RECUPERACIÓ

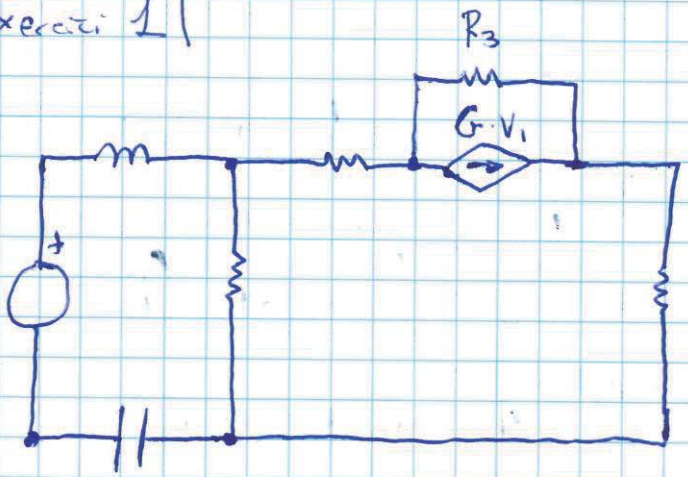
1er PARCIAL

SIEK 13-14/Q2

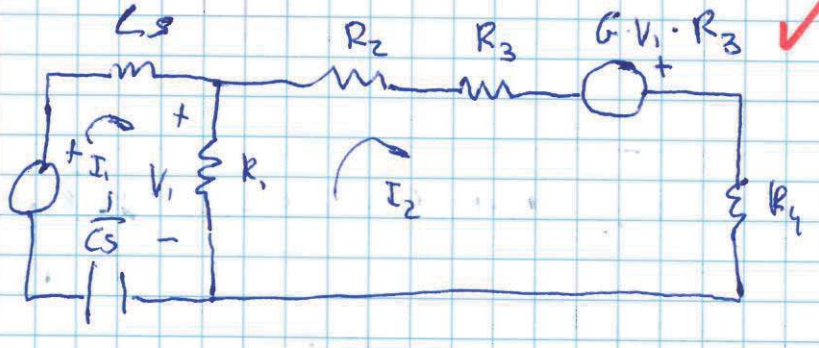
1r. Cognom 2n. Cognom Nom D.N.I.

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Exercici 1



3,5



✓

0,5

$$I_1 \cdot C_s - V_a + R_1 \cdot (I_1 - I_2) + I_1 \frac{1}{Cs} = 0$$ ✓

$$I_2 \cdot R_2 + I_2 \cdot R_3 - G \cdot R_1 (I_1 - I_2) \cdot R_3 + I_2 R_4 - R_1 \cdot (I_1 - I_2) = 0$$

✓

$$\begin{vmatrix} Cs+\frac{1}{Cs}+R_1 & -R_1 \\ -R_1-GR_1R_3 & R_2+R_3+R_4+GR_1R_3+R_1 \end{vmatrix} \cdot \begin{vmatrix} I_1 \\ I_2 \end{vmatrix} = \begin{vmatrix} V_a \\ 0 \end{vmatrix}$$

$$I_1 = \frac{\begin{vmatrix} V_a & -R_1 \\ 0 & R_2+R_3+R_4+GR_1R_3+R_1 \end{vmatrix}}{\begin{vmatrix} Cs+\frac{1}{Cs}+R_1 & -R_1 \\ -R_1-GR_1R_3 & R_2+R_3+R_4+GR_1R_3+R_1 \end{vmatrix}} = \frac{V_a\cdot(R_2+R_3+R_4+GR_1R_3+R_1)}{\left(Cs+\frac{1}{Cs}+R_1\right)(R_2+R_3+R_4+GR_1R_3+R_1)-R_1(R_1-GR_1R_3)}$$

$$= \frac{V_a(R_2+R_3+R_4+GR_1R_3+R_1)}{Cs(R_2+R_3+R_4+GR_1R_3+R_1)+\frac{1}{Cs}\cdot(R_2+R_3+R_4+GR_1R_3+R_1)+R_1(R_2+R_3+R_4)}$$

