

# **MAR GREGORIOS COLLEGE OF ARTS & SCIENCE**

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Affiliated to the University of Madras  
Approved by the Government of Tamil Nadu  
An ISO 9001:2015 Certified Institution



## **PG DEPARTMENT OF COMMERCE**

**SUBJECT NAME: FUNDAMENTALS OF INFORMATION TECHNOLOGY**

**SUBJECT CODE: KDA31**

**SEMESTER: III**

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## SYLLABUS

**Objective:** To offer basic skills in computer applications and to develop working knowledge on business related software.

Unit1: Introduction to Computer- Classification of Digital Computer system- Computer architecture- Number System- Compliments- Logic gates- Truth table- Boolean algebra-Table Simplification of Boolean Function.

Unit 2: Introduction to Computer Software- Introduction to Computer Software -'C'- Introduction to Computer Software –DBMS, RDBMS- Implementing Number Sorting- Matrix addition, Multiplication- Palindrome checking-Searching an Element in an Array.

Unit 3: **Ms- word**- Creating word document-Editing text- Adding and Formatting Numbers- Symbols- Getting into Print- **Ms-excel**: Creating tables using Excel- Using Tables and Creating Graphs- **Ms-access**: Planning and Creating Tables- Forms- Modifying tables- Creating relational Database- Form design- Reports- **Ms-Powerpoint**: Introduction- Creating slides and Slideshow- Preparing Power Point Presentation for Marketing Products such as CREDIT CARD, Newly Introduced Cosmetic item etc.,

Unit 4: Introduction to Internet- Resources of Internet- Hardware and Software Requirement of Internet- Internet service providers- Creating an E-Mail Account- Sending and Receiving Messages with Attachments to our friends account- Introduction to multimedia- Multimedia and its Applications.

Unit 5: Application software- Accounting packages- Statistical packages- Preparation of financial statements- Statistical analysis- SPSS Software- Using SPSS software.

## UNIT I

### INTRODUCTION TO COMPUTER

The word computer is derived from the word compute. Compute means to calculate. The computer was originally defined as a super fast calculator. It had the capacity to solve complex arithmetic and scientific problems at very high speed. But nowadays in addition to handling complex arithmetic computations, computers perform many other tasks like accepting, sorting, selecting, moving, comparing various types of information. They also perform arithmetic and logical operations on alphabetic, numeric and other types of information. This information provided by the user to the computer is data. The information in one form which is presented to the computer is the input information or input data.

Information in another form is presented by the computer after performing a process on it. This information is the output information or output data.

The set of instructions given to the computer to perform various operations is called as the computer program.

The process of converting the input data into the required output form with the help of the computer program is called as data processing. The computers are therefore also referred to as data processors. Therefore a computer can now be defined as a fast and accurate data processing system that accepts data, performs various operations on the data, has the capability to store the data and produce the results on the basis of detailed step by step instructions given to it. The terms hardware and software are almost always used in connection with the computer.

- **The Hardware:** The hardware is the machinery itself. It is made up of the physical parts or devices of the computer system like the electronic Integrated Circuits (ICs), magnetic storage media and other mechanical devices like input devices, output devices etc. All these various hardware are linked together to form an effective functional unit. The various types of hardware used in the computers, has evolved from vacuum tubes of the first generation to Ultra Large Scale Integrated Circuits of the present generation.

- **The Software:** The computer hardware itself is not capable of doing anything on its own. It has to be given explicit instructions to perform the specific task. The computer program is the one which controls the processing activities of the computer. The computer thus functions according to the instructions written in the program. Software mainly consists of these computer programs,

procedures and other documentation used in the operation of a computer system. Software is a collection of programs which utilize and enhance the capability of the hardware.

## ❖ CLASSIFICATION OF COMPUTERS

Computers are broadly classified into two categories depending upon the logic used in their design as:

**Analog computers:** In analog computers, data is recognized as a continuous measurement of a physical property like voltage, speed, pressure etc. Readings on a dial or graphs are obtained as the output, ex. Voltage, temperature; pressure can be measured in this way.

**Digital Computers:** These are high speed electronic devices. These devices are programmable. They process data by way of mathematical calculations, comparison, sorting etc. They accept input and produce output as discrete signals representing high (on) or low (off) voltage state of electricity. Numbers, alphabets, symbols are all represented as a series of 1s and 0s. Digital Computers are further classified as General Purpose Digital Computers and Special Purpose Digital Computers. General Purpose computers can be used for any applications like accounts, payroll, data processing etc. Special purpose computers are used for a specific job like those used in automobiles, microwaves etc. Another classification of digital computers is done on the basis of their capacity to access memory and size like:

**Small Computers:** I) Microcomputers: Microcomputers are generally referred to as Personal Computers (PCs). They have Smallest memory and less power. They are widely used in day to day applications like office automation, and professional applications, ex. PCAT, Pentium etc. II) Note Book and Laptop Computers: These are portable in nature and are battery operated. Storage devices like CDs, floppies etc. and output devices like printers can be connected to these computers. Notebook computers are smaller in physical size than lap top computers. However, both have powerful processors, support graphics, and can accept mouse driven input.

**Hand Held Computers:** These types of computers are mainly used in applications like collection of field data. They are even smaller than the note book computers.

**Hybrid Computers:** Hybrid Computers are a combination of Analog and Digital computers. They combine the speed of analog computers and accuracy of digital computers. They are mostly

used in specialized applications where the input data is in an analog form i.e. measurement. This is converted into digital form for further processing. The computers accept data from sensors and produce output using conventional input/output devices.

**Mini Computers:** Mini computers are more powerful than the micro computers. They have higher memory capacity and more storage capacity with higher speeds. These computers are mainly used in process control systems. They are mainly used in applications like payrolls, financial accounting, Computer aided design etc. ex. VAX, PDP-11

**Mainframe Computers:** Main frame computers are very large computers which process data at very high speeds of the order of several million instructions per second. They can be linked into a network with smaller computers, micro computers and with each other. They are typically used in large organizations, government departments etc. ex. IBM4381, CDC

**Super Computers:** A super computer is the fastest, most powerful and most expensive computer which is used for complex tasks that require a lot of computational power. Super computers have multiple processors which process multiple instructions at the same time. This is known as parallel processing. These computers are widely used in very advanced applications like weather forecasting, processing geological data etc.

## **APPLICATIONS OF COMPUTERS**

Today computers find widespread applications in all activities of the modern world. Some of the major application areas include:

**Scientific, Engineering and Research:** This is the major area where computers find vast applications. They are used in areas which require lot of experiments, mathematical calculations, weather forecasting, and complex mathematical and engineering applications. Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) help in designing robotics, automobile manufacturing, automatic process control devices etc.

**Business:** Record keeping, budgets, reports, inventory, payroll, invoicing, accounts are all the areas of business and industry where computers are used to a great extent. Database management is one of the major area where computers are used on a large scale. The areas of application here

include banking, airline reservations, etc. where large amounts of data need to be updated, edited, sorted, searched from large databases.

**Medicine:** Computerized systems are now in widespread use in monitoring patient data like , pulse rate, blood pressure etc. resulting in faster and accurate diagnosis. Modern day medical equipment are highly computerized today. Computers are also widely used in medical research.

**Information:** This is the age of information. Television, Satellite communication, Internet, networks are all based on computers.

**Education:** The use of computers in education is increasing day by day. The students develop the habit of thinking more logically and are able to formulate problem solving techniques. CDs on a variety of subjects are available to impart education. On line training programs for students are also becoming popular day by day. All the major encyclopedias, dictionaries and books are now available in the digital form and therefore are easily accessible to the student of today. Creativity in drawing, painting, designing, decoration, music etc. can be well developed with computers.

**Games and Entertainment:** Computer games are popular with children and adults alike. Computers are nowadays also used in entertainment areas like movies, sports, advertising etc.

### **Advantages of Computers:**

**Speed:** The speed of a computer is measured in terms of the number of instructions that it can perform or execute in a second. The speeds of computers are measured in milliseconds (10~3 sec), micro-seconds (10\*6 sec), and nano-seconds (10~9sec). Computers are superfast machines and can process millions of instructions per second. Smaller computers can execute thousands of instructions per second, while the more complex machines can execute millions of instructions per second.

**Accuracy:** Computers are very accurate. They are capable of executing hundreds of instructions without any errors. They do not make mistakes in their computations. They perform each and every calculation with the same accuracy.

**Efficiency:** The efficiency of computers does not decrease with age. The computers can perform repeated tasks with the same efficiency any number of times without exhausting there selves. Even if they are instructed to execute millions of instructions, they are capable of executing them all with the same speed and efficiency without exhaustion.

**Storage Capability:** Computers are capable of storing large amounts of data in their storage devices. These devices occupy very less space and can store millions of characters in condensed forms. These storage devices typically include floppy disks, tapes, hard disks, CDs etc, the data stored on these devices can be retrieved and reused whenever it is required in future

**Versatility:** Computers are very versatile. They are capable not only of performing complex mathematical tasks of science and engineering, but also other non numerical operations fielding air-line reservation, electricity bills, data base management etc. Limitations of Computers: Although the computers of today are highly intelligent and sophisticated they have their own limitations. The computer cannot think on its own, since it does not have its own brain. It can only do what is has been programmed to do. It can execute only those jobs that can be expressed as a finite set of instructions to achieve a specific goal. Each of the steps has to be clearly defined. The computers do not learn from previous experience nor can they arrive at a conclusion without going through all the intermediate steps. However the impact of computers on today's society is phenomenal and they are today an important part of the society.

## ❖ COMPUTER ARCHITECTURE

Any system is defined as a group of integrated parts which are designed to achieve a common objective. Thus, a system is made up of more than one element or part, where each element performs a specific function and where all the elements (parts) are logically related and are controlled in such a way that the goal (purpose) of the system is achieved.

A computer is made up of a number of integrated elements like –

The central processing unit

The input and output devices

The storage devices.

Each of these units performs a specific task. However, none of them can function independently on their own. They are logically related and controlled to achieve a specific goal. When they are thus integrated they form a fully fledged computer system.

### **COMPONENTS OF A COMPUTER SYSTEM**

The basic parts of computer system are:

- Input Unit
- The Central Processing Unit
- Output Unit

**The Input Unit:** Input devices are the devices which are used to feed programs and data to the computer. The input system connects the external environment with the computer system. The input devices are the means of communication between the user and the computer system. Typical input devices include the keyboard, floppy disks, mouse, microphone, light pen, joy stick, magnetic tapes etc. The way in which the data is fed into the computer through each of these devices is different. However, a computer can accept data only in a specific form. Therefore these input devices transform the data fed to them, into a form which can be accepted by the computer. These devices are a means of communication and interface station between the user and the computer systems.

Thus the functions of the input unit are:

- Accept information (data) and programs.
- Convert the data in a form which the computer can accept.
- Provide this converted data to the computer for further processing.

**The Central Processing Unit:** This is the brain of any computer system. The central processing unit or CPU is made of three parts:

- The control unit
- The arithmetic logic unit
- The primary storage unit

**The Control Unit:** The Control Unit controls the operations of the entire computer system. The control unit gets the instructions from the programs stored in primary storage unit interprets these instructions and subsequently directs the other units to execute the instructions. Thus it manages and coordinates the entire computer system.

**The Arithmetic Logic Unit:** The Arithmetic Logic Unit (ALU) actually executes the instructions and performs all the calculations and decisions. The data is held in the primary storage unit and transferred to the ALU whenever needed. Data can be moved from the primary



storage to the arithmetic logic unit a number of times before the entire processing is complete. After the completion, the results are sent to the output storage section and the output devices.

**The Primary Storage Unit:** This is also called as Main Memory. Before the actual processing starts the data and the instructions fed to the computer through the input units are stored in this primary storage unit. Similarly, the data which is to be output from the computer system is also temporarily stored in the primary memory. It is also the area where intermediate results of calculations are stored. The main memory has the storage section that holds the computer programs during execution.

Thus the primary unit:

- Stores data and programs during actual processing
- Stores temporary results of intermediate processing
- Stores results of execution temporarily

**Output Unit:** The output devices give the results of the process and computations to the outside world. The output units accept the results produced by the computer, convert them into a human readable form and supply them to the users. The more common output devices are printers, plotters, display screens, magnetic tape drives etc.

## ❖ Number System

The language we use to communicate with each other is comprised of words and characters. We understand numbers, characters and words. But this type of data is not suitable for computers. Computers only understand the numbers. So, when we enter data, the data is converted into electronic pulse. Each pulse is identified as code and the code is converted into numeric format by ASCII. It gives each number, character and symbol a numeric value (number) that a computer understands. So to understand the language of computers, one must be familiar with the number systems.

