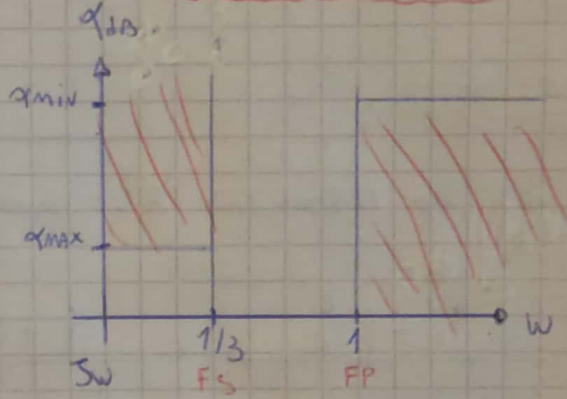
TAREA SEMANAL 6

FP = 300Hz ; fs = ? ; H(z.m. 100Hz) = 0

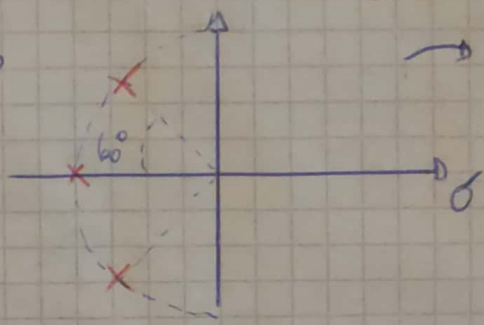
TOMO UN α_{MAX} DE 3dB (NO ACLARA). SIMULANDO EL CIRCUITO, NOTE
↳ BUTTER
QUE SE TRATABA DE UN ORDEN 3 PASA BAJOS. (NO ACLARA ALPHA MIN)

PLANTILLA PASA-BAJOS

PLANTILLA PASA-ALTOS



BUTTER ORDEN 3 →



→ $Q = \frac{1}{2\cos 60°} \Rightarrow Q = 1$

$$H(\$') = \frac{3^2}{\$'^2 + \$' + 1} \cdot \frac{1}{\$' + 1}$$ → PASA BAJOS

$$H(\$') = \frac{\$' + 3^2}{\$^2 + \$ + 1} \quad \frac{1}{\$' + 1}$$ → PASA BAJOS NOTCH

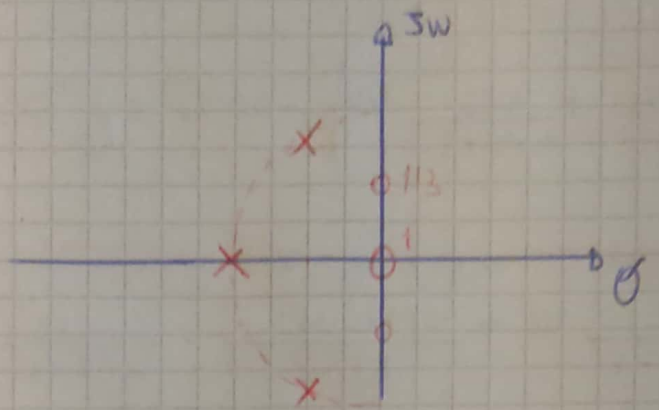
NOTA

PASA ALTOS

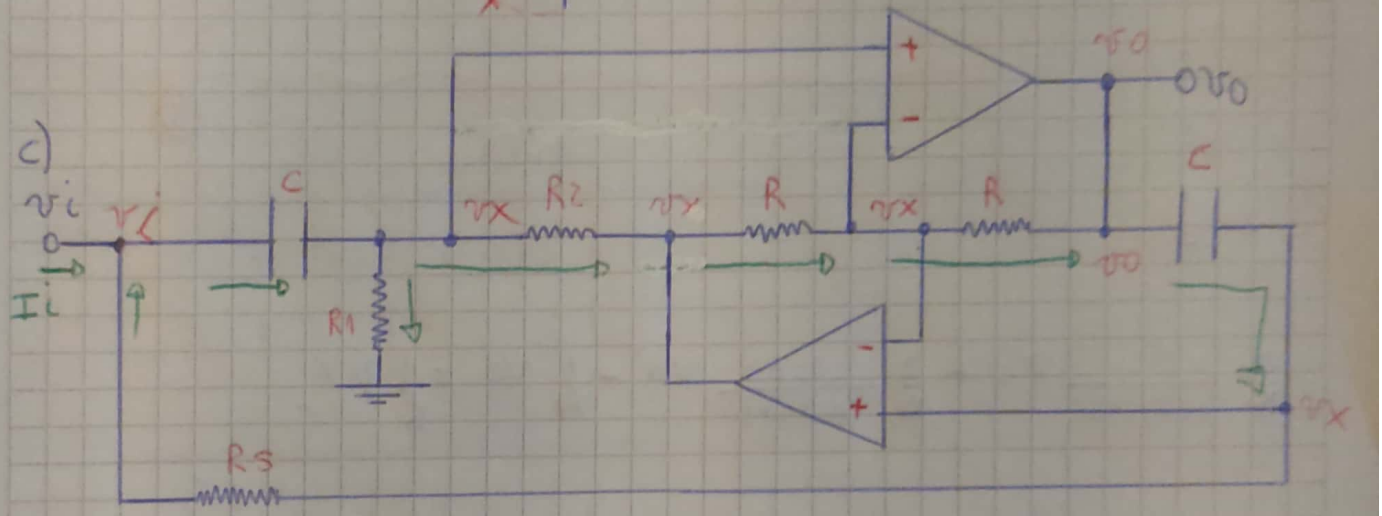
$$H(\$) = H(\$')\Big|_{\$' = \frac{1}{\$}} \Rightarrow H(\$) = \frac{\frac{1}{\$^2} + 3^2}{\frac{1}{(\$)^2} + \frac{1}{\$^2} + 1} \cdot \frac{1}{\frac{1}{\$} + 1}$$

