VIJAYABHERI

MALAPPURAM DISTRICT PANCHAYATH EDUCATIONAL PROJECT

COMPUTER APPLICATIONS (COMMERCE)

Focus Plus One - 2021

ACADEMIC SUPPORT: ACT MALAPPURAM

ആമുഖം

മലപ്പുറം ജില്ലാ പഞ്ചായത്ത് വിജയഭേരി വിദ്യാഭ്യാസ പദ്ധതിയുടെ ഭാഗമായി കഴിഞ്ഞ വർഷം പ്ലസ്ടു / വി.എച്ച്.എസ്.ഇ. രണ്ടാം വർഷ വിദ്യാർത്ഥികൾക്കായി ഫോക്കസ് 21 എന്ന പേരിൽ തയ്യാറാക്കിയ സ്റ്റഡി മെറ്റീരിയലുകൾക്ക് അധ്യാപകരിൽ നിന്നും വിദ്യാർത്ഥികളിൽ നിന്നും വളരെ നല്ല പ്രതികരണമാണ് ലഭിച്ചത്. കോവിഡ് മഹാമാരിമൂലം സാധാരണ ക്ലാസുകൾ ലഭിക്കാത്ത വിദ്യാർത്ഥികൾക്ക് പ്രസ്തുത മെറ്റീരിയൽ ഏറെ സഹായകരമായെന്ന് അവർ സാക്ഷ്യപ്പെടുത്തുന്നു.

ഒന്നാം വർഷ വിദ്യാർത്ഥികൾക്കുള്ള പരീക്ഷ സെപ്റ്റംബർ ആദ്യവാരം നടക്കുകയാണ്. ഫോക്കസ് പാഠഭാഗങ്ങൾക്കായി വിജയഭേരി ഫോക്കസ് +1 എന്ന പേരിൽ കഴിഞ്ഞ വർഷത്തേതു പോലെ ഈ വർഷവും വിവിധ വിഷയങ്ങൾക്ക് പ്രത്യേക സ്റ്റഡീ മെറ്റീരിയൽ മലപ്പുറം ജില്ലാ പഞ്ചായത്ത് വിജയഭേരി വിദ്യാഭ്യാസ പദ്ധതിയുടെ ഭാഗമായി പുറത്തിറക്കുകയാണ്. മലപ്പുറം ഡയറ്റാണ് പ്രസ്തുത മെറ്റീരിയലിനുള്ള അക്കാദമിക പിന്തുണ നൽകിയിട്ടുള്ളത്. വിവിധ വിഷയങ്ങളുടെ ജില്ലാ തല അധ്യാപകരുടെ അസോസിയേഷനാണ് ഈ പ്രവർത്തനങ്ങൾക്ക് ഞങ്ങളുടെ കൂടെ നിന്നത്. എല്ലാവരെയും ഈ അവസരത്തിൽ നന്ദിയോടെ സ്മരിക്കുന്നു.

ഈ ഉദ്യമം അധ്യാപകർക്കും വിദ്യാർത്ഥികൾക്കും ഏറെ ഉപകാരപ്പെടുമെന്ന് പ്രതീക്ഷിക്കുന്നു. എല്ലാ വിദ്യാർത്ഥികൾക്കും മികച്ച വിജയം കൈവരിക്കാൻ കഴിയട്ടെ എന്നാശംസിക്കുന്നു.

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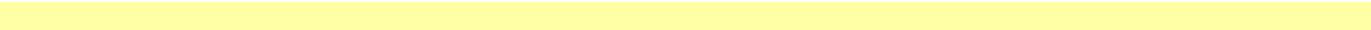
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C o n t e n t s

Fundamentals of Computer

Data and Information

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

Eg:- Suresh, 17, 12

**Information** is the meaningful and processed form of data.

Eg:-

Name	Age	Class
Suresh	17	12

Comparison between Data & 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

Functional units of a computer

Input Unit, Central Processing Unit(CPU), Storage Unit and Output Unit.
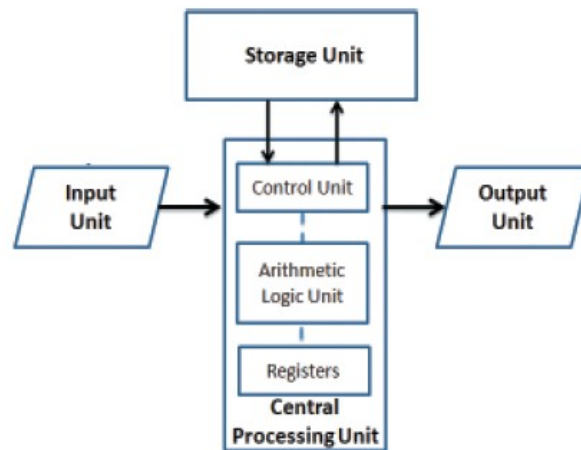
1. Input Unit

Accepts instructions and data for processing.   Eg:- Keyboard, mouse

2. Central Processing Unit (CPU)

The CPU is the brain of the computer. All major computations and comparisons are made inside the CPU.

The functions of CPU are performed by three components:-

(i) **Arithmetic Logic Unit(ALU):** It performs all arithmetic and logical operations.

(ii) **Control Unit(CU):** It manages and co-ordinates all other units of the computer.

(iii) **Registers:** These are the temporary storage areas inside the CPU.

3. Storage Unit

Store data and instructions, intermediate results and final results.

4. Output Unit

Supplies the results to the outside world.

Eg:- Monitor, Printer

Computer

It is an electronic device for storing and processing data according to instructions given to it.

Characteristics of Computers

Advantages: Speed, Accuracy, Diligence, Versatility, Huge memory

Limitations: Lack of IQ, Lack of decision making power

Number system

The number of symbols used in a number system is called **base** or **radix**.

Number System	Base	Symbols used	Example
Binary	2	0, 1	$(1101)_2$
Octal	8	0, 1, 2, 3, 4, 5, 6, 7	$(236)_8$
Decimal	10	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	$(5876)_{10}$
Hexadecimal	16	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F (A, B, C, D, E, F represents 10, 11, 12, 13, 14, 15 respectively)	$(12AF)_{16}$

Number Conversions

Decimal to binary conversion

Repeated division by 2 and grouping the remainders. Remainders will be either 0 or 1

Example: Convert $(30)_{10}$ to binary.

```
2 | 30      Remainders
2 | 15        0
2 |  7        1
2 |  3        1
2 |  1        1
  |  0        1
```

$(30)_{10} = (11110)_2$

Decimal to Octal conversion

Repeated division by 8 and grouping the remainders. Remainders will be either 0,1,2,3,4,5,6 or 7

Example: Convert $(120)_{10}$ to octal.

```
8 | 120     Remainders
8 |  15        0
8 |   1        7
8 |   0        1
```

$(120)_{10} = (170)_8$

Decimal to Hexadecimal conversion

Repeated division by 16 and grouping the remainders. Remainders will be either 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E or F

Example: Convert $(165)_{10}$ to hexadecimal.

16	165	Remainders
16	10	5
16	0	10 (A)

$(165)_{10} = (A5)_{16}$

Binary to decimal conversion

Multiply binary digit by place value (power of 2) and find their sum.

Example: Convert $(110010)_2$ to decimal.

$(110010)_2$ $= 1×2^5 + 1×2^4 + 0×2^3 + 0×2^2 + 1×2^1 + 0×2^0$

$= 32 + 16 + 0 + 0 + 2 + 0 = 50$

Weight	2^5	2^4	2^3	2^2	2^1	2^0
Bit	1	1	0	0	1	0

$(110010)_2 = (50)_{10}$

Octal to decimal conversion

Multiply octal digit by place value (power of 8) and find their sum.

