PHYSICS

BOOKS - RESNICK AND HALLIDAY PHYSICS (HINGLISH)

ELECTROMAGNETIC OSCILLATIONS AND ALTERNATING CURRENT

Sample Problem

1. A 1.5 μF capacitor is charged to 57 V. The charging battery is then disconnected , and a 12 mH coil is

connected in series with the capacitor so that LC oscillations occur. What is the maximum current in the coil ? Assume that the circuit contains no resistance , which woudl cause the energy to be dissipated.

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2. Resistance R is 200 Ω and the sinusoidal alternating emf device operates at amplitude E_m =36.0 V and frequency f_d=60.0 Hz.

(a) What is the potential difference $v_R(t)$ across the resistance as a function of time t, and what is the

amplitude V_R of $V_R(t)$? (b)What is the current $v_R(t)$ in the resistance and the amplitude I_R of $I_R(t)$?

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3. Capacitance C is 15.0 μF and the sinusoidal alternating emf device operates at amplitude E_m = 36.0 V and frequency f_d= 60.0 Hz.

(a) What are the potential difference $V_C(t)$ across the capacitance and the amplitude V_C of $V_c(t)$? (b) What are the current $I_C(t)$ in the circuit as a function of time and the amplitude I_C of $I_c(t)$?

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4. Inductance L is 230 mH and the sinusoidal alternating emf device operates at amplitude E_m =36.0 V and frequency f_d=60.0 Hz.

(a) What are the potential difference $v_L(t)$ across the inductance and the amplitude V_L of $v_L(t)$?

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5. Let R=200 Ω, C= 15.0 μF, L=230 mH , f_d = 60.0 Hz, and E_m=36.0 V . (These parameters are those used in the earlier sample problems).

(a) What is the current amplitude I ?

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6. A series RLC circuit , driven with E_{rms}=120 V at frequency f_d=60.0 Hz, contains a resistance $R = 200\Omega$, and inductance with inductive reactance $X_L = 80.0\Omega$, and a capacitance with capacitive reactance $X_C = 150\Omega$.

(a) What are the power factor cos ϕ and phase constant ϕ of the circuit ?

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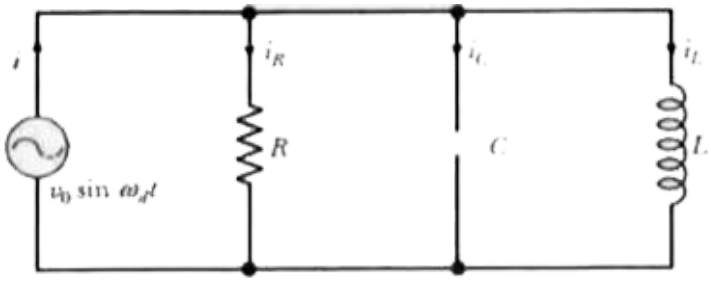
7. Find the instantaneous current through each element. Also find (a) the total instananeous current

through the source and (b) the expression for the phase angle of this current and the impedance of the circuit . Draw a phasor diagram to illustrate the relationship of the instanteous current to the instantaneous emf.



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8. The rms voltage of the generator is V_0 The frequency of the ac generator is very near zero. What is the rms current through the circuit?

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9. A transformer on a utility pole operates at V_p=8.5 kV on the primary side and supplies electrical energy to a number of nearby houses at V_s=120V , both quantities being rms values. Assume an ideal step-down transformer, a purely resistive load , and a power factor of unity.

(a) What is the turns ratio N_p / N_s of the transformer ?

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Check Point

1. A charged capacitor and an inductor are connected in series at time t= 0. In terms of the period T of the resulting oscillations. determine how much later the following reach their maximum value: (a) the charge on the capacitor, (b) the voltage across the capacitor, with its original polarity: (c) the energy stored in the electric field, and (d) the current.

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2. A capacitor in an LC oscillator has a maximum potential difference of 17 V and a maximum energy of 160 μJ. When the capacitor has a potential difference of 5 V and an energy of 10 μJ, what are (a) the emf across the inductor and (b) the energy stored in the magnetic field?

