Sinais e Sistemas Electrónicos

Exercícios - 7

Circuitos em regime sinusoidal

(de "Exercícios Parte 2 AC A", João Nuno Matos, 2015)

1- Converta os seguintes números complexos para a forma polar

a) $z = 5 + j5$

b) $z = 10e^{-t/10}\cos(\pi t + \pi/4) + j100e^{-t/10}\sin(\pi t + \pi/4)$

c) $z = 1/(5 + j5)$

2- Converta os seguintes números complexos para a forma cartesiana.

a) $z = 5e^{j\frac{\pi}{4}}$

b) $z = 4e^{j(2\pi t + 3\pi/4)} + 5e^{[(t/10) + j\pi t]}$

c) $z = 1/\left[5e^{j(2\pi t + \pi/4)}\right]$

3- Calcule a impedância vista entre os terminais A e B dos circuitos da fig. 1. Admita que os circuitos estão a ser operados em regime sinusoidal com $\omega = 1Mrad/s$. Considere $R_1 = R_3 = 1K\Omega$, $R_2 = 2K\Omega$, $C_1 = C_2 = 10nF$, $L_1 = 200\mu H$ e $L_2 = 100\mu H$.

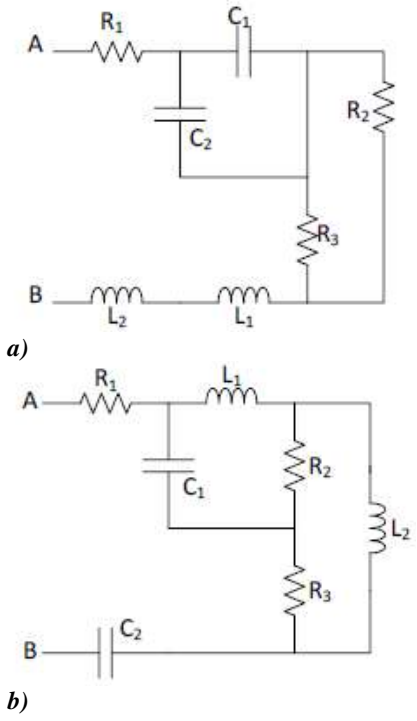

Fig. 1

4- Considere os circuitos da fig. 2. Sabendo que $Vi = V_m\cos(\omega t)$ *[V],* calcule *Vo(t)* para cada um dos casos.

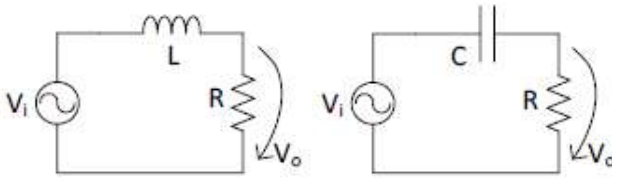

Fig. 2

5- Para o circuito da fig. 3 calcule *i(t)* e *v(t)*. Considere $V_s = 17\cos(3t)$ *[V], R=5/3Ω, L=5H* e *C=(1/25)F.*

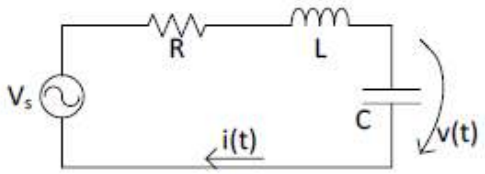

Fig. 3

6- Determine I_1 e I_2 no circuito da fig. 4, sabendo que $Z=78+j45$ *[Ω],* $V_1 = 250\sqrt{2}e^{-j30^\circ}$ *[V]* e $V_2 = 250\sqrt{2}e^{-j90^\circ}$ *[V].*

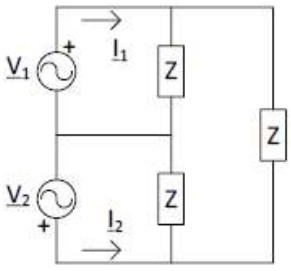

Fig. 4

7- Considere o circuito da fig. 5. Os valores eficazes das correntes I_1, I_2, e I_S são, respectivamente, *18, 15* e *30A*. $R_2 = 4\Omega$.
Determine R_1 e o valor da impedância da bobina L_1.