Example: Convert $(167)_8$ to decimal.

$(167)_8 = 1×8^2 + 6×8^1 + 7×8^0$

$= 64 + 48 + 7 = 119$

Weight	8^2	8^1	8^0
Octal digit	1	6	7

$(167)_8 = (119)_{10}$

Hexadecimal to decimal conversion

Multiply hexadecimal digit by place value (power of 16) and find their sum.

Example: Convert $(2B5)_{16}$ to decimal.

$(2B5)_{16} = 2×16^2 + 11×16^1 + 5×16^0$

$= 512 + 176 + 5$

$= 693$

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

$(2B5)_{16} = (693)_{10}$

Representation of integers

There are three methods for representing an integer number in computer memory. (i) Sign and magnitude representation, (ii) 1's complement representation, (iii) 2's complement representation

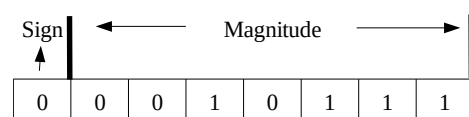**i) Sign and magnitude representation**

- First find binary equivalent of integer and write it in 8- bit form.
- Make the first bit 1 for negative numbers and 0 for positive numbers.

Example: Represent +23 in sign and magnitude form.

Binary of 23 in 8-bit form = $(00010111)_2$

Number is positive, so first bit is 0.

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

Sign	Magnitude						
0	0	0	1	0	1	1	1

Example: Represent -23 in sign and magnitude form.

Binary of 23 in 8-bit form = $(00010111)_2$

Number is negative, so first bit is 1.

So -23 can be represented as **$(10010111)_2$**

Sign							
1	0	0	1	0	1	1	1

Sign ← Magnitude →

ii) 1's complement representation

- 1's complement of a binary is obtained by replacing every 0 with 1 and every 1 with 0.
- If the number is negative, it is represented as 1's complement of 8-bit form binary.
- If the number is positive, the 8-bit form binary itself is the 1's complement.

Example: Represent +23 in 1's complement form.

Binary of 23 in 8-bit form = $(00010111)_2$

+23 in 1's complement form = **$(00010111)_2$** (For +ve numbers, no need to find 1's complement)

Example: Represent -23 in 1's complement form.

Binary of 23 in 8-bit form = $(00010111)_2$

-23 in 1's complement form = **$(11101000)_2$** (by replacing 0 with 1 and 1 with 0)

iii) 2's complement representation

- 2's complement of a binary number is calculated by adding 1 to its 1's complement.
- 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 2's complement.

Example: Represent +23 in 2's complement form.

Binary of 23 in 8-bit form = $(00010111)_2$

+23 in 2's complement form = **$(00010111)_2$** (For +ve numbers, no need to find 2's complement)

Example: Represent -23 in 2's complement form.

Binary of 23 in 8-bit form   = $(00010111)_2$

-23 in 1's complement form   = $(11101000)_2$ (by replacing 0 with 1 and 1 with 0)

-23 in 2's complement form   = $11101000 +$
$$\underline{1}$$
= **$(11101001)_2$**

Representation of characters

Different methods to represent characters in computer memory are: ASCII, Unicode, ISCII, EBCDIC

ASCII (American Standard Code for Information Interchange)

- ASCII uses 7 bits for each character, can represent only 128 characters.
- Another version is ASCII-8, which uses 8 bits, can represent 256 characters.

Unicode

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

Sample Questions

1. Meaningful and processed form of data is known as ....

2. The number of symbols used in a number system is called ....

3. ASCII stands for ....

4. The base of hexadecimal number system is ....

5. CPU stands for ....

6. Distinguish between data and information.

7. List down the characteristics of computers.

8. Name the components of CPU.

9. Convert $(1010)_2$ to decimal.

10. Convert $(35)_{10}$ to binary.

11. Fill in the blanks.

   (a) $(DA)_{16} = (...........)_2$

   (b) $(25)_{10} = (...........)_8$

12. What are the methods of representing integers in computer memory?

13. Write a short note on Unicode.

14. Write short notes on ASCII.

15. Represent -25 in the following forms:

   (*Hint: Use 8 bit form of representation*).

   (a) Sign and Magnitude (b) 1's complement (b) 2's complement

16. With the help of a block diagram, explain the functional units of a computer.

Components of the Computer System

Memory

Memory is a place where we can store data, instructions and results temporarily or permanently.

Memory measuring units

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

Primary memory

Primary memory is a semiconductor memory that is accessed directly by the CPU.

Three types of primary memory are RAM, ROM and Cache.

Comparison between RAM and ROM

RAM (Random Access Memory)	ROM (Read Only Memory)
It is volatile, i.e. it will lose its data if the power is turned off.	It is non-volatile, i.e. it keeps its data even if the power is turned off.
It is faster than ROM	It is a slower memory
It allows reading and writing.	Allows reading only.
It stores programs that are currently running.	It stores the program required to boot the computer.

Input devices

An **input device** is used to feed data and instructions into the computer.

Different types of input devices are:

1. Keyboard: It is an input device used to input alphabets, numbers and other characters.

2. Mouse: It is a hand-held device that controls the movement of the cursor on a display screen.

3. Light pen: It is a light-sensitive pointing device used to draw pictures on a computer screen.

4. Touch screen: It allows the user to operate the computer by simply touching on the display screen.

5. Graphic tablet: It allows artists to create graphical images.

6. Touchpad: It is a pointing device used to move the mouse pointer on a display screen.

7. Joystick: It is a pointing device commonly used for playing video games.

8. Microphone: It is used to input sound.

9. Scanner: It is an input device that scans documents such as photos and pages of text.

10. Optical Mark Reader (OMR): It reads pencil marks made on pre-defined positions on the OMR form. It is used to process competitive exam results quickly and accurately..

11. Barcode Reader/Quick Response (QR) code reader

Barcode readers are electronic devices for reading printed barcodes.

A QR code is similar to barcodes. Barcodes are single dimensional whereas QR codes are two dimensional. It can store website URLs, plain text, phone numbers, etc.

12. Magnetic Ink Character Recognition (MICR) Reader: It is used in banks for faster clearing of cheques.

13. Biometric sensor: It is used to identify unique human physical features like fingerprints, retina, etc.

14. Smart card reader: A smart card is a plastic card that stores and transacts data (Eg:- ATM Card). Smart card readers are used to access data in a smart card.

15. Digital camera: It can take pictures and videos and that can be transferred to a computer.

Output devices

Output device is used to present information from a computer system.

Different types of output devices are:

1. Monitor

An output device used to display information from a computer.

Different types of Monitors are:

a. Cathode Ray Tube (CRT) monitor: Similar to old television sets. Use more power, produce lot of heat.

b. Flat panel monitor: It is thinner, lighter in weight, consume less power, emit less heat.

Eg:- LCD Monitors, LED Monitors, Plasma Monitors, OLED Monitors.

2. LCD projector

It is used for displaying video, images or computer data on a large screen.

3. Printer

Printers are used to produce hardcopy output.

Classified into two:- **impact** and **non-impact** printers.

Impact printers direct contact with the paper while printing.   Eg:- Dot-matrix printers.

Dot Matrix Printer (DMP)

- Printing material: Ink ribbon
- Cheaper to print, Carbon copy possible, slow, noisy.

Non-impact printers do not touch the paper while printing.

Eg:- Inkjet, Laser and Thermal printers

Inkjet printer

- Printing material: Liquid ink
- Quiet, high print quality, printers are inexpensive, ink is expensive.

