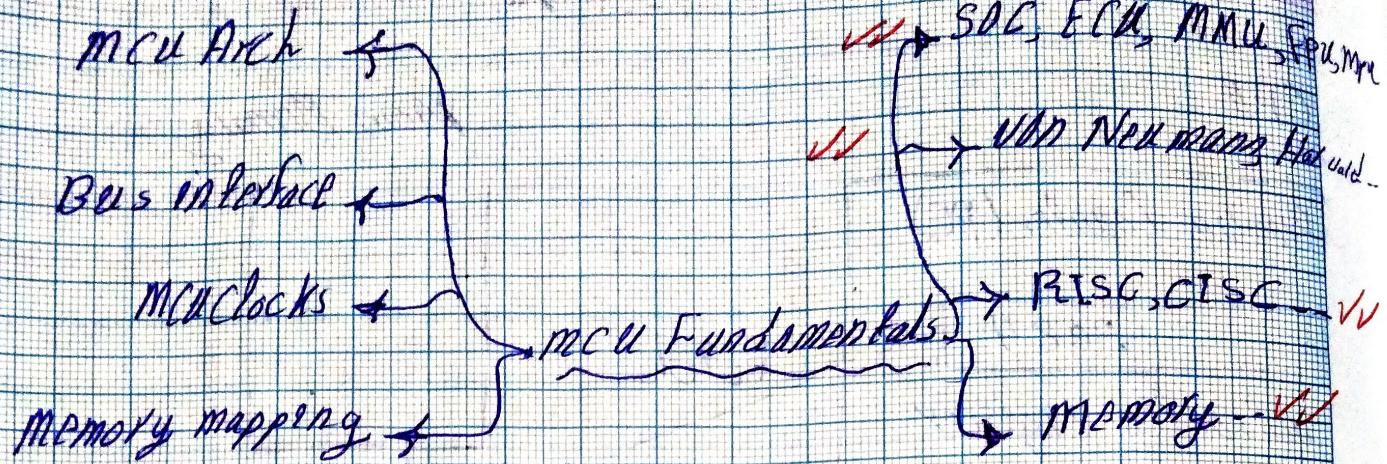


UNIT 6 LESSON 1

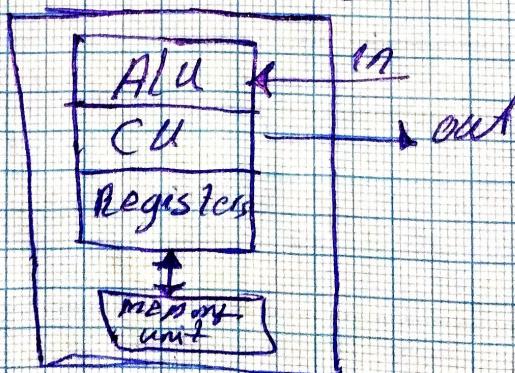


what is embedded systems...? *

is a special-purpose computer system designed to perform one or few dedicated functions....

what is microprocessor...? *

microprocessor is an integrated circuit which can perform arithmetic and logical operations.

