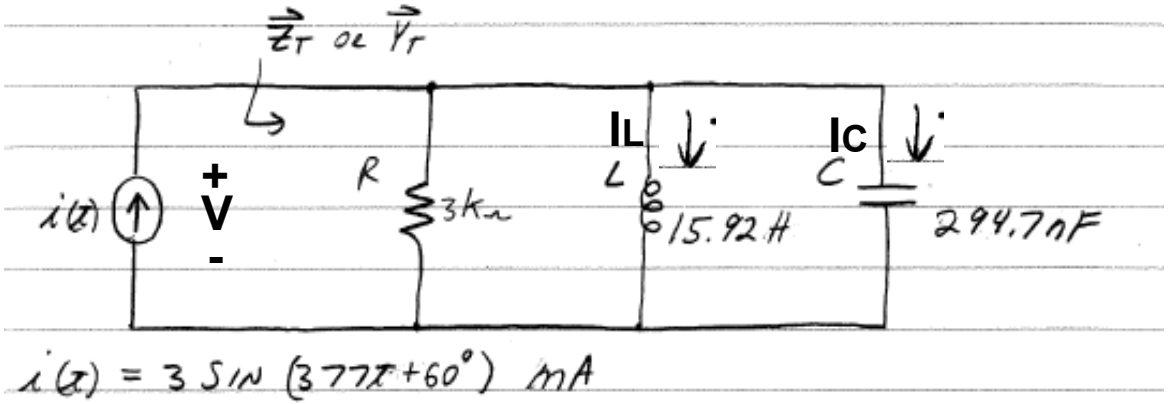
ICP – Parallel AC Circuit Analysis



1 – Find the voltage **V** across the elements (use RMS)

2 – Find v(t), the voltage across the elements

3 - Find $\mathbf{I_L}$ and $\mathbf{I_C}$ (use RMS)

4 - Find $i_L(t)$ and $i_C(t)$

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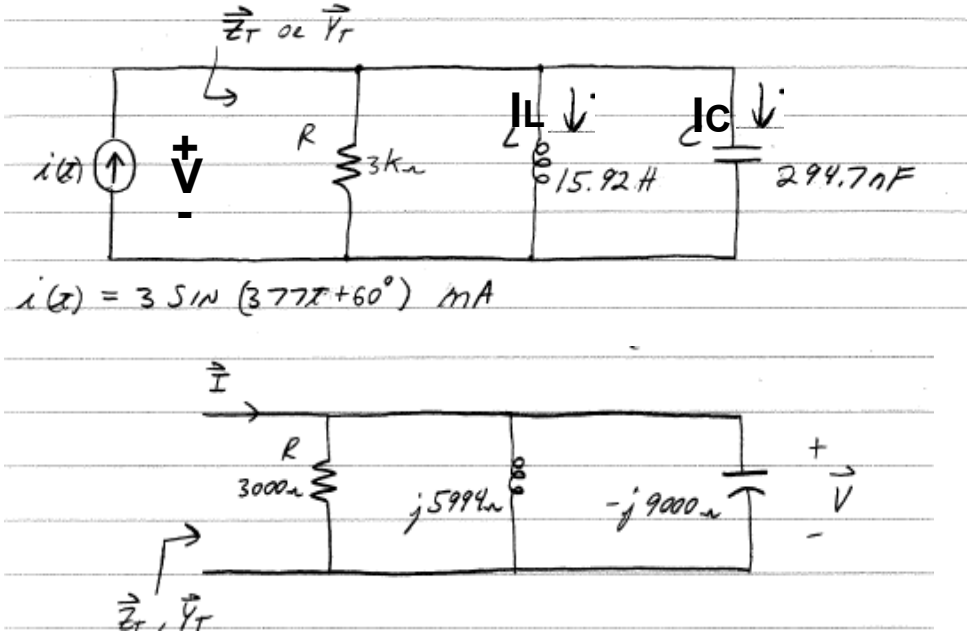

1 – Find the voltage **V** across the elements (use RMS)

$$\vec{V} = \vec{I}\,\vec{Z}_T = \frac{\vec{I}}{\vec{Y}_T} = \frac{3\,\frac{1}{\sqrt{2}}\,\angle 60^\circ \text{ mA}_{RMS}}{337.9\,\mu\text{S}\,\angle -9.49^\circ \text{ S}}$$

$$\vec{V} = 6.28\text{ V}_{RMS}\,\angle 69.49^\circ$$

NP

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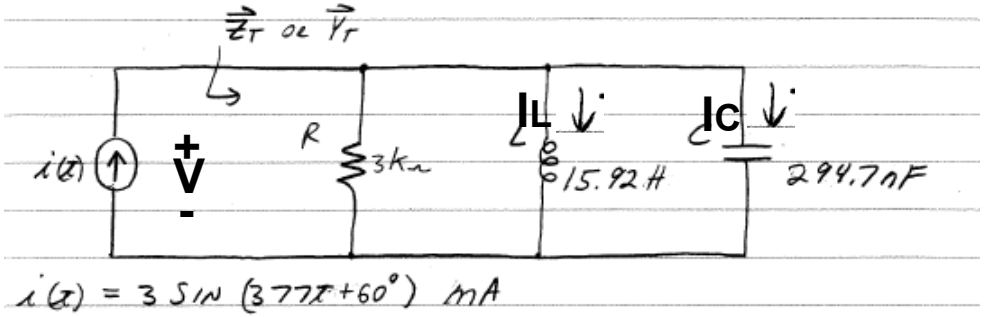

