Circuits Problems

Problem 1: Consider the sinusoidal voltage

$$\mathbf{v(t) = 80 \cos (1OOO\pi t - 30°)\ V.}$$

Find:
a) The amplitude of the voltage?
b) The frequency in hertz?
c) The frequency in rad/s
d) The phase angle in radians?
e) The phase angle in degrees?
f) The period in milliseconds?
g) The first time after $t = 0$ that $v = 80$ V?
h) The sinusoidal function is shifted 2/3 ms to the left along the time axis, What is the expression for *v(t)*.

Problem 2:
1) Transform the following sinusoids to phasors:

a) $v = 170\cos(377t - 40°)$ V.

b) $i = 10\sin(1000t + 20°)$ A.

c) $i = [5\cos(\omega t + 36.87°) + 10\cos(\omega t - 53.13°)]$ A.

d) $v = [300\cos(20{,}000\pi t + 45°) - 100\sin(20{,}000\pi t + 30°)]$ mV.

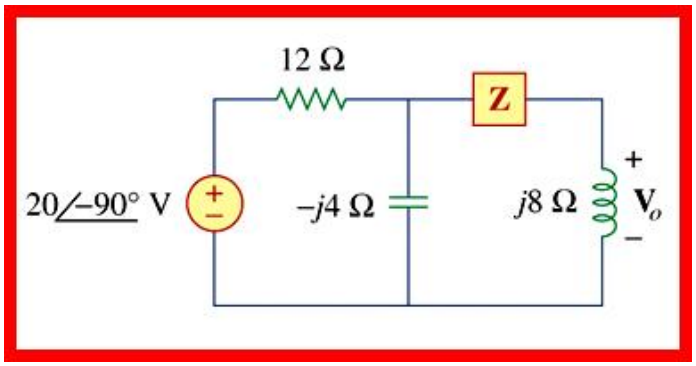
2) Find the time-domain expression corresponding to each phasors:

a) $\mathbf{V} = 18.6\angle -54°$ V.

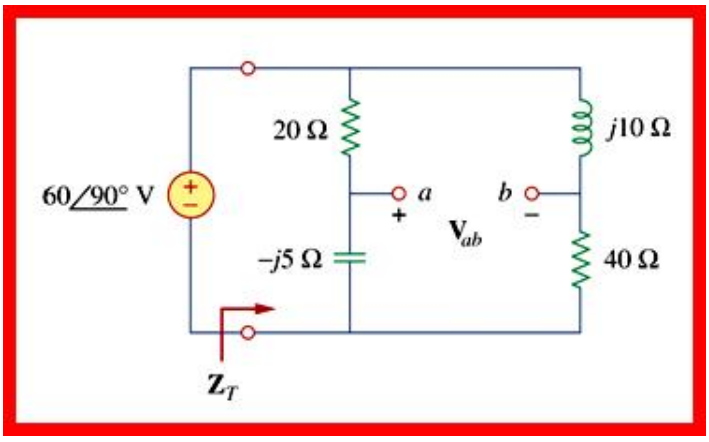
b) $\mathbf{I} = (20\angle 45° - 50\angle -30°)$ mA.

c) $\mathbf{V} = (20 + j80 - 30\angle 15°)$ V.

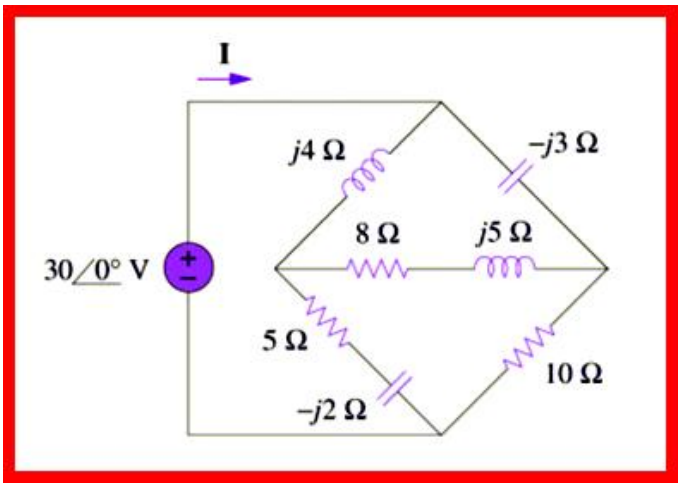
Problem 3: Find **Z** in the network, given that $\mathbf{V}_o = 4\angle 0°$ V



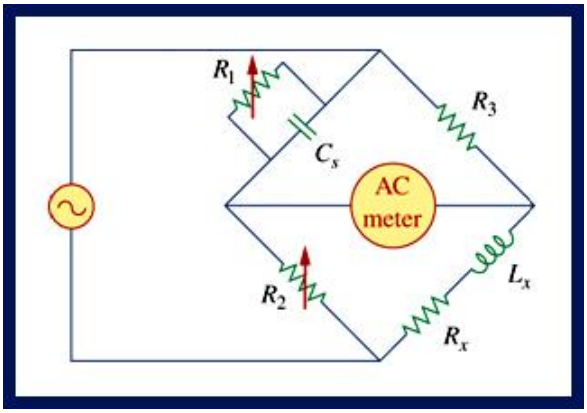
Problem 4: For the circuit in the Figure, calculate $\mathbf{Z_T}$ and $\mathbf{V_{ab}}$.