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3. If we increase the driving frequency in a circuit with a purely resistive load, do (a) amplitude V_R and (b) amplitude I_R increase , decrease, or remain the same ?

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4. If we increase the driving frequency in a circuit with a purely capacitive load, do (a) amplitude V_C and (b) amplitude I_C increase, decrease, or remain the same? If, instead, the circuit has a purely inductive load, do (c) amplitude V_L and (d) amplitude I_L increase, decrease, or remain the same?

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5. A long wire of finite resistance is connected to an ac generator . This wire is then wound into a coil of

many loops and reconnected to the generator . Is the current in the circuit with the coil greater than, less than, or the same as the current in the circuit with the uncoiled wire ?

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6. How are the capacitive reactance and inductive reactance , respectively , for three sinusoidally driven series RLC circuits : (1) 50Ω , 100Ω , (2) $100\Omega, 50\Omega$, (3) $50\Omega, 50\Omega$. (a) For each does the current lead or lag the applied emf , or are the two in phase ? (b) Which circuit is in resonance ?

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7. (a)If the current in a sinusoidally driven series RLC circuit leads the emf , would we increase or decrease the capacitance to increase the rate at which energy is supplied to the resistance ? (b) Would this change bring the resonant angular frequency of the circuit closer to the angular frequency of the emf or put it father away ?

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8. An alternating-current emf device in a certain circuit has a smaller resistance than that of the

resistive load in the circuit , to increase the transfer of energy from the device to the load , a transformer will be connected between the two . (a) Should N_s be greater than or less than N_p ? (b) Will that make it a step-up or step-down transformer ?

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Problems

1. In an oscillating LC circuit with L = 79 mH and C = 4.0 μF, the current is initially a maximum. How long will it take before the capacitor is fully charged for (a) the first time and (b) the second time?

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2. An ac generator with emf $E = E_m \sin \omega_d t$, where E_m = 25.0 V and ω_d= 377 rad/s, is connected to a 4.15 μF capacitor. (a) What is the maximum value of the current? (b) When the current is a maximum, what is the emf of the generator? (c) When the emf of the generator is -12.5 V and increasing in magnitude, what is the current?

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3. (a) In an RLC circuit, can the amplitude of the voltage across an inductor be greater than the amplitude of the generator emf? (b) Consider an RLC circuit with emf amplitude E_m = 10 V, resistance R = 5.0 Ω, inductance L = 1.0 H, and capacitance C = 1.0 μF. Find the amplitude of the voltage across the inductor at resonance.

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4. An air conditioner connected to a 125 V rms ac line is equivalent to a 9.20 Ω resistance and a 4.70 Ω inductive reactance in series. Calculate (a) the

impedance of the air conditioner and (b) the average rate at which energy is supplied to the appliance.

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5. An alternating source drives a series RLC circuit with an emf amplitude of 6.00 V, at a phase angle of $+30.0^\circ$. When the potential difference across the capacitor reaches its maximum positive value of +5.00 V, what is the potential difference across the inductor (sign included)?

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6. A coil of inductance 62 mH and unknown resistance and a 0.94 μF capacitor are connected in series with an alternating emf of frequency 930 Hz. If the phase constant between the applied voltage and the current is 82°, what is the resistance of the coil?

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7. A generator supplies 100 V to a transformer's primary coil, which has 100 turns. If the secondary coil has 500 turns, what is the secondary voltage?

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8. What direct current will produce the same amount of thermal energy, in a particular resistor, as an alternating current that has a maximum value of 7.82 A?

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9. What is the capacitance of an oscillating LC circuit if the maximum charge on the capacitor is 1.60 μC and the total energy is 140 μJ?

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10. In an oscillating LC circuit, L = 5.97 mH and C= 4.00 μF. The maximum charge on the capacitor is 3.00 μC. Find (a) the maximum current and (b) the oscillation period.

