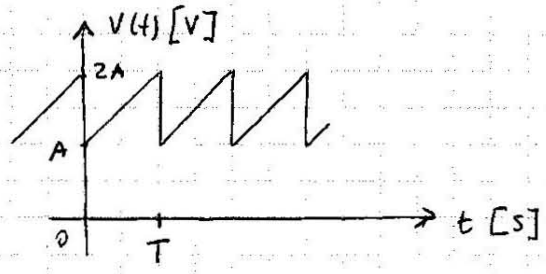
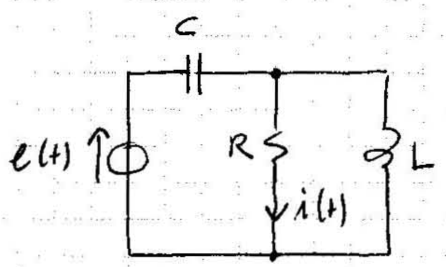
ELETTRONICA

1) SCRIVERE L'ESPRESSIONE DEL SEGNALE IN FIGURA E DETERMINARNE IL VALORE EFFICACE V_{RMS}



2) DETERMINARE LA CORRENTE $i(t)$ RAPPRESENTATA IN FIGURA



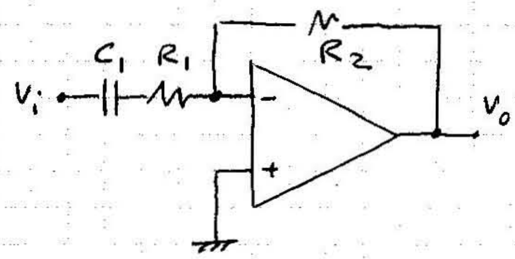
$R = 20\,\Omega$

$L = 2\,H$

$C = 5\,mF$

$e(t) = 100 \cos 10t$ V

3) CON RIFERIMENTO AL CIRCUITO IN FIGURA



$R_1 = 2{,}5\,\Omega$

$R_2 = 10\,\Omega$

$C_1 = 1\,F$

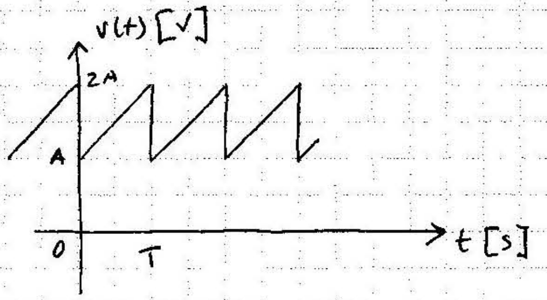
a) DETERMINARE LA FUNZIONE DI TRASFERIMENTO

b) DETERMINARE POLI E ZERI

c) SCRIVERE L'ESPRESSIONE DEL MODULO E DELLA FASE DELLA FdT

D) RAPPRESENTARE I DIAGRAMMI DI BODE

1)



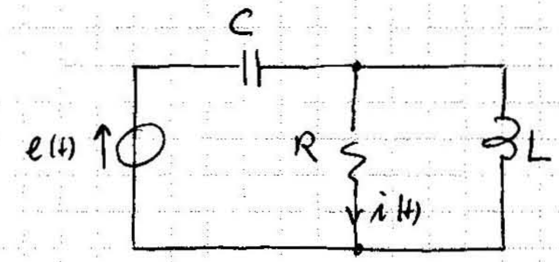
$$v(t) = A + \frac{A}{T}t = A\left(1+\frac{t}{T}\right) V$$

$$v^2(t) = A^2\left(1+\frac{t}{T}\right)^2 = A^2\left[1+2\frac{t}{T}+\frac{t^2}{T^2}\right]$$

$$V_{RMS} = \sqrt{\frac{1}{T}\int_0^T v^2(t)\,dt} = \sqrt{\frac{1}{T}\int_0^T A^2\left(1+\frac{2t}{T}+\frac{t^2}{T^2}\right)dt} = A\sqrt{\frac{1}{T}\left[t+\frac{2}{T}\frac{t^2}{2}+\frac{1}{3}\frac{t^3}{T^2}\right]_0^T} =$$

$$= A\sqrt{\frac{1}{T}\left[T+\frac{2}{T}\cdot\frac{T^2}{2}+\frac{1}{3}\frac{T^3}{T^2}\right]} = A\sqrt{\frac{1}{T}\left[2T+\frac{1}{3}T\right]} = A\sqrt{2+\frac{1}{3}} = \sqrt{\frac{7}{3}}A$$

