# Digital Contents

Computer Fundamentals
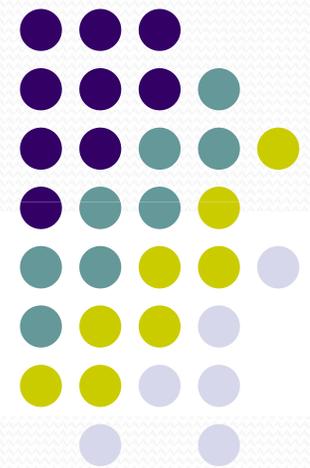
Basic Terminology

- **Computer**
  - A device that accepts input, processes data, stores data, and produces output, all according to a series of stored instructions.

- **Hardware**
  - Includes the electronic and mechanical devices that process the data; refers to the computer as well as peripheral devices.

- **Software**
  - A computer program that tells the computer how to perform particular tasks.

- **Network**
  - Two or more computers and other devices that are connected, for the purpose of sharing data and programs.

- **Peripheral devices**
  - Used to expand the computer's input, output and storage capabilities.

HISTORICAL PROSPECTIVE

Brief History of Computer Evolution

Two phases:

1. before VLSI 1945 – 1978
   - ENIAC
   - IAS
   - IBM
   - PDP-8

2. VLSI 1978 → present day
   - microprocessors AND microcontrollers…

Evolution of Computers
FIRST GENERATION (1945 – 1955)

- Program and data reside in the same memory (stored program concepts – John von Neumann)

- ALP was made used to write programs

- Vacuum tubes were used to implement the functions (ALU & CU design)

- Magnetic core and magnetic tape storage devices are used

- Using electronic vacuum tubes, as the switching components

SECOND GENERATION (1955 – 1965)
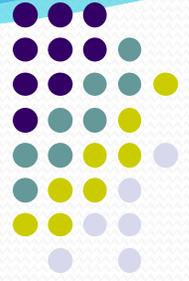
- Transistor were used to design ALU & CU
- HLL is used (FORTRAN)
- To convert HLL to MLL compiler were used
- Separate I/O processor were developed to operate in parallel with CPU, thus improving the performance
- Invention of the transistor which was faster, smaller and required considerably less power to operate

THIRD GENERATION (1965-1975)
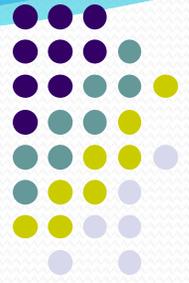
- IC technology improved
- Improved IC technology helped in designing low cost, high speed processor and memory modules
- Multiprogramming, pipelining concepts were incorporated
- DOS allowed efficient and coordinate operation of computer system with multiple users
- Cache and virtual memory concepts were developed
- More than one circuit on a single silicon chip became available

FOURTH GENERATION (1975-1985)

- CPU – Termed as microprocessor
- INTEL, MOTOROLA, TEXAS,NATIONAL semiconductors started developing microprocessor
- Workstations, microprocessor (PC) & Notebook computers were developed
- Interconnection of different computer for better communication LAN,MAN,WAN
- Computational speed increased by 1000 times
- Specialized processors like Digital Signal Processor were also developed

BEYOND THE FOURTH GENERATION (1985 – TILL DATE)
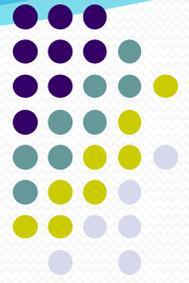
- E-Commerce, E- banking, home office
- ARM, AMD, INTEL, MOTOROLA
- High speed processor - GHz speed
- Because of submicron IC technology lot of added features in small size

COMPUTER TYPES

Computers are classified based on the parameters like

- Speed of operation
- Cost
- Computational power
- Type of application

DESK TOP COMPUTER

- Processing & storage units, visual display &audio units, keyboards
- Storage media-Hard disks, CD-ROMs
- Eg: Personal computers which is used in homes and offices
- Advantage: Cost effective, easy to operate, suitable for general purpose educational or business application

NOTEBOOK COMPUTER

- Compact form of personal computer (laptop)
- Advantage is portability

WORK STATIONS

• More computational power than PC

•Costlier

•Used to solve complex problems which arises in engineering application (graphics, CAD/CAM etc)

ENTERPRISE SYSTEM (MAINFRAME)

•More computational power

•Larger storage capacity

•Used for business data processing in large organization

•Commonly referred as servers or super computers

SERVER SYSTEM

• Supports large volumes of data which frequently need to be accessed or to be modified
•Supports request response operation

SUPER COMPUTERS

•Faster than mainframes
•Helps in calculating large scale numerical and algorithm calculation in short span of time
•Used for aircraft design and testing, military application and weather forecasting

HANDHELD

- Also called a PDA (Personal Digital Assistant).

