Examen partiel 2018

1-a) en boucle fermée, $\omega_{-3dB} = \beta \omega_t$ or $\beta \simeq \frac{1}{|A_{BF}|}$

ici $A_{BF} = -\frac{R_2}{R_1} = -50$ V/V donc $\omega_{-3dB} \simeq \frac{1}{50} \cdot 2\pi \cdot 15$ M rad/s

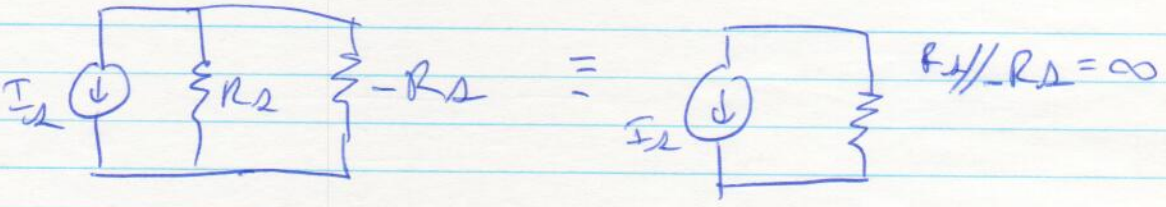
$= 2\pi \cdot 0{,}3$ M rad/s

sinon, $\beta = \frac{v_-}{v_0} = \frac{R_1}{R_1+R_2} = \frac{R_1}{R_1+50R_1} = \frac{1}{51}$ ...

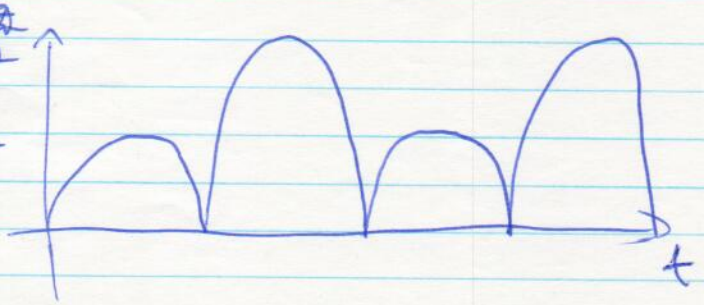
b) $v_0 = \left[v_1 \left(-\frac{R_3}{R_1} \right) + v_2 \left(-\frac{R_3}{R_2 + \frac{1}{sC_1}} \right) \right] \cdot \left(\frac{-\frac{1}{sC_2} \,//\, R_5}{R_4} \right)$

c) Régulateur de tension : produit une tension constante et un courant variable. ~~Vref~~ $V_{reg} = V_{ref}$ par c.c. virtuel.

d) Annulation de la résistance de source R_s d'une source de courant.



e)



2a) $Z_{in} = \infty$, $A_{cm} = 1 V/V$

b) $v_1 = v_{icm} - \frac{v_{id}}{2} = 1{,}5 \cos 2\pi f_2 t + \frac{0{,}1}{2} \cos 2\pi f_1 t$

$v_2 = v_{icm} + \frac{v_{id}}{2} = 1{,}5 \cos 2\pi f_2 t - \frac{0{,}1}{2} \cos 2\pi f_1 t$

$v_{o1} = 1{,}5 \cos 2\pi f_2 t - \frac{1{,}1}{2} \cos 2\pi f_1 t$

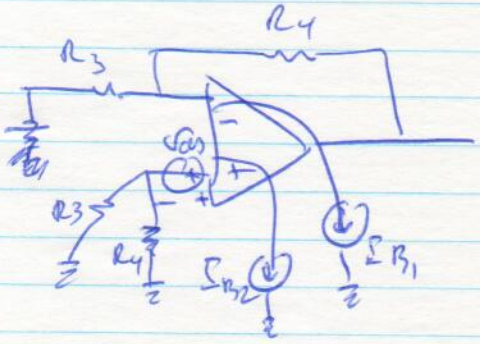
$v_{o2} = 1{,}5 \cos 2\pi f_2 t - \frac{1{,}1}{2} \cos 2\pi f_1 t$

$v_o = 1{,}1 \cos 2\pi f_1 t + \frac{1{,}5 \cos 2\pi f_2 t}{10000}$

c) $TRMC_{complet} = TRMC_{étage1} + TRMC_{étage2}$

$= 20 \log\left(\frac{11}{1}\right) + 80\,dB = \underline{100{,}8\,dB}$

d)



(par superposition)

$v_o = v_{o1}\left(1 + \frac{R_4}{R_3}\right) + (-I_{B2} R_3 // R_4) + R_4\left(I_{B1} - I_{B2}\frac{R_3 // R_4}{R_3}\right)$

e) $\frac{v_o}{v_{id}} = \left(1 + \frac{1}{2R_2C_1}\right)\frac{1}{2C_4R_3}$

3-a) $1 + 1{,}414\Omega + \Omega^2$, $Q_1 = \frac{1}{1{,}414} = 0{,}707$.

comme $A_{max} = 3dB$, $\varepsilon = 1$ et $\omega_{01} = 2\pi \cdot 1000\,Hz$

b) $T_1(s) = \frac{\omega_{01}^2}{s^2 + \frac{\omega_{01}}{Q=0{,}707} s + \omega_{01}^2} = \frac{aK_1G_1G_2/C^2}{s^2 + s\left(G_1+G_2(2-K)\right) + G_1G_2/C^2}$

si $R_1 = R_2 = R$, $\omega_{01} = \frac{1}{RC}$ donc $C = 10\,nF$

$R = \frac{1}{2\pi \cdot 10000 \cdot 10nF} = 1592\,\Omega$

$R_A = 1592\,\Omega$, donc $R_B = (2 - 1/Q) R_A = 932\,\Omega$

$K_1 = 3 - 1/Q = 3 - \frac{1}{0{,}707} = 1{,}586\ V/V$

c) $1 + 1{,}414\Omega + \Omega^2$, $Q_2 = 0{,}707$

$\omega_{02} = 2\pi \cdot 100Hz$

d) prototype passe-bas: $T_2'(\Omega) = \frac{K_2 \omega_{02}^2}{\Omega^2 + \frac{\omega_{02}}{0{,}707} + \omega_{02}^2}$

$T(\Omega) = \frac{K_2 \Omega^2}{\Omega^2 + \frac{\omega_0^2}{0{,}707} + \omega_{02}^2}$

$R = \frac{1}{\omega_{02} C} = 159\,155\,\Omega$

$R_A = 159\,155\,\Omega$
$R_B = 93\,264\,\Omega$
$K_2 = 1{,}586\ V/V$

e) $T(s) = \dfrac{K_1 \omega_{01}^2}{s^2 + \frac{\omega_{01}}{0.707} + \omega_{01}^2} \cdot \dfrac{K_2 s^2}{s^2 \frac{\omega_{02}}{0.707} + \omega_{02}^2}$