=> Assembly language -

A person looking at a program which is written in binary language will face difficult to understanding it then they have to need to write program in meaningful language, which easy to understand and used to in english word instead of 0's and 1's.

Such a programming language in which symbolic instruction are used insted of binary or hexadecimal number is known as assembly language program.

Assembly code is converted into executable machine code by a utility program refered to as an assembler.

Assembly language is a low level programming language for a computer.

Being a low level language assembly language need the programmer to write instruction for every step that the hardware must do to solve the program hence they have a good knowledge about computer hardware for programming in assembly language.

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Q"-> Explain advantage and disadvantage of assembly language over that of the machine language.

Ans.->

Assembly language-

As we know that assembly language is such type of programming language technique in which some define instruction called pseudo instruction are used to perform certain task.

Such instruction memory allready defined inside assembly and not take part execution only used for understood by assembler.

Such instruction are ADD, SUB, MUL, ST, DIV, DSL etc are assembler instruction.

Machine language-

Machine language strings of 0's and 1's is called binary number program.

It is directly execute by CPU and there are no need for conversion work in machine language.

Advantage of assembly language over Machine language-

(i) Writing of a program is easier.
(ii) It is understoodable.
(iii) It decrease complexicity.
(iv) Writing a program take less time.

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(v) It takes memory space as a high level language.
(vi) There is use an assembler to decode program.

Disadvantage -
(i) Debugging is very time consuming.
(ii) We have to need large number of instruction to write a program.
(iii) Program written in one computer can not run on other computer i.e it is Machine depend.
(iv) A programmer must have a well knowledge to write this type of program.

Q". → Write advantage of Machine language -
Ans.- (i) Directly executed by CPU.
(ii) It takes less time to execute.
(iii) Written only in form of 0's and 1's.
(iv) This is not machine depend.
(v) There is no require decoder equipment.

⇒ Pseudo operation -
A pseudo operation is describe act of a software sending instruction or code to a hardware device that has not bee compiled after words the hardware device translate the instruction into machine language.

⇒ Subroutine in assembly language -
In a given program it is often needs to perform a particular sub task many times on different data value, such a sub task is usually called a Subroutine.
Ex.- A subroutine may sort numbers is an integer

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array or perform a complex mathematical operation on and input variable easy calculate / sin x).

=> Component of Subroutine -

An Assembly language has -

(i) An entry point (the location of first instruction in the routine)

(ii) Parameters (The list of register and memory location that contain the parametre for the routine.)

(iii) Return value (The list of register or memory location to save the result.

(iv) Working Storage - The register or memory location required by the routine to perform its task.

→ There are two ideas behind a subroutine -

(i) We should be able to call the subroutine anywhere.

(ii) Ones the subroutine is complete, it should return back to the place that called the Subroutine.

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Unit - 06

# Microprogrammed Control Unit

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=> Micro-programming -

We know that a program is sequence or set of instruction which perform a task same as set of microprograms operation.

When a microprogram is loaded in auxillary memory or optical disk called Dynamic programming.

Multiprogramming is the ability of an operating system to execute multiple program at the same time on single processor machine.

=> Control

Control unit is a seperated section of a computer system that control all the program executed by CPU. Control unit generate a string of 0's and 1's called control word is used performing various operation.

A control unit which stores binary control variables in memory called a microprogram control unit.

* Microprogramming is a process of writing microcode for a microprocessor.

* Microcode is low level code that define how a microprocessor should function, when it executes machine language instruction.

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## ⇒ Microprogrammed Controler -

An alternative and flexible way of implementing the control sub system is to use a microprogrammed controler.

This microprogrammed controler consist of following module -

(i) Control Store (C.S)

A memory device (RAM/ROM) containing the microprogram.

(ii) Control Store address register (CSAR).

A register containing the address of the micro-instruction to be executed.

(iii) Address Generator -

Computes the address of the next microinstruction.

(iv) Decoder -

Generates control and other signal from the microinstructions.

(v) Micro-controller -

Sequence the operation of the microprogrammed controller.

