Série 2

Prob 1

a) $v = -4 \operatorname{sen}(30t + 50)$

Sabemos que $-\operatorname{sen}\alpha = \cos(\alpha + 90)$

Logo $v = 4\cos(30t + 140)$

$\Rightarrow V = 4 \angle 140°$

b) $i = 6\cos(50t - 40)$

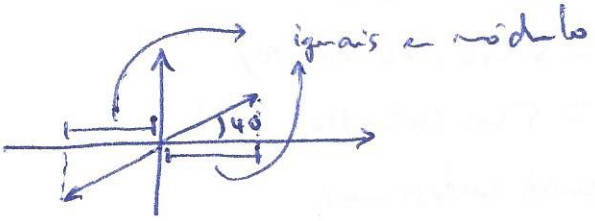
como i já está na forma $\cos\alpha \Rightarrow I = 6 \angle -40°$

Prob. 2

a) $v = -7\cos(2t + 40)$

Logo $v = 7\cos(2t + 220)$

$V = 7 \angle 220°$



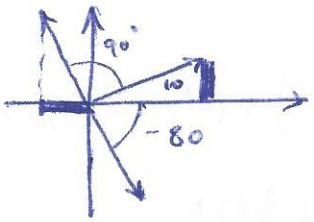
b) $i = 4\operatorname{sen}(10t + 10)$

$= -4\cos(\ldots + 100)$

$= 4\cos(\ldots + 280)$

$= 4\cos(\ldots - 80)$

$I = 4 \angle -80°$



outra forma é $\operatorname{Se}\alpha = \cos(\alpha - 90)$

Prob. 3

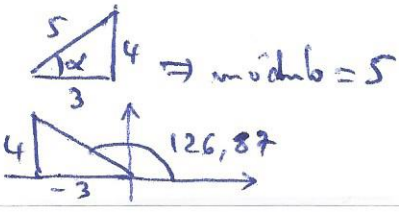
a) $V = j8e^{-j20}$

$j = 1 \angle 90° \Rightarrow V = (1 \angle 90°) * (8 \angle -20°) = 8 \angle 90-20 = 8 \angle 70°$

$\Rightarrow v = 8\cos(\omega t + 70°)\ V$

b) $I = -3 + j4 = 5 \angle 126{,}87°$

$i(t) = 5\cos(\omega t + 126{,}87$



Prob 4 Por definição $V = X \angle \phi$

$$v(t) = X \cos(\omega t + \phi) + j X \operatorname{sen}(\omega t + \phi)$$

$i_1 = 4 \cos(\omega t + 30)$

o fasor será $I_1 = 4 \angle 30$

em coordenadas cartesianas temos

$I_1 = 3{,}464 + j2$

para $i_2(t) = 5 \operatorname{sen}(\omega t - 20)$

convertemos em cos

$= 5 \cos(\omega t - 20 - 90)$

$= 5 \cos(\omega t - 110)$

em coord. cartesianas

$I_2 = 5 \cos(\omega t - 110) + j \operatorname{sen}(\omega t - 110)$

$= -1{,}71 - j4{,}698$ (para $t=0$)

$I_1 + I_2 = (3{,}464 + j2) + (-1{,}71 - j4{,}698)$

$I_T = 1{,}754 - j2{,}698$

$= 3{,}2 \angle -56{,}9$

ou seja no tempo

$i_t(t) = 3{,}2 \cos(\omega t - 56{,}9)$

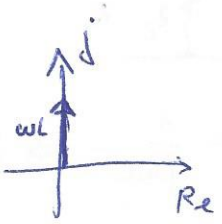
Prob 5. $L = 0{,}1\ H$

$v = 12\cos(60t + 45)$

Qual a corrente no indutor?

