

Basic of Computer Science



1

PROF. MUHAMMAD IQBAL BHAT

Head

Department of Computer Sciences



What?

IS

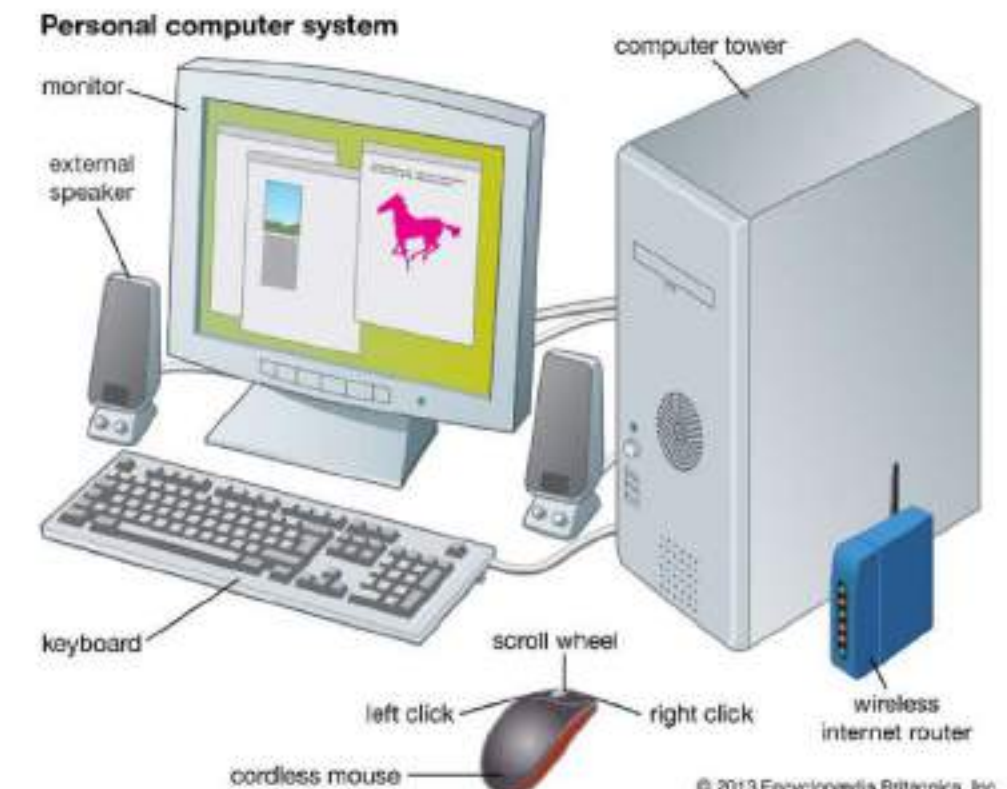
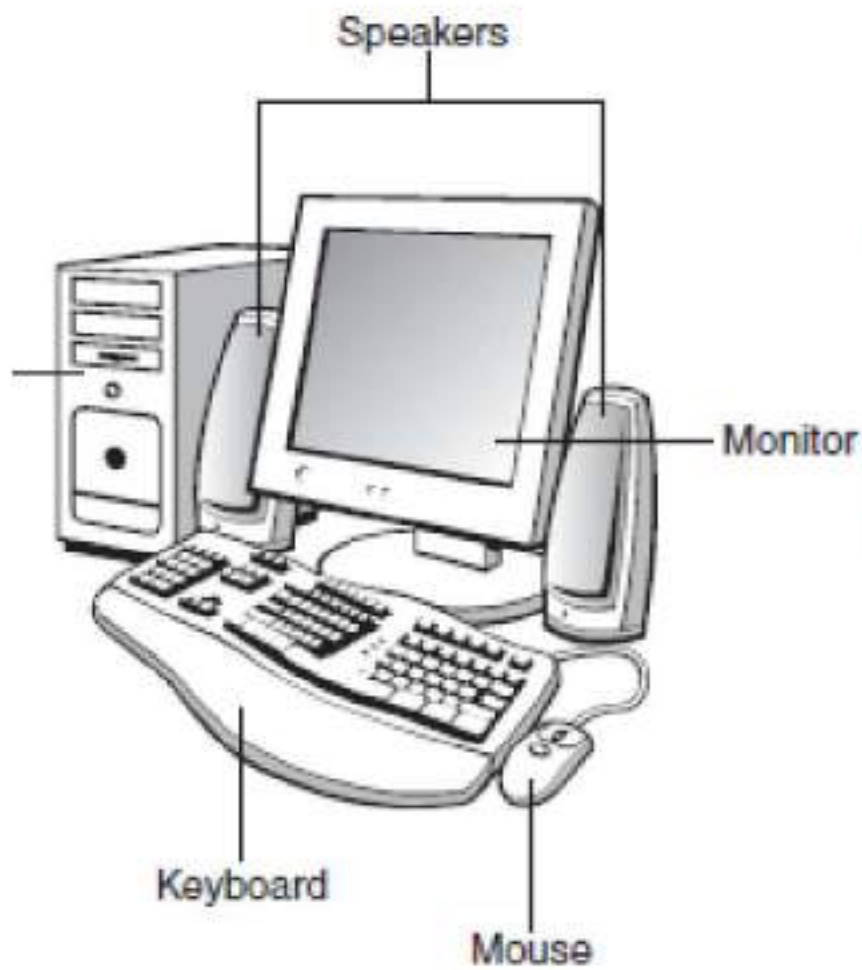
A

COMPUTER

Prof. M. Iqbal Bhat (JKHED)

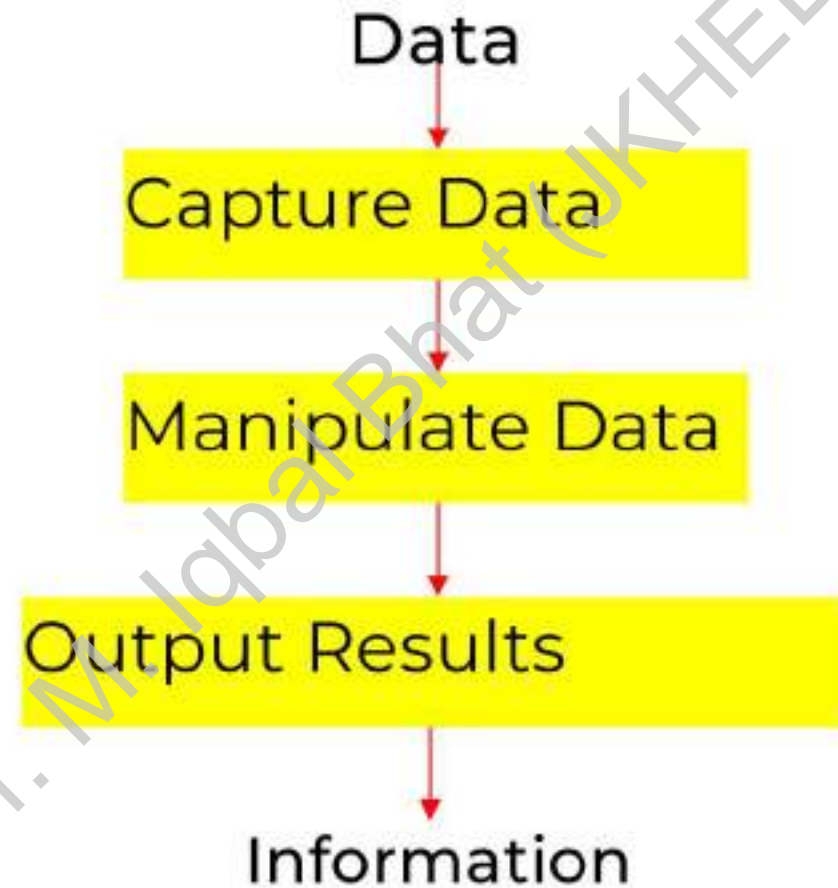
Computer

- The word computer comes from the word “compute”, which means, “to calculate”
- Thereby, a computer is an electronic device that can perform arithmetic operations at high speed
- A computer is also called a *data processor* because it can store, process, and retrieve data whenever desired



Data Processing

The activity of processing data using a computer is called *data processing*.



Data is raw material used as input and *information* is processed data obtained as output of data processing.

