

① list out the semiconductor products & its corresponding companies:-

* Products: Microprocessors

Cpus for desktop's, laptop, servers & mobile phones

company:- Intel, AMD, ARM, Qualcomm, Apple, NVIDIA.

• product: memory (DRAM, NAND flash memory)

company:- Samsung, Micron technology, Toshiba, western digital logic chips.

• product: Microcontroller, FPGAs, RF chips, Cpus

company:- TSMC, Samsung foundry, Intel, AMD, Analog Semiconductors

• product: Amplifier, semiconductors, converters, voltage regulators, power management ICs

company:- TI, Analog device, Maxim Integrated products discrete

Sensors:-

• products: Imagesensors, temperature sensors, accelerometers, gyroscopes.

company:- Sony, Samsung, Bosch, NXP, ST microelectronics

• products: power electronics involve MOSFETs, IGBTs, power module, inverters, converters

company:- Infineon, Technologies, ON semiconductors

• Products: RF components involve RF switches, filters, Mixers, oscillators

company:- Qorvo, Skyworks, NXP, Broadcom.

• products: Optical Components: LEDs, lasers, photodetector, optical amplifiers, optical modulators
Company: Samsung, LG Innotek, Broadcom, Oram.
Products from specific companies:

• AMD: They manufacture microprocessors, produces wide range of semiconductor products including graphics cards, PCMs & logic chips.

• Intel: Intel is a leading manufacturer of microprocessors, memory, logic chips

• TSMC: TSMC is world's largest foundry manufacturer chips for other companies. It is major supplier for Apple, NVIDIA & Qualcomm.

• Bosch: Manufactures MEMS devices & sensors.

• Qualcomm: Manufactures Snapdragon processors, 5G & 4G modems, wi-fi bluetooth chips, RF transceivers

② Why there is a shift from BJT to MOSFET & MOSFET to FINFET.

Current technology nodes of

BJT = 22nm

MOSFET: 7nm

FINFET: 5nm.

As you can see there is a degradation of transistor manufacturing integrating on a chip from BJT to MOSFET & MOSFET to FINFET

→ BJT's to MOSFET's

→ power efficiency & scaling: MOSFET's gained prominence over BJT's due to their superior power efficiency & scalability. MOSFET's operate on the

principle of voltage control offering high input impedance, low power consumption of over BJT.

- MOSFET's are smaller in size & has faster switching speeds, making them suitable for high frequency applications.

- CMOS technology which became modern integrated circuits, offers low power consumption & also digital logic circuit design.

→ MOSFET's to FINFET's:-

- scaling limitations: MOSFET's were scaled down to smaller sizes, they face challenges to short-channel effects increasing leakage currents.

- finfets feature a three-dimensional fin-like structure for the channel, offering better control over the channel.

- finfets providing superior control, reduced leakage power & better scalability.

Q What are the latest laptop processors from AMD, Intel & Apple: frequency & node?

A AMD:-

- AMD Ryzen 9 7900 series

Q AMD Ryzen 9 7950X3D

clock frequency: 4.2GHz (Base clock)

Technology node: TSMC 5nm FINFET

max. clock frequency: upto 5.7GHz

Q AMD Ryzen 9 7945HX3D:-

Base clock: 3.7GHz

Max. Boost clock: upto 5.4GHz

Technology node: TSMC 5nm finfet.

Intel:-

Intel Core 14th generation
frequency: up to 6.0 GHz
processor family: Meteor Lake

Technology node: 5nm process node

Apple:-

① M1 Pro & M1 Max:-

M1 Pro:-

frequency: up to 3.49 GHz

Technology node = 5nm

M1 Max:-

frequency: up to 3.54 GHz

Technology node = 5nm

② What are the different job roles available in VLSI fields.

