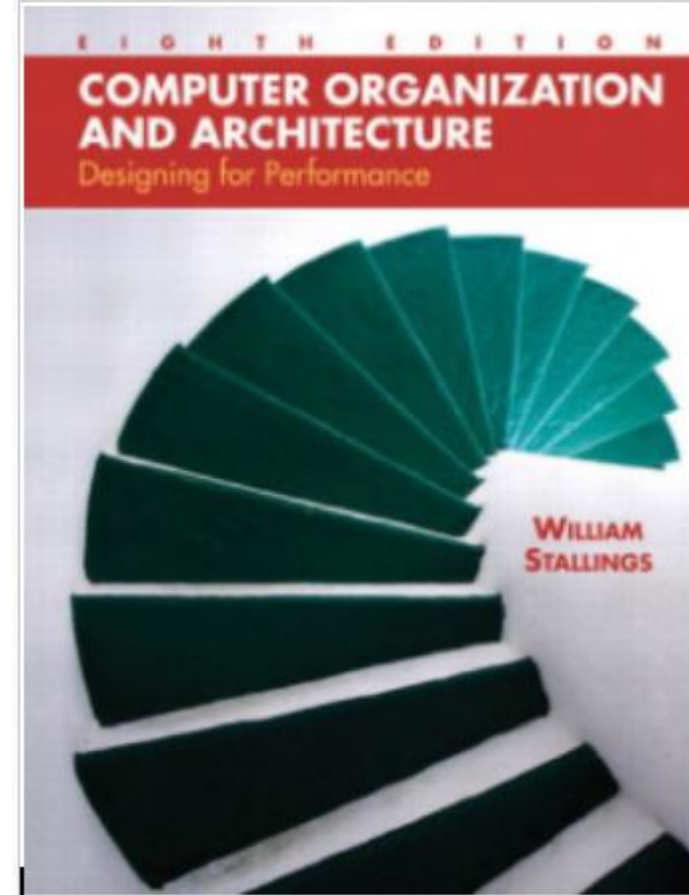# CSC2222: COMPUTER SYSTEMS II

M S HIRUNI PEIRIS

DEPARTMENT OF COMPUTER SCIENCE

UNIVERSITY OF RUHUNA

Reference:

Computer Organization and Architecture
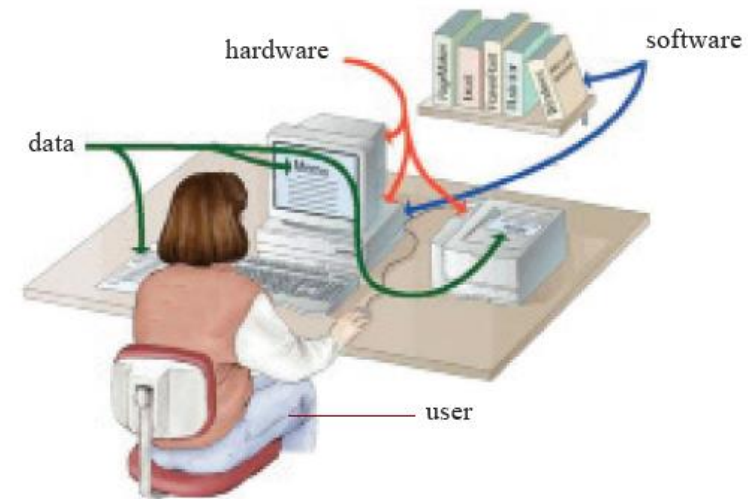Designing for performance –
William Stallings (08th edition)

OUTLINE

- Basic components of Computer System
- Functions of CPU/Microprocessor
- Memory Hierarchy
- Internal Memory
- External Memory
- Motherboard
- Information Processing Cycle

COMPUTER SYSTEM

- Hardware
- Software
- Data
- User

Fig.2.1: The four components of a computer system

COMPUTER SYSTEM

- Hardware
- Physical elements of a computer
- Anything that can be touched

- Software
- A set of electronic instructions that tells the hardware how to perform a task