Characteristics of Computers

- 1) **Automatic:** Given a job, computer can work on it automatically without human interventions
- 2) **Speed:** Computer perform data processing jobs very fast, usually measured in **microseconds** (10^{-6}), **nanoseconds** (10^{-9}), and **picoseconds** (10^{-12})
- 3) **Accuracy:** Accuracy of a computer is consistently high and the degree of its accuracy depends upon its design. Computer errors caused due to incorrect input data or unreliable programs are often referred to as *Garbage-In-Garbage-Out* (GIGO)

Characteristics of Computers

- 4) **Diligence:** Computer is free from monotony, tiredness, and lack of concentration. It can continuously work for hours without creating any error and without grumbling
- 5) **Versatility:** Computer is capable of performing almost any task, if the task can be reduced to a finite series of logical steps
- 6) **Power of Remembering:** Computer can store and recall any amount of information because of its secondary storage capability. It forgets or loses certain information only when it is asked to do so

Characteristics of Computers

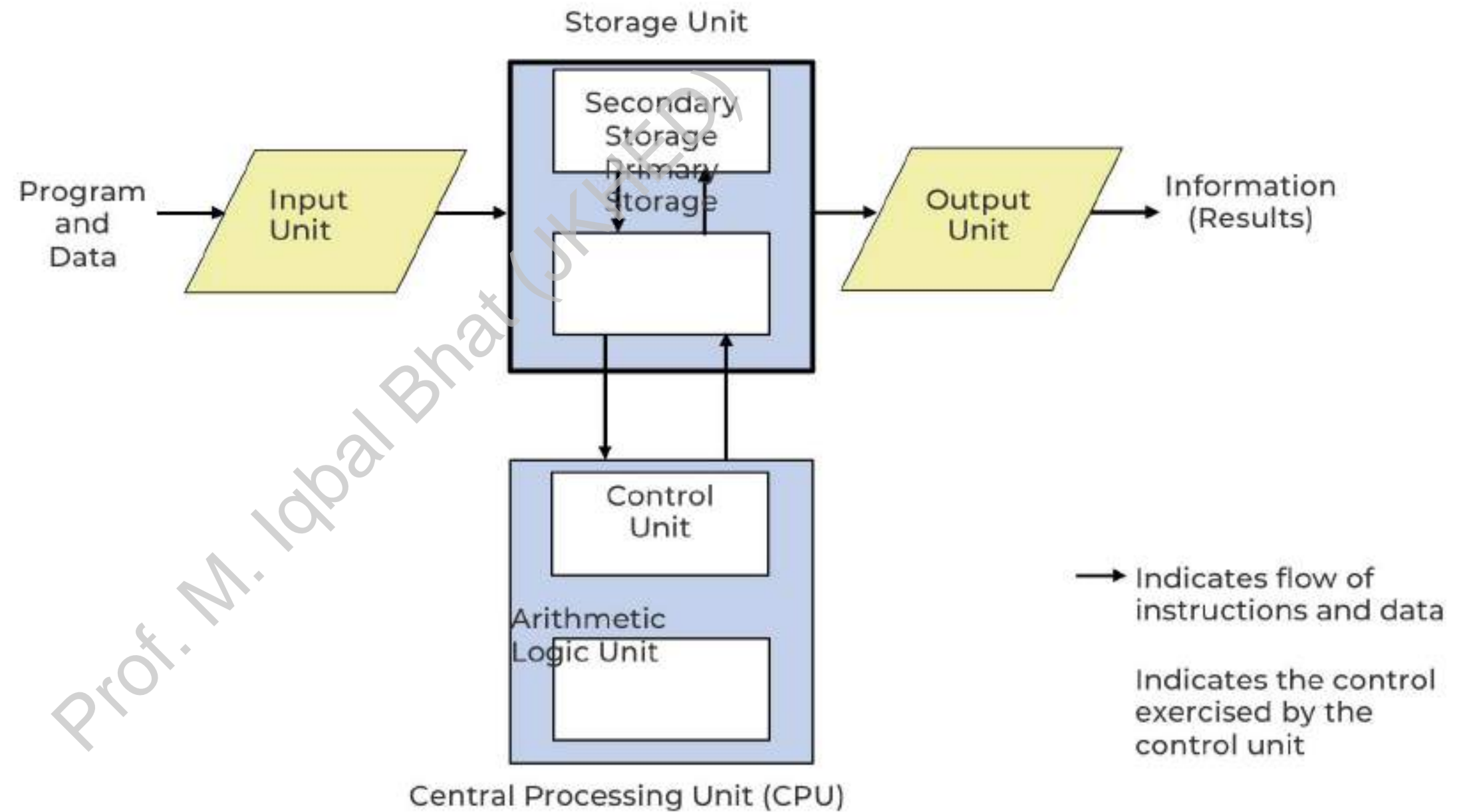
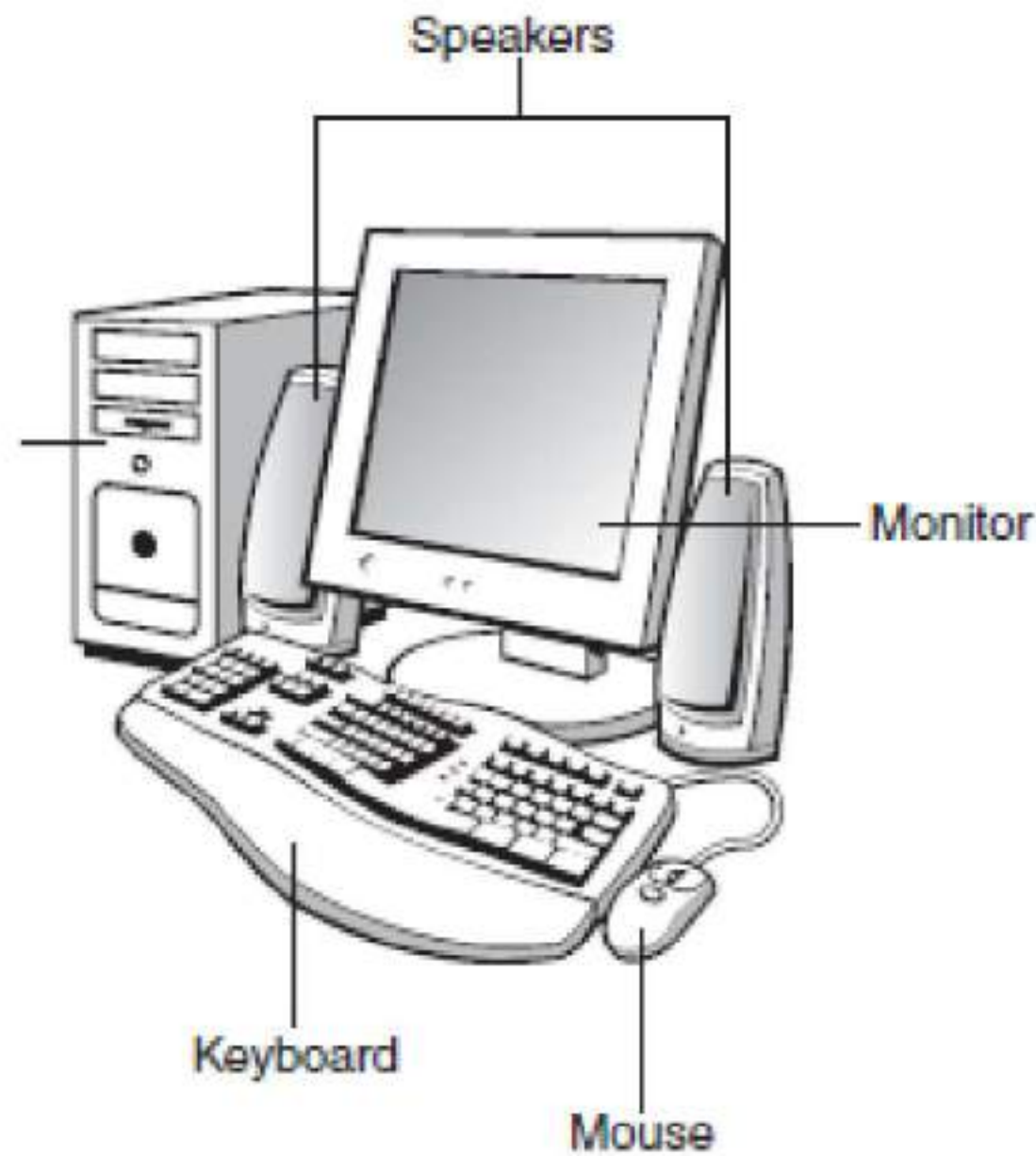
- 7) **No I.Q.:** A computer does only what it is programmed to do. It cannot take its own *decision* in this regard
- 8) **No Feelings:** Computers are devoid of emotions. Their judgement is based on the instructions given to them in the form of programs that are written by us (human beings)

Prof. M. Iqbal Bhat (UKHED)

Basic Structure of Computer

Prof. M. M. Bhat (JKHED)

Basic Organization of a Computer System



The Five Basic Operations of a Computer System

- **Inputting.** The process of entering data and instructions into the computer system
- **Storing.** Saving data and instructions to make them readily available for initial or additional processing whenever required
- **Processing.** Performing arithmetic operations (add, subtract, multiply, divide, etc.) or logical operations (comparisons like equal to, less than, greater than, etc.) on data to convert them into useful information
- **Outputting.** The process of producing useful information or results for the user such as a printed report or visual display
- **Controlling.** Directing the manner and sequence in which all of the above operations are performed

Input Unit

An input unit of a computer system performs the following functions:

1. It accepts (or reads) instructions and data from outside world
2. It converts these instructions and data in computer acceptable form
3. It supplies the converted instructions and data to the computer system for further processing



Keyboard



Mouse



Joystick



Touchpad



Stylus



Trackball



Scanner



Graphic Tablet



Touchscreen



Microphone



Camera



Webcam

Output Unit

An output unit of a computer system performs the following functions:

1. It accepts the results produced by the computer, which are in coded form and hence, cannot be easily understood by us
2. It converts these coded results to human acceptable (readable) form
3. It supplies the converted results to outside world

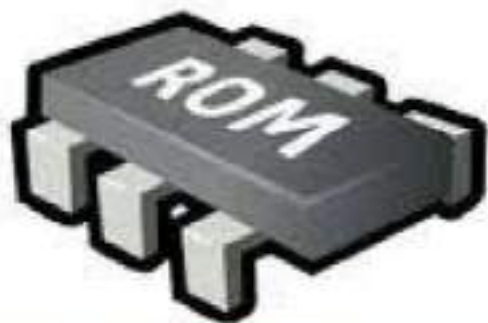


Prof. M. Iqbal Bhat (JKTEd)

Storage Unit

The storage unit of a computer system holds (or stores) the following :

1. Data and instructions required for processing (received from input devices)
2. Intermediate results of processing
3. Final results of processing, before they are released to an output device.



