Chapter 10, Solution 59.

Calculate the output impedance of the circuit shown in Fig. 10.102.

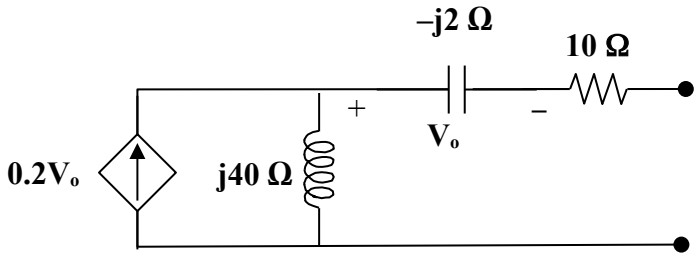
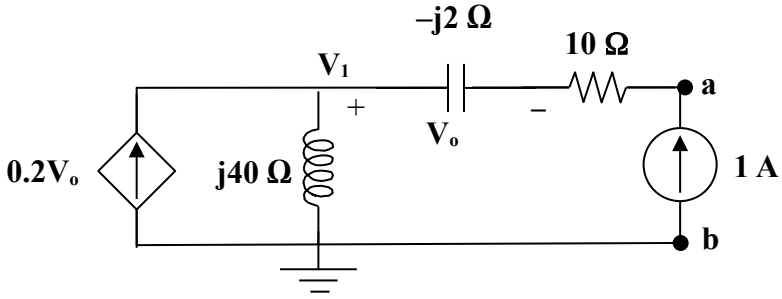


Figure 10.102
For Prob. 10.59.

Solution

Since there are no independent sources, we need to inject a current, best value is to make it 1 amp, into the terminals on the right and then to determine the voltage at the terminals.



Clearly $\mathbf{V_o} = -(-j2) = j2$ and $\mathbf{V_1} = (0.2V_o + 1)j40 = (1+j0.4)j40 = -16+j40$ V.
Next, $\mathbf{V_{ab}} = 10 - j2 - 16 + j40 = -6+j38 = 38.47\angle 98.97°$ V or

$$\mathbf{Z_{eq}} = \mathbf{(-6+j38)\ \Omega}.$$