$$V_C = \frac{V_a(R_2+R_3+R_4+GR_1R_3+R_1)}{s^2\cdot C^2L(R_2+R_3+R_4+GR_1R_3+R_1)+Cs(R_2+R_3+R_4+GR_1R_3+R_1)+Cs\,R_1(R_2+R_3+R_4)}\cdot\frac{1}{Cs}$$

$$\frac{V_C}{V_a} = \frac{(R_2+R_3+R_4+GR_1R_3+R_1)}{C^2L(R_2+R_3+R_4+GR_1R_3+R_1)}\cdot\frac{1}{s^2+\frac{R_1(R_2+R_3+R_4)Cs}{C^2L(R_2+R_3+R_4+GR_1R_3+R_1)}+\frac{R_2+R_3+R_4}{C^2L(R_2+R_3+R_4+GR_1R_3+R_1)}}$$

$$\frac{V_C}{V_a} = \underbrace{1}_{K}\cdot\frac{\frac{(R_2+R_3+R_4+GR_1R_3+R_1)}{C^2L(R_2+R_3+R_4+GR_1R_3+R_1)}}{s^2+\underbrace{\frac{R_1(R_2+R_3+R_4)Cs}{C^2L(R_2+R_3+R_4+GR_1R_3+R_1)}}_{2\zeta\omega_n s}+\underbrace{\frac{(R_2+R_3+R_4+GR_1R_3+R_1)}{C^2L(R_2+R_3+R_4+GR_1R_3+R_1)}}_{\omega_n^2}}$$

$\omega_n^2 = ?$ $\quad \frac{1}{CL}$

b)

$$H(s) = \frac{V_c(s)}{V_a(s)} = \frac{210000}{s^2+190s+100000} = \frac{100000}{s^2+190s+100000} \cdot 2,1$$

$K = 2,1$ ✓

$\omega_n = \sqrt{100000} = 316,22768$ ✓

$$SIP = e^{-\frac{0,3}{\sqrt{1-0,3^2}}\pi} = 0,3723$$ ✓

$\sqrt{1-\xi^2} = 0,954$

$2\xi\omega_n = 190$

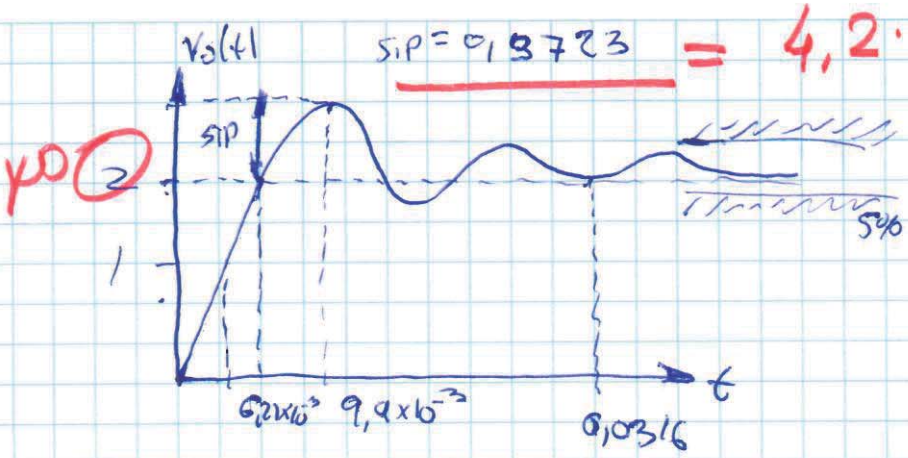
$\xi = 0,3$ ✓

$\omega_d = 301,6813 = \omega_n \cdot \sqrt{1-\xi^2}$ ✓

$$t_r = \frac{\pi-\beta}{\omega_d} = 6,21\times10^{-3}\,s$$ ✓

$$t_s = \frac{3}{\xi\omega_n} = 0,0316$$ ✓

$$t_p = \frac{\pi}{\omega_d} = 9,9\times10^{-3}$$ 0,2



$SIP = 0{,}3723 = 4{,}2 \cdot 1{,}37 = 5{,}\ldots$

0,2

2,5

1r. Cognom 2n. Cognom Nom D.N.I.

