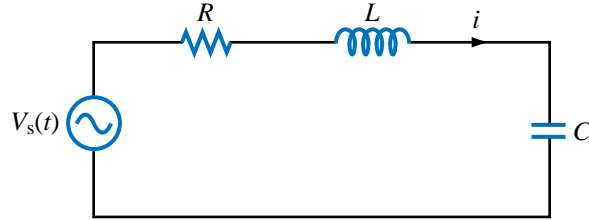


**Problem 1.28** A series RLC circuit is connected to a generator with a voltage  $v_s(t) = V_0 \cos(\omega t + \pi/3)$  (V).

- (a) Write the voltage loop equation in terms of the current  $i(t)$ ,  $R$ ,  $L$ ,  $C$ , and  $v_s(t)$ .
- (b) Obtain the corresponding phasor-domain equation.
- (c) Solve the equation to obtain an expression for the phasor current  $\tilde{I}$ .



**Figure P1.28:** RLC circuit.

**Solution:**

(a)  $v_s(t) = Ri + L \frac{di}{dt} + \frac{1}{C} \int i dt.$

(b) In phasor domain:  $\tilde{V}_s = R\tilde{I} + j\omega L\tilde{I} + \frac{\tilde{I}}{j\omega C}.$

(c)  $\tilde{I} = \frac{\tilde{V}_s}{R + j(\omega L - 1/\omega C)} = \frac{V_0 e^{j\pi/3}}{R + j(\omega L - 1/\omega C)} = \frac{\omega C V_0 e^{j\pi/3}}{\omega RC + j(\omega^2 LC - 1)}.$

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