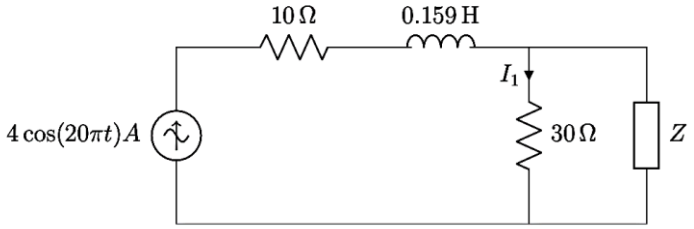
Topics

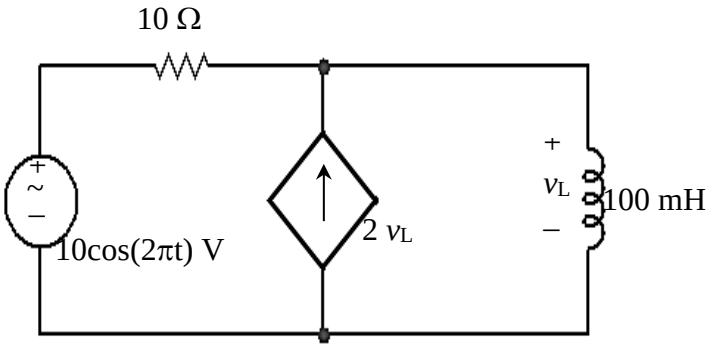
Sinusoidal sources, Phasors, Impedance model, frequency response

Questions

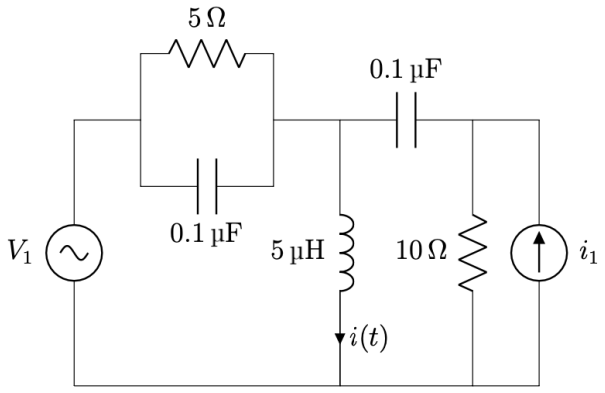
1. Determine the value of the impedance Z in the following circuit if the current I_1 = (2.56+j1.92)A.



2. Determine the voltage v_L across the inductor in the following circuit, and the average power supplied by the dependent current source.



3. For the circuit shown below, $V = 10\angle 0^o$V and $I = 10\angle 90^o$ mA at $\omega = 10^5$ rad/s. If the circuit is in steady state, find the current $i(t)$ through the inductor.

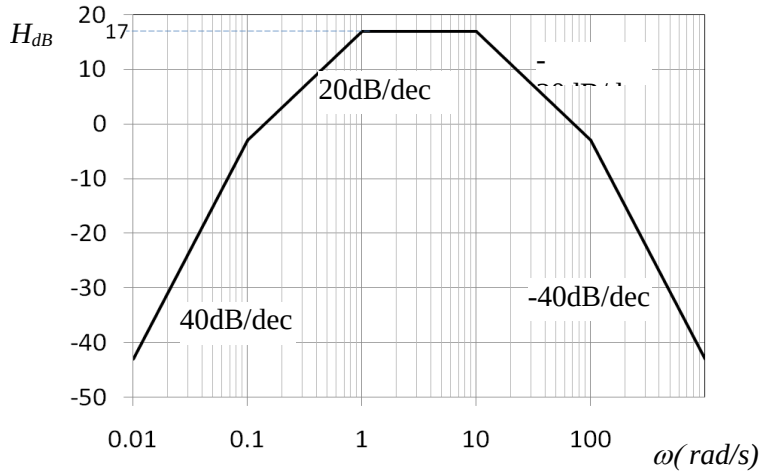


4. Draw the Bode magnitude plot for the following transfer functions.

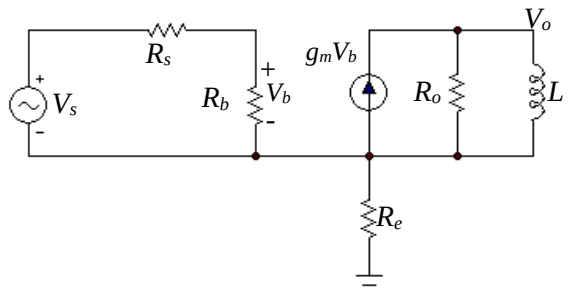
(a) $H(j\omega) = \dfrac{200\,j\omega}{(j\omega+2)(j\omega+10)}$

