Proposed Problems on Phasors and AC Circuits

EEEN20090 – Electric Energy Systems

1. Find the amplitude, phase, period, frequency and angular frequency of the sinusoid $v(t) = 12\cos(314t + 12°)$ V.
2. Calculate the phase angle between $v_1(t) = -5\cos(\omega t + 45°)$ V and $v_2(t) = 12\sin(\omega t - 15°)$ V State which sinusoid is leading.
3. Calculate the phase angle bw. v_1 and v_2 and sketch the phasor diagram. $v_1 = -10\cos(\omega t + 50°)$, $v_2 = 12\sin(\omega t - 10°)$.
4. Calculate the phase angle bw. i_1 and i_2 and sketch the phasor diagram. $i_1(t) = -4\sin(377t + 25°)$, $i_2(t) = 5\cos(377t - 40°)$.
5. Evaluate these complex numbers:

$$\sqrt[3]{25e^{-j45°} + 12e^{j30°}}, \qquad \frac{10e^{-j30°} + (3 - j3)}{(2 + j4)(3 - j5)^*} .$$

6. Evaluate the folowing complex numbers:

$$[(5 - j2)(-1 + j4) - 5e^{j60°}]^*$$
$$\frac{10 + j5 + 3e^{j40°}}{-3 + j4} + 10e^{j30°} + j5$$

7. Transform these sinusoids to phasors:

$$v = -24\sin(314t + 63°) \text{ V}$$
$$i = 0.6\cos(314t - 15°) \text{ A}$$

8. Find the sinusoids represented by these phasors:

$$\bar{V} = j3e^{-j35°}$$
$$\bar{I} = -3 + j4$$

9. Using the phasor approach, determine the current $i(t)$ in a circuit described by the integro-differential equation.

$$i + 2\int i dt - 3\frac{di}{dt} = 4\cos(5t + 75°) \text{ A}$$

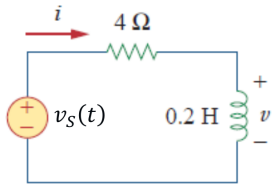
10. Find the sum of the following currents and sketch the phasor diagram.

$$i_1 = 4\cos(\omega t + 30°) \text{ A}$$
$$i_2 = 5\sin(\omega t - 206\circ) \text{ A}$$

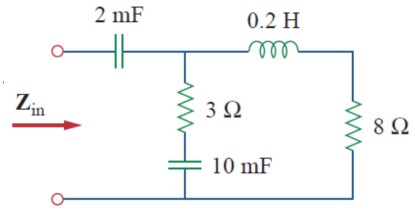
11. The voltage $v = 24\cos(314t + 45°)$ V is applied to a 100 mH inductor. Find the steady-state current through the inductor.

12. The voltage $v = 6\cos(100t - 30°)$ V is applied to a 50 μF capacitor. Calculate the current through the capacitor and sketch the phasor diagram.

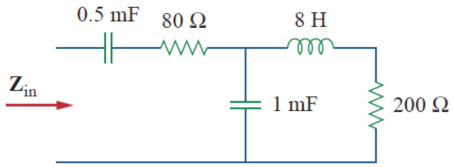
13. Find $v(t)$ and $i(t)$ in the circuit below assuming $v_s(t) = 5\sin(10t)$.



14. Find $\bar{Z}_{\text{in}}$ in the circuit below assuming $\omega = 50$ rad/s.



15. Find $\bar{Z}_{\text{in}}$ in the circuit below assuming $\omega = 10$ rad/s.



16. Find $v_0(t)$ in the circuit below assuming $v_s(t) = 20\cos(4t - 15°)$ V.