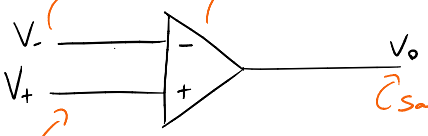
# Apuntes

jueves, 13 de enero de 2022 23:31

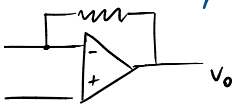
E. invers. — Tendrá una ganancia $A_V = \frac{V_o}{V_i}$ o $A_i = \frac{I_o}{I_i}$




Salida

Entrada no inversora

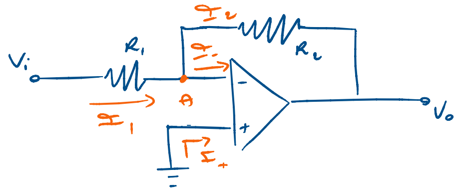
Trabajaremos siempre con el modelo ideal y realimentación positiva.




$I_+ = I_- = 0$

$V_+ = V_-$

Si alimentamos el AO por $V_-$



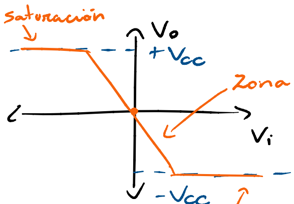

Analizando por nudos

$I_- = I_+ = 0$ A: $I_1 = \cancel{I_-}^{0} + I_2 \Rightarrow \frac{V_i - V_A^{\,0}}{R_1} = \frac{V_A^{\,0} - V_o}{R_2} \Rightarrow \frac{V_i}{R_1} = -\frac{V_o}{R_2}$

$V_A = V_- = V_+ = 0$

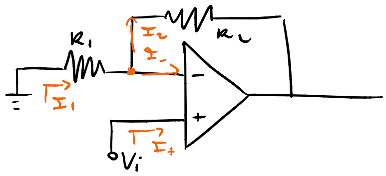
$\frac{V_o}{V_i} = -\frac{R_2}{R_1} = A_V$

Como $A_V < 0 \Longrightarrow$ Configuración inversora



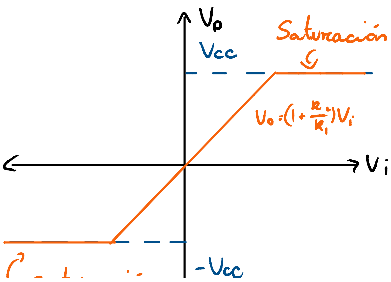

Zona lineal $V_o = \underbrace{-\frac{R_2}{R_1}}_{\text{Pendiente}} V_i$

Si tiene alimentación en $V_+$




$I_- = I_+ = 0$ A: $I_1 = \cancel{I_-}^{0} + I_2$

$V_- = V_A = V_+ = V_i$ $\frac{-V_A}{R_1} = \frac{V_A - V_o}{R_2} \Rightarrow \frac{-V_i}{R_1} = \frac{V_i - V_o}{R_2}$

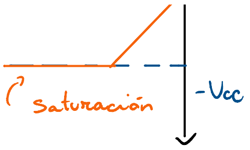



$-R_2 V_i = R_1 V_i - R_1 V_o \Rightarrow V_i(R_1 + R_2) = R_1 V_o$

$\frac{V_o}{V_i} = \frac{R_1 + R_2}{R_1} = A > 0 \Longrightarrow$ No inversor

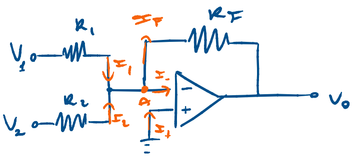
$\Updownarrow$

$\frac{V_o}{V_i} = 1 + \frac{R_2}{R_1}$




$$\frac{V_o}{V_i} = 1 + \frac{\cdots}{R_1}$$

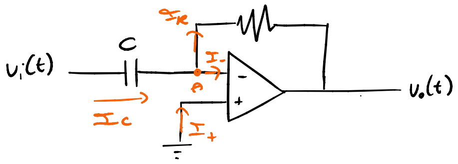
Si existen varias fuentes: Conf. sumadora




$I_+ = I_- = 0A$ $\qquad A: I_1 + I_2 = I_F + \cancel{I_-}^{0}$

$V_+ = V_- = V_A = 0V$ $\qquad \frac{V_1}{R_1} + \frac{V_2}{R_2} = \frac{\cancel{V_A}^{0} - V_o}{R_F} \Rightarrow V_o = -R_F\left(\frac{V_1}{R_1} + \frac{V_2}{R_2}\right)$