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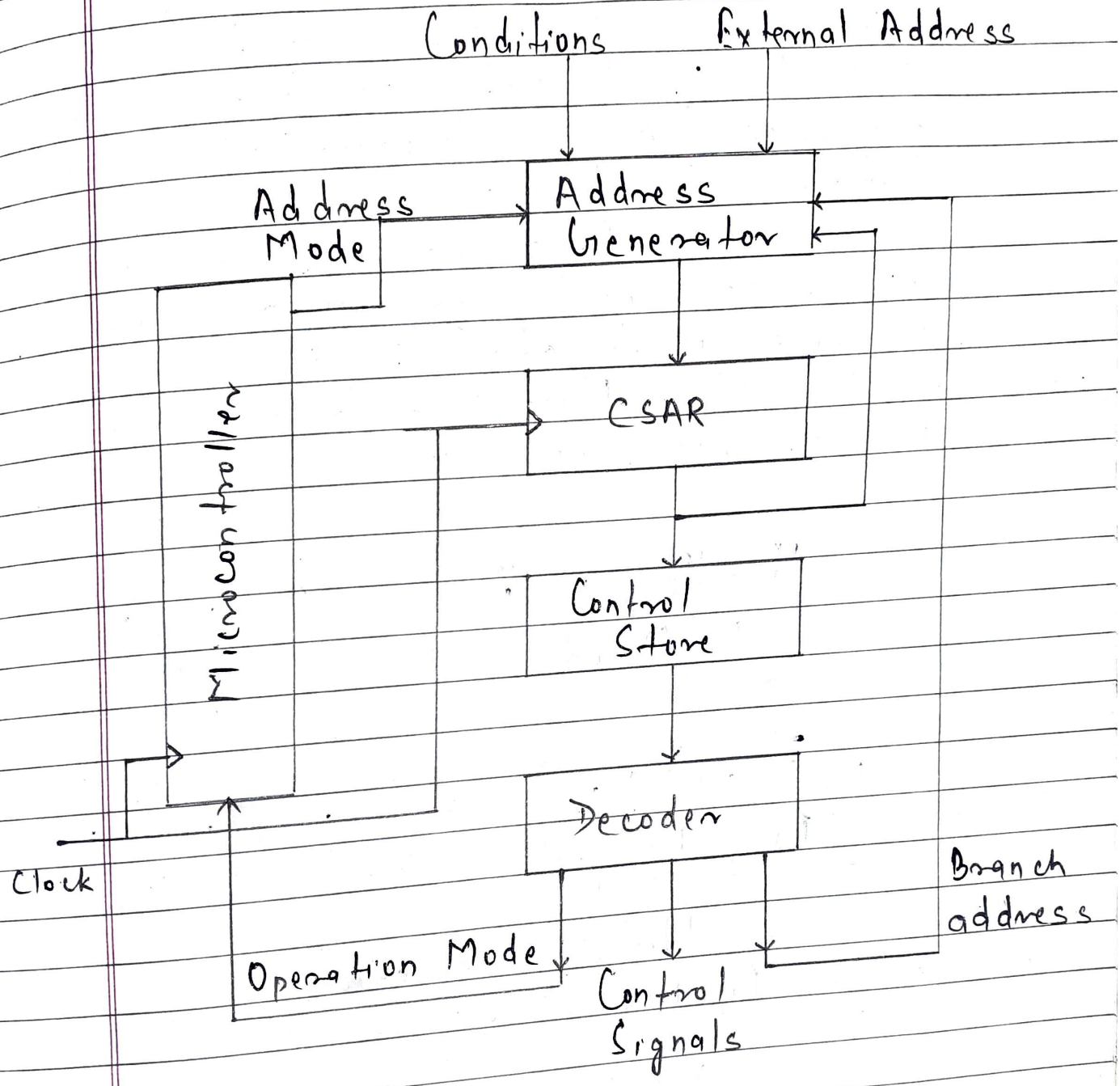
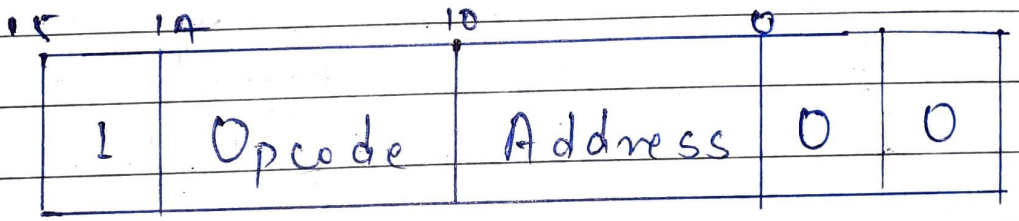