Laser printer

- Printing material: Ink powder
- Quiet, prints faster, high print quality, Toner is expensive, Device is expensive.

Thermal printer

- Printing material: Heat sensitive paper.
- Quiet, faster, smaller, lighter, consume less power, portable.

4. Plotter

It is an output device used to produce hard copies of large graphs and designs on the paper.

It is used in the design of cars, ships, aircrafts, buildings, highways etc.

5. Three dimensional (3D) printer

It is a new generation output device used to print 3D objects.

It can print ceramic cups, plastic toys, metal machine parts, etc.

6. Speakers

Speakers are the output device that produces sound.

e-Waste

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

Eg:- discarded computers, mobile phones, television sets, refrigerators.

e-Waste disposal methods

a. Reuse: It refers to second-hand use.

b. Incineration: It is a combustion process in which the waste is burned at a high temperature.

c. Recycling: It is the process of making new products from old devices.

d. Land filling: In this method soil is excavated and e-waste is buried in it.

System software

It is a set of one or more programs designed to control the operations of a computer.

Components of system software are:

Operating system, Language processors and Utility software.

a. Operating system

It is a set of programs that acts as an interface between the user and computer hardware.

Example:- DOS, Windows, Unix, Linux

Major functions of an Operating System are:

Process management, Memory management, File management and Device management

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Computer languages

Low Level Language: machine-oriented languages. Two types:

a. Machine language: The language, which uses only binary digits 0 and 1.

b. Assembly language: is an intermediate-level symbolic programming language. It uses mnemonic symbols like ADD, SUB, etc.

High Level Language is like English language and is simpler to understand. Not

understandable to the computer.   Example: C++

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b. Language processor

It translates programs written in high level language or assembly language into its equivalent machine language.

Types of language processors

Assembler: It converts assembly language into machine language.

Interpreter: It converts a high level language program into machine language line by line.

Compiler: It converts the whole high level language program into machine language at a time.

Free and open source software

It gives the user the freedom to use, copy, distribute, examine, change and improve the software.

Eg:- GNU/Linux, GIMP, Mozilla Firefox, OpenOffice.org

Four Freedoms of Free Software

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

Freedom 1 - The freedom to study how the program works and adapt it to your needs.

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

Freedom 3 - The freedom to improve the program and release your improvements to the public.

Sample Questions

1. 1 Byte = ... bits

2. Name the software that translates assembly language program into machine language program.

3. RAM stands for ....

4. OMR stands for ....

5. Give two examples for *free and open source software*.

6. Compare RAM and ROM.

7. What is an input device? List and explain any two input devices.

8. What is an output device? List few commonly used output devices.

9. Compare dot matrix printers and laser printers.

10. Give two examples for non-impact printers.

11. Define (a) Plotter (b) 3D Printer

12. What is e-Waste? List and explain different e-waste disposal methods.

13. Define (a) Assembler   (b) Interpreter   (c) Compiler

14. Define operating system. Give two examples for OS.

15. List four major functions of operating system.

16. What do you mean by free and open source software? Give two examples.

17. What are the four freedoms which make up free and open source software?

Principles of Programming and Problem Solving

Phases in programming

> (1) Problem identification
>
> (2) Preparing Algorithms and Flowcharts
>
> (3) Coding the program
>
> (4) Translation
>
> (5) Debugging
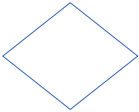>
> (6) Execution and testing
>
> (7) Documentation

Algorithm

> It is a step-by-step procedure to solve a problem.

Flowcharts

> The pictorial representation of an algorithm is known as **flowchart**.
>
> **Flowchart symbols**
>
> 1. **Ellipse:** used to indicate START and STOP.
>
> 2. **Parallelogram:** used as the input/output symbol.
>
> 3. **Rectangle:** used to represent the processing step.
>
> 4. **Rhombus:** used as decision symbol.
>
> 5. **Flow lines**: used to indicate the flow of operation.

Eg: Write an algorithm and draw a flowchart to find the sum of two numbers

> Step 1: Start
>
> Step 2: Input A, B
>
> Step 3: S = A + B
>
> Step 4: Print S
>
> Step 5: Stop
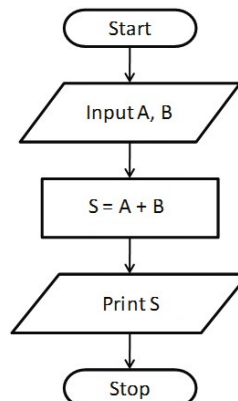
Eg: Write an algorithm and draw a flowchart to find the sum and average of three numbers

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
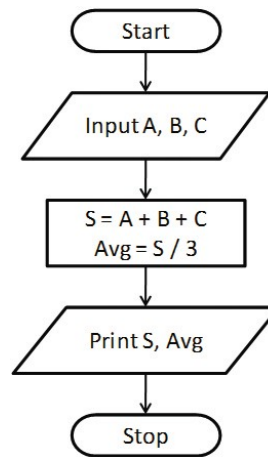
Eg: Write an algorithm and draw a flowchart to find the biggest of two numbers.

Step 1: Start

Step 2: Input N1, N2

Step 3: If N1 > N2 Then

Step 4: Print N1

Step 5: Else

Step 6: Print N2

Step 7: End of If

Step 8: Stop
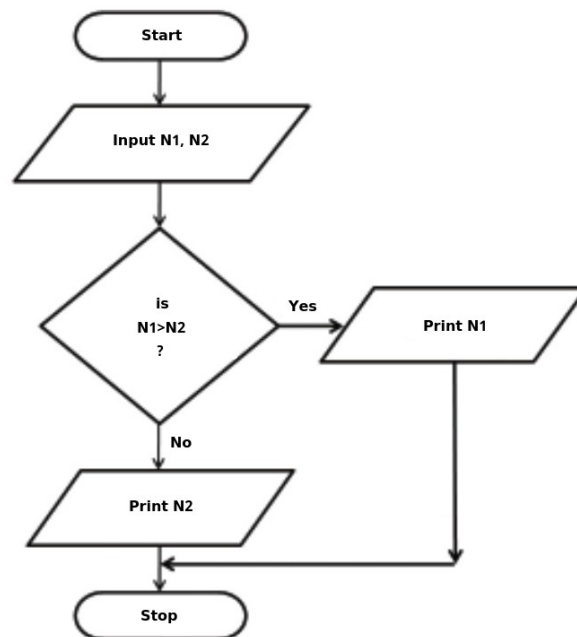
Debugging

Programming errors are known as '**bugs**'. The process of detecting and correcting bugs is called **debugging**.

There are three types of errors:

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

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

Run-time errors: Errors which occur during program execution.   Eg:- division by zero

Sample Questions

1. Pictorial representation of algorithm is known as ....

2. .... is a step by step procedure to solve a problem.

3. Which flow chart symbol has one entry flow and two exit flows?

4. In a flowchart, ... is used as the input/output symbol.

5. Program errors are known as ....

6. What is debugging?

7. List different phases in programming.

8. Define: (a) Syntax errors   (b) Logical errors   (c) Run-time errors

9. Write an algorithm to find the sum and average of 3 numbers.

Getting Starting with C++

Tokens

Fundamental building blocks of C++ program. (Lexical units)

Classification: (POLIK)

1. Punctuators: Special symbols used in C++ program. Eg: # ; ( ] }

2. Operators: Symbols that indicate an operation. Eg: +, <, *, &&

3. Literals(Constants): Constant values used in program.

(a) Integer literals: Whole numbers. Eg: 23, -145

(b) Floating literals: Constants having fractional parts. Eg: 12.5, 1.87E05

(c) Character literals: A character in single quotes. Eg: 'a', '8'

Escape sequences are character constants used to represent non graphic symbols. Eg: '\n,' '\t'

(d) String literals: One or more characters within double quotes. Eg: "a", "score1"

4. Identifiers: Names given to different program elements.

(a) Variable: Name given to memory location.

