PRINCIPLES OF EE1

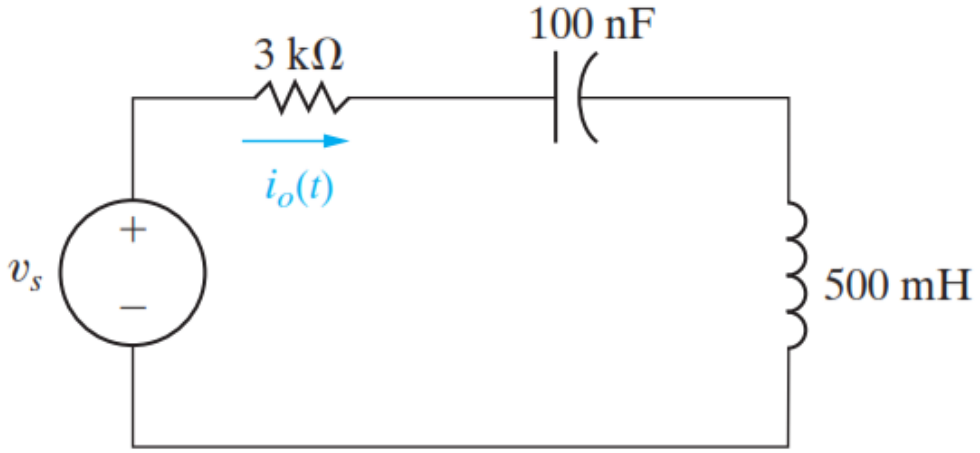
HW

Deadline: 8:00, 30 JUNE 2024

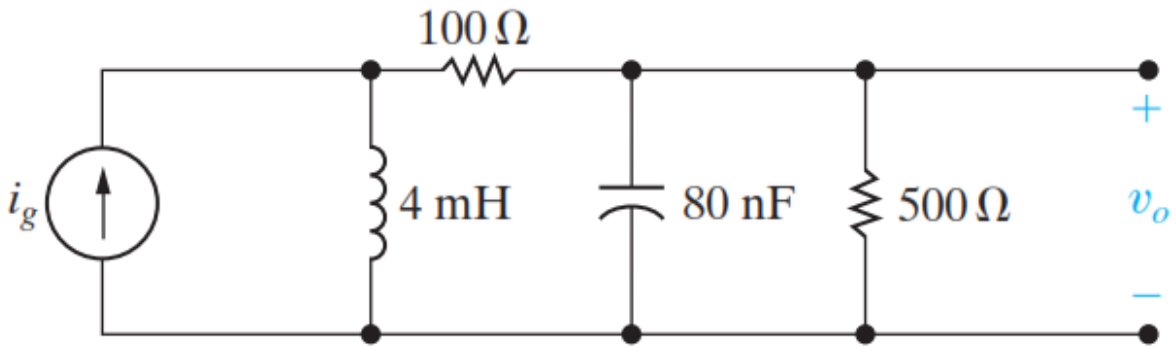
INSTRUCTIONS: Students scan and upload answer into Blackboard

Q1.

Find the steady state for $i_o(t)$ in the circuit if $v_s = 20\cos(2000t)V$

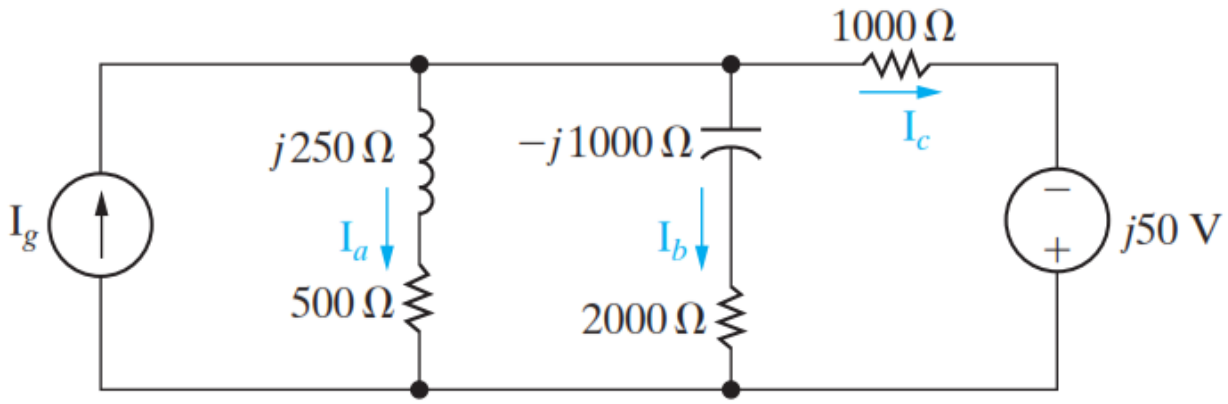


Q2. (9.31)



Find the steady state for $v_o(t)$ if $i_g = 20\cos(45000t)mA$

Q3.