- Data
- Pieces of information
- Computer organize and present data

- Users
- People operating the computer
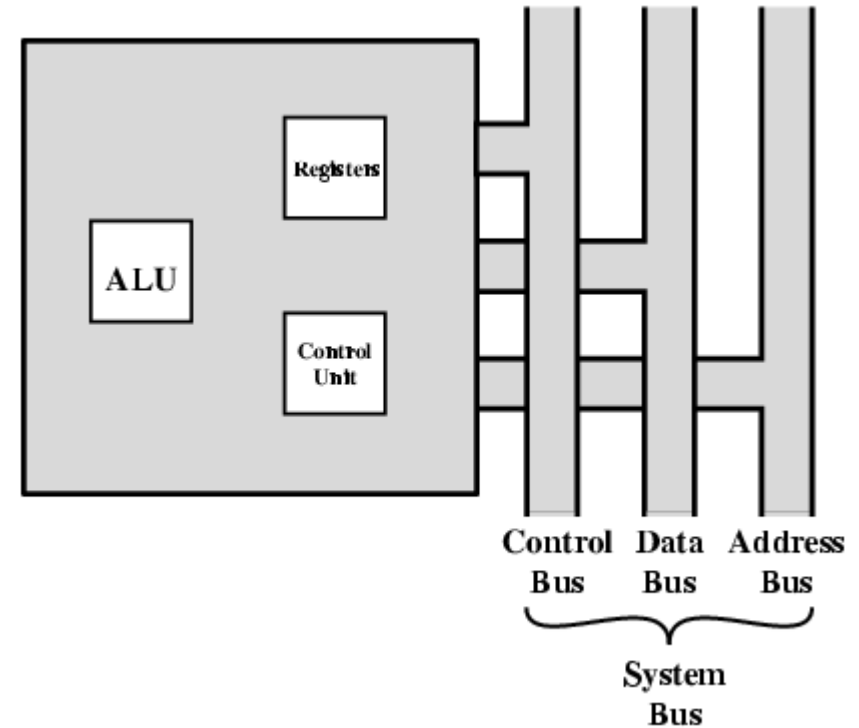- Instruct the computer what to perform

PERSONAL COMPUTER HARDWARE

- Case
- Power supply Motherboard CPU
- Expansion cards Secondary storage devic[e]
- Input and output peripherals

MICROPROCESSOR/CPU

- Brain of the computer
- Composed of thin layers of millions of transistors
- Performs all the calculations and logical operations

