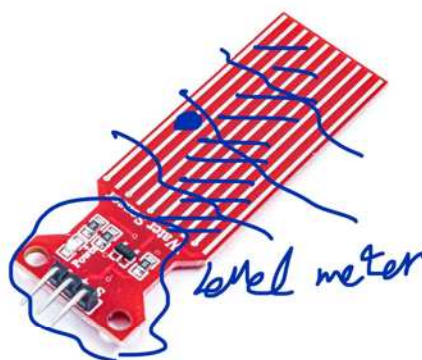
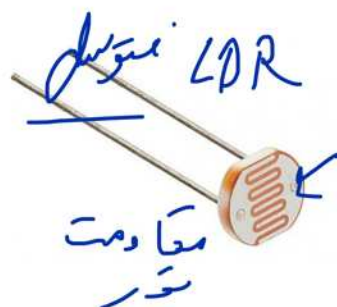
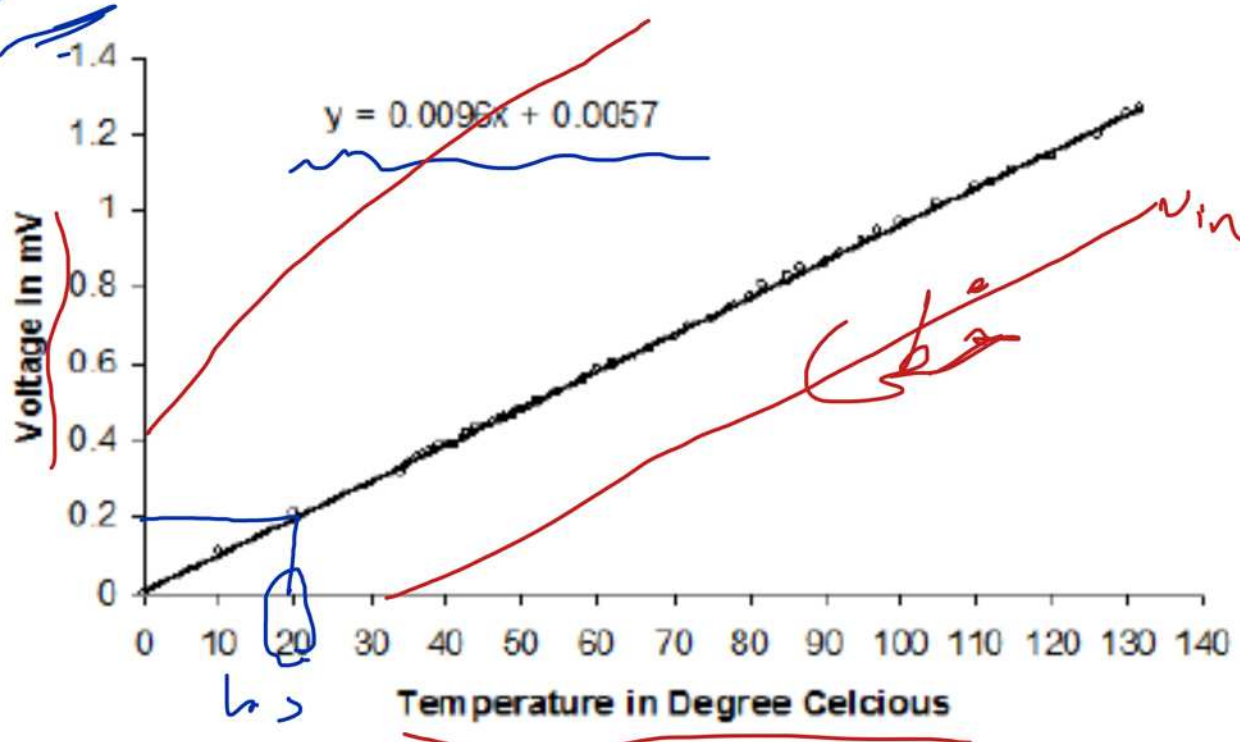