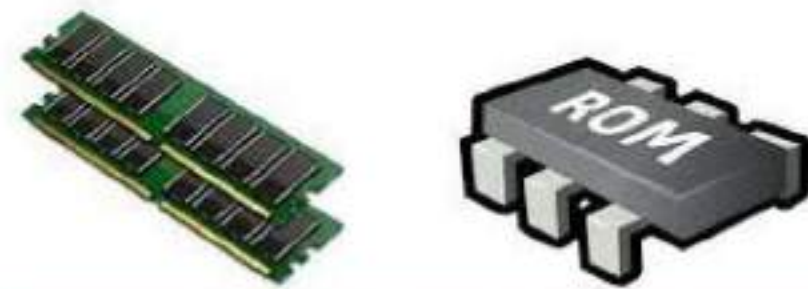
RAM Vs ROM

Two Types of Storage

- Primary storage

- Used to hold running program instructions
- Used to hold data, intermediate results, and results of ongoing processing of job(s)
- Fast in operation
- Small Capacity
- Expensive
-
-
-

Volatile (loses data on power dissipation)



RAM Vs ROM

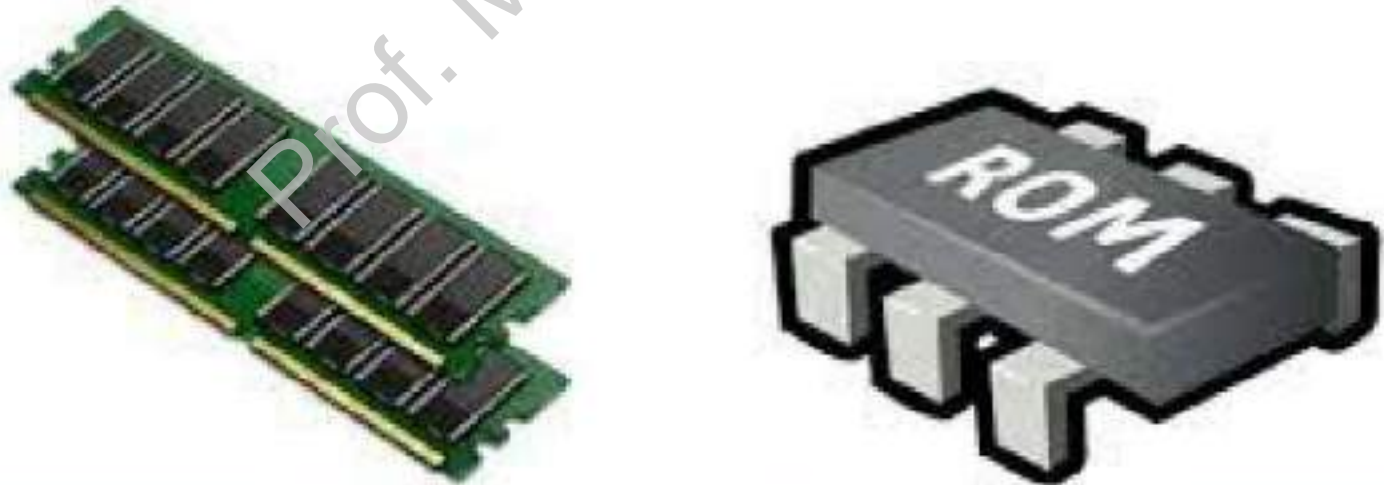
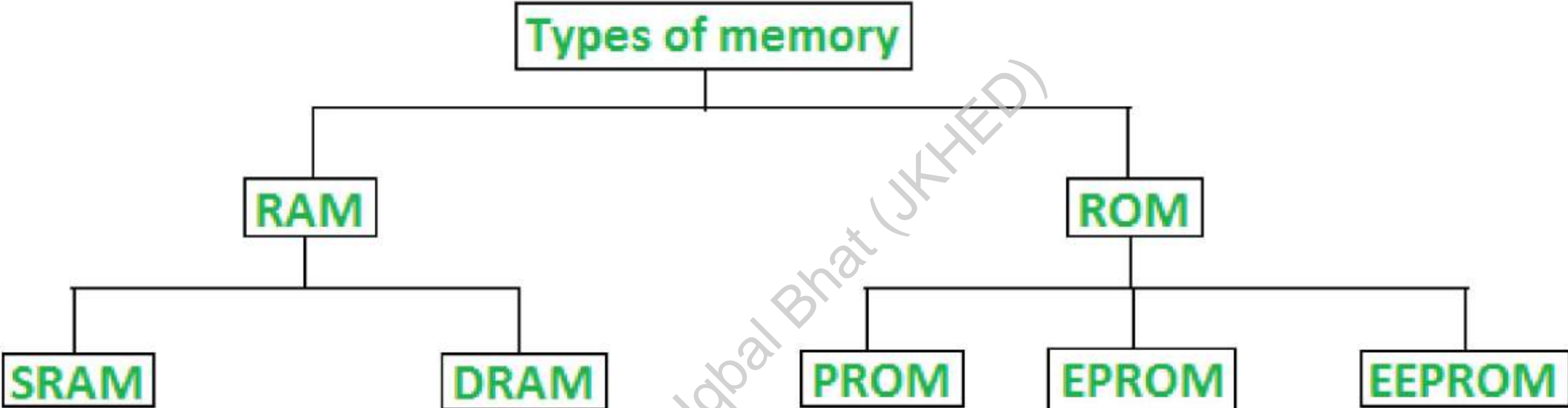
- Secondary storage

- Used to hold stored program instructions
- Used to hold data and information
- Slower than primary storage
- Large Capacity
- Lot cheaper than primary storage
- Retains data even without power

of stored jobs



Primary Memory



RAM Vs ROM

Difference	RAM	ROM
Data retention	RAM is a volatile memory which could store the data as long as the power is supplied.	ROM is a non-volatile memory which could retain the data even when power is turned off.
Working type	Data stored in RAM can be retrieved and altered.	Data stored in ROM can only be read.
Use	Used to store the data that has to be currently processed by CPU temporarily.	It stores the instructions required during bootstrap of the computer.
Speed	It is a high-speed memory.	It is much slower than the RAM.
CPU Interaction	The CPU can access the data stored on it.	The CPU can not access the data stored on it unless the data is stored in RAM.
Size and Capacity	Small size with less capacity.	Large size with higher capacity.
Used as/in	CPU Cache, Primary memory.	Firmware, Micro-controllers
Accessibility	The data stored is easily accessible	The data stored is not as easily accessible as in RAM
Cost	Costlier	cheaper than RAM.

RAM (Random Access Memory)

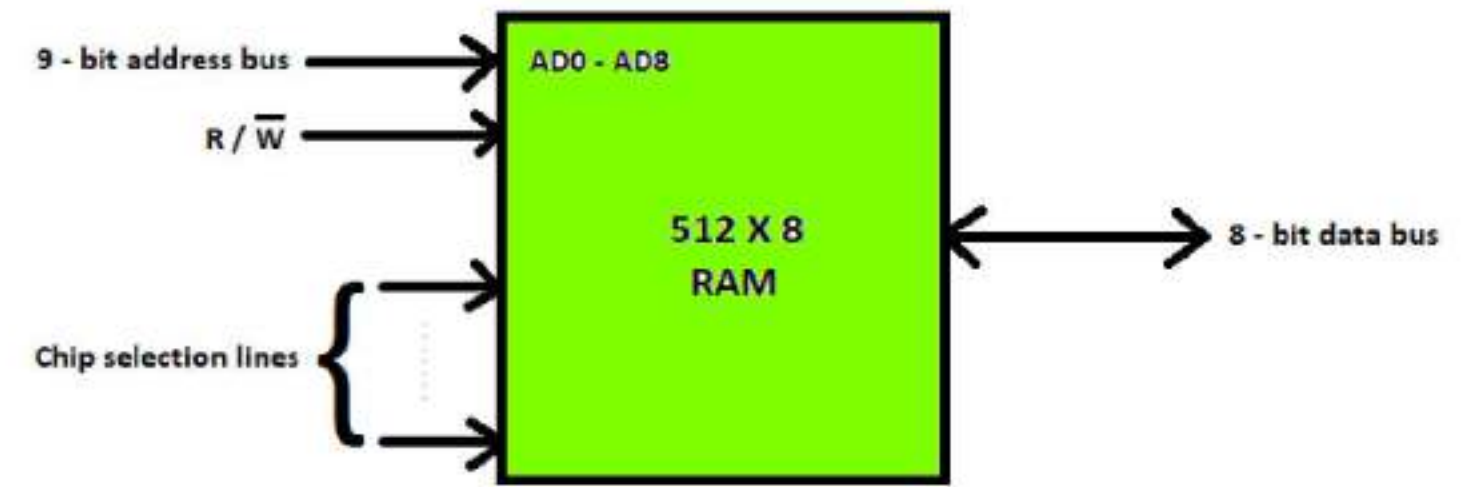
Random Access Memory (RAM) –

- It is also called read-write *memory* or the *main memory* or the *primary memory*.
- The programs and data that the CPU requires during the execution of a program are stored in this memory.
- It is a volatile memory as the data is lost when the power is turned off.
- RAM is further classified into two types:
 - SRAM (*Static Random Access Memory*) and
 - DRAM (*Dynamic Random Access Memory*).