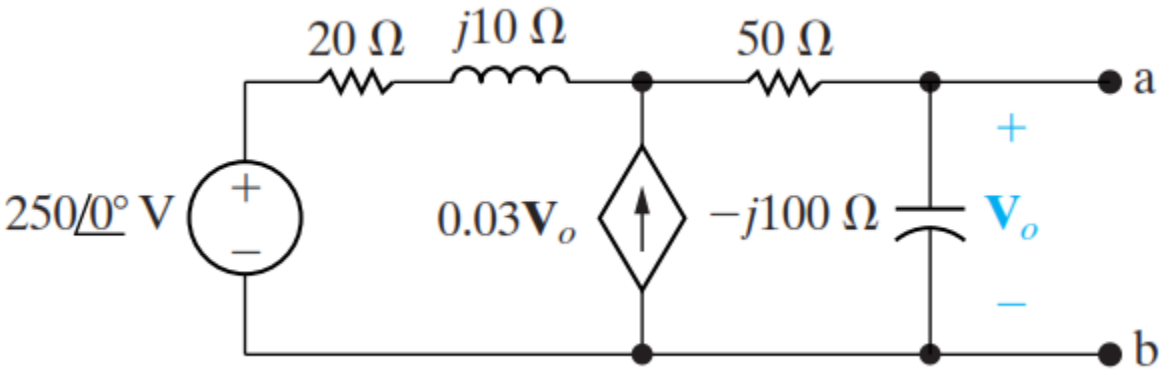


Given $\mathbf{I}_b = 25\angle 0° mA$

a) Find $\mathbf{I}_a, \mathbf{I}_c, \mathbf{I}_g$

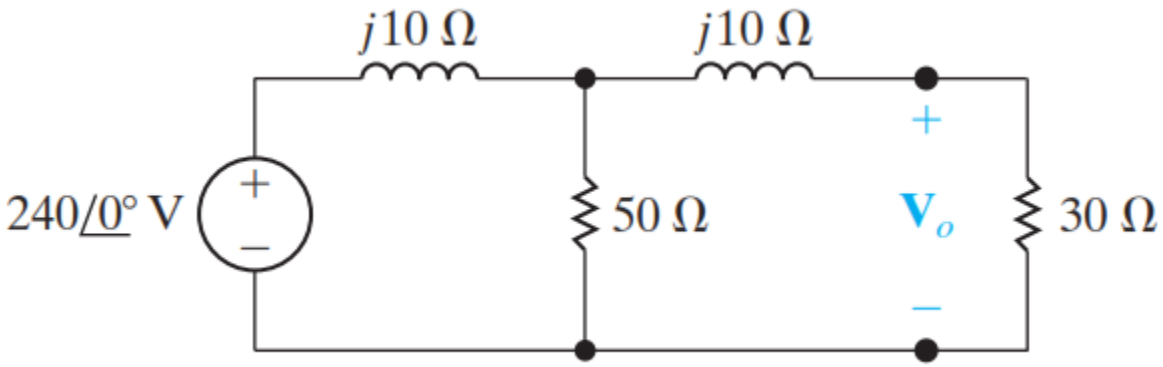
b) If $\omega = 1500\ rad/s$, write expression for $i_a(t), i_b(t), i_g(t)$

Q4.



Find the Thévenin equivalent circuit with respect to the terminals a,b of the circuit

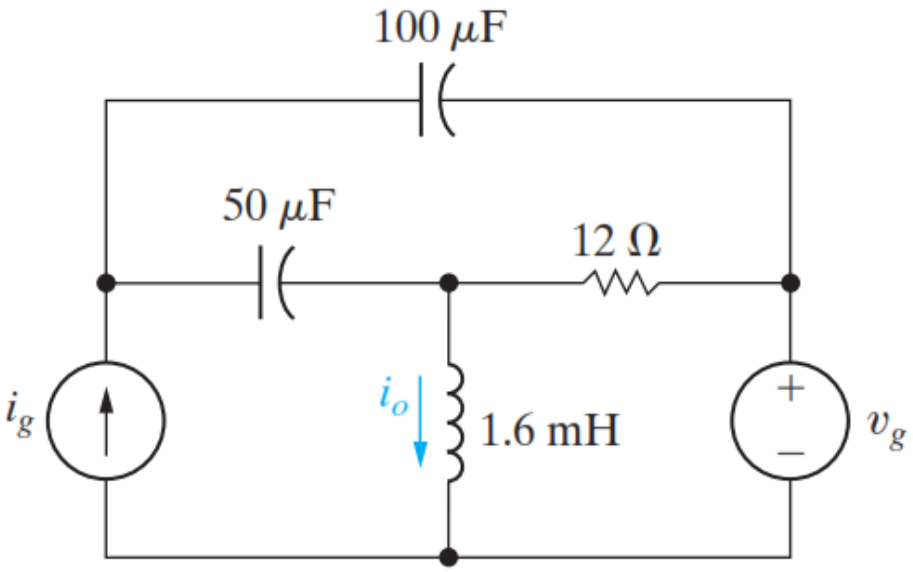
Q5.



