ALLEN CAREER INSTITUTE KOTA (RAJASTHAN)

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TG: @Chalnaayaaar

PRE-MEDICAL

PHYSICS

ENTHUSIAST | LEADER | ACHIEVER

EXERCISE

Alternating Current

ENGLISH MEDIUM

EXERCISE-I (Conceptual Questions) — Build Up Your Understanding

PEAK, AVERAGE AND RMS VALUE

1. What is the r.m.s. value of an alternating current which when passed through a resistor produces heat which is thrice of that produced by a direct current of 2 amperes in the same resistor :-

(1) 6 amp (2) 2 amp

(3) 3.46 amp (4) 0.66 amp

AC0001

2. The peak value of an alternating e.m.f. which is given by $E = E_0 \cos\omega t$ is 10 volts and its frequency is 50 Hz. At time $t = \frac{1}{600}$ s, the instantaneous e.m.f. is

(1) 10 V (2) $5\sqrt{3}$ V

(3) 5 V (4) 1V

AC0002

3. The phase difference between current and voltage in an AC circuit is $\frac{\pi}{4}$ radian, If the frequency of AC is 50 Hz, then the phase difference is equivalent to the time difference:-

(1) 0.78 s (2) 15.7 ms

(3) 2.5 s (4) 2.5 ms

AC0003

4. A current in circuit is given by $i = 3 + 4 \sin \omega t$. Then the effective value of current is :

(1) 5 (2) $\sqrt{7}$ (3) $\sqrt{17}$ (4) $\sqrt{10}$

AC0004

5. Incorrect statement are :

(a) A.C. meters can measure D.C also

(b) If A.C. meter measures D.C. there scale must be linear and uniform

(c) A.C. and D.C. meters are based on heating effect of current

(d) A.C. meter reads rms value of current

(1) a,b (2) b,c (3) c,d (4) d,a

AC0005

6. The r.m.s. value of current for a variable current $i=i_1 \cos \omega t + i_2 \sin \omega t$:–

(1) $\frac{1}{\sqrt{2}}(i_1 + i_2)$ (2) $\frac{1}{\sqrt{2}}(i_1 + i_2)^2$

(3) $\frac{1}{\sqrt{2}}(i_1^2 + i_2^2)^{1/2}$ (4) $\frac{1}{2}(i_1^2 + i_2^2)^{1/2}$

AC0006

7. The relation between an A.C. voltage source and time in SI units is :

$V = 120 \sin (100 \pi t) \cos (100 \pi t)$ volt value of peak voltage and frequency will be respectively :–

(1) 120 volt and 100 Hz

(2) $\frac{120}{\sqrt{2}}$ volt and 100 Hz

(3) 60 volt and 200 Hz

(4) 60 volt and 100 Hz

AC0007

8. If an A.C. main supply is given to be 220 V. What would be the average e.m.f. during a positive half cycle :-

(1) 198 V (2) 386 V

(3) 256 V (4) None of these

AC0008

9. The hot wire ammeter measures :-

(1) D.C. current

(2) A.C. current

(3) None of above

(4) both (1) & (2)

AC0009

10. Frequency of A.C. in India is –

(1) 45 Hz (2) 60 Hz

(3) 50 Hz (4) None of the above

AC0010

11. For an alternating current $I = I_0\cos\omega t$, What is the rms value and peak value of current :-

(1) $I_0, \frac{I_0}{\sqrt{2}}$ (2) $\frac{I_0}{\sqrt{2}}, I_0$

(3) $I_0, \frac{I_0}{2}$ (4) $2I_0, \frac{I_0}{\sqrt{2}}$

AC0011

12. If a step up transformer have turn ratio 5, frequency 50 Hz root mean square value of potential difference on primary 100 volts and the resistance of the secondary winding is 500 Ω then the peak value of voltage in secondary winding will be (the efficiency of the transformer is hundred percent)

(1) $500\sqrt{2}$ (2) $10\sqrt{2}$

(3) $50\sqrt{2}$ (4) $20\sqrt{2}$

AC0012

SIMPLE AC CIRCUIT

13. A resonant A.C. circuit contains a capacitor of capacitance 10^{-6} *F* and an inductor of 10^{-4} *H*. The frequency of electrical oscillations will be :-