RAM

RAM (Random Access Memory)



DRAM	SRAM
1. Constructed of tiny capacitors that leak electricity.	1. Constructed of circuits similar to D flip-flops.
2. Requires a recharge every few milliseconds to maintain its data.	2. Holds its contents as long as power is available.
3. Inexpensive.	3. Expensive.
4. Slower than SRAM.	4. Faster than DRAM.
5. Can store many bits per chip.	5. Can not store many bits per chip.
6. Uses less power.	6. Uses more power.
7. Generates less heat.	7. Generates more heat.
8. Used for main memory.	8. Used for cache.

Difference between SRAM and DRAM

ROM (Read Only Memory)

Read Only Memory (ROM) –

- Stores crucial information essential to operate the system, like the program essential to boot the computer.
- It is not volatile (nonvolatile).
- Always retains its data.
- Used in embedded systems or where the programming needs no change.
- Used in calculators and peripheral devices.
- ROM is further classified into four types-
 - MRROM, PROM, EPROM, and EEPROM.



Vs ROM

ROM (Read Only Memory)

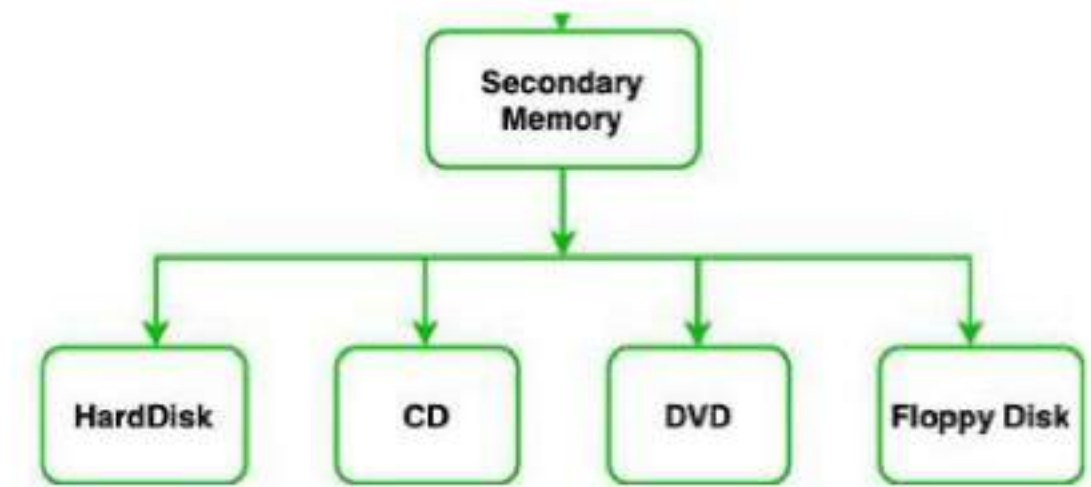
- **MRROM(Mask ROM)** – Mask ROM is a kind of read-only memory, that is masked off at the time of production. Like other types of ROM, mask ROM cannot enable the user to change the data stored in it. If it can, the process would be difficult or slow.
- **PROM (Programmable read-only memory)** – It can be programmed by the user. Once programmed, the data and instructions in it cannot be changed.
- **EPROM (Erasable Programmable read-only memory)** – It can be reprogrammed. To erase data from it, expose it to ultraviolet light. To reprogram it, erase all the previous data.
- **EEPROM (Electrically erasable programmable read-only memory)** – The data can be erased by applying an electric field, with no need for ultraviolet light. We can erase only portions of the chip.

Secondary Storage:

- Secondary memory is used for different purposes but the main purposes of using secondary memory are:
 - **Permanent storage:** As we know that primary memory stores data only when the power supply is on, it loses data when the power is off. So we need a secondary memory to store data permanently even if the power supply is off.
 - **Large Storage:** Secondary memory provides large storage space so that we can store large data like videos, images, audio, files, etc permanently.
 - **Portable:** Some secondary devices are removable. So, we can easily store or transfer data from one computer or device to another.

Secondary Storage:

- The secondary memory stores data and instructions permanently.
- The information can be stored in secondary memory for a long time (years), and is generally permanent in nature unless erased by the user.
- It is a non-volatile memory.
- It provides back-up storage for data and instructions.
- Hard disk drives, floppy drives, magnetic tape drives and optical disk drives are some examples of storage devices.
- The data and instructions that are currently not being used by CPU, but may be required later for processing, are stored in secondary memory.
- Secondary memory has a high storage capacity than primary memory.
- Secondary memory is also cheaper than primary memory.
- It takes a longer time to access the data and instructions stored in secondary memory than
- in primary memory.



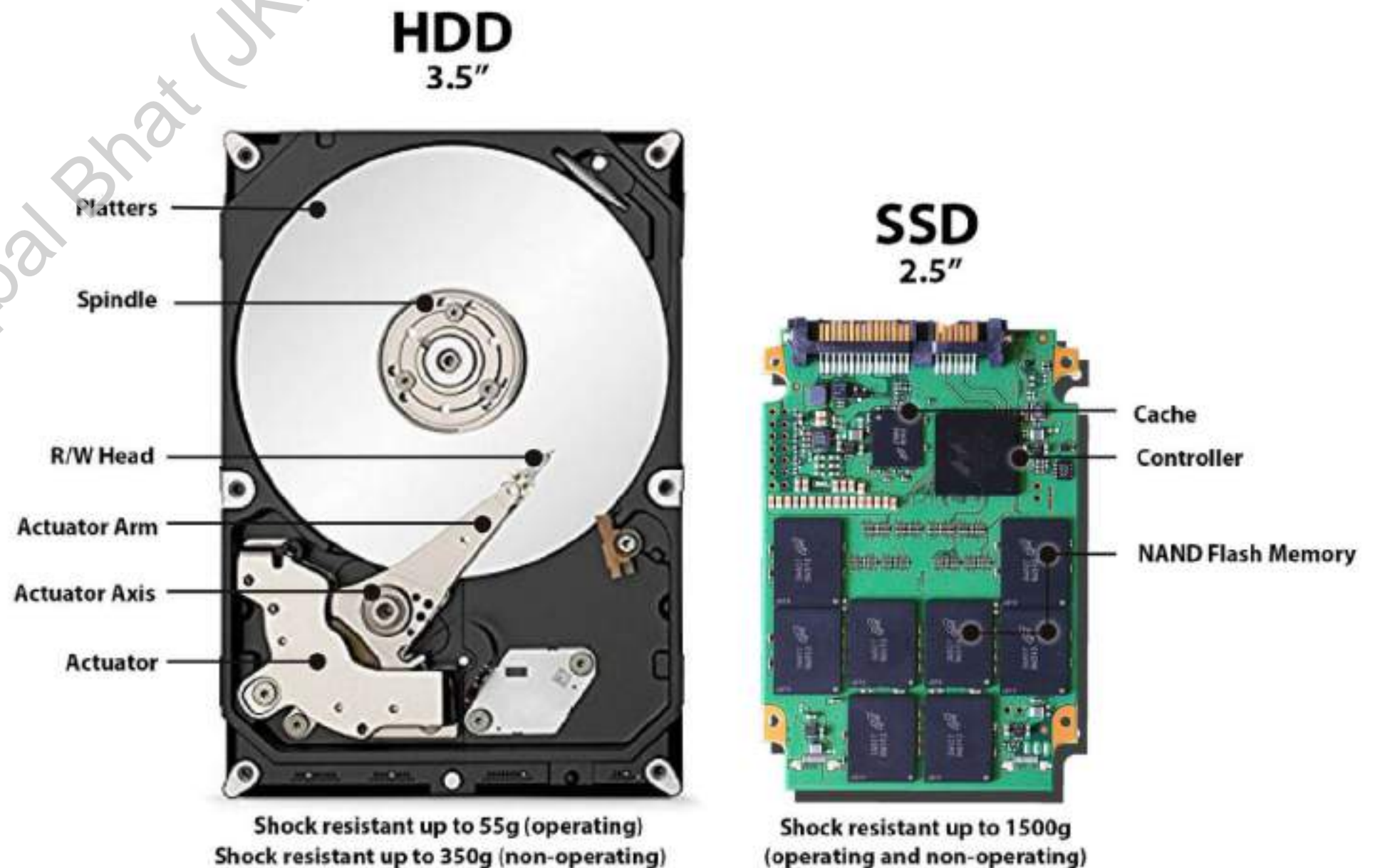


Secondary Storage Memory:

- Types of Secondary storage:
 - Fixed
 - Removable

Fixed Storage

- In secondary memory, a fixed storage is an internal media device that is used to store data in a computer system. Fixed storage is generally known as fixed disk drives or hard drives:
 - **Internal flash memory (rare)**
 - **SSD (solid-state disk)**
 - **Hard disk drives (HDD)**