Analog Signal

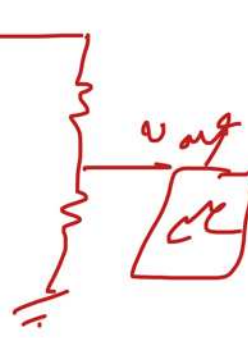


ولتاژ

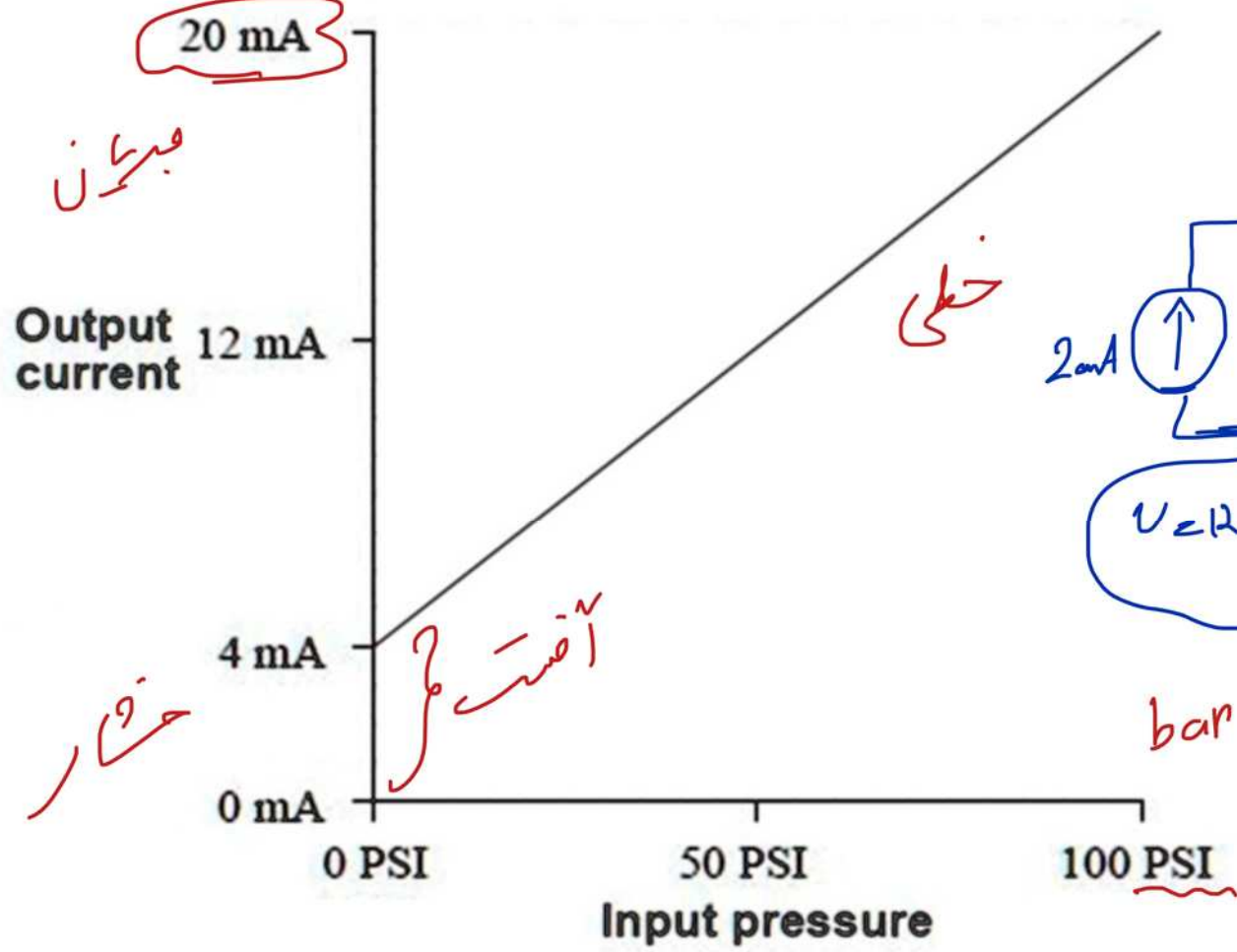
Characteristics of LM35



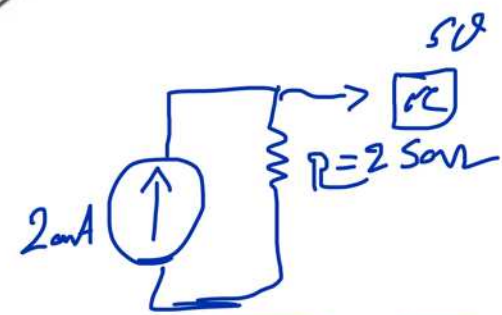
ولتاژی



فشار

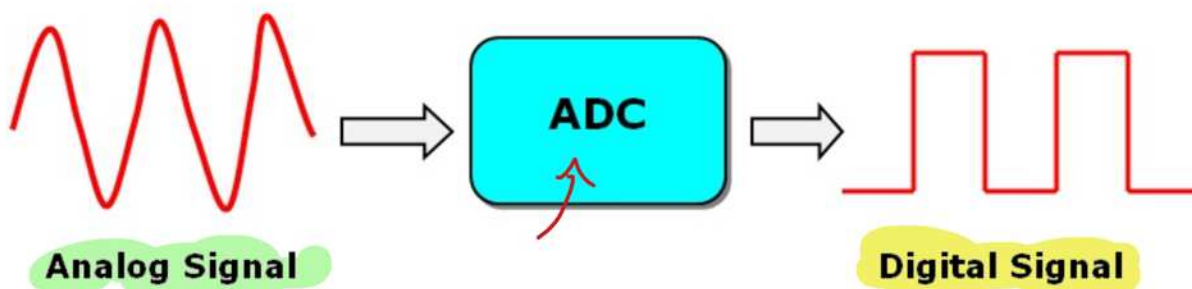
