

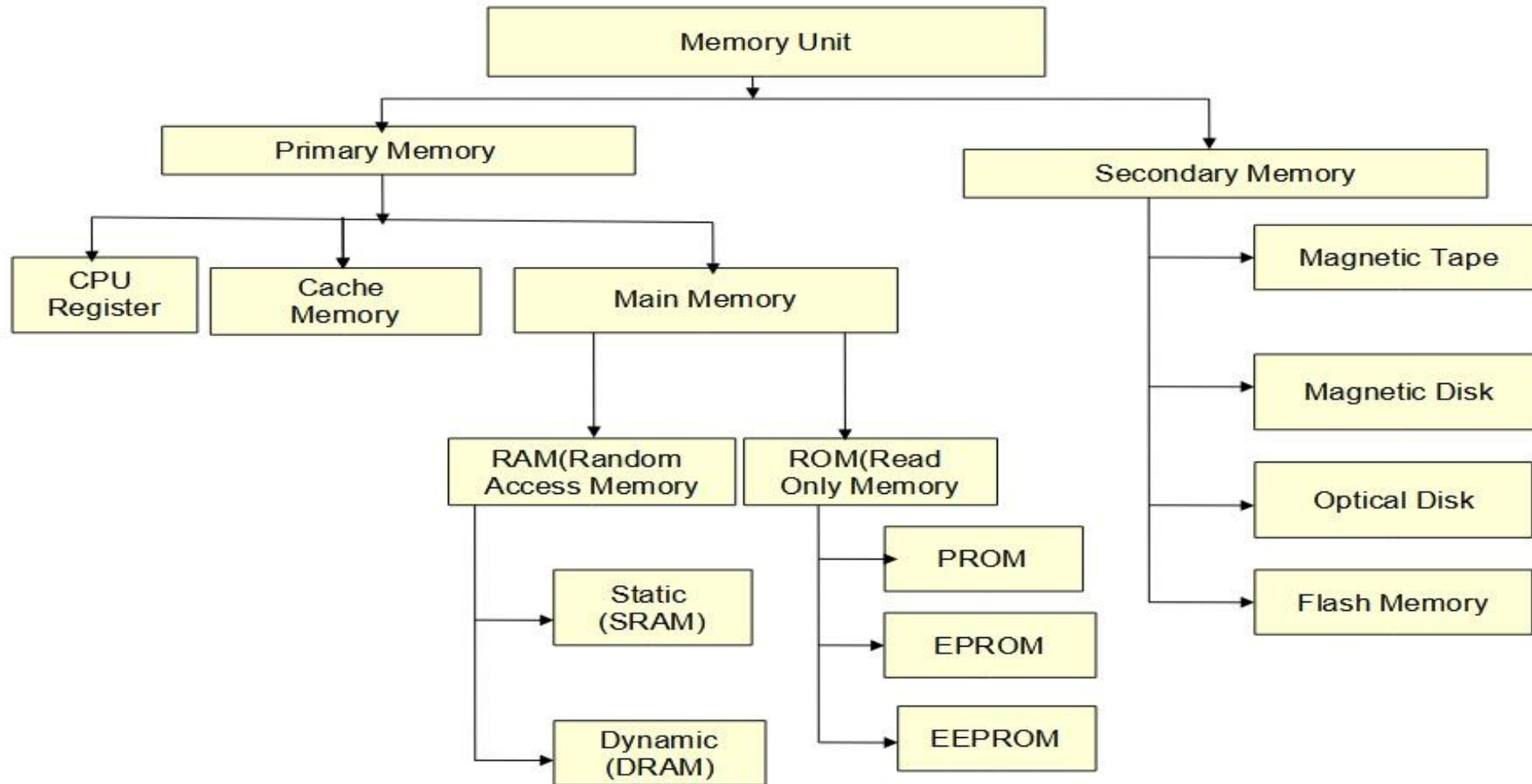
ASSIGNMENT 1

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1) Why there is a shift from BJT to MOSFET to FinFET ?

