* Señal de transmisión PCM para

$$f(t) = 2\cos(2\pi t) + \operatorname{sen}(4\pi t)$$

a) $f = 2\,Hz$ $\quad f_N \geq 2W \Rightarrow f_N \geq 4\,Hz$

b) $f_s = 8\,Hz$ $\quad W?$ $\quad C?$

$N = 64$ niveles

↝ Codificación binaria

$$C = \frac{\log_2 2}{\tau} = \frac{1}{\frac{1}{48}} = \boxed{48\ bps}$$

(binario)

cada $\frac{1}{8}$ s se muestrea $\quad \log_2 64 = \underline{6\ pulsos}$

$$\tau = \frac{\frac{1}{8}}{6} = \frac{1}{48}\ seg$$

$$C = 2W \frac{\log_2 n}{1} \rightsquigarrow C = 2W \qquad W = \frac{C}{2} = \frac{48}{2} = \boxed{24\,Hz}$$

↝ Codificación cuaternaria

$$C = \frac{\log_2 4}{\tau} = \frac{2}{\frac{1}{24}} = \boxed{48\,bps}$$

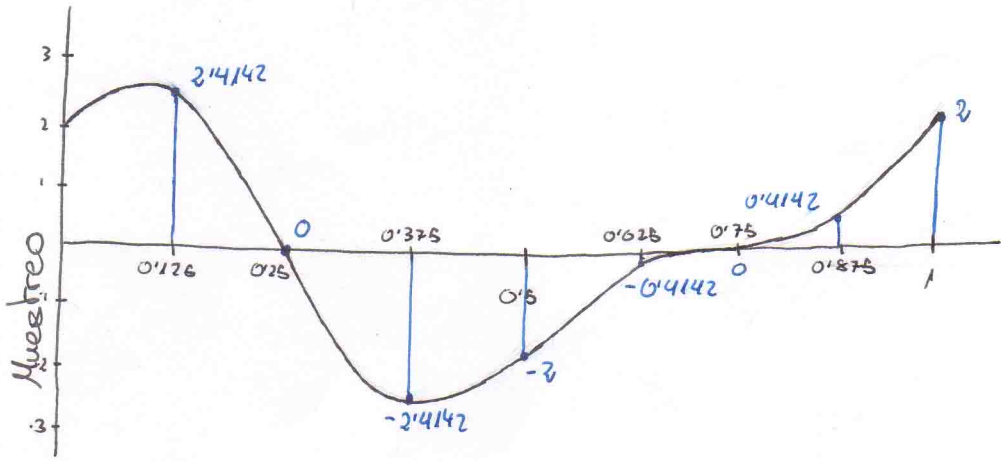
$\log_4 64 = \underline{3\ pulsos}$

$$\tau = \frac{\frac{1}{8}}{3} = \frac{1}{24}\ seg$$

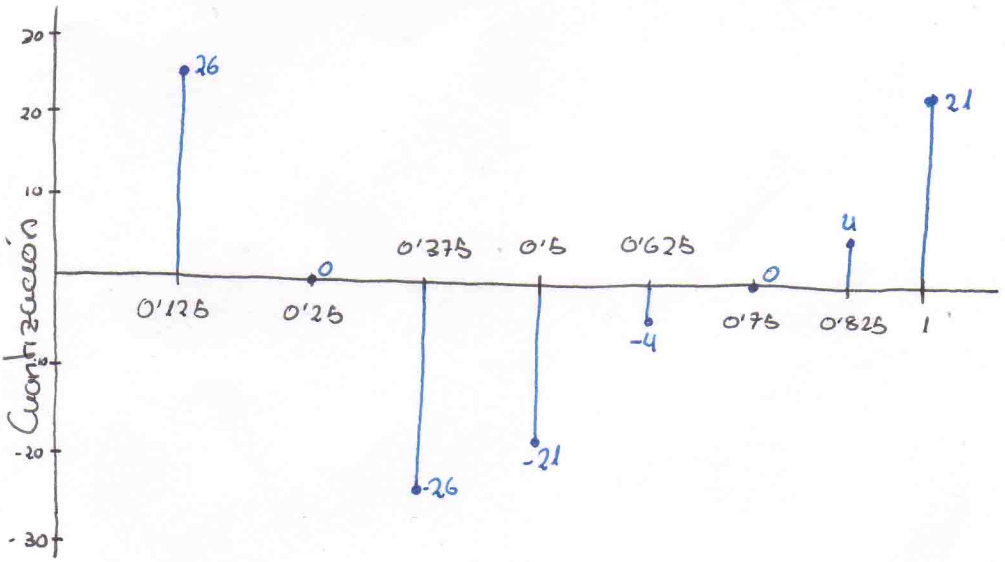
$$C = 2W \log_2 4 = 4W \rightsquigarrow W = \frac{C}{4} = \boxed{12\,Hz}$$

