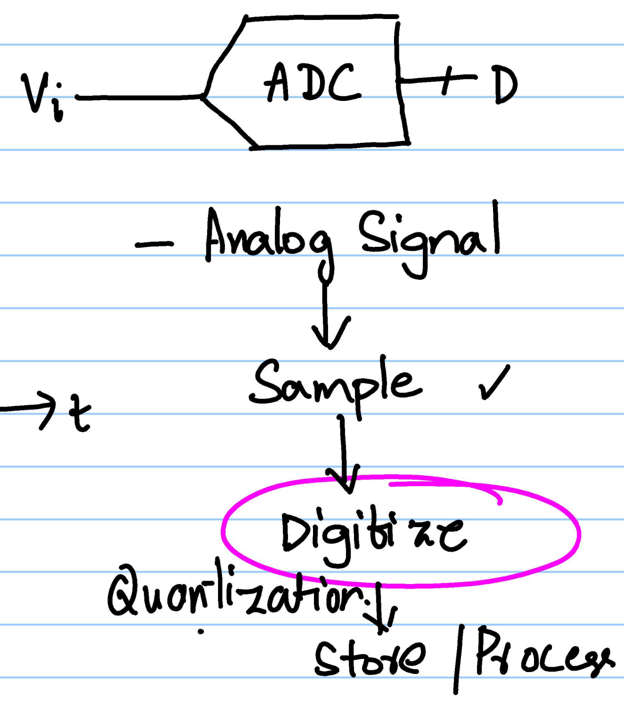
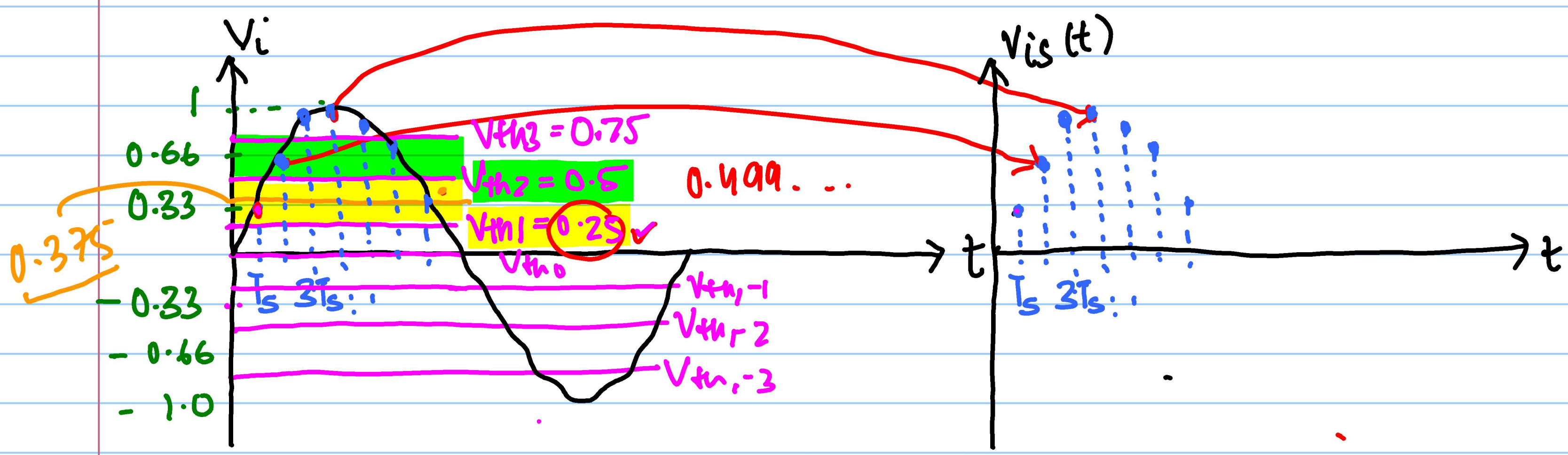
Lecture # 43

Analog to Digital Converter (ADC)





$V_i(t) = A\sin(\omega_0 t) = A\sin\left(\frac{2\pi}{T} \cdot t\right)$ ✓

$\omega_0 = \frac{2\pi}{T} = 2\pi f_0$ [rad/s]

