Analog Assignment-1

Name -: Varasala Swathi Deepika

Roll no -: EE23BTECH11061

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 -:

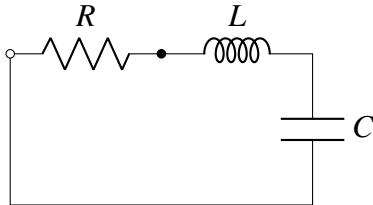In Exercise 7.18, the following information is provided:

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

TABLE 0
ELECTRICAL COMPONENT PARAMETERS

Resonant frequency (f_0):

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

Substituting the given values:

$$f_0 \approx \frac{1}{2\pi \sqrt{(0.2)(32 \times 10^{-6})}}$$

Calculating:

$$f_0 \approx \frac{1}{2\pi \sqrt{6.4 \times 10^{-6}}}$$

$$f_0 \approx \frac{1}{2 \times 3.14159 \times 0.0025298221281347}$$

$$f_0 \approx \frac{1}{0.015915494309189}$$

$$f_0 \approx 62.83 \, \text{Hz}$$

Quality factor (Q):

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

Substituting the given values:

$$Q = \frac{1}{10} \sqrt{\frac{0.2}{32 \times 10^{-6}}}$$

Calculating:

$$Q \approx \frac{1}{10} \sqrt{\frac{0.2}{3.2 \times 10^{-5}}}$$

$$Q \approx \frac{1}{10} \sqrt{\frac{0.2}{0.000032}}$$

$$Q \approx \frac{1}{10} \sqrt{6250}$$

$$Q \approx \frac{1}{10} \times 79.0569415$$

$$Q \approx 7.91$$