Computer Applications in Business

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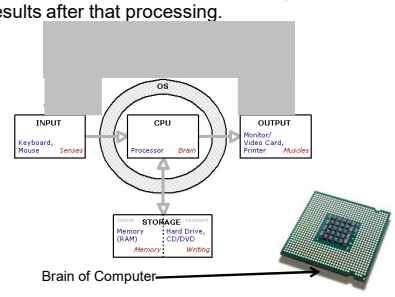
1.1 What is Computer?

- A computer is an electronic device that can accept data, process it, store it and give results after that processing.



Brain of Computer

1.1.1 Uses of Computer

Common uses of computer which are as follow:

- *Data Storage*
- *Education*
- *Communication*
- *Defense Purpose*
- *Office Work*
- *Science and Technology*
- *Training Purpose*
- *Transportation*
- *E-Learning*
- *Medical Science*

- *Office Automation*
- *Banking*
- *Internet*
- *Video Conference*
- *Stock Exchange*
- *Publishing*
- *Government*
- *Sports*
- *Research Purpose*
- *Gaming Purpose*
- *E-mail*
- *Online Purchasing*
- *Online Selling*
- *Data Analysis*

1.1.2 Characteristics of a Computer

- Speed
  - High Speed Device
  - Data and instructions flow along through circuits with high speed that is close to speed of light.
  - MHz (Mega Hertz) or GHz(Giga Hertz)
- Accuracy
  - Garbage- Garbage Out
- Storage
  - Internal memory , secondary memory (HD, CD, etc)
- Efficiency
  - Multiple tasks simultaneously.
  - At same time you can communicate, store and retrieve information .
- Automation
  - Perform operations without interference of the user
  - Control different devices attached with the computer.
  - Example : program instructions in PC, ATM, Transportation System,

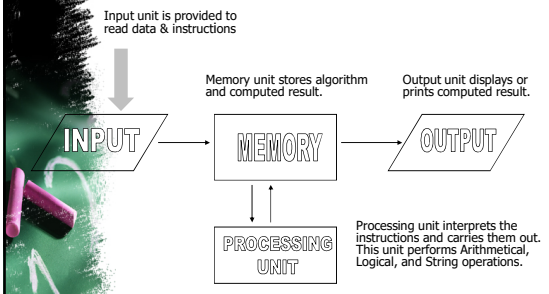
Characteristics of a Computer (Continue)

- Consistency
  - *Difficult for People to repeat an act again and again.*
  - *Example: lecturer*
  - *Meanwhile computer does*
  - *Example: Spell Checker , multimedia animation*
- Precision
  - *Perform operations accurately and precisely.*
  - *Example: calculations and rounding fractional values you can keep the accurate and precise up to level of your desire.*
  - *Lengthy calculations remain precise.*
- Reliability
  - *Low failure rate*
  - *No need of service call for modern personal computer.*

Characteristics of a Computer (Continue)

- Retrieving data and programs
  - *Data can be store and retrieve and store very quickly for further use (processing).*
- Versatility
  - *Mean Flexible*
  - *Can perform different kind of tasks one by one or simultaneously .*
  - *At one moment your are playing game and in next moment you are composing and sending emails if it is connected to internet.*
- Communication
  - *Exchange messages*
  - *Email, Chat, Video Conferencing , Audio conversation.*

Organization of Computer



Central Processing Unit (CPU) = Control Unit (CU) + Arithmetic & Logical Unit (ALU)

Components of Computer

- Input
- Output
- Processing
- Storage
- Communication
- Applications

Input Components

- Text Input
- Point/Touch Input
- Image/Object Input
- Audio Input
- Video Input
- Control Signal Inputs

Input Devices

Examples of Input devices:

1. Keyboard
2. Mouse
3. Light Pen
4. Optical/magnetic Scanner
5. Touch Screen
6. Microphone for voice as input
7. Track Ball
8. Joystick
9. Camera
10. Web cam (PC video camera)
11. MICR/OCR/BCR

Output Components

- Soft Copy / Soft Output
- Hard Copy / Hard Output
- Audio Output
- Multi Media Output

Output Devices

- **Examples of Output Devices**
- Monitor
- Printer
- Audio Speakers
- Headphones
- Projector
- GPS
- Sound Card
- Video Card
- Braille Reader
- Plotter

Processing Components

- Motherboard.
- Processor/CPU.
- Power Supply.
- Hard Drive.
- PCI-Express Cards.
- Graphics Cards.
- RAM/Memory.