(b) Label: Name given to a statement.

(b) Function name: Name given to a group of statements.

Rules to form an identifier:

(a) Can have only alphabets(upper and lower), digits and _ (underscore).

(b) Cannot be keywords.

(c) Cannot start with digit.

Eg: score, score1, score_1, INT

The following are **invalid identifiers**:

score 1(space cannot be used)

int(keyword cannot be used)

1score(cannot start with digit)

score$1($ not permitted)

5. Keyword(Reserved word): They convey a specific meaning to the compiler.

Eg: float, if, break, switch

Sample Questions

1. Classify the following identifiers as valid or invalid. If invalid, give a reason.

    a)Height_1, b) _Height1   c) 1Height d) Height 1

2. Define token in C++. Name the tokens available in C++ with one example each.

3. The tokens that convey a specific meaning to the language compiler are called

4. What are escape sequence characters in C++? Give an example .

5. Differentiate between character literal and string literal

6.Distinguish between keywords and identifiers.

7. The following are invalid identifiers in C++. Write reason for each

    a) Id#   b) void c) 2ab d) avg hgt

8. Which one of the following is NOT a character constant in C++ .

    a). 'n'   b) n   c) '4'   d) '\n'

9. Identify and classify the different tokens in the following C++ statement.

    int score=20;

10. Name any two types of identifiers.

Data Types and Operators

Datatypes: Used to identify nature and type of data stored in a variable.

Fundamental datatypes:

Datatype	Type of value	Memory (bytes)	Eg:
void	null or empty data	0	
char	character values	1	'A', '\n'
int	integer values	4	84, -4
float	real values	4	5.6, -89.5
double	Real values(more precision than float)	8	

Integral datatypes

Floating point datatypes

Numerical datatypes

Variables: Names given to memory locations.

Eg: int Num=18;

1001

18

Num

i. Variable name : The name of the variable. (**Num**)
ii. Memory address(L-value):The memory address.(**1001**)
iii. Content(R-value) :The value stored in the variable.(**18**)

Operators: Symbols that indicate an operation. Eg: +, <, *, &&

*In the expression a+b, + is the **operator** and a and b are the **operands**.*

Classification of operators

(1) Based on number of operands:

Category	No. of operands	Example
Unary	1	Unary +, unary -, ++,--
Binary	2	+, &&,<
Ternary	3	?:

2. Based on nature of operation

(a) Arithmetic operators : Used for arithmetic operations such as addition(+), subtraction(-), multiplication(*), division(/) and modulus (%).

x	y	x+y	x-y	x*y	x/y	x%y
7	3	10	4	21	2	1(remainder)

(b) Relational operators:

Used for comparing numeric data, resulting in either **true** (1) or **false** (0). The relational operators are <(less than), >(greater than), <=(less than or equal to), >=(greater than or equal to, ==(equal to), !=(not equal to).

x	y	x<y	x>y	x<=y	x>=y	x==y	x!=y
7	3	0	1	0	1	0	1

(c) Logical operators:

Used to combine logical values, resulting in true or false. The logical operators are &&(AND), || (OR) and ! (NOT)

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

E	!(E)
0	1
1	0

Eg: (2>5) && (4<6) results in 0

        (2>5) || (4<6) results in 1

        !(2>5) results in 1

Input / Output operators:

- The **get from (extraction)** operator (>>) is used for input. Eg: cin>>a;

- The **put to (insertion)** operator (<<) is used for output.   Eg: cout<<a;

Assignment operator (=)

        Used to store a value in a variable.   Eg: a=5;

Difference between = and == operators.

=	==
Assignment operator	Relational operator
Assigns value to a variable	Compares values

Expressions: Combination of operators and operands.

(a) *Arithmetic expressions:* contains arithmetic operators. Eg: m + n * y

    (i) Integer expressions: contains integer operands.

    (ii)Floating point(Real) expressions: contains real operands.

    (iii)Constant expressions: contains constant values. (eg: 5+m/3)

(b) *Relational expressions:* contains relational operators. Eg: x >y

(c)Logical expressions :contains logical operators. Eg: a<b && c>d

Statements: Smallest executable unit of a program. *C++ statement ends with;*

    1. Declaration statement: Specifies the type of data that will be stored in a variable.

        Syntax: datatype var_name;

        eg: float avg;

    2. Assignment statements: It stores a value to a variable. Eg: a=15;

    3. Input statements: Specifies an input operation. Eg: cin>>score;

    4. Output statement: Specifies output operation. Eg: cout<<score;

The multiple use of input/output operators in a single statement is called **cascading of I/O operators**. Eg: cin>>x>>y>>z;

Sample Questions

1. The _____ datatype is used for null or empty set of values.

2. Which among the following is the insertion operator?

    (<< , >> , < , >)

3. The fundamental datatype that uses 8 bytes of memory is _____.

4. Predict the output of the following expressions if m=7 and n=2

    (i) m/y   (ii) m%y   (iii) (m==n)   (iv) (m>10)&&(n<5)

5. Distinguish between == and = operators.

6. What is the importance of datatype ? Name two integral datatypes in C++.

7. Find the Rvalue and memory size of the variable total from the following c++ statement

    float total = 34.6;

8. How is a binary operator different from a unary operator? Give one example each.

9. Write a C++ statement to declare a variable to store the mark of a student.

10. What are statements in C++? Explain any three types of statements with an example each.

Introduction to Programming

Basic structure of a C++ Program

    #include <headerfile>   -----> *line 1*

    using namespace identifier;   ----> *line 2*

    int main()   ----> *line 3*

    {   statements;

         :

       return 0;   }

Line 1: Preprocessor directive :

    Instructs the compiler to perform an action before actual compilation. Starts with the symbol #.

    eg: #include<iostream>   --instruction to link the header file iostream.

Line 2: Namespace statement:

    Tells the compiler to use namespace **std** in this program. std is the standard namespace in which a lot of objects, including cin and cout are defined.

Line 3: Function header:

    main() is the essential function for every C++ program. A c++ program starts and ends within the main() function.

A sample program

    #include<iostream>

    using namespace std;

    int main()

    {

            cout<<"Hello, Welcome to C++";

            return 0;

    }

Variable Initialisation:

    (a) Supplying the initial value to a variable at the time of declaration.

        eg: int n =5 ;   or   int n(5);

    (b) Supplying the initial value to a variable during execution(dynamic initialisation)

        eg: float sum=a+b;

Arithmetic assignment operators(C++ shorthands)

    The operators which combine arithmetic and assignment operators. They are +=, -=, *=, /=, %=

eg: a=a+5 can be given as a+=5   a=a/10 can be given as a/=10

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

++ is used to *increment* the value in a variable by 1.

-- is used to *decrement* the value in a variable by 1.

a++(post increment form) and **++a** (preincrement form) are same as a=a+1 or a+=1

a--(post decrement form) and **--a** (predecrement form) are same as a=a-1 or a-=1

(A post-form denotes <u>use, then change </u>method and a pre-form denotes <u>change, then use</u> method)

int m=5;	int m=5;
n=m++;	n=--m;
(Now n -> 5 and m -> 6)	*(Now n -> 4 and m -> 4)*

Type conversion: Conversion of the datatype of an operand to another.

