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Parâmetro 7:  $f_1 = 5,7 \text{ KHz}$ ;  $f_2 = 6 \text{ KHz}$

$$\delta_2 = 0,1; \Delta\omega = 0,05\pi \text{ rad}$$

•  $V_{03} \rightarrow B_e = 6,5 \text{ KHz}$   
 $\rightarrow f_s = 13 \text{ KHz}$

$$\omega_s > B_e$$
$$\omega_s < f_1 + f_2$$
$$T_s = \frac{1}{f_s}$$

•  $\omega_s = 4,5 \text{ KHz}$

$$\omega_s = 4,5 \text{ K} \cdot 2\pi \cdot T_s$$

$$\omega_s = 4,5 \text{ K} \cdot 2\pi \cdot \frac{1}{13 \text{ K}}$$

$$\boxed{\omega_s = 0,69\pi \text{ rad}}$$

•  $\Delta\omega = |\omega_s - \omega_p|$

$$0,05\pi = 0,69\pi - \omega_p$$

$$\omega_p = 0,69\pi - 0,05\pi$$

$$\boxed{\omega_p = 0,64\pi \text{ rad}}$$

•  $\omega_c = \frac{\omega_p + \omega_s}{2}$

$$\omega_c = \frac{0,64\pi + 0,69\pi}{2}$$

$$\boxed{\omega_c = 0,66\pi \text{ rad}}$$

•  $A_n = 20 \log_{10} \frac{\delta_2}{1}$

$$A_n = 20 \log_{10} \frac{0,1}{1}$$

$$\boxed{A_n = -20 \text{ dB}}$$

Is janela Retangular

$$\Delta f = \frac{0.9}{M}$$

$$\frac{\Delta \omega}{2\pi} = \frac{0.9}{M}$$

$$M = \frac{2\pi \cdot 0.9}{0.05\pi}$$

$$M = 36$$

$$M = \frac{2\pi \cdot 0.9}{\Delta \omega}$$

$$H_d(e^{j\omega}) = \frac{\sin(\omega_c n)}{\pi n}$$

# Rectangular

$$w[n] = \begin{cases} 1, & 0 \leq n \leq M \\ 0, & \text{c.c} \end{cases}$$

$$h[n] = h_d[n - M/2] \cdot w[n]$$

$$H(e^{j\omega}) = H_d(e^{j\omega}) * W(e^{j\omega})$$

$$h[n] = \frac{\sin(\omega_c \cdot (n - M/2))}{\pi(n - M/2)} \cdot w[n]; 0 \leq n \leq M$$

$$f_1 = 5.7 \text{ kHz} \rightarrow \omega_1 = 2\pi f_1 T = 2\pi \cdot 5.7 \text{ K} \cdot \frac{1}{13 \text{ K}} = 0.87\pi \text{ rad}$$

$$f_2 = 6 \text{ kHz} \rightarrow \omega_2 = 2\pi f_2 T = 2\pi \cdot 6 \text{ K} \cdot \frac{1}{13 \text{ K}} = 0.92\pi \text{ rad}$$

$$x(t) = a_1 \cos(2\pi f_1 t) + a_2 \cos(2\pi f_2 t)$$

$$x[n] = x(t) \Big|_{t=nT} = a_1 \cos(2\pi f_1 nT) + a_2 \cos(2\pi f_2 nT)$$

 **straumann**

$$x[n] = a_1 \cos(\omega_1 n) + a_2 \cos(\omega_2 n)$$