Storage Components

Digital Data Storage Devices: 10 Examples

- Hard Drive Disk
- Floppy Disk
- Tape
- Compact Disc (CD)
- DVD and Blu-ray Discs
- USB Flash Drive
- Secure Digital Card (SD Card)
- Solid State Drive (SSD)
- Cloud Storage
- Punch Card

Communication Components

Following are the five components of a data communication network.

- Data
- Sender
- Receiver
- Transmission Medium
- Protocol

Application Components

- System Software
  - *Operating System*
  - *Translator*
  - *System management tools*
- Applications Software
  - *Windows Application Software*
  - *Web Application Software*

Memory Measurement Units

- 1 Bit = Binary Digit
- 8 Bits = 1 Byte
- 1024 Bytes = 1 KB (**Kilo Byte**)
- 1024 KB = 1 MB (**Mega Byte**)
- 1024 MB = 1 GB (**Giga Byte**)
- 1024 GB = 1 TB (**Terra Byte**)
- 1024 TB = 1 PB (**Peta Byte**)
- 1024 PB = 1 EB (**Exa Byte**)
- 1024 EB = 1 ZB (**Zetta Byte**)
- 1024 ZB = 1 YB (**Yotta Byte**)
- 1024 YB = 1 BB (**Bronto Byte**)
- 1024 BB = 1 GOB (**Geop Byte**)

System Software and Operating System

A overview of Software Tools

Software

- The software is a bunch of related programs.
- Software is lifeline of hardware
- Software can be engineered as Hardware
- Programmers make them as per requirement
- Software can be divided into two categories:
  - System Software
  - Application Software

Two Types of Software

- Application Software

- Operating System Software

Application Software

- Programs that work with operating system software to help the computer to do specific types of work.
- There are six basic types of application software...

Application Software

1. Business software: word processors, spreadsheets, and database programs.
2. Communication software: allows computers to communicate with other computers: fax software, Novell NetWare, AOL, Modem Software.
3. Graphics software: software that allows users to create and manipulate graphics...Photoshop, Print Shop, etc.

Application Software

ducation and Reference Software: Programs that lp teach new material and ideas, and programs t can be used to find information...Encarta, Worldbook Encyclopedia, Jumpstart Kindergarten, MicroType.

5. Entertainment and Leisure Software... Warcraft, Age of Empires, Barbie Design Center, Pacman, Solitair, Candy Crush, Teen Patti
6. Integrated Software: Combines several types of software into one program or package...Quicken (Spreadsheet/data base/communications/reference) or Print Shop (Graphics/Word processor), MS-Office.

Operating System Software

- Directs all the activities and sets all the rules for how the hardware and software will work together.

Examples would be:

DOS, Windows 95, 98, ME, NT, XP, Vista, Windows 7, Windows 8.

Unix, Linux,

MAC system OS 6,7,8,9,10

Command Line Operating Systems

DOS is an example of a command line operating system.

On the next slide, Notice that there are no:

- Icons (pictures)
- Colors
- Mouse Pointer
- Buttons
- You have to memorize commands in order to use this text based operating system.

```
C:\WINDOWS>dir h:

 Volume in drive H is USERS
 Directory of H:\TLC FILES

.             <DIR>                  .
..            <DIR>                  ..
HUMANRES SHW      317,952  09-14-01  8:12a Human resources Activity 2.shw
HUMANRE0 SHW      196,608  09-17-01  2:08p Human Resources Activity 5.shw
HUMANRE1 SHW      135,680  09-18-01  1:46p Human Resources Job Application.shw
CASHIERI SHW      126,976  09-20-01  9:00a Cashiering Lesson 1.shw
THELORAX WPD        3,862  08-29-01  2:56p The Lorax.wpd
TLCDISCL SHW      167,424  09-19-01 10:57a TLC Disclosure.shw
KASH     SHW      105,472  09-19-01  1:32p KASH.shw
ETHICS   SHW       94,208  09-19-01  1:44p Ethics.shw
CASHIER0 SHW      200,192  09-20-01  3:26p Cashiering Lesson 2.shw
COMPUTER SHW      140,800  09-21-01 11:05a computer basics.shw
       10 file(s)      1,489,174 bytes
        2 dir(s)      12,995.44 MB free

C:\WINDOWS>_
```

