance etc.

3. Benefits of e-Governance

- Government services are easily available

- Strengthens democracy

- Ensure transparency in government services

- Avoids unnecessary visits to public offices

- Documents can be reproduced easily, if lost

4. Challenges to e-Governance

- People in remote areas may not get access to services

- Huge initial investment is necessary

- The possibility of cyber attacks

- Integrity of many departments is essential

5. Useful e-Governance websites

www.dhsekerala.gov.in (Higher secondary education portal)
www.edistrict.kerala.gov.in (death, birth certificate etc.)

www.keralamvd.gov.in (Kerala motor vehicle department),

www.rti.gov.in (Right to information act portal)

II. E-Business

E-Business is the sharing of business information, maintaining business relationships and conducting business transactions using ICT applications. e-Business helps in effective marketing and reducing communication and travel cost.

1. e-Commerce and e-Business: e-commerce covers business transaction that involves exchange of money. e-business includes all aspects of running a business such as marketing, collecting raw material, customer education etc.

2. Electronic Payment System: It is a system of financial exchange between buyers and sellers in an online environment using credit/debit card or digital cash.

3. e-Banking: - It is accessing of banking services through electronic mode. E.g. internet banking, online fund transfer, ATM etc,

4. Advantages of e-Business

- It overcomes geographical limitations
- Reduces operational costs
- Minimizes travel time and cost
- Available all the time
- Large number of choices for product selection

5. Challenges to e-Business

- Many people are unaware of e-business
- People in rural area do not have plastic money (debit/credit card, net banking etc.
- Carelessness may result in loss of money

- Customers don't have touch and feel option when purchasing

- Efficient shipment is necessary

6. Useful e-Business websites

www.amazone.in (For purchasing products), www.irctc.co.in (Railway ticket booking), www.keralartc.com (KSRTC bus ticket booking), www.bookmyshow.com (Movie ticket booking)

III. E-Learning

The use of electronic media and ICT in education is known as e-Learning.

1. e-Learning tools

a. e-Books: - e-Books are digital form of books. It is usually read by e-book reader such as kindle. It has many advantages. It can move to any pages or books quickly. Some readers have voice output.

b. e-Text: - It is the text information available in electronic format. It can be converted to different formats. Texts can be read aloud with software.

c. Online chat: -It is the real time exchange of text messages between two or more persons over the internet. This can be used to discuss topics with teachers and other students.

d. e-Content: - These are materials in different formats like videos, presentations, graphics, animations etc.

e. Education TV channels: - These channels are dedicated for e-Learning. e.g. VYAS and VICTERS.

2. Advantages of e-Learning

- Offers variety of courses from different institutions in the world

- Cost is very less

- Time and place is not an issue in e-Learning

- No need to travel which saves time

3. Challenges to e-Learning

- Face to face contact between students and teachers are not there

- High speed internet connectivity is required

- Weak students may not get proper care

- Practical and lab experimentation is not possible

4. Useful e-Learning websites

www.ignouonline.ac.in, www.ncert.nic.in, www.w3shools.com

EXCERCISES

1 Score Questions

1. What is e-business?

2. Write an example for common service center.

3. Write a short note about KSWAN.

2 Score Questions

1. What is common service center (CSC)?

2. What are the benefits of e-governance?

3. What are the e-learning tools?

4. What is e-learning? Write advantages of e-learning.

3 Score Questions

1. What is e-governance? What are the types of interactions in e-governance?

2. Write the advantages and disadvantages of e-governance.

3. What are the advantages and challenges to e-business?