The Number Systems used in computers are:

- Binary number system

- Octal number system
- Decimal number system
- Hexadecimal number system

### **Binary number system**

It has only two digits '0' and '1' so its base is 2. Accordingly, In this number system, there are only two types of electronic pulses; absence of electronic pulse which represents '0' and presence of electronic pulse which represents '1'. Each digit is called a bit. A group of four bits (1101) is called a nibble and group of eight bits (11001010) is called a byte. The position of each digit in a binary number represents a specific power of the base (2) of the number system.

### **Octal number system**

It has eight digits (0, 1, 2, 3, 4, 5, 6, 7) so its base is 8. Each digit in an octal number represents a specific power of its base (8). As there are only eight digits, three bits ( $2^3=8$ ) of binary number system can convert any octal number into binary number. This number system is also used to shorten long binary numbers. The three binary digits can be represented with a single octal digit.

### **Decimal number system**

This number system has ten digits (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) so its base is 10. In this number system, the maximum value of a digit is 9 and the minimum value of a digit is 0. The position of each digit in decimal number represents a specific power of the base (10) of the number system. This number system is widely used in our day to day life. It can represent any numeric value.

### **Hexadecimal number system**

This number system has 16 digits that ranges from 0 to 9 and A to F. So, its base is 16. The A to F alphabets represent 10 to 15 decimal numbers. The position of each digit in a hexadecimal number represents a specific power of base (16) of the number system. As there are only sixteen digits, four bits ( $2^4=16$ ) of binary number system can convert any hexadecimal number into

binary number. It is also known as alphanumeric number system as it uses both numeric digits and alphabets.

Binary arithmetic is essential part of all the digital computers and many others digital system.

### Binary Addition

It is a key for binary subtraction, multiplication, division. There are four rules of binary addition.

Case	A + B	Sum	Carry
1	0 + 0	0	0
2	0 + 1	1	0
3	1 + 0	1	0
4	1 + 1	0	1

In fourth case, a binary addition is creating a sum of  $(1 + 1 = 10)$  i.e. 0 is written in the given column and a carry of 1 over to the next column.

Example – Addition

$$\begin{array}{r}
 0011010 + 0011100 = 00100110 \quad \begin{array}{l} 11 \\ \text{carry} \end{array} \\
 0011010 = 26_{10} \\
 +0001100 = 12_{10} \\
 \hline
 0100110 = 38_{10}
 \end{array}$$

### Binary Subtraction

**Subtraction and Borrow**, these two words will be used very frequently for the binary subtraction. There are four rules of binary subtraction.

Case	A - B	Subtract	Borrow
1	0 - 0	0	0
2	1 - 0	1	0
3	1 - 1	0	0
4	0 - 1	0	1

### Example – Subtraction

$$0011010 - 001100 = 00001110$$

$$\begin{array}{r}
 \phantom{00}11 \text{ borrow} \\
 00\cancel{1}1010 = 26_{10} \\
 -0001100 = 12_{10} \\
 \hline
 0001110 = 14_{10}
 \end{array}$$

### Binary Multiplication

Binary multiplication is similar to decimal multiplication. It is simpler than decimal multiplication because only 0s and 1s are involved. There are four rules of binary multiplication.

Case	A	x	B	Multiplication
1	0	x	0	0
2	0	x	1	0
3	1	x	0	0
4	1	x	1	1

### Example – Multiplication

Example:

$$0011010 \times 001100 = 100111000$$

$$\begin{array}{r}
 0011010 = 26_{10} \\
 \times 0001100 = 12_{10} \\
 \hline
 0000000 \\
 0000000 \\
 0011010 \\
 0011010 \\
 \hline
 0100111000 = 312_{10}
 \end{array}$$

### Binary Division

Binary division is similar to decimal division. It is called as the long division procedure.

### Example – Division

$$101010 / 000110 = 000111$$

$$\begin{array}{r}
 111 = 7_{10} \\
 000110 \overline{) 101010 = 42_{10}} \\
 \underline{-110 = 6_{10}} \\
 1001 \\
 \underline{-110} \\
 110 \\
 \underline{-110} \\
 0
 \end{array}$$

## ❖ COMPLEMENTS

Complements are used in the digital computers in order to simplify the subtraction operation and for the logical manipulations. For each radix-r system (radix r represents base of number system) there are two types of complements.

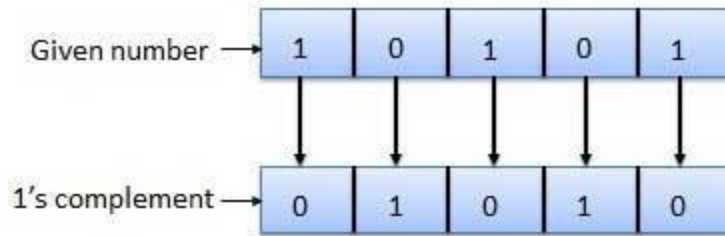
S.N.	Complement	Description
1	Radix Complement	The radix complement is referred to as the r's complement
2	Diminished Radix Complement	The diminished radix complement is referred to as the (r-1)'s complement

### Binary system complements

As the binary system has base  $r = 2$ . So the two types of complements for the binary system are 2's complement and 1's complement.

#### 1's complement

The 1's complement of a number is found by changing all 1's to 0's and all 0's to 1's. This is called as taking complement or 1's complement. Example of 1's Complement is as follows.

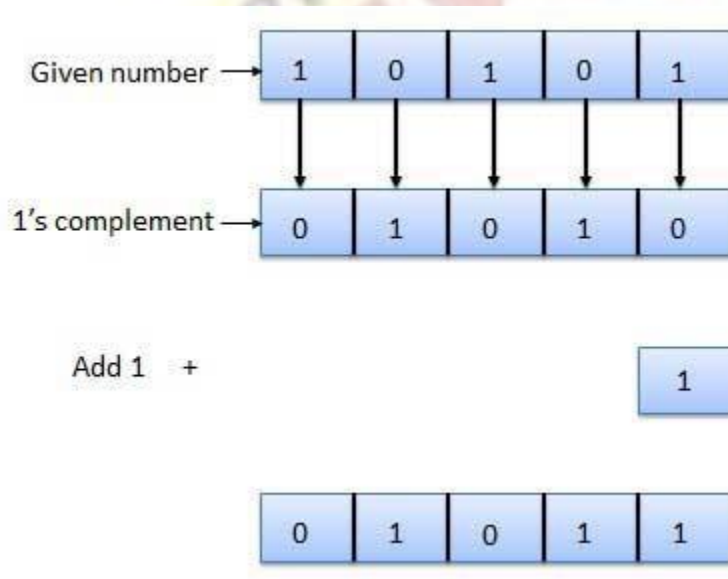


### 2's complement

The 2's complement of binary number is obtained by adding 1 to the Least Significant Bit (LSB) of 1's complement of the number.

2's complement = 1's complement + 1

Example of 2's Complement is as follows.



## ❖ LOGIC GATES, TRUTH TABLE

Logic gates are the basic building blocks of any digital system. It is an electronic circuit having one or more than one input and only one output. The relationship between the input and the output is based on a **certain logic**. Based on this, logic gates are named as AND gate, OR gate, NOT gate etc.

**AND Gate** : A circuit which performs an AND operation is shown in figure. It has n input ( $n \geq 2$ ) and one output.

$$\begin{aligned}
 Y &= A \text{ AND } B \text{ AND } C \dots\dots N \\
 Y &= A.B.C \dots\dots N \\
 Y &= ABC \dots\dots N
 \end{aligned}$$

Logic diagram



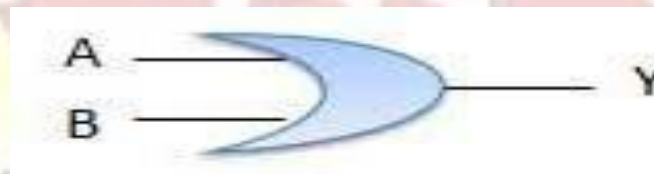
Truth Table

Inputs		Output
A	B	AB
0	0	0
0	1	0
1	0	0
1	1	1

**OR Gate:** A circuit which performs an OR operation is shown in figure. It has  $n$  input ( $n \geq 2$ ) and one output.

$$\begin{aligned}
 Y &= A \text{ OR } B \text{ OR } C \dots\dots N \\
 Y &= A + B + C \dots\dots N
 \end{aligned}$$

Logic diagram



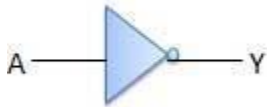
Truth Table

Inputs		Output
A	B	A + B
0	0	0
0	1	1
1	0	1
1	1	1

**NOT Gate:** NOT gate is also known as Inverter. It has one input A and one output Y.

$$\begin{aligned} Y &= \text{NOT } A \\ Y &= \overline{A} \end{aligned}$$

Logic diagram



Truth Table

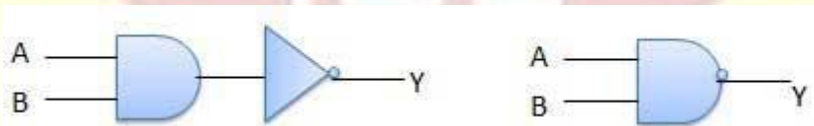
Inputs	Output
A	B
0	1
1	0

**NAND Gate**

A NOT-AND operation is known as NAND operation. It has n input ( $n \geq 2$ ) and one output.

$$\begin{aligned} Y &= \text{A NOT AND B NOT AND C ..... N} \\ Y &= \text{A NAND B NAND C ..... N} \end{aligned}$$

Logic diagram





Truth Table

Inputs		Output
A	B	$\overline{AB}$
0	0	1
0	1	1
1	0	1
1	1	0

**NOR Gate**

A NOT-OR operation is known as NOR operation. It has n input ( $n \geq 2$ ) and one output.

$$Y = \overline{A \text{ NOT OR } B \text{ NOT OR } C \dots \dots N}$$

$$Y = \overline{A \text{ NOR } B \text{ NOR } C \dots \dots N}$$

Logic diagram



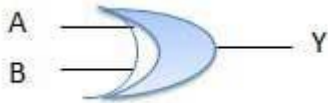
Truth Table

Inputs		Output
A	B	$\overline{A+B}$
0	0	1
0	1	0
1	0	0
1	1	0

**XOR Gate :** XOR or Ex-OR gate is a special type of gate. It can be used in the half adder, full adder and subtractor. The exclusive-OR gate is abbreviated as EX-OR gate or sometime as X-OR gate. It has n input ( $n \geq 2$ ) and one output.

$$\begin{aligned}
 Y &= A \text{ XOR } B \text{ XOR } C \dots\dots N \\
 Y &= A \oplus B \oplus C \dots\dots N \\
 Y &= \overline{AB} + \overline{AB}
 \end{aligned}$$

Logic diagram



Truth Table

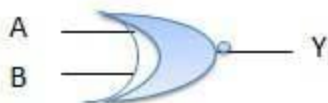
Inputs		Output
A	B	$A \oplus B$
0	0	0
0	1	1
1	0	1
1	1	0

### XNOR Gate

XNOR gate is a special type of gate. It can be used in the half adder, full adder and subtractor. The exclusive-NOR gate is abbreviated as EX-NOR gate or sometime as X-NOR gate. It has n input ( $n \geq 2$ ) and one output.

$$\begin{aligned}
 Y &= A \text{ XOR } B \text{ XOR } C \dots\dots N \\
 Y &= A \ominus B \ominus C \dots\dots N \\
 Y &= \overline{AB} + \overline{AB}
 \end{aligned}$$

Logic diagram



Truth Table

Inputs		Output
A	B	$A \oplus B$
0	0	1
0	1	0
1	0	0
1	1	1

## ❖ BOOLEAN ALGEBRA

Boolean Algebra is used to analyze and simplify the digital (logic) circuits. It uses only the binary numbers i.e. 0 and 1. It is also called as **Binary Algebra** or **logical Algebra**. Boolean algebra was invented by **George Boole** in 1854.

Rule in Boolean Algebra

Following are the important rules used in Boolean algebra.

- Variable used can have only two values. Binary 1 for HIGH and Binary 0 for LOW.
- Complement of a variable is represented by an overbar (-). Thus, complement of variable B is represented as  $\bar{B}$ . Thus if  $B = 0$  then  $\bar{B} = 1$  and  $B = 1$  then  $\bar{B} = 0$ .
- ORing of the variables is represented by a plus (+) sign between them. For example ORing of A, B, C is represented as  $A + B + C$ .
- Logical ANDing of the two or more variable is represented by writing a dot between them such as  $A.B.C$ . Sometime the dot may be omitted like  $ABC$ .

Boolean Laws

There are six types of Boolean Laws.

**Commutative law**

Any binary operation which satisfies the following expression is referred to as commutative operation.

$$(i) A \cdot B = B \cdot A \quad (ii) A + B = B + A$$

Commutative law states that changing the sequence of the variables does not have any effect on the output of a logic circuit.