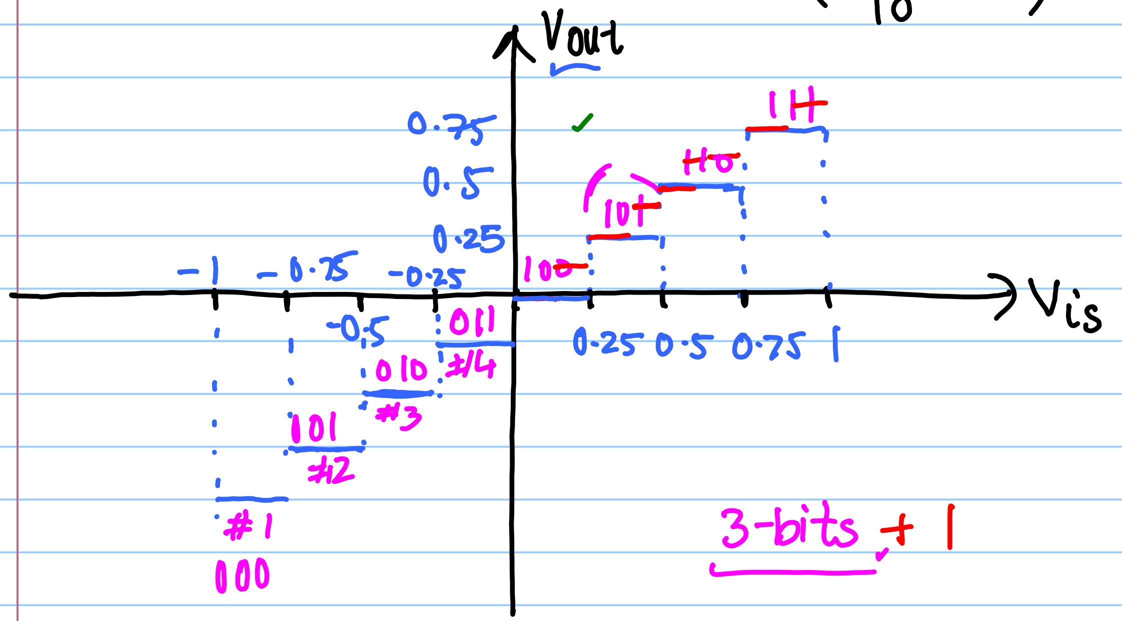
$V_{is}(t) = V_i[nT_s] = A\sin(\omega_0 \cdot nT_s)$