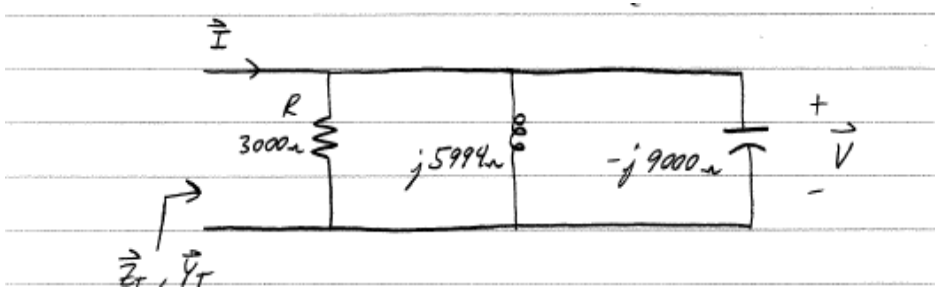

2 – Find v(t), the voltage across the elements

$$\vec{V} = 6.28\,V_{RMS} \angle 69.49^\circ$$

$$V(t) = (6.28)\sqrt{2}\ \text{SIN}(377t + 69.5^\circ)\ V$$

NP

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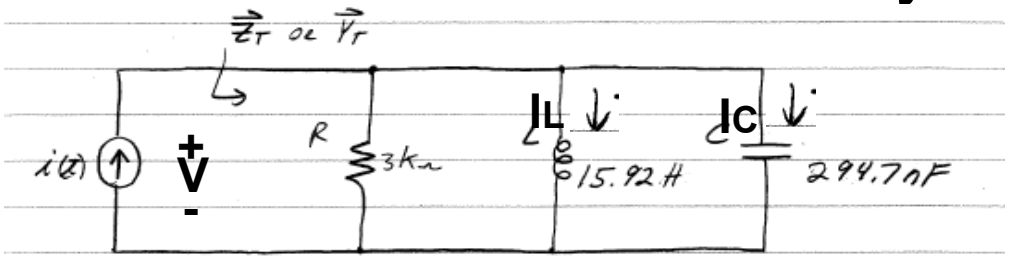
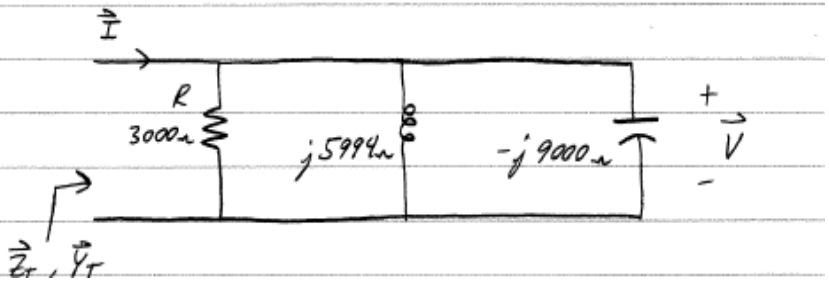


$i(t) = 3\sin(377t + 60°)$ mA



3 - Find **IL** and **Ic** (use RMS)

Current Divider - **IL**

$$\vec{I}_L = \vec{I} \cdot \frac{\vec{Z}_T}{\vec{Z}_x \leftarrow \vec{Z}_L}$$

$$\vec{I}_L = 2.12\,mA_{RMS} \angle 60° \cdot \frac{2959\Omega \angle 9.49°}{5994\Omega \angle 90°}$$

$$\boxed{\vec{I}_L = 1.047\,mA_{RMS} \angle -20.51°}$$

Current Divider - **Ic**

$$\vec{I}_c = \vec{I} \cdot \frac{\vec{Z}_T}{\vec{Z}_c}$$

$$= 2.12\,mA_{RMS} \angle 60° \cdot \frac{2959\Omega \angle 9.49°}{-j\,9000\Omega}$$

$$\therefore \boxed{\vec{I}_c = 697\,\mu A_{RMS} \angle 159.5°}$$

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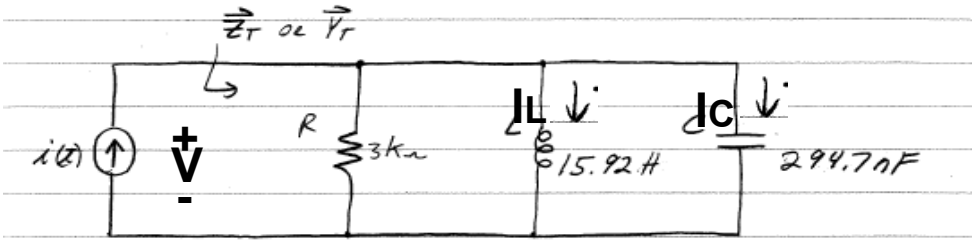
ICP – Parallel AC Circuit Analysis



$i(t) = 3\sin(377t + 60°)$ mA

4 - Find $i_L(t)$ and $i_C(t)$

$\vec{I}_L = 1.047\ mA_{RMS} \angle -20.51°$

$\therefore i_L(t) = 1.48 \times 10^{-3} \sin(377t - 20.51°)$ A

check : $V(t) = 8.88\sin(377t + 69.5°)$ V

ELI

90° PHASE SHIFT

$\therefore \vec{I}_C = 697\ \mu A_{RMS} \angle 159.5°$

$i_C(t) = 985.7 \times 10^{-6} \sin(377t + 159.5°)$ A

check : ICE SATISFIED?

YES

NP