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11. In an oscillating $L-C$ circuit in which $C=4.00\mu F$, the maximum potential difference capacitor during the oscillations is $1.50V$ and the maximum current through $50.0mA$.

(a) What is the inductance L?

(b) What is the frequency of the oscillations?

(c) How much time does the charge on the capacitor take to rise from zero to its maximum value?

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12. A 85.0 mH inductor is connected as in Fig. to an ac generator with E_m = 30.0 V. What is the amplitude of the resulting alternating current if the frequency of the emf is (a) 1.00 kHz and (b) 5.00 kHz?

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13. A transformer has 400 primary turns and 10 secondary turns. (a) If V_p is 120 V (rms), what is V_s

with an open circuit? If the secondary now has a resistive load of 27 Ω what is the current in the (b) primary and (c) secondary?

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14. In a certain oscillating LC circuit, the total energy is converted from electrical energy in the capacitor to magnetic energy in the inductor in 2.50 μs. What are (a) the period of oscillation and (b) the frequency of oscillation? (c) How long after the magnetic energy is a maximum will it be a maximum again? (d) In one full cycle, how many times will the electrical energy be maximum?

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15. An ac voltmeter with large impedance is connected in turn across the inductor, the capacitor, and the resistor in a series circuit having an alternating emf of 125 V (rms), the meter gives the same reading in volts in each case. What is this reading?

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16. In Fig. R = 25.0 Ω, C = 4.70 μF, and L = 25.0 mH. The generator provides an emf with rms voltage 75.0 V

and frequency 550 Hz. (a) What is the rms current? What is the rms voltage across (b) R, (c) C, (d) L, (e) C and L together, and (f) R, C, and L together? At what average rate is energy dissipated by (g) R, (h) C, and (i) L?

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17. A series circuit containing inductance L_1 and capacitance C_1 oscillates at angular frequency ω. A second series circuit, containing inductance L_2 and capacitance C_2 oscillates at the same angular frequency. In terms of ω, what is the angular

frequency of oscillation of a series circuit containing all four of these elements? Neglect resistance.

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18. What is the maximum value of an ac voltage whose rms value is 220 V?

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19. In an oscillating LC circuit, L = 25.0 mH and C = 2.89 μF. At time t=0 the current is 9.20 mA, the charge on the capacitor is 3.80 μC and the capacitor is charging. What are (a) the total energy in the circuit,

(b) the maximum charge on the capacitor, and (c) the maximum current? (d) If the charge on the capacitor is given by q= $\cos(\omega t + \phi)$, what is the phase angle ϕ ? (e) Suppose the data are the same, except that the capacitor is discharging at t= 0. What then is ϕ ?

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20. An electric motor has an effective resistance of 61.0 Ω and an inductive reactance of 52.0 Ω when working under load. The rms voltage across the alternating source is 420 V. Calculate the rms current.

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21. A 0.50 kg body oscillates in SHM on a spring that, when extended 2.0 mm from its equilibrium position, has an 8.0 N restoring force. What are (a) the angular frequency of oscillation, (b) the period of oscillation, and (c) the capacitance of an LC circuit with the same period if L is 5.0 H?

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22. LC oscillators have been used in circuits connected to loudspeakers to create some of the sounds of electronic music. What inductance must be used with a 6.7 μF capacitor to produce a frequency

of 10 kHz, which is near the middle of the audible range of frequencies?

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23. In an oscillating LC circuit, L = 3.00 mH and C = 3.90 μF. At t=0 the charge on the capacitor is zero and the current is 1.75 A. (a) What is the maximum charge that will appear on the capacitor? (b) At what earliest time $t > 0$ is the rate at which energy is stored in the capacitor greatest, and (c) what is that greatest rate?

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24. An oscillating LC circuit consists of a 75.0 mH inductor and a 3.60 μF capacitor. If the maximum charge on the capacitor is 5.00 μC, what are (a) the total energy in the circuit, (b) the maximum current, and (c) the period of the oscillations?