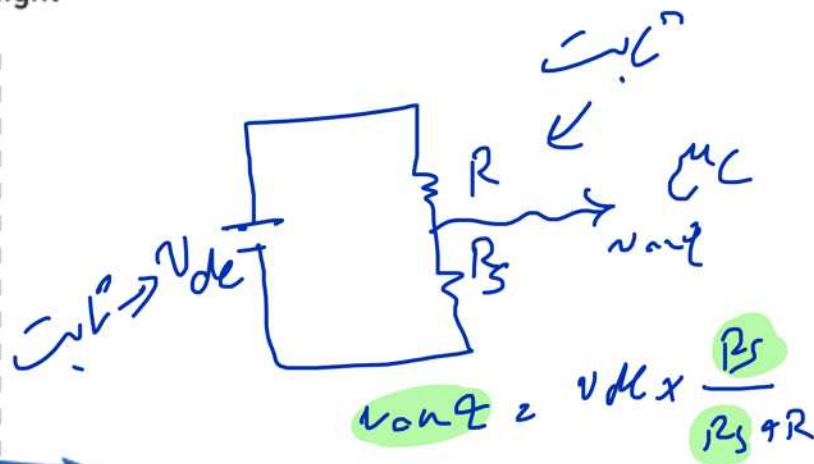
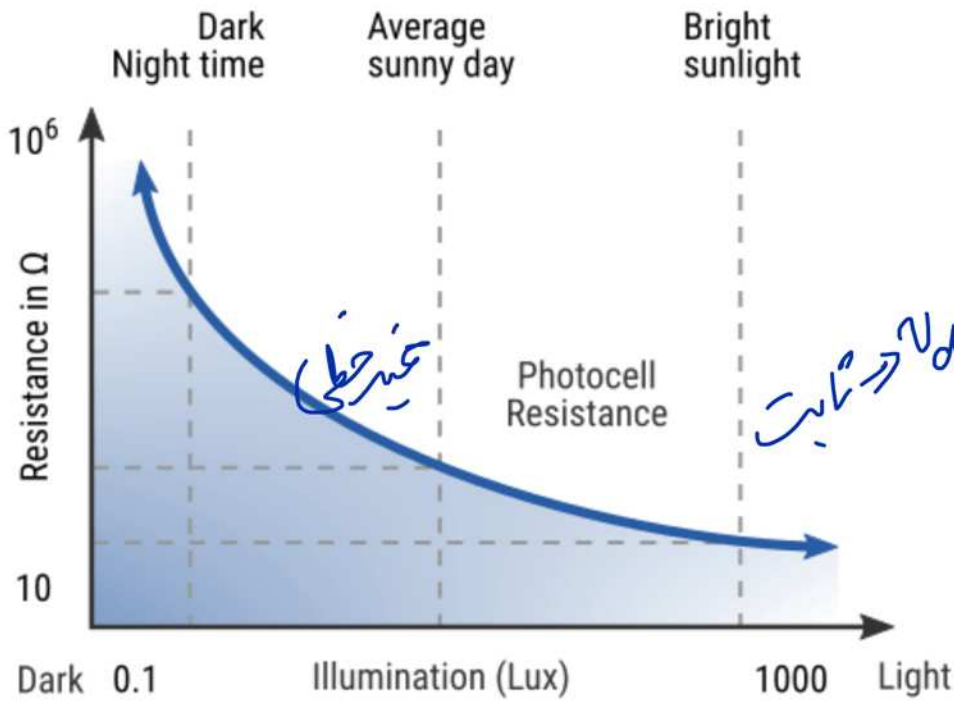
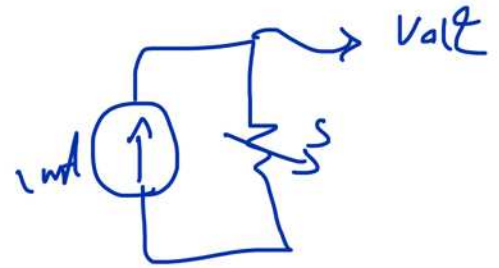
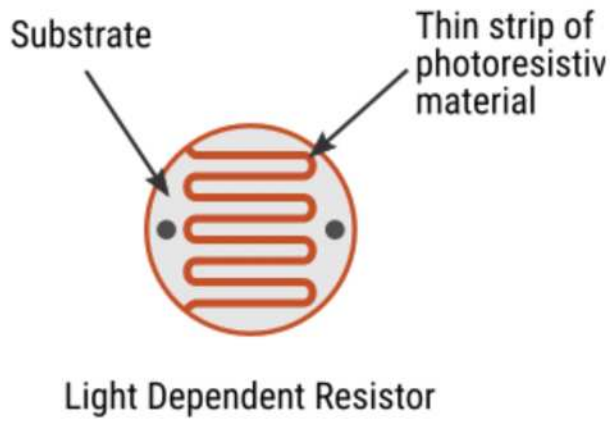
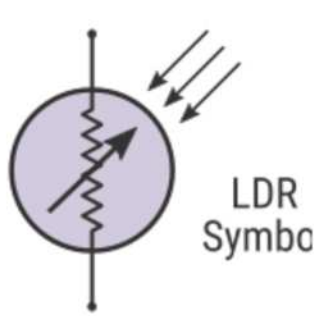


