**Answer on Question #52448-Engineering-Other**

A circuit consists of three blocks connected in series. The first block consists of a resistor of 31ohm, and a capacitance of 100 muF connected in parallel. The second block consists of a resistor of 50 ohm. The third block consists of a resistor of 20 ohm and an inductance of 0.11 H connected in parallel. The circuit is connected to a supply of 230 V at 50 Hz. Determine the overall current taken from the supply and its phase using the complex notations.

**Solution**

The overall current taken from the supply is

$$I = \frac{V}{Z}.$$

The impedance is

$$Z = Z_1 + Z_2 + Z_3.$$

$$Z_1 = \frac{R_1\left(\frac{1}{i\omega C_1}\right)}{R_1 + \frac{1}{i\omega C_1}} = \frac{R_1\left(\frac{1}{i\omega C_1}\right)\left(R_1 - \frac{1}{i\omega C_1}\right)}{\left(R_1 + \frac{1}{i\omega C_1}\right)\left(R_1 - \frac{1}{i\omega C_1}\right)} = \frac{R_1\left(\frac{1}{\omega C_1}\right)\left(\frac{1}{\omega C_1} - iR_1\right)}{R_1^2 + \left(\frac{1}{\omega C_1}\right)^2}.$$

$$\frac{1}{\omega C_1} = \frac{1}{2\pi 50\ \text{Hz} \cdot 100\ \mu\text{F}} = 32\ ohm.$$

$$Z_1 = \frac{31(32\ )(32\ - i31)}{31^2 + (32\ )^2} = (16 - 15.5i) ohm.$$

$$Z_2 = 50\ ohm.$$

$$Z_3 = \frac{R_3(i\omega L)}{R_3 + i\omega L} = \frac{R_3(i\omega L)(R_3 - i\omega L)}{(R_3 + i\omega L)(R_3 - i\omega L)} = \frac{R_3(\omega L)(iR_3 + \omega L)}{R_3^2 + (\omega L)^2}.$$

$$\omega L = 2\pi 50\ \text{Hz} \cdot 0.11\ \text{H} = 34.6\ \text{ohm}.$$

$$Z_3 = \frac{20(34.6)(i20 + 34.6)}{20^2 + 34.6^2} = (8.7i + 15) ohm.$$

$$Z = 16 - 15.5i + 50 + 8.7i + 15 = (81 - 6.8i) ohm.$$

$$I = \frac{230\angle 0°}{(81 - 6.8i)} = 2.8A\angle 4.8°.$$

**Answer: $2.8A\angle 4.8°$.**