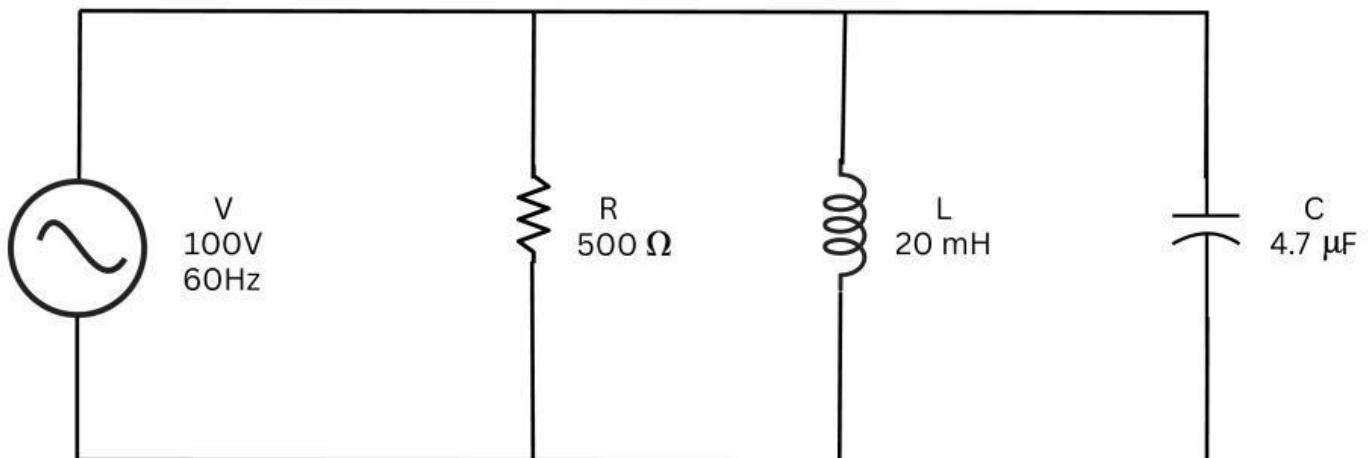


## Assessment 7: RLC Parallel Circuit



A circuit consisting of a resistor of  $500\Omega$ , capacitor of  $4.7\mu F$  and an inductor of  $20mH$  are connected in parallel to a supply voltage of  $100V$ ,  $60$  Hz as circuit above. Calculate the following: -

1. The current in the resistor,  $I_R$  (2m)
2. The current in the coil,  $I_L$  (3 m)
3. The current in the capacitor,  $I_C$  (3 m)
4. The supply current,  $I_T$  (4 m)
5. The total impedance,  $Z_T$  (2 m)
6. The power consumed (2 m)
7. The power factor (4 m)

### SOLUTION:

The capacitive reactance

$$X_C = \frac{1}{2\pi f C}$$

$$\begin{aligned}
 &= \frac{1}{2 \times \boxed{\phantom{0}} \times \boxed{\phantom{0}} \times \boxed{\phantom{0}} \times \boxed{\phantom{0}} \times \boxed{\phantom{0}}} \\
 &= \boxed{\phantom{0.00}} \Omega
 \end{aligned}$$

The inductive reactance

$$\begin{aligned} X_L &= 2 \pi f L \\ &= \boxed{\phantom{00}} \times \boxed{\phantom{00}} \times \boxed{\phantom{00}} \times \boxed{\phantom{00}} \times \boxed{\phantom{00}} \Omega \\ &= \boxed{\phantom{000}} \Omega \end{aligned}$$

The current flowing in the resistor

$$\begin{aligned} I_R &= \frac{\boxed{V} \angle \boxed{\theta}^{\circ}}{\boxed{R} \angle \boxed{\theta}^{\circ}} \\ &= \frac{\boxed{\phantom{00}} \angle \boxed{\phantom{00}}^{\circ}}{\boxed{\phantom{00}} \angle \boxed{\phantom{00}}^{\circ}} \\ &= \boxed{\phantom{00}} \angle \boxed{\phantom{00}}^{\circ} \text{ A} \end{aligned}$$

The current flowing in the inductor

$$\begin{aligned} I_L &= \frac{\boxed{V} \angle \boxed{\theta}^{\circ}}{\boxed{X_L} \angle \boxed{\theta}^{\circ}} \\ &= \frac{\boxed{\phantom{00}} \angle \boxed{\phantom{00}}^{\circ}}{\boxed{\phantom{00}} \angle \boxed{\phantom{00}}^{\circ}} \\ &= \boxed{\phantom{00}} \angle \boxed{\phantom{00}}^{\circ} \text{ A} \end{aligned}$$

The current flowing in the capacitor

$$\begin{aligned} I_C &= \frac{V \angle \theta^\circ}{X_C \angle \theta^\circ} \\ &= \frac{\square \angle \square^\circ}{\square \angle \square^\circ} \\ &= \square \angle \square^\circ \text{ A} \end{aligned}$$

The supply current

$$\begin{aligned} I_T &= I_R \angle \theta^\circ + I_L \angle \theta^\circ + I_C \angle \theta^\circ \\ &= \square \angle \square^\circ + \square \angle \square^\circ + \square \angle \square^\circ \\ &= (\square \quad \square \quad \square) + (\square \quad \square \quad \square) + (\square \quad \square \quad \square) \\ &= \square \quad \square \quad \square \\ &= \square \angle \square^\circ \text{ A} \end{aligned}$$

The total impedance

$$\begin{aligned} Z_T &= \frac{V \angle \theta^\circ}{I_T \angle \theta^\circ} \\ &= \frac{\square \angle \square^\circ}{\square \angle \square^\circ} \\ &= \frac{\square \quad \square}{\square \quad \square} \\ &= \frac{\square}{\square} \angle \square^\circ \quad \Omega \end{aligned}$$

The phase angle,

$$\theta = \square^\circ$$

The true power

$$\begin{aligned} P &= \boxed{V} \times \boxed{I} \times \boxed{\cos} \boxed{\theta}^{\circ} \\ &= \boxed{\phantom{000}} \times \boxed{\phantom{000}} \times \boxed{\phantom{000}}^{\circ} \\ &= \boxed{\phantom{000}} \quad \text{W} \end{aligned}$$

The apparent power

$$\begin{aligned} S &= \boxed{V} \times \boxed{I} \\ &= \boxed{\phantom{000}} \times \boxed{\phantom{000}} \\ &= \boxed{\phantom{000}} \quad \text{VA} \end{aligned}$$

The power factor

$$\begin{aligned} P_f &= \frac{\boxed{P}}{\boxed{S}} \\ &= \frac{\boxed{\phantom{000}}}{\boxed{\phantom{000}}} \\ &= \boxed{\phantom{000}} \end{aligned}$$