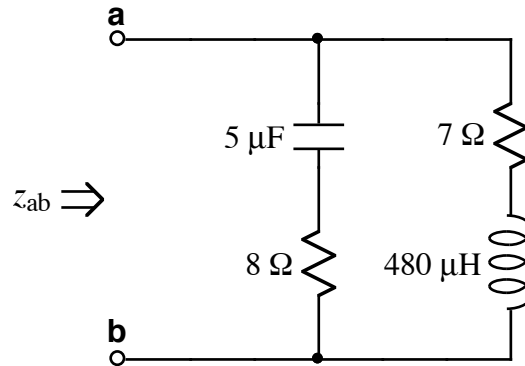


Ex:



Given $\omega = 50 \text{ k rad/s}$, find z_{ab} .

sol'n:

We compute impedances using

$$z_R = R, \quad z_L = j\omega L, \quad z_C = \frac{1}{j\omega C} = \frac{-j}{\omega C}$$

$$\therefore z_L = j \cdot 50 \text{ k rad/s} \cdot 480 \mu\text{H}$$

$$= j \cdot 50 \cdot 480 \text{ m}\Omega$$

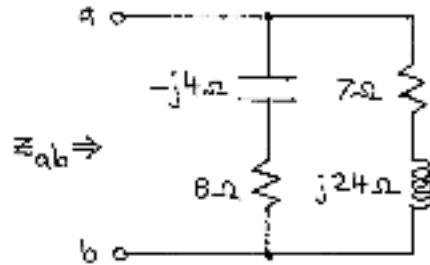
$$= j \cdot 24 \Omega$$

$$z_C = \frac{-j}{50 \text{ k rad/s} \cdot 5 \mu\text{F}}$$

$$= \frac{-j}{250 \text{ m}} \Omega$$

$$= -j4 \Omega$$

Now we draw the frequency- (or s-domain) model:



$$\text{We have } z_{ab} = (8 - j4 \Omega) \parallel (7 + j24 \Omega)$$

$$= \frac{(8 - j4)(7 + j24) \Omega}{8 - j4 + 7 + j24}$$

$$= \frac{\sqrt{8^2 + 4^2} \tan^{-1}(-4/8) \sqrt{7^2 + 24^2} \tan^{-1}(24/7) \Omega}{15 + j20}$$

$$= \frac{4\sqrt{5} \angle -26.6^\circ \cdot 25 \angle 73.7^\circ \Omega}{25 \angle 53.1^\circ}$$

$$= 4\sqrt{5} \angle -26.6^\circ + 73.7^\circ - 53.1^\circ \Omega$$

$$z_{ab} = 4\sqrt{5} \angle -6^\circ \Omega$$