Pablo Ramos Criado

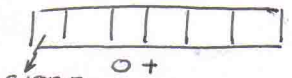
c)



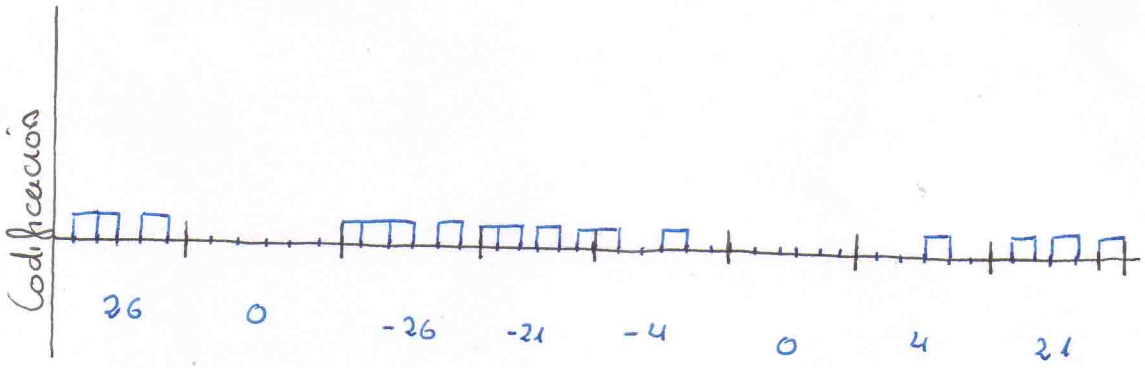
$[-3,3] \rightsquigarrow 6$ $\quad$ $6/64_{\text{niveles}} = 0'09375$



Codificación binaria 0/1



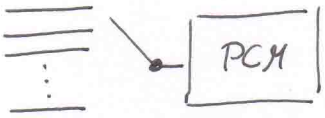
signo 0 +
1 −



Pablo Ramos Criado

d)

8 señales $f(t)$



$f_M = 4\,kHz$ ⇝ Cogemos $f_s = 8\,kHz$

$f_r = 8 \cdot 8\ señales = 64\,kHz$ ⇝ de una señal a otra

64 niveles

Codificación binaria

$\log_2 64 = \underline{6\ pulsos}$

cada $\frac{1}{64}$ seg se muestrea

$\tau = \frac{\frac{1}{64}}{6} = \frac{1}{384}$ seg

$C = \frac{\log_2 2}{\tau} = \frac{1}{\frac{1}{384}} = \boxed{384\,bps}$

$C = 2W \log_2 2 \Rightarrow W = \frac{C}{2} = \boxed{192\,Hz}$

Codificación cuaternaria

$\log_4 64 = \underline{3\ pulsos}$

$\tau = \frac{\frac{1}{64}}{3} = \frac{1}{192}$ seg

$C = \frac{\log_2 4}{\frac{1}{192}} = \boxed{384\,bps}$

$C = 2W \log_2 4 \Rightarrow W = \frac{C}{4} = \boxed{96\,Hz}$

Pablo Ramos Criado