- A computer that fits into a pocket, runs on batteries, and is used while holding the unit in your hand.

- Typically used as an appointment book, address book, calculator, and notepad.

- Can be synchronized with a personal microcomputer as a backup.

Basic units of Computer

I/O		Processor
Input	**Memory**	**Arithmetic and logic**
Output		**Control**

System Interconnections
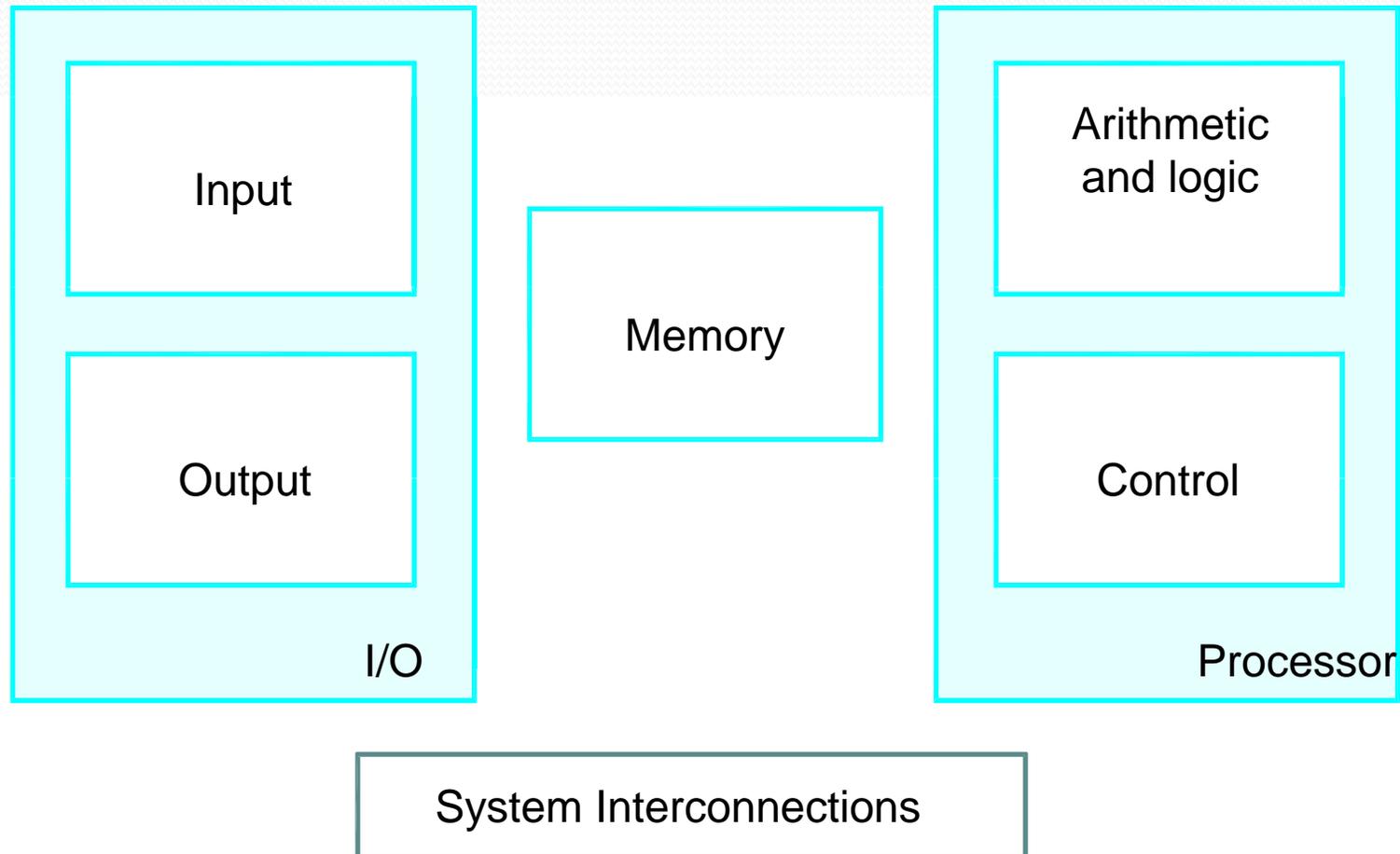
.   Basic functional units of a computer.