CPU

- Consists of:
- ALU - does the arithmetic and logical comparisons that need to be processed Eg:- Addition, subtraction, multiplication, division
- CU - determines the sequence in which computer programs and
  - instructions are executed
    - Fetching- fetch next program instruction from memory
    - Decoding- decode program instructions into commands computer can process
    - Executing- direct appropriate components to execute instructions
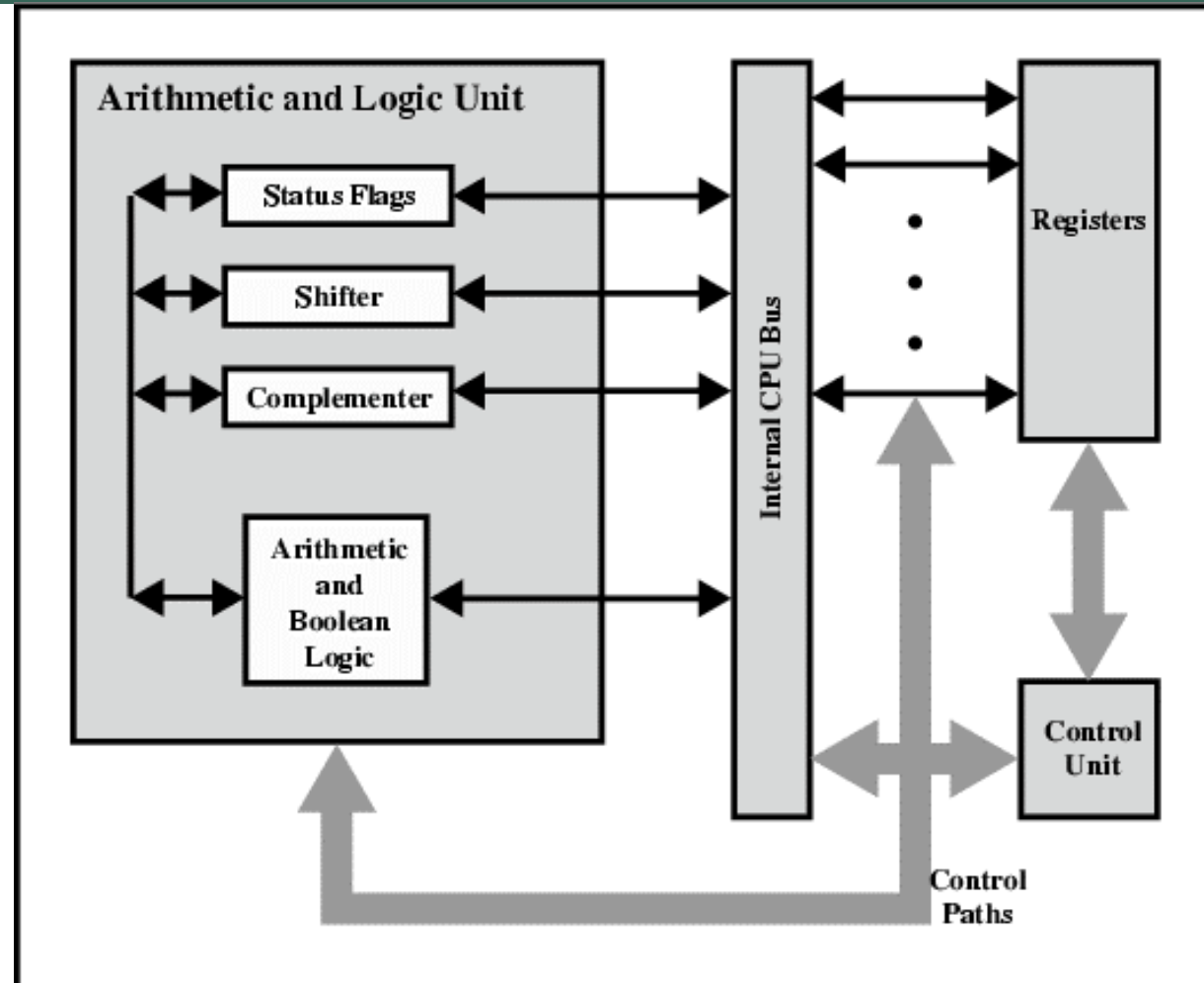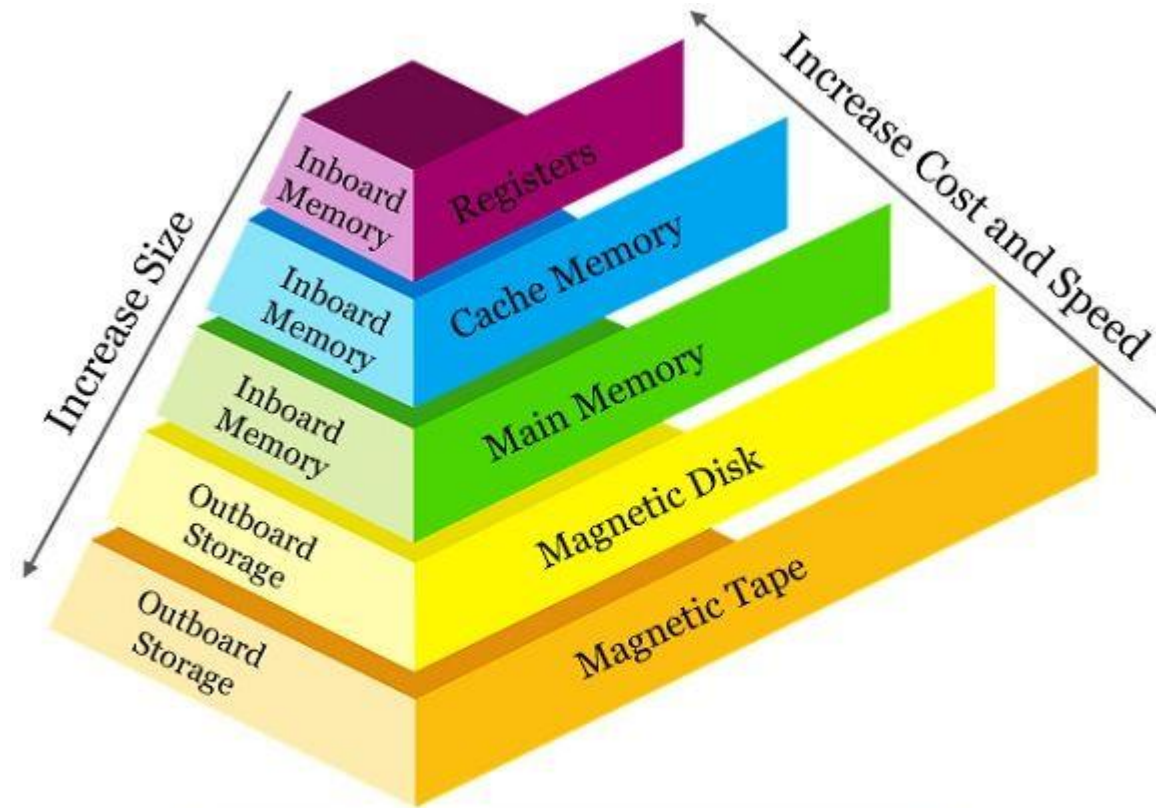   - Storing – writing instruction results into main memory

FUNCTIONS OF CPU

- Tasks:

1. Fetch instructions
2. Interpret instructions
3. Fetch data
4. Process data
5. Write data

INTERNAL STRUCTURE OF CPU

-

MEMORY

Memory Hierarchy

TYPES OF INTERNAL MEMORY

- Main memory (RAM)
- Read Only Memory (ROM)
  - ROM
  - ROM : Programmable ROM
  - PROM : Erasable Programmable ROM
  - EPROM : Electrically Erasable Programmable ROM

- Cache memory (L1, L2, L3)
- Registers

RANDOM ACCESS MEMORY (RAM)

- Main memory/ primary memory/ RAM
- Volatile memory- information is lost if the power is removed
- When the operating system loads from disk when first switch on the computer, it is copied into RAM
- Two main forms:
- SRAM- very fast and expensive
- DRAM- slow and less expensive than SRAM

READ ONLY MEMORY (ROM)

- Non-volatile memory, programmed when manufacturing
- Data stored in ROM cannot be modified

- Stores critical programmes:
  - BIOS (Boot program)
  - Error recovery programmes
  - Part of OS

- Variants:
  - PROM- Programmable (allows one time writing after manufacture)
  - EPROM- Erasable programmable (can be erased repeatedly using ultraviolet light and reprogrammed)
  - EEPROM- Electrically erasable programmable (can be electrically/electrical charge erased repeatedly)

peirismsh@dcs.ruh.ac.lk

CACHE AND MAIN MEMORY
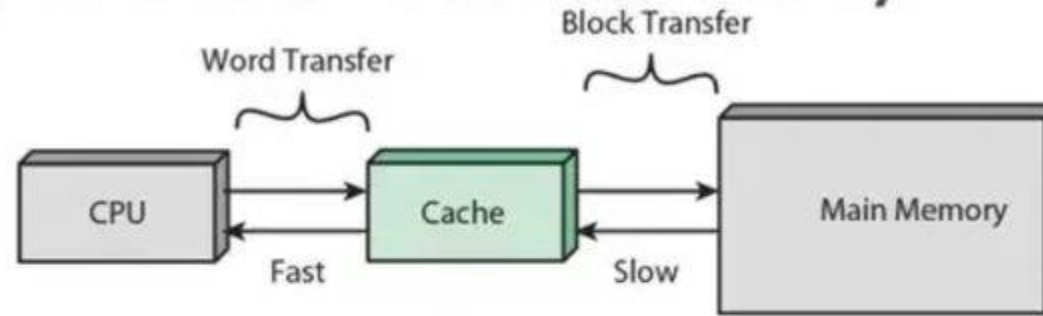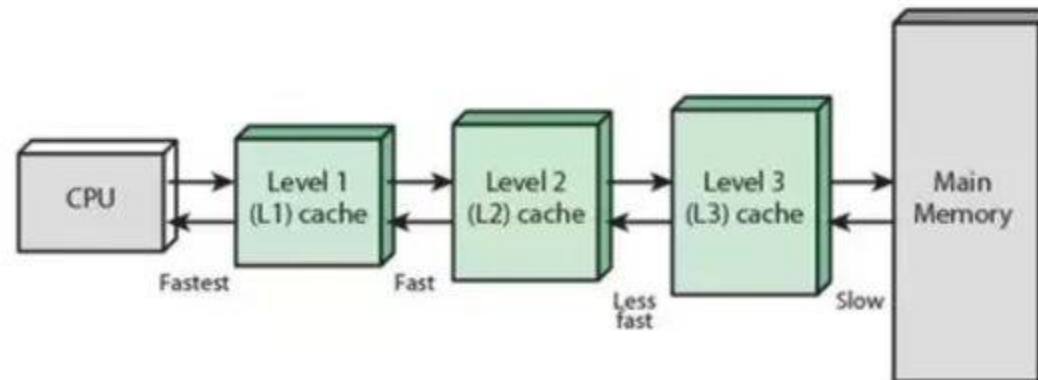
CACHE MEMORY

- Fast random access memory/CPU cache

- A small memory chip which lies between the CPU and main memory

- Access time is close to processing speed of CPU

- CPU uses this to reduce the average access time to access main memory

- L1 cache- usually built onto the microprocessor chip itself

- L2 cache- on a separate chip (motherboard) that can be accessed more quickly than the main memory

- L3 cache- on a separate chip (motherboard)