$= A\sin\left(2\pi n \frac{T_s}{T}\right)$

for $T_s = T/20$

$$V_{is}(t) = V_i(nT_s) = A\sin\left(2n\pi \frac{T_s}{10T_s}\right)$$

$$= A\sin\left(\frac{2\pi}{10} \cdot n\right) \checkmark$$



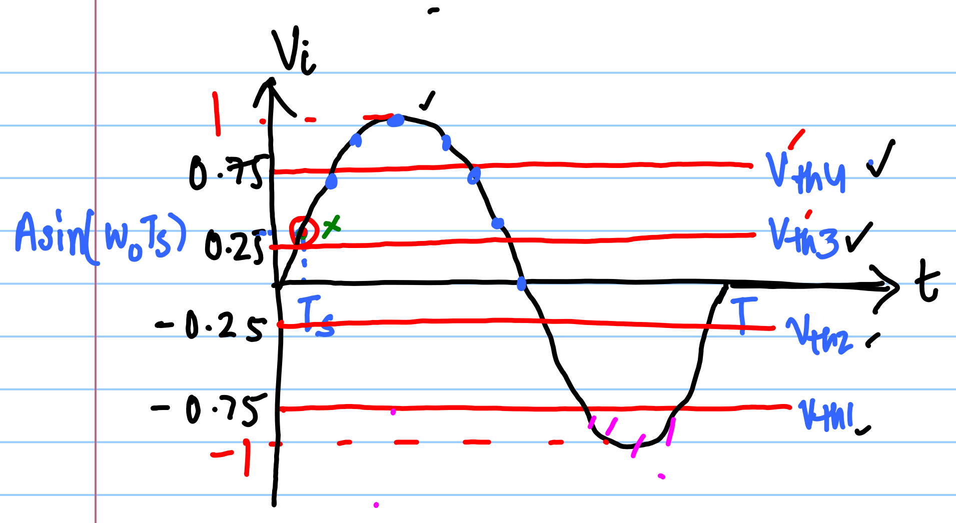
A=1.00000

Sampled value will be accurate to 0.00001

x # of digital bits to save sampled values from −1.00 to +1.00

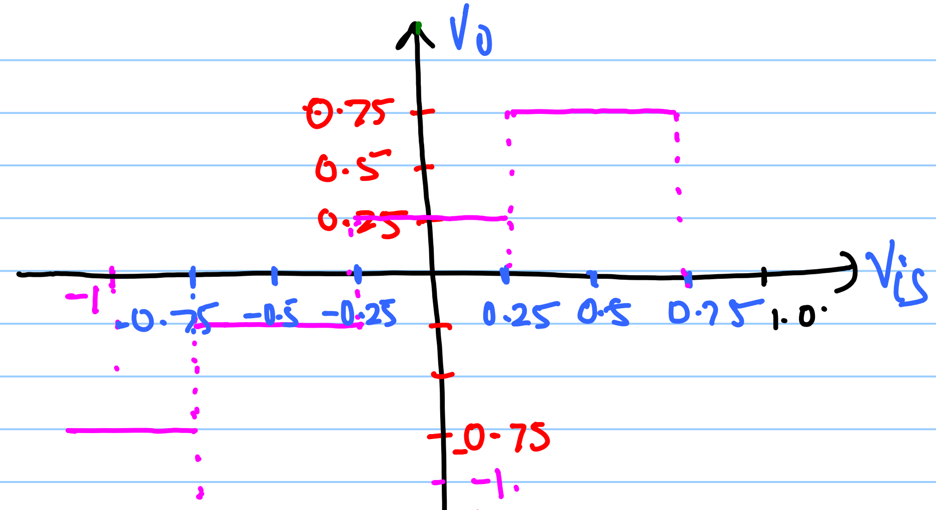
$$\frac{1-(-1.00)}{0.01} = 200$$

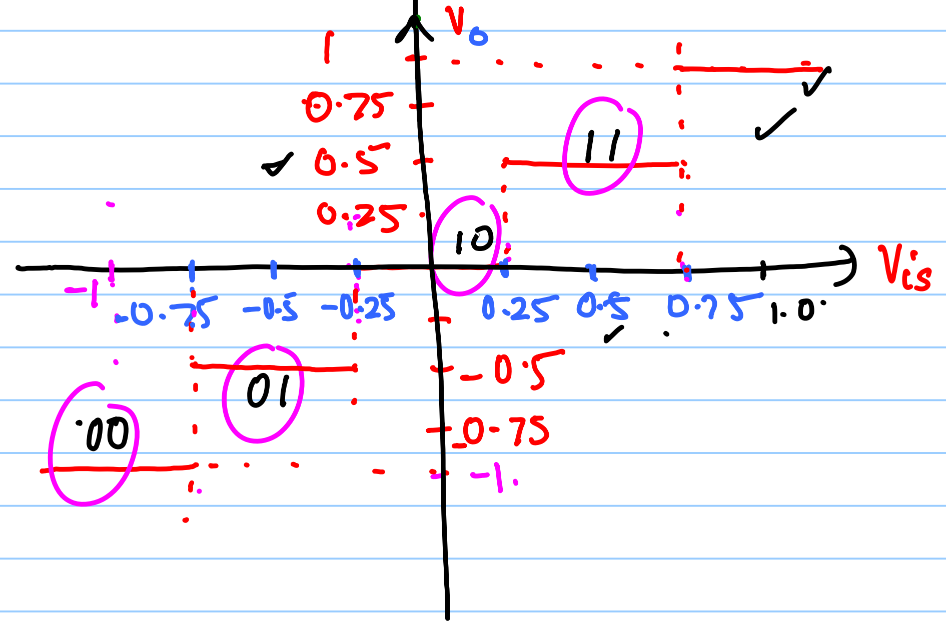
$$\frac{1-(-1.0)}{0.00001} = 2\times10^5 \checkmark$$