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c)

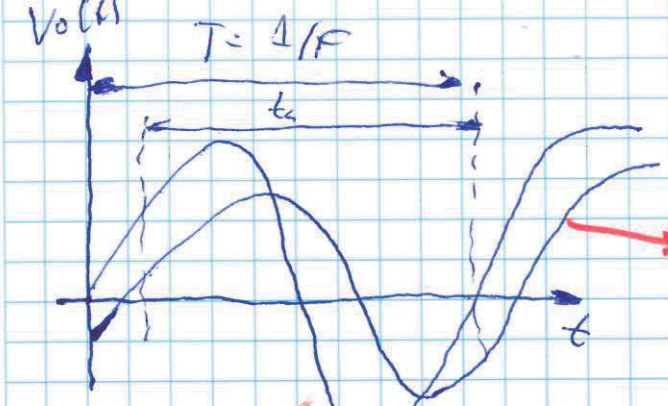
$$|H(j\omega)| = 2{,}1 \frac{100000}{\sqrt{\left(100000 - (2\pi \cdot 20)^2\right)^2 + \left(2 \cdot 0{,}3 \cdot \sqrt{100000} \cdot 2\pi \cdot 20\right)^2}} =$$

$\xi = 0{,}3$

$$= \frac{210000}{\sqrt{7091093865 + \ldots}} = 2{,}4\ V$$ ✓

$$\not\prec H(j\omega) = \tan^{-1}\left(\frac{2\xi\omega_n\omega}{\omega_n^2 - \omega^2}\right) = -1{,}57\ (-89{,}95°)$$

No.



+ t_{ram}

1,3

No.

$$v_o(t) = 24 \sin(40\pi t - 1{,}57)$$ ✓

$$t_1 = 2{,}4 \frac{1}{20} \cdot 360 = 43{,}2°$$?

Exercici 1

b) $V_c(t)$ $\quad v_a(t) = 2 \cdot u(t)$

$v_a(s) = 2 \cdot \frac{1}{s}$

$\omega_n = \sqrt{100000} = 316,2277$ ✓

$\zeta = \frac{190}{2\omega_n} = 0,3$ ✓

$V_c(s) = 2 \cdot \frac{1}{s} \cdot \frac{200000}{s^2+190s+100000}$

$V_c(s) = 2 \frac{1}{s} \cdot \frac{200000}{s^2+190s+100000} = 2 \cdot \frac{1}{0} \cdot \frac{200000}{100000} =$

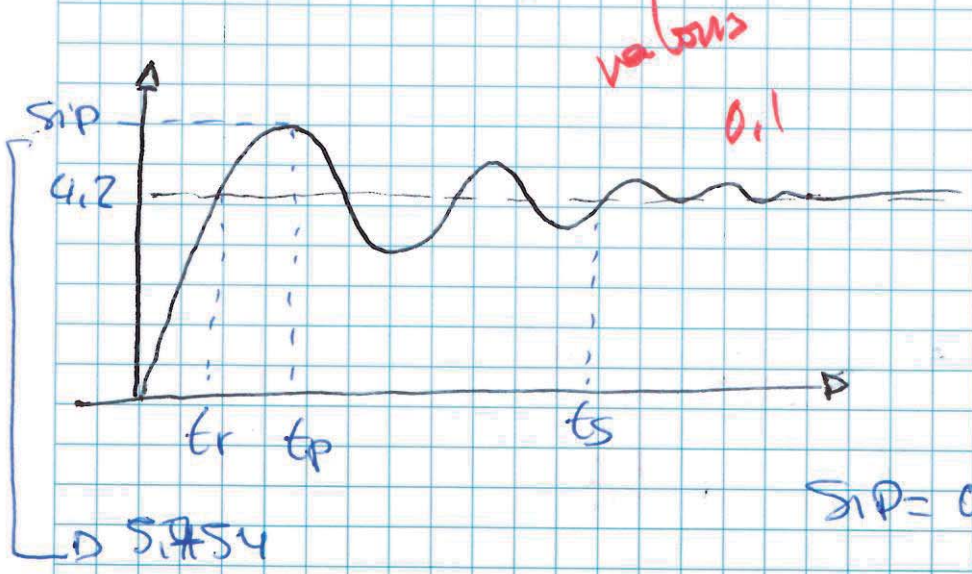
$s \to 0$

$= \infty$

$V_c(\infty) = s \cdot \lim_{s \to 0} 2 \cdot \frac{1}{s} \cdot \frac{200000}{s^2+190s+100000} =$