REGISTERS

The Central Processing Unit (CPU)
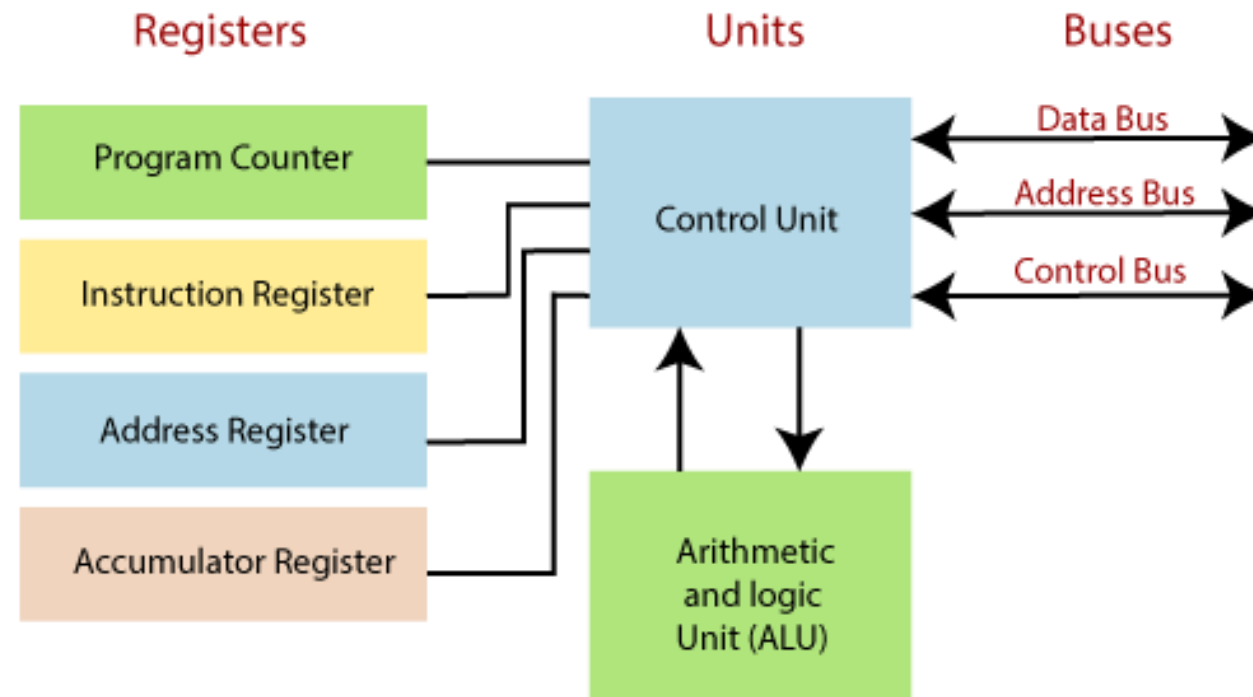
REGISTERS

- a small amount of temporary storage inside CPU
- stores the data that is to be executed next

- quickly accessible

- Load data from memory into registers where it is used for arithmetic, manipulated, or tested, by some machine instruction

- Transfer the processed data (information) with high speed

- Two types:
    1. User Visible Registers
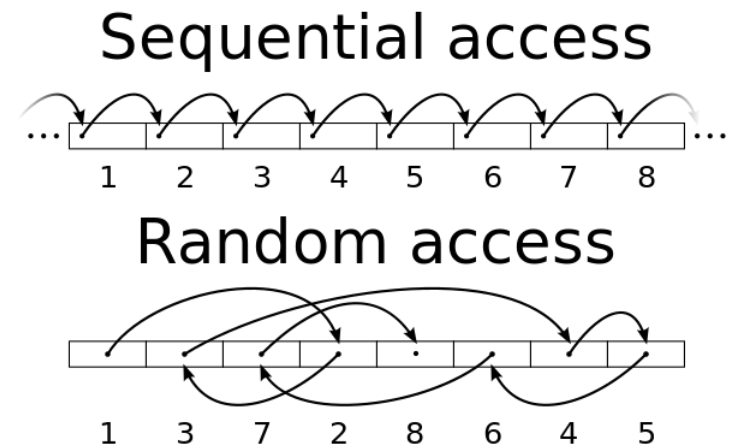   2. Control and Status Registers

ACCESSING DATA MEMORY

- Sequential access

  Records retrieve in the same order in which they are physically stored on the medium

- Random access

  Records retrieve in any order

Sequential access

Random access

EXTERNAL MEMORY

- Known as secondary storage/auxiliary storage
- Not directly accessed by CPU
- provides permanent storage
- Includes:
  - Hard Disk Drive(HDD)
  - Flash memory (pen drive)
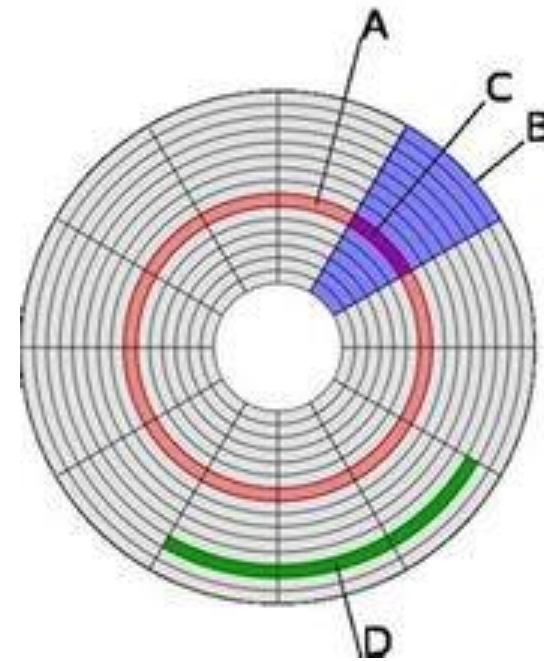 - Optical disks
  - Floppy disks