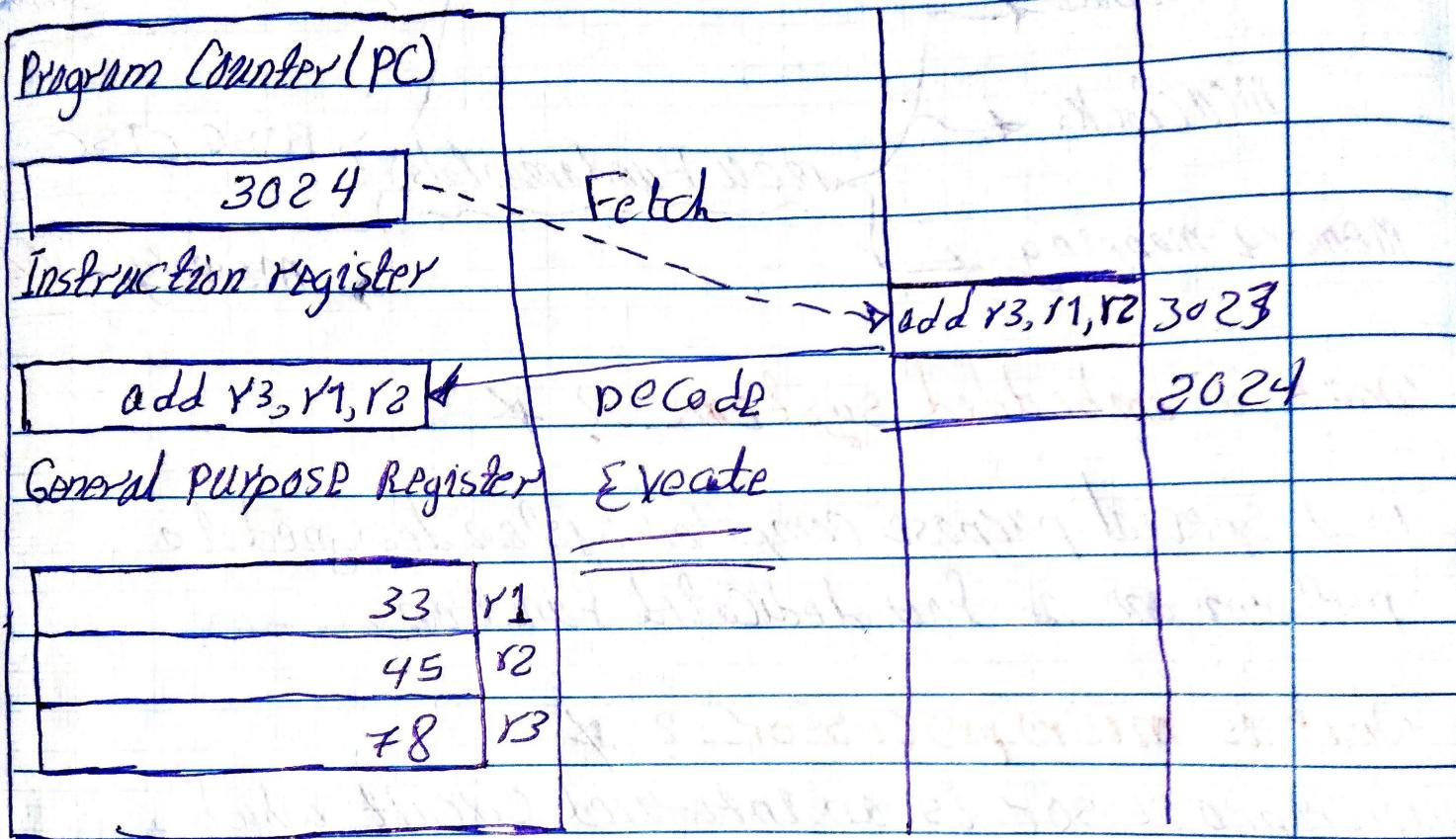


التاريخ: موضوع الدرس:

how microprocessor works?!!! *

CPU

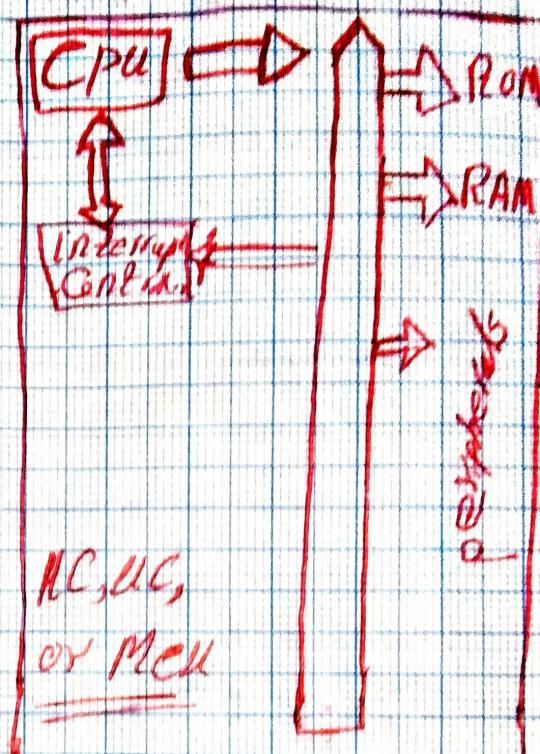
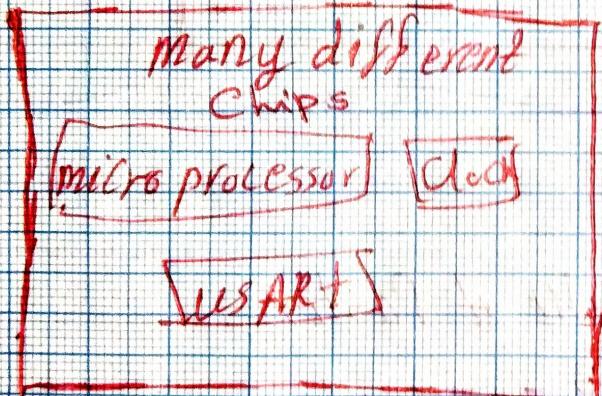
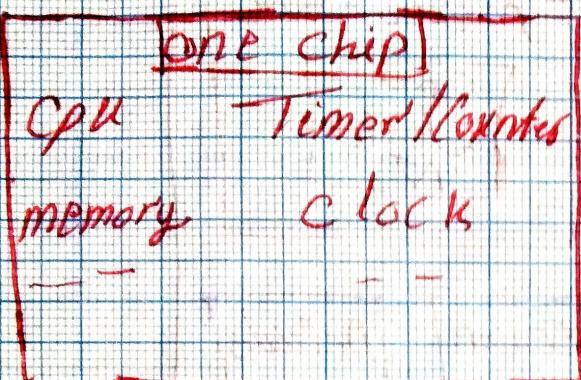
Main Memory



microcontroller

is also an IC which consists of CPU and other components like RAM, ROM, GPIO-----

Note it can be only on one chip like that



Difference between SOC and MCU

SOC

SOC → is high performance micro controller.

موضع الدرس: التاريخ:

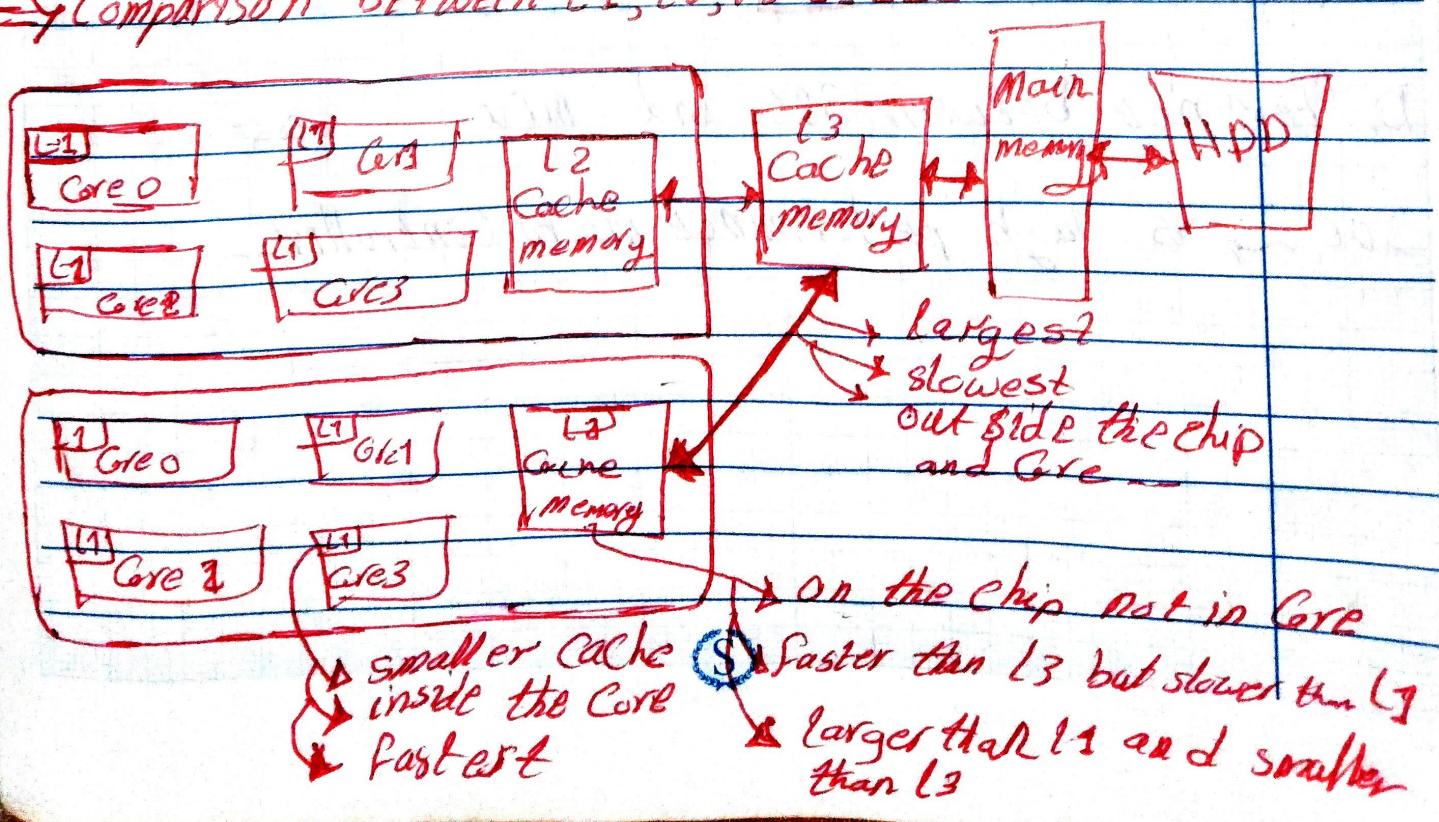
what is ECU ??

