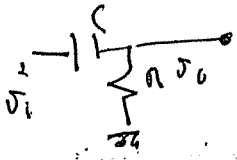
1ª Parte.

RESOLUCIÓN EXAMEN 5-7-2005

1º)



$\frac{V_o}{V_i} : \frac{1}{2\pi RC} = f_c \Rightarrow C = 0'1\mu F$.

$f_c = 50Hz$: $RC = \frac{1}{2\pi \cdot 50}$ $\Bigg\} R = \frac{1}{2\pi \cdot 50 \cdot 0'1 \cdot 10^{-6}} = 31'9K \rightarrow 33K$

2º) $R_2 = 220K$

3º) $R_{comp} = R_1 \| R_2 = 9'79K \simeq 10K$

$\frac{1}{2\pi RC} = 100Hz$: $C = \frac{1}{2\pi \cdot 9'79 \cdot 10^3 \cdot 100} = 0'162\mu F \rightarrow 160nF$

4º) $R_1 = 1K$ $R_2 = 100K$ $R = 1K$

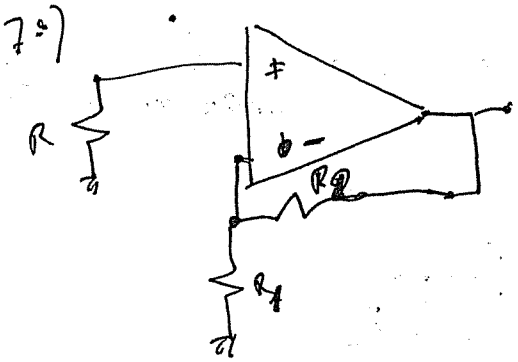
$\frac{1}{2\pi R \cdot C_1} = f_{BL} \Rightarrow f_{BL} = \frac{1}{2\pi \cdot 1 \cdot 10^3 \cdot 0'1 \cdot 10^{-6}} = 1.591Hz$

5º) $f_z = A_{OLC} \cdot f_{BLC} \Rightarrow f_{BLC} = \frac{1MHz}{100} = 10KHz$

6º) $A_{OLC} = -R_2/R_1 = 47$

$f_{BLC} = \frac{1MHz}{47} = 21'3KHz$

7º)



$V^+ = -RI_{BIAS}$

$V^- = -(R_1 \| R_2) I_{BIAS} + \frac{R_1}{R_1+R_2} \cdot V_o$

$= (R_1 \| R_2) I_{BIAS} + \frac{R_1}{R_1+R_2} V_o = -R I_{BIAS}$

$\left[\frac{R_1 R_2}{R_1+R_2} + R\right) I_{BIAS} = \frac{R_1}{R_1+R_2} V_o$

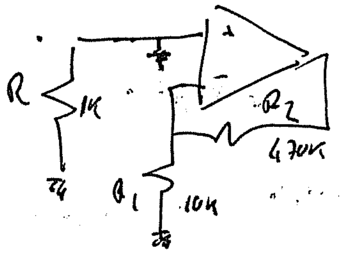
$V_o = \left(\frac{R_1 \cdot R_2}{R_1} + \frac{R(R_1+R_2)}{R_1}\right) I_{BIAS}$

$V_o = \left[R_2 + R\left[1+\frac{R_2}{R_1}\right]\right] I_{BIAS} = 470K + 1K(1+470) \cdot I_{BIAS}$

$= 51'9K\, I_{BIAS}$

Si $I_{BIAS} = 100nA \Rightarrow V_{o_{ERR}} = 5'19mV$

8:)



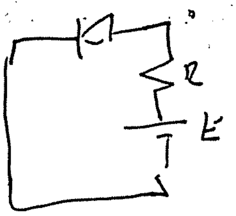
$V^-(G_1+G_2) - G_2 V_o = 0$

$V^- = V_{OFFin}$

$V_o = \frac{G_1+G_2}{G_2} = \left(1+\frac{R_2}{R_1}\right) V_{OFFin}$

Si $V_{OFFin} = 5mV$: ⇒ $V_{OFFOUT} = 48 \times V_{OFFIN} = 48 \times 5 = \underline{240mV}$

9:)



$\frac{15-0'7}{R} = 5mA$

$R = 2'86K$

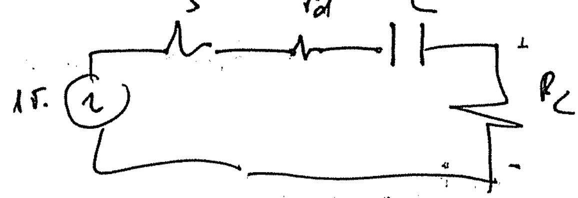
10:) $r_d = \frac{V_T}{I_{DQ}} = \frac{26mV}{5mA} = 5'2\Omega$