HARD DISK DRIVE

- Non volatile random access digital magnetic data storage Provides a large storage capacity

   Eg:- 40GB,80GB,…..,320GB, 500GB, 640GB

- Data is recorded electromagnetically in concentric circles or "tracks" on the disk

- Housed inside the system unit

MEMORY MEASUREMENTS

- 1 Bit = 0 / 1
- 8 Bits = 1 Byte
- 1024 Bytes = 1 Kilobyte
- 1024 Kilobytes = 1 Megabyte
- 1024 Megabytes = 1 Gigabyte
- 1024 Gigabytes = 1 Terabyte

HARD DISK

Actuator
Actuator Axis
Head
Actuator Arm
Spindle
Platter
IDE Connector
Jump Block
Power Connetor

Hard Drive Structure:

A = track
B = sector
C = sector of a track
D = cluster

FLASH MEMORY

- Provides a non-volatile mechanism for portable storage of large amount of data
- Semiconductor memory, stable, can be modified

FLOPPY DISKS

- A disk of thin and flexible magnetic storage medium, sealed in a rectangular plastic carrier lined with fabric that removes dust particles

- Disk capacity (3 $\frac{1}{2}$" floppy) is 1.44 MB or 1,440,000 bytes

OPTICAL DISKS

- CD/DVD

- Circular disc which encodes binary data on a special material

- Data is recorded by making marks in a pattern that can be read back with the aid of light, usually a beam of laser light precisely focused on a spinning disc.

- Most commonly used for storing music (e.g.CD), video (e.g. DVD), or data and programs for PCs Types: CD-R, CD-RW, VCD, SVCD, DVD-R, DVD-RW

CD R

- "Compact Disc-Recordable"
- Write Once Read Many optical medium
- Uses laser technology to read data that is permanently stored

CD RW

- "Compact Disc-ReWritable"
- Discs need to be blanked before reuse
- Similar to a CD-R, but rewritable