Operating Systems: GUI

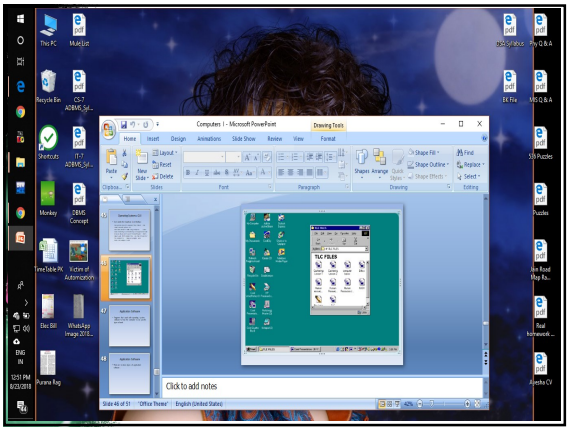
- GUI stands for Graphical User Interface

Uses pictures (icons) to represent files, folders, disk drives, modems, printers, etc.

GUI's were created to make using a computer easier, more interesting, non-threatening to inexperienced users.

A mouse allows users to point at something and click to make it work. With command line you have to have all of the commands to make your programs work.

Here is an example of a GUI



What is Operating System

✓ OS is system software, which may be viewed as collection of software consisting of procedures for operating the computer.

✓ It provides an environment for execution of programs (application software).

✓ It's an interface between user & computer.

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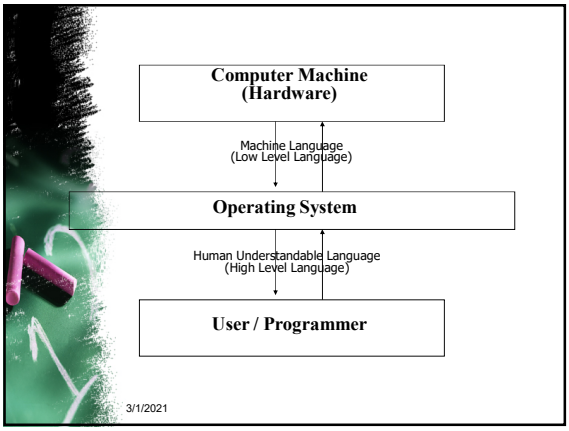

Types of OS

- ✓ *Multiprogramming OS*
- ✓ *Multitasking/Multiprocessing*
- ✓ *Multiuser OS*
- ✓ *Time Sharing OS*
- ✓ *Real Time OS*
- ✓ *Distributed OS*

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A Second Classification

This Classification is based on the type of interface Operating System provides for the user to work in.

- ✓ Character User Interface (CUI)

  The User has to type the commands on the command prompt to get the work completed. Ex. DOS, UNIX.

- ✓ Graphical User Interface (GUI)

  The User need not type any commands. He/She just point and clicks on the desired Icon to get the work done.

  Ex. Windows (9X, XP, NT, 2000), Linux.

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Functions of OS

- ✓ **File Management**
- ✓ **Memory Management**
- ✓ **Process Management**
- ✓ **Device Management**

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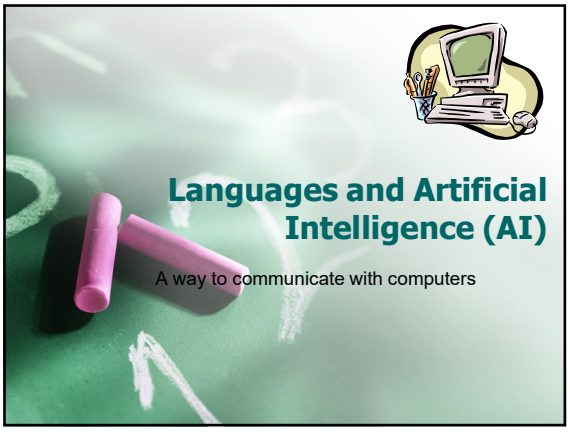
Types of Processing

- ✓ *Serial Processing*

  The job is processed at the time when it is submitted.

- ✓ *Batch Processing*

  The similar jobs are bunched together and are kept for processing at an later time.