Find $\mathbf{V}_o$

a) Use the node-voltage
b) Use the mesh-current

Q6.

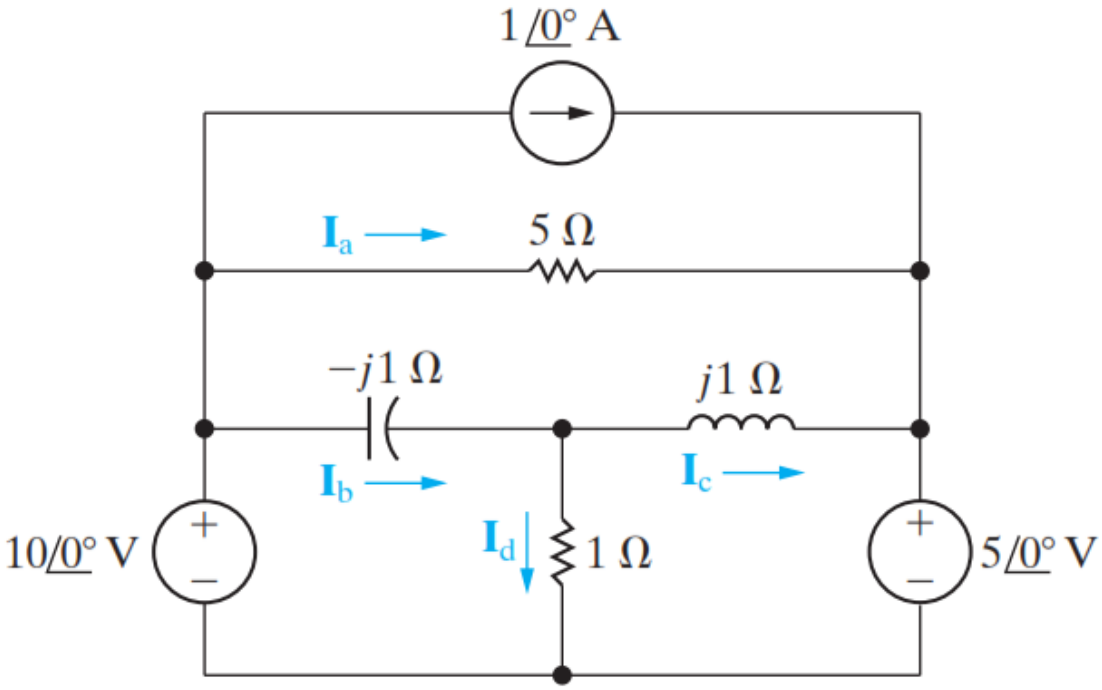


$i_g = 5\cos(2500t)\,A; v_g = 20\cos(2500t + 90°)V$

Find i_o

a) Use the node-voltage
b) Use the mesh-current

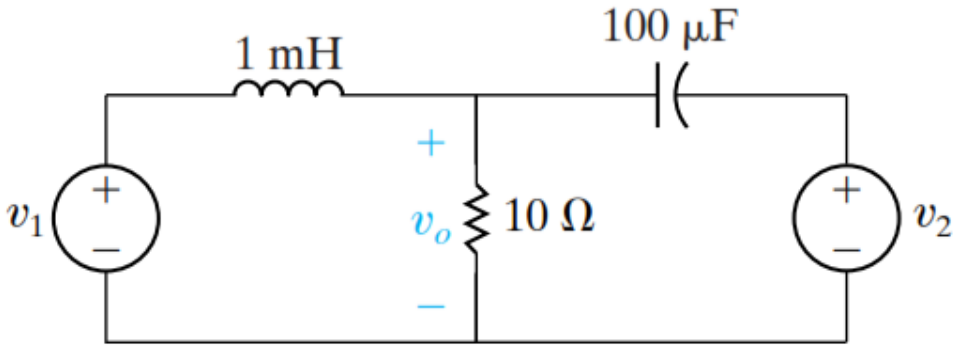
Q7.