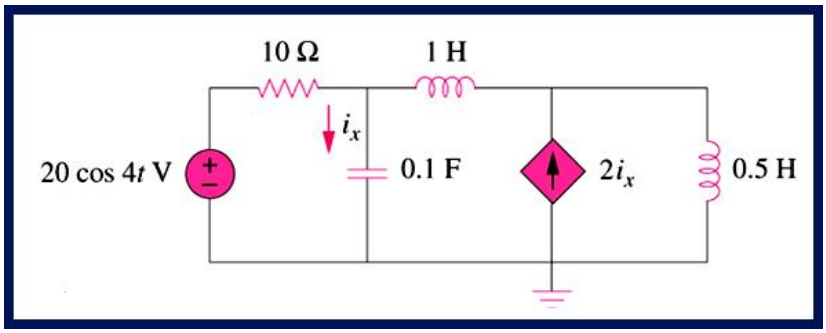
Problem 5: Find the current I in the circuit given?



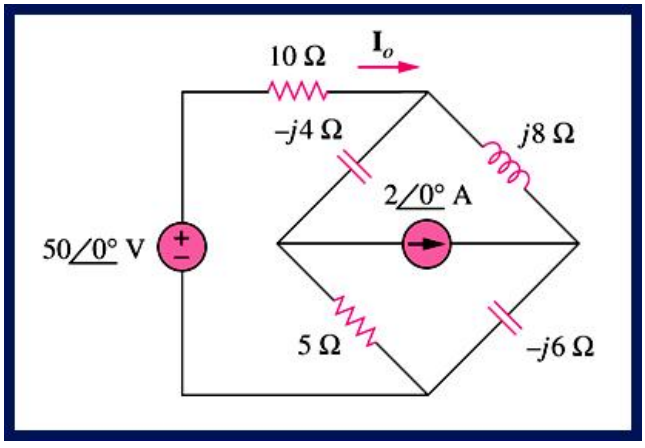
Problem 6: The ac bridge shown is known as a *Maxwell bridge* and is used for accurate measurement of inductance and resistance of a coil in terms of a standard capacitance ***Cs***. Show that when the bridge is balanced, $\boldsymbol{Lx} = \boldsymbol{R}_2\,\boldsymbol{R}_3\,\boldsymbol{Cs}$ and $Rx = (R_2/R_1)\,R_3$, Find ***Lx*** and ***Rx*** for $\boldsymbol{R}_1$ = 40 kΩ, $\boldsymbol{R}_2$ = 1.6 kΩ, $\boldsymbol{R}_3$ = 4 kΩ, and ***Cs*** = 0.45 *m*F



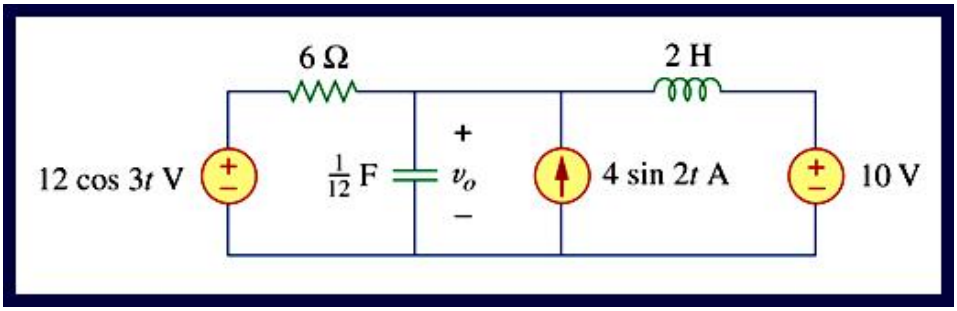
Problem 7: **Calculate ix using Nodel analysis**



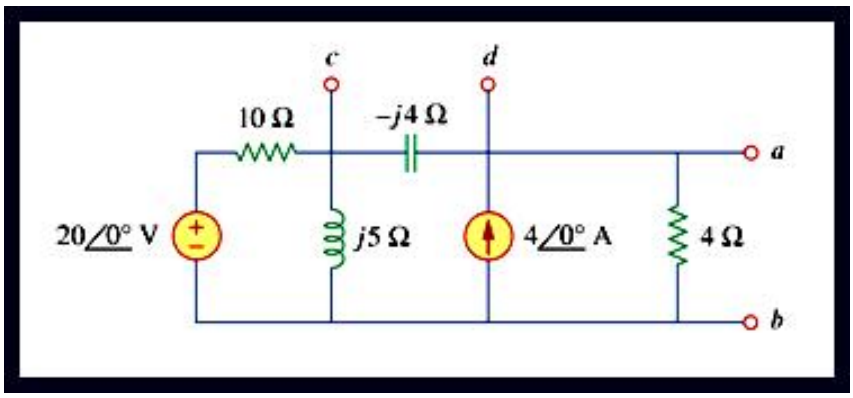
Problem 8: Calculate the current I_o using Mesh analysis



Problem 9: Solve for $v_o(t)$ in the circuit using the superposition principle.



Problem 10: Find the Thevenin equivalent of the circuit as seen from:
(a)terminals *a-b* (b) terminals *c-d*



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