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25. In an oscillating LC circuit with C = 64.0 μF, the current is given by i = (1.60) sin(4100t + 0.680), where t is in seconds, i in amperes, and the phase constant in radians. (a) How soon after t=0 will the current

reach its maximum value? What are (b) the inductance L and (c) the total energy?

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26. An oscillating LC circuit has a current amplitude of 750 mA, a potential amplitude of 250 mV, and a capacitance of 220 μF. What are (a) the period of oscillation, (b) the maximum energy stored in the capacitor, (c) the maximum energy stored in the inductor, (d) the maximum rate at which the current changes, and (e) the maximum rate at which the inductor gains energy?

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27. An oscillating LC circuit consisting of a 1.0 μF capacitor and a 9.0 mH coil has a maximum voltage of 3.0 V. What are (a) the maximum charge on the capacitor, (b) the maximum current through the circuit, and (c) the maximum energy stored in the magnetic field of the coil?

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28. In an oscillating LC circuit, when 75.0% of the total energy is stored in the inductor's magnetic field, (a) what multiple of the maximum charge is on the

capacitor and (b) what multiple of the maximum current is in the inductor?

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29. The frequency of oscillation of a certain LC circuit is 200 kHz. At time t = 0, plate A of the capacitor has maximum positive charge. At what earliest time t > 0 will (a) plate A again have maximum positive charge, (b) the other plate of the capacitor have maximum positive charge, and (c) the inductor have maximum magnetic field?

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30. (a) At what frequency would a 12 mH inductor and a 10 μF capacitor have the same reactance? (b) What would the reactance be? (c) Show that this frequency would be the natural frequency of an oscillating circuit with the same L and C.

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Practice Questions Single Correct Choice

1. The voltage of an ac source varies with time according to the equation

$V = 100 \sin 100\pi t \cos 100\pi t$ where t is in seconds and V is in volt. Then

A. The peak voltage of the source is 100 V

B. The peak voltage of the source is 50 V

C. The peak voltage of the source is $100/\sqrt{2}$

D. The frequency of the source is 50 Hz

Answer: B

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2. An a.c. source of angular frequency ω is fed across a resistor R and a capacitor C in series. The current

registered is I. If now the frequency of the source is changed to $\omega/3$ (but maintaining the same voltage), the current in the circuit is found to be halved. calculate the ratio of reactance to resistance at the original frequency ω.

A. $\sqrt{\frac{3}{5}}$

B. $\sqrt{\frac{2}{5}}$

C. $\sqrt{\frac{1}{5}}$

D. $\sqrt{\frac{4}{5}}$

Answer: A

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3. A coil having n turns and resistance $R\Omega$ is connected with a galvanometer of resistance $4R\Omega$. This combination is moved in time t seconds from a magnetic field W_1 weber to W_2 weber. The induced current in the circuit is

A. $-\frac{W_2 - W_1}{5Rnt}$

B. $-\frac{n(W_2 - W_1)}{5Rnt}$

C. $-\frac{W_2 - W_1}{Rnt}$

D. $-\frac{n(W_2 - W_1)}{Rnt}$

Answer: B

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4. If the total charge stored in the LC circuit is Q_0, then for $t \geq 0$

A. the charge on the capacitor is

$$Q = Q_0 \cos\left(\frac{\pi}{2} + \frac{t}{\sqrt{LC}}\right)$$

B. the charge on the capacitor is

$$Q = Q_0 \cos\left(\frac{\pi}{2} - \frac{t}{\sqrt{LC}}\right)$$

C. the charge on the capacitor is $Q = -LC\frac{d^2Q}{dt^2}$

D. the charge on the capacitor is $Q = \frac{1}{\sqrt{LC}}\frac{d^2Q}{dt^2}$

Answer: C

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5. A charged capacitor and an inductor are connected in series. At time t = 0, the current is zero, but the capacitor is charged. If T is the period of the resulting oscillations, the next time after t = 0, the maximum voltage across the inductor is

A. T

B. T/4

C. T/2

D. T

Answer: C

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6. The electrical analog of a spring constant k is