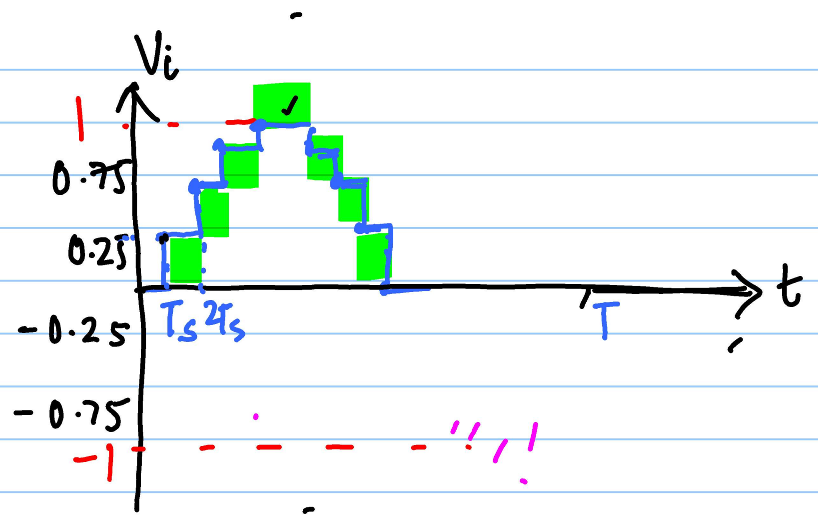


$$\Delta = \frac{1-(-1)}{4} = 0.5$$

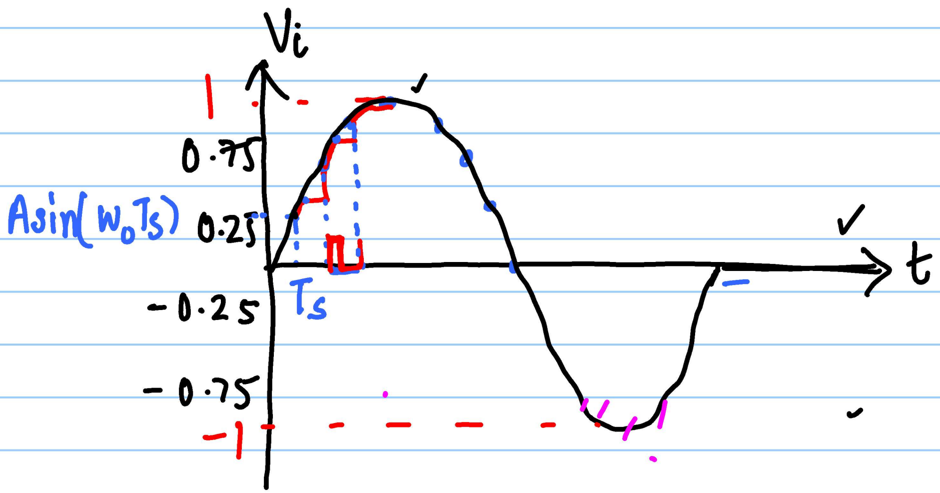
$B_1 B_0$	→	Vanalog
0 0		−0.75
0 1		−0.25
1 0		+0.25
1 1		+0.75



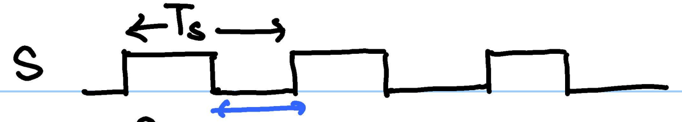




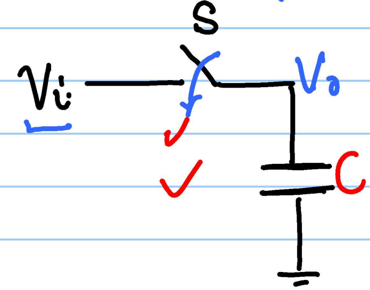
Vi
1
0.75
0.25
-0.25
-0.75
-1
Ts
2Ts
T
t