Two types of conversion:

1.Implicit (Type promotion): This is done by the compiler and the conversion is from lower datatype to higher.

Eg: 5/2.0 => 2.5 (Here, int datatype of 5 is converted to float by compiler. Thus the result of the float expression is also float)

2.Explicit (Type casting): This is done by the programmer explicitly and conversion can be to any datatype.

Eg: 5/(int)2.0 => 2 (Here, programmer uses type casting (int) to convert the float datatype of 2.0 to int. Thus the result of this integer expression is also an integer.)

Sample Questions

1. ____ is the essential function for every C++ program.

2. Pick out the symbol which indicates a preprocessor direcive.

   (" , $, #, {)

3. Give the output for the following C++ code segment

   int a=10, b=20;

   a=b++;

   cout<<a<<'\n'<<b;

4. Give the equivalent statement using arithmetic assignment operator for the following.

   (a) a=a*35;   (b) sum=sum+num;

5. What is variable initialisation? Give examples

6. Write four statements to increment the value of x by 1.

7. Write the output of given C++ statements giving explanations

   1. cout << 5/2;

   2. cout << 5.0/2;

8. Write C++ statements/expression for the following.

   a) Display the message "We shall overcome"

   b) Initialise an integer variable num with 25.

9. Explain type conversion in C++, listing out the different types with examples.

10. Write a C++ program to display the message, Stay home, stay safe.

Control Statements

Control Statements:

The statements used to change the normal sequential flow of program execution.

Two types: (1) Decision   (2) Iteration

1. Decision (Selection) Statements : Statements are selected for execution based on a condition.

(a) **if**

Syntax: if (condition)   eg: if(mark>35)

{ statement block ; }   { cout<<"Passed";}
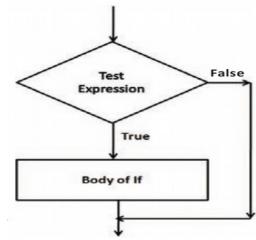
(b) **if-else**

Syntax:if (condition)   eg: if(mark>35)

{statement block 1;}   {cout<<"Passed";}

else   else

{statement block 2;}   {cout<<"Failed";}
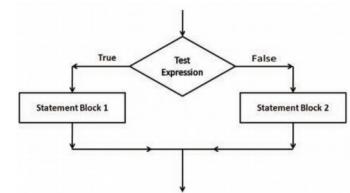
(c) **if-else if ladder**

*Syntax:*if (condition 1)   eg: if (score >= 80)

statement block 1;   cout<<"A Grade";

else if (condition 2)   else if (score >= 60)

statement block 2;   cout<<"B Grade ";

....   else if (score >= 40)

else   cout<<"C grade";

statement block n;   else

cout<<"D grade";

(d) **switch**

Syntax: switch (expression)   eg: switch (game)

{   {

case constant_1: statement block 1;break;   case 1: cout<<"Football"; break;

case constant_2: statement block 2;break;   case 2: cout<<"Cricket"; break;

:   default: cout<<Invalid ";

default :   statement block n;   }

}

All switch statements can be converted to else if ladder. But not all if-else if can be converted to switch.

switch	if else if ladder
Permits multiple branching.	Permits multiple branching.
Can be used only for checking equality	Any relational or logical condition can be checked
Case constant is integer or character	Can compare against a set of values including floating numbers
Uses **default** when no match is found, and **break** is used to exit.	When no condition is true, else block executes.

2. Iteration(Looping) statements

Statements that allow repeated execution of a set of one or more statements.

There are 3 loop s in C++ : while, for, do-while

A loop has the following components:

Loop components – (1) initialisation - statement that gives starting value to loop variable(**i=1**)

(2) condition – the test expression. (**i<=10**)

(3) updation – statement that changes the value in loop variable (**i++**)

(4) body of loop- set of statements to execute repeatedly (**cout<<i;**)

for loop	**while loop**	**do while loop**

for (i=1;i<=10;i++)
{ cout << i; }
	i=1;
	while(i<=10)
	{cout<<i;
	 i++; }
		i=1;
		do
		{cout<<i;
		 i++;
		}while(i<=10);
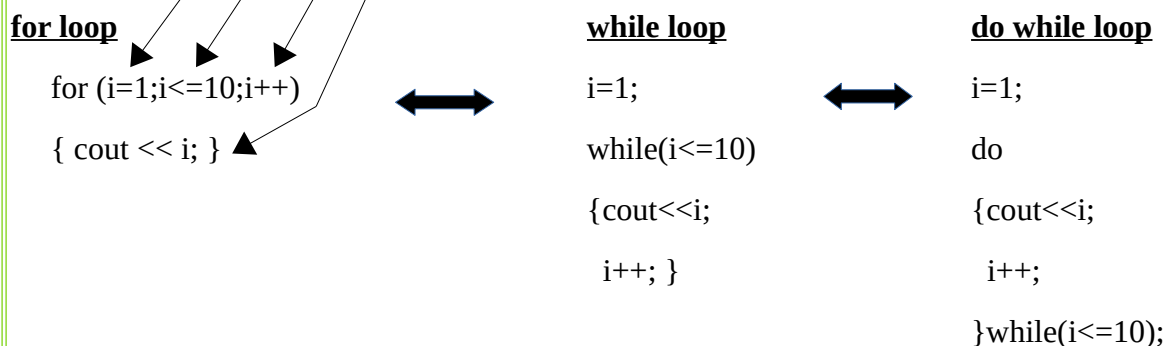
Here, i is the loop variable (its value controls the loop).

[All the three loops given above produce the same output – displays numbers from 1 to 10]

Entry controlled loop

1. condition before loop body

2. loop will run only if condition is true
eg: for, while

Exit controlled loop

1. condition after loop body

2. loop will run atleast once even if condition is
true/false   eg: do while

Sample Questions

1. Control Statements can be classified in to two. Explain each with example.

2. Explain loop elements with a suitable example

3. How is entry controlled loops different from exit controlled loops ?

4.. "There are situations where if ..else if ladder cannot be rewritten using switch statement " what are the situations?

5. Do as instructed :

    (a) Rewrite using switch

```
if(ch==1) cout<<"Red";
        else if (ch==2) cout<<"Blue";
                else if (ch==3) cout<<"Green";
                        else cout<<"Wrong code";
```

    (b) Rewrite using do while and identify the loop components.

```
for(a=5; a<=20; a++)
        { cout<<a*a ; }
```

CHAPTER 8

Computer Networks

It is an interconnection of computers and other hardware devices like printers, scanners, etc using a communication medium.

Advantages

1) Resource sharing - Any hardware /software resource in one system can be shared with other systems in the network.

2) Price-performance ratio - The cost of purchasing licensed software for each computer, can be reduced by purchasing network versions of such software in a network.

3) Communication – The computer network helps users to communicate with any other computer in the network through its services like e-mail, chatting, video conferencing, etc.
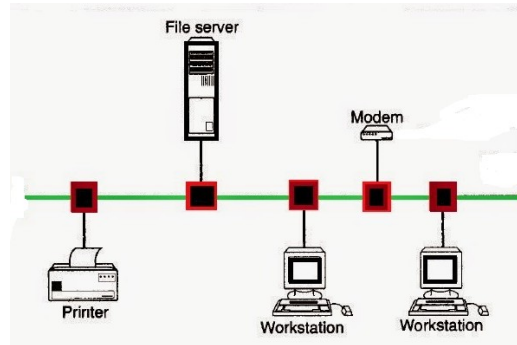
Fig 8.1 Computer Networks

4) Reliability- In a network, it is possible to backup data on multiple computers. This helps users to retrieve data in the case of failures in accessing data.

