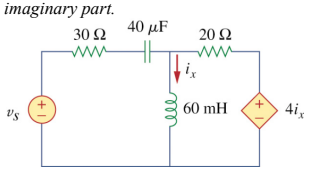
1:
If $v(t) = 160\cos 50t$ V and $i(t) = -20\sin(50t - 30^\circ)$, calculate the instantaneous power, average power, and apparent power. The apparent power, S, is the magnitude of the complex power, $\mathbf{S} = \frac{1}{2}\mathbf{V}\mathbf{I}^*$,

2:
An ac motor with impedance $\mathbf{Z}_L = 4.2 + j3.6\Omega$ is supplied by a 220V, 60 Hz source. Find power factor (pf), P, and Q.

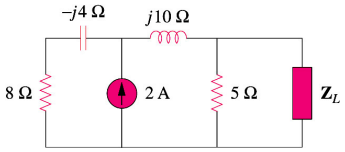
3:
For the following voltage and current phasors, calculate the complex power, apparent power, real power, and reactive power. Specify whether the pf is leading ($\theta_V - \theta_I > 0$) or lagging.

7.1 $\mathbf{V} = 220\angle 30^\circ$ Vrms, $\mathbf{I} = 0.5\angle 60^\circ$ Arms
7.2 $\mathbf{V} = 250\angle -10^\circ$ Vrms, $\mathbf{I} = 6.2\angle -25^\circ$ Arms
7.3 $\mathbf{V} = 120\angle 0^\circ$ Vrms, $\mathbf{I} = 2.4\angle -15^\circ$ Arms

4:
Find the complex power delivered by v_s to the network below. Let $v_s(t) = 100\cos 2000t$ V.
Hint: AC dependent sources are treated the same way they are treated in DC circuits, except with complex arithmetic. So $4i_x$ will, in general, have a magnitude and phase or a real and imaginary part.



5:
Find the load impedance that absorbs the maximum power. Find the maximum power in the load impedance. *Hint: Think Thevenin!*



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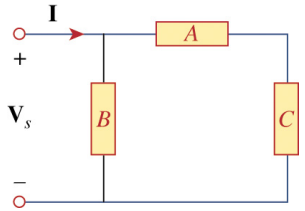
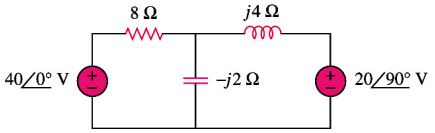
6:
In the circuit show below, device A receives 2 kW at 0.8 pf lagging, device B receives 3kVA at 0.4 pf leading, and device C is inductive (i.e. "leading") and consumes 1 kW with a reactive component of 500 VAR.

(a) Determine the power factor (pf) of the entire system.
(b) Find $\mathbf{I}$ given $\mathbf{V}_S = 120\angle 45^\circ$ rms



7:
Find the complex power associated with each of the five elements in this circuit, then determine the real power in each case. The voltages are given in RMS units (Volts rms)



8. Find the (possibly complex) load impedance connected across terminals A-B that absorbs the maximum power. Find the maximum power when matched load is present. The sinusoidal amplitude is the peak voltage, not the rms.