Conditions
External Address
Address Mode
Address Generator
CSAR
Microcontroller
Control Store
Decoder
Clock
Branch address
Operation Mode
Control Signals

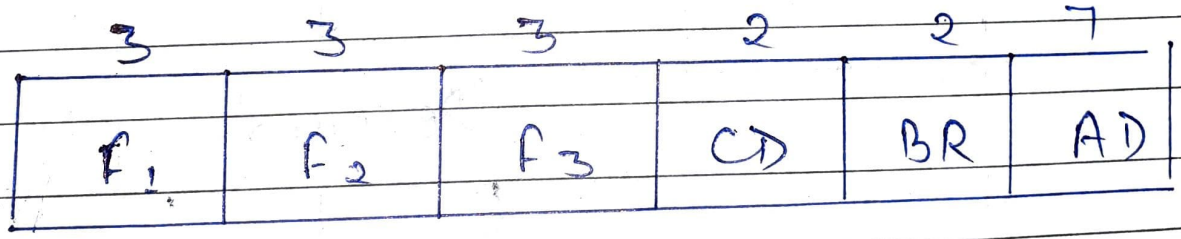
=> Microinstructions -

An instruction that controls data flow and instruction execution & sequencing in a processor at a more fundamental level.

A series of microinstructions is necessary to perform an individual machine instruction.

Microinstruction specify one or more operation




Micro instruction

where $F_1$, $F_2$, $F_3$ - equal to microinstruction field

CD = Condition if branching.

BR = Branch field

AD = Address field.

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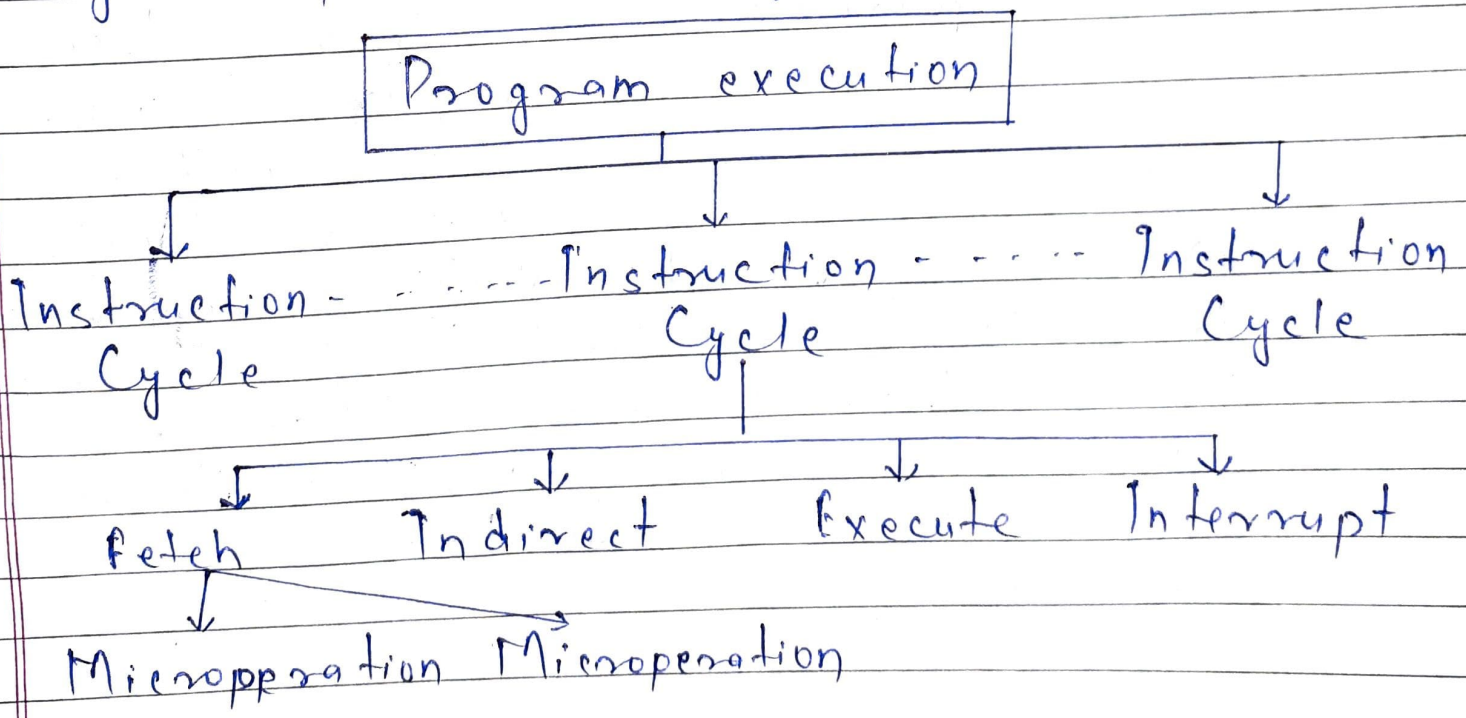
=> Microoperation -

