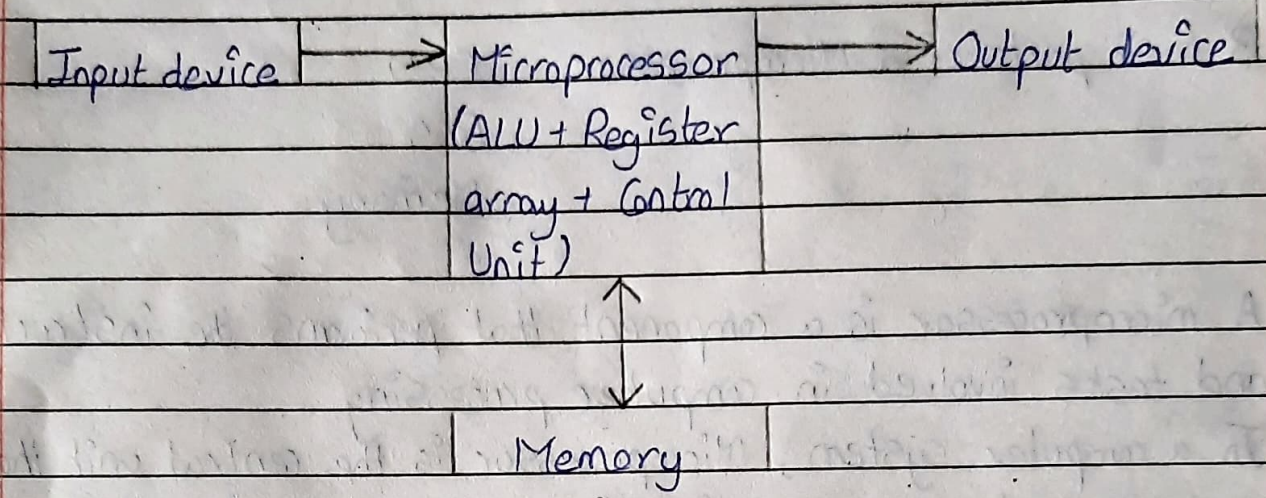
JMP

- Microprocessor: Computer processor where the data processing logic and control is included on small integrated circuit

⇒ Contains the arithmetic, logic and control circuitry required to perform the functions of a CPU

- Microcomputer: Device which has microprocessor in it

Von neumann architecture ⇒



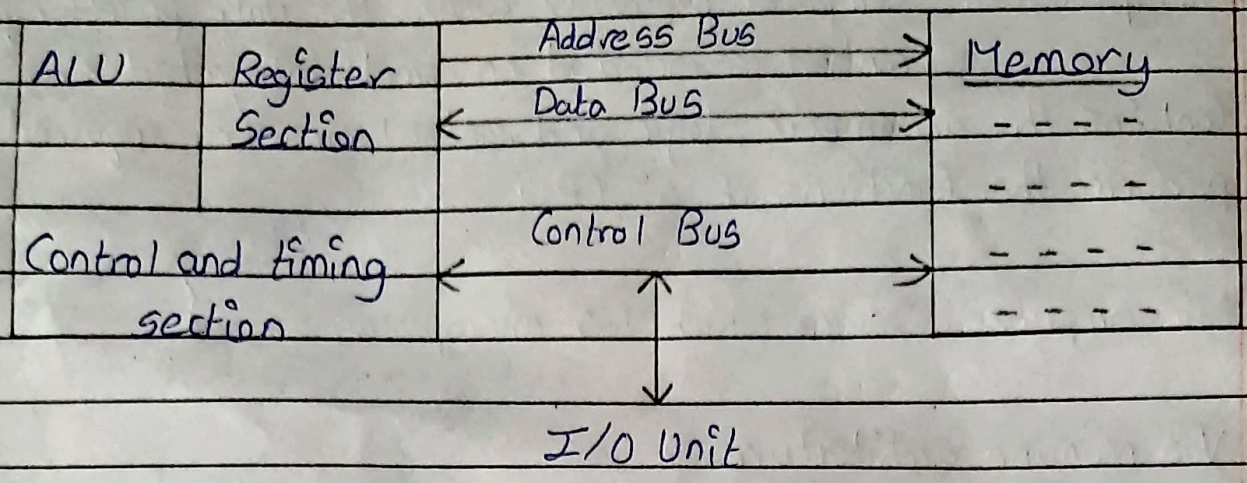
- Microprocessor: Instruction cycle

1.) FETCH - Fetch instruction from memory
Instruction are stored in memory as series of bits
MP fetches binary instructions from memory

2.) DECODE - understands binary instruction (opcode) [0, 1]
Uses a multiplexer as a decoder

3.) EXECUTE - executes the decoded instruction

- Microprocessor: Internal Structure and Basic operation



3 basic parts of a Microprocessor : CPU
Bus
Memory

- A microprocessor is a component that performs the instructions and tasks involved in computer processing
In a computer system, Microprocessor is the central unit that executes and manages logical instruction passed to it

