Chap31

1. *Chapter 31, Problem 85

An LC circuit oscillates at a frequency of 10.8 kHz. (a) If the capacitance is 352 mF, what is the inductance (in H)? (b) If the maximum current is 7.04 mA, what is the total energy in the circuit? (c) What is the maximum charge (in C) on the capacitor?

(a) 6.169501708487E-10 H
(b) Number 1.528851879377E-14 Units J
(c) 1.03744443858E-7 C

2. *Chapter 31, Problem 23

In an oscillating LC circuit, \( L = 29.7 \) mH and \( C = 10.1 \) μF. At time \( t = 0 \) the current is 8.65 mA, the charge on the capacitor is 5.56 μC, and the capacitor is charging. What are (a) the total energy in the circuit, (b) the maximum charge (in C) on the capacitor, and (c) the maximum current? (d) If the charge on the capacitor is given by \( q = Q \cos(\omega t + \phi) \), what is the phase angle \( \phi \)? (e) Suppose the data are the same, except that the capacitor is discharging at \( t = 0 \). What then is \( \phi \)?

(a) Number 0.000002641490 Units J
(b) 0.000007304663 C
(c) 0.013337096344 A
(d) Number -40.43364359946 Units ° (degrees)
(e) Number -40.4336435946 Units ° (degrees)

3. *Chapter 31, Problem 25

What resistance \( R \) should be connected in series with an inductance \( L = 170 \) mH and capacitance \( C = 10.3 \) μF for the maximum charge on the capacitor to decay to 96.9% of its initial value in 59.0 cycles? (Assume \( \omega' \approx \omega \).)

Number 0.021826586692 Units Ω

Significant digits are disabled; the tolerance is +/-2%

4. Test Bank, Question 37

In a purely inductive circuit, the current lags the voltage by:

- 0
- one-fourth of a cycle
- one-half of a cycle
- three-fourths of a cycle
- one cycle

5. *Chapter 31, Problem 32

In the figure, an ac generator with emf $E = E_m \sin \omega_d t$, where $E_m = 24.2$ V and $\omega_d = 373$ rad/s, is connected to a 12.2 H inductor. (a) What is the maximum value of the current (in A)? (b) When the current is a maximum, what is the emf (in V) of the generator? (c) When the emf of the generator is - 12.0 V and increasing in magnitude, what is the current (in A)?

(a) Number 0.005317980047 Units A  
(b) 0 V  
(c) Number 0.004618123450 Units A

6. *Chapter 31, Problem 34

In the figure, an ac generator with emf $E = E_m \sin \omega_d t$, where $E_m = 24.0$ V and $\omega_d = 375$ rad/s, is connected to a 4.08 $\mu$F capacitor. (a) What is the maximum value of the current (in A)? (b) When the current is a maximum, what is the emf (in V) of the generator? (c) When the emf of the generator is - 12.5 V and increasing in magnitude, what is the current (in A)?

(a) Number 0.03672 Units A  
(b) 0 V  
(c) Number -0.031346335910 Units A

7. Test Bank, Question 45

In an RLC series circuit, which is connected to a source of emf $E_m \cos (\omega t)$, the current lags the voltage by 45° if:

- $R = 1/ \omega C - \omega L$
- $R = 1/ \omega L - \omega C$
- $R = \omega L - 1/ \omega C$
- $R = \omega C - 1/ \omega L$
- $\omega L = 1/ \omega C$
8. Test Bank, Question 48

The impedance of the circuit shown is:

\[ Z = 50 \, \Omega + 0.20 \, H + 150 \, \mu F \]

50 Hz, 240 V \text{rms}

- 21 \, \Omega
- 50 \, \Omega
- 63 \, \Omega
- 65 \, \Omega
- 98 \, \Omega

9. *Chapter 31, Problem X2

A single-loop series RLC circuit is connected to an 42 V ac voltage generator with a frequency of 60.0 Hz. The resistance is \( R = 180 \, \Omega \), the inductance is \( L = 190 \, \text{mH} \), and the capacitance is \( C = 15.0 \, \mu \text{F} \). When the generator emf is a maximum, what is the voltage across (a) the generator, (b) the resistance, (c) the capacitance and (d) the inductance?

(a) 42 V
(b) 31.304886441162 V
(c) 17.97648030619 V
(d) -7.28133471781 V

10. *Chapter 31, Problem 48

Figure 31-31 shows a driven RLC circuit that contains two identical capacitors and two switches. The emf amplitude is set at 11.6 V, and the driving frequency is set at 60.4 Hz. With both switches open, the current leads the emf by 31.9°. With switch \( S_1 \) closed and switch \( S_2 \) still open, the emf leads the current by 15.1°. With both switches closed, the current amplitude is 440 mA. What are (a)\( R \), (b)\( C \) (in F), and (c)\( L \) (in H)?
11. *Chapter 31, Problem 49

In Fig. 31-32, a generator with an adjustable frequency of oscillation is connected to resistance \( R = 118 \, \Omega \), inductances \( L_1 = 2.24 \, \text{mH} \) and \( L_2 = 2.26 \, \text{mH} \), and capacitances \( C_1 = 5.67 \, \mu\text{F} \), \( C_2 = 3.36 \, \mu\text{F} \), and \( C_3 = 4.87 \, \mu\text{F} \). What is the resonant frequency of the circuit? (Hint: See Problem 45 in Chapter 30.)

![Figure 31-32](image)

\[ 636.365124095804 \, \text{Hz} \]

*Significant digits are disabled; the tolerance is +/-2%*

12. *Chapter 31, Problem 54

What is the maximum value of an ac voltage whose rms value is 137 V?

\[ 193.747258045114 \, \text{V} \]

*Significant digits are disabled; the tolerance is +/-2%*

13. Test Bank, Question 60

An \( RLC \) circuit has a sinusoidal source of emf. The average rate at which the source supplies energy is 5 nW. This must also be:

- the average rate at which energy is stored in the capacitor
- the average rate which energy is stored in the inductor
- the average rate at which energy is dissipated in the resistor
- twice the average rate at which energy is stored in the capacitor
three times the average rate at which energy is stored in the inductor

14. *Chapter 31, Problem 57

In an $RLC$ circuit such as that of Fig. 31-7 assume that $R = 4.65 \, \Omega$, $L = 58.7 \, \text{mH}$, $f_d = 75.2 \, \text{Hz}$, and $\varepsilon_m = 30.6 \, \text{V}$. For what values of the capacitance would the average rate at which energy is dissipated in the resistance be (a) a maximum and (b) a minimum? What are (c) the maximum dissipation rate and the corresponding (d) phase angle and (e) power factor? What are (f) the minimum dissipation rate and the corresponding (g) phase angle and (h) power factor?

Figure 31-7

(a) $0.000076307369 \, \text{F}$
(b) $0 \, \text{F}$
(c) Number $100.683870967742 \, \text{Units W}$
(d) Number $0 \, \text{Units } ^\circ \, (\text{degrees})$
(e) Number $1 \, \text{Units} \, \text{This answer has no units}$
(f) Number $0 \, \text{Units W}$
(g) Number $-90 \, \text{Units } ^\circ \, (\text{degrees})$
(h) Number $0 \, \text{Units} \, \text{This answer has no units}$

15. *Chapter 31, Problem 62

A generator supplies 94 V to a transformer’s primary coil, which has 54 turns. If the secondary coil has 630 turns, what is the secondary voltage?

$1096.6666666667 \, \text{V}$

*Significant digits are disabled; the tolerance is +/-2%*