Vi
1
0.75
Asin(w0Ts)
0.25
-0.25
-0.75
-1
Ts
t

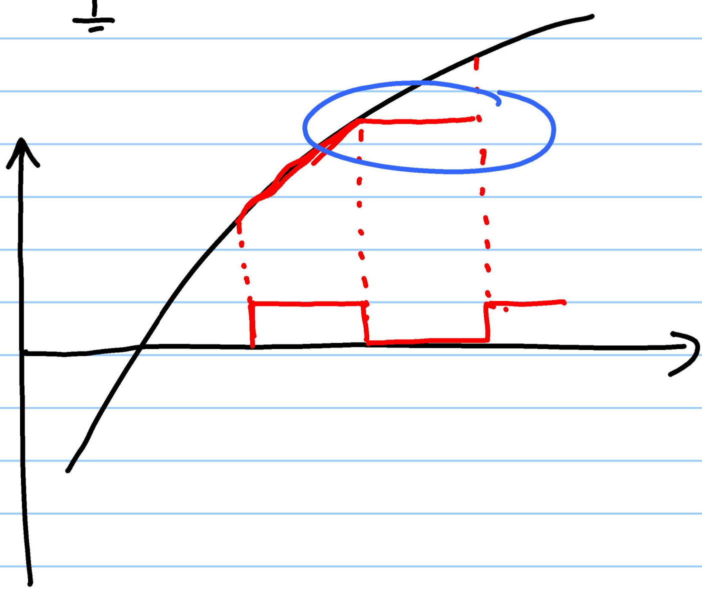


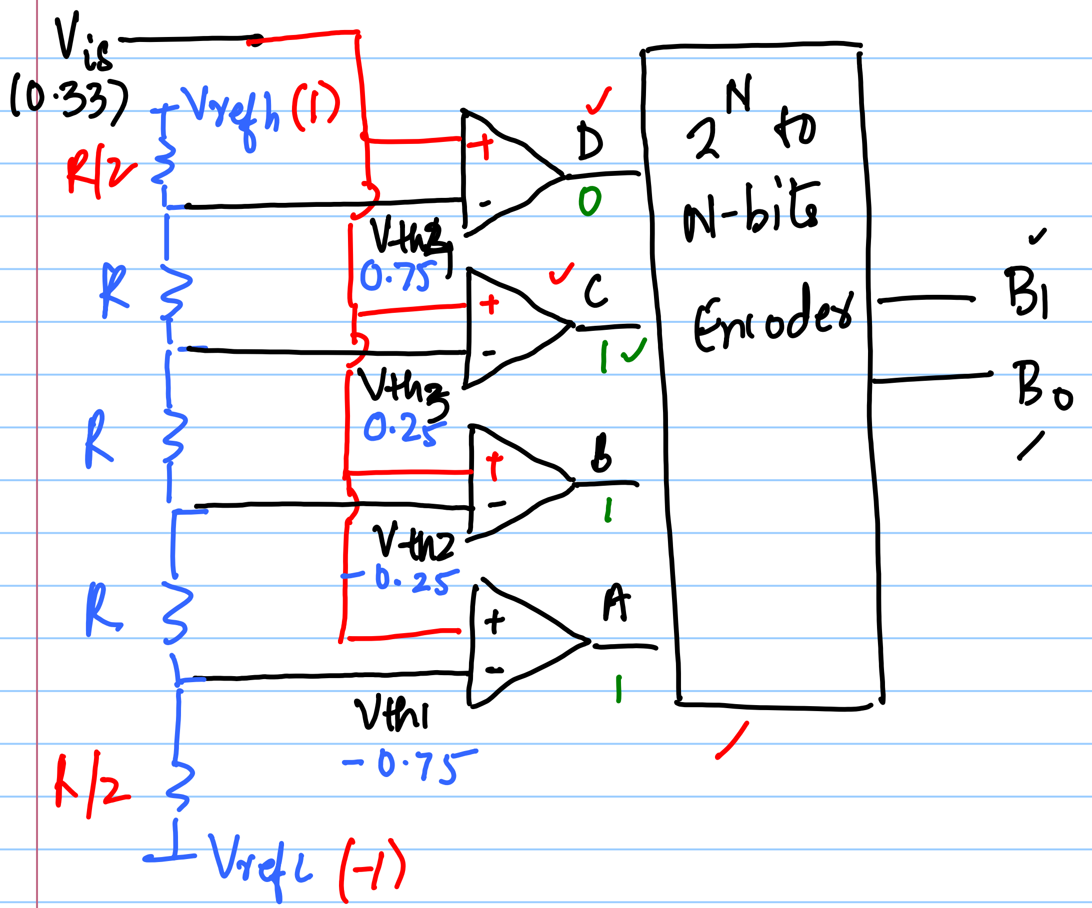
S
Ts



S
Vi
Vo
C

Track & Hold





D	C	B	A
0	0	0	0
0	0	0	1
0	0	1	1
0	1	1	1
1	1	1	1

B_1	B_0
0	0
0	1
1	0
1	1