A microprocessor may also be called a processor or Central processing unit, but it is more advanced in terms of architectural design and is built over a silicon microchip

It is the most important unit within a computer system and is responsible for processing the unique set of instructions and processes

- 3 basic parts of Microprocessors

1.) CPU

A computer's CPU handles all instructions it recieves from hardware and software running on the computer

CPU is fabricated as a very large scale integrated circuit and has these parts:

- Instruction Register that holds the instruction to be executed
- Decoder which decodes the instruction and sends to ALU
- ALU (Arithmetic logic Unit) has circuits to perform arithmetic, logical, memory, register and program sequencing operations
- Registers holds intermediate results obtained during program processing

2.) Bus

A bus is a high speed internal connections

Buses are used to send control signals and data between the processor and other components

3 types of Bus:

i Data Bus - lines that carry data to and from memory
Is bidirectional with width equal to word length of the microprocessor

ii Address Bus - Is unidirectional responsible for carrying address of a memory location or I/O port from CPU to memory or I/O port

iii Control Bus - lines that carry control signals like clock signals, interrupt signal or ready signal
Are bidirectional
Generates timing and control signals

3) Memory (Semiconductor Memory)
Stores data and instruction
2 types:
i ROM (Read only memory)
ii RAM (Random access memory)
Main memory element of a Microcomputer based system
Programs may be stored in ROM or RAM, the program does not normally change while it executes, while data is stored in the registers and RAM
If you turn off the chip and turn it on again, you have lost all the content of registers and ram.

i ROM
Types:
a MROM Masked Read only Memory
b PROM Programmable Read only Memory
c EPROM Erasable Programmable Read only Memory
d EEPROM Electrically erasable programmable Read only Memory

ii RAM
Types:
a DRAM Dynamic Random Access Memory
b SRAM Static Random Access Memory

DRAM: slow, uses capacitor for storage
SRAM: fast, uses flip-flops for storage

- 3 basic types of Microprocessors

1.) CISC (Complex Instruction Set Computer)
Computer architecture in which single instruction can execute several low level operations capable of multistep operations or addressing modes within single instruction

2.) RISC (Reduced Instruction Set Computer)
Microprocessor designed to perform a smaller number of types of computer instruction so that it can operate at a higher speed

3.) EPIC (Explicitly Parallel Instruction Computing)
64 bit, provides upto 128 general and floating point unit registers and uses loading, prediction to accomplish it's task

- Clock in Microprocessor

Every microprocessor has an internal clock that regulates the speed at which it executes instructions and also synchronizes it with other components

Speed at which microprocessor executes instructions is called Clock Speed

- Tristate logic

A device can assume 3 states: logic 1
logic 0
High impedance

Can be thought of as a switch

Reduces Number of pin required

Reduces the cost of hardware

Tri state logic is used to allow multiple circuits to share the same output or bus lines which may not be capable of listening to more than one device or circuit at a time

In this way, high impedance state acts as a selector which blocks out circuits which are not being used

When the circuit is in high impedance mode it looks as if it is disconnected from the output completely

- Bit → Binary Digit (0 and 1)

Decimal digit → 10 symbols (0 to 9)

Nibble	4	Bit Word
Byte	8	
Word	16	
long Word	32	

Decimal Number system (10 digits : 0 to 9)
To have them save in a Computer system, you need to represent them in binary
Now using 3 bits, you get 2^3 symbols viz. 8
So you need 4 bits for representation
Using 4 bits, you get 2^4 symbols viz. 16
That gives us Hexadecimal Number system
You get a wider combinations because now you can represent a wide range of numbers
(0H, ..., 9H, AH, .. FH)

We use Hexadecimal system because by using that we can store more information in less space

Decimal	Hexadecimal	Binary
0	0H	0000
⋮	⋮	⋮
9	9H	1001
(10 values)	AH (10)	1010
	⋮	⋮
	FH (15)	1111
	(16 values)	

} 4 bits

Hexadecimal to Binary : 8 4 2 1 Format

E.g:

FH(15)	1	1	1	1	} 4 bit no.s
3H	0	0	1	1	
CH(12)	1	1	0	0	
7H	0	1	1	1	
35H	0011	0101			} 8 bit no.s
41H	0100	0001			

8 bit no.s	16 bit no.s
00H	0000H
⋮	⋮
FFH	FFFFH
Byte	Word

E.g

25	6000
FC	51FC
62	5721

2^0	1
2^1	2
2^2	4
2^3	8
2^4	16
2^5	32
2^6	64
2^7	128
2^8	256
2^9	512
2^{10}	1024 = 1K
2^{20}	1 M
2^{30}	1 G
2^{40}	1 T

E.g

$2^{11} = 2^{10} \times 2^1$

$= 1K \times 2$

$= 2K$

$2^{19} = 2^{10} \times 2^9$

$= 1K \times 512$

$= 512 K$

$2^{20} = 2^{10} \times 2^{10}$

$= 1K \times 1K$

$= 1M$

$2^{23} = 2^{20} \times 2^3$

$= 1M \times 8$

$= 8M$