DVD- R

- Digital versatile Disks -Recordable" format
- Typically has a storage capacity of 4.71 GB Data on a DVD-R cannot be changed, whereas a   DVD-RW (rewritable DVD) can be rewritten multiple (1000+) times
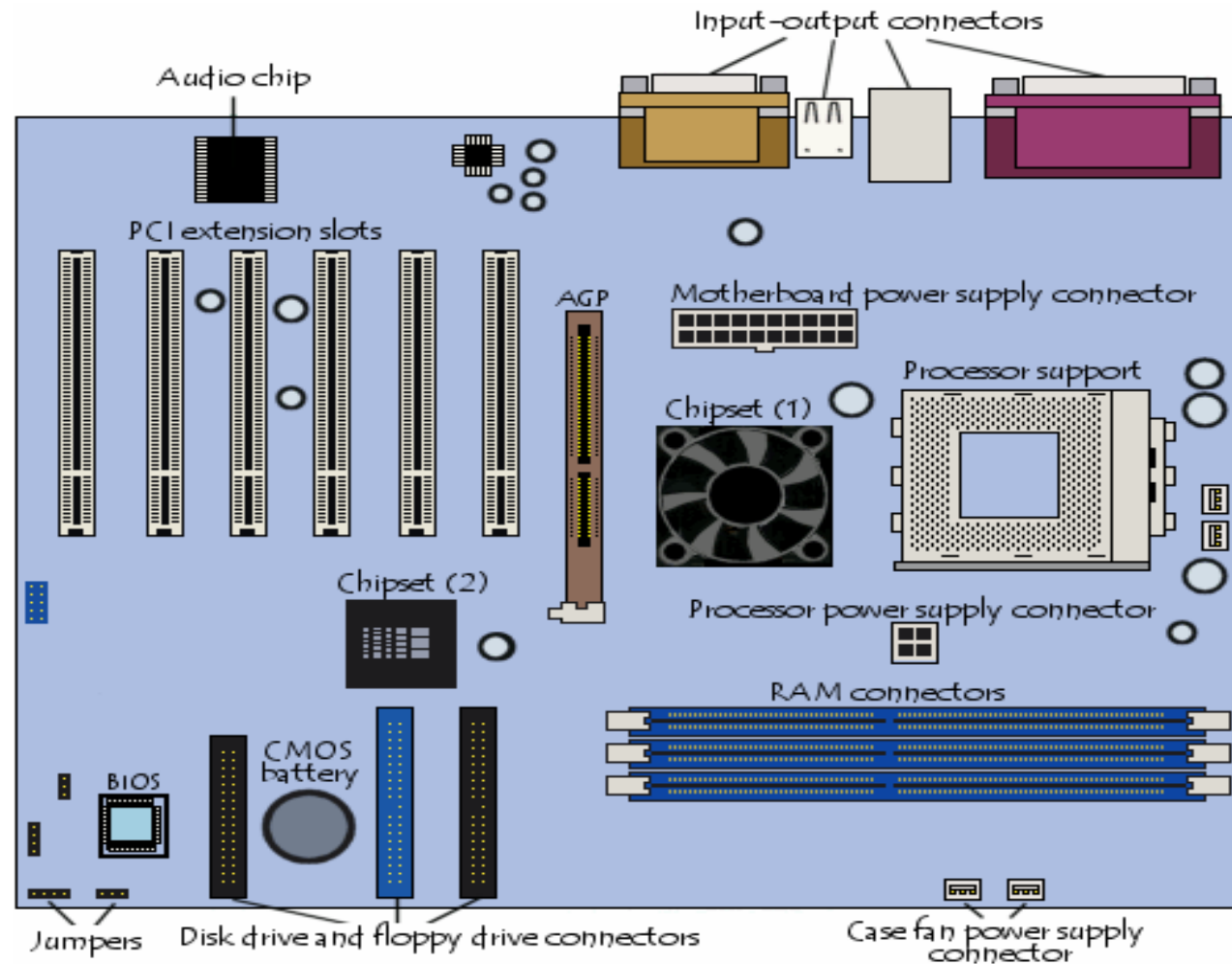
USING A CD ROM DRIVE

CD-ROM

Drive Tray

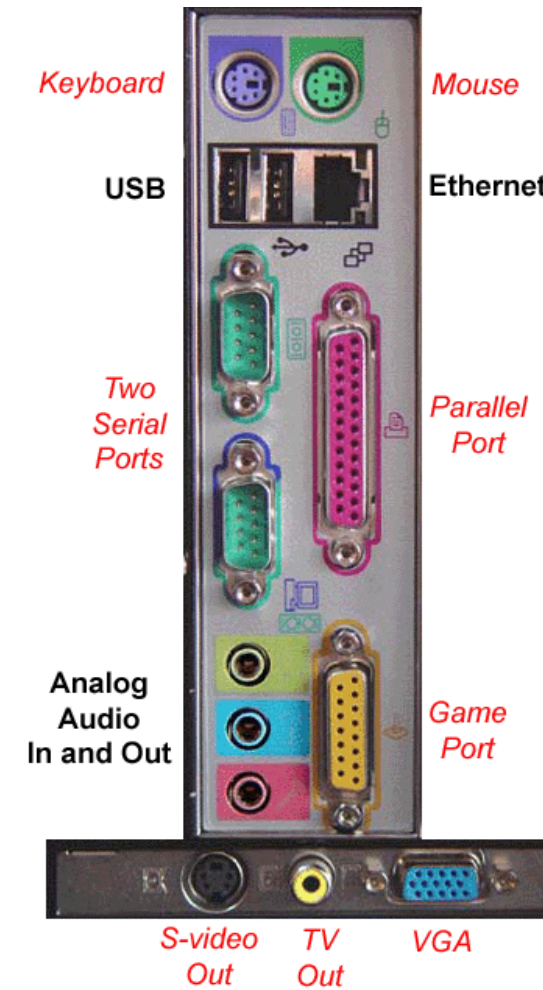Tray-activator button
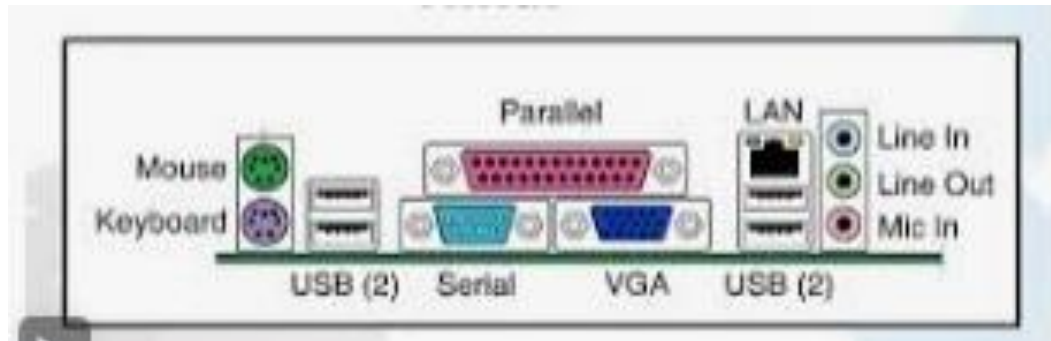
Indicator Light

