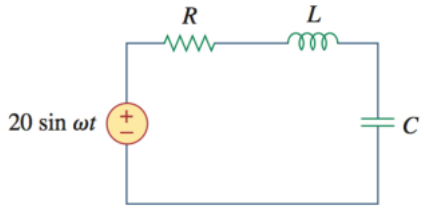
ELEE 250/ Electric Circuits II Final Exam/ Summer 2020 120 Minutes Date: 19/07/2020

Student's Name: Student's ID:

Problem #1: A balanced three-phase Δ-connection generator with positive sequence has impedance $\mathbf{0.6 + j\,1.5\ \Omega}$ feeds a balanced three-phase Δ-connected load with an impedance $\mathbf{117 + j84\ \Omega}$ through connected lines that have impedances of $\mathbf{0.8 + j1.5\ \Omega}$. The internal voltage is $120\sqrt{3}\angle 30°$ V.

a) Construct a single-phase equivalent circuit of the three-phase system.
b) Obtain the phase currents $\boldsymbol{I_{AB}, I_{BC}\ and\ I_{CA}}$
c) Calculate the line currents $\boldsymbol{I_{aA}, I_{bB}\ and\ I_{cC}}$.
d) Find the phase voltages at load terminals ($\boldsymbol{V_{AB}, V_{BC}\ and\ V_{CA}}$).
e) Determine the line voltages.
f) Determine phase voltages at the terminals of generator ($\boldsymbol{V'_{ab}, V'_{bc}\ and\ V'_{ca}}$).
g) Find the average power delivered to load.
h) Calculate the total average power at load.
i) Find the total power lost at line.
j) Find the total power lost at generator.
k) Determine the total reactive power (Q) absorbed by load.
l) Calculate the total complex power (S) delivered by source.

Problem #2: For the following circuit, $R = 10\ \Omega, L = 5\ mH, and\ C = 2\ \mu F$.



a) Find the resonant frequency and the half-power frequencies.

b) Calculate the quality factor and bandwidth.

c) Determine the amplitude of the current at ω_0, ω_1, and ω_2.

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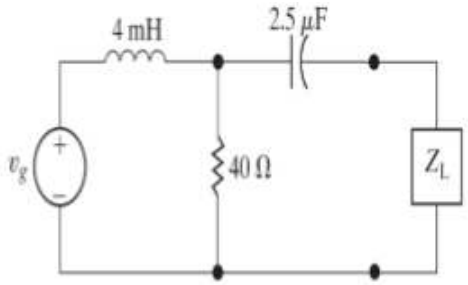
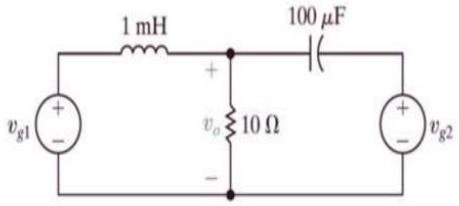
Problem #3: For the entire circuit,

a) If $\omega = 10\ krad/sec$, obtain the load impedance.

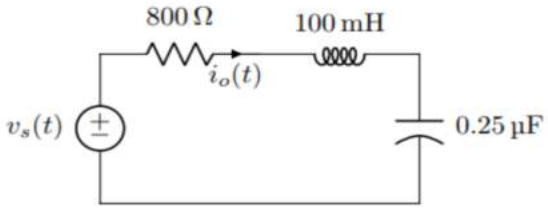
b) By assuming the $v_g(t) = 120\sin(10{,}000t + 90°)\ V$, find the maximum average power delivered to the load.



Problem #4: Find the steady state expression for $v_o(t)$ in the circuit shown below by using nodal analysis if $v_{g1} = 20\sin(2000t + 53.14°)\ V$ *and* $v_{g2} = 50\cos(2000t - 106.26°)\ V$.



Problem #5: Find the steady state expression for $i_o(t)$ in the circuit. If $v_s = 500\sin(4000t)\ mV$.



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Good Luck