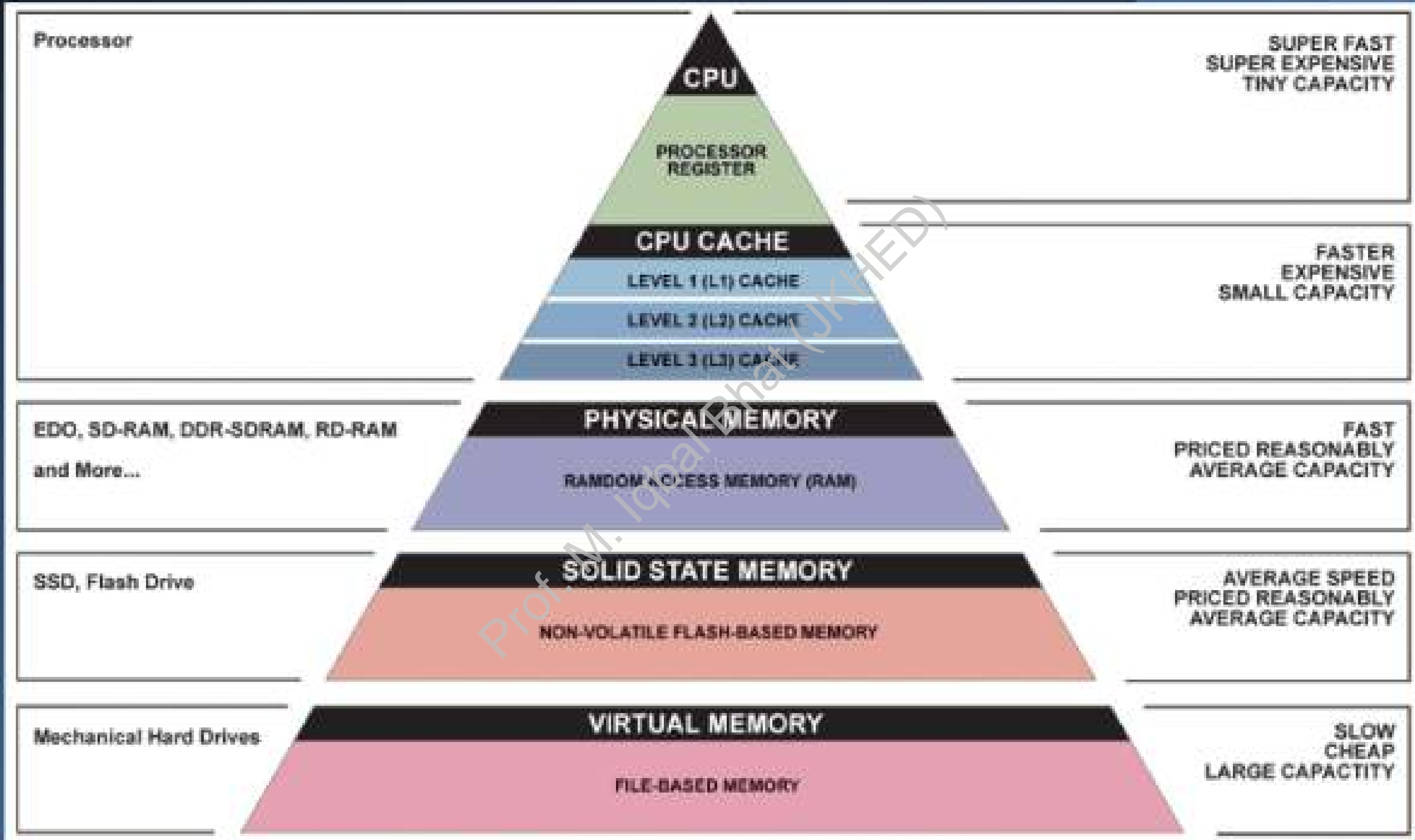


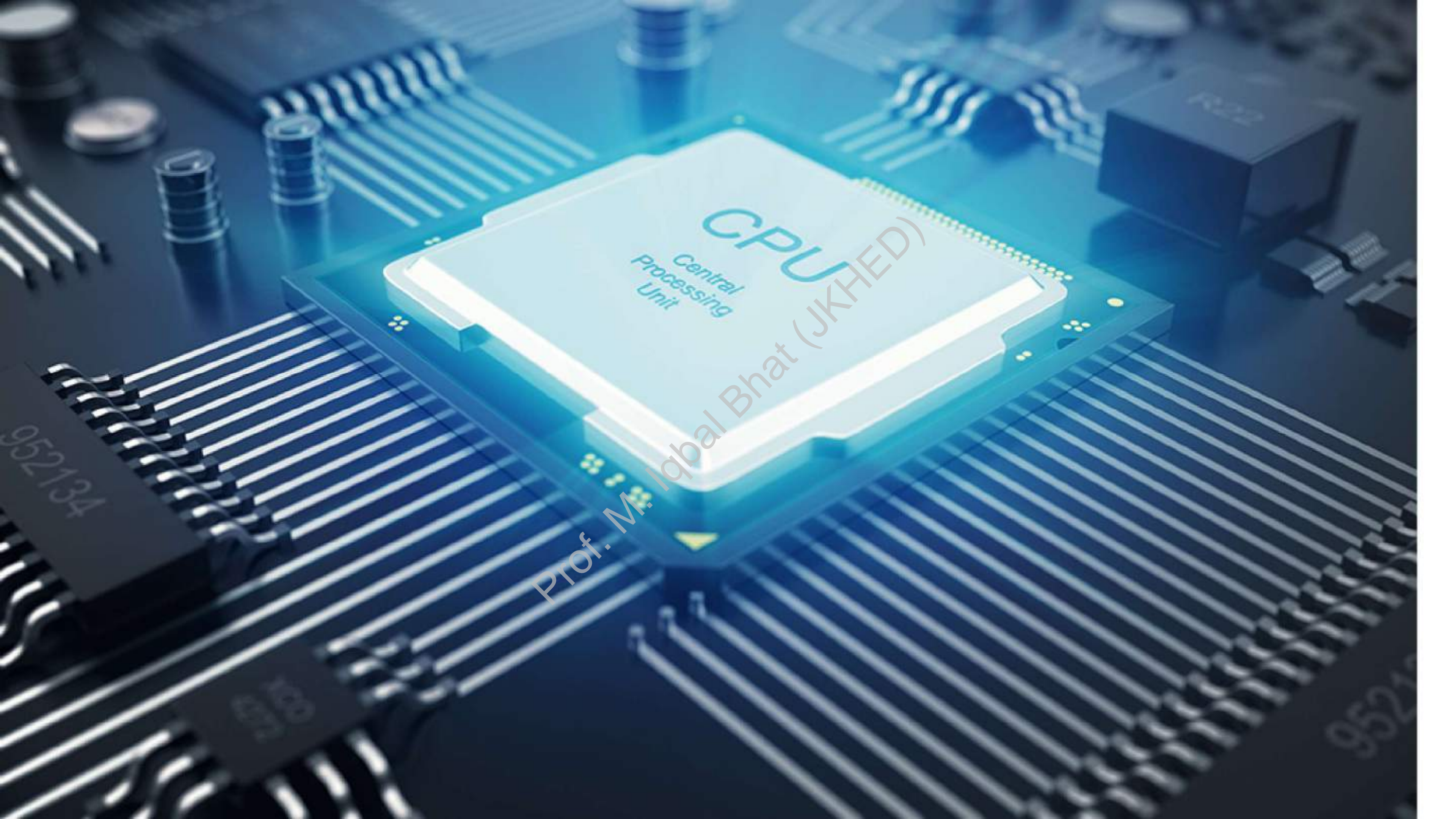
Removable Storage



- In secondary memory, removable storage is an external media device that is used to store data in a computer system. Removable storage is generally known as disks drives or external drives.:
 - **Optical discs (like CDs, DVDs, Blu-ray discs, etc.)**
 - **Memory cards**
 - **Floppy disks**
 - **Magnetic tapes**
 - **Disk packs**
 - **Paper storage**
(like punched tapes, punched cards, etc.)







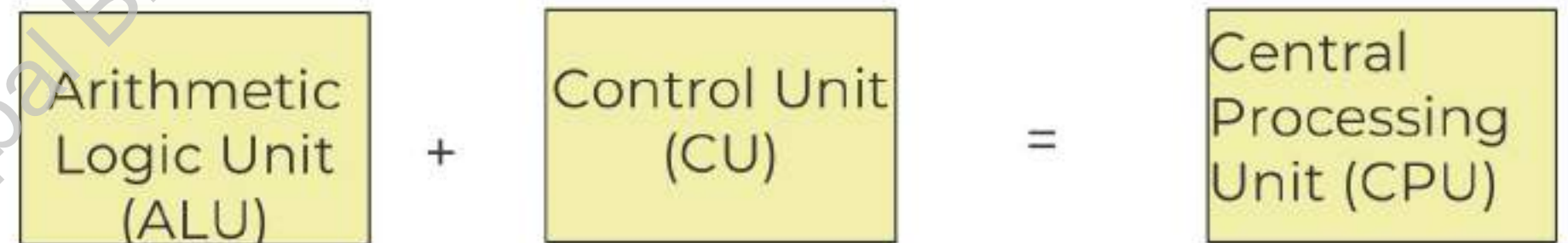
Prof. M. Iqbal Bhat (JKHED)

952134

952134

Central Processing Unit (CPU)

- A Central Processing Unit is also called a processor, central processor, or microprocessor.
- It carries out all the important functions of a computer.
- It receives instructions from both the hardware and active software and produces output accordingly.
- It stores all important programs like operating systems and application software.
- CPU also helps Input and output devices to communicate with each other. Owing to these features of CPU, it is often referred to as the brain of the computer.