is any embedded system in automotive electronics
that Controls one or more of the electrical systems



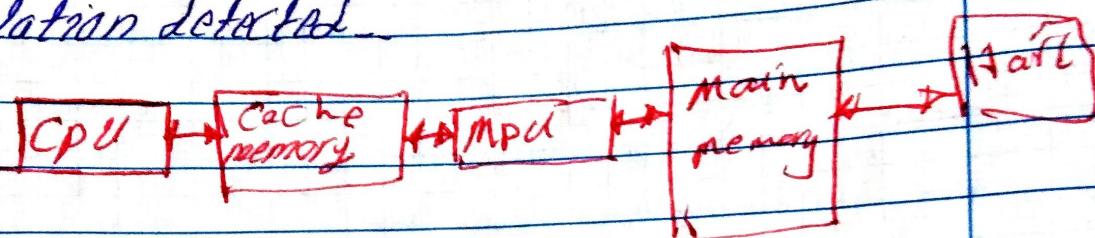
what's Cache memory ?!

Memory placed at CPU to make it Faster
⇒ Comparison between L1, L2, L3



memory protection unit (MPU)

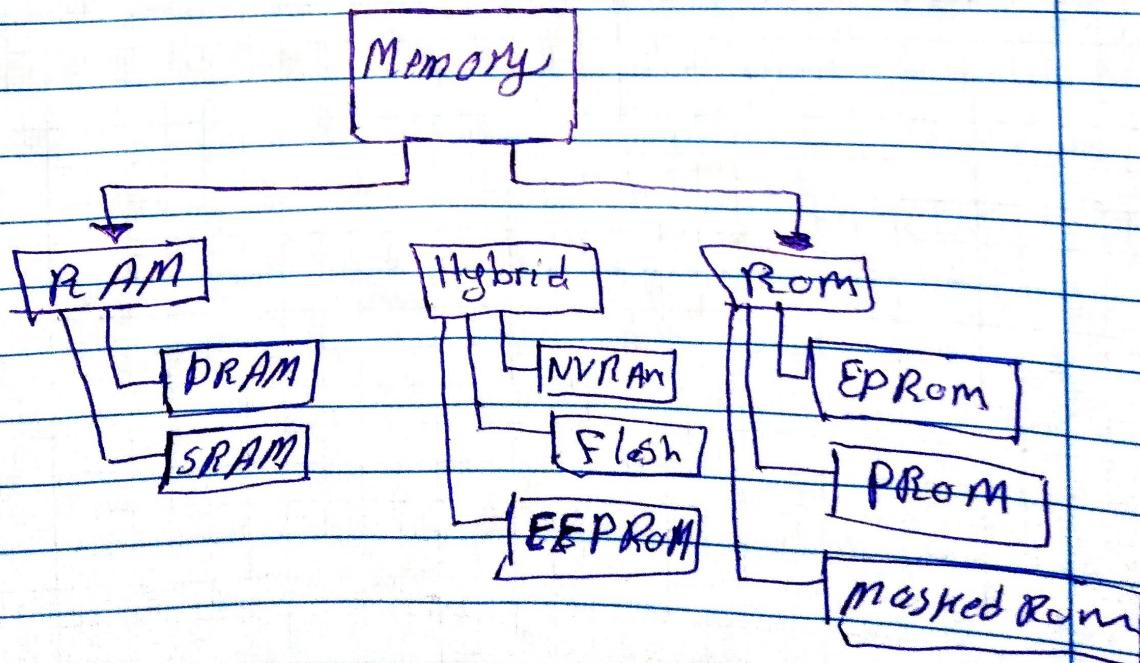
- define regions in the memory and to assign access permissions to those regions
- MPU monitors transactions between the CPU and memory, raises a fault exception error if access violation detected