INPUT UNIT

- Computer accepts the coded information through input unit.

- It has the capability of reading the instruction & data to be processed.

- Converts the external world data to a binary format, which can be understood by CPU.

- Eg: Keyboard, Mouse, Joystick etc

Functional Unit(I/O)
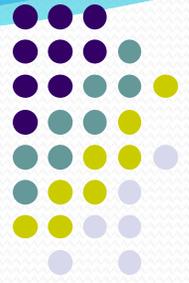
- A computer handles *two types of information* :

- **Instruction** :
    - An instruction *controls the transfer of information* between a computer and its I/O devices and also within the computer.
    - A *list of instructions* that performs a task is called a *program*, which is stored in the memory.
    - To execute a program, *computer fetches the instructions one by one* and specifies the arithmetic and logical operations to be performed which are needed for the desired program.
    - A computer is completely controlled by *the stored programs except any external interrupts* comes from any I/O device.

Functional Unit(I/O)

- **Data** :
  - Data is a kind of information which is _used as an operand_ for a program.
  - So, data can be any _number or character_.
  - Even, a list of instructions, means _an entire program can be data_ if it is processed by another high-level program.
  - In such case, that data is called _source program_.
- The most well-known input device is the keyboard, beside this, there are many other kinds of input devices are available, i.e., mouses, joysticks etc.

OUTPUT UNIT

- Converts the binary format data to a format that a common man can understand

- Displays the processed results.

- Eg: Monitor, Printer, LCD, LED etc

MEMORY UNIT

- Composed of large array of bytes.
- Store programs and data .

- **Parts of the memory subsystem**

  - Fetch/store controller

    - Fetch: Retrieve a value from memory

    - Store: Store a value into memory

  - Memory address register (MAR)

  - Memory data register (MDR)

  - Memory cells with decoder(s) to select individual cells

Types of Memory

➢ **Primary storage**

❖ Fast and Direct Access

❖ Programs must be stored in memory while they are being executed.

❖ Large number of semiconductor storage cells.

❖ RAM and ROM

➢ **Secondary storage**

❖ used for bulk storage or mass storage.

❖ Indirect Access and slow.

❖ Magnetic Harddisks,CDs. Etc.

CACHE MEMORY

- Memory access is much slo er than processing time.

- Faster memory is too expensive to use for all memory cells.

- Small size, fast memory just for values currently in use speeds computing time.

- System Performance improved using this buffer memory.

Arithmetic and Logic Unit (ALU)

- Most computer operations are executed in ALU of the processor.
- Load the operands into memory – bring them to the processor – perform operation in ALU – store the result back to memory or retain in the processor.
- Registers
- Fast control of ALU

Arithmetic and Logic Unit (ALU)

- Actual computations are performed

- Primitive operation circuits

  - Arithmetic (ADD)

  - Comparison (CE)

  - Logic (AND)

- Data inputs and results stored in registers

- Multiplexor selects desired output

The Control Unit

- Manages stored program execution.

- The timing signals that govern the I/O transfers are also generated by the control unit.