5) Scalability - Computing capacity can be increased or decreased easily by adding or removing computers to the network**.**

Some key terms

Bandwidth : It measures the amount of data that can be sent over a specific connection in a given amount of time.

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

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

Data communication devices:

A data communication device provides an interface between computer and the communication channel.

1) Switch:

- ➢ A switch is a device that connects several computers to form a network.

- ➢ It an intelligent device, because it can transmit the received data to the destination only.

- ➢ It will store the addresses of all the devices connected to it .
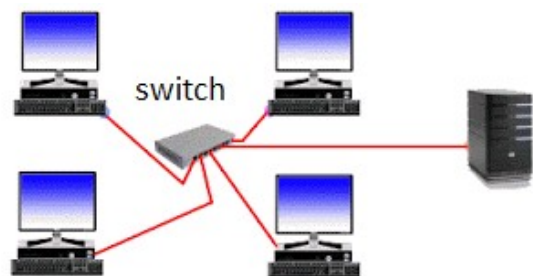
Fig 8.2 Switch

2) Bridge

➢ A bridge is a device used to segmentize a network.

➢ A network can be split into different segments and can be interconnected using a bridge.

➢ This reduces the amount of traffic on a network.
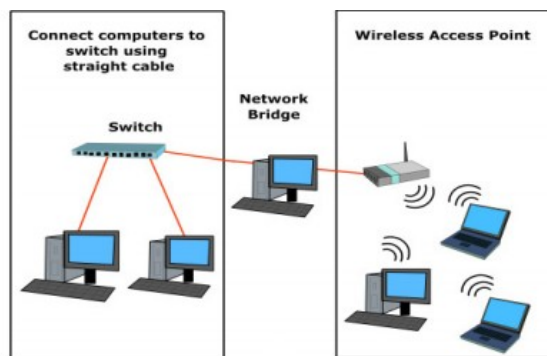
Fig 8.4 Bridge

3) Router

➢ A router is a device that can interconnect two networks of the same type using the same protocol.

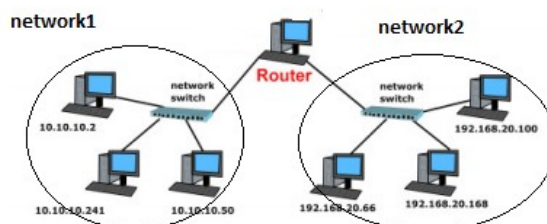➢ It can find the optimal path for data packets to travel and reduce the amount of traffic on a network.

Fig 8.5 Router

4) Gateway :

➢ A gateway is a device that can interconnect two different networks having different protocols.

➢ It can translate one protocol to another.

➢ It can find the optimal path for packets to reach the destination.
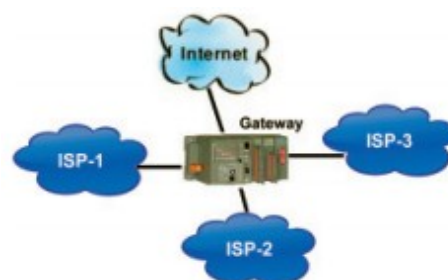
Fig 8.6 Gateway

Data Terminal Equipments:

Data terminal equipment is a device that controls data flowing to or from a computer.

1) Modem :

➢ A modem is a device used for communication between computers through telephone lines.

➢ The name is formed from **modulator and demodulator**.

➢ It converts digital signals received from a computer to analog signals for telephone lines and vice versa.
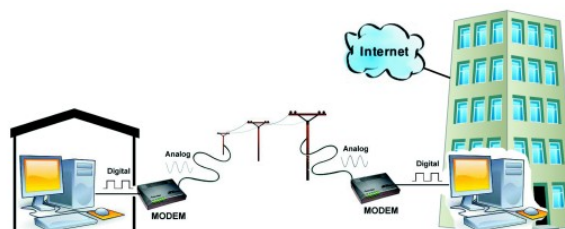
Fig 8.7 Modem

Network topologies

Topology : The way in which the nodes are physically interconnected to form a network.

Major topologies are bus, star, ring, and mesh.

1)Bus topology:

➢ In bus topology, all the nodes are connected to a main cable called bus.

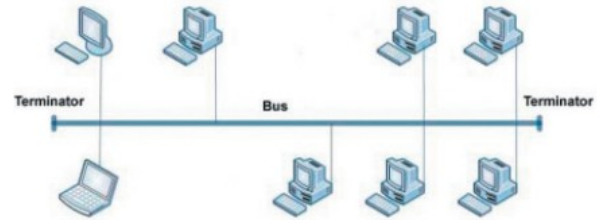➢ A small device called a terminator is attached to each end of the bus.

Fig 8.8 Bus topology

• If a node has to send data to another node, it sends data to the bus. The signal travels through the bus and each node checks the bus and only the intended node will accept the data. When the signal reaches the end of the bus, the terminator absorbs the signal from the bus.

Characteristics of bus topology

1)Easy to install.

2)Requires less cable length and hence it is cost-effective.

3)Failure of a node does not affect the network.

4)Failure of cable (bus) or terminator leads to a breakdown of the entire network.

5)Fault diagnosis is difficult.

6)Only one node can transmit data at a time.

2)Star topology

• In star topology, each node is directly connected to a hub/switch.

• If any node has to send some information to any other node, it sends the signal to the hub/switch.

• The signal is then broadcasted (in the case of a hub) to all the nodes but is accepted only by the intended node.

• In the case of a switch, the signal is sent only to the intended node..
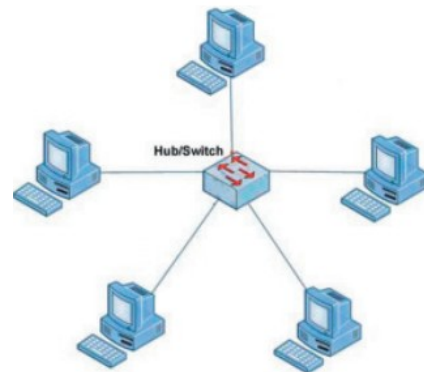
Fig 8.9 Star topology

Characteristics of star topology

1)More efficient compared to bus topology.

2) Easy to install.

3) Easy to diagnose faults.

4)Easy to expand depending on the specifications of the central hub/switch.

5)Failure of hub/switch leads to failure of the entire network.

6) Requires more cable length compared to bus topology.

3) Ring topology

- In ring topology, all nodes are connected using a cable that loops the ring or circle.

- A ring topology is in the form of a circle.

- Data travels only in one direction in a ring.

- Each node regenerates the signal and passes to the next node until it reaches the intended node reaches.
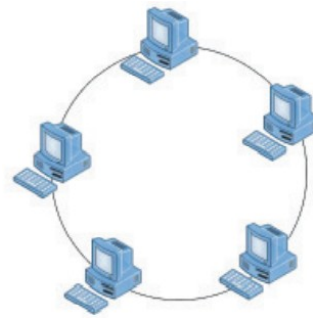

Fig 8.10 Ring topology

Characteristics of ring topology

1) No signal amplification is required as each node amplifies the signal.

2)Requires less cable length and hence is cost-effective.

3)If one node fails, the entire network will fail.

4) Addition of nodes to the network is difficult.

4) Mesh topology :

- In 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.

Characteristics of mesh topology

1) Network will not fail even if one path between the nodes fails.