$= \frac{200000 \cdot 2}{100000} =$

valor final: $V_c(\infty) = 4,2$ ✓



$\omega_d = 301,662$ rad/s

$t_p = 0,010414$ s ✓

$\beta = 1,26$ rad ✓

$t_r = 6,237$ ms ✓

$t_{s5\%} = 0,03165$ s ✓

$SiP = 0,37 - 0,37\%$ ✓

7,9

$\omega = \frac{2\pi}{T}$ $\omega = 20 \cdot 2\pi = 40\pi$

$\omega = \frac{f_R}{2\pi}$

c) $v_C(t)$

$v_a(t) = 10 \cdot \sin(\underbrace{2\pi 20}_{\omega} \cdot t)$ on $f = 20\,Hz$

$K = 2,1$

$$V_C(s) = \frac{200000}{s^2 + 120s + 400000} \cdot V_a$$

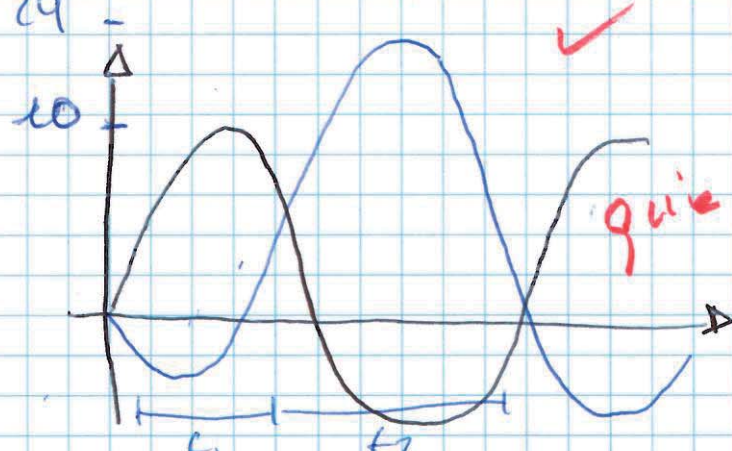
$$|H(j\omega)| = \frac{K \cdot \omega_n^2}{-\omega^2 + 2\xi\omega_n j\omega + \omega_n^2}$$ ✓

$$|H(j\omega)| = K \frac{\omega_n^2}{\sqrt{(\omega_n^2 - \omega^2)^2 + (2\xi\omega_n\omega)^2}} = 2,3994496$$

$$\angle H(j\omega) = \tan^{-1}\left(\frac{2\xi\omega_n\omega}{\omega_n^2 - \omega^2}\right) = -0,2759\,rad = -15,80°$$ ✓

$$V_C(s) = 10 \cdot 2,39944 \cdot \sin(2\pi \cdot 20t - 0,2759\,rad)$$ ✓

$$V_C(s) = 23,9944 \cdot \sin(2\pi \cdot 20t - 0,2759\,rad)$$ ✓



$T = \frac{1}{20} = 0,05$

(2)

$t_1 = \frac{0,2759}{2\pi} \cdot T = 7,19 \cdot 10^{-3}\,s$

$t_2 = \frac{\pi - 0,2759}{2\pi} 0,05$

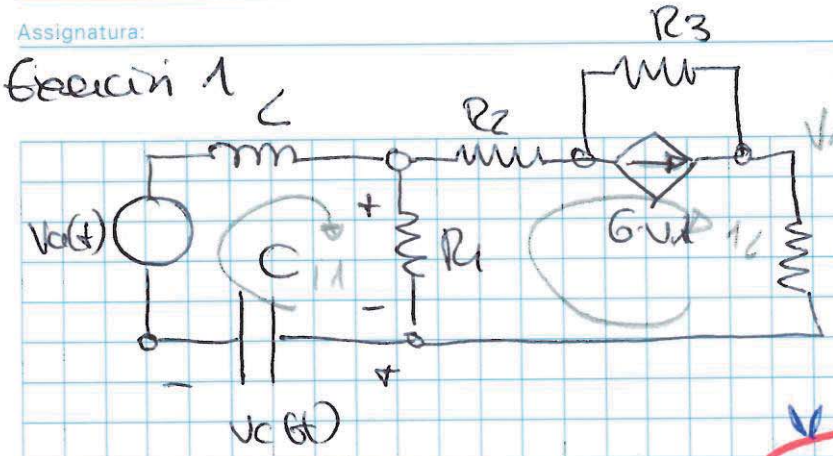
$= 0,04785$

1r. Cognom | 2n. Cognom | Nom | D.N.I.