(1) 10^5 Hz (2) 10 Hz

(3) $\frac{10^5}{2\pi}$ Hz (4) $\frac{10}{2\pi}$ Hz

AC0013

14. A resistance of 300Ω and an inductance of $\frac{1}{\pi}$ henry are connected in series to a A.C. voltage of 20 volts and 200 Hz frequency. The phase angle between the voltage and current is :-

(1) $\tan^{-1}\left(\frac{4}{3}\right)$

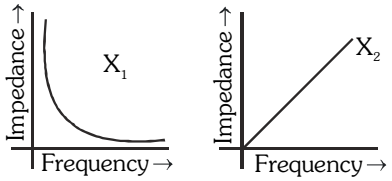
(2) $\tan^{-1}\left(\frac{3}{4}\right)$

(3) $\tan^{-1}\left(\frac{3}{2}\right)$

(4) $\tan^{-1}\left(\frac{2}{3}\right)$

AC0014

15. The graphs given below depict the dependence of two reactive impedances X_1 and X_2 on the frequency of the alternating e.m.f. applied individually to them. We can then say that :



(1) X_1 is an inductor and X_2 is a capacitor

(2) X_1 is a resistor and X_2 is a capacitor

(3) X_1 is a capacitor and X_2 is an inductor

(4) X_1 is an inductor and X_2 is a resistor

AC0015

16. A 12 ohm resistor and a 0.21 henry inductor are connected in series to an AC source operating at 20 volts, 50 cycle/second. The phase angle between the current and the source voltage is:

(1) 30° (2) 40°

(3) 80° (4) 90°

AC0016

17. A 110 V, 60 W lamp is run from a 220 V AC mains using a capacitor in series with the lamp, instead of a resistor then the voltage across the capacitor is about:-

(1) 110 V (2) 190 V

(3) 220 V (4) 311 V

AC0017

18. The resistance that must be connected in series with inductance of 0.2 H in order that the phase difference between current and e.m.f. may be 45° when the frequency is 50 Hz, is:-

(1) 6.28 ohm. (2) 62.8 ohm.

(3) 628 ohm. (4) 31.4 ohm.

AC0018

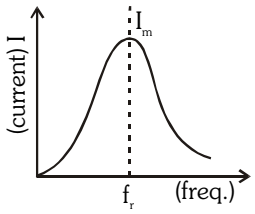
19. A student connects a long air cored - coil of manganin wire to a 100 V D.C. supply and records a current of 25 amp. When the same coil is connected across 100 V. 50 Hz a.c. the current reduces to 20 A , the reactance of the coil is :-

(1) 4 Ω (2) 3 Ω

(3) 5 Ω (4) None

AC0020

20. The graph shows variation of I with f for a series R-L-C network. Keeping L and C constant. If R decreases :



(a) Maximum current (I_m) increases
(b) Sharpness of the graph increases
(c) Quality factor increases
(d) Band width increases
(1) a, b, c (2) b, c, d (3) c, d, a (4) All

AC0021

21. Alternating current is flowing in inductance L and resistance R. The frequency of source is $\omega/2\pi$. Which of the following statement is correct :
(1) For low frequency the limiting value of impedance is L.
(2) For high frequency the limiting value of impedance is ωL.
(3) For high frequency the limiting value of impedance is R.
(4) For low frequency the limiting value of impedance is ωL.

AC0022

22. A bulb and a capacitor are connected in series to a source of alternating current. If its frequency is increased, while keeping the voltage of the source constant, then
(1) Bulb will give more intense light.
(2) Bulb will give less intense light.
(3) Bulb will give light of same intensity as before
(4) Bulb will stop radiating light.