Find $\mathbf{I}_a, \mathbf{I}_b, \mathbf{I}_c$

a) Use the node-voltage
b) Use the mesh-current

Q8

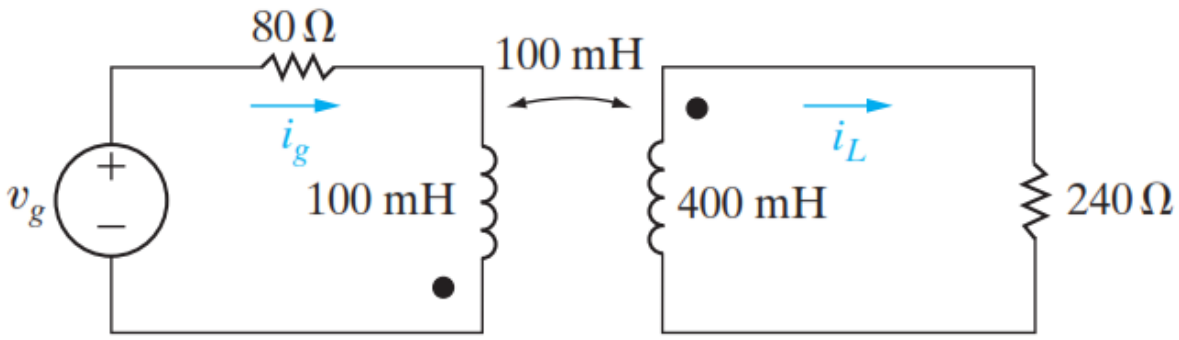


$v_1 = 20\cos(2000t - 36.87°)V$

$v_2 = 10\cos(5000t + 16.26°)V$

Find the steady-state expression $v_o(t)$

Q9.



$$v_g = 168\cos(800t)V$$

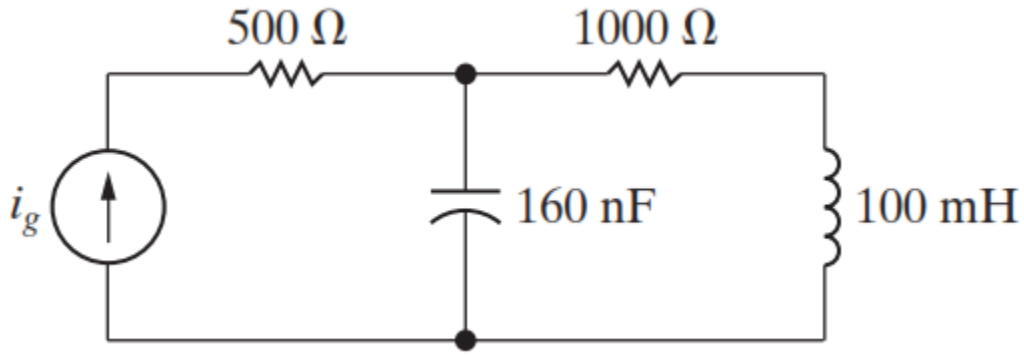
a) Find i_g, i_L

b) Find the coefficient of coupling $k = \dfrac{M}{\sqrt{L_1 L_2}}$

c) Find the energy stored in the magnetically coupled coils at $t = 625\pi\ (\mu S)$

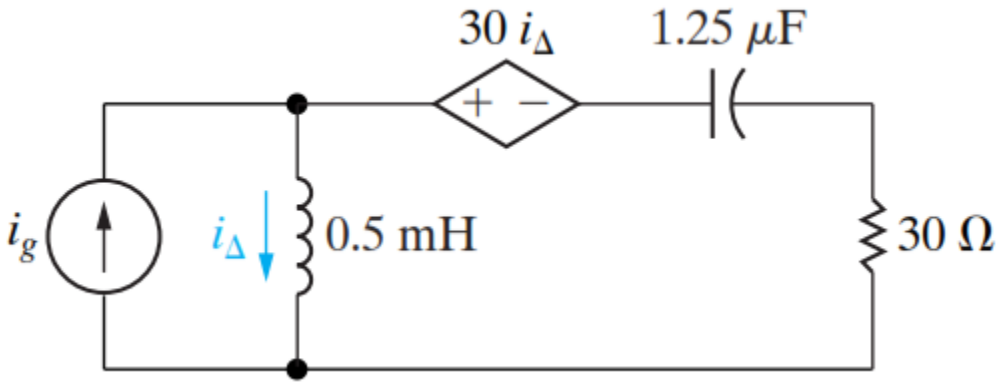
(hint: apply $W = \frac{1}{2}L_1 i_g^2 + \frac{1}{2}L_2 i_L^2 + M i_g i_L$)

Q10.