$V = zI \qquad z = j\omega L$

$= j6 \Rightarrow 6\angle 90$



$I = \frac{V}{z} = \frac{12\angle 45}{6\angle 90} = 2\angle -45$

Passando para o domínio do tempo

$i(t) = 2\cos(60t - 45)$

Prob. 6

$v = 6\cos(100t - 30)$

$V = 6\angle -30$

$z_c = \frac{1}{j\omega c} \qquad \omega c = 5\times 10^{-3}$

$z_c = 200\angle -90$

$I = \frac{V}{z} = \frac{6\angle -30}{200\angle -90}$

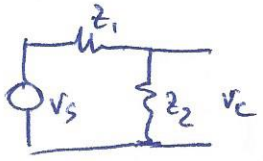
$I = 0{,}03\angle 60\ A$

No domínio do tempo fica

$i(t) = 0{,}03\cos(100t + 60)\ A$

Prob 7

Vamos substituir o circuito por:



$z_1 = 5$; $z_2 = \frac{1}{j\omega C} \Rightarrow z_{Total} = 5 - j2{,}5 \rightsquigarrow 5{,}59 \angle -26{,}5$

$I = \frac{V}{z}$ onde V é o fasor de $v(t)$ ou seja $V = 10 \angle 0$

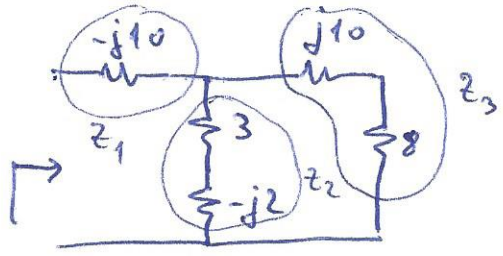
$$I = \frac{10 \angle 0}{5{,}59 \angle -26{,}5} = 1{,}78 \angle +26{,}5$$

Ao condensador $V_c = z_c I = \frac{1}{j\omega C} 1{,}78 \angle +26{,}5$

$$V_c = \left(\underbrace{\frac{1}{0{,}4}}_{\omega_c} \angle -90\right) * (1{,}78 \angle +26{,}5) = 4{,}45 \angle -63{,}5$$

Prob 8

Substituimos os componentes pelas suas impedâncias



Logo $z_{in} = z_1 + z_2 // z_3$

$$= -j10 + \frac{(3-j2)(8+j10)}{(3-j2)+(8+j10)}$$

$$= -j10 + \frac{44+14j}{11+j8}$$

$$= -j10 + \frac{(44+14j)*(11-j8)}{(11+j8)(11-j8)}$$

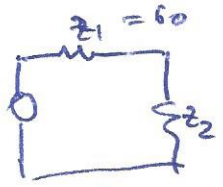
$$= 3{,}22 - j\,11{,}07$$

Prob 9

Semelhante ao prob. 8

Prob 10

Substituímos os componentes pelas suas impedâncias



$\omega C = 4 \times 40 \times 10^{-3}$

A tensão V_0 é a tensão no indutor

$$Z_2 = \underbrace{Z_C}_{\frac{1}{j\omega C}} // \underbrace{Z_L}_{j\omega L} = \frac{-j25 \times j20}{j20 - j25} = \frac{500}{-j5} = j100$$

Logo $Z_{total} = 60 + j100$

$$V_0 = V \frac{Z_2}{Z_1 + Z_2} \qquad \frac{Z_2}{Z_1+Z_2} = \frac{j100}{60+j100} = \frac{j100 * (60-j100)}{60^2+100^2} = \frac{j6000 + 1\times10^4}{13600}$$

$$= 0{,}441\,j + 0{,}735 = \underbrace{0{,}857 \angle 30{,}96}_{\text{complexo}}$$

com |Z| e ângulo

$$V_0 = 20 \angle -15 * 0{,}857 \angle 30{,}96$$

$$= 17{,}14 \angle 15{,}96$$

no domínio do tempo temos

$$V_0(t) = 17{,}14 \cos(4t + 15{,}96^\circ)\ V$$