Computer Languages

A way to program computer

Different Languages

- Just as there are different human languages there are also different computer languages.
- These include:
  - ***Pascal*** *(named after its inventor)*
  - ***Ada*** *(named after Countess Lovelace)*
  - ***Logo*** *(Greek for thought)*
  - ***FORTRAN*** *(short for FORmula TRANslation)*

Types of Language

- All of these are used to carry out different tasks
- But the all have one thing in common; they are all **High Level Languages.**
- There is another type of computer language:

Low Level Language

Examples of High Level Languages

```
10 Number:= 1
20 Answer:= Number + 1
30 PRINT Answer
40 END
```

Basic

```
make 'number 1
make 'answer 'number + 1
say 'answer
```

LOGO

```
PROGRAM adder;
VAR answer,number: real;
BEGIN
  Number:=1;
  Answer:=number+1;
WRITELN(answer);
END.
```

Pascal

Examples of Low Level Languages

```
LDA #1
STA 1000
LDA 1000
ADC
STA 1001
JSR OSWRCH
RTS
```

Assembler

```
10101001 00000001
10000101 01110000
10100101 01110000
01101001 00000001
10000101 01110001
00100000 11101110
11111111 01100000
```

Machine Code

Differences Between High & Low Level Languages

High Level

1. All used to solve problems
2. Easily understood by humans
3. Uses English like words
4. Easy to locate and identify errors
5. Must be translated before the computer can understand it

Low Level

1. Understood by computers without the need for translation
2. Difficult for humans to read and understand
3. Take up a lot of space to write down
4. Its difficult to spot errors in the code

Translating

- To change a program we write in a **high level language** into a **low level language** we use a program called a **translator**
- There are 2 types of translator program we can use:
  - ***Interpreters***
  - ***Compilers***

Interpreters

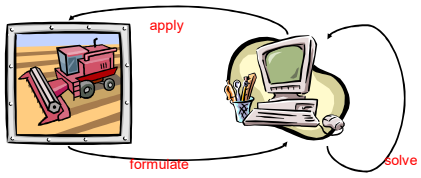
- A computer interpreter works much like a human interpreter:
  1. *It translates a single line of the program at a time.*
  2. *Each line is then run by the computer as it is translated.*
  3. *This is done every time the program is run.*
  4. *This allows errors to be located quickly when making a program but can be slow when running a finished program.*

Compilers

1. These work by translating the whole program at once (the object code) and saving the compiled low level version (the source code).
2. This can be slow to use when creating programs as even if an error is found the whole program is translated.
3. Once a completed program is translated it can be run over and over again without the need to retranslate.

What's AI? (to me)

Computers making decisions in real-world problems



What is Intelligence?

- Intelligence:
  - *"the capacity to learn and solve problems" (Websters dictionary)*
  - *in particular,*
    - *the ability to solve novel problems*
    - *the ability to act rationally*
    - *the ability to act like humans*
- Artificial Intelligence
  - *build and understand intelligent entities or agents*

2 main approaches:

- *"engineering" versus "cognitive modeling"*

What's involved in Intelligence?

- Ability to interact with the real world
  - *to perceive, understand, and act*
  - *e.g., speech recognition and understanding and synthesis*
  - *e.g., image understanding*
  - *e.g., ability to take actions, have an effect*
- Reasoning and Planning
  - *modeling the external world, given input*
  - *solving new problems, planning, and making decisions*
  - *ability to deal with unexpected problems, uncertainties*
- Learning and Adaptation
  - *we are continuously learning and adapting*
  - *our internal models are always being "updated"*
    - e.g., a baby learning to categorize and recognize animals

Artificial Intelligence

- **Artificial intelligence** (**AI**) is an area of computer science that emphasizes the creation of **intelligent** machines that work and react like humans.
- **AI Technique** is a manner to organize and use the knowledge efficiently in such a way that − It should be perceivable by the people who provide it. It should be easily modifiable to correct errors. It should be useful in many situations though it is incomplete or inaccurate.
- Some of the activities computers with **artificial intelligence** are designed for include: Speech recognition.

Goals in AI

- To build systems that exhibit intelligent behavior
- To understand intelligence in order to model it.
- Artificial general intelligence (AGI) is the intelligence of a machine that could successfully perform any intellectual task that a human being can. It is a primary goal of some artificial intelligence **research** and a common topic in science fiction and future studies.