- RTL design engineer

- Verification Engineer

- DFT engineer

- STA engineer

- physical design engineer

- layout engineer

- Analog design engineer

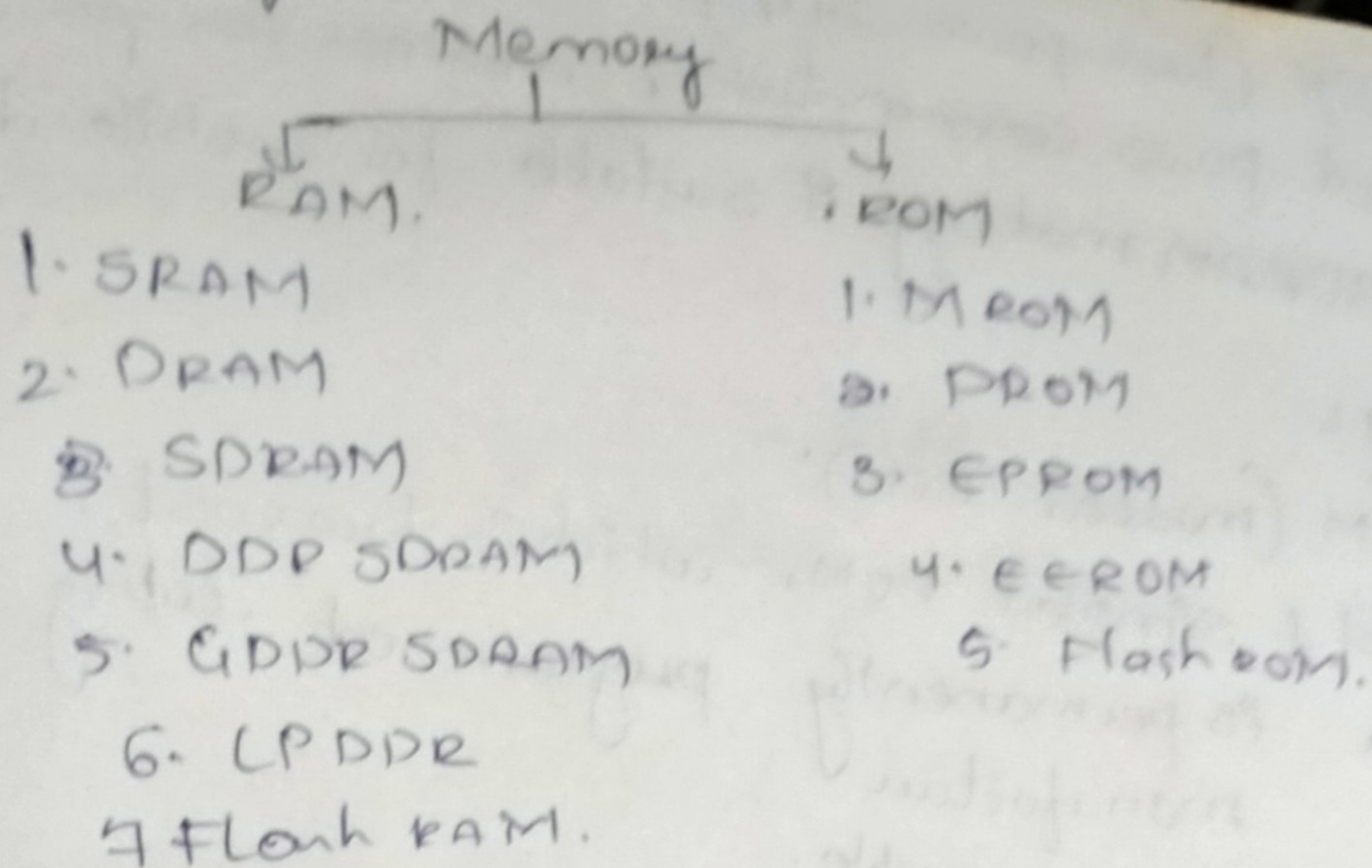
- Digital design engineer

- IP design engineer

- SoC Architect

- FPGA design engineer

⑤ Evolution of memories.



RAM:-

1. SRAM (Static RAM)

- offers the fastest access times of all RAM types.
- volatile: loses data when power is lost.
- More expensive

2. DRAM (Dynamic RAM).

- slower than SRAM, used for general purpose applications.
- volatile
- less expensive

3. SDRAM (Synchronous RAM).

- Synchronous its operation with the system clock, enhanced data transfer than DRAM.
- widely used.

4. DDR SDRAM (Double Data Rate SDRAM):

- Improved performance, transfer data on both rising and falling edges of the clock signal.
- * Multiple generations each offering different specifications.

⑤ GDDR SDRAM (Graphics Double Data Rate SDRAM)

- Optimised for graphics
- faster than standard DDR.

- ⑥ LPDDR (low-power DDR)
Reduced power consumption; consumes less power standard
DDR, SDRAM making it suitable for mobile devices

→ ROM:-

① MROM (masked ROM):

- oldest & simplest ROM, which is low cost
- Data is permanently programmed during the chip manufacture.
- Not reprogrammable.

② PROM (programmable ROM):-

- Data can be programmed once using a special device called a PROM programmer.
- less flexible, used in applications where the data is unlikely to change.

③ EPROM (erasable programmable ROM):-

- Data can be erased using ultraviolet light & then reprogrammed.

④ EEPROM (Electrically Erasable programmable ROM)

- Data can be erased & reprogrammed electronically.
- Most versatile type of ROM.

⑤ Flash ROM:-

- A type of EEPROM,
- widely used in USB flash drives: ssd's (solid state devices) & other storage devices
- offers high density, high speed & low power consumption

6) What are latest mobile processors available from Qualcomm & Mediatek: frequency & node.

A Qualcomm:-

- Snapdragon 8 Gen 3

clock speed (frequency): 3.3GHz.

process node & technology = 4nm.

- Snapdragon 8 Gen 2:

clock speed: 3.36GHz

process node: 4nm

Mediatek:

- Mediatek Dimensity 9300

→ clock speed: 4x Arm Cortex-X4 at 3.25GHz

; 4x Arm cortex - A720 upto 2.0GHz

Process node: 3rd gen TSMC 4nm chip.

- Mediatek Dimensity 9200+

→ clock speed: 1x Arm cortex-X2 at 3.35GHz.

3x Arm cortex - A715 upto 3.0GHz.

4x Arm cortex - A510 upto 2.0GHz

→ process node: 4nm TSMC chip.