2) Expensive because of the extra cables needed.
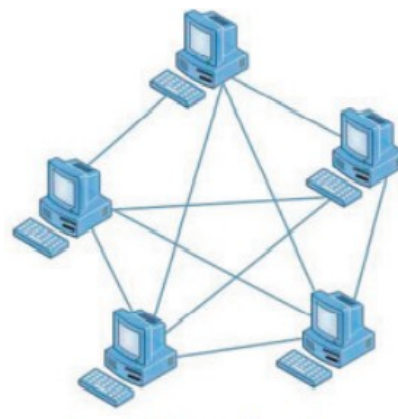
3)Very complex and difficult to manage.

Fig 8.11 Mesh topology

Types of networks

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

• PAN - Personal Area Network

• LAN - Local Area Network

• MAN - Metropolitan Area Network

• WAN -Wide Area Network

1) Personal Area Network (PAN)

- ➤ PAN is a network of communicating devices (computer, mobile, tablet, printer, etc.) in the proximity of an individual.

- ➤ It can cover an area of a radius of few meters.

Fig 8.12 PAN

2) LAN (Local Area Network)

- ➤ LAN is a network of computing and

- ➤ communicating devices in a room building or campus.

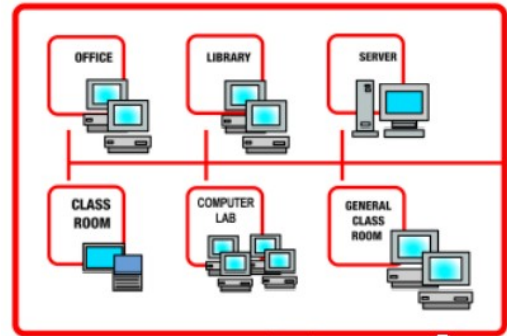- ➤ It can cover an area of few meters to few kilometers.

Fig 8.12 LAN

3) MAN (Metropolitan Area Network):

- ➤ MAN is a network of computing and communication devices within a city.

- ➤ It can cover an area of a few kilometers to a few hundred kilometers radius.

- ➤ MAN is usually formed by interconnecting a number of LANs and individual computers.
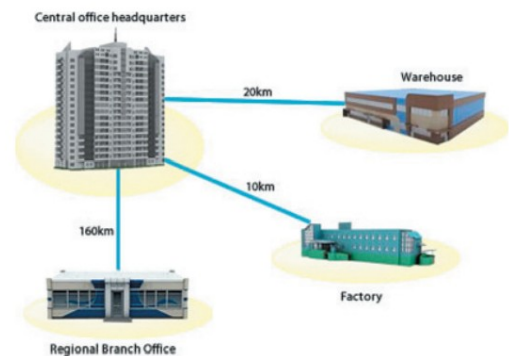

Fig 8.13 MAN

4) WAN (Wide Area Network):

- ➤ WAN is a network of computing and communicating devices crossing the limits of a city, country, or continent.

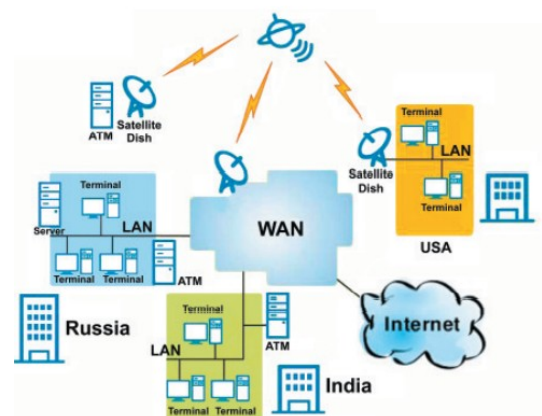- ➤ It can cover an area of hundreds of Kilometers in radius.

Fig 8.14 WAN

Summary of PAN, LAN, MAN, WAN				
Parameter	**PAN**	**LAN**	**MAN**	**WAN**
Area covered	Small area (Up to 10 m radius)	A few meters to few Kilometers (Up to 10 Km radius)	A city and its vicinity (Up to 100 Km radius)	Entire country, continent, or globe
Transmission speed	High speed	High speed	Moderate speed	Low speed
Networking cost	Negligible	Inexpensive	Moderately expensive	Expensive

Identification of Computers on a network

1) Media Access Control (MAC) address:

➢ A universally unique address (12 digit hexadecimal number) assigned to each NIC (Network Interface Card) by its manufacturer.

➢ MAC addresses are usually written in one of the following two formats:

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

➢ The first half (MM:MM:MM) of a MAC address contains the ID number of the adapter manufacturer.

➢ The second half (SS:SS:SS) of a MAC address represents the serial number assigned to the adapter (NIC) by its manufacturer.

eg. 00:A0:C9 : 14:C8:35

2) 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.
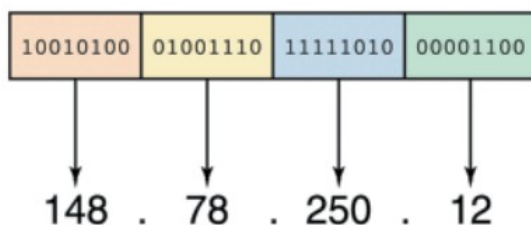

Fig 8.15 IP address

Sample Questions

1. A----------- is a computer peripheral that allows you to connect and communicate with other computers via telephone lines.

2. In ----------topology, all devices are connected to a central hub/switch.

3. Explain any two advantages of computer networks.

4. There are many advantages in using networked computers instead of stand-alone computers. Write any four advantages of them.

5. Differentiate between HUB and SWITCH.

6. Define the term, topology. Consider that, your principal has decided to network your computer Iab. Which topology will you suggest? Justify your answer.

7. Compare ring topology and mesh topology.

8. Define following terms related to computer network

    a) Bandwidth   b) Noise   c) Node

9. How is a WAN different from a LAN ?

Internet

Services on Internet

The internet offers a variety of services like WWW, e-mail, search engines, social media.

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

a) 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.
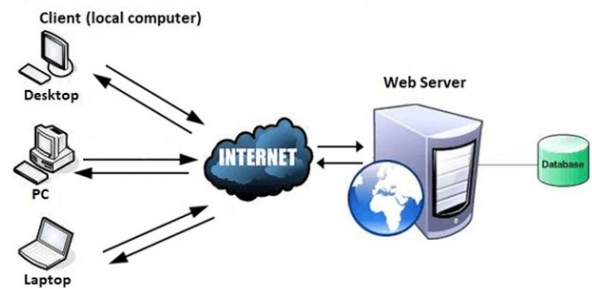
b) Web browsing:

➢ Traversing through the web pages of World Wide Web is called web browsing.

Fig 9.1 WWW

2) Search engines

➢ Internet search engine websites are special programs that are designed to help people to find the information available in World Wide Web.

➢ Search engine programs search documents available on the World Wide Web for specified keywords.

➢ It returns a list of the documents/web pages matching the keywords.