Especialitat:

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Exercici 1



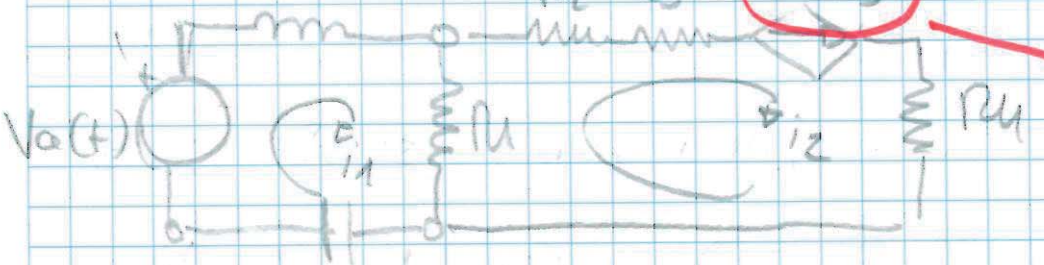
$V_1 = \frac{i_1 - i_2}{R_1}$

$V_c = \frac{1}{Cs} \cdot i_1 \; V_a$

NO.

$V_1 = i_1 \cdot R_1$

$\frac{G\,V_1}{R_3} = i_2$ $\quad \frac{G \cdot i_1 R_1}{R_3} = i_2$



Font de tensió de valor $G V_1 \cdot R_3$

$$V_a(s) = Cs \cdot i_1 + R_1 (i_1 - i_2) + \frac{1}{Cs} i_1$$

$$0 = R_2 \cdot i_2 + R_3 \cdot i_2 + R_4 i_2 + R_1 (i_1 - i_2)$$

$$\begin{pmatrix} Cs + R_1 + \frac{1}{Cs} & -R_1 \\ -R_1 & R_2 + R_3 + R_4 + R_1 \end{pmatrix} \begin{pmatrix} i_1 \\ i_2 \end{pmatrix} = \begin{pmatrix} V_a(s) \\ 0 \end{pmatrix}$$

0,4 V

$G V_1 R_3$ Cal fent ca hlode i cal bona l'element.

1r. Cognom | 2n. Cognom | Nom | D.N.I.

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B)

$$H(s) = \frac{2'71 \times 10^5}{s^2 + 140s + 10^5} = 2'71 \frac{10^5}{s^2 + 140s + 10^5}$$

$K_0 = 2'71$

$\omega_n = \sqrt{10^5} = 316'227766 \simeq 316'28$ ✓

$\xi = \frac{140}{2\sqrt{10^5}} = 0'300471 \simeq 0'3$ ✓

$SIP = e^{-\frac{0'3 \cdot \pi}{\sqrt{1-0'3^2}}} = 0'372 \rightarrow 37'2\%$ ✓

$t_p = \pi/\omega_d = \frac{\pi}{\omega_n \sqrt{1-\xi^2}} = \frac{\pi}{316'28 \sqrt{1-0'3^2}} = 0'0149\,seg$ ✗