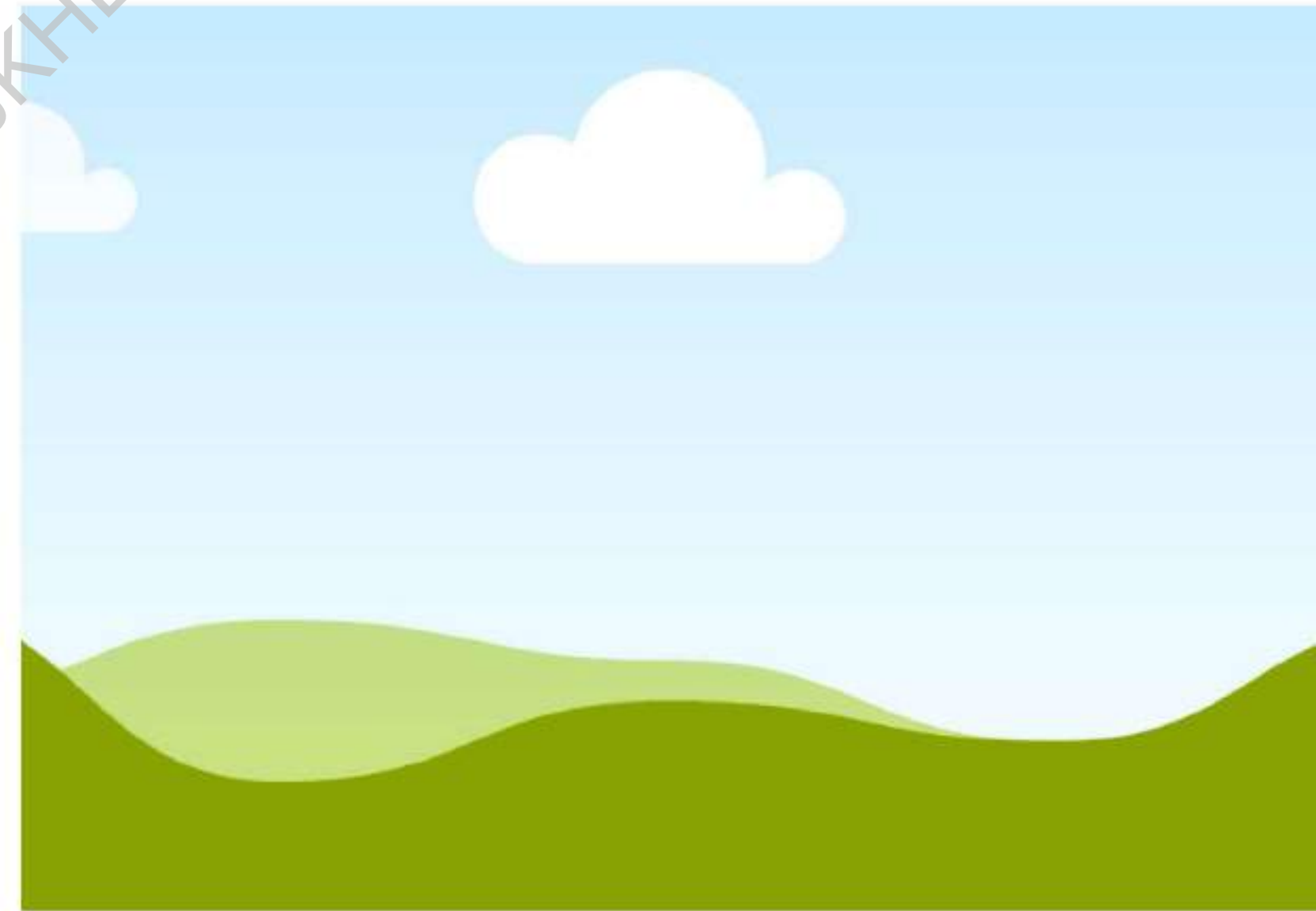


- It is the brain of a computer system
- It is responsible for controlling the operations of all other units of a computer system

Arithmetic Logic Unit (ALU)

Arithmetic Logic Unit of a computer system is the place where the actual execution of instructions takes place during operations.

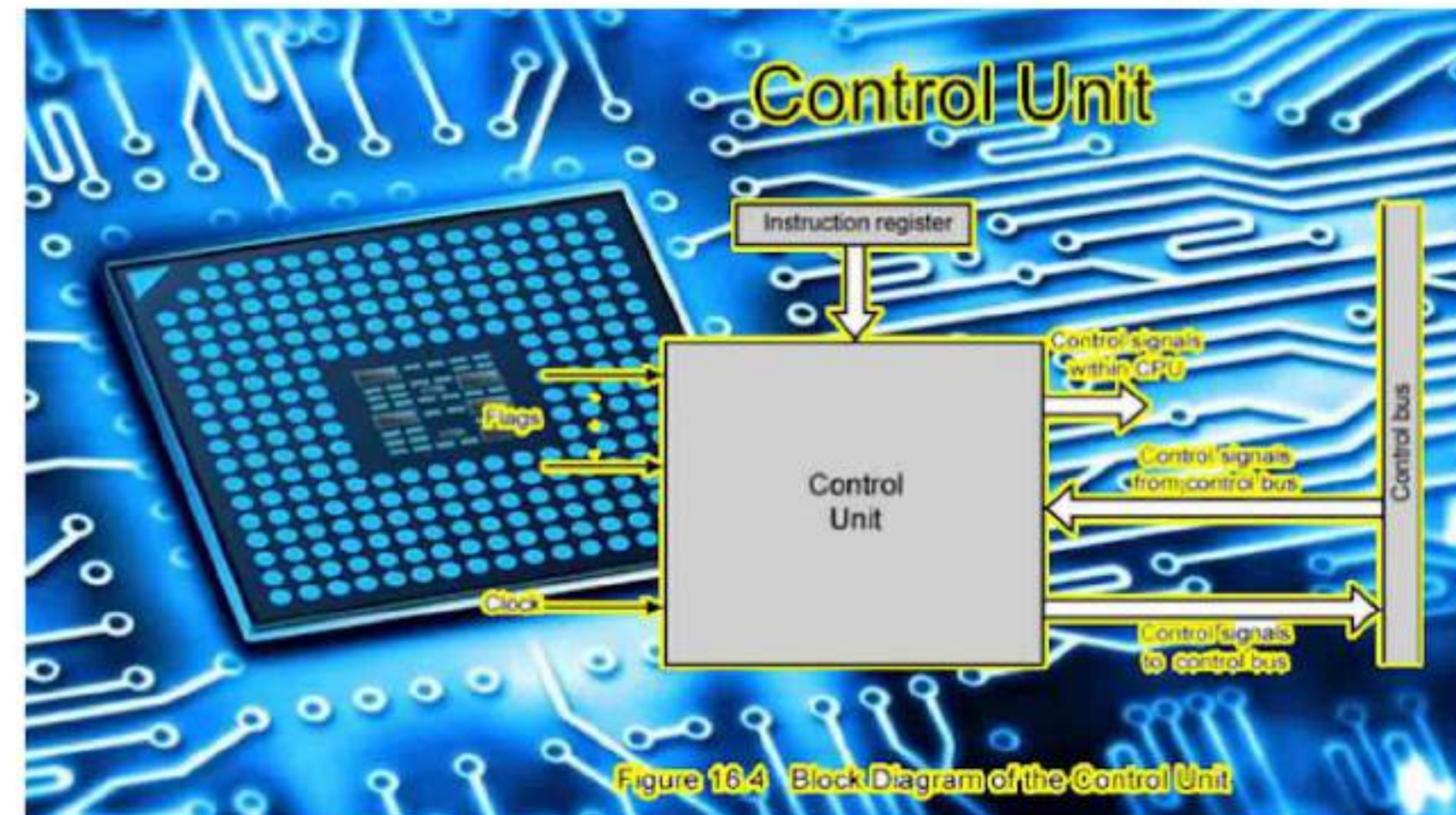
- **Logical Operations:** The logical operations consist of NOR, NOT, AND, NAND, OR, XOR, and more.
- **Bit-Shifting Operations:** It is responsible for displacement in the locations of the bits to the right or left by a certain number of places that are known as a multiplication operation.
- **Arithmetic Operations:** Although it performs multiplication and division, this refers to bit addition and subtraction. But multiplication and division operations are more costly to make. In the place of multiplication, addition can be used as a substitute and subtraction for division.

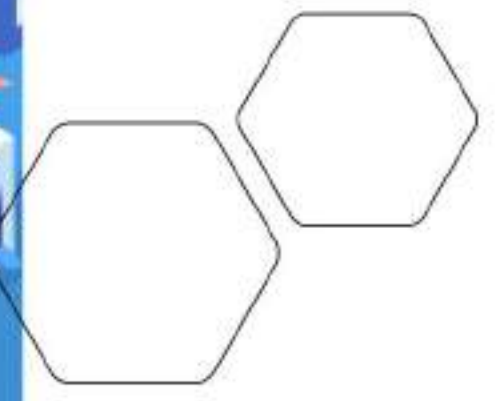


Control Unit (CU)

Control Unit of a computer system manages and coordinates the operations of all other components of the computer system

- It is the circuitry in the control unit, which makes use of electrical signals to instruct the computer system for executing already stored instructions.
- It takes instructions from memory and then decodes and executes these instructions.
- So, it controls and coordinates the functioning of all parts of the computer.
- The Control Unit's main task is to maintain and regulate the flow of information across the processor. It does not take part in processing and storing data.