خطی

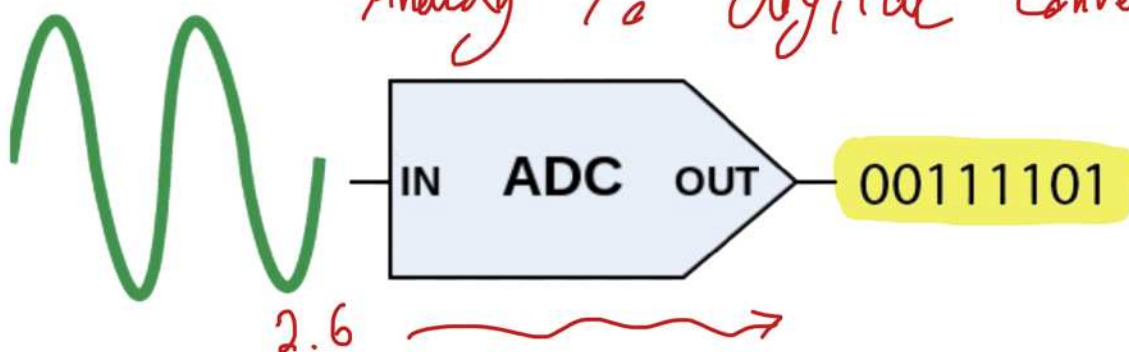


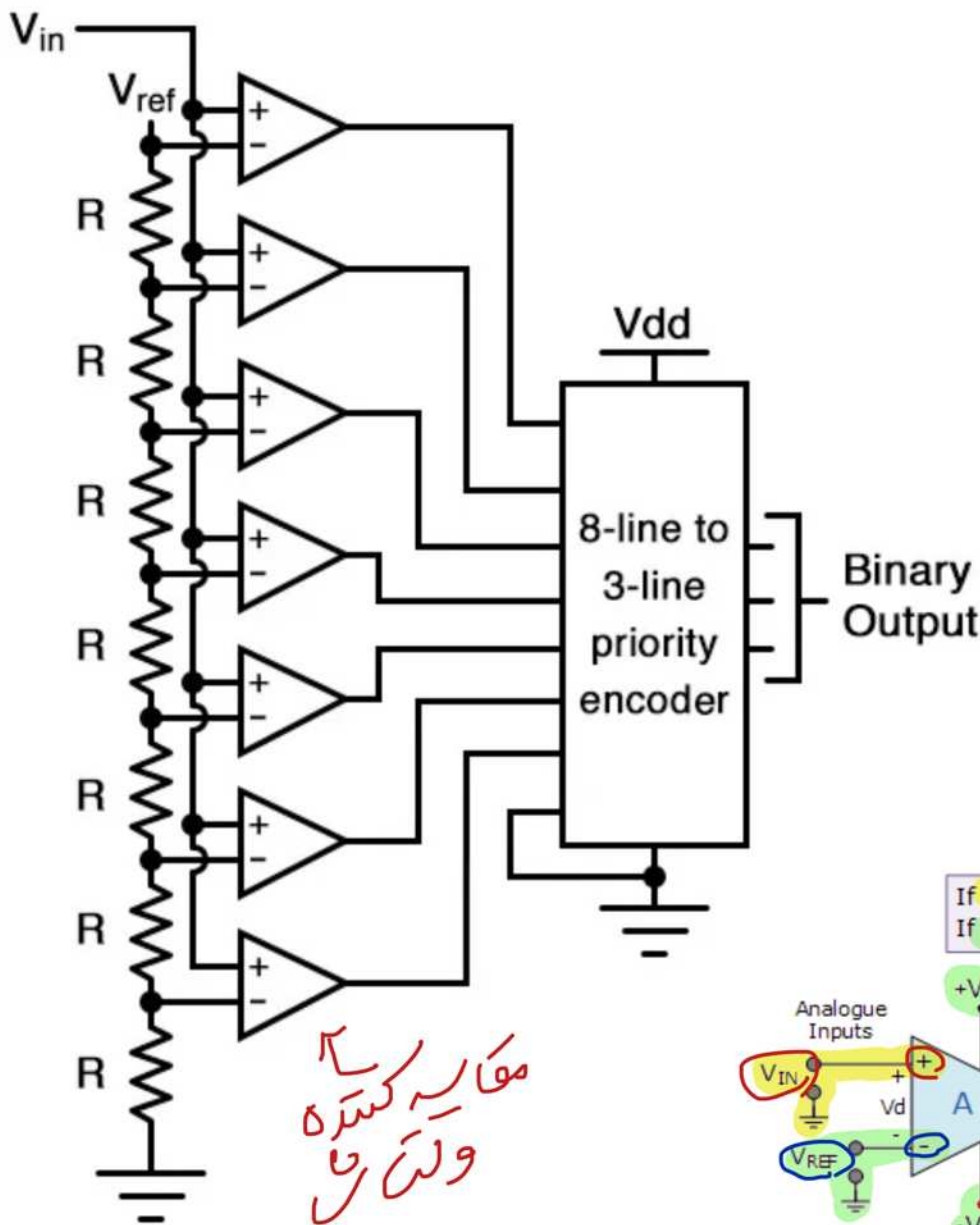
$$V = RI = 250 \times 2mA = 5V$$

bar



Handwritten: Analog to digital converter



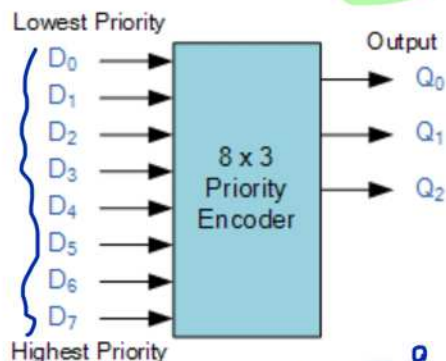
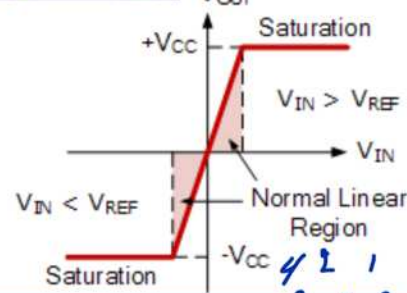
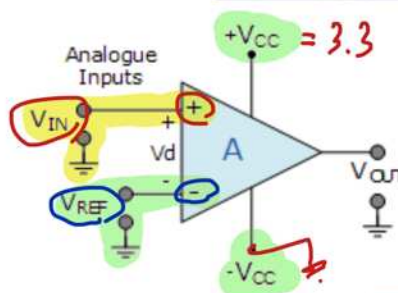


$$2^3 - 1 = 7$$

$$ADC = \frac{7}{7 \text{ volt}} \times V_{in}$$

$$ADC = \frac{V_{in}}{7}$$

