Chapter 11, Solution 17.

We find Z_{eq} at terminals a-b following Fig. (a).

(a)
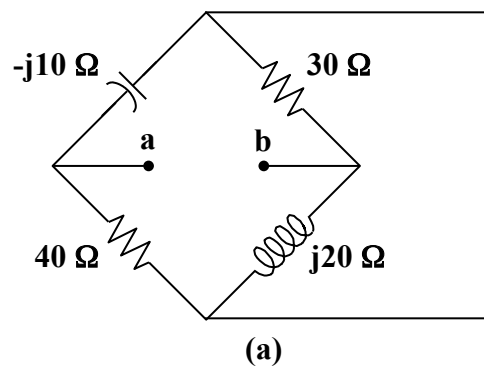
$$\mathbf{Z}_{eq} = \left(- j10 + 30\right) \| \left(j20 + 40\right) = \frac{(30 - j10)(40 + j20)}{70 + j10} = \mathbf{20\ \Omega} = \mathbf{Z_L}$$

We obtain $\mathbf{V}_{Thev}$ from Fig. (b).

(b)
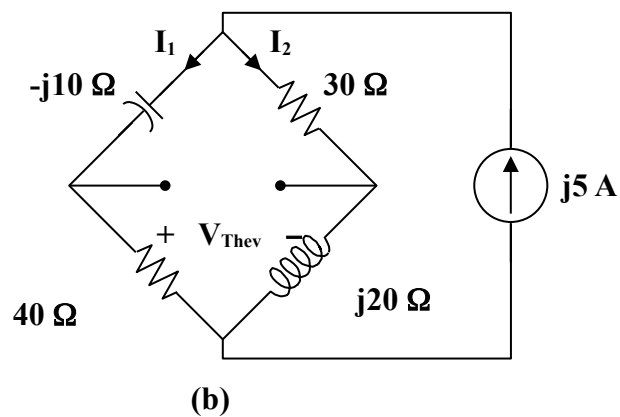
Using current division,

$$\mathbf{I}_1 = \frac{30 + j20}{70 + j10}(j5) = -1.1 + j2.3$$

$$\mathbf{I}_2 = \frac{40 - j10}{70 + j10}(j5) = 1.1 + j2.7$$

$$\mathbf{V}_{Th} = 30\mathbf{I}_2 + j10\mathbf{I}_1 = 10 + j70$$

$$P_{max} = \frac{\left|\mathbf{V}_{Th}\right|^2}{2\left(Z_{eq} + Z_L\right)^2} Z_L = \frac{5000}{(2)(2x20)^2} 20 = \mathbf{31.25\ W}$$