i) List out the semiconductor products and its corresponding companies.

Ans

| Company | Product |
|---|---|
| i) TSMC (Taiwan Semiconductor manufacturing Company) | Service for manufacturing semiconductor |
| ii) NVIDIA Corporation | GPUs, Processors, AI and Deep Learning hardware |
| iii) Advanced Micro Devices (AMD) | CPU, GPUs, SOC |
| iv) Intel Corporation | microprocessor, SSD, FPGA, Graphics software |
| v) Qualcomm Incorporated | Mobile processor, GPUs, Modem, |
| vi) Samsung Electronics | Memory (DRAM, Flash) Processors, Image Sensors |
| vii) Texas Instruments | Analog IC, DSP, microcontroller |

2) What are the latest laptop processors from AMD, Intel and Apple: Frequency and node

Ans :

i) Intel
               i9-14900K or i9 $14^{th}$ gen

             Clock Speed :- upto 6.0 GHz

             Process node :- 10 nm or Intel 7

ii) AMD
              Ryzen 9 7950x3D

             Clock speed : upto 5.7 GHZ

             Process node : 5 mm

iii) Apple
              M3 Max
             Clock speed :- upto 4.05 GHZ
             Process node :- 3nm

3) What are the latest mobile processors available from Qualcomm and mediatek : Frequency and node

Ans   Qualcomm :     Snapdragon Gen 3

                    clock Speed :- 3-3 GHz

                    Process node :- 4nm

      Mediatek :-       Dimensity 9300
                    Clock Speed :- 3.25 GHz
                    Process node :- 4nm

4) What are the different job rules available in VLSI field.

Ans i) VLSI Design Engineer

ii) Verification Engineer

iii) Physical Design Engineer

iv) ASIC Design Engineer

v) FPGA Design Engineer

vi) Design Automation Engineer

Vii) Analog / Mixed Signal design Engineer

Viii) CAD Engineer

iX) SOC Architect

x) RF Design Engineer

5) Why there is a shift from BJT - MOSFET - FINFET in detail.

Ans Reasons why there was a shift from BJT to MOSFET:.

i) Power Efficiency :- MOSFETs consume less power compared to BJTs because they have a very high input impedance and draw negligible input current when in a static state

ii) Miniature MOSFETs allow for easier miniaturization of devices due to their simpler structure and compatibility with IC fabrication processes.

iii) CMOS Technology :- CMOS technology, which uses MOSFETs, became popular for its low power consumption, making it a standard choice for digital IC.

Reasons for shift from MOSFET to FINFET.

i) Leakage Current :- As transistor sizes decreased, leakage current became significant concern in MOSFETs. FinFETs with their 3D structure help this issue by providing better control over current.

ii) Scaling and Performance :- FinFET enables better scaling of transistor dimensions, allowing for the continuation of Moore's law. It provides better performance and energy efficiency.

iii) Subthreshold Slope :- FinFETs exhibit better subthreshold slope characteristics, which means they can switch between on and off states more effectively reducing power consumption during switching

6) Evolution of memory technology

Ans    1) Vacuum Tubes and Delay lines:
          • Early computers used vacuum tubes memory
             storage. There were large, power-hungry, and
             had limited capacity.
          • Delay lines were also used involving delay of
             acoutic waves through a medium to represent
             binary data.

       2) Magnetic core memory
          • Introduced in 1950s, it used small magnetized
             rings to store bits, providing faster and more
             reliable data storage.

       3) DRAM (Dynamic Random Access Memory)
          • Introduced in 1960s, DRAM relies on the charge
             stored in capacitors to represent bits. Its widely
             used due to its higher density compared to other.

       4) SRAM (static RAM)
          • SRAM, introduced around same time as DRAM
             uses flip flops to store bits. It is faster
             than DRAM but costlier and lower density.

5) Flash Memory or NAND memory

 • Flash memory ; introduced in 1980s, revolutionizes non-vollatile storage . It is used in USB drives , memory cards and SSDs . Flash memory stores data in floating gate transistors.

6) SDRAM ( Synchronous Dynamic RAM )

 • SDRAM introduced in 1990s , synchronized memory operations with clock speed of CPU providing faster data rates compared to DRAM.

7) DDR ( Double Data Rate ) SDRAM

 DDR SDRAM , starting with DDR in early 2000s , improved data transfer rates by transferring data on both rising and falling edges of clock -

8) 3D NAND Flash

 3D NAND introduced in 2010s stacked memory cells vertically increasing storage density and overcoming some limitations of Flash NAND .