10,4

$\beta = \tan^{-1}\left(\frac{316'28\sqrt{1-0'3^2}}{0'3 \cdot 316'28}\right)$

$\beta = 72'54 = 1'2660$

$t_r = \frac{\pi - 1'2660}{316'28\sqrt{1-0'3^2}} = 6'29$ mil segundos ✓

$t_{5\%} = \frac{3}{0'3 \cdot 316'28} = 0'031617\,seg$ ✓

$Vd(t_p) = K_0 V_0 (SIP + 1)$

$Vo(t_p) = 2'71 \cdot 2 (0'372 + 1)$

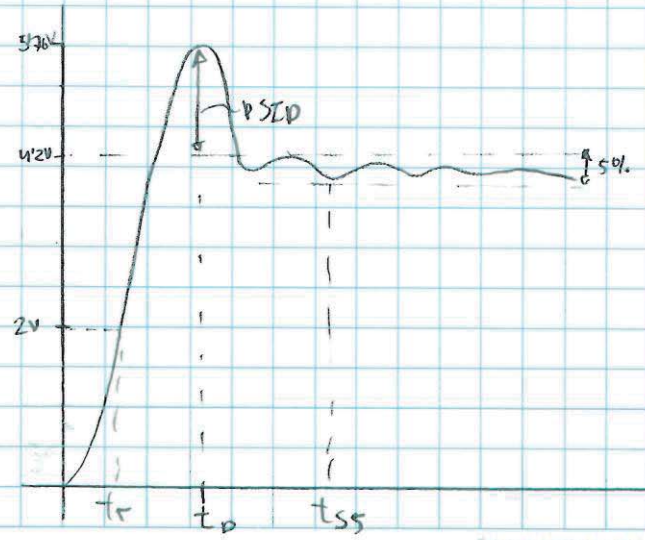
$Vo(t_p) = 5'17624$

$SIP \cdot Vo(\infty) = Vo(t_p) - Vo(\infty)$

$(1 + SIP) \cdot Vo(\infty) = Vo\,t_p$

$Vo(\infty) = Vo(t_p)/1+SIP = \frac{5'17624}{1'372} = 4'2V$ ✓

1,3



0,1

exacto valor.

c) $V_a = 10 \sin(\underbrace{2\pi \cdot 20}_{\omega} t)$ $f = 20\,Hz$; $V_c = 10 \cdot |H(j\omega)| \sin(40\pi t + \measuredangle H(j\omega))$

Modulo: $|H(j\omega)| = 2'1 \dfrac{316'28^2}{\sqrt{(316'28^2 - (40\pi)^2)^2 + (2 \cdot 0'3 \cdot 316'28 \cdot 40\pi)^2}}$

$$|H(j40\pi)| = 1'14\,2557$$

Fase: $\measuredangle H(j40\pi) = -\tan^{-1}\left(\dfrac{2 \cdot 0'3 \cdot 316'28 \cdot 40\pi}{316'28^2 - (40\pi)^2}\right) = -15'80^\circ = -0'2758\ rad$

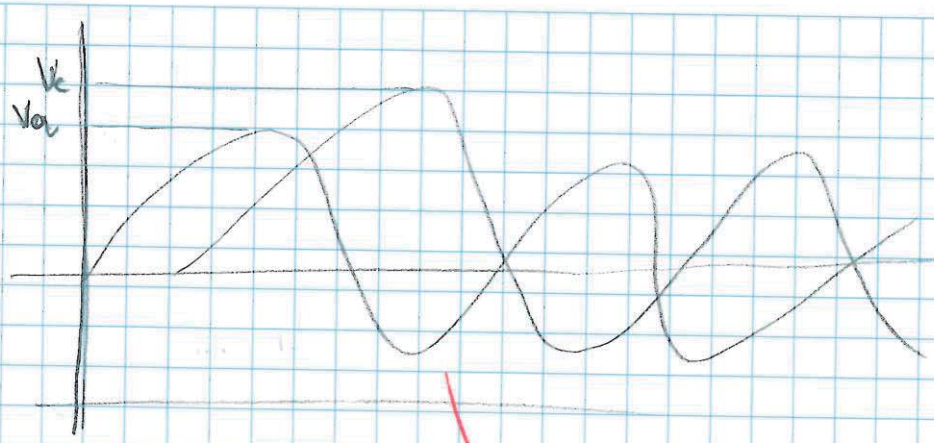
(1)

$V_c = 10 \cdot 1'14\,2557 \cdot \sin(40\pi t - 0'2758) = 11'42557 \sin(40\pi t - 0'27\,58\,V)$

1r. Cognom 2n. Cognom Nom

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$T = \frac{2\pi}{\omega} = 0'019865$

$t_1 = \frac{H}{2\pi} \cdot T = 3'6 \text{ ms}$

$t_2 = T - T_1 = 0'016258$

més proius.

0,3