If $V_{IN} > V_{REF}$ then $V_{OUT} = +V_{CC}$ → 1
If $V_{IN} < V_{REF}$ then $V_{OUT} = -V_{CC}$ → 0



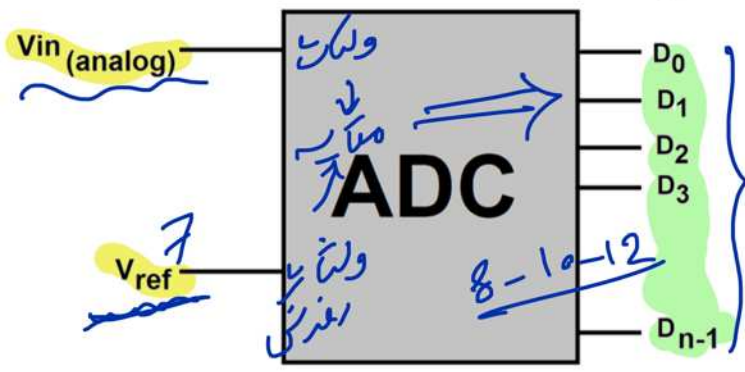
Inputs								Outputs		
D ₇	D ₆	D ₅	D ₄	D ₃	D ₂	D ₁	D ₀	Q ₂	Q ₁	Q ₀
0	0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	1	x	0	0	1
0	0	0	0	0	1	x	x	0	1	0
0	0	0	0	1	x	x	x	0	1	1
0	0	0	1	x	x	x	x	1	0	0
0	0	1	x	x	x	x	x	1	0	1
0	1	x	x	x	x	x	x	1	1	0
1	x	x	x	x	x	x	x	1	1	1