AC0023

23. In an A.C. circuit resistance and inductance are connected in series. The potential and current in inductance is:

(1) $V_0 \sin \omega t, \frac{V_0}{\omega L} \sin\omega t$

(2) $V_0 \sin \omega t, \frac{V_0}{\omega L} \sin(\omega t + \pi/2)$

(3) $V_0 \sin (\omega t+ \pi/2), \frac{V_0}{\omega L} \sin\omega t$

(4) $V_0 \sin (\omega t + \pi/2), \frac{V_0}{\omega L} \sin (\omega t - \pi/2)$

AC0024

24. An a.c. source of voltage V and of frequency 50 Hz is connected to an inductor of 2 H and negligible resistance. A current of r.m.s value I flows in the coil. When the frequency of the voltage is changed to 400 Hz keeping the magnitude of V the same, the current is now :-
(1) 8 I in phase with V
(2) 4 I and leading by 90° from V
(3) $\frac{I}{4}$ and lagging by 90° from V
(4) $\frac{I}{8}$ and lagging by 90° from V

AC0025

25. A capacitor of capacity C is connected in A.C. circuit. The applied emf is $V=V_0 \sin\omega t$, then the current is :

(1) $I = \frac{V_0}{\omega L} \sin\omega t$

(2) $I = \frac{V_0}{\omega L} \sin(\omega t + \pi/2)$

(3) $I = V_0 \omega C \sin\omega t$

(4) $I = V_0 \omega C \sin (\omega t + \pi/2)$

AC0026

26. The impedence of a circuit, when a resistance R and an inductor of inductance L are connected in series in an A.C. circuit of frequency (f) is :-

(1) $\sqrt{R + 4\pi f L^2}$ (2) $\sqrt{R + 4\pi^2 f^2 L^2}$

(3) $\sqrt{R^2 + 4\pi^2 f^2 L^2}$ (4) $\sqrt{R^2 + 2\pi^2 f^2 L^2}$

AC0027

27. A capacitor of capacity C and reactance X if capacitance and frequency become double then reactance will be :–

(1) 4X (2) $\frac{X}{2}$

(3) $\frac{X}{4}$ (4) 2X

AC0028

28. The coil of choke in a circuit :

(1) increases the current

(2) controled the current

(3) has high resistance to d.c. circuit

(4) does not change the current

AC0029

29. The inductive reactance of an inductive coil with $\frac{1}{\pi}$ henry and 50 Hz :–

(1) $\frac{50}{\pi}$ ohm (2) $\frac{\pi}{50}$ ohm

(3) 100 ohm (4) 50 ohm

AC0030

30. In the L–R circuit R = 10Ω and L = 2H. If 120 V, 60 Hz alternating voltage is applied then the flowing current in this circuit will be :-

(1) 0.32 A (2) 0.16 A

(3) 0.48 A (4) 0.80 A

AC0031

31. An inductance of 0.4 Henry and a resistance of 100 ohm are connected to a A.C. voltage source of 220 V and 50 Hz. Then find out the phase difference between the voltage and current flowing in the circuit :

(1) $\tan^{-1}(2.25\,\pi)$ (2) $\tan^{-1}(0.4\,\pi)$

(3) $\tan^{-1}(1.5\,\pi)$ (4) $\tan^{-1}(0.5\,\pi)$

AC0032

32. A capacitor of capacitance 100 μF & a resistance of 100Ω is connected in series with AC supply of 220V, 50Hz. The current leads the voltage by .....

(1) $\tan^{-1}\left(\frac{1}{2\pi}\right)$ (2) $\tan^{-1}\left(\frac{1}{\pi}\right)$

(3) $\tan^{-1}\left(\frac{2}{\pi}\right)$ (4) $\tan^{-1}\left(\frac{4}{\pi}\right)$

AC0033

33. If the current through an inductor of inductance L is given by $I = I_0 \sin\omega t$, then the voltage across inductor will be :-

(1) $I_0\,\omega L \sin(\omega t - \pi/2)$ (2) $I_0\,\omega L \sin(\omega t + \pi/2)$

(3) $I_0\,\omega L \sin(\omega t - \pi)$ (4) None of these

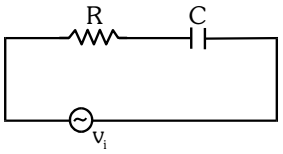
AC0034

34. There is a 5 Ω resistance in an A.C., circuit. Inductance of 0.1 H is connected with it in series. If equation of A.C. e.m.f. is 5 sin 50 t then the phase difference between current and e.m.f. is :-