$$H(\$) = \frac{\$^2 + \frac{1}{9}}{\$^2 + \$ + 1} \cdot \frac{\$}{\$ + 1}$$

b)



c)



$$v_x\left(\frac{1}{R_2}+\frac{1}{R_1}+sC\right)-sCv_i-R_2^{-1}v_y=0$$

$$\frac{sCR_1R_2+R_1+R_2}{R_1R_2}v_x-sCv_i=\frac{1}{R_2}v_y \quad (1)$$

$$v_x\left(\frac{2}{R}\right)-\frac{1}{R}v_o-\frac{1}{R}v_y=0 \rightarrow \frac{2}{R}v_x-\frac{1}{R}v_o=\frac{1}{R}v_y \quad (2)$$

$$v_x\left(sC+\frac{1}{R_5}\right)-sCv_o-v_i\frac{1}{R_5}=0 \rightarrow \frac{sCR_5+1}{R_5}v_x=\frac{1}{R_5}v_i+sCv_o$$

$$v_x=\frac{1}{sCR_5+1}v_i+\frac{sCR_5}{sCR_5+1}v_o \quad (3)$$

NOTA

(3) en (1)

$$\frac{sCR_1R_2+R_1+R_2}{R_1R_2}\left(\frac{1}{sCR_5+1}v_i+\frac{sCR_5}{sCR_5+1}v_o\right)-sCv_i=\frac{1}{R_2}v_y$$

$$v_y=\frac{sCR_1R_2+R_1+R_2}{R_1}\cdot\frac{1}{sCR_5+1}v_i+\frac{sCR_1+R_1+R_2}{R_1}\cdot\frac{sCR_5}{sCR_5+1}v_o-sCR_2v_i \quad (4)$$

(3) en (2)

$$\frac{2}{R}\cdot\frac{1}{sCR_5+1}v_i+\frac{2}{R}\cdot\frac{sCR_5}{sCR_5+1}v_o-\frac{1}{R}v_o=\frac{1}{R}v_y$$

$$v_y=\frac{2}{sCR_5+1}v_i+\frac{2sCR_5}{sCR_5+1}v_o-v_o$$

$$v_y=\frac{2}{sCR_5+1}v_i+\frac{sCR_5-1}{sCR_5+1}v_o \quad (5)$$

(4) = (5)

$$\frac{sCR_1R_2+R_1+R_2}{R_1}\cdot\frac{1}{sCR_5+1}v_i+\frac{sCR_1+R_1+R_2}{R_1(sCR_5+1)}\cdot sCR_5v_o-sCR_2v_i=$$

$$=\frac{2}{sCR_5+1}v_i+\frac{sCR_5-1}{sCR_5+1}v_o$$

NOTA

$$\left[\frac{SCR1R2+R1+R2}{R1(SCRS+1)} \quad \frac{-2}{SCRS+1} \quad -SCR2\right] Vi = \left[\frac{SCRS-1}{SCRS+1} - \frac{SCRS(SCR1R2+R1+R2)}{R1(SCRS+1)}\right] Vo$$

$$\frac{SCR1R2+R1+R2-2R1-SCR2(SCR1RS+1)R1}{R1(SCRS+1)} Vi = \frac{R1SCRS-R1-SCRS(SCR1R2+R1+R2)}{R1(SCRS+1)}$$

$$H(S) = -\frac{-S^2C^2R2RS-R1+R2}{S^2C^2R1R2RS+SCRSR2+R1}$$

$$H(S) = \frac{S^2 + \frac{R1-R2}{R1R2RSC^2}}{S^2 + \frac{1}{R1C}S + \frac{1}{R2RSC^2}}$$

$$WP^2 = \frac{1}{R2RSC^2} \rightarrow C^2 = \frac{1}{R2WP^2} \rightarrow C = \frac{1}{\sqrt{R2^2}WP} \rightarrow C = 1/WP$$

$R5 = R2$

$$\frac{R1-R2}{R1R2\underbrace{R5C^2}_{1}} = WO^2 \rightarrow \frac{R1-R2}{R1} = WO^2 WP^{-2}$$

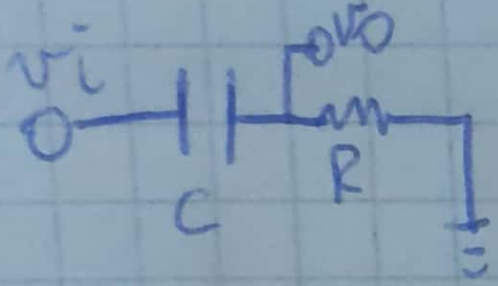
$$\frac{WP}{Q} = \frac{1}{R1C} \quad / \cdot R1 = \frac{Q}{\underbrace{WP}_{1}} \frac{1}{C} \Rightarrow R1 = \frac{Q}{1}\frac{1}{\sqrt{R2^2}} \rightarrow R1 = Q.\sqrt{R2^2}$$

$$R1 = Q.R2$$

$$\frac{-R2+QR2}{QR2} = WO^2/WP^2 \quad ; \quad R2 = 1$$

$$\rightarrow Q\left[1 - \frac{WO^2}{WP^2}\right] = 1 \rightarrow Q = (8/9)^{-1} \rightarrow Q = 9/8$$

$1/9$



$$H(S) = \frac{S}{S + 1/RC}$$