Find the average power delivered by the ideal current source in the circuit if $i_g = 4\cos(5000t)mA$

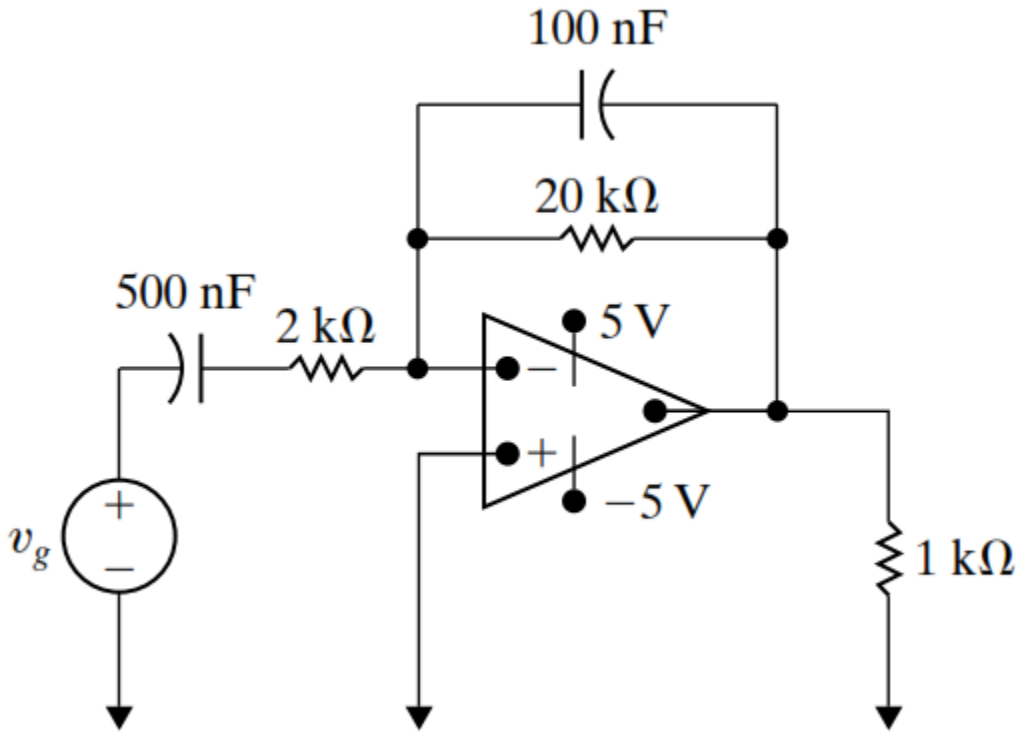
Q11.



$i_g = 6\cos(20000t)\,A$

Find the average power dissipated in the 30Ω resistor

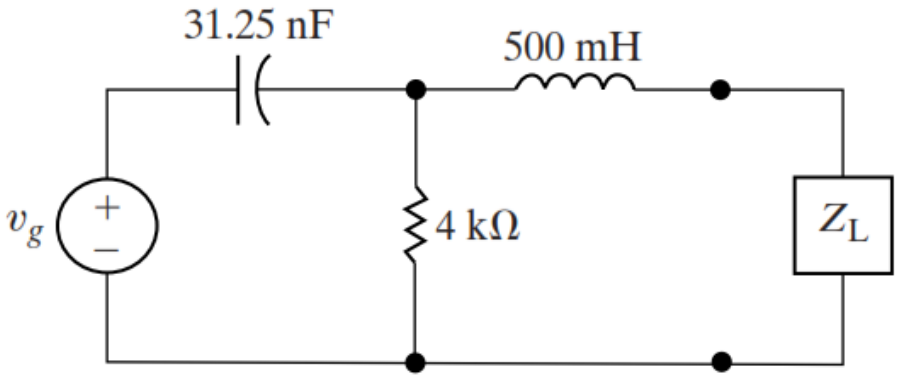
Q12.



$v_g = \cos(1000t)V$

The op amp is ideal. Calculate the average power delivered to the $1K\Omega$ resistor

Q13.



Determine the load impedance for the circuit that will result in maximum average power being transferred to the load if $\omega = 8000\text{rad/s}$

Determine the maximum average power delivered to the load if $v_g = 10\cos(8000t)V$