# Computer Organization and Architecture

Functional units of digital System and thair interconnections:-

Functional units are a part of a CPU (Central Processing unit) that performs the operations and calculations called for by the computer program. A Computer consists of five main components namely, Input unit, central processing unit, memory unit, Arithmetic and logical unit, contral unit and an output unit.

Program and data → Input unit → Storage unit → Output unit → RSULT

Control unit

Arithmetic Logic unit

→ Central processing unit
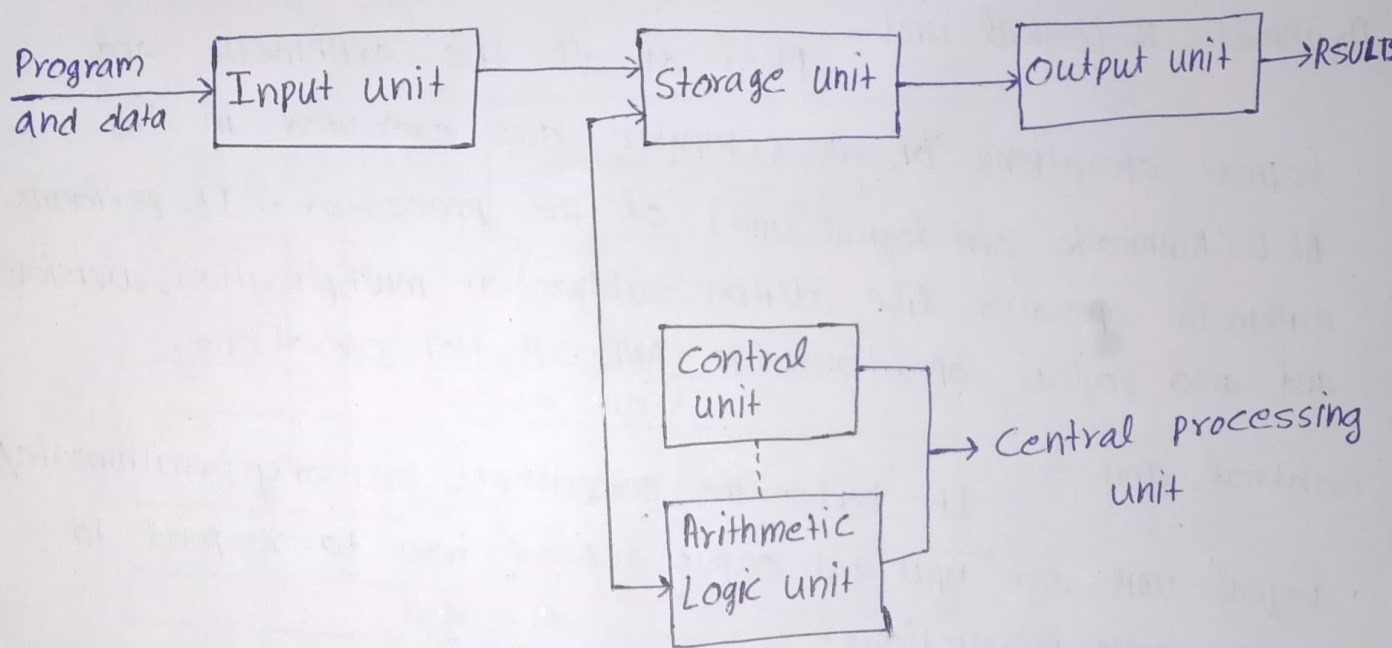
Input unit -

Input units are used by the computer to read the data. The most commonly used input devices are keyboards, mouse, joysticks track balls, micro-phone etc.

Central Processing Unit -

Central Processing unit commonly known as CPU can be referred as an electronic circuitry within a computer that carries out the instruction given by a computer program by performing the basic

arithmetic, logical, control and input/output (I/O) operations specified by the instructions.

Memory/storage unit —
The memory unit can be referred to as the storage area in which programs are kept which are running, and that contains data needed by the running programs.

Arithmetic & Logical unit —
Most of all the arithmetic and logical operations of a computer are executed in the ALU (Arithmetic and logical unit) of the processor. It performs arithmetic operation like addition, subtraction multiplication, division and also logical operations like AND, OR, NOT operations.

control unit —
It tells the computer's memory, arithmetic/logical unit and input and ouput devices how to respond to a program's instructions.