Microoperation are detailed low level instruction used in some design to implement complex machine instruction.

Microoperation perform basic operation on data stored in one or more register, including transferring data between register.

It also performs arithmatic or logical operation on register.



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Q^n.→ Write difference between horizontal and vertical Micro program control Unit'.

Ans.→

| Horizontal | Vertical |
|---|---|
| (i) The control signals are represented in decoded binary format. | (i) The control signals are represented in incoded binary format. |
| (ii) It supports longer control words. | (ii) It support shorter con--trol words. |
| (iii) No additional hardware is required. | (iii) Additional hardware in the form of decoder are required to generate con--trol signals. |
| (iv) It is faster | (iv) It is slower. |
| (v) It is less flexible. | (v) It is more flexible. |
| (vi) It allow higher degree of parellilism if degree is n then n control signals are enabled at a time. | (vi) It allow low degree of parellilsn i.e degree of parellilsn is either 0's and 1's. |

⇒ Address Sequencing:-

The transformation of the instruction code bitles to an address in control memory where the routine of instruction located is refered as mapping process.

Micro instruction are store in counter memory in groups, with this group specifying a routine.

Each computer instruction has its on micro program routine to generate

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the micro operation.

⇒ Micro Sequence -

A sequence or micro sequence generates the address use to step through the micro-program of a control store.

It is used as a part of the control unit of a CPU or as a stand alone generator for address range.

⇒ Write and explain the basic task perform by micro program control unit -

Ans. - A control unit whose binary control variable are stored in memory is called a micro-programmed control unit.

A symbolic microprogram can be translated into its binary equivalent by means of an assembler.

Each line of assembly language micro-program defines a symbolic microinstruction.

Control memory is the storage in the microprogrammed control unit to store the microprogram.

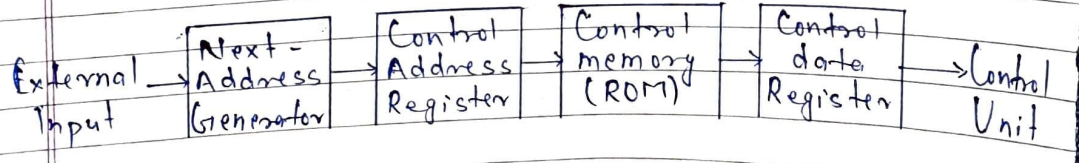
The control variables at any given time can be represented by a control word string of 0's and 1's called a control word.

ROM words are made permanent during the hardware production of the unit.

The use of a micro program involves placing all control variables in words of ROM for use by the control unit through successive.

The control memory is assumed to be a ROM within.

