

1.29 A series RLC circuit is connected to a generator with a voltage

$$v_s(t) = V_0 \cos(\omega t + \pi/3) \quad (\text{V}).$$

- (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} .

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