- ❖ As there are plenty of opportunity are available at nanoscale and the futuristic technological advancement will fully prominent by nano electronic devices. There are still lots of challenges with the low dimension devices. Now a major question is how can we go smaller and faster and still well.
- ❖ A transistor is a three-terminal device. There are the different types of the transistor has been developed till now .A most common transistor is bipolar junction transistor(BJT).To overcome the shortcoming of the bit scientist has introduced the other transistors like FET, mosfet, FinFET etc.
- ❖ The down scaled FETs geometry is continuously evolving from planar MOSFET to non planar FinFET to gate-all-around(GAA) nanowire and stacked nanosheet FET (NS-FET).
- ❖ Further scaling of MOSFETs faces challenges regarding device performance due to several short-channel effects.
- ❖ FinFET technology used in state-of-the-art devices faces great challenges when scaling down beyond the 7-nm technology node, primarily due to threshold voltage roll of, drain-induced barrier lowering (DIBL), and SS degradation. In short-channel MOS transistors, the decrease of the threshold voltage and resulting sub threshold current variation at higher drain voltage is known as DIBL. DIBL is a very important short-channel effect, being a foremost reason for the large slope of the saturation drain current versus the drain voltage in the weak inversion region. Similarly, the SS of a MOS transistor can be evaluated by letting the oxide capacitance go to infinity.
- ❖ As scaling approaches more than one physical limit and as new device structures and new materials are presented. So, FinFET transistor has been offered to prevent the issues because of downscaling of MOSFET dimension reduce the short channel effects like DIBL sub threshold conduction, punch through, hot electrons etc

2) Evolution of Memory Technology



3) Different job roles available in VLSI Domain

❖ VLSI is mainly divided into two parts as

1. Frontend Design

2. Backend Design

❖ There are specific job roles in front end design and back end design and are listed below .

- RTL Design
- ASIC/SOC/IP Verification
- RTL Integration
- CPU/Processor Verification
- Pre Silicon Validation/Verification

❖ Back end VLSI design engineers.

- STA/Synthesis Engineer
- Physical Design Engineer
- Physical Verification
- Memory Characterization
- DFT Engineer
- Post Silicon Validation
- Emulation Engineer

❖ There is also a separate set of job Skills needed for Analog Design and Analog layout engineers .

- Analog Layout
- Analog Design

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

❖ AMD Ryzen 7000 Series

- Created on leading 5nm manufacturing technology
- These processors maximum clock speed upto 5.7 GHz.

❖ Intel Core i9-14900K

- Created on leading 10nm manufacturing technology.
- These processors maximum clock speed upto 6 GHz.

❖ Apple Macs With M1 Chip

- Created on leading 5nm manufacturing technology.
- These processors maximum clock speed upto 3.8 GHz.

5) What are the latest mobile processors available from Qualcomm and Mediatek

❖ Qualcomm

- Snapdragon 8 Series Mobile Platforms
- Created on leading 4nm manufacturing technology
- These processors maximum clock speed upto 3.2 GHz

❖ Mediatek (Dimensity 9300)

- Created on leading 4nm manufacturing technology
- These processors maximum clock speed upto 3.05 GHz

6) Semi conductor products and its corresponding companies.

❖ CPU Processor - Intel, AMD, Qualcomm, Apple.

❖ Integrated circuit manufacturing service – TSMC, Texas Instruments, Analog Devices, STMicroelectronics.

❖ Wireless semiconductor supplier - Qualcomm, Broadcom, Skyworks Solutions.

❖ DRAM maker – SK Hynix, Samsung, Micron.

❖ DRAM, NAND flash memory and CMOS image sensors – Micron

❖ Analog Semiconductors - Analog Devices, Texas Instruments.

❖ Graphics Processing Units - NVIDIA, AMD.

❖ Sensors and Microcontrollers - NXP