The general configuration of a micro-programmed control unit is demonstrated in block diagram.



Unit - 08

# I/O Organisation

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⇒ Input Device -

Input device are those which is used to enter data and instruction into computer.

Some input device are - mice, keyboard, Scanner, lightpen.

⇒ Output device -

Output device are used to transfer the information store in computer or the result of any processing done by the computer to the outside world.

Some output device are - printer, speaker, monitor, Headphone, GPS.

Output device are done in different way but we study here about a handshake based communication and strobe based communication.

⇒ Handshake based Communication -

In handshake based communication control lines are used.

One line is used to inform the destination that data present in bus.

Second line is used to reply that destination is ready to accept the data.

Both lines are opposite to other.

Handshake can be control by other using Hardware or software.

A Hardware handshake used to Ex.- Charge the signal between CPU and external device.

A Software handshake is used to Ex.- Avoide disadvantage Exchange the signal between two modems.

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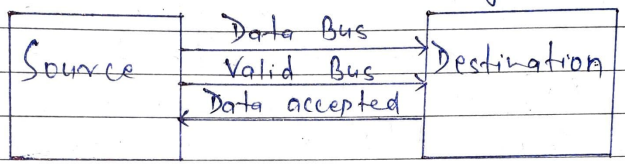
This communication is used to avoide dis-advantage of Strobe based Communication.

In this type of Communication the destination unit recive data signal and then send data ~~value~~ valid.

Accepted singnal to source to indicate that the information is accepted by destination.




⇒ ~~Strobe~~ based communication -

A strobe based communication uses a singal control line ~~signal~~ to time each transfer.

Data transfer can be serial or parallel, in serial data transmition each bit in the message sent in succession, one after another in parallel data transmition the whole of data bits of a message sent side by side.

In same time 'n' wires required to 'n' data.

The parallel data transfer is faster then serial data transfer but it is expensive.

Strobe based Communication is use to serial base asynchronous serial data transmition.

In this system special bits

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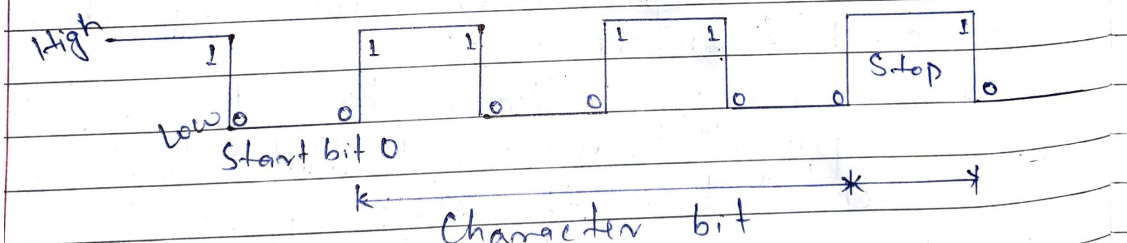
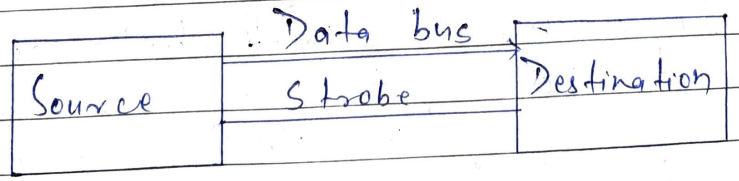
are inserted at both ends of is called strobe pulse. Thus a transmitted chara-cter consist of three part-

(i) Start bit
(ii) Character bit
(iii) Stop bit

When no character is transmi-tion, the line is at high state when a character is to be transmitted start bit (0) is sent begining of the character and stop bit (1) at least one or two time after character to seperate this character from others.



