# EECS70A / CSE 70A Network Analysis I
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Homework # 7 solution

Chapter 9, Solution 38.

$$\frac{1}{6}\text{ F} \longrightarrow \frac{1}{j\omega C} = \frac{1}{j(3)(1/6)} = -j2$$

$$\mathbf{I} = \frac{-j2}{4 - j2}(10\angle 45°) = 4.472\angle -18.43°$$

Hence, i(t) = **4.472 cos(3t – 18.43°) A**

$$\mathbf{V} = 4\mathbf{I} = (4)(4.472\angle -18.43°) = 17.89\angle -18.43°$$

Hence, v(t) = **17.89 cos(3t – 18.43°) V**

(a) $$\frac{1}{12}\text{ F} \longrightarrow \frac{1}{j\omega C} = \frac{1}{j(4)(1/12)} = -j3$$

$$3\text{ H} \longrightarrow j\omega L = j(4)(3) = j12$$

$$\mathbf{I} = \frac{\mathbf{V}}{\mathbf{Z}} = \frac{50\angle 0°}{4 - j3} = 10\angle 36.87°$$

Hence, i(t) = **10 cos(4t + 36.87°) A**

$$\mathbf{V} = \frac{j12}{8 + j12}(50\angle 0°) = 41.6\angle 33.69°$$

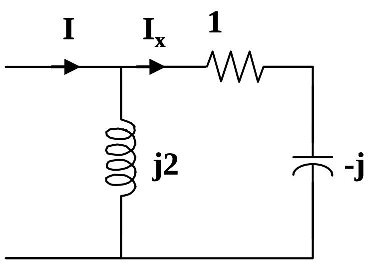
Hence, v(t) = **41.6 cos(4t + 33.69°) V**

**Chapter 9, Solution 49.**

$$\mathbf{Z}_T = 2 + j2 \,||\, (1 - j) = 2 + \frac{(j2)(1 - j)}{1 + j} = 4$$

$i_x = 0.5\sin 200t = 0.5\cos(200t - 90°)$

$\mathbf{I}_x = 0.5\angle -90°$




$$\mathbf{I} = \frac{V_S}{Z_T} = \frac{V_S}{4}$$

$$I_X = (\frac{j2}{1+j})\frac{V_S}{4} = 0.5\angle -90°$$ using current divider

$$\mathbf{V}_s = \mathbf{(0.5\angle -90°)\cdot 4\cdot(\frac{1+j}{j2})} = 1.414\angle -135°$$

$v_s(t) =$ **1.414cos(200t-135°)= 1.414 sin(200t – 45°) V**

**Chapter 9, Solution 57.**

$$2\text{H} \longrightarrow j\omega L = j2$$

$$1\text{F} \longrightarrow \frac{1}{j\omega C} = -j$$

$$\text{Z} = 1 + \text{j}2 // (2 - \text{j}) = 1 + \frac{\text{j}2(2-\text{j})}{\text{j}2 + 2 - \text{j}} = 2.6 + \text{j}1.2$$

$$\text{Y} = 1/\text{Z} = \underline{0.3171 - \text{j}0.1463\ \text{S}}$$

**Chapter 9, Solution 64.**

$$\text{Z}_\text{T} = 4 + \frac{-\text{j}10(6+\text{j}8)}{6-\text{j}2} = \underline{19 - \text{j}5\Omega}$$

$$\text{I} = \frac{30\angle 90°}{\text{Z}_\text{T}} = -0.3866 + \text{j}1.4767 = \underline{1.527\angle 104.7°\ \text{A}}$$

**Chapter 14, Solution 48.**

$$\mathbf{H}(\omega) = \frac{R \parallel \frac{1}{j\omega C}}{j\omega L + R \parallel \frac{1}{j\omega C}}$$

$$\mathbf{H}(\omega) = \frac{\frac{R/j\omega C}{R + 1/j\omega C}}{j\omega L + \frac{R/j\omega C}{R + 1/j\omega C}}$$

$$\mathbf{H}(\omega) = \underline{\frac{\mathbf{R}}{\mathbf{R + j\omega L - \omega^2 RLC}}}$$

$H(0) = 1$ and $H(\infty) = 0$ showing that **this circuit is a lowpass filter**.

**Chapter 14, Solution 50.**

$$\mathbf{H}(\omega) = \frac{\mathbf{V}_o}{\mathbf{V}_i} = \frac{j\omega L}{R + j\omega L}$$

$H(0) = 0$ and $H(\infty) = 1$ showing that **this circuit is a highpass filter**.

$$\mathbf{H}(\omega_c) = \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{1 + \left(\frac{R}{\omega_c L}\right)^2}} \longrightarrow 1 = \frac{R}{\omega_c L}$$

or $\omega_c = \frac{R}{L} = 2\pi f_c$

$$f_c = \frac{1}{2\pi} \cdot \frac{R}{L} = \frac{1}{2\pi} \cdot \frac{200}{0.1} = \underline{\mathbf{318.3\ Hz}}$$