(1) $\frac{\pi}{2}$ (2) $\frac{\pi}{6}$ (3) $\frac{\pi}{4}$ (4) 0

AC0035

35. A 50 Hz a.c. source of 20 volts is connected across R and C as shown in figure below. The voltage across R is 12 volts. The voltage across C is



(1) 8 V

(2) 16V

(3) 10 V

(4) Not possible to determine unless values of R and C are given

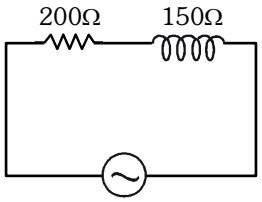
AC0036

36. 200 Ω resistance and 1H inductance are connected in series with an A.C. circuit. The frequency of the source is $\frac{200}{2\pi}$ Hz. Then phase difference in between V and I will be :-

(1) 30° (2) 60° (3) 45° (4) 90°

AC0037

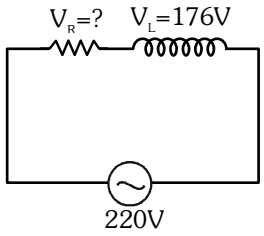
37. Impedance of the following circuit will be :



(1) 150Ω (2) 200Ω (3) 250Ω (4) 340Ω

AC0038

38. In showing figure find V_R :



(1) 132V (2) 396V

(3) 185 V (4) $\sqrt{220\times176}$V

AC0039

39. If alternating current of 60 Hz frequency is flowing through inductance of L=1 mH and drop in ΔV_L is 0.6 V then alternating current :-

(1) $\frac{1}{\pi}$A (2) $\frac{5}{\pi}$A (3) $\frac{50}{\pi}$A (4) $\frac{20}{\pi}$A

AC0040

LCR SERIES CIRCUIT, RESONANCE

40. An inductance of $1mH$, a condenser of $10\mu F$ and a resistance of 50Ω are connected in series. The reactance of inductor and condensers are same. The reactance of either of them will be :-

(1) 100 Ω (2) 30 Ω

(3) 3.2 Ω (4) 10 Ω

AC0041

41. L, C and R represent physical quantities inductance, capacitance and resistance respectively. The combination representing dimension of frequency is

(1) LC (2) $(LC)^{-1/2}$ (3) $\left(\frac{L}{C}\right)^{-1/2}$ (4) $\frac{C}{L}$

AC0042

42. A circuit contains R, L and C connected in series with an A. C. source. The values of the reactances for inductor and capacitor are 200Ω and 600Ω respectively and the impedance of the circuit is Z_1. What happens to the impedance of the same circuit if the values of the reactances are interchanged:-

(1) The impedance will remain unchanged

(2) The impedance will increase

(3) The impedance will decrease

(4) Information insufficient

AC0043

43. When V = 100 sinωt is applied across a series (R-L-C) circuit, At resonance the current in resistance (R=100 Ω) is i = i_0 sinωt, then power dissipation in circuit is:-

(1) 50 W (2) 100 W

(3) 25 W (4) Can't be calculated

AC0044

44. At resonance in a series LCR circuit, which of the following statements is true:-

(1) Current in the circuit is maximum and phase difference between E and I is π/2

(2) Current in the circuit is maximum and phase difference between E and I is zero

(3) Voltage is maximum and phase difference between E and I is π/2

(4) Current is minimum and phase difference between E and I is zero

AC0045

45. An alternating voltage is connected in series with a resistance r and an inductance L. If the potential drop across the resistance is 200 volt and across the inductance is 150 volt, the applied voltage:

(1) 350 volt (2) 250 volt

(3) 500 volt (4) 300 volt

AC0046

46. For a series R-L-C circuit :-

(a) Voltage across L and C are differ by π

(b) Current through L and R are in same phase

(c) Voltage across R and L differ by π/2

(d) Voltage across L and current through C are differ by π/2

(1) a, b, c (2) b, c, d (3) c, d, a (4) All

AC0047

47. A series R - L - C (R = 10 Ω, X_L = 20 Ω, Xc = 20 Ω) circuit is supplied by V = 10 sin ωt volt then power dissipation in circuit is :-