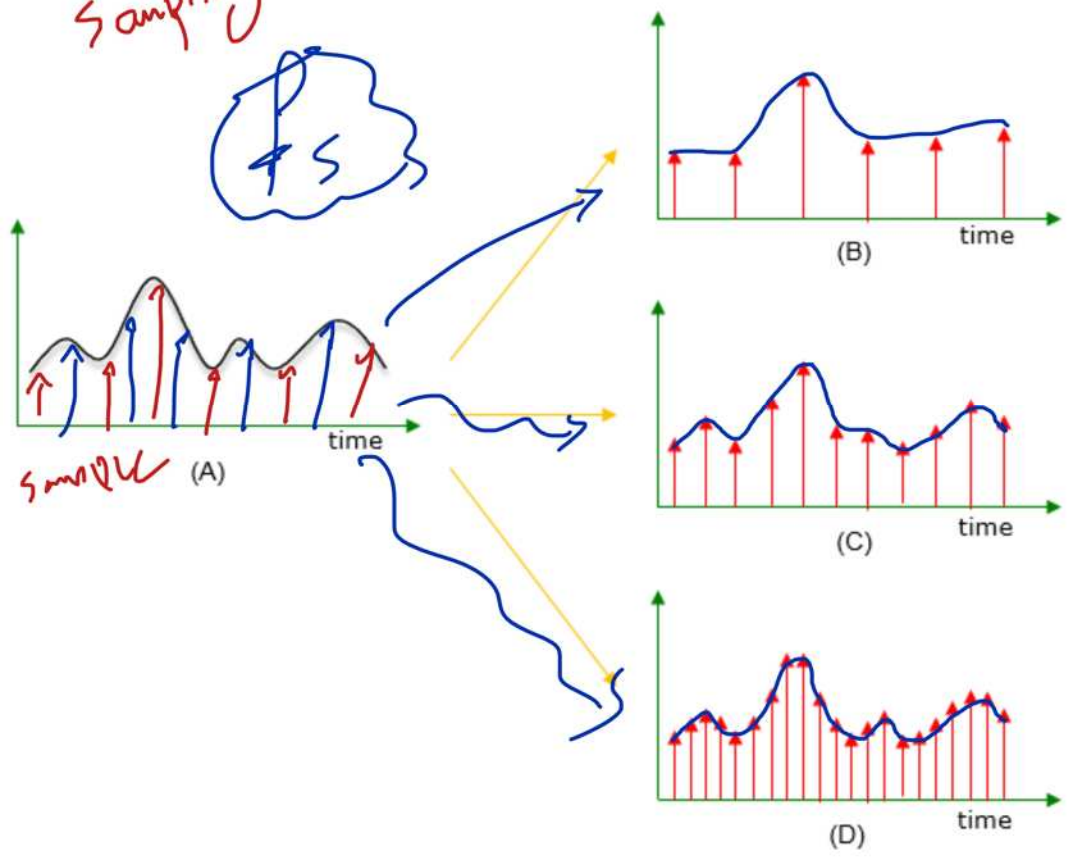
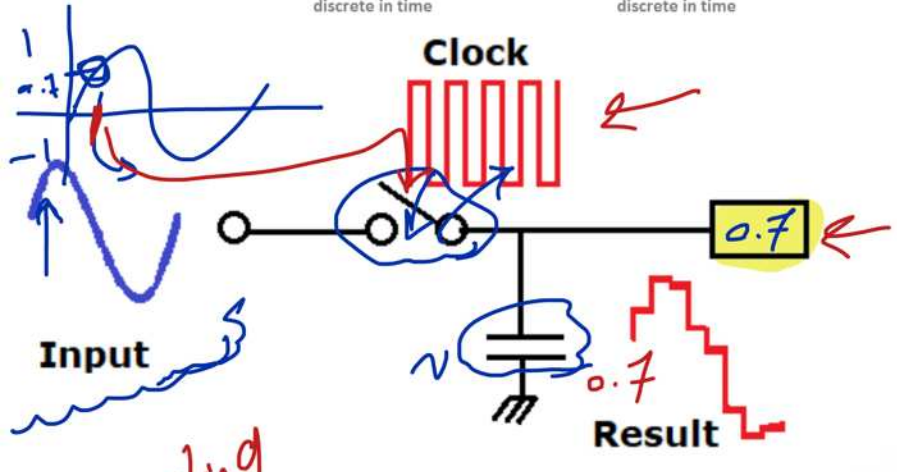
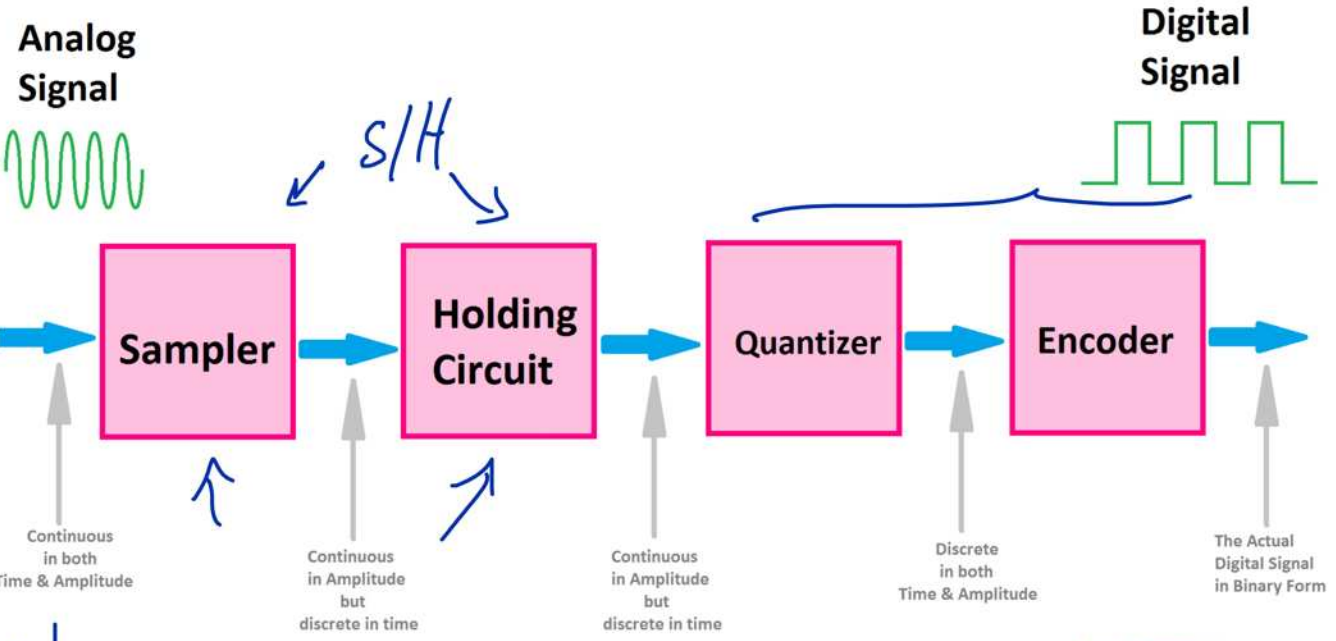
X = don't care

