University of Calgary
Department of Electrical and Computer Engineering

ENGG 225 - Fundamentals of Electrical Circuits and Machines
Winter, 2017

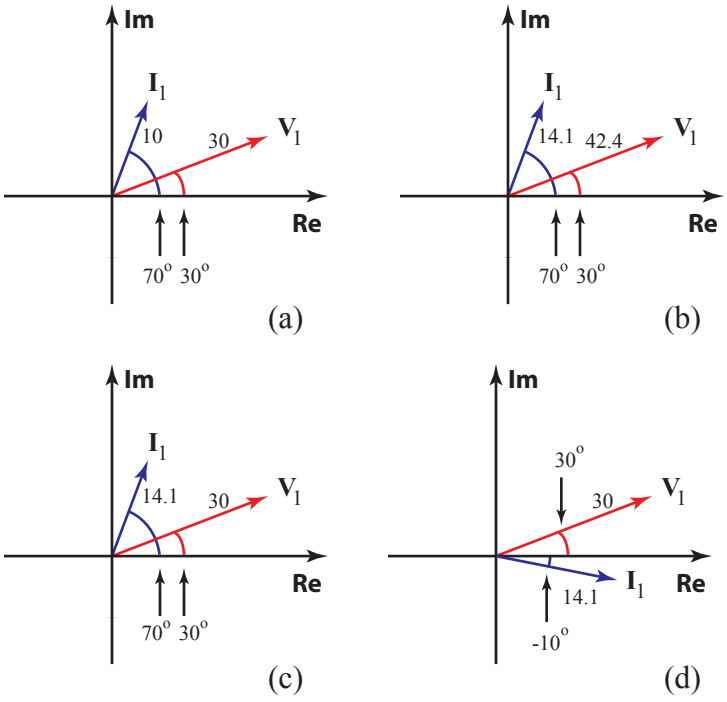
Problem Assignment #7

1. **[1 mark.]** The current $i(t) = 2\sin(120\pi t)$ flows through a 4 Ω resistor. What is the average power delivered to the resistor? Express your answer in *Watts (W)*.

2. **[2 marks.]** A current of $i_C(t) = 2\cos(120\pi t)$ is applied to a 400 μF capacitor. Give the *peak amplitude* of $v_C(t)$ in *Volts (V)*.

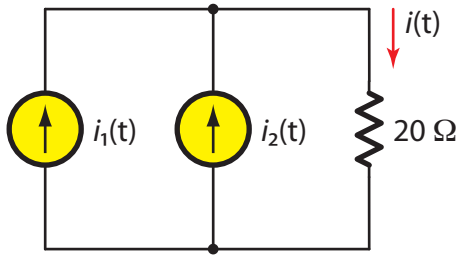
3. **[2 marks.]** Consider two sinusoidal current waveforms $i_1(t)$ and $i_2(t)$. $i_1(t)$ has angle phase of $\theta_1 = -45°$, and reaches its positive peak 0.1875 ms *later* than the corresponding peak in $i_2(t)$. Both currents have a frequency of 1000 Hz. Give the phase angle θ_2 for $i_2(t)$ in degrees such that $-180° \leq \theta_2 < 180°$.

4. **[2 marks.]** The voltage across an element is $v_1(t) = 30\cos(\omega t + 30°)$. The current through that element, $i_1(t)$, has an rms value of 10 A, and it *leads* $v_1(t)$ by 40°. Choose the phasor diagram from the choices below that correctly depicts $\mathbf{V}_1$ and $\mathbf{I}_1$.



(e) None of the above.

5. **[2 marks.]** Let $i_1(t) = 10\cos(120\pi t + 45°)$ in the circuit at right. Suppose that the current through the resistor, as indicated, is measured to be $i(t) = 8\cos(120\pi t + 30°)$. Determine the phase angle θ_2 of $i_2(t)$ in degrees such that $-180° \leq \theta_2 < 180°$.



6. **[1 mark.]** For Question #5 above, give the *rms* amplitude of $i_2(t)$. Give your answer in *Amperes (A)*.

7. **[2 marks.]** A circuit element has a phasor voltage of $\mathbf{V} = 400\angle 120°$ and a current of $\mathbf{I} = 5\angle 30°$. The angular frequency is 100 rad/s. Decide on whether the circuit element is a capacitor or an inductor. If it is a capacitor, give its capacitance in *microFarads* (μF); if it is an inductor, give its inductance in *Henrys* (H).