The control unit also known as the nerve center of a computer system

Output unit —
As the name suggests, it display information in a way that the user can under-stands.

The most common example of an output device is a monitor printer etc

System Buses

Buses is the group of conducting wries which carries information. All the peripherals are connected to microprocessor (CPU) through bus.

there are three different buses -

1. Data bus
2. Address bus
3. contral bus
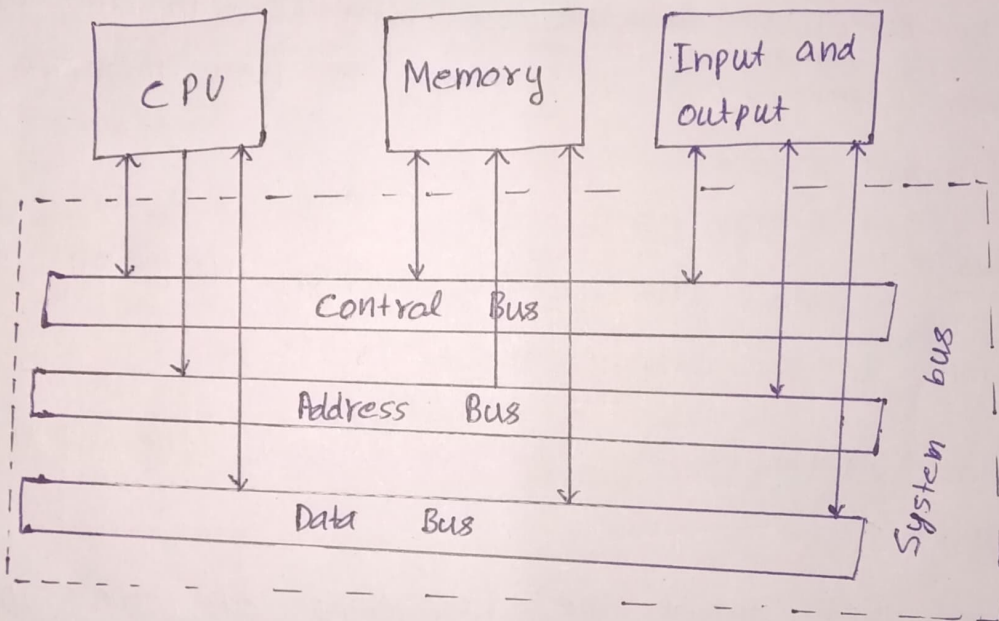
1 Data Bus

- The most common bus is the data bus. A data bus carries data.

- It is an electrical path that connects the CPU, memory, input output devices and secondary storage devices.

- The number of lines in bus affects the speed at which data travels between different components

- It is bidirectional

ii) <u>Address Bus</u>

An address bus carries address information. It is set of wires similar to the data bus but it only connect CPU and memory.

* Whenever the processor needs data from the memory, it places the address of data on the address bus.

* the address is carried to the memory where the data from the requested address is fetched and placed on the data bus. the data bus carries to CPU

* It is uni-directional beas because data flow in one direction from miroprocesser (CPU) to memory or from microprocesser to input/output devices.

3) <u>Control Bus</u> =

Control bus carries control information the control unit to the other unit.

The control information is used for directing the activities of all unit

The control unit control the functioning of other unit. eg input/output devices, secondary storage etc.

USB (universal serial bus)
IDE (integrated Development Environment)

Bus Arbitration

Bus Arbitration scheme usually try to balance 'Bus priority' and 'fairness'.

Bus arbitration refers the process by which the current Bus master accessed and then leaves the controls of the bus and passed it to the anot anyothe bus requesting processor unit. the control that has access to a bus at an instance is known as Bus master.

There are two approaches to bus arbitration

I) centralised Arbitration

Only single bus arbiter performs the required arbitration and it can be either a processor or a separate DMS Controller

**II) Distributed Arbitration** All devices participate in the selection of the next bus master,

Methods of bus arbitration

There are three bus arbitration methods :-

a) Daisy chaining method — It is a centralised bus Arbitration method. During any bus cycle, the bus master may be any device - the processor or any other DMA controller unit, connected to the bus.