A Brief History of AI

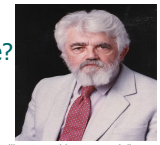
- 1943: McCulloch and Pitts propose a model of artificial neurons
- 1950: English Mathematician Alan Turing published a paper entitled "Computing Machinery and Intelligence" which opened the doors to the field that would be called AI.
- A further step towards the development of modern AI was the creation of The Logic Theorist. Designed by Newell and Simon in 1955 it may be considered the first AI program.
- 1956 Minsky and Edmonds build first neural network computer, the SNARC

The Dartmouth Conference (1956)

- The person who finally coined the term artificial intelligence and is regarded as the father of AI is **John McCarthy**.
- John McCarthy organizes a two-month workshop for researchers interested in neural networks and the study of intelligence
- Agreement to adopt a new name for this field of study: Artificial Intelligence

What is Artificial Intelligence?

(John McCarthy, Stanford University)



- **What is artificial intelligence?**

  It is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable.
- **Yes, but what is intelligence?**

  Intelligence is the computational part of the ability to achieve goals in the world. Varying kinds and degrees of intelligence occur in people, many animals and some machines.
- **Isn't there a solid definition of intelligence that doesn't depend on relating it to human intelligence?**

  Not yet. The problem is that we cannot yet characterize in general what kinds of computational procedures we want to call intelligent. We understand some of the mechanisms of intelligence and not others.

Components of AI

- Learning. ...
- Reasoning. ...
- Problem-solving. ...
- Perception. ...
- Language-understanding.

Academic Disciplines relevant to AI

Philosophy foundations	Logic, methods of reasoning, mind as physical system, of learning, language, rationality.
Mathematics Computation,	Formal representation and proof, algorithms, (un)decidability, (in)tractability
Probability/Statistics modeling	uncertainty, learning from data
Economics	utility, decision theory, rational economic agents
Neuroscience	neurons as information processing units.
Psychology/ Cognitive Science	how do people behave, perceive, process cognitive information, represent knowledge.
Computer engineering	building fast computers
Control theory	design systems that maximize an objective function over time
Linguistics	knowledge representation, grammars

Some application areas of AI

- Game Playing
- Speech Recognition
- Computer Vision
- Expert Systems
- Diagnostic Systems
- Financial Decision Making
- Classification Systems
- Natural Language Understanding
- Scheduling and Planning
- Robotics and Path planning
- Biology and medicine

AI Tools – An Overview

- Search and optimization
  - *Search algorithm*
  - *Mathematical optimization*
  - *Evolutionary computation*
- Logic
  - *Logic Programming*
  - *Automated Reasoning*
- Probabilistic methods for uncertain reasoning
- Classifiers and statistical learning methods
- Neural networks
- Control theory
- Languages

Programming Languages for AI

- Python: Python is considered to be in the first place in the list of all AI development languages due to the simplicity. ...
- R: R is one of the most effective language and environment for analyzing and manipulating the data for statistical purposes. ...
- Lisp. ...
- Prolog. ...
- Java.

Data File Organization

An structural approach to save and retrieve data

Why Not Store Everything in Main Memory?

- *Costs too much.* INR 5000 will buy you over 8GB of RAM or 1TB of disk today.
- *Main memory is volatile.* We want data to be saved between runs. (Obviously!)
- Typical storage hierarchy:
  - *Main memory (RAM) for currently used data.*
  - *Disk for the main database (secondary storage).*
  - *Tapes for archiving older versions of the data (tertiary storage).*

Disks

- DBMS stores information on ("hard") disks.
- This has major implications for DBMS design!
  - *READ: transfer data from disk to main memory (RAM).*
  - *WRITE: transfer data from RAM to disk.*
  - *Both are high-cost operations, relative to in-memory operations, so must be planned carefully!*

Disks

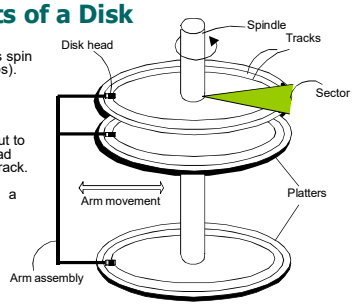
- Secondary storage device of choice.
- Main advantage over tapes: *random access* vs. *sequential*.
- Data is stored and retrieved in units called *disk blocks* or *pages*.
- Unlike RAM, time to retrieve a disk page varies depending upon location on disk.
  - *Therefore, relative placement of pages on disk has major impact on DBMS performance!*

Components of a Disk

The platters spin (say, 1000rps).