Associative law

This law states that the order in which the logic operations are performed is irrelevant as their effect is the same.

$$(i) (A \cdot B) \cdot C = A \cdot (B \cdot C) \quad (ii) (A + B) + C = A + (B + C)$$

Distributive law

Distributive law states the following condition.

$$A \cdot (B + C) = A \cdot B + A \cdot C$$

AND law

These laws use the AND operation. Therefore they are called as **AND** laws.

$$(i) A \cdot 0 = 0 \quad (ii) A \cdot 1 = A \\ (iii) A \cdot A = A \quad (iv) A \cdot \bar{A} = 0$$

OR law

These laws use the OR operation. Therefore they are called as **OR** laws.

$$(i) A + 0 = A \quad (ii) A + 1 = 1 \\ (iii) A + A = A \quad (iv) A + \bar{A} = 1$$

INVERSION law

This law uses the NOT operation. The inversion law states that double inversion of a variable results in the original variable itself.

$$\overline{\overline{A}} = A$$

## ❖ TABLE SIMPLIFICATION OF BOOLEAN FUNCTION.

Boolean algebra deals with binary variables and logic operation. A **Boolean Function** is described by an algebraic expression called **Boolean expression** which consists of binary variables, the constants 0 and 1, and the logic operation symbols. Consider the following example.

$$\begin{array}{l} F(A, B, C, D) \\ \text{Boolean Function} \end{array} = \begin{array}{l} A + \overline{BC} + ADC \\ \text{Boolean Expression} \end{array} \quad \text{Equation No. 1}$$

Here the left side of the equation represents the output Y. So we can state equation no. 1

$$Y = A + \overline{BC} + ADC$$

**Truth Table Formation:** A truth table represents a table having all combinations of inputs and their corresponding result. It is possible to convert the switching equation into a truth table. For example, consider the following switching equation.

$$F(A, B, C) = A + BC$$

The output will be high (1) if  $A = 1$  or  $BC = 1$  or both are 1. The truth table for this equation is shown by Table (a). The number of rows in the truth table is  $2^n$  where n is the number of input variables ( $n=3$  for the given equation). Hence there are  $2^3 = 8$  possible input combination of inputs.

Inputs			Output
A	B	C	F
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

Methods to simplify the boolean function

The methods used for simplifying the Boolean function are as follows –

- Karnaugh-map or K-map, and
- NAND gate method.

### Karnaugh-map or K-map

The Boolean theorems and the De-Morgan's theorems are useful in manipulating the logic expression. We can realize the logical expression using gates. The number of logic gates required for the realization of a logical expression should be reduced to a minimum possible value by K-map method. This method can be done in two different ways, as discussed below.

### Sum of Products (SOP) Form

It is in the form of sum of three terms  $AB$ ,  $AC$ ,  $BC$  with each individual term is a product of two variables. Say  $A.B$  or  $A.C$  etc. Therefore such expressions are known as expression in SOP form. The sum and products in SOP form are not the actual additions or multiplications. In fact they are the OR and AND functions. In SOP form, 0 represents a bar and 1 represents an unbar.

SOP form is represented by  $\sum$ .

Given below is an example of SOP.

In SOP form  $\bar{A}\bar{B} + \bar{A}B + AB$

$\begin{array}{ccc} \downarrow\downarrow & \downarrow\downarrow & \downarrow\downarrow \\ 00 & 01 & 11 \end{array}$

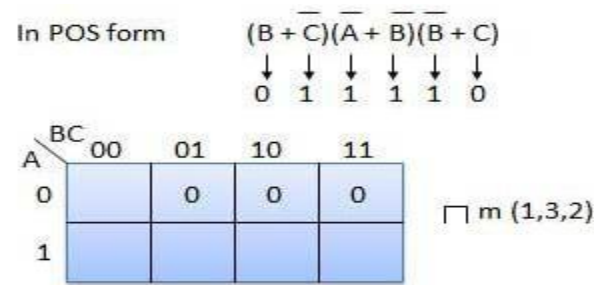
A \ B	0	1	
0	1	1	$\sum m(0,1,3)$
1		1	

Answer:  $\bar{A}\bar{B} + \bar{A}B + AB = \bar{A} + B$

### Product of Sums (POS) Form

It is in the form of product of three terms  $(A+B)$ ,  $(B+C)$ , or  $(A+C)$  with each term is in the form of a sum of two variables. Such expressions are said to be in the product of sums (POS) form. In POS form, 0 represents an unbar and 1 represents a bar. POS form is represented by  $\prod$ .

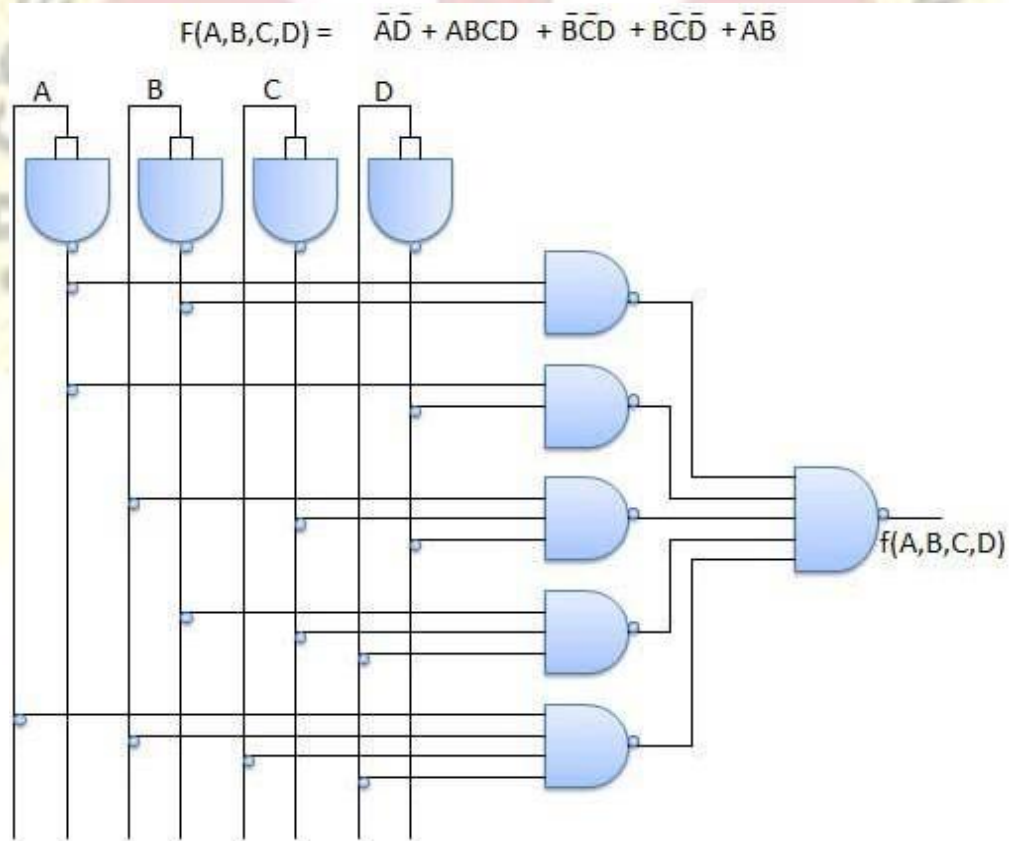
Given below is an example of POS.



Answer :  $(A + \bar{C})(A + \bar{B})$

NAND gates Realization

NAND gates can be used to simplify Boolean functions as shown in the example below.



## UNIT II

### ❖ Introduction to Computer Software

Software is a set of programs, which is designed to perform a well-defined function. A program is a sequence of instructions written to solve a particular problem.

There are two types of software –

- System Software
- Application Software

#### **System Software**

The system software is a collection of programs designed to operate, control, and extend the processing capabilities of the computer itself. System software is generally prepared by the computer manufacturers. These software products comprise of programs written in low-level languages, which interact with the hardware at a very basic level. System software serves as the interface between the hardware and the end users.

Some examples of system software are Operating System, Compilers, Interpreter, Assemblers, etc.

Here is a list of some of the most prominent features of a system software –

- Close to the system
- Fast in speed
- Difficult to design
- Difficult to understand
- Less interactive
- Smaller in size
- Difficult to manipulate
- Generally written in low-level language



## **Application Software**

Application software products are designed to satisfy a particular need of a particular environment. All software applications prepared in the computer lab can come under the category of Application software.

Application software may consist of a single program, such as Microsoft's notepad for writing and editing a simple text. It may also consist of a collection of programs, often called a software package, which work together to accomplish a task, such as a spreadsheet package. Examples of Application software are the following –

- Payroll Software
- Student Record Software
- Inventory Management Software
- Income Tax Software
- Railways Reservation Software
- Microsoft Office Suite Software
- Microsoft Word
- Microsoft Excel
- Microsoft PowerPoint

**Features of application software are as follows –**

- Close to the user
- Easy to design
- More interactive
- Slow in speed
- Generally written in high-level language
- Easy to understand
- Easy to manipulate and use
- Bigger in size and requires large storage space

## ❖ Introduction to Computer Software - 'C'

A computer program is a sequence of instructions written using a Computer Programming Language to perform a specified task by the computer.

The two important terms that we have used in the above definition are –

- Sequence of instructions
- Computer Programming Language

C is a procedural programming language. It was initially developed by Dennis Ritchie in the year 1972. It was mainly developed as a system programming language to write an operating system. The main features of the C language include low-level memory access, a simple set of keywords, and a clean style, these features make C language suitable for system programmings like an operating system or compiler development.

Many later languages have borrowed syntax/features directly or indirectly from the C language. Like syntax of Java, PHP, JavaScript, and many other languages are mainly based on the C language. C++ is nearly a superset of C language (Few programs may compile in C, but not in C++).

### **Beginning with C programming:**

#### **1. Structure of a C program**

After the above discussion, we can formally assess the structure of a C program. By structure, it is meant that any program can be written in this structure only. Writing a C program in any other structure will hence lead to a Compilation Error.

The structure of a C program is as follows:

Structure of C Program	
Header	#include <stdio.h>
main()	int main() {
Variable declaration	int a = 10;
Body	printf( "%d ", a );
Return	return 0; }

The components of the above structure are:

1. **Header Files Inclusion:** The first and foremost component is the inclusion of the Header files in a C program. A header file is a file with extension .h which contains C function declarations and macro definitions to be shared between several source files.

Some of C Header files:

- `stddef.h` – Defines several useful types and macros.
- `stdint.h` – Defines exact width integer types.
- `stdio.h` – Defines core input and output functions
- `stdlib.h` – Defines numeric conversion functions, pseudo-random network generator, memory allocation
- `string.h` – Defines string handling functions
- `math.h` – Defines common mathematical functions

2. **Main Method Declaration:** The next part of a C program is to declare the `main()` function. The syntax to declare the main function is:

**Syntax to Declare the main method:**

```
int main()
{
}
```

**Variable Declaration:** The next part of any C program is the variable declaration. It refers to the variables that are to be used in the function. Please note that in the C program, no variable can be used without being declared. Also in a C program, the variables are to be declared before any operation in the function.

**Example:**

```
int main()
{
    int a;
```

**Body:** The body of a function in the C program, refers to the operations that are performed in the functions. It can be anything like manipulations, searching, sorting, printing, etc.

**Example:**

```
int main()
{
    int a;

    printf("%d", a);
```

**Return Statement:** The last part of any C program is the return statement. The return statement refers to the returning of the values from a function. This return statement and return value depend upon the return type of the function. For example, if the return type is void, then there will be no return statement. In any other case, there will be a return statement and the return value will be of the type of the specified return type.

**Example:**

```
int main()
{
    int a;

    printf("%d", a);

    return 0;
}
```

**Writing first program:**

Following is first program in C

```
#include <stdio.h>
int main(void)
{
    printf("GeeksQuiz");
    return 0;
}
```

1. Let us analyze the program line by line.

**Line 1:** [ *#include <stdio.h>* ] In a C program, all lines that start with # are processed by a preprocessor which is a program invoked by the compiler. In a very basic term,

the preprocessor takes a C program and produces another C program. The produced program has no lines starting with #, all such lines are processed by the preprocessor. In the above example, the preprocessor copies the preprocessed code of stdio.h to our file. The .h files are called header files in C. These header files generally contain declarations of functions. We need stdio.h for the function printf() used in the program.

**Line 2 [ int main(void) ]** There must be a starting point from where execution of compiled C program begins. In C, the execution typically begins with the first line of main(). The void written in brackets indicates that the main doesn't take any parameter (See this for more details). main() can be written to take parameters also. We will be covering that in future posts.

The int was written before main indicates return type of main(). The value returned by main indicates the status of program termination. See this post for more details on the return type.

**Line 3 and 6: [ { and } ]** In C language, a pair of curly brackets define scope and are mainly used in functions and control statements like if, else, loops. All functions must start and end with curly brackets.

**Line 4 [ printf("GeeksQuiz"); ]** printf() is a standard library function to print something on standard output. The semicolon at the end of printf indicates line termination. In C, a semicolon is always used to indicate end of a statement.

