Analog Assignment-1

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Problem Assigned -: 12.7.6

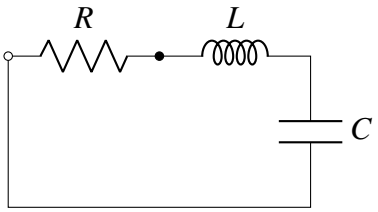
***Abstract*—Obtain the resonant frequency of a series of LCR circuit with l=2.0H, c=32muF and R=10 ohm. What is the Q-value of this circuit?**

Solution -:

In Exercise 7.18, the following information is provided:

Component	Value	Unit
Inductor	2.0	H
Capacitor	32μ	F
Resistance	10	*ohm*

TABLE 0
Electrical Component Parameters



Given values: $L = 2.0\,\text{H}$, $C = 32 \times 10^{-6}\,\text{F}$, $R = 10\,\Omega$.

The resonant frequency f_0 is given by:

$$f_0 = \frac{1}{2\pi\sqrt{LC}}$$

Substituting the values:

$$f_0 = \frac{1}{2\pi\sqrt{(2.0\,\text{H})(32 \times 10^{-6}\,\text{F})}}$$

Calculating f_0:

$$f_0 \approx \frac{1}{2\pi\sqrt{0.000064}} \approx \frac{1}{2\pi \times 0.008} \approx \frac{1}{0.05027} \approx 19.90\,\text{Hz}$$

The quality factor Q is given by:

$$Q = \frac{1}{R}\sqrt{\frac{L}{C}}$$

Substituting the values:

$$Q = \frac{1}{10\,\Omega}\sqrt{\frac{2.0\,\text{H}}{32 \times 10^{-6}\,\text{F}}}$$

Calculating Q:

$$Q \approx \frac{1}{10} \times \sqrt{\frac{2.0}{0.000064}} \approx \frac{1}{10} \times \sqrt{31250} \approx \frac{1}{10} \times 177.05 \approx 17.71$$

Therefore, the resonant frequency is $f_0 \approx 19.90\,\text{Hz}$ and the quality factor is $Q \approx 17.71$.