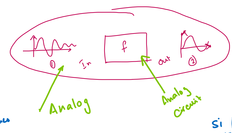
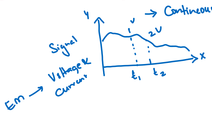
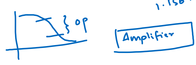
1. Why do we need circuits?
→ manipulate signals
→ Process
→ Transform



Light ← EM
Sounds ← Vib
Signal < Value / time

2. What is Analog?





Analog Components
Materials

3. Limitations of Analog
→ Difficulty in processing
→ Storing analog is challenging
→ Noise
→ Size of the circuit
→ power

? process better
? store better
? perform better
? save space
? save power

Convenient

4. Digital Domain
→ Domain
→ Representation

→ Sampling = pick values at regular instances (time)

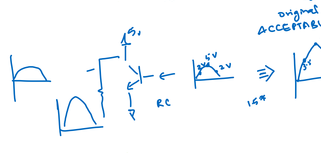
→ Nyquist Criterion (freq)

$f_s \geq 2 f_{sig}$

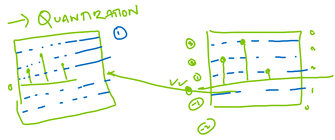
f_{sig} signal freq

f_s 10 samples 30Hz

After sampling, you should be able to reproduce the original signal with ACCEPTABLE Accuracy

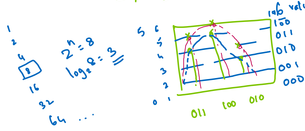


→ QUANTIZATION



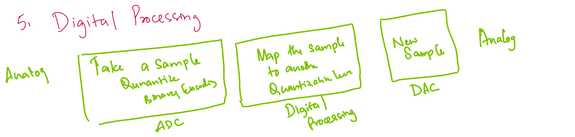
Samples are approximated to predefined levels

→ BINARY REPRESENTATION



0, 1 base Number system
bit
0101 Nibble
0011 1011 Byte
$2^n = N$
n → bit
N → Value
$2^5 = 8$
$\log_2 32$

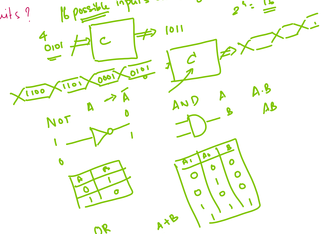
5. Digital Processing



6. How to design digital Circuits?

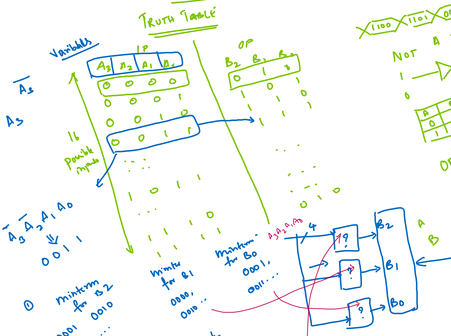
16 possible inputs at any instant

$2^4 = 16$



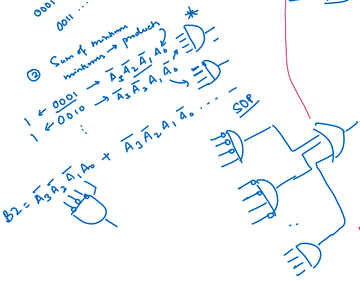
0101 → 1011

TRUTH TABLE



① minterm for B2
0001 0010
0011 ...

② Sum of minterm → product
minterm → product



① What is the feasibility of this method if the variable increase ⇒ in a larger Truth table

② Should/Could we optimize the Circuit?
On what parameters
Ex: size Why?