**Line 5 [ return 0; ]** The return statement returns the value from main(). The returned value may be used by an operating system to know the termination status of your program. The value 0 typically means successful termination.

## 2. How to execute the above program:

In order to execute the above program, we need to have a compiler to compile and run our programs. There are certain online compilers

like <https://ide.geeksforgeeks.org/>, <http://ideone.com/>, or <http://codepad.org/> that can be used to start C without installing a compiler.

**Windows:** There are many compilers available freely for the compilation of C programs like Code Blocks and Dev-CPP. We strongly recommend Code Blocks.

**Linux:** For Linux, gcc comes bundled with Linux, Code Blocks can also be used with Linux.

## ❖ Introduction to Computer Software –DBMS, RDBMS

**Database:** Database is a collection of inter-related data which helps in efficient retrieval, insertion and deletion of data from database and organizes the data in the form of tables, views, schemas, reports etc. For Example, university database organizes the data about students, faculty, and admin staff etc. which helps in efficient retrieval, insertion and deletion of data from it.

**DDL** is short name of Data Definition Language, which deals with database schemas and descriptions, of how the data should reside in the database.

- CREATE: to create a database and its objects like (table, index, views, store procedure, function, and triggers)
- ALTER: alters the structure of the existing database
- DROP: delete objects from the database
- TRUNCATE: remove all records from a table, including all spaces allocated for the records are removed
- COMMENT: add comments to the data dictionary
- RENAME: rename an object

**DML** is short name of Data Manipulation Language which deals with data manipulation and includes most common SQL statements such SELECT, INSERT, UPDATE, DELETE, etc., and it is used to store, modify, retrieve, delete and update data in a database.

- SELECT: retrieve data from a database
- INSERT: insert data into a table
- UPDATE: updates existing data within a table
- DELETE: Delete all records from a database table
- MERGE: UPSERT operation (insert or update)
- CALL: call a PL/SQL or Java subprogram
- EXPLAIN PLAN: interpretation of the data access path
- LOCK TABLE: concurrency Control

**Database Management System:** The software which is used to manage database is called Database Management System (DBMS). For Example, MySQL, Oracle etc. are popular commercial DBMS used in different applications. DBMS allows users the following tasks:

**Data Definition:** It helps in creation, modification and removal of definitions that define the organization of data in database.

**Data Updation:** It helps in insertion, modification and deletion of the actual data in the database.

**Data Retrieval:** It helps in retrieval of data from the database which can be used by applications for various purposes.

**User Administration:** It helps in registering and monitoring users, enforcing data security, monitoring performance, maintaining data integrity, dealing with concurrency control and recovering information corrupted by unexpected failure.

### **Paradigm Shift from File System to DBMS**

File System manages data using files in hard disk. Users are allowed to create, delete, and update the files according to their requirement. Let us consider the example of file based University Management System. Data of students is available to their respective Departments, Academics Section, Result Section, Accounts Section, Hostel Office etc. Some of the data is common for all sections like Roll No, Name, Father Name, Address and Phone number of students but some data is available to a particular section only like Hostel allotment number which is a part of hostel office. Let us discuss the issues with this system:

- **Redundancy of data:** Data is said to be redundant if same data is copied at many places. If a student wants to change Phone number, he has to get it updated at various sections. Similarly, old records must be deleted from all sections representing that student.
- **Inconsistency of Data:** Data is said to be inconsistent if multiple copies of same data does not match with each other. If Phone number is different in Accounts Section and Academics Section, it will be inconsistent. Inconsistency may be because of typing errors or not updating all copies of same data.
- **Difficult Data Access:** A user should know the exact location of file to access data, so the process is very cumbersome and tedious. If user wants to search student hostel allotment number of a student from 10000 unsorted students' records, how difficult it can be.
- **Unauthorized Access:** File System may lead to unauthorized access to data. If a student gets access to file having his marks, he can change it in unauthorized way.

- **No Concurrent Access:** The access of same data by multiple users at same time is known as concurrency. File system does not allow concurrency as data can be accessed by only one user at a time.
- **No Backup and Recovery:** File system does not incorporate any backup and recovery of data if a file is lost or corrupted.

## RDBMS

- RDBMS stands for **R**elational **D**atabase **M**anagement **S**ystem. RDBMS is the basis for SQL, and for all modern database systems like MS SQL Server, IBM DB2, Oracle, MySQL, and Microsoft Access.

A Relational database management system (RDBMS) is a database management system (DBMS) that is based on the relational model as introduced by E. F. Codd.

### What is a table?

The data in an RDBMS is stored in database objects which are called as **tables**. This table is basically a collection of related data entries and it consists of numerous columns and rows.

Remember, a table is the most common and simplest form of data storage in a relational database. The following program is an example of a CUSTOMERS table –

```
+.....+.....+.....+.....+.....+
| ID | NAME   | AGE | ADDRESS | SALARY |
+.....+.....+.....+.....+.....+
| 1 | Ramesh | 32 | Ahmedabad | 2000.00 |
| 2 | Khilan | 25 | Delhi     | 1500.00 |
| 3 | kaushik | 23 | Kota      | 2000.00 |
| 4 | Chaitali | 25 | Mumbai   | 6500.00 |
| 5 | Hardik | 27 | Bhopal    | 8500.00 |
| 6 | Komal | 22 | MP        | 4500.00 |
| 7 | Muffy | 24 | Indore    | 10000.00 |
+.....+.....+.....+.....+.....+
```



### What is a field?

Every table is broken up into smaller entities called fields. The fields in the CUSTOMERS table consist of ID, NAME, AGE, ADDRESS and SALARY.

A field is a column in a table that is designed to maintain specific information about every record in the table.

### What is a Record or a Row?

A record is also called as a row of data is each individual entry that exists in a table. For example, there are 7 records in the above CUSTOMERS table. Following is a single row of data or record in the CUSTOMERS table –

+.....+	+.....+	+.....+	+.....+	+.....+
1	Ramesh	32	Ahmedabad	2000.00
+.....+	+.....+	+.....+	+.....+	+.....+

A record is a horizontal entity in a table.

### What is a column?

A column is a vertical entity in a table that contains all information associated with a specific field in a table.

For example, a column in the CUSTOMERS table is ADDRESS, which represents location description and would be as shown below –

+.....+
ADDRESS
+.....+
Ahmedabad
Delhi
Kota
Mumbai
Bhopal

MP	
Indore	
+-----+	+-----+

### What is a NULL value?

A NULL value in a table is a value in a field that appears to be blank, which means a field with a NULL value is a field with no value.

It is very important to understand that a NULL value is different than a zero value or a field that contains spaces. A field with a NULL value is the one that has been left blank during a record creation.

### SQL Constraints

Constraints are the rules enforced on data columns on a table. These are used to limit the type of data that can go into a table. This ensures the accuracy and reliability of the data in the database.

Constraints can either be column level or table level. Column level constraints are applied only to one column whereas, table level constraints are applied to the entire table.

Following are some of the most commonly used constraints available in SQL –

- NOT NULL Constraint – Ensures that a column cannot have a NULL value.
- DEFAULT Constraint – Provides a default value for a column when none is specified.
- UNIQUE Constraint – Ensures that all the values in a column are different.
- PRIMARY Key – Uniquely identifies each row/record in a database table.
- FOREIGN Key – Uniquely identifies a row/record in any another database table.
- CHECK Constraint – The CHECK constraint ensures that all values in a column satisfy certain conditions.
- INDEX – Used to create and retrieve data from the database very quickly.

### Data Integrity

The following categories of data integrity exist with each RDBMS –

- **Entity Integrity** – There are no duplicate rows in a table.
- **Domain Integrity** – Enforces valid entries for a given column by restricting the type, the format, or the range of values.
- **Referential integrity** – Rows cannot be deleted, which are used by other records.
- **User-Defined Integrity** – Enforces some specific business rules that do not fall into entity, domain or referential integrity.

### Database Normalization

Database normalization is the process of efficiently organizing data in a database. There are two reasons of this normalization process –

- Eliminating redundant data, for example, storing the same data in more than one table.
- Ensuring data dependencies make sense.

Both these reasons are worthy goals as they reduce the amount of space a database consumes and ensures that data is logically stored. Normalization consists of a series of guidelines that help guide you in creating a good database structure.

Normalization guidelines are divided into normal forms; think of a form as the format or the way a database structure is laid out. The aim of normal forms is to organize the database structure, so that it complies with the rules of first normal form, then second normal form and finally the third normal form.

It is your choice to take it further and go to the fourth normal form, fifth normal form and so on, but in general, the third normal form is more than enough.

- First Normal Form (1NF)
- Second Normal Form (2NF)
- Third Normal Form (3NF)

## ❖ Implementing Number Sorting

Given an array `arr[]` of size `N`, the task is to sort this array in ascending order in C.

**Examples:**

**Input:** `arr[] = {0, 23, 14, 12, 9}`

**Output:** `{0, 9, 12, 14, 23}`

**Input:** `arr[] = {7, 0, 2}`

**Output:** `{0, 2, 7}`

**Approach:**

There are many ways by which the array can be sorted in ascending order, like:

- Selection Sort
- Binary Sort
- Merge Sort
- Radix Sort
- Insertion Sort, etc

For simplicity, we will be using Selection Sort in this article.

The array can be sorted in ascending order by repeatedly finding the minimum element (considering ascending order) from unsorted part and putting it at the beginning. The algorithm maintains two subarrays in a given array.

1. The subarray which is already sorted.
2. Remaining subarray which is unsorted.

In every iteration of selection sort, the minimum element (considering ascending order) from the unsorted subarray is picked and moved to the sorted subarray.

Below is the implementation of the above approach:

```
// C program to sort the array in an
// ascending order using selection sort
```

```
#include <stdio.h>
```

```
void swap(int* xp, int* yp)
{
    int temp = *xp;
    *xp = *yp;
    *yp = temp;
}
```

```
// Function to perform Selection Sort
void selectionSort(int arr[], int n)
{
    int i, j, min_idx;

    // One by one move boundary of unsorted subarray
    for (i = 0; i < n - 1; i++) {

        // Find the minimum element in unsorted array
        min_idx = i;
        for (j = i + 1; j < n; j++)
            if (arr[j] < arr[min_idx])
                min_idx = j;

        // Swap the found minimum element
        // with the first element
        swap(&arr[min_idx], &arr[i]);
    }
}

// Function to print an array
void printArray(int arr[], int size)
{
    int i;
    for (i = 0; i < size; i++)
        printf("%d ", arr[i]);
    printf("\n");
}

// Driver code
int main()
{
    int arr[] = { 0, 23, 14, 12, 9 };
    int n = sizeof(arr) / sizeof(arr[0]);
    printf("Original array: \n");
    printArray(arr, n);

    selectionSort(arr, n);
    printf("\nSorted array in Ascending order: \n");
    printArray(arr, n);

    return 0;
}
```

**Output:**

Original array:

0 23 14 12 9

Sorted array in Ascending order:

0 9 12 14 23

**Time Complexity:**  $O(N^2)$

**Auxiliary Space:**  $O(1)$

## ❖ Matrix addition, Multiplication

Program for addition of two matrices

$$\begin{bmatrix} 0 & 4 \\ 1 & 3 \end{bmatrix} + \begin{bmatrix} 3 & 2 \\ 5 & 1 \end{bmatrix} \rightarrow \begin{bmatrix} 0+3 & 4+2 \\ 1+5 & 3+1 \end{bmatrix} \rightarrow \begin{bmatrix} 3 & 6 \\ 6 & 4 \end{bmatrix}$$

GG

```
#include <stdio.h>
#define N 4

// This function adds A[][] and B[][], and stores
// the result in C[][]
void add(int A[][N], int B[][N], int C[][N])
{
    int i, j;
    for (i = 0; i < N; i++)
        for (j = 0; j < N; j++)
            C[i][j] = A[i][j] + B[i][j];
}

int main()
{
    int A[N][N] = { {1, 1, 1, 1},
                    {2, 2, 2, 2},
                    {3, 3, 3, 3},
                    {4, 4, 4, 4}};

    int B[N][N] = { {1, 1, 1, 1},
```

```

    {2, 2, 2, 2},
    {3, 3, 3, 3},
    {4, 4, 4, 4}};

```

```

int C[N][N]; // To store result
int i, j;
add(A, B, C);

printf("Result matrix is \n");
for (i = 0; i < N; i++)
{
    for (j = 0; j < N; j++)
        printf("%d ", C[i][j]);
    printf("\n");
}

return 0;
}

```

**Output:**

```

Result matrix is
2 2 2 2
4 4 4 4
6 6 6 6
8 8 8 8

```

**Matrix Multiplication**

Given two matrices, the task to multiply them. Matrices can either be square or rectangular.

