JOINT INSTITUTE
交大密西根学院

Recitation Class 9

(Examples)

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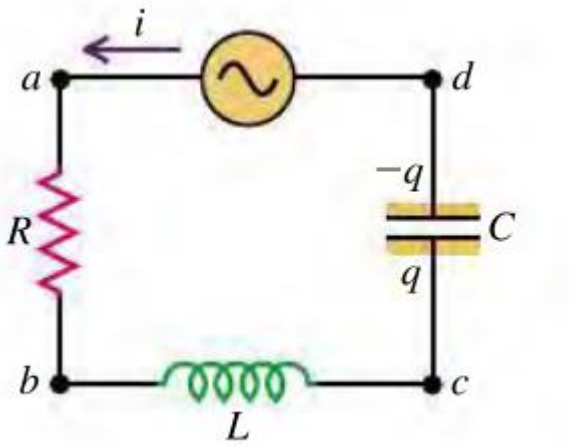
RLC circuits

RLC circuits



In the series circuit of Fig. 31.13a, suppose $R = 300\ \Omega$, $L = 60$ mH, $C = 0.50\ \mu$F, $V = 50$ V, and $\omega = 10{,}000$ rad/s. Find the reactances X_L and X_C, the impedance Z, the current amplitude I, the phase angle ϕ, and the voltage amplitude across each circuit element.

Find amplitude only

RLC circuits

31.61 • A resistance R, capacitance C, and inductance L are connected in series to a voltage source with amplitude V and variable angular frequency ω. If $\omega = \omega_0$, the resonance angular frequency, find (a) the maximum current in the resistor; (b) the maximum voltage across the capacitor; (c) the maximum voltage across the inductor; (d) the maximum energy stored in the capacitor; (e) the maximum energy stored in the inductor. Give your answers in terms of R, C, L, and V.

Waves

Waves

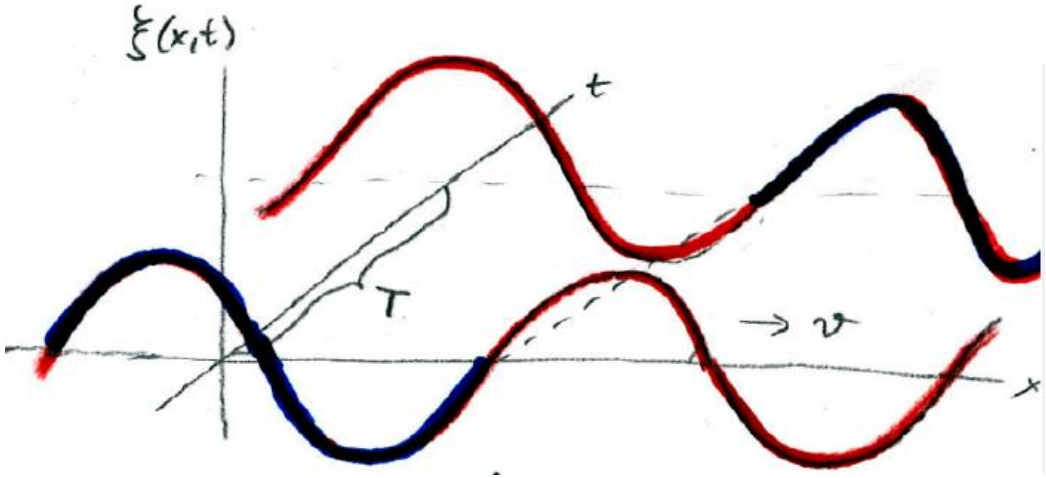
Recall (summer semester): classical wave equation (in 1D)

$$\frac{\partial^2 \xi}{\partial x^2} = \frac{1}{v^2} \frac{\partial^2 \xi}{\partial t^2}$$

ξ: displacement

v: phase speed

Waves



$$\xi(x,t) = A\cos(kx - \omega t + \varphi) \quad \rightarrow \text{ right-travelling}$$

$$\xi_{\leftarrow}(x,t) = A\cos(kx + \omega t - \varphi) = \quad \leftarrow \text{ left-travelling}$$

$$= A\cos[-(-kx - \omega t + \varphi)] \overset{\text{even}}{=} A\cos(-kx - \omega t + \varphi)$$

Note. $\xi \overset{t \leftrightarrow -t}{\leftrightarrow} \xi_{\leftarrow}$