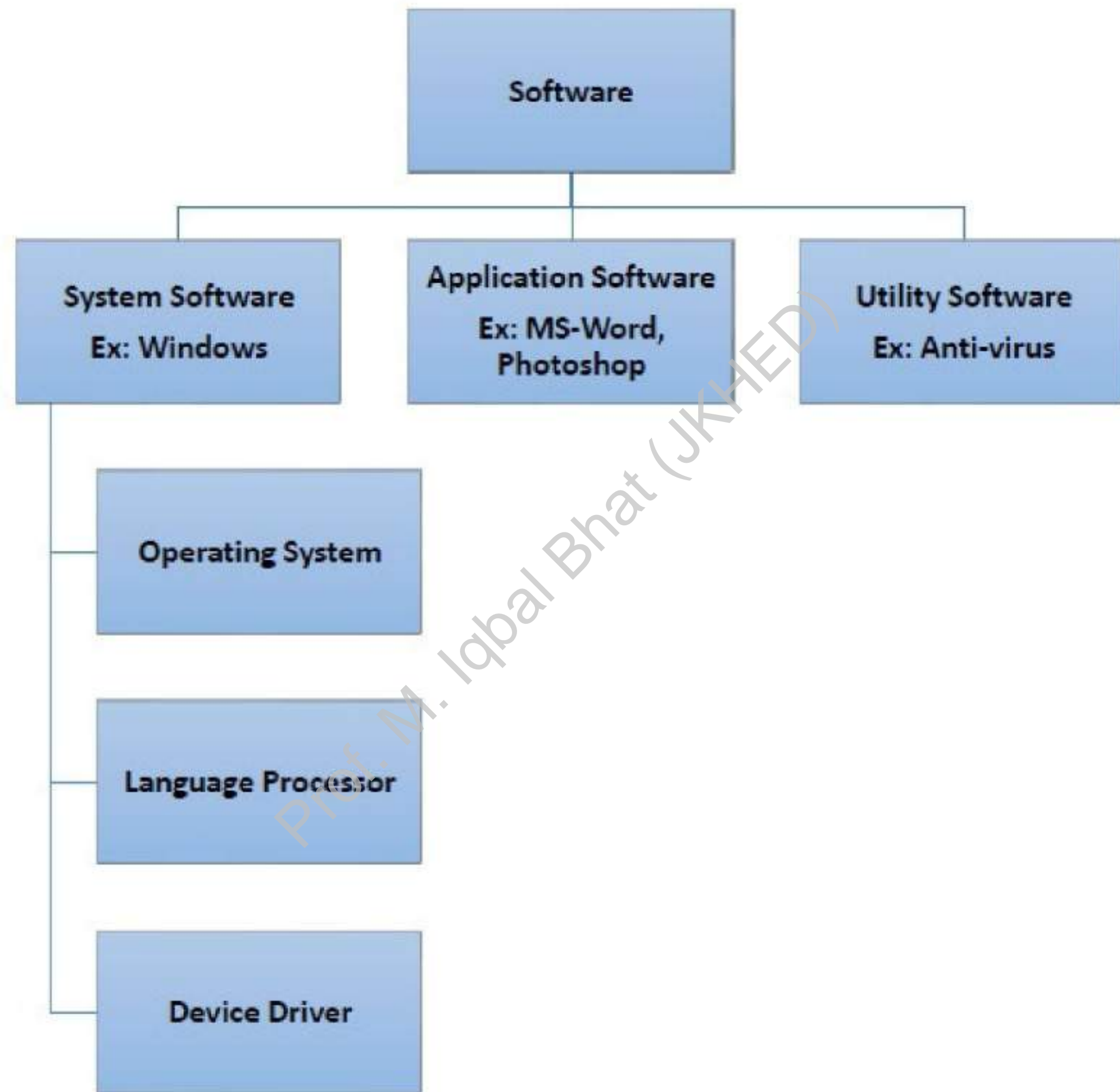
HARDWARE AND SOFTWARE

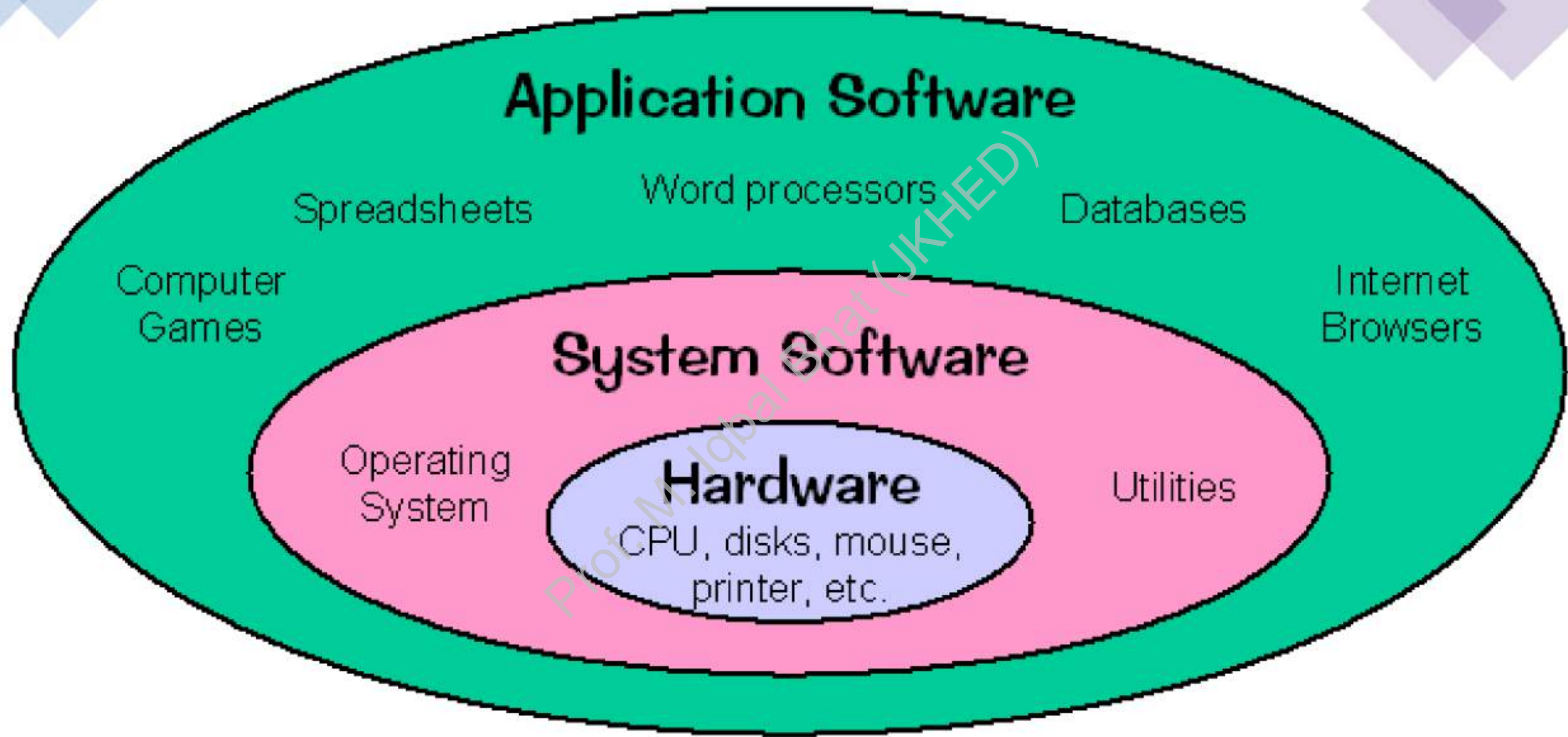


Software

Hardware

	Software	Hardware
Definition	Collection of instructions that enables a user to interact with the computer	Physical devices that are required to store and execute (run) the software
Types	System software and application software	Input, storage, processing, control, and output devices
Function	Provides the instruction to the hardware	Performs the task at machine level
Faults	Software failure is systematic. Software does not have an increasing failure rate.	Hardware failure is random. Hardware has increasing failure at the last stage.
Durability	Software is durable and doesn't wear out, but with time, <u>bugs</u> may arise in the software which could be rectified.	Hardware wears out with time.
Nature	Software is logical in nature.	Hardware is physical in nature.
Examples	QuickBooks, Adobe Acrobat, <u>Google Chrome</u> , Microsoft Word, Microsoft Excel, Apple Maps	CPU, <u>Hard drive</u> , <u>RAM</u> , keyboard, mouse, <u>USB drive</u>





Application

Software

- Application software is software that helps an end-user complete tasks such as doing research, taking notes, setting an alarm, designing graphics, or keeping an account log.
- Application software lies above the system software and is different from system software in that it's designed for the end use and is specific in its functionality.
- This type of software is sometimes referred to as non-essential software because it's installed and operated based on the user's needs.
- Any application on a mobile phone is an example of application software.