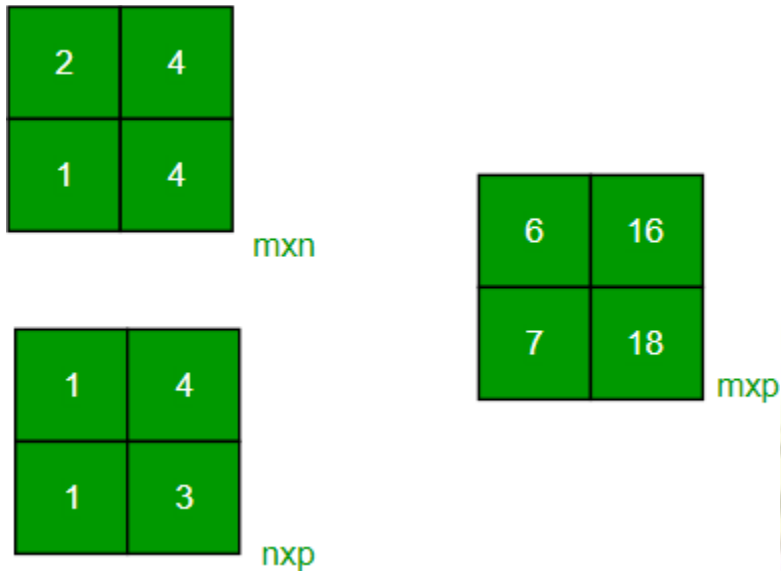
**Examples:**

**Input :** mat1[][] = {{1, 2},  
                   {3, 4}}  
 mat2[][] = {{1, 1},  
                   {1, 1}}

**Output :** {{3, 3},  
                   {7, 7}}

**Input :** mat1[][] = {{2, 4},  
                   {3, 4}}  
 mat2[][] = {{1, 2},  
                   {1, 3}}

**Output :** {{6, 16},  
                   {7, 18}}



### Multiplication of Square Matrices :

The below program multiplies two square matrices of size 4\*4, we can change N for different dimensions.

```
// C program to multiply two square matrices.
#include <stdio.h>
#define N 4

// This function multiplies mat1[][] and mat2[],
// and stores the result in res[][]
void multiply(int mat1[][N], int mat2[][N], int res[][N])
{
    int i, j, k;
    for (i = 0; i < N; i++) {
        for (j = 0; j < N; j++) {
            res[i][j] = 0;
            for (k = 0; k < N; k++)
                res[i][j] += mat1[i][k] * mat2[k][j];
        }
    }
}

int main()
{
    int mat1[N][N] = { { 1, 1, 1, 1 },
                      { 2, 2, 2, 2 },
                      { 3, 3, 3, 3 },
```



```

        { 4, 4, 4, 4 } };

int mat2[N][N] = { { 1, 1, 1, 1 },
                  { 2, 2, 2, 2 },
                  { 3, 3, 3, 3 },
                  { 4, 4, 4, 4 } };

int res[N][N]; // To store result
int i, j;
multiply(mat1, mat2, res);

printf("Result matrix is \n");
for (i = 0; i < N; i++) {
    for (j = 0; j < N; j++)
        printf("%d ", res[i][j]);
    printf("\n");
}

return 0;
}

```

### Output

```

Result matrix is
10 10 10 10
20 20 20 20
30 30 30 30
40 40 40 40

```

### ❖ Palindrome checking

Given an integer N, write a program that returns true if the given number is a palindrome, else return false.

**Examples:**

**Input:** N = 2002

**Output:** true

**Input:** N = 1234

**Output:** false

## Check if a number is Palindrome



### Approach:

A simple method for this problem is to first reverse digits of  $n$ , then compare the reverse of  $n$  with  $n$ . If both are same, then return true, else false. Below is the implementation of the above approach:

```
// C program to check whether a number
// is Palindrome or not.
```

```
#include <stdio.h>
```

```
/* Iterative function to reverse digits of num*/
```

```
int reverseDigits(int num)
```

```
{
```

```
    int rev_num = 0;
```

```
    while (num > 0) {
```

```
        rev_num = rev_num * 10 + num % 10;
```

```
        num = num / 10;
```

```
    }
```

```
    return rev_num;
```

```
}
```

```
/* Function to check if n is Palindrome*/
```

```
int isPalindrome(int n)
```

```
{
```

```
    // get the reverse of n
```

```
    int rev_n = reverseDigits(n);
```

```
    // Check if rev_n and n are same or not.
```

```
    if (rev_n == n)
```

```
        return 1;
```

```

    else
        return 0;
}

/*Driver program to test reversDigits*/
int main()
{
    int n = 4562;
    printf("Is %d a Palindrome number? -> %s\n", n,
        isPalindrome(n) == 1 ? "true" : "false");

    n = 2002;
    printf("Is %d a Palindrome number? -> %s\n", n,
        isPalindrome(n) == 1 ? "true" : "false");
    return 0;
}

```

**Output:**

Is 4562 a Palindrome number? -> false

Is 2002 a Palindrome number? -> true

### ❖ Searching an Element in an Array.

**Problem:** Given an array arr[] of n elements, write a function to search a given element x in arr[].**Examples :**

**Input :** arr[] = {10, 20, 80, 30, 60, 50,  
110, 100, 130, 170}

x = 110;

**Output :** 6

Element x is present at index 6

**Input :** arr[] = {10, 20, 80, 30, 60, 50,  
110, 100, 130, 170}

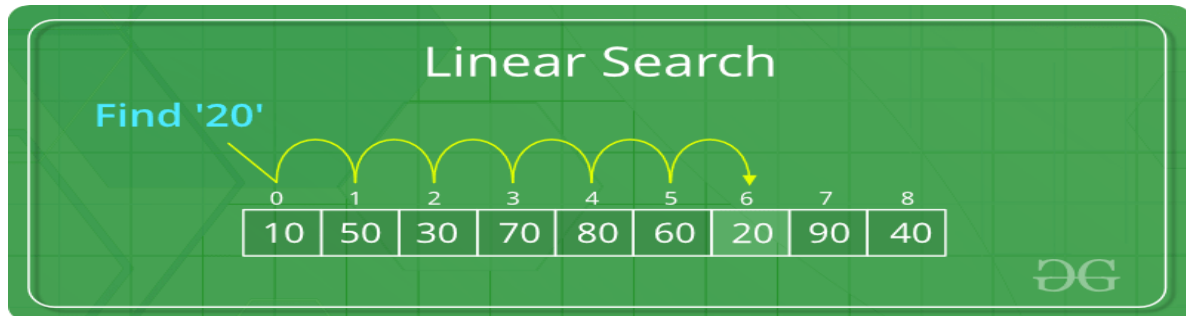
x = 175;

**Output :** -1

Element x is not present in arr[].

A simple approach is to do a **linear search**, i.e

- Start from the leftmost element of arr[] and one by one compare x with each element of arr[]
- If x matches with an element, return the index.
- If x doesn't match with any of elements, return -1.



### Example:

```
// C code to linearly search x in arr[]. If x
// is present then return its location, otherwise
// return -1
```

```
#include <stdio.h>
```

```
int search(int arr[], int n, int x)
```

```
{
```

```
    int i;
```

```
    for (i = 0; i < n; i++)
```

```
        if (arr[i] == x)
```

```
            return i;
```

```
    return -1;
```

```
}
```

```
int main(void)
```

```
{
```

```
    int arr[] = { 2, 3, 4, 10, 40 };
```

```
    int x = 10;
```

```
    int n = sizeof(arr) / sizeof(arr[0]);
```

```
    // Function call
```

```
    int result = search(arr, n, x);
```

```
    (result == -1)
```

```
        ? printf("Element is not present in array")
```

```
        : printf("Element is present at index %d", result);
```

```
    return 0;
```

```
}
```

### Output

```
Element is present at index 3
```

### UNIT III

#### ❖ Ms- word

A **word** processor is a computer program used to create and print text documents that might otherwise be prepared on a typewriter. The key advantage of a **word** processor is its ability to make changes easily, such as correcting spelling, adding, deleting, formatting and relocating text.

**Given below are the basic functions of Microsoft Word:**

- Creating text documents.
- Editing and Formatting the existing documents.
- Making a text document interactive with different features and tools.
- Graphical documents, comprising images.
- Used by Authors and Researchers.
- Detect grammatical errors **in** a text document.

#### ❖ Creating word document

##### **Create a document**

1. Open **Word**. Or, if **Word** is already open, select **File** > New.
2. In the Search for online templates box, enter a search **word** like letter, resume, or invoice. Or, select a category under the search box like Business, Personal, or Education.
3. Click a template to see a preview. ...
4. Select **Create**.

#### ❖ Editing text

##### **Edit a Microsoft Word document**

1. Open the file that you want to **edit**.
2. Choose from the following tasks: Task. Steps. **Edit text**. Click the. **Edit**. tab. Select the **text** that you want to **edit**. Using the tools in the **edit** toolbar, change the required formatting including font style, paragraph alignment, list formatting, and indentation options. Insert images.

#### ❖ Adding and Formatting Numbers- Symbols

**Microsoft** products allow you to organize content using **bulleted and numbered** lists. You can also create customized lists by editing the **bullet/number** font, color, alignment, and icon style.

### **Bullets**

1. Within your Microsoft document, place your cursor or highlight the text where you wish to insert a bulleted list.
2. Under the [Home] tab in the “Paragraph” section, click the [Bullets] drop-down menu.
3. Choose a bullet style or select "Bullets and Numbering” to create a customized bullet style.
4. To change the alignment of the bulleted list, from the "Paragraph" section, click the [Align Text] drop-down menu.

### **Numbering**

1. Within your Microsoft document, place your cursor or highlight the text where you wish to insert a numbered list.
2. the [Home] tab in the “Paragraph” section, click the [Numbering] drop-down menu.
3. Choose a numbering style or select "Bullets and Numbering” to create a customized numbering style.
4. To change the alignment of the numbered list, from the "Paragraph" section, click the [Align Text] drop-down menu.

### **To insert a symbol:**

1. From the **Insert** tab, click **Symbol**.
2. Choose the symbol that you want from the drop-down list. If the symbol is not in the list, click **More Symbols**. In the font box, choose the font you are using, click the symbol you want to insert, and select **Insert**.

### **To insert a special character:**

1. From the **Insert** tab, click **Symbol**.
2. Click **More Symbols**.
3. Select the **Special Characters** tab.
4. Choose the character you want to insert, and select **Insert**.

## ❖ Getting into Print

### Preview your document

1. Click File > **Print**.
2. To preview each page, click the forward and backward arrows at the bottom of the page. If the text is too small to read, use the zoom slider at the bottom of the page to enlarge it.
3. Choose the number of copies, and any other options you want, and click the **Print** button.

## ❖ Ms-excel:

**Excel definition:** a software program created by Microsoft that uses spreadsheets to organize numbers and data with formulas and functions. **Excel** analysis is ubiquitous around the world and used by businesses of all sizes to perform financial analysis.

Microsoft Excel is a **spreadsheet** program. That means it's used to create grids of **text**, **numbers** and **formulas** specifying calculations. That's extremely valuable for many businesses, which use it to record expenditures and income, plan budgets, chart data and succinctly present fiscal results.

### Features of Microsoft Excel

- Add Header and Footer. MS Excel allows us to keep the header and footer in our spreadsheet document.
- Find and Replace Command. ...
- Password Protection. ...
- Data Filtering. ...
- Data **Sorting**. ...
- Built-in formulae. ...
- Create different charts (Pivot Table Report) ...
- Automatically edits the result.

## ❖ Creating tables using Excel

1. Open the **Excel** spreadsheet.
2. **Use** your mouse to select the cells that contain the information for the **table**.
3. Click the "Insert" tab > Locate the "**Tables**" group.

4. Click "**Table**". ...
5. If you have column headings, check the box "My **table** has headers".
6. Verify that the range is correct > Click [OK].

### ❖ Using Tables and Creating Graphs

1. Enter your data into Excel.
2. Choose one of nine **graph** and chart options to **make**.
3. Highlight your data and 'Insert' your desired **graph**.
4. Switch the data on each axis, if necessary.
5. Adjust your data's layout and colors.
6. Change the size of your chart's legend and axis labels.

### ❖ Ms-access:

**Microsoft Access** is an information management tool, or relational database, that helps you store information for reference, reporting and analysis. **Access** can also overcome the limitations found when trying to manage large amounts of information in Excel or other spreadsheet applications.

#### **Features**

- Ideal for individual users and smaller team.
- Easier than client-server database to understand and use.
- Import and export to other **Microsoft Office** and other applications.
- Ready templates for regular users to create and publish data.
- Allows building and publishing Web databases effortlessly.

### ❖ Planning and Creating Tables

#### **Planning Tables**

1. **Plan Tables.** **Tables** are one of the fundamental **building** blocks of a database. ...
2. Choose Data Types. When you **create** a **table**, you must decide what fields to include and the appropriate format for those fields. ...