- Task

  - Fetch from memory the next instruction to be executed

  - Decode it: Determine what is to be done

  - Execute it: Issue appropriate command to ALU, memory, and I/O controllers

BUS STRUCTURE
Connecting CPU and memory

The CPU and memory are normally connected by three groups of connections, each called a bus: *data bus*, *address bus* and *control bus*
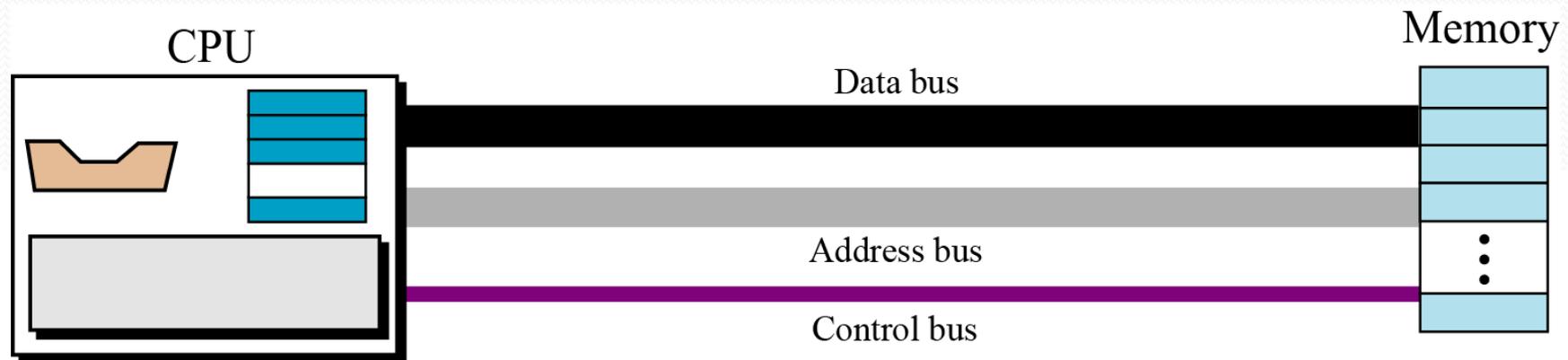
Connecting CPU and memory using three buses

Representing Numbers: Integers

- Humans use **Decimal** Number System
- Computers use Binary Number System
- Important to understand Decimal system before looking at binary system
- **Decimal Numbers - Base 10**
  - 10 digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9
  - **Positional** number system: the position of a digit in a number determines its value
  - Take the number 1649
    - The 1 is worth 1000
    - The 9 is worth 9 units

  - Formally, the digits in a decimal number are weighted by increasing powers of 10 i.e. they use the base 10. We can write 1649 in the following form:
    - $1*10^3 + 6*10^2 + 4*10^1 + 9*10^0$

Representing Numbers: Integers

weighting:	10^3	10^2	10^1	10^0
Digits	1	6	4	9
1649 =	$1*10^3$ +	$6*10^2$ +	$4*10^1$ +	$9*10^0$

- **Least Significant Digit**: rightmost one - *9* above
  - Lowest power of 10 weighting
  - Digits on the right hand side are called the **low-order digits** (lower powers of 10).

- **Most Significant Digit**: leftmost one - *1* above
  - Highest power of 10 weighting
  - The digits on the left hand side are called the **high-order digits** (higher powers of 10)

Representing Numbers: Decimal Numbers

- Largest n-digit number ?
  - Made up of *n* consecutive *9*'s (= $10^n - 1$)
  - Largest 4-digit number if 9999
  - 9999 is $10^4 - 1$

- Distinguishing Decimal from other number systems such as Binary, Hexadecimal (base 16) and Octal (base 8)

  - How do we know whether the number 111 is decimal or binary

  - One convention is to **use subscripts**
  - Decimal: 111_{10} Binary:111_2 Hex: 111_{16} Octal: 111_8
    - Difficult to write use keyboard

  - Another convention is to append a letter (D, B, H, O)
    - Decimal: 111**D**   Binary:111**B**   Hex: 111**H**   Octal: 111**O**

94

Representing Numbers: Binary Numbers

- **Binary numbers** are **Base 2** numbers
  - Only 2 digits: 0 and 1
  - Formally, the digits in a binary number are weighted by increasing powers of 2

  - They operate as decimal numbers do in all other respects

  - Consider the binary number $0101\ 1100$

- Weight 2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0
- bits $\quad$ 0 $\quad$ 1 $\quad$ 0 $\quad$ 1 $\quad$ 1 $\quad$ 1 $\quad$ 0 $\quad$ 0

- $01011100 = 0*2^7 + 1*2^6 + 0*2^5 + 1*2^4 + 1*2^3 + 1*2^2 + 0*2^1 + 0*2^0$
  $$= 0\ +\ 64_{10} + 0\ +\ 16_{10} + 8_{10}\ +\ 4_{10} + 0\ +\ 0$$
  $$= 92_{10}$$

Representing Numbers: Binary Numbers
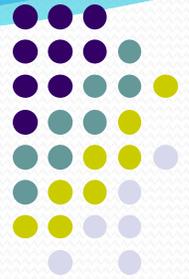
- Leftmost bit is the **most significant bit** (**MSB**).
  - The leftmost bits in a binary number are referred to as the **high-order** bits.