DMA - Direct memory access

Daisy chaining bus arbiteration
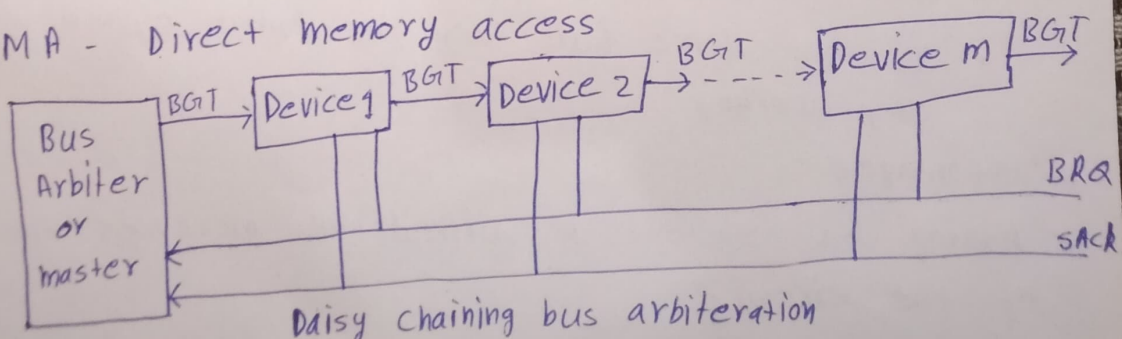
Advantage –

    ① Simplicity and Scalability

    ⑪ The user can add more devices anywhere along chain, up to a certain maximum value.

Disadvantages –

① The value of priority assigned to a device depends on the position of the master bus.

⑪ Propagation delay arises in this method.

⑪⑪ If one devices fails then the entire system will stop working.

b) Polling or Rotating Priority method –

    In this method the devices are assigned unique priority and complete to access the bus, but the priorities are dynamically changed to give every device an opportunity to access th bus.
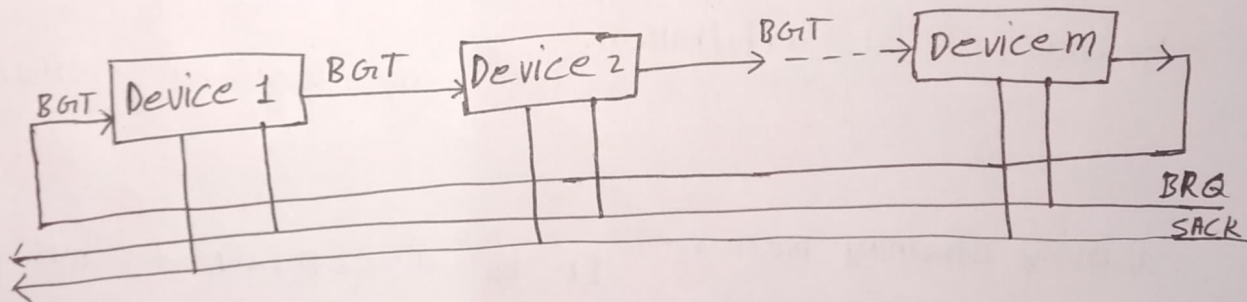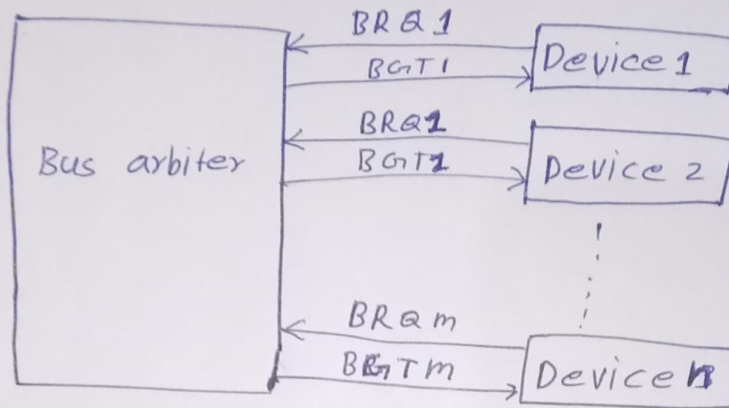

Advantages –

Bus • This method does not favor any particular device and processor

• The method is also quite simple.

• If one device fails then the entire system will not stop working

Disadvantages –

• Adding bus masters is difficult as increases the number of the circuit.

fixed priority or Independent Request method -

In this method each master have separate pair of bus grant and bus request line and each pair has a priority assigned to it.

Advantages

This method generates a fast response

Disadvantages -

Hardware cost is high as a large no. of control lines is required.