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Q^n. → Write the difference between strobe based communication and hand shake based communi-cation -

Ans.-

| Handshake based | Strobe based |
|---|---|
| (i) A handshake based uses two control signals. One line is used to inform the destination that data present in bus. Second line is used to ~~inform~~ reply that destination is ready to accept the data. | (i) A strobe based uses a single control line to time each transfer. |
| (ii) This communication is use to avoide disadvantage of Strobe based communication. | (ii) It is use to serial base asynchronous serial data transmition. |
| (iii) Handshake can be activated by either source or by destination | (iii) Strobe can be initiated either by source or by destination. |

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Q. -> Difference between RAM and ROM -

Ans -> 

| RAM | ROM |
|---|---|
| It stands for Random Access Memory. | It stands for Read only memory. |
| It is volatile | It is non volatile. |
| RAM's data can be read, erased and modified. | ROM's data is only for read. |
| It's speed is high | It's speed is slow. |

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=> Vector and Priority interrupt -

The interrupt initiated input output, the CPU perform the input output operation when it recive the interrupt signal from some device which is ready to transmit data.

The CPU has special subroutine for surveeing data transfer request from each device. The CPU branches to specific location in the memory where the subroutine is stored for a device.

In vector interrupt, interrupting device supply the address of the subroutine.

This is the branch add. -ress where CPU has to transfer control when a device interrupt is provided by the interrupting device itself.

In priority interrupt when many device are active at a time, then many interrupt can occur and there needs to be some macanism to handle them. app -ropriately also.

If during an interrupt proce. -ssing another interrupt is occur, it must be decided whether to continue with the current job or go and process the newly arrived interrupt, this can be done by knowing which is more important.

The relative important given to different interrupt is called its

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priority of the interrupting device with highest priority value will be serve first.

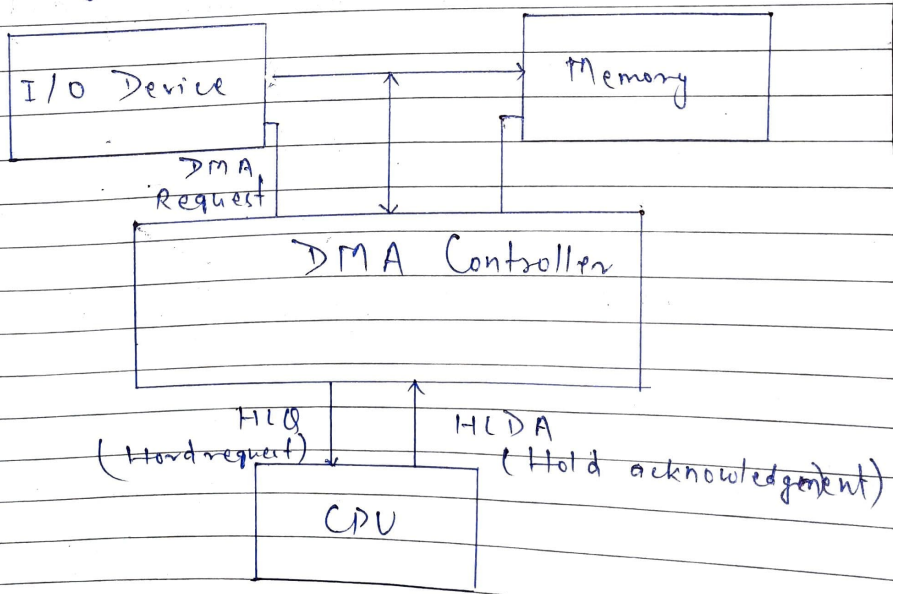
High speed device are given higher priority and slow device such as keyboard are given lower priority.

⇒ Direct Memory Access (DMA) -

DMA is direct memory access is a technique for moving data directly between main memory and peripheral device without meeting CPU intervension.

DMA is designed to transfer data at a faster rate.

Input/Output device writes data to or read data from the memory through memory bus



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Q⁴.→ How DMA works?

Ans.-

(i) I/O device wants to send a data to memory.

(ii) I/O device has to send DMA request to DMA controller.

(iii) DMA controller send HLQ (Hold request) to CPU.

(iv) DMA controller wait until CPU sends HLDA (Hold acknowledgment) to DMA.

(v) CPU become slave and DMA controller becomes master.

(vi) CPU leaves control over the memory and I/O device.

(vii) CPU is in hold state, DMA controller has to manage operation over system bus between CPU, memory and I/O device.