

Task-2:

① List out the semiconductors products and its corresponding companies:

• products: Microprocessors

cpus for desktop's, laptops, servers and 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: microcontrollers, FPGAs, RF chips, CPUs.

Company: TSMC, Samsung Foundry, Intel, AMD, Analog Semiconductors.

• Product: Amplifiers, Semiconductors, converters, voltage regulators, power management IC's.

Company: TI, Analog devices, Maxim Integrated products discrete sc.

• Product: Power semiconductors, diodes, transistors, resistors, capacitors, inductors.

Company:- Infineon technologies, Vishay Intertechnology, STMicroelectronics.

- Products: Sensors: Image sensors, temperature sensors, accelerometers, gyroscopes.

Company:- Sony, Samsung, Bosch, NXP, STMicroelectronics

- Products: Power electronics involve MOSFETs, IGBTs, Power modules, inverters, converters,

Company :- Infineon Technologies, ON semiconductors, Fuji electrics.

- Products: RF components involves RF switches, filters, mixers, oscillators.

Company: Qorvo, skyworks, NXP, Broadcom.

- Products: Optical components: LED's, lasers, photodetectors, optical amplifiers, optical modulators.

Company: Samsung, LG innotek, Broadcom, OSRAM.

Products from specific companies:

- AMD :- They manufacture microprocessors. Produces wide range of semiconductor products including graphic cards, FPGAs and logic chips.
- Intel :- Intel is a leading manufacturer of microprocessors, memory, logic chips.

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

BOSCH :- Manufactures MEMS devices & sensors.

Qualcomm :- Manufactures Snapdragon processors, 5G and 4G modems, Wi-Fi Bluetooth chips, RF transceivers.

Q2 Why there is a shift from BJT to MOSFET and MOSFET to FinFET?

A Current technology nodes of :-

BJT : 22 nm (most common process to manufacture)

MOSFET : 7 nm

FinFET : 5 nm

As you can see there is a degradation of transistors

manufacturing (integrating) in a chip from BJT to MOSFET and

MOSFET to FinFET.

BJT's to MOSFET's :

→ Power efficiency & scaling :- MOSFET's gained

power prominence over BJT's due to their

superior power efficiency and scalability.

MOSFET's operate on the principle of voltage control,

offering high input impedance, low power consumption etc over BJT.

- MOSFET's are smaller in size and has faster switching speeds, making them suitable for high frequency application.
- CMOS technology, which became popular in integrated circuits, offers low power consumption and 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.
- Finfet's providing superior control, reduced leakage power and better scalability.

③ What are the latest laptop processors from AMD, Intel and Apple : frequency and node?

Ans: AMD:

- AMD Ryzen 9 7000 series

- ① AMD Ryzen 9 7950X3D

clock frequency: 4.2 GHz. (Base clock)

Technology node: TSMC 5nm FINFET.

Max. clock frequency : upto 5.7 GHz

② AMD Ryzen 9 7945HX3D :-

Base clock : 3.7 GHz

Max. Boost clock : upto 5.4 GHz.

Technology node : TSMC 5nm FINFET.

Intel:

① Intel Core i9 14th generation.

Frequency : upto 6.0 GHz.

Processor family : Meteor Lake.

Technology node : 5nm process node.

Apple:

① M2 Pro and M2 Max:

M2 Pro:-

Frequency : upto 3.49 GHz.

Technology node : 5nm.

M2 Max:-

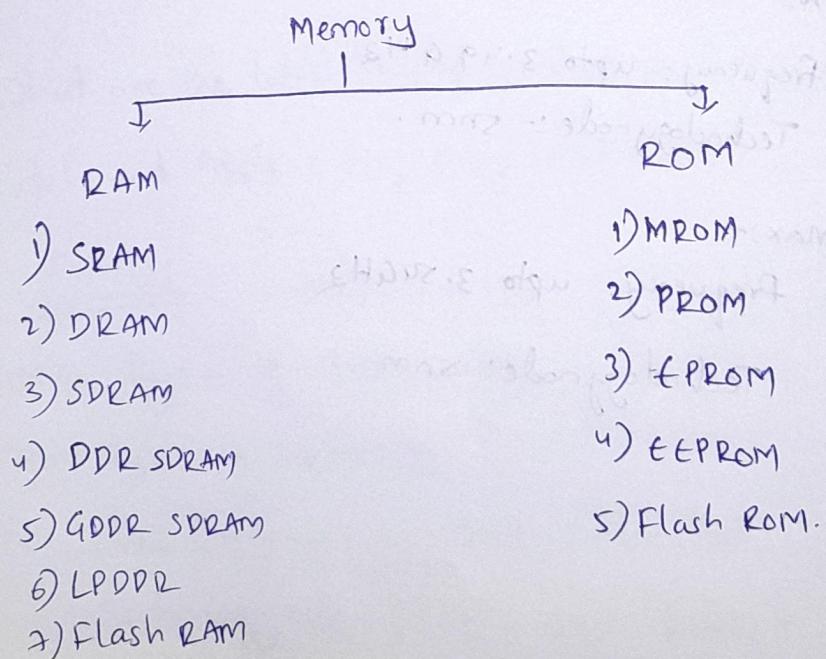
Frequency : upto 3.54 GHz.

Technology node : 5nm

(4) What are different job roles available in VLSI field.

- 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):

- synchronises its operation with the system clock, enhanced data transfers than DRAM.
- widely used.

4) DDR SDRAM (Double Data Rate SRAM):

- Improved performance transfers data on both rising & falling edges of the clock signal.
- multiple generations each offering different specifications.

5) GDDR SDRAM (Graphics Double Data Rate SRAM):

- optimised graphics

- faster than standard DDR.

6) LPDDR (Low-power DDR):

- Reduced power consumption, consumes less power than standard DDR SDRAM, making it suitable for mobile devices.

ROM:

① MROM (Masked ROM):

- oldest and 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 EEPROM (Erasable Programmable ROM):

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

④ EEPROM (Electrically Erasable Programmable ROM):

- Data can be erased and reprogrammed electronically.
- most versatile type of ROM.

⑤ Flash ROM:

- A type of EEPROM.
- widely used in USB flash drives, SSD's (Solid state drives) and other storage devices.
- offers high density, high speed and low power consumption.

⑥ What are latest mobile processors available from Qualcomm and MediaTek : Frequency and node.

Ans: Qualcomm:

- Snapdragon 8 Gen 3

Clock speed (frequency) : 3.3GHz

Process node and 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-X3 at 3.25GHz

3x Arm Cortex-A715 upto 3.0GHz

4x Arm Cortex-A510 upto 2.0GHz.

→ Process node : 4nm TSMC chip.