A. L

B. 1/L

C. C

D. 1/C

Answer: D

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7. An LC series circuit with an inductance L and a capacitance C has an oscillation frequency f. Two isolated induc tors, each with inductance L, and two capacitors, each with capacitance C, are all wired in series and the circuit is com pleted. The oscillation frequency is

A. f/4

B. f/2

C. f

D. 2f

Answer: C

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8. In oscillating Lc circuit, the total stored energy is U and maximum charge upon capacitor is $\frac{Q}{2}$, the energy stored in the inductor is

A. U/2

B. U/4

C. (4/3)U

D. 3U/4

Answer: D

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9. The resonance frequency of a certain RLC series circuit is ω_0, A source of sinusoidal emf, with angular frequency $2\omega_0$, is inserted into the circuit. After transients die out the angular frequency of the current oscillations is

A. $\omega_0 / 2$

B. ω_0

C. $2\omega_0$

D. $1.5\omega_0$

Answer: C

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10. A variable inductor inductor is connected to an AC source. When inductance increases, The reactance

A. Reactance - No change , Current - No change

B. Reactance - Decreases , Current - No change

C. Reactance - Increases , Current - Increases

D. Reactance - Increases , Current - Decreases

Answer: D

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11. A variable capacitor is connected to an ac source. What effect does decreasing the capacitance have on the reactance and current in this circuit?

A. Reactance - No change , Current - No change

B. Reactance - Decreases , Current - No change

C. Reactance - Increases , Current - Increases

D. Reactance - Increases , Current - Decreases

Answer: D

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12. In a series RLC circuit, if the frequency is increased to a very large value, what value does the phase angle between current and voltage approach ?

A. 90°

B. 0°

C. 30°

D. 45°

Answer: A

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13. A series LCR circuit, has equal resistance capacitive reactance. What is the phase angle between voltage across generator and resistor ?

A. 0°

B. 45°

C. 60°

D. 90°

Answer: A

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14. In an RL series circuit driven by an ac voltage source with fixed amplitude,

A. The source current leads the source voltage in phase

B. The source current lags the source voltage in phase

C. The source current amplitude increases as source frequency increase

D. The inductor voltage lags the inductor current in phase

Answer: B

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15. An inductor, a capacitor, and a resistor are connected in series with a frequency generator to complete a circuit. The frequency generator can supply alternating current at frequencies ranging from about 0 Hz to 100 MHz. As the frequency is increased from the lowest to the highest value of the generator there is a particular value for which the voltage across the resistor is maximum. At that frequency

A. The voltage across the inductor is zero at all times

B. The voltage across the capacitor is zero at all times

C. The voltage across the inductor and the capacitor are zero at all times

D. The voltage across the inductor and the capacitor are opposite in phase at all times

Answer: D

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16. Consider an ac circuit where an incandescent light bulb is in series with an inductor. If the frequency of generator is increased, what will happen to the brightness of bulb ?

A. The bulb will have the same brightness

B. The bulb will shine brighter

C. The bulb will become dimmer

D. Depends on the value of L and R

Answer: C

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17. Which of the following is true for an ideal capacitor connected to a sinusoidal voltage source ?

A. Neither the average power nor the average current is zero

B. The average current is zero but the average power is not zero

C. The average power is zero but the average current is not zero

D. Both the average power and the average current are zero

Answer: D

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18. In a LCR series lags the applied emf. The rate at which energy is dissipated in the resistor, can be increased by

A. Decreasing the capacitance and making no other changes

B. Increasing the capacitance and making no other changes

C. Increasing the inductance and making no other changes

D. Increasing the driving frequency and making no other changes

Answer: A

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19. Core of transformer is made up

A. Facilitate easy assembly

B. Reduce i^2R losses in the coils

C. Increase the magnetic flux

D. Prevent Eddy currents

Answer: D

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20. The primary coil of an ideal transformer has 100 turns and the secondary coil has 600 turns. Then

A. The power in the primary circuit is less than that in the secondary circuit

B. The currents in the two circuits are the same

C. The voltages in the two circuits are the same

D. The primary current is six times the secondary current

Answer: D

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21. Complete the following statement: When the current in an oscillating LC circuit is zero,

A. The charge on the capacitor is zero.

B. The energy in the electric field is maximum.

C. The energy in the magnetic field is a maximum.

D. The charge is moving through the inductor.

Answer: B

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22. A series RCL circuit operating at 60.0 Hz contains a 35 Ω resistor and an 8.2 μF capacitor. If the power factor of the circuit is +1.00, what is the inductance of the inductor in this circuit?

