CASE WESTERN RESERVE UNIVERSITY
Case School of Engineering
Department of Electrical Engineering and Computer Science

ENGR 210. Introduction to Circuits and Instruments (4)

Homework Set No. 11 Issued 3/30/05
References: [T&R4] sections 7-1, 7-4, 8-1, 8-2. Due 4/6/05

Elementary phasors

1) (5 pts) Basic phasors.

Convert the following phasors into sinusoids.

(a) $V_1 = 10 + j40, \omega = 10$

(b) $V_2 = (8 - j3)5e^{-j60^\circ}, \omega = 20$

(c) $I_1 = 8 - j3 + \frac{3}{j}, \omega = 300$

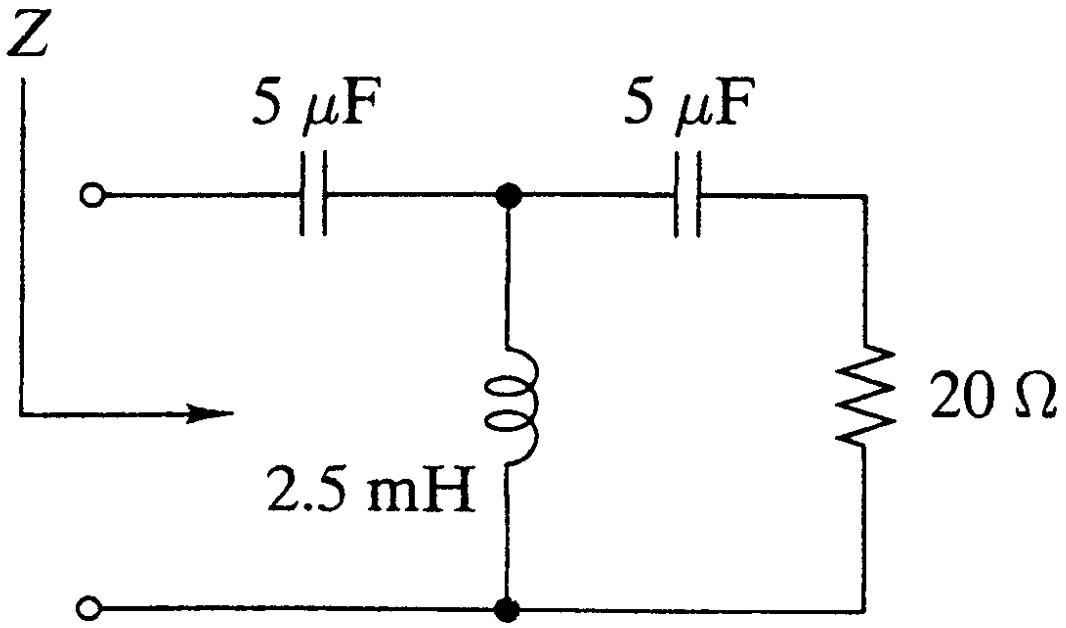
(d) $V_1 = \frac{3 + j1}{1 - j3}, \omega = 50$

2) (5 pts) Basic phasors.

Given the sinusoids $v_1(t) = 50\cos(\omega t - 45^\circ)$ and $v_2(t) = 25\sin(\omega t)$ use the additive property of phasors to find $v_3(t)$ such that $v_1 + v_2 + v_3 = 0$

3) (5 pts) Combining impedances.

The circuit shown below is operating in the sinusoidal steady state with ω=20 krads/s. Find the equivalent impedance Z.



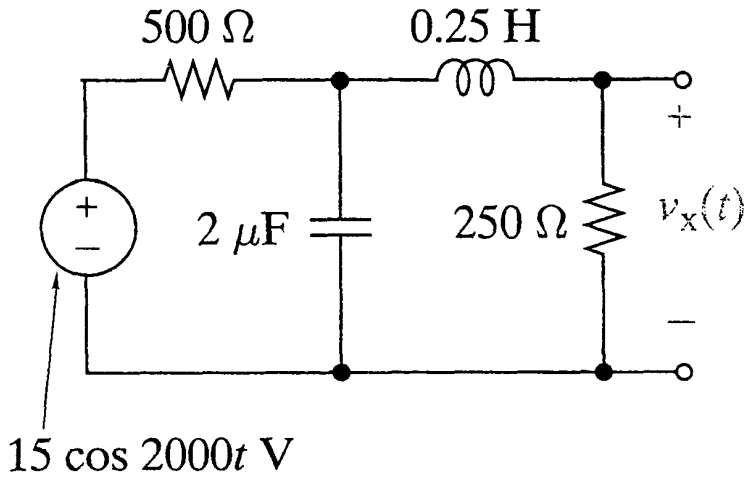
Basic circuit analysis using phasors

4) (5 pts) Time domain specification of a series circuit.

A current source delivering $i(t) = 300\cos(2000t)$ milliamperes is connected across a parallel combination of a 10-kΩ resistor and a 50-nF capacitor. Find the steady-state current $i_R(t)$ through the resistor and the steady-state current $i_C(t)$ through the capacitor. Draw a phasor diagram showing **I**, $\mathbf{I_C}$, and $\mathbf{I_R}$.

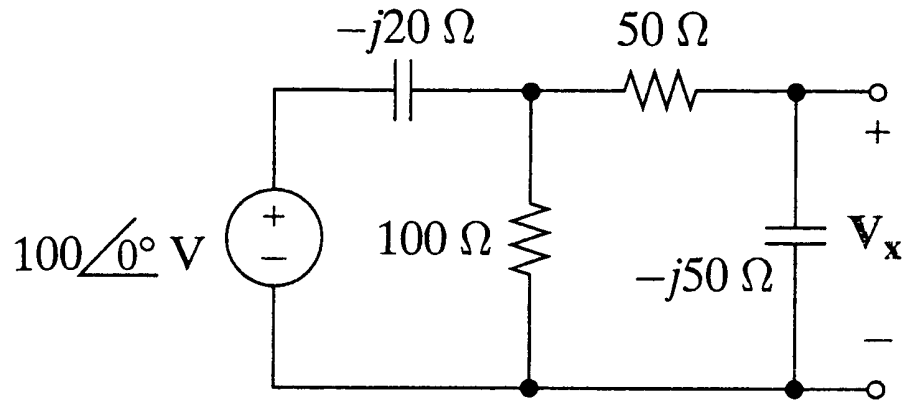
5) (5 pts) Steady state response.

The circuit shown below is operating in the sinusoidal steady state. Use circuit reduction to find the input impedance seen by the voltage source and the steady-state response $v_x(t)$.



6) (5 pts) Complex specification of a circuit.

The circuit shown below is operating in the sinusoidal steady state. Use circuit reduction to find the input impedance seen by the voltage source and the steady-state phasor response V_x.



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