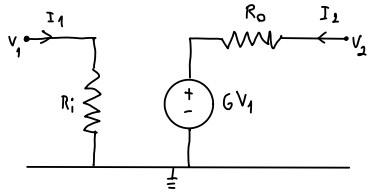
1.1) B 1.2) A 1.3) B 1.4) B 1.5) B

II a) Série - Série

Transadmitância

$$Af = \frac{I_2}{V_1}$$

b) A:

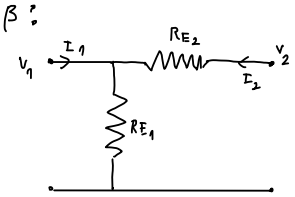


$$h_{11} = \left.\frac{V_1}{I_1}\right|_{I_2=0} = R_i \qquad h_{21} = \left.\frac{V_1}{I_2}\right|_{I_1=0} = 0$$

$$h_{21} = \left.\frac{V_2}{I_1}\right|_{I_2=0} = \frac{GV_1}{I_1} = GR_i \qquad h_{22} = \left.\frac{V_2}{I_2}\right|_{I_1=0} = R_0$$

$$A = \begin{bmatrix} 2K & 0 \\ -1M & 200 \end{bmatrix} \Omega$$

B:

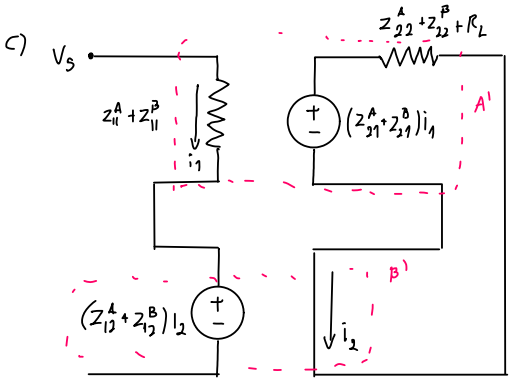


$$h_{11} = \left.\frac{V_1}{I_1}\right|_{I_2=0} = RE_1 \qquad h_{21} = \left.\frac{V_1}{I_2}\right|_{I_1=0} = RE_1$$

$$h_{21} = \left.\frac{V_2}{I_1}\right|_{I_2=0} = RE_1 \qquad h_{22} = \left.\frac{V_2}{I_2}\right|_{I_1=0} = RE_1 + RE_2$$

$$B = \begin{bmatrix} 2K & 2K \\ 2K & 12K \end{bmatrix} \Omega$$

c)



$$A' = \frac{I_2}{V_{1A'}} = 11.24\ mS$$

$$\beta' = 2K\Omega$$

d) $$Af = \frac{A'}{1 + A'\beta'} = 478.7\ \mu S$$

$$K_V = \frac{V_0}{V_S} = -R_L \cdot \frac{I_2}{V_S} = -R_S Af = -4.79$$

III a) FIR => São sempre estáveis

$$y_m = 4x_m + 0{,}8x_{m-1} + 1.6x_{m-2} + 0{,}8x_{m-3} + 4x_{m-4}$$

b) $$T(z) = 4 + 0{,}8z^{-1} + 1.6z^{-2} + 0{,}8z^{-3} + 4z^{-4} \qquad T = \frac{1}{f_S}$$

$$z = e^{j\omega T}$$

$$T(e^{j\omega T}) = 4 + 0{,}8e^{-j\omega T} + 1.6e^{-2j\omega T} + 0{,}8e^{-3j\omega T} + 4e^{-4j\omega T} =$$

$$= e^{-2j\omega T}\left(4e^{2j\omega T} + 4e^{-2j\omega T} + 0{,}8e^{j\omega T} + 0.8e^{-j\omega T} + 1.6\right) =$$

$$= e^{-2j\omega T}\left(8\cos(2\omega T) + 1.6\cos(\omega T) + 1.6\right)$$

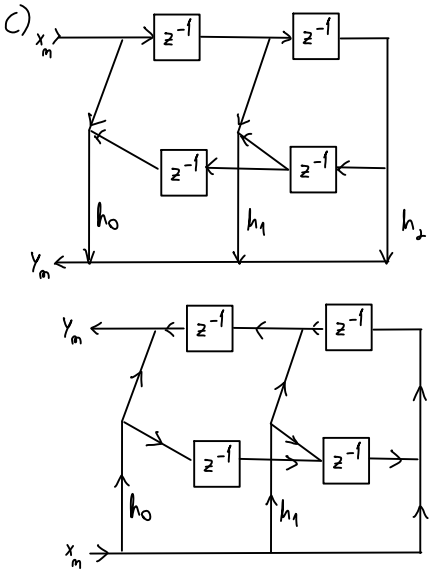
$\phi = -2\omega T$

$$\tau = -\frac{\partial\phi}{\partial\omega} = 2T = \frac{2}{f_S} = 20\ \mu S$$

DC => $\omega = 0$

$8 + 1.6 + 1.6 = 11.2 \Rightarrow 20.98\ dB$

c)



$h_0 = 4$

$h_1 = 0{,}8$

$h_2 = 1.6$

d) $$\Delta\gamma = \frac{A}{N} \qquad \Delta\gamma = 2\pi(f_2 - f_1)T = \frac{2\pi(15K - 10K)}{200K} = \frac{5\pi}{100}$$

$$\frac{5\pi}{100} = \frac{4\pi}{N} \Leftrightarrow N = 80$$

A = 4π (Retangular)

$N = m + 1 \qquad m > 79$

IV a)

$$\frac{\frac{\Delta K}{RC_2}}{s^2 + s\left(\frac{1}{RC_3} + \frac{3-K}{RC_2}\right) + \frac{2}{R^2C_3C_2}} \qquad \frac{\Delta K}{s^2 + \frac{\omega_p}{Q}s + \omega_p^2}$$

Condição $\Rightarrow$ $= 0$

$$\omega_p^2 = \frac{2}{R^2C_3C_2} \Rightarrow \omega_p = \sqrt{\frac{2}{R^2C_3C_2}} = 282.843\,K\,rad/s \Rightarrow 45\,K\,Hz$$

$$\frac{1}{RC_3} + \frac{3-K}{RC_2} = 0 \Leftrightarrow \frac{4-K}{RC} = 0 \Rightarrow K = 4 \;//$$

b) $B \downarrow \Rightarrow b = "0"$ $\quad B \to 0$ ("0")

$\bar{B} \uparrow \Rightarrow b = "0"$ $\quad \bar{B} \to 5V$ ("1")

Aí é amplificador

c) Vantagens

Só uma parte $\Rightarrow$ Menos transistores, Menos área, Menos atrasos

Não tem efeito de corpo

Desvantagens

Tensão low $> 0 \Rightarrow$ Pode levar a erros de transmissão

Consumo estático "low" não nulo!