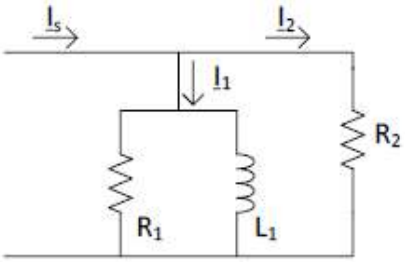

Fig. 5

8- Determine o equivalente de Thévenin do circuito da fig. 6 entre os terminais A e B.
Considere $\omega = 5\ rad/s$, $V_s = 9\angle 0^o[V]$, $R_1 = 6\Omega$, $R_2 = 3\Omega$, $C_1 = (1/15)F$ e $A_V = 2$.

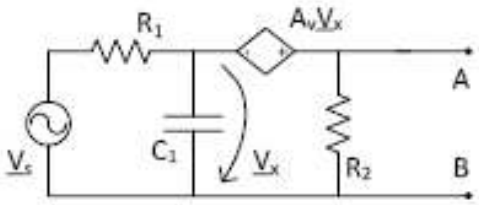

Fig. 6

9- Determine o equivalente de Norton do circuito da fig. 7 entre os terminais A e B.
Considere $i_s(t) = 20\cos(10^4 t)[A]$, $R_1 = 10K\Omega$, $L_1 = 2H$ e $C_1 = 10nF$.

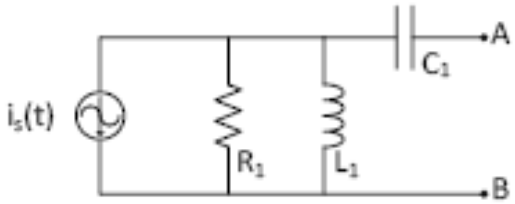

Fig. 7

10- Para o circuito da fig. 8, calcule os valores instantâneos de V_a, I_a e da potência absorvida pelo elemento A, no instante $t = 2.5ms$.
Considere $\omega = 1000\ rad/s$, $V_s = 150\angle 0^o[V]$, $I_1 = 6 + j\ [A]$, $I_2 = 2 - j5\ [A]$ e $V_1 = 100 - j40\ [V]$.

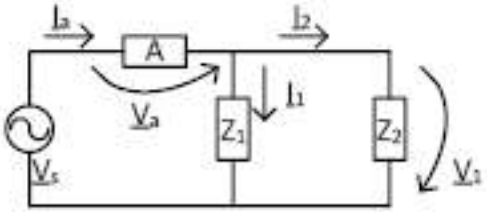

Fig. 8

Respostas

1- a) $5\sqrt{2}\angle 45^o$;

b) $10e^{-t/10}\sqrt{[\cos(\pi t+\pi/4)]^2+[10\sin(\pi t+\pi/4)]^2}$; $\angle artcg[10tg(\pi t+\pi/4)]$

c) $(1/10)\sqrt{2}\angle -45^o$

2- a) $5\frac{\sqrt{2}}{2}+j5\frac{\sqrt{2}}{2}$;

b) $4\cos(2\pi t+3\pi/4)+5e^{t/10}\cos(\pi t)+ + j[4\sin(2\pi t+3\pi/4)+5e^{t/10}\sin(\pi t)]$;

c) $\frac{1}{5}\cos(2\pi t+\pi/4)-j\frac{1}{5}\sin(2\pi t+\pi/4)$.

3- a) $Z=(1667+j250)\Omega$; **b)** $Z=(990-j200)\Omega$

4-

a) $Vo(t)=\frac{V_m}{\sqrt{1+(\omega L/R)^2}}\cos(\omega t-arctg(\omega L/R))$;

b) $Vo(t)=\frac{V_m}{\sqrt{1+(1/\omega RC)^2}}\cos(\omega t-arctg(1/\omega RC))$;

5- $i(t)=\frac{3\sqrt{17}}{5}\cos(3t-76^o)[A]$;
$v(t)=5\sqrt{17}\cos(3t-166^o)[V]$

6- $I_1=6.5\angle -25.23^o[A]$, $I_2=6.8\angle -150^o[A]$

7- $R_1=5.13\Omega$, $jX_L=j4.39\Omega$

8- $V_{TH}=3.71\angle -16^o[V]$, $Z_{TH}=2.47\angle -16^o[\Omega]$

9- $I_{TH}=17.9\angle -116.6^o[A]$, $Z_{TH}=10\angle -36.9^o[K\Omega]$

10- *$V_a(2.5ms) = -64V$; $I_a(2.5ms) = -4A$; $P_a(2.5ms) = 256W$.*