- Rightmost bit is the **least significant bit** (**LSB**).
  - The rightmost bits in a binary number are referred to as the **low-order** bits.
  - Largest n-bit binary number ?
    - Made up of n consecutive 1's (= $2^n - 1$)
    - e.g. largest 4-bit number: $1111 = 2^4 - 1 = 15$

Representing Numbers: Converting Decimal to Binary
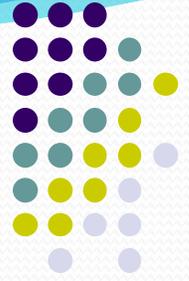
- To convert from one number base to another:
  - you repeatedly divide the number to be converted by the new base
  - the remainder of the division at each stage becomes a digit in the new base
  - until the result of the division is 0.

- Example: To convert decimal 35 to binary we do the following:

	Remainder
35 / 2	1
17 / 2	1
8 / 2	0
4 / 2	0
2 / 2	0
1 / 2	1
0	

- The result is read **upwards** giving $35_{10} = 100011_2$.

Representing Numbers: Converting Decimal to Binary
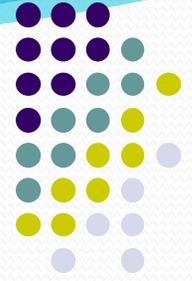
- Exercise: Convert the following decimal numbers to binary

- (1) 64 (2) 65   (3) 32   (4) 16   (5) 48

Shortcuts

- To convert any decimal number which is a power of 2, to binary, simply write 1 followed by the number of zeros given by the power of 2.
- For example, 32 is 2^5, so we write it as 1 followed by 5 zeros, i.e. 10000; 128 is 2^7 so we write it as 1 followed by 7 zeros, i.e. 100 0000.

- Remember that the largest binary number that can be stored in a given number of bits is

  made up of n 1's.
- An easy way to convert this to decimal, is to note that this is 2n - 1.
- For example, if we are using 4-bit numbers, the largest value we can represent is 1111 which is 2^4-1, i.e. 15

Representing Numbers: Converting Decimal to Binary

- Binary Numbers that you should remember because they occur so frequently

Binary	Decimal
111	7
1111	15
0111 1111	127
1111 1111	255

DOS Internal Commands

These commands are automatic loaded into the memory when operating system is loaded into the memory. Thus these are also called *memory-resident* commands. The command available are all combined together and are stored in Command.com file, which is a executable command file. These internal command are further grouped according to their properties.

General purpose	File related commands	Directory related commands

1. CLS
2. DIR
3. VER
4. VOL
5. DATE
6. TIME
7. COPY CON
8. TYPE

9. COPY
10. REN
11. DEL
12. MD
13. CD
14. RD

General purpose commands

1. **CLS**:- (*Clear the screen*) This command is used to clear

the screen or wipe out every thing written on the screen.

Syntax:-   C:\> CLS   and press Enter

2. **DIR:-** (*Directory*) Dir command is used for listing files

and directories present in the current disk.

Syntax:- C:\> DIR [/switches]

Example:-   C:\> DIR /P

Switches:-

```
Volume in drive C is JAI
Volume Serial Number is 3E42-1907
Directory of C:\

AUTOEXEC DOS           250   10-18-01 10:17a AUTOEXEC.DOS
FRUNLOG  TXT           781   01-07-02 10:47p FRUNLOG.TXT
KPCMS         <DIR>          07-04-01  7:02p KPCMS
CONFIG   DOS             9   07-12-01  9:06p CONFIG.DOS
WINDOWS       <DIR>          06-29-01  6:08p WINDOWS
NETLOG   TXT         7,787   02-05-02 11:41p NETLOG.TXT
SCANDISK LOG        31,652   02-12-02  1:30p SCANDISK.LOG
LOGFILE  TXT           108   10-07-01  1:58a LOGFILE.TXT
MYDOCU~1      <DIR>          06-29-01  6:43p My Documents
PROGRA~1      <DIR>          06-29-01  6:08p Program Files
CUSTMSS       <DIR>          11-12-01  2:33p CUSTMSS
TALLY5        <DIR>          06-29-01  7:38p tally5
TEST          <DIR>          07-17-01  7:13p TEST
BC5           <DIR>          07-22-01  1:40p BC5
~MSSTFQF T    <DIR>          07-01-01  7:59a ~MSSTFQF.T
DRAGON        <DIR>          11-18-01  9:10p dragon
SOURCE        <DIR>          12-25-01  7:46p SOURCE
CONFIG   BAK            30   02-05-02  9:50p CONFIG.BAK
VB            <DIR>          01-08-02  8:27p VB
Press any key to continue . . .
```

