ICP Set 1 – Phasors

Use PEAK Values for your voltage and current phasors and make sure you LABEL your phasors properly

1 - Express the following in phasor form:

a) $230 \sin(\omega t + 30^{\circ})$ V $\longrightarrow$ $230 V_{pk} \angle 30^{\circ}$

b) $10 \sin(\omega t - 90^{\circ})$ A $\longrightarrow$ $10 A_{pk} \angle -90^{\circ}$

$\omega = 2\pi f = 6283 \text{ r/s}$

2 - Express the following as sinusoids at f = 1kHz:

a) $\mathbf{I} = 10\text{E-}3A_{pk} \angle -80^{\circ}$ $\rightarrow$ $10 \times 10^{-3} \sin(6283t - 80^{\circ})$ A

b) $\mathbf{V} = 169V_{pk} \angle 45^{\circ}$ $\longrightarrow$ $169 \sin(6283t + 45^{\circ})$ V

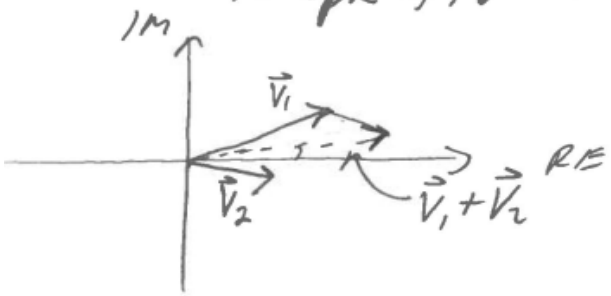
c) $\mathbf{V} = 10V_{RMS} \angle 23^{\circ}$ $(10V_{RMS})(\sqrt{2})$, $14.14 \sin(6283t + 23^{\circ})$ V

$14.14 V_{pk}$

3 - Find v(t) = v1(t) + v2(t) if

v1(t) = $10 \sin(\omega t + 10^{\circ})$ and v2(t) = $5 \sin(\omega t - 10^{\circ})$

$10 V_{pk} \angle 10^{\circ} + 5 V_{pk} \angle -10^{\circ} = \boxed{14.8 V_{pk} \angle 3.36^{\circ}}$



or

$\boxed{v(t) = 14.8 \sin(\omega t + 3.36^{\circ})}$

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ICP Set 2 – Impedance

RECALL

$\vec{Z}_R = R_\Omega \angle 0°$ $\quad \vec{Z}_L = X_{L\Omega} \angle 90°$ $\quad \vec{Z}_C = X_{C\Omega} \angle -90°$

1 – Find the impedance of:

a) A 1000 Ohm resistor → $1000_\Omega \angle 0°$ or $(1000 + j0)_\Omega$

b) A 100mH inductor at 60 Hz → $\underbrace{2\pi fL}_{X_L} = 37.7_\Omega$ ∴ $\vec{Z}_L = 37.7_\Omega \angle 90°$ or $j37.7_\Omega$

c) A 100mH inductor at 2.5kHz → $2\pi fL = 1{,}571_\Omega$ ∴ $\vec{Z}_L = 1571_\Omega \angle 90°$ or $j1571_\Omega$

d) A 0.1uF capacitor at 60 Hz → $\underbrace{\frac{1}{2\pi fC}}_{X_C} = 26{,}526_\Omega$ ∴ $\vec{Z}_C = 26{,}526_\Omega \angle -90°$ or $-j26{,}526_\Omega$

e) A 0.1uF capacitor at 2.5kHz → $X_C = 636.6_\Omega$ ∴ $\vec{Z}_C = 636.6_\Omega \angle -90°$ or $-j636.6_\Omega$

2 - If a component has an impedance of 4<90 ° Ohms at f=400Hz, find the component type and value

$\vec{Z}_L = X_{L\Omega} \angle 90°$

$X_L = 2\pi fL = 4_\Omega$

$f = 400\,Hz$

∴ $L = \frac{4_\Omega}{(2\pi)(400\,Hz)} = 1.59\,mH$

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