A. 0.86 H

B. 2.3 H

C. 1.1 H

D. 57 H

Answer: A

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23. A series RCL circuit contains a 222 Ω resistor, a 1.40 μF capacitor, and a 0.125 H inductor. The 444 Hz ac generator in the circuit has an rms voltage of 208 V. What is the average electric power dissipated by the circuit?

A. 135 W

B. 166 W

C. 81 W

D. 191 W

Answer: B

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Practice Questions More Than One Correct

1. The symbols L, C, and R represent inductance, capacitance, and resistance, respectively. The

dimensions of frequency are given by the combination

A. 1/RC

B. R/L

C. $1/\sqrt{LC}$

D. C/L

Answer: A::B::C

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2. An ac source producing $V = V_0 \sin \omega t + V_0 \sin 2\omega t$ is connected in series with a box containing either

capacitor or inductor and resistance. The current found in the circuit is $I = I_1 \sin(\omega t + \phi_1) + I_2 \sin(2\omega t + \phi_2)$. Here, ϕ_1 and ϕ_2 may be positive or negative.

A. If $I_1 > I_2$, box has inductor and resistor

B. If $I_1 > I_2$, box has capacitor and resistor

C. If $I_2 > I_1$, box has inductor and resistor

D. If $I_2 > I_1$, box has capacitor and resistor

Answer: A::D

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3. A power outlet puts out 60 Hz ac. Which of the following statements is true?

A. Voltage goes to zero only 120 times per second

B. Current goes to zero only 120 times per second

C. Power output goes to zero only 60 times per second

D. Voltage, current, and power output stay constant

Answer: A::B

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Practice Questions Linked Comprehension

1. The following table gives the reactance and rms voltage across the elements of a series RCL circuit :

Circuit element	Reactance	Voltage across element
Resistor	$2.00 \times 10^2 \Omega$	$86V$
Inductor	$3.77 \times 10^2 \Omega$	$162V$

What is the rms current in the circuit?

A. 0.25 A

B. 0.50 A

C. 0.43 A

D. 0.86 A

Answer: C

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2. The following table gives the reactance and rms voltage across the elements of a series RCL circuit :

Circuit element	Reactance	Voltage across element
Resistor	$2.00 \times 10^2 \Omega$	$86V$
Inductor	$3.77 \times 10^2 \Omega$	$162V$

What is the impedance of the circuit ?

A. 11 Ω

B. 349 Ω

C. 22 Ω

D. 486 Ω

Answer: B

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3. The following table gives the reactance and rms voltage across the elements of a series RCL circuit :

Circuit element	Reactance	Voltage across element
Resistor	$2.00 \times 10^2 \Omega$	$86V$
Inductor	$3.77 \times 10^2 \Omega$	$162V$

Determine the peak (not rms) voltage of the ac generator .

A. 150 V

B. 300 V

C. 212 V

D. 414 V

Answer: C

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4. The following table gives the reactance and rms voltage across the elements of a series RCL circuit :

Circuit element	Reactance	Voltage across element
Resistor	$2.00 \times 10^2 \Omega$	$86V$
Inductor	$3.77 \times 10^2 \Omega$	$162V$

What is the power factor for this circuit ?

A. 0.40

B. 0.81

C. 0.47

D. 1.4

Answer: C

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5. A 750 Hz-20 V source is connected to a resistance of 100 Ω, an inductance of 0.1803 H and a capacitor of 10 μF all in series. Resistance will get heated up by $10^{\circ} C$ in time t. Thermal capacity is $2 J /^{\circ} C$.

