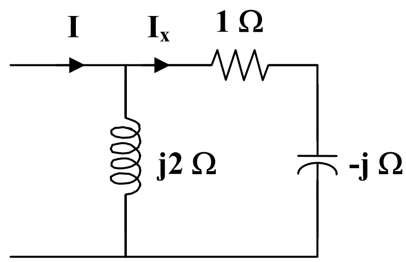
Chapter 9, Solution 49.

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



$$\mathbf{I}_x = \frac{j2}{j2+1-j}\mathbf{I} = \frac{j2}{1+j}\mathbf{I}, \qquad \text{where} \quad \mathbf{I}_x = 0.5\angle 0° = \frac{1}{2}$$

$$\mathbf{I} = \frac{1+j}{j2}\mathbf{I}_x = \frac{1+j}{j4}$$

$$\mathbf{V}_s = \mathbf{I}\,\mathbf{Z}_T = \frac{1+j}{j4}(4) = \frac{1+j}{j} = 1-j = 1.414\angle -45°$$

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

Chapter 9, Solution 57.

2H $\longrightarrow$ $j\omega L = j2$

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

$$Z = 1 + j2 // (2 - j) = 1 + \frac{j2(2-j)}{j2 + 2 - j} = 2.6 + j1.2$$

$$Y = 1/Z = \underline{0.3171 - j0.1463 \ \text{S}}$$

Chapter 9, Solution 38.

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

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

Hence, i(t) = **<u>4.472 cos(3t – 18.43°) A</u>**

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

Hence, v(t) = **<u>17.89 cos(3t – 18.43°) V</u>**

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

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

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

Hence, i(t) = **<u>10 cos(4t + 36.87°) A</u>**

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

Hence, v(t) = **<u>41.6 cos(4t + 33.69°) V</u>**

Chapter 9, Solution 64.

$$Z_T = 4 + \frac{-j10(6+j8)}{6-j2} = \underline{19 - j5\Omega}$$

$$I = \frac{30\angle 90^\circ}{Z_T} = -0.3866 + j1.4767 = \underline{1.527\angle 104.7^\circ\ A}$$

Chapter 14, Solution 48.

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

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

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

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

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 **<u>this circuit is a highpass filter</u>**.

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

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

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