

Chapter 11, Solution 59.

Calculate the reactive power in the inductor and capacitor in the circuit of Fig. 11.78.

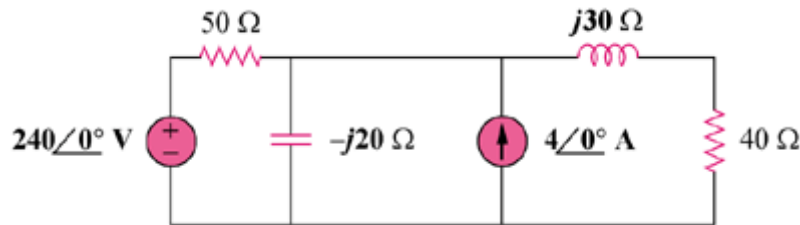


Figure 11.78
For Prob. 11.59.

Solution

Let V_o represent the voltage across the current source and then apply nodal analysis to the circuit and we get:

$$4 + \frac{240 - V_o}{50} = \frac{V_o}{-j20} + \frac{V_o}{40 + j30}$$
$$88 = (0.36 + j0.38)V_o$$
$$V_o = \frac{88}{0.36 + j0.38} = 168.13 \angle -46.55^\circ$$

$$I_1 = \frac{V_o}{-j20} = 8.41 \angle 43.45^\circ$$

$$I_2 = \frac{V_o}{40 + j30} = 3.363 \angle -83.42^\circ$$

Reactive power in the inductor is

$$S = |I_2|^2 Z_L = (3.363)^2 (j30) = j339.3 \text{ VAR}$$

Reactive power in the capacitor is

$$S = |I_1|^2 Z_c = (8.41)^2 (-j20) = -j1.4146 \text{ kVAR}$$