2)

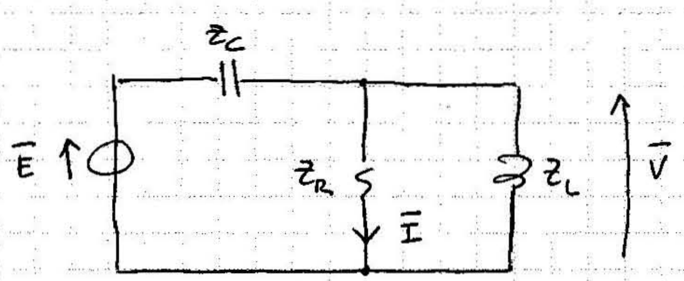


$R = 20\,\Omega$
$L = 2\,H$
$C = 5\,mF$
$e(t) = 100\cos 10t$ V

FASORI E IMPEDENZE $\quad (\omega = 10\ rad/s)$

$$\bar{E} = 100\ V \qquad Z_R = R = 20\,\Omega \qquad Z_L = j\omega L = j20\,\Omega \qquad Z_C = \frac{1}{j\omega C} = -j20\,\Omega$$

CIRCUITO NEL DOMINIO DEI FASORI



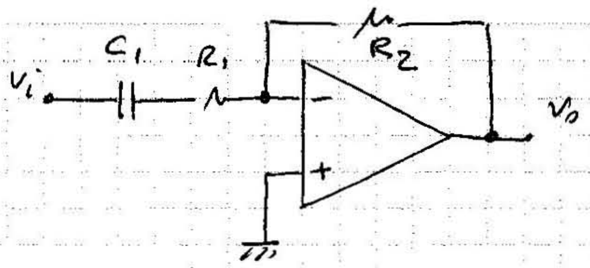
$$Z_R /\!/ Z_L = \frac{j\omega RL}{R + j\omega L} = \frac{j20}{1+j} = \frac{j(1-j)20}{(1+j)(1-j)} = \frac{(1+j)20}{2} = (1+j)10\ \Omega$$

$$\bar{V} = \frac{Z_R /\!/ Z_L}{Z_R /\!/ Z_L + Z_C}\bar{E} = \frac{(1+j)10}{(1+j)10 - j20}100 = \frac{1+j}{1-j}100 = j100\ V$$

$$\bar{I} = \frac{\bar{V}}{Z_R} = \frac{j100}{20} = j5\ A = 5e^{j\pi/2}\ A$$

$$i(t) = Re\left[\bar{I}e^{j\omega t}\right] = 5\cos\left(10t + \frac{\pi}{2}\right) = -5\sin 10t\ A$$

3)



$R_1 = 2{,}5\,\Omega$

$R_2 = 10\,\Omega$

$C_1 = 1\,F$

a) $F(s) = \dfrac{V_0}{V_i} = -\dfrac{Z_2}{Z_1}$ con $\begin{cases} Z_2 = R_2 \\ Z_1 = R_1 + \dfrac{1}{sC_1} = \dfrac{1 + sR_1C_1}{sC_1} \end{cases}$

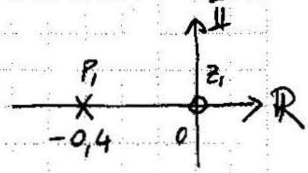
$$F(s) = -\frac{R_2}{\dfrac{1+sR_1C_1}{sC_1}} = -\frac{sR_2C_1}{1+sR_1C_1}$$

SOSTITUENDO

$$F(s) = -\frac{10s}{1+2{,}5s} \qquad F(s) = \frac{N(s)}{D(s)}$$

b) ZERI $N(s) = 0$ $s = 0$ (z_1)

POLI $D(s) = 0$ $1 + 2{,}5s = 0$ $s = -0{,}4$ (p_1)



c) $s \to j\omega$ $F(j\omega) = -\dfrac{j10\omega}{1+j2{,}5\omega}$

$$|F(j\omega)| = \frac{10\omega}{\sqrt{1+(2{,}5\omega)^2}} \qquad \varphi[F(j\omega)] = -90^\circ - \operatorname{atg} 2{,}5\omega$$

d)