(1) Zero (2) 10 watt

(3) 5 watt (4) 2.5 watt

AC0048

48. The self inductance of the motor of an electric fan is 10 H. In order to impart maximum power at 50Hz. It should be connected to a capacitance of :

(1) 2×10^{-6} F (2) 3×10^{-6} F

(3) 10^{-4} F (4) 10^{-6} F

AC0049

49. In a series resonant R-L-C circuit, if L is increased by 25% and C is decreased by 20%, then the resonant frequency will :

(1) Increases by 10% (2) Decreases by 10%

(3) Remain unchanged (4) Increases by 2.5%

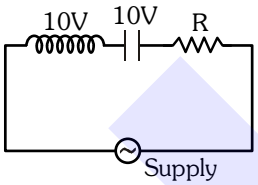
AC0050

50. The value of quality factor is :-

(1) $\frac{\omega L}{R}$ (2) $\frac{\omega}{RC}$ (3) $\sqrt{LC}$ (4) L/R

AC0051

51. If value of R is changed, then :-



(1) Voltage across L remains same

(2) Voltage across C remains same

(3) Voltage across LC combination remains same

(4) Voltage across LC combination changes

AC0052

52. In a series LCR circuit voltage across resister, inductor and capacitor are 1V, 3V and 2V respectively. At the instant t when the source voltage is given by :

$V=V_0 \cos \omega t$, the current in the circuit will be :

(1) $I = I_0 \cos\left(\omega t + \frac{\pi}{4}\right)$ (2) $I=I_0 \cos\left(\omega t - \frac{\pi}{4}\right)$

(3) $I = I_0 \cos\left(\omega t + \frac{\pi}{3}\right)$ (4) $I=I_0 \cos\left(\omega t - \frac{\pi}{3}\right)$

AC0053

53. In an AC Circuit decrease in impedance with increase in frequency indicates that circuit has/have :-

(1) Only resistance

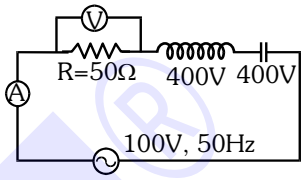
(2) Resistance & inductance.

(3) Resistance & capacitance

(4) Resistance, capacitance & inductance.

AC0054

54. In given LCR circuit, the voltage across the terminals of a resistance & current will be–



(1) 400V, 2A (2) 800V, 2A

(3) 100V, 2A (4) 100V, 4A

AC0055

55. Phase of current in LCR circuit –

(1) Is in the phase of potential

(2) Leading from the phase of potential

(3) Lagging from the phase of potential

(4) Before resonance frequency, leading from the phase of potential and after resonance frequency, lagging from the phase of potential

AC0056

56. In LCR circuit, the voltage across the terminals of a resistance, inductance & capacitance are 40V, 30V & 60V, then the voltage across the main source will be –

(1) 130 volt

(2) 100 volt

(3) 70 volt

(4) 50 volt

AC0057

57. For an alternating current of frequency $\frac{500}{\pi}$ Hz in L-C-R series circuit with L = 1H, C = 1 μF, R = 100Ω, impedance is :-

(1) 100 Ω

(2) $100\sqrt{\pi}\,\Omega$

(3) $100\sqrt{2\pi}\,\Omega$

(4) $100\,\pi\,\Omega$

AC0058

POWER IN AC CIRCUIT

58. A sinusoidal A.C. current flows through a resistor of resistance *R*. If the peak current is I_P, then the power dissipated is :-

(1) $I_p^2 R\cos\theta$ (2) $\frac{1}{2} I_p^2 R$

(3) $\frac{4}{\pi} I_p^2 R$ (4) $\frac{1}{\pi^2} I_p^2 R$

AC0059

59. An AC circuit draws 5A at 160 V and the power consumption is 600 W. Then the power factor is:-

(1) 1 (2) 0.75

(3) 0.50 (4) Zero

AC0060

60. Which is not correct for average power P at resonance :

(1) $P=I_{rms} V_{rms}$

(2) $P = \frac{V}{\sqrt{2}}\frac{I}{\sqrt{2}}$

(3) P=VI

(4) $P=I^2_{rms} R$

AC0061

61. In an A.C. circuit inductance, capacitance and resistance are connected. If the effective voltage across inductance is V_L , across capacitance is V_c and across resistance is V_R, then the total effective value of voltage is :