$V_T = KT$ Si a 300°K — $V_T = 26mV$
a 360°K — $V_T = x$ $x = 31'2mV$

11:) $r_d = \frac{31'2mV}{5mA} = 6'24\Omega$

12:) $f_c = 1KHz$ $\frac{1}{2\pi R_L C_1} = 1KHz \Rightarrow C_1 = \frac{1}{2\pi \cdot 50 \cdot 1000}$ 3μF

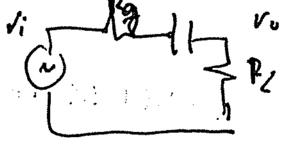
13:) 3μF



$I_{DQ} = \frac{15-0'7}{R_2} = 100mA \Rightarrow R_2 = 150\Omega \Rightarrow$

$\frac{v_o}{v_i} = \frac{R_L C S}{1+(R_L+r_g)CS}$

$r_d = \frac{31'2mV}{100mA} = 0'31$



$v_o = \frac{R_L}{R_L+r_g+\frac{1}{CS}} v_i = \frac{R_L CS}{1+CS(R_L+r_g)}$ $\left|\frac{v_o}{v_i}\right| = \frac{R_L C\omega}{\sqrt{1+[(R_L+r_g)C\omega]^2}}$

$\omega = 2\pi f$

a $f_c = \frac{1}{2\pi (R_L + R_S) C} = 159$

$\frac{2\pi \cdot 5000 \cdot 1 \cdot 10^{-6}}{\sqrt{1^2 + (2\pi \cdot 5000)^2 \cdot (1 \cdot 10^{-6})^2 \cdot (100)^2}} = \frac{2\pi \cdot 1000 \cdot 1 \cdot 10^{-6}}{1'00 1} =$

$\frac{R_L C \omega}{\sqrt{1 + ((R_L + r_g) C \omega)^2}} = \frac{5\pi \cdot 1 \cdot 10^{-6} \cdot 2\pi \cdot 1000}{1'395}$ $\omega = C (R_L + r_g) = 2 \cdot \pi \cdot 1000 \cdot 1 \cdot 10^{-6} \cdot 100 = 0'628$

$= \frac{0'314}{1'395} = 0'225 \cdot 1$

$\Rightarrow V_L = 225 mV$

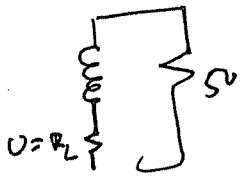
$\frac{R_L C \omega}{\left(R_L + R_g\right) k}$

@ 20 kHz estamos a una frecuencia muy superior a la de corte

por tanto $V_o = \frac{R_g \cdot R_L}{R_L + r_g} = 0'5 \cdot 100 mV = 50 mV$

@ 1.591 Hz es precisamente la frecuencia de corte.

por tanto: $V_o = 0'5 \cdot 0'2 V_i = 0'5 \cdot 0'7 \cdot 100 mV = 35 mV$



@ 1 kHz $\angle \omega$

$\frac{V}{Z_2} \angle 0'05 \cdot \frac{V}{50}$ $Z_2 \gg \frac{5V}{0'05} = 1 k\Omega$

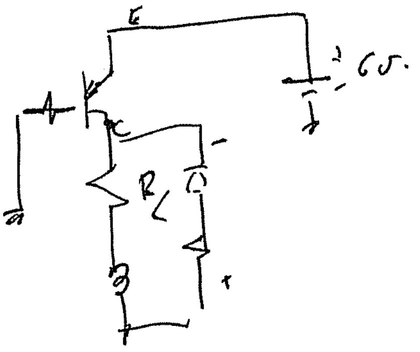
$1k = \angle = 2\pi f$

$\angle = \frac{1.000}{2\pi \cdot 1000} = 159'1 mH$

Figura 2. Transistor Q_1 silici, PNP $\beta_{mín} = 50$ // $\beta_{max} = 150$ // L_1

Si $R_L = 33\Omega$. Calcula valor mínim R_1 per garantizar ... per caso que, cuando ... Q_1 passe a saturació — ... R ...

$V_1 =$ · 6,0 V



$I_C = \frac{6-0'2}{R_L} = \frac{6-0'2}{33} = 175'75\,mA$

$I_B > \frac{I_C}{\beta_{mi}} = \frac{175'75}{50} = 3'51\,mA$

$\frac{6-0'8}{R_1} = 3'51\,mA \Rightarrow R = 1'48\,k\Omega$

$V_{CE} =$ 0'1 r 100

$\frac{6-0'8}{4'7k} = 1'1\,mA$

$35\,mA = \frac{6-0'2}{R} \Rightarrow$

$R_{mi} = 165\,\Omega$

$\frac{L}{R} = \frac{100}{320}$

$\frac{L}{R_2 + R} = \frac{1m\,H}{320} = \frac{0'1}{320}$

$R_2 + R_3$