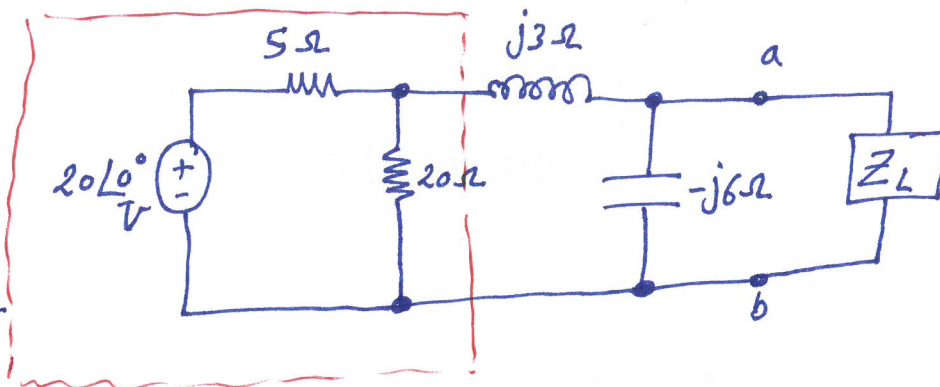⊛ Example 10.8 - part "a":
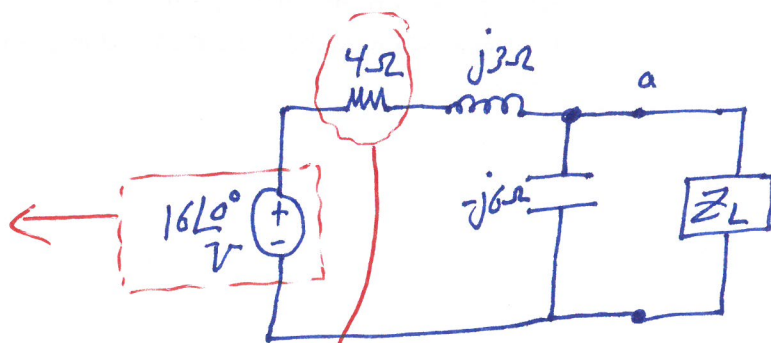
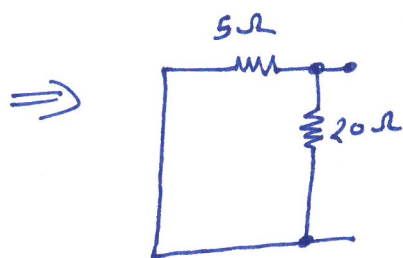

⊛ Source Transformation for this block will lead to the following:

voltage divider

$$\frac{20\angle 0° \times 20}{5 + 20}$$

$$= 16\angle 0° \; V$$
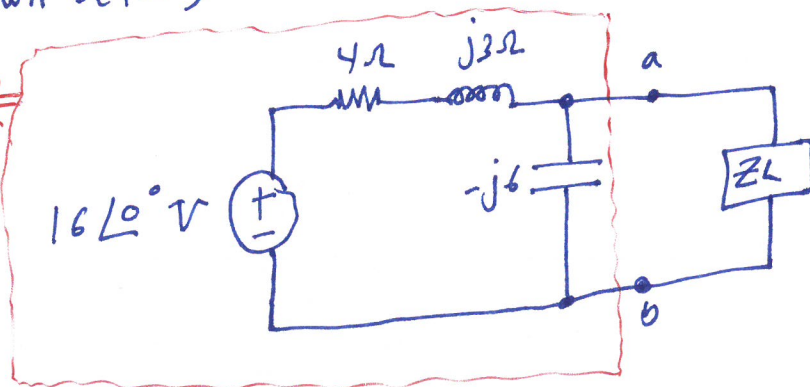
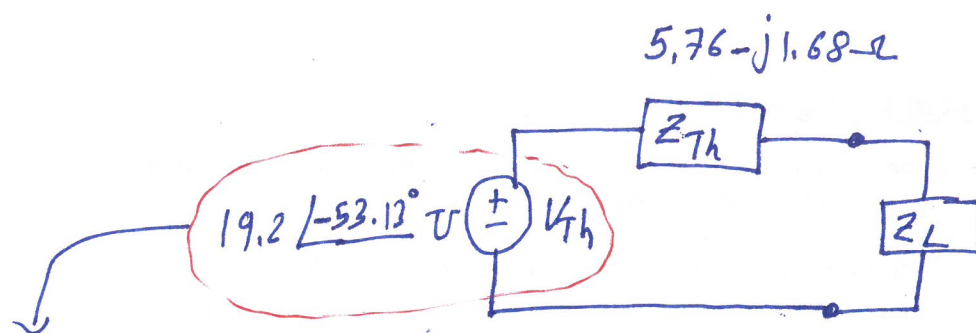⊛ To find This resistor, short circuit the voltage source & find Req for resistors inside The red block

$$5\Omega \, || \, 20\Omega \Rightarrow Req = 4\Omega$$

⊛ Then as shown before, the circuit simplifies to look like This:

⊙ now, we perform one more source transformation for This block

$5.76 - j1.68\,\Omega$

Z_{Th}

$19.2\,\underline{/-53.13°}\,U\,\left(\pm\right)\,V_{th}$ Z_L

⊛ Voltage divider between the capacitor $(-j6)$ ∅ the resistor and the inductor $(4+j3\,\Omega)$ will lead to:

The $-j$ is a $-90°$ phase shift.

$$U_{Th} = \frac{16\,\underline{/0°}\,(-j6)}{4+j3-j6}$$

$$V_{Th} = \frac{96\,\underline{/-90°}}{5\,\underline{/-36.87}} = 19.2\,\underline{/-53.13°} = 11.52 - j15.36\,V.$$

⊛ Now, to find Z_{Th}, we short circuit the voltage source:

4   j3

$-j6$

$(4+j3)\,||\,-j6$

$$\Rightarrow Z_{Th} = \frac{(-j6)(4+j3)}{4+j3-j6}$$

$$= 5.76 - j1.68\,\Omega.$$