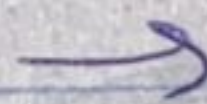


Assignment 1]

Q1]

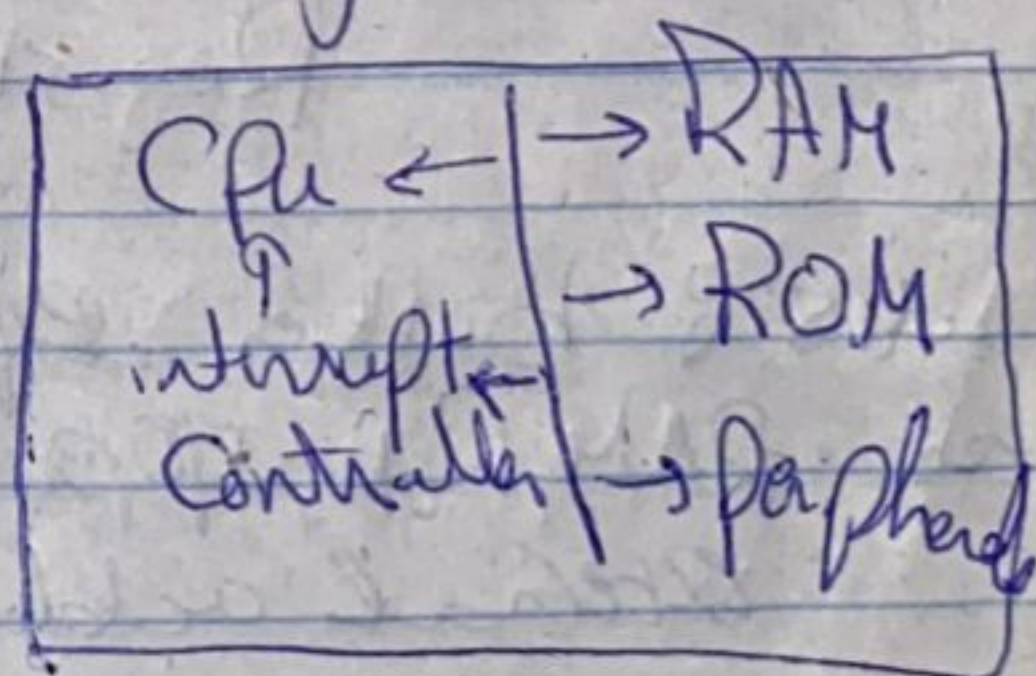
→ Microprocessor : General Purpose Processor which contain ALU for arithmetic & logical operations, Control unit for decoding opcodes, Registers (General purpose 32 ~~bits~~ Registers) can also include cache Memory / FPU / MMU.

Mpu



→ Micro Controller : Specific Purpose chip includes Cpu, interrupt Controller, RAM & ROM, Peripherals → I/O Ports to control embedded Systems.

MCu



→ Embedded Systems : Electrical / electromechanical Systems where it's controlled by special Purpose Computer inside it.

→ Mechatronic System : System where mechanical hardware is driven by Embedded Systems.

→ n bit processor: Processor works on n bit of data at a time if it's more than n-bit, data is broken into n bit pieces.

Q2] Microprocessor	Microcontroller
→ General Purpose chip	→ Special purpose chip
includes ALU, CU, CN, Registers	includes the MPU + I/O ports, RAM, ROM
dis : bulkier & expensive RAM, ROM, I/O ports are external addition	dis → designer can't add anything externally to fit more advanced tasks
adv : System → versatile, designer can add ROM/RAM timers I/O ports to fit the task as he please.	adv : for apps which cost & size (space) is critical, MCU is suitable.

Q3

Von Neuman Arc.

Harvard Arc.

→ 1 whole memory for both instructions & data

→ Separate memory for each data, instruction

→ 1 bus for data & instructions

→ 2 separate buses → 1 for RAM, 1 for ROM

→ no pipelining, used for our computers

→ Pipelining: used for smaller devices

Q4] ROM types: [Read only Memory]

→ PROM: Programmable ROM, user burns info into, not erasable, programmable once, each bit → fuse burnt when it's programmed

→ Mask ROM: the IC Manufacturer burns info into it once, cheapest, can't be erased or overwritten

→ EPROM: ~~er~~erasable PROM, can be erased only outside the board by ultraviolet, erased whole chip at once

Hybrid:

→ EEPROM: electrically EPROM, can be erased electrically on the board, erasing only byte not whole chip, costs more than EPROM.

→ Flash: electrically erasable, erasing block not byte or whole chip, it's programmed on system board.

→ NVRAM: non-volatile RAM. Can be read & written, like SRAM, has a backup energy source, where if power's out, the contents aren't lost due to lithium battery.

Q5] RAM types: [Random access Memory]

→ SRAM: Static RAM: for each bit there's 6 transistors so it's expensive, don't require refreshing → fast, less capacity than DRAM.

→ DRAM: dynamic RAM: cheaper than SRAM as it requires 1 transistor + 1 capacitor, due to charge leakage, it needs refreshing & it can't be read during refreshing so it's slower, more power consumption, capacity.

Q6] CPU can't write on ~~RAM~~ ROM unless there's special configurations or external device writes on it.

Q7]

* Type	* Volatile	* Writable	* Erase size	* Max Erase cycle	* Cost	* Speed
SRAM	Yes	yes	byte	unlimited	Expensive	fast
DRAM	Yes	yes	byte	unlimited	moderate	moderate
NVRAM	no	yes	byte	unlimited	expensive	fast
Flash	no	yes	block	limited	moderate	fast to read
PROM	no	once by user	none	none	moderate	fast
Mask ROM	no	no	none	none	cheap	fast
EPROM	no	yes by device programmer	whole chip	limited	moderate	fast
EEPROM	no	yes	byte	unlimited limited	expensive	fast to read