3. Specify a Primary Key. You should also identify which field or fields are the **table's** primary keys.

### **Create a new table in a new database**

1. Click File > New, and then select Blank desktop database.
2. In the File Name box, type a file name for the new database.
3. To browse to a different location and save the database, click the folder icon.
4. Click **Create**.

### **❖ Forms- Modifying tables**

1. **Here's the step-by-step process to create your new input form:**
2. Select Create in the menu, and select **Form Wizard**.
3. Select the >> button to select all fields in the **table**.
4. Select the Next button to continue.
5. Choose the **form** layout that you'd like. ...
6. Select the Next button to continue.

Modify:

7. On the **Create** tab, in the Macros & Code group, click Query Design.
8. On the Design tab, in the Query Type group, click Data Definition. ...
9. Type the following SQL statement: ...
10. On the Design tab, in the Results group, click Run.
11. **Create** a primary key for the **table** by using an **ALTER TABLE** statement:

### **❖ Creating relational Database**

#### **Relational Database Design Process**

1. Step 1: Define the Purpose of the **Database** (Requirement Analysis) ...
2. Step 2: Gather Data, Organize in tables and Specify the Primary Keys. ...
3. Step 3: **Create** Relationships among Tables. ...
4. Step 4: Refine & Normalize the Design.

## ❖ Form design- Reports

**Reports** offer a way to view, format, and summarize the information in your **Microsoft Access** database. For example, you can create a simple **report** of phone numbers for all your contacts, or a summary **report** on the total sales across **different** regions and time periods.

1. A **report** consists of information that is pulled from tables or queries, as well as information that is stored with the **report design**, such as labels, headings, and graphics.
2. The tables or queries that provide the underlying data are also known as the **report's** record source.

How to make a **report**:

1. Balance text with visuals for a digestible **report design**.
2. Use a single highlight color to draw attention to key information.
3. **Create** a clear text hierarchy for an easy-to-navigate **report design**.
4. Incorporate your branding for a cohesive **report design**.

## ❖ Ms-Powerpoint

**Microsoft PowerPoint** is a professional presentation program that allows the user to create "presentation slides" that can be displayed on the computer screen or through a projector that is plugged into the computer. The program uses **slides** to convey information rich in multimedia.

- Customize Color Schemes.
- Add Animation effects.
- Use the Slide, Notes and Handout Masters.
- Create, Edit and Import Charts.
- Create and Edit Tables.
- Manage Hyperlinks.
- Create Custom Shows.
- Export Outlines & **Presentation** Slides to Word.

## ❖ Introduction- Creating slides and Slideshow

A **slide** is a single page of a presentation. Collectively, a group of **slides** may be known as a **slide deck**. ....In the digital age, a **slide** most commonly refers to a single page developed using a presentation program such as MS PowerPoint, Apple Keynote, Google **Slides**, Apache OpenOffice or LibreOffice.

## CREATING SLIDES

1. Open Microsoft PowerPoint.
2. Go to File at the top of the screen and click New. ...
3. In the “New Presentation” dialog box, click on “From Design Template.” You may then scan through design templates and choose one that you like.
4. Step 4: **Slide Design**. ...
5. Step 5: **Slide Layout**. ...
6. Step 6: Adding Text. ...
7. Step 7: Adding Pictures.

## Slideshow

Click **the Slide Show** tab on **the** ribbon. Select From Beginning or From Current Slide. You can also press F5 on **your** keyboard or click **the Slide Show** button in **the** status bar to **start** the presentation.

### ❖ Preparing Power Point Presentation for Marketing Products such as CREDIT CARD, Newly Introduced Cosmetic item etc.,

#### *Content of this Powerpoint Presentation*

**Slide 1:** This slide introduces Example Presentation of Product. State Your Company Name and begin.

**Slide 2:** This is an Agenda slide. State your agendas here.

**Slide 3:** This slide shows Outline as- Product Idea Screening, New Product Analysis, Product Lifecycle, Tools & Techniques, Market Analysis, Development Plans, Branding &

Repositioning, Cost Analysis, Product Feasibility & Review.

**Slide 4:** This slide presents Product Idea Screening describing- New Product Introduction, New Product Detailed Overview, Understanding Customer Needs, External Sources of Ideas, Internal Sources of Ideas, Product Roadmap.

**Slide 5:** This slide displays New Product Introduction. Explain the product idea in detail for e.g. Requirement of the product, Technology used etc.

**Slide 6:** This slide represents New Product Detailed Overview.

**Slide 7:** This slide showcases Understanding Customer Needs describing- What they do: Understand their occupation and interest? Understand your customer: are they a small private company or a big MNC? When they buy: Understand the purchasing cycle of your customer What they expect of you: if your customers expect reliable delivery and you don't disappoint them, you stand to gain repeat business How they buy: Website, App, in-person?

**Slide 8:** This slide shows External Source of New Product Ideas describing- Overseas experience transferring foreign products, Learning From, Competitors, Long Range Studies, Market Gap Analysis, Consumer Activity Analysis, Market Research.

**Slide 9:** This slide presents Internal Sources of New Product Ideas describing- Management, Employee Suggestions, Stockholders, Innovation Group Meetings, Sales Force, Research and Engineering.

**Slide 10:** This slide displays Product Roadmap as- Product Launch, Data Logging Module, Bootstrap upgrade, Teach support portal, Chrome Support, Public API.

**Slide 11:** This slide represents New Product Analysis describing- Detailed Analysis, Category Analysis - Example Slide, Category Analysis, Porter's Five Forces Analysis.

**Slide 12:** This slide showcases Detailed Analysis with- Strengths, Weaknesses, Features, Benefits.

**Slide 13:** This slide shows Category Analysis with Positioning Claims/trends, Price, Packing formats types & materials, Consumption Drivers.

**Slide 14:** This slide presents Category Analysis – Example Slide.

**Slide 15:** This slide displays Porter's Five Forces Model describing- Intensity of Rivalry, Barriers to Entry, Substitutes, Bargaining Power of suppliers, Bargaining Power of Buyer.

**Slide 16:** This slide represents Product Life Cycle as- Introduction Stage, Maturity Stage, Repositioning a Product, Growth Stage, Decline Stage.

**Slide 17:** This slide showcases Product Life Cycle Stages describing- Introduction, Growth, Maturity, Decline.

**Slide 18:** This slide shows Introduction Stage with- Cost, Targets, Competition, Profits, Sales.

**Slide 19:** This slide presents Growth Stage with following points- Promotions, Distribution Channels, Pricing, Product Quality.

**Slide 20:** This slide displays Maturity Stage.

**Slide 21:** This slide represents Decline Stage.

**Slide 22:** This slide showcases Tools & Techniques as- BCG Matrix, Empathy Map, Ansoff Matrix, Kano Model.

**Slide 23:** This slide shows BCG Matrix.

**Slide 24:** This slide presents Ansoff Matrix.

**Slide 25:** This slide displays Empathy Map to come up with all the possible customer segments to whom you might want to sell your product.

**Slide 26:** This slide represents Kano Map.

**Slide 27:** This slide represents Market Analysis describing- Market Segmentation, Competitive Strategies, Product Market Mapping, Market Attractiveness.

**Slide 28:** This slide showcases Market Segmentation with factors as- Geographic, Demographic, Psychographic, Behavioral.

**Slide 29:** This slide shows Product Market Mapping.

**Slide 30:** This slide presents Competitive Strategies in a matrix form.

**Slide 31:** This slide displays Market Attractiveness.

**Slide 32:** This slide represents Development Plans describing- Manufacturing Plan, Marketing Launch Plan, Digital Marketing Plan, Operations Plan, Marketing Communication Plan, Budgeting Plan.

**Slide 33:** This slide displays Manufacturing Plan.

**Slide 34:** This slide represents Operations Plan.

**Slide 35:** This slide showcases Marketing Launch Plan as- Create Press Release, Update The Website, Use Twitter, Garner Endorsements, Attend Tradeshows, Create Email Contest, Build Demand, Use Advertising.

**Slide 36:** This slide shows Marketing Communication Plan as- Direct Marketing, Public Relations, Personal Selling, Sales Promotion, Advertising.

**Slide 37:** This slide presents Digital Marketing Plan.

**Slide 38:** This slide displays Budgeting Template in a tabular form.

**Slide 39:** This slide represents Branding & Repositioning as- Repositioning Strategy, Maturity Stage, Repositioning a Product, Growth Stage, Decline Stage.

**Slide 40:** This slide displays Repositioning a Product To new Consumers and Among Existing Customers.

**Slide 41:** This slide represents Repositioning Strategy in a matrix form.

**Slide 42:** This slide displays Building Brand Preference in a tabular form.

**Slide 43:** This slide represents Cost Analysis as- Marketing & Launch Cost Analysis, Production & Operation Cost Analysis, Business & Financial Analysis.

**Slide 44:** This slide showcases Production & Operation Cost Analysis in a tabular form.

**Slide 45:** This slide shows Marketing & Launch Cost Analysis.

**Slide 46:** This slide presents Business & Financial Analysis.

**Slide 47:** This slide displays Product Feasibility & Review with- Evaluating Scores, Product Quality Check, Feasibility Review, Alpha & Beta Testing Timelines, Launch Monitoring Dashboard.

**Slide 48:** This slide represents Feasibility Review describing- Operational Feasibility, Economic Feasibility, Legal Requirement Feasibility, Scheduling Requirement Feasibility, Technical Feasibility.

**Slide 49:** This slide showcases Evaluating Scores in a tabular form.

**Slide 50:** This slide shows Alpha & Beta Testing Timelines.

**Slide 51:** This slide presents Product Quality Check to rate the product's quality as per the alpha/beta testing done in the previous slide.

**Slide 52:** This slide displays Launch Monitoring Dashboards of Return On Investment, Target Units Sold, Customer Satisfaction.

**Slide 53:** This slide reminds about 30 minutes Coffee Break.

**Slide 54:** This slide shows Example Presentation of Product Icons.

**Slide 55:** This is another slide continuing Example Presentation of Product Icons.

**Slide 56:** This slide is titled as Additional Slides for moving forward.

**Slide 57:** This is Our Mission slide with related imagery.

**Slide 58:** This is Our Team slide with names and designation.

**Slide 59:** This is About us slide to show company specifications etc.

**Slide 60:** This is Our Main Goal slide. Show your important goals here.

**Slide 61:** This is a Comparison slide to state comparison between commodities, entities etc.

**Slide 62:** This is Our Main Target slide. Show your targets here.

**Slide 63:** This slide displays Australia Map.

**Slide 64:** This is a Hierarchy slide with member's names and designation.

**Slide 65:** This is a Location slide with USA map.

**Slide 66:** This is Contact Us slide with Building Address, Telephone, Email and Business Hours.



## UNIT IV

### ❖ Introduction to Internet

The **Internet** is a worldwide network of computer networks that connects university, government, commercial, and other computers in over 150 countries. Using the **Internet**, you can send electronic mail, chat with colleagues around the world, and obtain information on a wide variety of subjects.

Internet allows people to improve the quality of their life. It opens access to the previously inaccessible things. With almost three millions of users, internet has been emerging as one of the most important tools of **communication**.

#### **Uses of Internet**

- Online Booking & Orders. ...
- Cashless Transactions. ...
- Education. ...
- Online Banking & Trading. ...
- Research. ...
- Electronic Mail. ...
- Job Search. ...
- Social Networking.

### ❖ Resources of Internet

The most effective communication **resources**, computers and the **Internet**, are part of our daily life and have become one of the important tools in the education. The **Internet** helps transfer information between different points therefore this satiation makes the **Internet** a very powerful information system.

A **web resource**, or simply **resource**, is any identifiable thing, whether digital, physical, or abstract. **Resources** are identified using Uniform **Resource** Identifiers. In the Semantic **Web**, **web resources** and their semantic properties are described using the **Resource**.

#### **Advantages of Internet**

- Connectivity, **communication**, and sharing. ...
- Information, **knowledge**, and **learning**. ...
- Address, mapping, and contact information. ...



- Selling and making **money**. ...
- Banking, bills, and shopping. ...
- Donations and **funding**. ...
- Entertainment. ...
- Work from home, **collaboration**, and access to a global workforce.

## ❖ Hardware and Software Requirement of Internet

The following are the methods of connecting a computer to the Internet using software and hardware peripherals.

- Connecting a computer using Wireless Broadband
- Connecting a computer using an Ethernet Cable
- Connecting a Computer Using Dial-Up Community

### **Hardware Requirement :**

- To connect the Internet, any one of the following is mandatory.
- Modem is used to connect Internet through Telephoneconnection.
- NIC- Network Interface Card(wired/ wireless) facility is the most important hardware required to connect Internet. For example, the Laptop can be connected Internet through the wired/wireless.
- Dongle is used to connect the Internet using cellular network
- Wi-Fi router or Hotspot is used to connect the Internet using wireless network
- Electronic device which supports cellular network
- Internet Connectivity such as Dial-up connection, ISDN, DSL, Cable TV, wired and wireless (Cellular) Network.