➢ Some of the most popular web search engine sites are Google, Bing, Yahoo Search, Ask, etc.
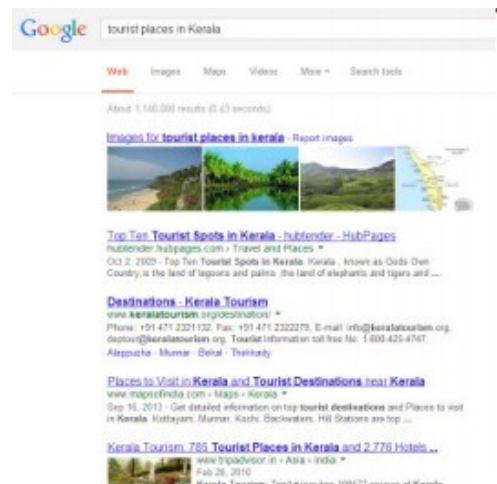

Fig 9.2 Search engine

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

Sections of an e-mail

To (Recipient Address), Cc (Carbon copy), Bcc (Blind carbon copy), Subject, Content

Advantages of using e-mail

Speed, Easy to use, Provision of   attachments, Environment friendly, Reply to an e-mail, Cost-effective, Available anywhere anytime

Disadvantages of using e-mail

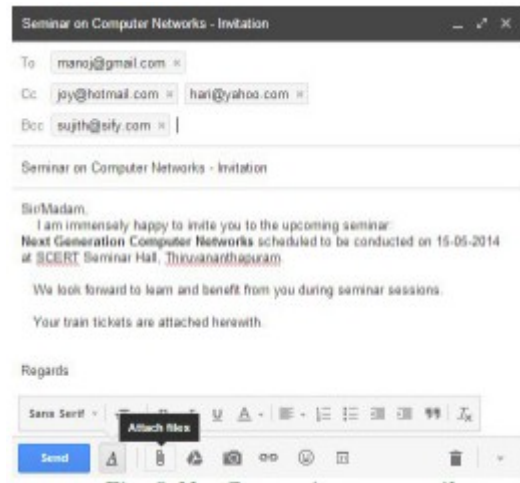E-mails may carry viruses, Junk mails

Fig 9.3 Email

4) 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.

Classification of social media.

a) Internet forums – It is an online discussion website where people can engage in conversations in the form of posted messages.

e.g. Ubuntu Forum.

Fig 9.4 Social Media

b) Social blogs – It is a discussion or informational website consisting of entries or posts displayed.e.g. Blogger and WordPress

c) Microblogs -Microblogs allow users to exchange short sentences, individual images or video links. e.g. Twitter.com

d) Wikis -Wikis allow people to add content or edit existing information in a web page, to form a community document.e.g.wikipedia.org

e) Social networks -Social networking sites allow people to build personal web pages and then connect with friends to communicate and share content. e.g. facebook.com and LinkedIn.

f) Content communities -Content communities are websites that organise and share contents like photos, videos, etc. e.g. YouTube

Advantages of social media

> ➤ Bring people together, Plan and organise events, Business promotion, Social skills

Limitations in use of social media

> ➤ Intrusion to privacy, Addiction, Spread rumours

Cyber Security

Computer Virus

- Its a program that attaches itself with another program or file to spread from one computer to another without our knowledge

- It will affect our normal operation of the computer

- It can corrupt or delete our files

Trojan Horse

- It will appear to be useful software but it can damage our files once installed or run in the computer

- Some Trojan creates a backdoor on the computer

- This gives malicious users access to confidential or personal information in the computer through the network

Hacking

- It is the unauthorized access of a computer, files or network

- The person who is doing this is called hacker

- Hacking is performed both by computer security experts and by computer criminals

- Computer experts perform hacking to test the security of the network

- Such computer experts are called "white hats" and this type of hacking is called "ethical hacking

- Computer criminals breake into a network and destroy data and Such criminals are called 'black hats'

- Gray hat hackers are fall between white and black hackers

- They act as both white hats and black hats

Phishing

- Phishing is an attempt to acquire information such as username, passwords, credit card details by acting like the original websites of the banks and other financial institutions

- The process of making these misleading websites is called spoofing

Sample Questions

1. Internet offers a variety of services and they are used widely around the world.

   a) One of these services requires an address like journey23@gmail.com. Name this service and write the reasons for the wide use of this service.

   b) Name the service which provides a list of websites containing information about a word or a phrase

2. Define the terms :

   (a) Phishing

   (b) Hacking

3. Write any two drawbacks in using social media.

IT Applications

e-Governance

- ➤ Government uses internet and communication technology for delivering their services for the people

Types of interactions in e-Governance

1) Government to Government (G2G)

- ➤ It is the sharing of data or information between government department or organisations

2) Government to Citizens (G2C)

- ➤ It creates an interface between the government and citizens. Here the citizens enjoy a large range of public services

3) Government to Business (G2B)

- ➤ The business people can interact with the government by using ICT tools

4) Government to Employee (G2E)

- ➤ Government uses information and communication tools for the interaction with their employees

e-Governance Infrastructure

1. State Data Centre (SDC)

   - ➤ Responsible for delivering online services for the citizens, keeping the central database of the state, securing data storage.

2. Kerala State Wide Area Network (KSWAN)

   - ➤ It acts as a backbone of the e-Governance infrastructure
   - ➤ It connects Thiruvananthapuram, Kochi, and Kozhikode as its hubs and extends to all the 14 districts linking each of the 152 Block Panchayaths.

3. Common Service Centres (CSC)

   - ➤ It is the front end delivery point of the e-Governance services for the rural areas.
   - ➤ It helps in utility payments such as electricity, telephone and water bills, submission of online applications etc.
   - ➤ Eg: Akshaya Centres

e-Business

- ➤ It is the sharing of business information, maintaining business relationships and conducting business transactions with the help of information technology

   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, obtaining raw materials or goods, customer education, looking for suppliers, etc.

2. Electronic Payment System (EPS)

> - A system of financial exchange between buyers and sellers in an online environment is called EPS

> - The financial exchange is done by credit/debit card, electronic cheque or digital cash

3. e-Banking

> - it is the automated delivery of banking services directly to customers through electronic channels.

Advantage of e-Business

- It overcomes geographical limitation

- Reduces the operational cost

- It minimises travel time and cost

- It remains open all the time

- We can locate the product quicker from the wider range of choice

Challenges to e-Business

- Lack of knowledge about e-Business and its possibilities

- Rural population do not possess plastic money- credit card, debit card and net banking system

- If not used with caution, customers may lose valuable information like their credit card number, passwords, etc.

- Customers don't have this 'touch and feel' advantage

- Efficient shipment facility is needed

e-Learning

- The use of electronic media and IT in education is termed e-Learning.

e-Learning Tools

1. Electronics Book Reader (e-Books)

> - Portable computer devices that are loaded with digital book content via communication interfaces is called electronic books reader

2. e- Text

> - Textual information available in electronic format is called e-Text

3. Online Chat

> - It is a real-time exchange of text messages between two or more persons over the internet

4. e-Content

> - The e-Learning materials such as videos, presentations, animations, graphics etc. are called e-Content

5. Educational TV channels

▷ These television channels are dedicated for e-Leaning purpose

▷ These channels broadcast recorded classes on various subjects, interviews with experts, lab experiments etc.

Advantages of e-Learning

▷ It can offer courses on a variety of subjects to large number of students from a distant location.

▷ Cost for learning is much less

▷ Students can do online courses from various nationally or internationally reputed institutions.

▷ Time and place is not a constraint for e-Learning.

Challenges to e-Learning

▷ Face to face contact between students and teachers is not possible.

▷ Limited interaction between teachers and students

▷ Computers or any similar kind of devices and high speed internet is required for e-Leaning

▷ Students will not get any individual attention

▷ Hands-on practicals in real laboratory scenario is also a constraint in e-Learning.

Sample Questions

1. Write any two challenges for implementing e-Governance.

2. e-Learning allows us to overcome many limitations of conventional teaching-learning process.

    a) Name any three e-Learning tools for enhancing e-Learning process.

    b) Write any three advantages of e-Learning.

3. Compare the advantage and disadvantages of implementing e-Business.

4. Almost all services and business are available online now.

    a) Name the system that facilitates money transaction between buyers and sellers in such cases.

    b) Explain the infrastructure of e-Governance.

5. Briefly describe any two benefits of e-Governance.