Impedance of circuit is

A. 834 Ω

B. 438 Ω

C. 348 Ω

D. 893 Ω

Answer: B

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6. A 750 Hz-20 V source is connected to a resistance of 100 Ω, an inductance of 0.1803 H and a capacitor of 10 μF all in series. Resistance will get heated up by $10^{\circ}C$ in time t. Thermal capacity is $2J/^{\circ}C$.

Power loss in LCR circuit is

A. 0.575 W

B. 0.999 W

C. 0.0575 W

D. 0.0755 W

Answer: C

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7. A $750Hz, 20V$ source is connected to as resistance of 100Ω an inductance of $0.1803H$ and a capacitance of $10\mu F$ all in sereis.Calculate the time in which the resistance (thermalcapacity $2J/.^{\circ}C$) wil get heated by $10^{\circ}C$.

A. 348 s

B. 438 s

C. 843 s

D. 834 s

Answer: C

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8. An LCR series circuit with 100 Ω resistance is connected to an ac source of 200 V and angular frequency 300 rad/s. When only the capacitance is removed, the current lags behind the voltage by 60°. When only the inductance is removed, the current leads the voltage by 60°.

When capacitor is removed, inductive reactance of the circuit is

A. $100\sqrt{3}\Omega$

B. $100\sqrt{2}\Omega$

C. $50\sqrt{2}\Omega$

D. $50\sqrt{2}\Omega$

Answer: A

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9. An LCR series circuit with 100 Ω resistance is connected to an ac source of 200 V and angular

frequency 300 rad/s. When only the capacitance is removed, the current lags behind the voltage by 60°. When only the inductance is removed, the current leads the voltage by 60°.

when inductor is removed , capacitive reactance of the circuit is

A. $\sqrt{3} \times 50\Omega$

B. $100\sqrt{3}\Omega$

C. $50\sqrt{3}\Omega$

D. $20\sqrt{2}\Omega$

Answer: B

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10. An LCR series circuit with 100 Ω resistance is connected to an ac source of 200 V and angular frequency 300 rad/s. When only the capacitance is removed, the current lags behind the voltage by 60°. When only the inductance is removed, the current leads the voltage by 60°.

Impedance of the LCR circuit is

A. 200Ω

B. 175Ω

C. 150Ω

D. 100Ω

Answer: D

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11. An $L-C-R$ series circuit with 100Ω resistance is connected to an AC source of $200V$ and angular frequency $300rad/s$. When only the capacitance is removed, the current lags behind the voltage by 60°. When only the inductance is removed the current leads the voltage by 60°. Calculate the current and the power dissipated in the $L-C-R$ circuit

A. 250.5 W

B. 500 W

C. 400 W

D. 450 W

Answer: C

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Practice Questions Integer

1. An a.c source of frequency $1000Hz$ is connected to a coil of $\frac{200}{\pi}mH$ and negligible resistance. If effective current through the coil is $7.5mA$, what is the voltage (in volt) across the coil ?

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2. An a.c. source of voltage $V = 100 \sin 100\pi t$. Is connected to a resistor of $\frac{25}{\sqrt{2}} ohm$. What is the r.m.s value of current (in ampere) through the resistor ?

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3. An a.c. voltage is represented by $E = 220\sqrt{2}\cos(8\pi)t$.

How many times will the current become zero in 1 sec ?

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4. Two alternating currents are given by $I_1 = I_0 \sin(\omega t - \phi)$ and $I_2 = I_1 \cos(\omega t + \phi)$. What is the ratio of virtual values of the two currents?

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5. An ac generator gives an output voltage of E= 170 sin 56.52t. What is the frequency of alternating voltage produced?

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6. A transformer working on $220V$ a.c. line gives an output current of $4A$ at $55V$. What is the primary current (in ampere) ? Assume that there is no loss of energy.

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7. A condenser of capacitor $0.144pF$ is used in a transmitte to transmit at wavelength λ. If inductace of $1/\pi^2 mH$ is used for resonance, what is the value of λ (in m) ?

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