(b) $H(j\omega) = \dfrac{(j\omega)^2(j\omega+100)}{(j\omega+1)(j\omega+10)(j\omega+1000)}$

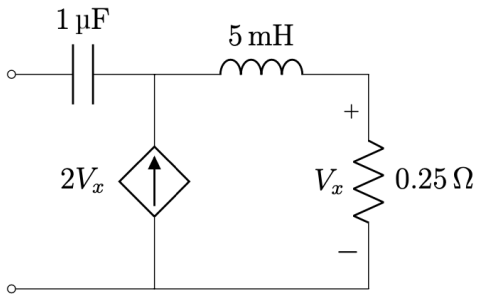
5. Find the transfer function for the following Bode plot.



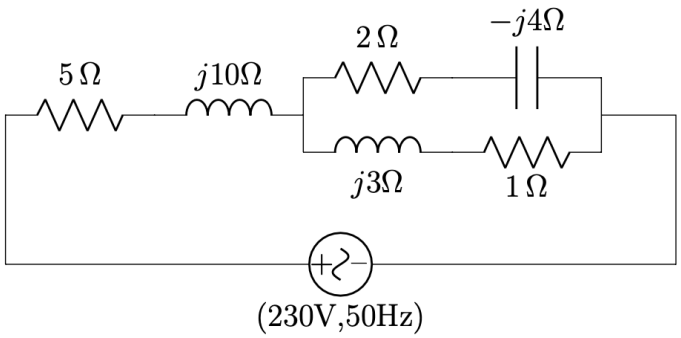
6. Determine the transfer function (V_o/V_s) for the following circuit.



7. Determine the resonant frequency for circuit shown below.



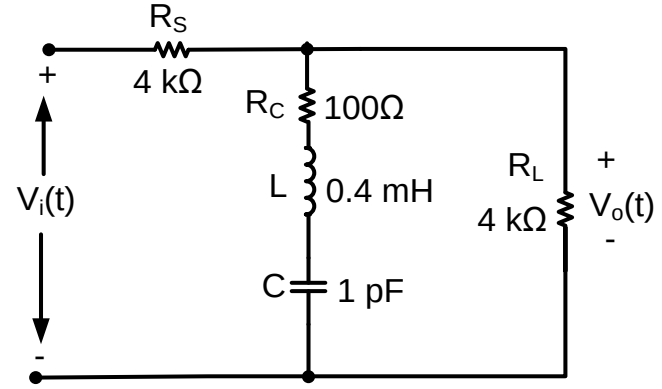
8. Find the average power and reactive power, in the network shown in figure below



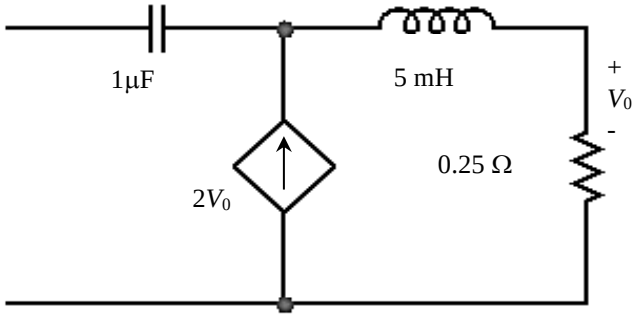
9. A band–reject (notch) filter is shown below. Derive the expression of its transfer function H in the form

$$H(j\omega) = \frac{V_o(j\omega)}{V_i(j\omega} = K\left[\frac{(1+ja)}{(1+jb)}\right].$$

Find out the expressions for the coefficients K, a and b. Determine the magnitudes of this transfer function at very low and very high frequencies from physical arguments. What is the resonance frequency of this circuit? What is the magnitude of the transfer function at this resonance frequency? Also calculate the level of rejection (in dB) at resonance frequency.



10. Determine the resonant frequency of the following circuit


1μF
5 mH
+
V_0
-
0.25 Ω
$2V_0$