MPU → translate the virtual addresses to physical addresses

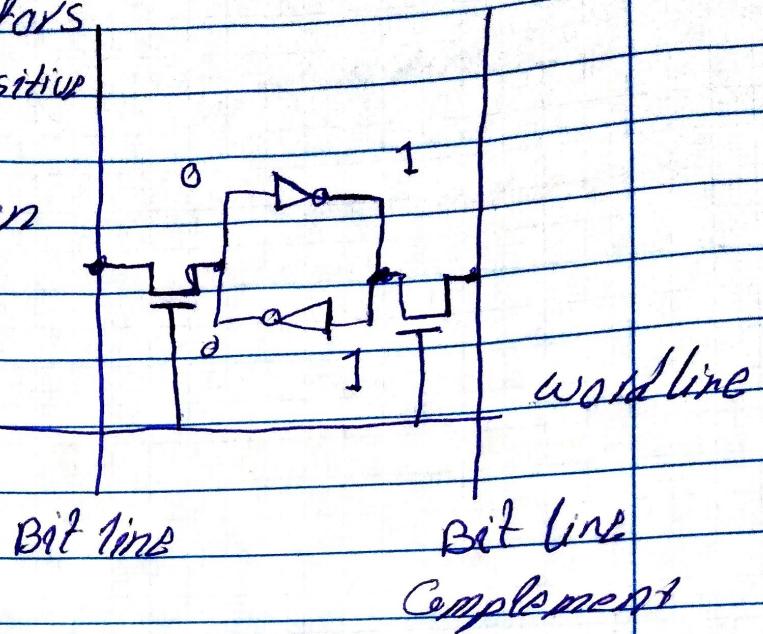
يقوم بتحويل adres ال�وري إلى physical address

Memory



what's an SRAM??!! ✘

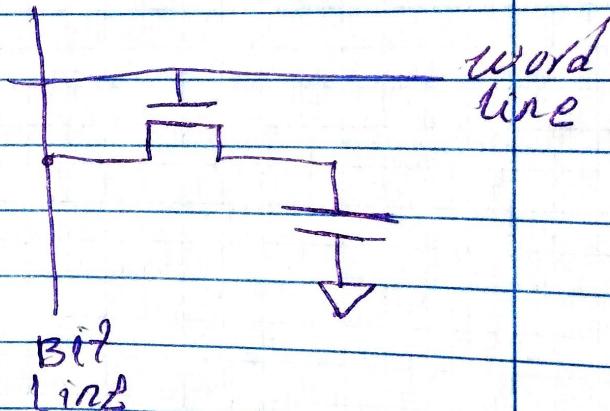
- ⇒ consists of 6 transistors
- ⇒ used to create speed sensitive cache
- ⇒ higher power consumption than DRAM
- ⇒ Complex design



what is an DRAM??!! ✘

- ⇒ Only we need a capacitor and one transistor

⇒ there's a leakage between ~~between~~ substrate and drain of mosfet so that we need to recharge this memory to retain their memory value