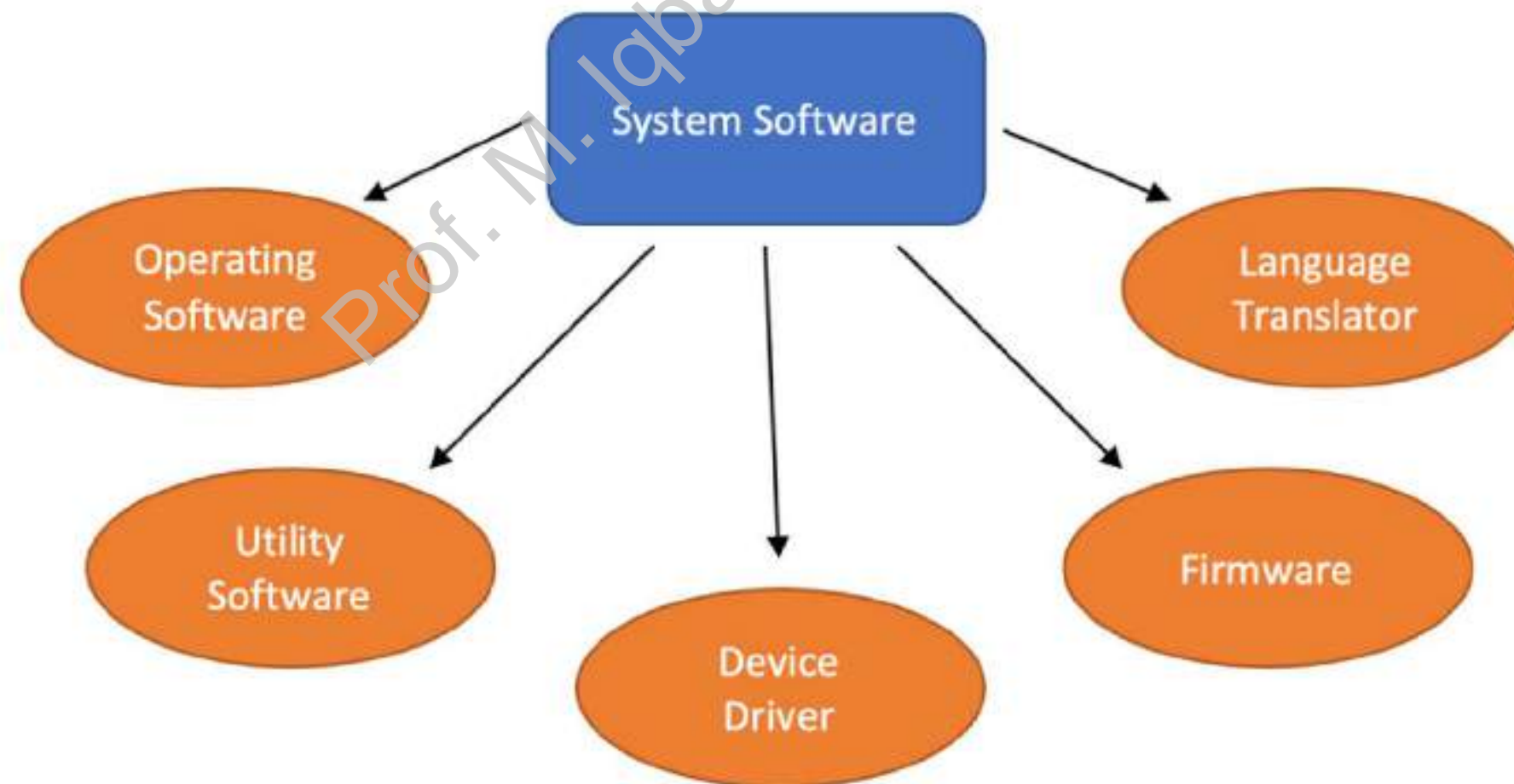
Application Software



- **Word processors:** Applications used for documentation. Examples include Microsoft Word, Google Docs, and AppleWorks
- **Spreadsheet software:** Software used to compute quantitative data. Examples include Microsoft Excel, Google Sheets, and Quattro Pro
- **Database software:** Software used to create and manage a database to organize data. This is also known as database management software (DBMS). Examples include MySQL, Clipper, and FileMaker
- **Multimedia software:** Tools that are able play, create, or record images, audio, or video files. It's used for video editing, animation, graphics, and image editing. Examples include Adobe Photoshop and Picasa
- **Application suites:** A collection of related programs sold as a package. Microsoft Office is the most widely used application suite.
- **Internet browsers:** Software used to access and view websites. Examples include Google Chrome and Internet Explorer.
- **Email programs:** Software used for emailing. Examples include Outlook and Gmail.

System Software

- Software required to run the hardware parts of the computer and other application software are called system software.
- System software acts as an interface between hardware and user applications. An interface is needed because hardware devices or machines and humans speak in different languages.
- It's essential in managing the whole computer system.
- When a computer is first turned on, it's the system software that is initially loaded into memory.
- Unlike application software, the system software isn't directly used by end users. Instead, it runs in the background of a device.

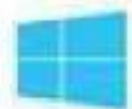


Operating System

- System software that is responsible for controlling or coordinating all hardware parts and their interoperability to carry out tasks successfully is called operating system (OS).
- OS is the first software to be loaded into computer memory when the computer is switched on and this is called booting.
- OS manages a computer's basic functions like storing data in memory, retrieving files from storage devices, scheduling tasks based on priority, etc.



Android



Windows 10



MICROSOFT
Windows



ibuntu
Ubuntu



Linux



mac
OS
macOS



Chrome OS



Operating System



Cost

Free of charge or lower cost

Must pay to use or higher cost



Source Code

With source code

Without source code



Flexibility

Can modify software

Cannot modify software



Installation

Can install freely

License required



Support

Rely on loyal and engaged online user community to deliver support

Full support from vendor if any problem occurs

Operating System

- **Singleuser operating system**
 - It allows only one users to use same computer at same time e.g. DOS.
- **Multiuser operating system**
 - It allows multiple users to use same computer at same time e.g. Linux, Unix and Windows server 2008.
- **Multiprocessor operating system**
 - It supports two or more processors running programs at the same time e.g. Linux, Unix and Windows server 2008.

Operating System

- **Multitasking operating system**
 - It can execute more than one programs at the same time e.g. Unix and windows 8.1
- **Time sharing operating system**
 - It allows many users to share the computer simultaneously. It is used when several users are linked through communication networks to a single computer.

Prof. M. Iqbal Bhat (JKHEP)

Types of operating systems

- Different types of operating system are as follows
 - Stand alone operating systems
 - Server operating systems
 - Mobile operating systems

Prof. M. Iqbal Bhat (JKHED)

Types of operating systems

- ***A stand alone operating system*** works on a desktop or laptop computer.
- Some stand alone operating systems can work with a server operating system and are called client operating system.
- Some examples are DOS, Windows, Unix, Linux and Mac OS.
- Windows is the most widely used OS developed by Microsoft.

Prof. M. Ismail (JHED)

Types of operating systems

- ***A server operating system*** is an operating system that is designed to support a network.
- It is also called network operating system.
- It usually resides on a server and client computers on the network depend on the server for resources.
- Some examples are Windows Server 2012/2016/2019, OS X Server, Sun Solaris, NetWare,

Prof. M. Iqbal Raza (UJHED)

Types of operating systems

- **Mobile operating system** is an operating system that is used in handheld computers and mobile devices.
- It provides graphical user interface (GUI) and other features such as touch screen support, navigation systems, speech recognition, wireless connectivity etc.
- Some examples are Android, iOS, Windows phone and BlackBerry.

Utility Programs

- **Utility program** is a software that is used for effective management of computer system.
- It keeps the computer system running smoothly.
- Users can use utility programs to perform maintenance tasks related to different devices and programs.
- Most operating systems include different built-in utility programs.

Prof. M. Iqbalphal (SKHED)

Types of Utility Programs

- Different types of utility programs are
- **Antivirus**
 - It is an application that is certain to be installed on every operating system, especially in the operating system Windows. Because without Antivirus, the operating system will be very high risk of loss or damage to a number of data and theft of sensitive data can occur with all hacking techniques.
 - Examples of popular antivirus applications such as Avast, SmAdav, AVG, BitDevender, and so forth. The variants of antivirus are also varied, some are paid and some are free.

Types of Utility Programs

- **Archivers and Data Compression**

- Software that can make a file into an archive and can also reduce or compress its size.
- An example is when you have 80 pdf files that you will send via email to your co-workers. If you want to send one file at a time, as many as 80 pdf files through attachment tools in the email, then that will be very troublesome for you. You can send as many as 80 pdf document files by archiving them in a .zip file and sending them via email.
- Some examples are WinZip, WinRAR, 7-Zip, FilZip

Types of Utility Programs

- **Backup Software**

- If the WinZip and FilZip software as above can be used to create an archive of a file, then the backup software can be used to create an archive from the hard disk drive partition.
- That way it can also be said that the data to be archived is the entire partition. As for some software that can perform backup needs, such as Nova Backup software, Norton Ghost and others.

Prof. M. Iqbal Bhat (UKED)

Types of Utility Programs

- **Recovery Software**

- Data is an asset that is very important for today's technological life. Indeed a number of data that you have deleted or when you do *quick form disk*, that means only the database table is left blank.
- Some of your actual old data is still in storage and has not been completely erased. So because of that, we can still restore power that has been erased by using data recovery software. Some data recovery software, such as Recuva, TestDisk, and so forth.

Types of Utility Programs

- **Software Uninstaller**

- You all must have uninstalled some of the software that is on your computer. By uninstalling the software, you no longer need the application. But have you ever found an application that cannot be uninstalled? If true, then you can overcome it with an uninstaller software.
- Some kinds of uninstaller software such as REVO uninstaller, IObit Uninstaller, Geek Uninstaller, and so on.

Types of Utility Programs

- **Disk Cleaner**

- Disk cleaner software works to clean the files on the hard disk drive that is no longer useful. Usually we mention it with junk files, that way, the free space on the hard disk drive can be optimized.
- An example of this Disk Cleaner application is CCleaner. Where the application has the main feature to clean disk files that are no longer useful.

Prof. M. Iqbal Bhatti (KPU)

Types of Utility Programs

- **Personal firewall**

- It is used to detect and protect a personal computer from unauthorized intrusions.
- Built-in personal firewall is automatically enabled when windows is installed.

Prof. M. Iqbal Bhat (UKHE)

Language

Processors

- An important function of system software is to convert all user instructions into machine-understandable language.
- System software that converts source code to object code is called a language processor.



Prof. M. Iqbal Bhat (JKUFE)

Language Processors