## Software Requirement

- The operating system should support TCP (Transfer Control Protocol) / IP (Internet Protocol), SMTP (Simple Mail Transfer Protocol), FTP (File Transfer Protocol), HTTP (Hyper Text Transfer Protocol) and HTTPS (Hyper Text Transfer Protocol Secured) protocols.
- Browsers and other Internet clients access to the web applications such as Outlook, Gmail, Whatsapp, Facebook, Twitter and etc.

**Connection Types:**The following methods are able to connect internet.

### Dial-up Connection :

A dial-up connection is established when two or more data communication devices use a **Public Switched Telephone Network** (PSTN) to connect to an Internet Service Provider (ISP) from computers. Many remote locations depend on Internet dial-up connections because broadband and cable are rare in remote areas with low population. Internet Service Providers often provide dial-up connections, a feasible alternative for budget-conscious subscribers.

### ISDN

ISDN is the acronym of **Integrated Services Digital Network**. It establishes the connection using the phone lines (PSTN) which carry digital signals instead of analog signals. It is a set of communication standards for simultaneous digital transmission of data, voice, video, and other services over the traditional circuits of the public switched telephone network. There are two techniques to deliver ISDN services such as Basic Rate Interface (BRI) and Primary Rate Interface (PRI).

The following diagram shows accessing internet using ISDN connection:



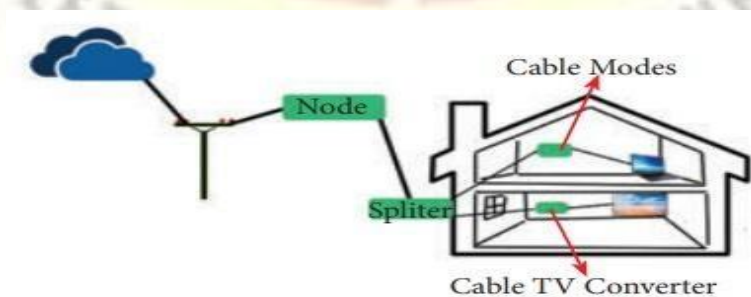
*Figure 15.4a Integrated Services Digital Network*

## DSL:

**Digital Subscriber Line (DSL)** is a high-speed Internet service for homes and businesses that competes with cable and other forms of broadband Internet. DSL provides high-speed networking over ordinary Telephone lines using broadband modem technology. The technology behind DSL enables Internet and telephone service to work over the same phone line without requiring customers to disconnect either their Voice or Internet connections.

## Cable TV Internet Connection (setup box):

The cable TV network can be used for connecting a computer or a local network to the Internet, competing directly with DSL (Digital Subscriber Line) technology. This type of network is classified as HFC (**Hybrid Fiber-Coaxial**), as it uses both fiber optics and coaxial cables. The connection between the cable TV company to the distribution points (Optical nodes) is made using fiber optics, with distances up to 25 miles (40 km). Each optical node is typically serves between 500 and 2,000 clients (customers). The following diagram shows that how internet is accessed using Cable TV connection:



*Figure 15.4b Cable TV Connection*

### Satellite Internet Connection:

Satellite Internet access is Internet access provided through satellite communication for domestic and enterprise usage. The facility of modern consumer grade satellite Internet service is typically provided to individual users through geostationary satellites. It provides fairly high data speeds, along with latest satellites using Ka-band to attain downstream data speeds up to 50 Mbps internet speed.

### Wireless Internet Connection:

It is a technology for wireless local area networking with devices based on the IEEE 802.11 standards. Devices that can use Wi-Fi technology include personal computers, video-game consoles, phones and tablets, digital cameras, smart TVs, digital audio players and modern printers. Wi-Fi compatible devices can connect to the Internet via a WLAN and a wireless access point. Such an access point (or hotspot) has a range of about 20 meters (66 feet) indoors and a greater range of outdoors. Hotspot coverage can be as small as a single room with walls that block radio waves, or as large as many square kilometers achieved by using multiple overlapping access points.



*Figure 15.3 Dial-up Connection*

## ❖ Internet service providers

An **Internet Service Provider (ISP)** is a company such as AT&T, Verizon, Comcast, or Spectrum that provides **Internet access** to companies, families, and even mobile users. **ISPs** use fiber-optics, satellite, copper wire, and other forms to provide **Internet access** to its customers.

## ❖ Creating an E-Mail Account

Create a Gmail account

To sign up for Gmail, create a Google Account. You can use the username and password to sign in to Gmail and other Google products like YouTube, Google Play, and Google Drive.

1. Go to the [Google Account creation page](#).
2. Follow the steps on the screen to set up your account.
3. Use the account you created to sign in to Gmail.

### Create an account

The username I want is taken

You won't be able to get a certain Gmail address if the username you requested is:

- Already being used.
- Very similar to an existing username (for example, if example@gmail.com already exists, you can't use example@gmail.com).
- The same as a username that someone used in the past and then deleted.
- Reserved by Google to prevent spam or abuse.

Someone is impersonating me

If you believe someone has created a Gmail address to try to impersonate your identity, you can:

- File a report with the [Internet Crime Complaint Center](#).

- Contact your state's Office of Consumer Protection.

Unfortunately, Gmail is unable to participate in mediations involving third parties regarding impersonation.

### **Use Gmail for your business**

If you want to use Gmail for your business, a Google Workspace account might be better for you than a personal Google Account. Google Workspace starts at \$6 per user per month and includes the following:

- A professional, ad-free Gmail account using your company's domain name, such as susan@example.com.
- Ownership of employee accounts so you are always in control of your company's accounts, emails, and files.
- 24/7 phone, email, and chat support from a real person.
- Increased Gmail and Google Drive storage.
- Mobile device management to keep your data secure, such as the ability to remotely wipe lost devices.
- Advanced security and administrative controls.

### **❖ Sending and Receiving Messages with Attachments to our friends account**

#### **Send emails as attachments**

You can attach emails to other emails without downloading them first. When you attach an email, it becomes an .eml file.

How it works

When you send emails as an attachment:

- You can attach as many emails as you'd like.
- If the file size grows over 25 MB, it will attach through Google Drive.
- When you click on an attached email, it will open in a new window.
- A security banner will appear at the top of an attached email sent or received

### **Forward an email as an attachment**

1. On your computer, go to Gmail.
2. Select the emails that you want.
3. Click More  $\vdots$  > Forward as attachment.
4. In the "To" field, add recipients. You can also add recipients in the "Cc" and "Bcc" fields.
5. Add a subject.
6. Write your message.
7. At the bottom, click Send.

Note: To forward as an attachment, you can also right-click on a message or drag and drop the file into the body of your message.

### **Reply with an attached email**

1. On your computer, go to Gmail.
2. Open the email > click Reply.
3. At the top right of the email, click the Pop out icon .
4. From your inbox, select the email you want to attach.
5. Drag the email into your message.
6. At the bottom, click Send.

## **❖ Introduction to multimedia**

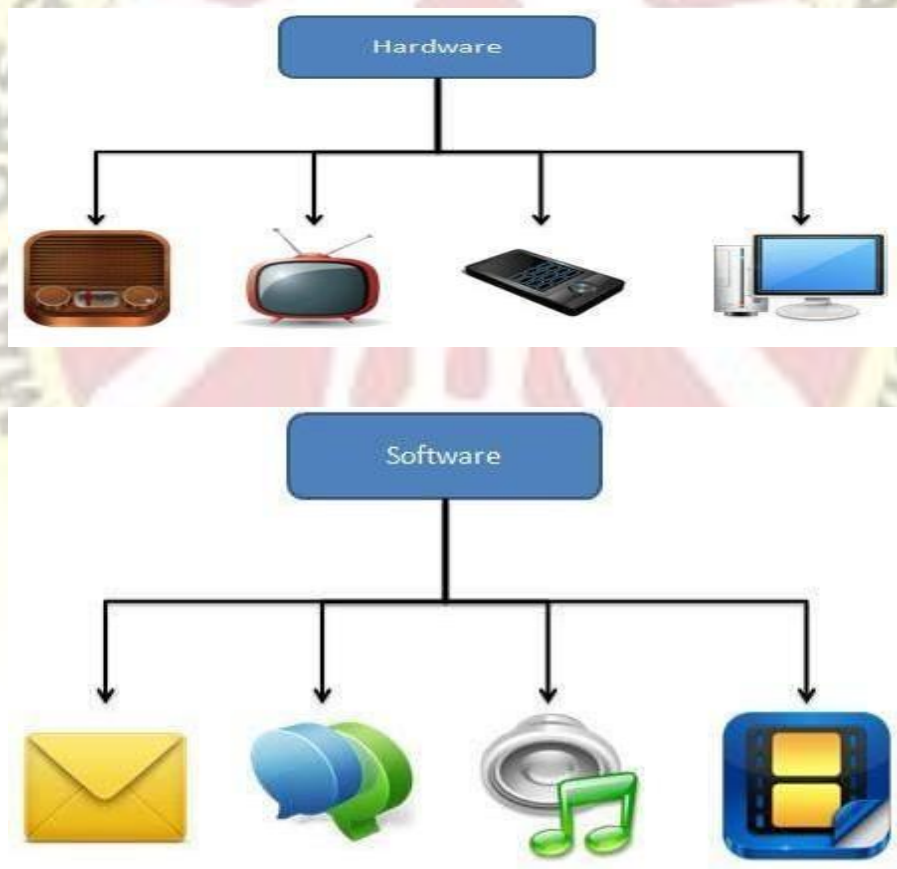
Multimedia is an interactive media and provides multiple ways to represent information to the user in a powerful manner. It provides an interaction between users and digital information. It is

a medium of communication. Some of the sectors where multimedia is used extensively are education, training, reference material, business presentations, advertising and documentaries.

### Definition of Multimedia

By definition Multimedia is a representation of information in an attractive and interactive manner with the use of a combination of text, audio, video, graphics and animation. In other words we can say that Multimedia is a computerized method of presenting information combining textual data, audio, visuals (video), graphics and animations. For examples: E-Mail, Yahoo Messenger, Video Conferencing, and Multimedia Message Service (MMS).

Multimedia as name suggests is the combination of Multi and Media that is many types of media (hardware/software) used for communication of information.





## Components of Multimedia

Following are the common components of multimedia:

- **Text-** All multimedia productions contain some amount of text. The text can have various types of fonts and sizes to suit the professional presentation of the multimedia software.
- **Graphics-** Graphics make the multimedia application attractive. In many cases people do not like reading large amount of textual matter on the screen. Therefore, graphics are used more often than text to explain a concept, present background information etc. There are two types of Graphics:
  - **Bitmap images-** Bitmap images are real images that can be captured from devices such as digital cameras or scanners. Generally bitmap images are not editable. Bitmap images require a large amount of memory.
  - **Vector Graphics-** Vector graphics are drawn on the computer and only require a small amount of memory. These graphics are editable.
- **Audio-** A multimedia application may require the use of speech, music and sound effects. These are called audio or sound element of multimedia. Speech is also a perfect way for teaching. Audio are of analog and digital types. Analog audio or sound refers to the original sound signal. Computer stores the sound in digital form. Therefore, the sound used in multimedia application is digital audio.
- **Video-** The term video refers to the moving picture, accompanied by sound such as a picture in television. Video element of multimedia application gives a lot of information in small duration of time. Digital video is useful in multimedia application for showing real life objects. Video have highest performance demand on the computer memory and on the bandwidth if placed on the internet. Digital video files can be stored like any other files in the computer and the quality of the video can still be maintained. The digital video files can be transferred within a computer network. The digital video clips can be edited easily.

- **Animation-** Animation is a process of making a static image look like it is moving. An animation is just a continuous series of still images that are displayed in a sequence. The animation can be used effectively for attracting attention. Animation also makes a presentation light and attractive. Animation is very popular in multimedia application

## ❖ **Multimedia and its Applications.**

### Applications of Multimedia

Following are the common areas of applications of multimedia.