ROM (Read only Memory)

why Rom is read only however you can write on it?
→ read only because you can't write on it by CPU
→ however you can write on it with another devices

ROM types:-

MASKED ROM:-

- (1) It's not a user programmable ROM
- (2) Its contents are only programmed by manufacturer

PROM :-

- (1) It can be programmed only once

→ one time programming

MASKED ROM: programmed by the company at once

PROM: programmed by the user at once

- (3) EPROM : It can be programmed ~~at~~ many times
But to remove its data you need to use Ultra violet -

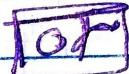
HYBRID

- ▶ Combination of RAM and ROM
- ▶ you can read or write from it as well as
it's non volatile -
types \rightarrow EEPROM

non volatile Erasable - Can be connected to SPI, I²C, ...

Flash memory is the most recent advancement
 \rightarrow electrically reprogrammable.

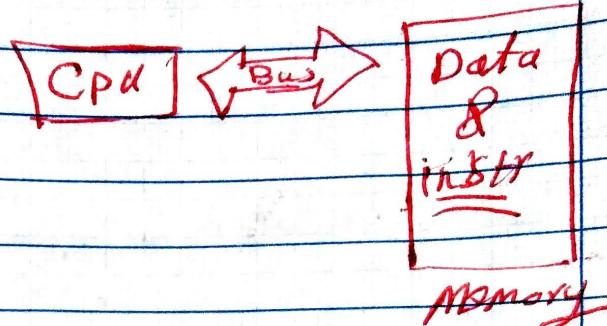
\Rightarrow NVRAM:- SRAM with backup battery



SRAM and EEPROM so that
 \rightarrow SRAM copies its content to EEPROM
when the power is off.

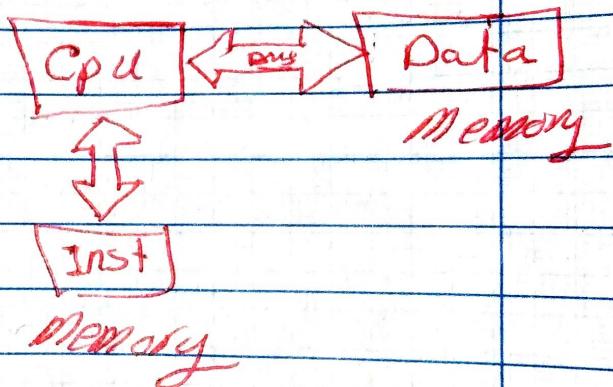
von-Neumann architecture:-

- the same memory and bus are used to store both data and instructions
- CPU can't access ~~mem~~ data memory and program memory at the same time
- the operation will enter unit state if the bus is not free.



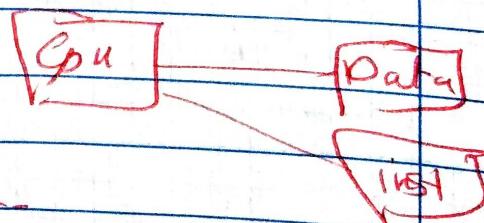
Harvard architecture

- Stores machine and data in separate memory using two different buses.



modified harvard

- NO physical separation between the memory spaces used by both data and instruction.



CISC VS RISC

CISC

- ⇒ Has more Complex hardware
- ⇒ Multiple machine Cycles per instruction
- ⇒ Can't support pipelining --

RISC

- ⇒ Has simpler hardware
- ⇒ Single machine cycle per instruction
- ⇒ Support pipelining --

Type	volatile	writable	Erase size	max size erase	Cost	Time
SRAM	✓	✓	Byte	unlimited	High	Fast
DRAM	✓	✓	Byte	unlimited	No Ram	Normal
Mosited Rom	X	X	-	-	-	Fast
Prom	X	X	-	-	-	Fast
EPROM	X	✓	chip	in data sheet	-	Fast
EPPROM	X	✓	Byte	in data sheet	-	Fast
Flash	X	✓	Sector	data sheet	-	Fast
NVRAM	X	✓	Byte	unlimited	High	Fast