(1) $V_R+V_L+V_c$

(2) $V_R+V_L-V_c$

(3) $\sqrt{V_R^2+(V_L-V_C)^2}$

(4) $\sqrt{V_R^2-(V_L-V_C)^2}$

AC0062

62. In an a.c. circuit V and I are given by

V = 100 sin (100 t) volts

I = 100 sin (100t + π/3) mA

The power dissipated in the circuit is

(1) 10^4 watt (2) 10 watt

(3) 2.5 watt (4) 5.0 watt

AC0063

63. For a series LCR circuit the power loss at resonance is :-

(1) $\frac{V^2}{\left[\omega L-\frac{1}{\omega C}\right]}$ (2) $I^2L\omega$

(3) I^2R (4) $\frac{V^2}{C\omega}$

AC0064

64. In an alternating circuit applied voltage and flowing current are $E = E_0 \sin\omega t$ and $I = I_0 \sin(\omega t+\pi/2)$ respectively. Then the power consumed in the circuit will be :

(1) Zero (2) $E_0I_0/2$

(3) $E_0I_0/\sqrt{2}$ (4) $E_0I_0/4$

AC0065

65. In which of the following case power factor will be negligible :–

(1) Inductance and resistance both high

(2) Inductance and resistance both low.

(3) Low resistance and high inductance

(4) High resistance and low inductance

AC0066

66. If V = 100 sin100t volt, and

I = 100 sin(100t + $\frac{\pi}{6}$) A. then find the watt less power in watt :-

(1) 10^4 (2) 10^3

(3) 10^2 (4) 2.5×10^3

AC0067

67. An A.C. supply gives 30V r.m.s. which passes through a 10Ω resistance. The power dissipated in it is :-

(1) $90\sqrt{2}$ W (2) 90W

(3) $45\sqrt{2}$ W (4) 45 W

AC0068

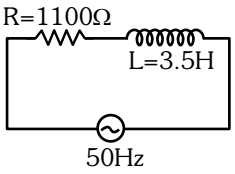
68. An inductor of inductance L and resistor of resistance R are joined in series and connected by a source of frequency ω. Power dissipated in the circuit is :-

(1) $\frac{(R^2+\omega^2L^2)}{V}$ (2) $\frac{V^2R}{(R^2+\omega^2L^2)}$

(3) $\frac{V}{(R^2+\omega^2L^2)}$ (4) $\frac{\sqrt{R^2+\omega^2L^2}}{V^2}$

AC0069

69. For given circuit the power factor is :



(1) 0

(2) 1/2

(3) $1/\sqrt{2}$

(4) None of these

AC0070

70. In a purely capacitive circuit average power dissipated in the circuit is -

(1) $V_{rms}\, I_{rms}$

(2) Depends on capacitance

(3) Infinite

(4) Zero

AC0071

71. Energy loss in pure capacitance in A.C. circuit is

(1) $\frac{1}{2}CV^2$ (2) CV

(3) $\frac{1}{4}CV^2$ (4) Zero

AC0072

72. Power dissipated in pure inductance will be :

(1) $\frac{LI^2}{2}$ (2) $2LI^2$

(3) $\frac{LI^2}{4}$ (4) Zero

AC0073

73. The power factor of L-R circuit is :

(1) $\frac{\omega L}{R}$ (2) $\frac{R}{\sqrt{(\omega L)^2 + R^2}}$

(3) ωLR (4) $\sqrt{\omega LR}$

AC0074

74. If alternating current of rms value 'a' flows through resistance R then power loss in resistance is :

(1) Zero (2) a^2R

(3) $\frac{a^2R}{2}$ (4) $2a^2R$

AC0075

75. Which of the following device in alternating circuit provides maximum power :-

(1) Only capacitor

(2) Capacitor and resistor

(3) Only inductor

(4) Only resistor

AC0076

LC OSCILLATION

76. Comparing the L–C oscillations with the oscillations of a spring–block system (force constant of spring = k and mass of block = m), the physical quantity mk is similar to :–