/P	Page wise
/W	Widths wise
/S	List all files and directory of subdirectories
/AH	Display directory with hidden files
/AS	Display directory with system files
/AD	Display only directories present in current drive

3. **VER:-**(*Version)* Version numbers indicates that which edition of DOS we are working on.
Syntax:- C:\> VER   press enter
Output:-
C:\>VER

Windows 98 [Version 4.10.2222]

4. **VOL:-**(*Volume*) Displays the disk volume label and serial number, if it exist.Syntax:- C:\> VOL press enter
Output:-C:\>VOL

Volume in drive C is JAI
Volume Serial Number is 3E42-1907

5. **DATE:-** Display the current DateSyntax:- C:\> DATE
C:\>DATE
Current date is Fri 02-15-2002
Enter new date (mm-dd-yy):

Type DATE without parameters to display the current date setting and
a prompt for a new one. Press ENTER to keep the same date.
Note:- We enter new date in the format of MM-DD-YY.
6. **TIME:-** Display current time
Syntax:- C:\> TIME
C:\>TIME
Current time is 8:38:47.70 AM
Enter new time:

File related commands

7. **COPY CON:-** This command gives the facility to create a new text file.

Syntax:-   C:\>   COPY   CON   <Filename>

C:\>COPY CON Rose.txt

A clock in a office can never get stolen

Too many employees watch it all the time

^Z

1 file(s) copied

After copy con we must specify a suitable file name. Press enter. Start typing the informations of the file. After gathering the information we press ^Z (CTRL+Z) button or F6 button to save the file. After pressing enter key computer will show a message like 1 file(s) copied. This means that file is stored in the disk. Suppose we don't want to save the file or we just want to abort from file creation job, then we simply press ^C (CTRL+C) button to abort without saving the file, intend of pressing ^Z button.

Notes:-   1.   Never   forget   to   give   a   suitable   filename
            2.   You can use extension as .TXT for denoting the file as Text file.

8. **TYPE:-** This command is used to display the contents or text of any file to the display device.

Syntax:- C:\> TYPE <Filename>

A:\>TYPE GULAB.TXT

A clock in a office can never get stolen

Too many employees watch it all the time

9. **COPY :-** Copy command is used for copy any file to another location or to copy the files to another directory. This command may also be used for copying any file to another disk with different file name.

Syntax:- C:\> COPY <Source filename> <Target file name>

C:\>COPY ROSE.TXT ROSE.MSG

    1 file(s) copied

TO copy a file from *hard disk* to *floppy disk*

C:\>COPY   Rose.txt   A:

    1 file(s) copied

10. **REN:-** (*Rename*) This command is used to change the name of any file or directory.

Syntax:- C:\> REN <Source filename> <Target filename>

C:\>REN   ROSE.TXT   GULBAL.TXT

If we get successfully C:\ that means filename or directory name is get changed. Either it will show the error message.

To changing the filename present in floppy disk

C:\>REN   A:\ROSE.TXT   GULAB.TXT

11. DEL:- This command is used for erasing any file from the disk.

Syntax:- C:\> DEL <Filename>

C:\>DEL LOTUS.TXT

If it successfully erase the file from disk then C:\> prompt will be appear, either computer will show an error message.

Note:- /P option is used for permission before deleting the file.
Directory related commands
12. MD:- (*Make Directory*)- This command allows to create a new directory.
Syntax:- C:\> MD <Dirname>
C:\> MD REPORT
Now this directory can be used for keeping various sort of reports.

13. **CD:-** (*Change Directory*):-

We can enter or exit from any directory using this command.

Syntax:- To access any directory

C:\> CD <Directory name>

C:\> CD REPORT

C:\REPORT>

Prompt will change with the directory name. If we keep two dots after CD command than we will exit from the directory.

Syntax:-C:\> CD..

C:\REPORT> CD..

C:\>

14. **RD:-**(*Remove directory*):- This command is used when we want to remove any unusable directory form our disk.
Syntax:- C:\> RD <Directory name>
C:\> RD REPORT
15. **PATH:-** This command is used for display or sets directories for executable files.
Syntax:- C:\> PATH
This command display current path settings.
C:\>
PATH=C:\WINDOWS\COMMAND;C:\WINDOWS\;C:\TC
this command will sets the directories windows, the command subfolder of windows and TC folder for executable files. Operating system will look for executable files in these directories.

Thank you