Analog Assignment-1

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***Question*—Suppose the circuit in Exercise 7.18 has a resistance of 15 Ω. Obtain the average power transferred to each element of the circuit, and the total power absorbed.**

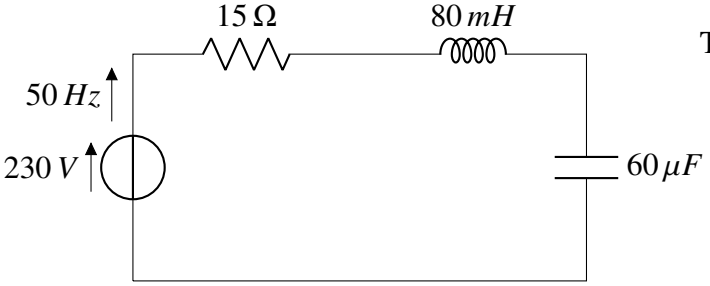
SOLUTION -:

In Exercise 7.18, the following information is provided:

Components	Values
Capacitance of capacitor	60 μF
IInductance of inductor	80 mH
Resistance of resistor	15 Ω
Potential of voltage supply	230 V
Frequency of signal	50 Hz

TABLE 0

Angular frequency of signal, $\omega = 2\pi f = 2\pi \cdot (50) = 100\pi$



The elements are connected in series to each other. Hence the impedence Z is givan as :

$$Z = \sqrt{R^2 + \left(\omega \cdot L - \frac{1}{\omega \cdot C}\right)^2} \tag{1}$$

$$= \sqrt{15^2 + \left(100\pi \cdot (80 \times 10^{-3}) - \frac{1}{100\pi \times 60 \times 10^{-6}}\right)^2} \tag{2}$$

$$= \sqrt{15^2 + (25.12 - 53.08)^2} \tag{3}$$

$$= 31.728 \ \Omega \tag{4}$$

Current flowing through the circuit I is :

$$I = \frac{V}{Z} = \frac{230}{31.728} \tag{5}$$

$$= 7.25 \ A \tag{6}$$

Average power transferred to resistance is given by :

$$P_R = I^2 \cdot R = (7.25)^2 \times 15 \tag{7}$$

$$= 788.44 \ W \tag{8}$$

Average power transferred to the capacitor, P_C = Average power transferred to the inductor, $P_L = 0$
Total power absorbed by circuit:

$$= P_R + P_C + P_L \tag{9}$$

$$= 788.44 + 0 + 0 \tag{10}$$

$$= 788.44 \ W \tag{11}$$

Total power absorbed by circuit is 788.44W