0 → 1
1 → 2
2 → 3
3 → 4
4 → 5
5 → 6
6 → 7
7 → 8

$$\text{Digital Output} = \frac{(2^N - 1) \times \text{Analog Input Voltage}}{\text{Reference Voltage}}$$

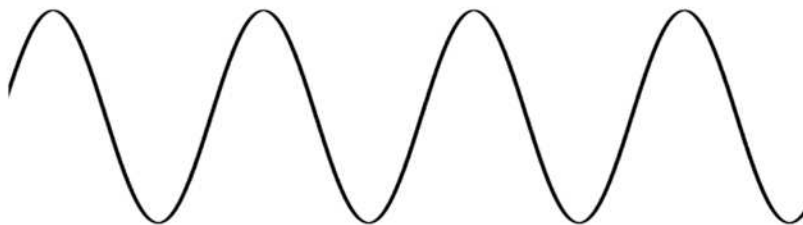
Convert this to Binary Equivalent
 $\frac{7}{255} \approx 27.4 \text{ mV}$
 $27.4 \text{ mV} \rightarrow 59.8 \text{ mV} \rightarrow 27.4 \text{ mV}$
 N = Number of bits in ADC converter (8)



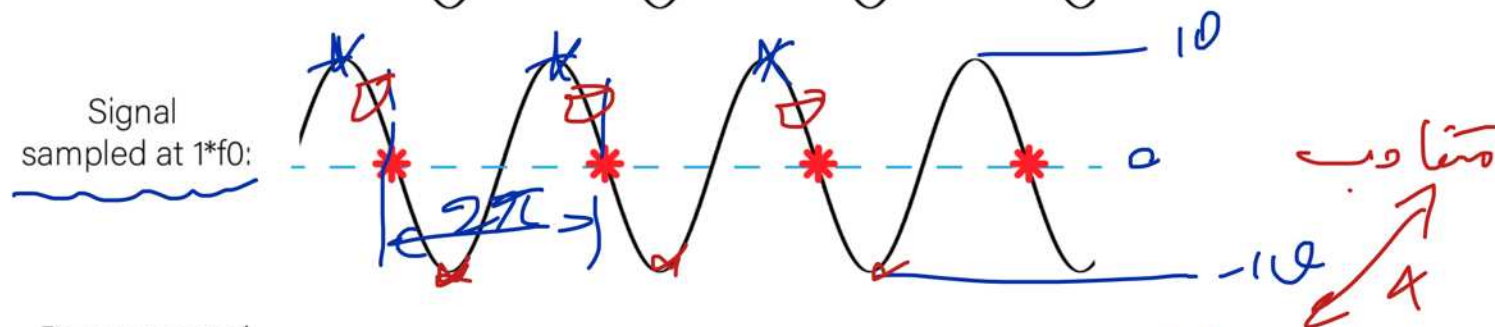


f_s

Original
Signal:



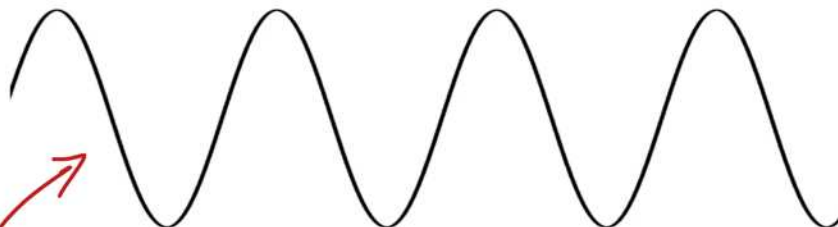
Signal
sampled at $1 \cdot f_0$:



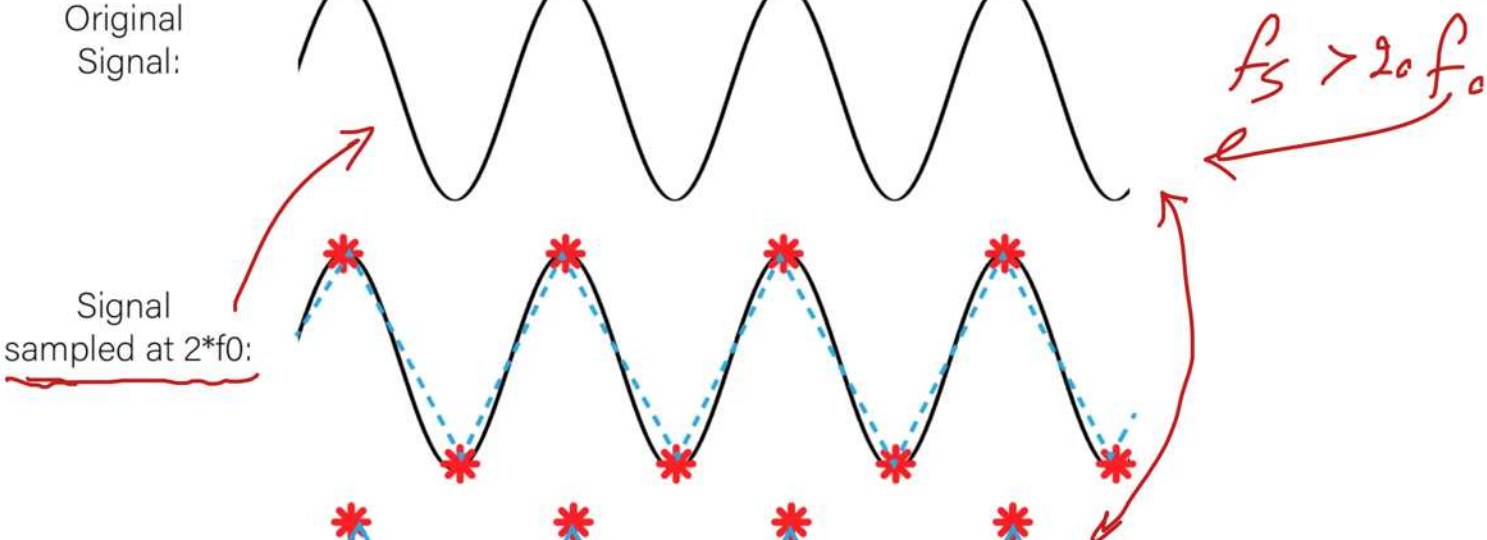
Reconstructed
Signal:



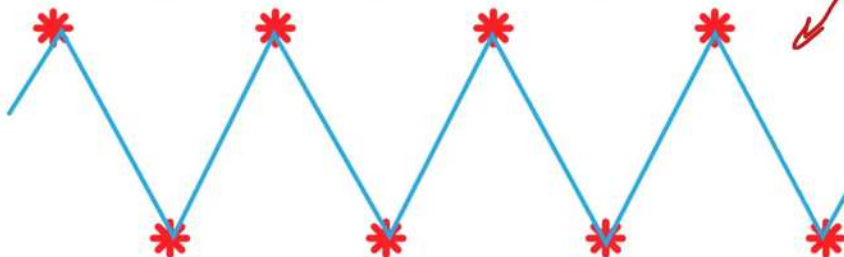
Original
Signal:



Signal
sampled at $2 \cdot f_0$:



Reconstructed
Signal:



Aliasing

Aliasing occurs due to sampling rate being too low with respect to Nyquist Rate