The arm assembly is moved in or out to position a head on a desired track. Tracks under heads make a *cylinder* (imaginary!).

Only one head reads/writes at any one time.



- *Block size* is a multiple of *sector size* (which is fixed).

Accessing a Disk Page

- Time to access (read/write) a disk block:
  - *seek time (moving arms to position disk head on track)*
  - *rotational delay (waiting for block to rotate under head)*
    - often called "rotational latency"
  - *transfer time (actually moving data to/from disk surface)*
- Seek time and rotational delay dominate.
  - *Seek time varies from about 1 to 20msec*
  - *Rotational delay varies from 0 to 10msec*
  - *Transfer rate is about 1msec per 4MB page*
- Key to lower I/O cost: reduce seek/rotation delays! Hardware vs. software solutions?

Arranging Pages on Disk

- *`Next'* block concept:
  - *blocks on same track, followed by*
  - *blocks on same cylinder, followed by*
  - *blocks on adjacent cylinder*
- Blocks in a file should be arranged sequentially on disk (by `next'), to minimize seek and rotational delay.
- For a sequential scan, *pre-fetching* several pages at a time is a big win!

Disk Space Management

- Lowest layer of DBMS software manages space on disk.
- Higher levels call upon this layer to:
  - *allocate/de-allocate a page*
  - *read/write a page*
- One such "higher level" is the buffer manager, which receives a request to bring a page into memory and then, if needed, requests the disk space layer to read the page into the buffer pool.

Files of Records

- Page or block is OK when doing I/O, but higher levels of DBMS operate on *records*, and *files of records*.
- FILE: A collection of pages, each containing a collection of records. Must support:
  - *insert/delete/modify record*
  - *read a particular record (specified using record id)*
  - *scan all records (possibly with some conditions on the records to be retrieved)*

Disk and File Summary

- Disks provide cheap, non-volatile storage.
  - *Random access, but cost depends on location of page on disk; important to arrange data sequentially to minimize seek and rotation delays.*
- Buffer manager brings pages into RAM.
  - *Page stays in RAM until released by requestor(s).*
  - *Written to disk when frame chosen for replacement (which is after all requestors release the page), or earlier.*
  - *Choice of frame to replace based on replacement policy.*
- File layer keeps track of pages in a file, and supports abstraction of a collection of records.

Definitions

- a **File** is a collection of organized data. (a group of records.)
- **Master Files** – contain permanent or semi-permanent data. master files do not contain event or activity data but their balances are updated by this data.
- **Transaction or Activity Files** (temporary) – designed to capture transaction or event data. because transaction files are used to update master files, they often link applications together.

Definitions Continue…

- In a **BATCH** processing system, groups of transactions are batched or stored together in a transaction file
- In an **ONLINE REALTIME** processing system, transactions are processed as they occur (individually) and may then be written to a transaction activity log file as backup.
- **OPEN FILES** are used to record incomplete transactions. they have characteristics of both master and transaction files (hybrid files).

Some System Files

- **SCRATCH FILES** – VERY TEMPORARY FILES. USED TO COLLECT DATA FOR FILE UPDATE OR FILE SORT—TEMPORARY BACKUP.
- **ARCHIVE or HISTORY FILES** – PROVIDE A PERMANENT RECORD OF TRANSACTIONS PROCESSED DURING CERTAIN TIME PERIOD.
- **BACKUP FILES** – DUPLICATE COPIES OF A FILE FOR SECURITY REASONS
- **REFERENCE FILE OR TABLE FILE** – A TYPE OF MASTER FILE CONTAINING REFERENTIAL DATA. CONTAINS DATA THAT ARE NECESSARY TO SUPPORT DATA PROCESSING i.e. IRS TAX TABLES – PRICE LISTS—DICTIONARY FILES
- **SUSPENSE FILE--** ERROR FILE – TRANSACTIONS NOT ABLE TO BE FULLY PROCESSED DUE TO THE PRESENCE OF ERRONEOUS DATA – THESE TRANSACTIONS ARE *SUSPENDED* FROM FURTHER PROCESSING

Ask your doubts … If Any

QUERY SESSION