Configuración derivadora

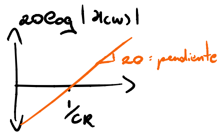



$i_- = i_+ = 0$ $\qquad A: i_c = i_R + \cancel{i_-}^{0} \Rightarrow C\frac{dv_c}{dt} = C\frac{dv_i}{dt} = \frac{-V_o}{R}$ $\qquad v_c = v_i - \cancel{v_A}^{0}$

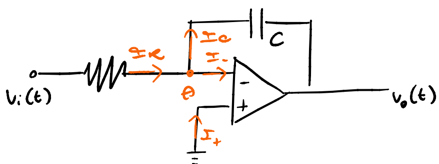
$v_+ = v_- = v_A = 0$

$\Updownarrow$

$i_c = i_R \Rightarrow \frac{v_i - \cancel{v_A}^{0}}{Z_c} = \frac{\cancel{v_A}^{0} - v_o}{Z_R} \Rightarrow \frac{v_o}{v_i} = -\frac{Z_R}{Z_c} = -jwCR = H(w)$



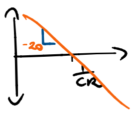

Configuración integradora

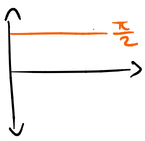



$i_+ = i_- = 0$ $\qquad A: i_R = i_c + \cancel{i_-}^{0} \Rightarrow \frac{v_i - \cancel{v_A}^{0}}{R} = \frac{-V_o}{Z_c} = -V_o \cdot jwC$

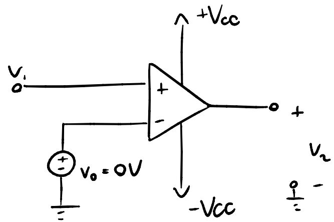
$V_+ = V_- = V_A = 0$

$$\frac{V_o}{V_i} = -\frac{1}{jwCR} = H(w) \Rightarrow$$




91.-




$V_{cc} = 5V$

a) $A = 10^5$

Si $A = 10^5 \Longrightarrow v_o = v_i \cdot 10^5 = 10^5 v_1 = v_2$

$v_o = A(v_+ - v_-)$

Para que no entre en saturación $|v_o| < V_{cc} = 5V$

$$|10^5 \cdot v_1| < 5V$$

$$|v_1| < 5 \cdot 10^{-5} V$$

$$-5 \cdot 10^{-5} \leq v_1 \leq 5 \cdot 10^{-5}$$

El valor máximo será $5 \cdot 10^{-5} V$

b) $v_2(t)$ $\quad t \in [0, 1]$ s $\quad A = 10^5$

$v_1(t) = 100 \, \text{sen} \, 2\pi t \, (\mu V)$

$v_1(0) = 0V \qquad v_1(1) = 0V \qquad v_1(0'5) = 0V$

$v_1(\frac{1}{2}) = 100 \mu V \Rightarrow$ Saturación

$v_1 \ max = 50 \mu V$

$v_1(t) = 50 = 100 \, sen(2\pi t)$

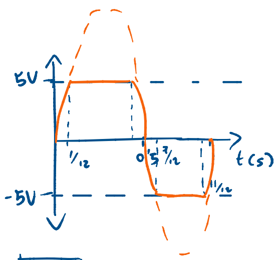
$sen(2\pi t) = 0'5 \Rightarrow 2\cancel{\pi} t = \frac{1}{6} \cancel{\pi} \Rightarrow 2\cancel{\pi} t = \cancel{\pi} - \frac{1}{6}\cancel{\pi} = \frac{5}{6}$

$t = \frac{1}{12}$ s $\qquad t = \frac{5}{12}$

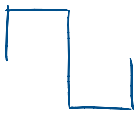
$-50 = 100 \, sen(2\pi t) \qquad (-\frac{1}{6}\pi)$

$sen(2\pi t) = -0'5 \Rightarrow 2\cancel{\pi} t = \frac{11}{6} \cancel{\pi} \Rightarrow t = \frac{11}{12}$

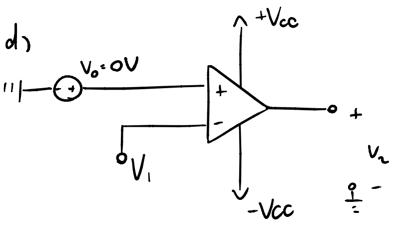
$2\cancel{\pi} t = \frac{7}{6} \cancel{\pi} \Rightarrow t = \frac{7}{12}$




c)



d)




$V_{cc} = 5V$

Si $A = 10^5 \Longrightarrow v_2 = A(v_+ - v_-) = 10^5(0 - V_1)$

$v_2 = -10^5 V_1$

Se invertiría la señal, $v_2$ sería $v_1$ amplificado y cambiado de signo