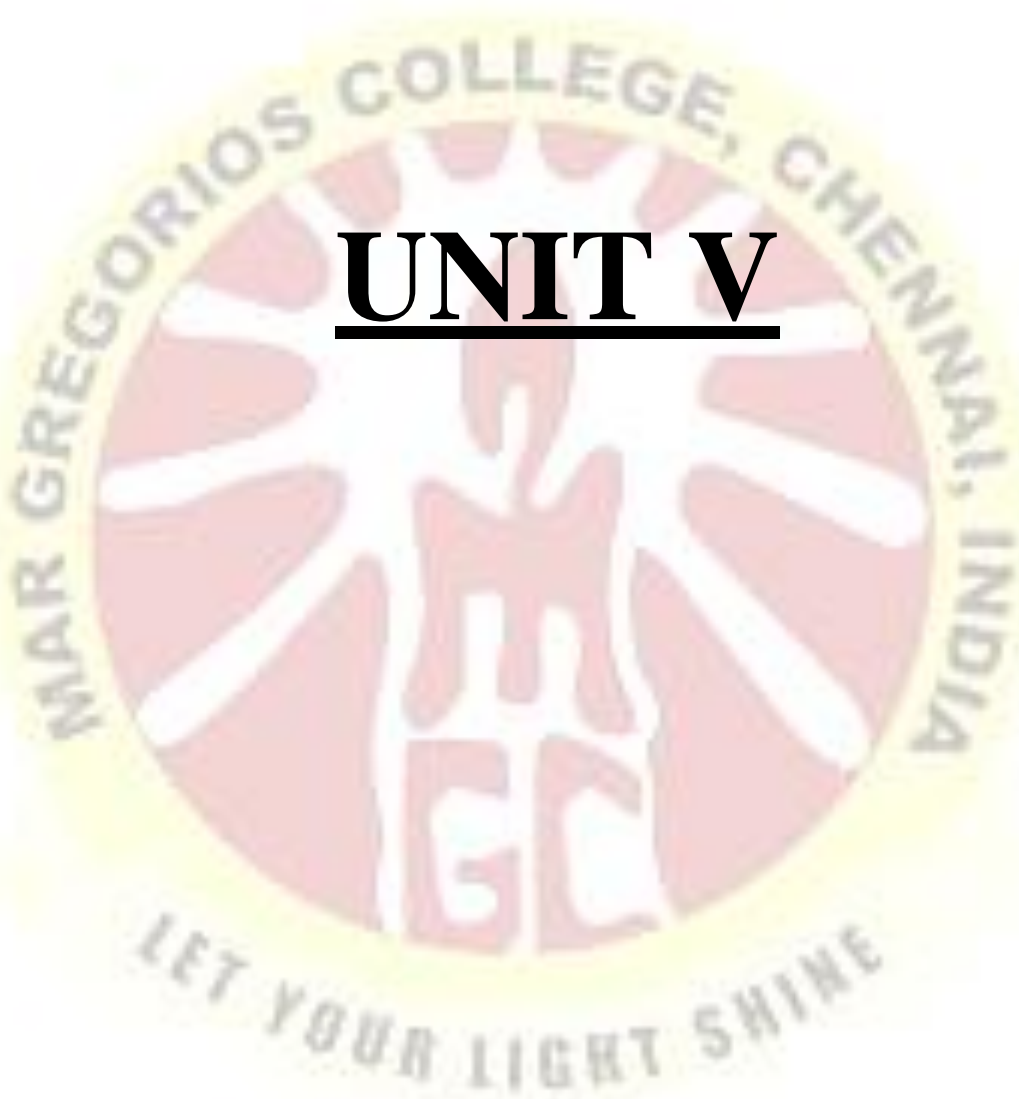
- **Multimedia in Business-** Multimedia can be used in many applications in a business. The multimedia technology along with communication technology has opened the door for information of global work groups. Today the team members may be working anywhere and can work for various companies. Thus the work place will become global. The multimedia network should support the following facilities:
  - Voice Mail
  - Electronic Mail
  - Multimedia based FAX
  - Office Needs
  - Employee Training
  - Sales and Other types of Group Presentation
  - Records Management
- **Multimedia in Marketing and Advertising-** By using multimedia marketing of new products can be greatly enhanced. Multimedia boost communication on an affordable cost opened the way for the marketing and advertising personnel. Presentation that have flying banners, video transitions, animations, and sound effects are some of the elements used in composing a multimedia based advertisement to appeal to the consumer in a way never used before and promote the sale of the products.

- **Multimedia in Entertainment-** By using multimedia marketing of new products can be greatly enhanced. Multimedia boost communication on an affordable cost opened the way for the marketing and advertising personnel. Presentation that have flying banners, video transitions, animations, and sound effects are some of the elements used in composing a multimedia based advertisement to appeal to the consumer in a way never used before and promote the sale of the products.
- **Multimedia in Education-** Many computer games with focus on education are now available. Consider an example of an educational game which plays various rhymes for kids. The child can paint the pictures, increase reduce size of various objects etc apart from just playing the rhymes. Several other multimedia packages are available in the market which provide a lot of detailed information and playing capabilities to kids.
- **Multimedia in Bank-** Bank is another public place where multimedia is finding more and more application in recent times. People go to bank to open saving/current accounts, deposit funds, withdraw money, know various financial schemes of the bank, obtain loans etc. Every bank has a lot of information which it wants to impart to its customers. For this purpose, it can use multimedia in many ways. Bank also displays information about its various schemes on a PC monitor placed in the rest area for customers. Today on-line and internet banking have become very popular. These use multimedia extensively. Multimedia is thus helping banks give service to their customers and also in educating them about banks attractive finance schemes.
- **Multimedia in Hospital-** Multimedia best use in hospitals is for real time monitoring of conditions of patients in critical illness or accident. The conditions are displayed continuously on a computer screen and can alert the doctor/nurse on duty if any changes are observed on the screen. Multimedia makes it possible to consult a surgeon or an expert who can watch an ongoing surgery line on his PC monitor and give online advice at any crucial juncture.

In hospitals multimedia can also be used to diagnose an illness with CD-ROMs/ Cassettes/ DVDs full of multimedia based information about various diseases and their treatment. Some hospitals extensively use multimedia presentations in training their

junior staff of doctors and nurses. Multimedia displays are now extensively used during critical surgeries.

- **Multimedia Pedagogues-** Pedagogues are useful teaching aids only if they stimulate and motivate the students. The audio-visual support to a pedagogue can actually help in doing so. A multimedia tutor can provide multiple numbers of challenges to the student to stimulate his interest in a topic. The instruction provided by pedagogue have moved beyond providing only button level control to intelligent simulations, dynamic creation of links, composition and collaboration and system testing of the user interactions.
- **Communication Technology and Multimedia Services-** The advancement of high computing abilities, communication ways and relevant standards has started the beginning of an era where you will be provided with multimedia facilities at home. These services may include:
  - Basic Television Services
  - Interactive entertainment
  - Digital Audio
  - Video on demand
  - Home shopping
  - Financial Transactions
  - Interactive multiplayer or single player games
  - Digital multimedia libraries
  - E-Newspapers, e-magazines



# UNIT V

## ❖ **Application software**

**Application software** is a type of computer program that performs a specific personal, educational, and business function. Each program is designed to assist the user with a particular process, which may be related to productivity, creativity, and/or communication.

**The application software list includes:**

- **Word processors.**
- Graphics software.
- **Database** software.
- **Spreadsheet** software.
- Presentation software.
- Web browsers.
- Enterprise software.
- Information worker software.

## ❖ **Accounting packages**

A business account software helps in keeping a track on the entire cash inflow and outflow of an organization. There are different kind of modules present through which the software works such as General Ledger, Account Receivables, Account Payable, etc. The software also manages the payroll system and takes care of reporting management. These individual modules are basic and can be customized to match the functionalities of any particular industry. For instance, the fund accounting system of a non-profit organization will vary from that of a government organization. As account management is one of the essential systems of a business, it often comes under the Enterprise Resource Planning System (ERP).

Accounting software is a type of application software that is used to keep track of all the transactions that are made to or from your business to an individual or another business. To run a successful and profitable business, one has to keep records of all the profits and losses that the business is going through at any given time. In old times ledger books were maintained to keep track of all the transactions, but with modern times this workload has been reduced using the

help of technology. There are many different types of accounting software available, and all types of businesses use them. Accounting system can be classified in various categories, and depending on the circumstances, anyone of them can be used to digitize the records. These are classified as follows:

### › *SPREADSHEETS*

A spreadsheet is an important business accounting tool. In simple words, a spreadsheet boils down to this, and it is a document consisting of grids of rows and columns, which makes it easy to store different types of relevant data together. Many small businesses rely entirely on spreadsheets for maintaining and accessing their financial data. Spreadsheets can be used for almost every accounting needs, including but not limited to, creating budgets, calculating profits, and visualizing this data using graphs and charts. Microsoft Excel is one of the best and most widely used spreadsheet software around the globe. If you are running a small business, then make sure to check it out.

### › *COMMERCIAL ACCOUNTING SOFTWARE*

From managing, income, and expenses to keeping track of the financial health of a business, commercial accounting software are more than capable of fulfilling every requirement of a small to mid-size business's accounting needs. These software are totally customizable, which means businesses can configure them to fit their specific needs. Software such as QuickBooks accounting can be used to invoice customers, pay bills, generate reports, and come in handy while preparing for taxes.

Other popular choices for commercial accounting systems are FreshBooks accounting and Xero. Some of the commercial software may require consulting the vendor to install and configure them accordingly and have lengthy installation processes.

### › ***ENTERPRISE ACCOUNTING SOFTWARE***

Enterprise accounting software allows a business to maintain its financial transactions and data. However, its functions go beyond the scope of just accounting processes. Enterprise software has different modules to deal with different areas such as billing and payrolls, maintaining the ledger, budgeting and forecasting, and more.

Enterprise resource planning software also referred to as ERP software, is programmed in such a way that it can handle complex operations for larger companies. Enterprise software combines other services such as project planning and workflow management with accounting, meaning the software integrates information from different parts of a business into a single database. This ensures better data flow between independent parts of a business which depends on a specific piece of software that does not have utilities like information sharing, which is very important. However, the installation process is quite lengthy, which means it can take up to a year to set it up, and it is also highly expensive. This is the reason this software is used by more important and more complex businesses and organizations.

### › ***CUSTOM ACCOUNTING SOFTWARE***

These are the applications, which are developed according to the particular needs of a business or an organization, meaning they are custom made for a specific purpose. Generally, businesses only decide to go for this software if their requirements are so specific that they cannot be fulfilled by a commercial or enterprise accounting system. But businesses rarely tend to go with custom made software as they are buggy and take more time and resources to manage and maintain as compared to custom or enterprise software.

Nowadays, as the applications are being developed cloud-based so that users can access their data from anywhere in the world, so is the case with accounting software. Businesses can log in to their vendor's site to access the software from anywhere in the globe, and this approach proves to be more productive and beneficial as compared to the primitive approach of installing in on a particular system and copying the files whenever they are required by other users on different systems.



## ❖ Statistical packages

**Statistical packages** are collections of software designed to aid in **statistical** analysis and data exploration. ... Second, **statistical packages** can provide a unified operating framework and common interface for data manipulation, visualization, and **statistical** analysis.

- **SPSS** (IBM) ...
- R (R Foundation for Statistical Computing) ...
- **MATLAB** (The Mathworks) ...
- Microsoft Excel. ...
- **SAS** (**Statistical Analysis** Software) ...
- GraphPad Prism. ...
- Minitab.

## ❖ Preparation of financial statements

**The eight steps of the accounting cycle include the following:**

1. Step 1: Identify **Transactions**. ...
2. Step 2: Record **Transactions** in a Journal. ...
3. Step 3: Posting. ...
4. Step 4: Unadjusted **Trial Balance**. ...
5. Step 5: Worksheet. ...
6. Step 6: Adjusting Journal Entries. ...
7. Step 7: Financial Statements. ...
8. Step 8: Closing the Books.

**Here are the types of financial statements and tips on how to create them:**

1. **Balance Sheet**. ...
2. **Income Sheet**. ...
3. **Statement** of Cash Flow. ...
4. Step 1: Make A Sales Forecast. ...
5. Step 2: Create A Budget for Your Expenses. ...
6. Step 3: Develop Cash Flow **Statement**. ...
7. Step 4: Project Net Profit. ...

8. Step 5: Deal with Your Assets and Liabilities.

### ❖ Statistical analysis- SPSS Software

The **SPSS software** platform offers advanced **statistical analysis**, a vast library of machine learning algorithms, text **analysis**, open source extensibility, integration with big **data** and seamless deployment into applications. Its ease of use, flexibility and scalability make **SPSS** accessible to users of all skill levels.

**SPSS Statistics**, the world's leading **statistical software**, is designed to solve business and research problems through ad hoc analysis, hypothesis testing, geospatial analysis and predictive analytics.

### ❖ Using SPSS software.

**SPSS** is short for **Statistical Package for the Social Sciences**, and it's **used** by various kinds of researchers for complex **statistical data analysis**..... Most top **research agencies use SPSS to analyze survey data** and mine text **data** so that they can get the most out of their **research** projects.

#### **Basic steps in data analysis**

1. Get your **data** into IBM **SPSS** Statistics. You can open a previously saved IBM **SPSS** Statistics **data** file, you can read a spreadsheet, **database**, or text **data** file, or you can enter your **data** directly in the **Data** Editor.
2. Select a procedure. ...
3. Select the variables for the **analysis**. ...
4. Run the procedure and look at the results.

To **run SPSS**, log in and click Start - Programs - IBM **SPSS** Statistics - IBM **SPSS** Statistics 23. When **SPSS** is first started you are presented with a dialog box asking you to open a file. Pick a recently opened file or pick "Open another file" from the list on the left.

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