MOTHERBOARD

MOTHERBOARD

- Electronic circuit board
- Main job is to hold the computer's microprocessor chip and let every essential components connect to it
- Provides communication among:
  - Microprocessor
  - Chipset
  - Memory chips
  - BIOS/ Basic Input Output System
  - System Bus and Expansion Bus

PORTS

CONNECTORS

- A connector is any connector used within computers or to connect computers to networks, printers or other devices

PS/2 CONNECTOR

- The PS/2 connector are use for connecting keyboard and mouse on the modern PCs

- The PS2 mouse connector and port is usually green in colour to distinguish it from the PS2 keyboard, which is purple

USB PORT

- Universal Serial Bus: a protocol for transferring data to and from digital devices
- Many digital cameras and memory card readers connect to the USB port on a computer

FIRE-WIRE IEEE 1394 PORT

- A type of cabling technology for transferring data to and from digital devices at high speed

- FireWire are typically faster than those that connect via USB.

RJ45 ETHERNET PORT

- LAN or (Local Area Network) uses a CAT5 cable and a RJ45 connection

- The CAT 5 cable is also called the Ethernet Cable

- Network connection generally uses a 10/100 Mbps speed. This means it has two different speeds 10 Mbps and 100 Mbps.
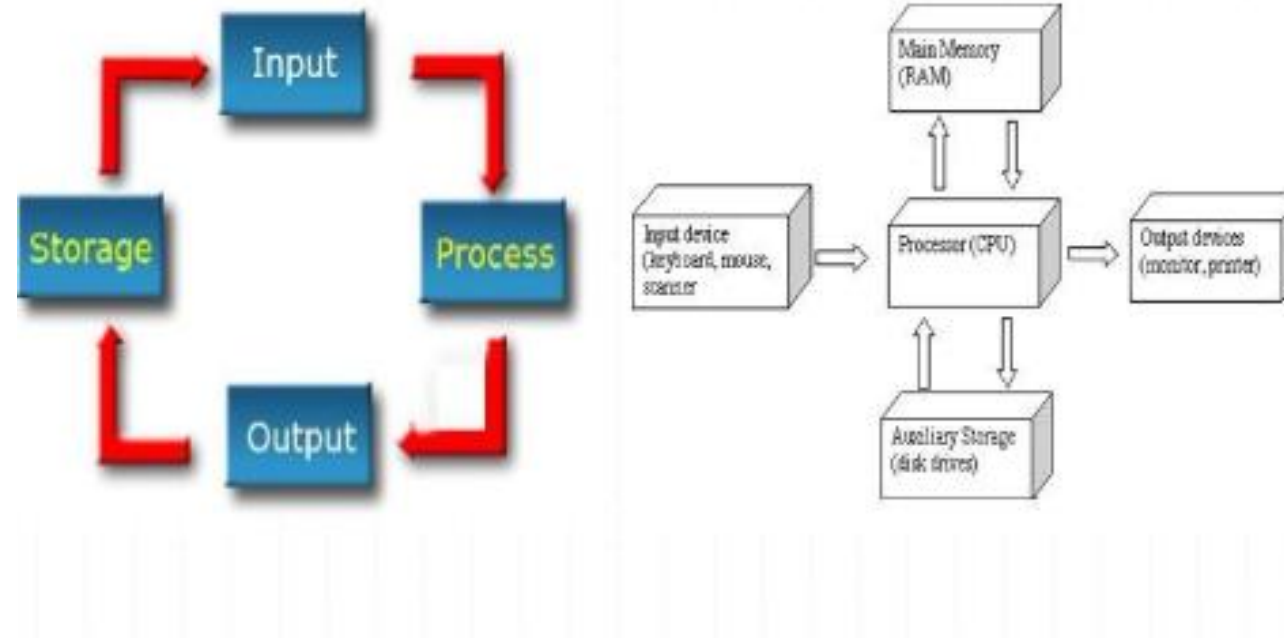
DB25 PARALLEL PORT

- The printer connects to your computer with a Parallel connector. This connector has 25 pins.

- Parallel means the device is capable of receiving more than one bit at a time (that is, it receives several bits in parallel).

INFORMATION PROCESSING CYCLE

- Questions?