(1) CL (2) $\frac{1}{CL}$

(3) $\frac{C}{L}$ (4) $\frac{L}{C}$

AC0077

77. In an oscillating LC circuit the maximum charge on the capacitor is Q. The charge on the capacitor when the energy is stored equally between the electric and magnetic fields is-

(1) Q/2 (2) $Q/\sqrt{3}$

(3) $Q/\sqrt{2}$ (4) Q

AC0078

78. A fully charged capacitor C with initial charge q_0 is connected to a coil of self inductance L at t = 0. The time at which the energy is stored equally between the electric and the magnetic fields is :-

(1) $2\pi\sqrt{LC}$ (2) $\sqrt{LC}$

(3) $\pi\sqrt{LC}$ (4) $\frac{\pi}{4}\sqrt{LC}$

AC0079

79. A LC circuit is in the state of resonance. if C = 0.1 μF and L = 0.25 henry. Neglecting ohmic resistance of circuit what is the frequency of oscillations

(1) 1007 Hz (2) 100 Hz

(3) 109 Hz (4) 500 Hz

AC0080

80. A 60 μF capacitor is charged to 100 volts. This charged capacitor is connected across a 1.5 mH coil, so that LC oscillations occur. The maximum current in the coil is :-

(1) 1.5 A (2) 2 A

(3) 15 A (4) 20 A

AC0081

EXERCISE-I (Conceptual Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**3**	**2**	**4**	**3**	**2**	**3**	**4**	**1**	**4**	**3**	**2**	**1**	**3**	**1**	**3**
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	**3**	**2**	**2**	**2**	**1**	**2**	**1**	**3**	**4**	**4**	**3**	**3**	**2**	**3**	**2**
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	**2**	**2**	**2**	**3**	**2**	**3**	**3**	**1**	**2**	**4**	**2**	**1**	**1**	**2**	**2**
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	**4**	**3**	**4**	**3**	**1**	**3**	**2**	**3**	**3**	**4**	**4**	**1**	**2**	**2**	**3**
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	**3**	**3**	**3**	**1**	**3**	**4**	**2**	**2**	**3**	**4**	**4**	**4**	**2**	**2**	**4**
Que.	76	77	78	79	80										
Ans.	**4**	**3**	**4**	**1**	**4**										

EXERCISE-II (Previous Year Questions) AIPMT/NEET

AIPMT 2006

1. A transistor-oscillator using a resonant circuit with an inductor L (of negligible resistance) and a capacitor C in series produce oscillations of frequency f. If L is doubled and C is changed to 4C, then frequency will be :-

(1) $\frac{f}{4}$ (2) 8 f

(3) $\frac{f}{2\sqrt{2}}$ (4) $\frac{f}{2}$

AC0082

2. A coil of inductive reactance 31Ω has a resistance of 8Ω. It is placed in series with a condenser of capacitative reactance 25Ω. The combination is connected to an a.c. source of 110 volt. The power factor of the circuit is :-

(1) 0.56 (2) 0.64

(3) 0.80 (4) 0.33

AC0083

AIPMT 2007

3. What is the value of inductance L for which the current is a maximum in a series LCR circuit with C=10 μF and $\omega = 1000s^{-1}$?

(1) 10 mH

(2) 100mH

(3) 1 mH

(4) cannot be calculated unless R is known

AC0084

AIPMT 2008

4. In an a.c. circuit the e.m.f. (e) and the current (i) at any instant are given respectively by :-

$e = E_0 \sin\omega t$ $i = I_0 \sin(\omega t - \phi)$

The average power in the circuit over one cycle of a.c. is :-

(1) $\frac{E_0 I_0}{2}\cos\phi$ (2) $E_0 I_0$

(3) $\frac{E_0 I_0}{2}$ (4) $\frac{E_0 I_0}{2}\sin\phi$

AC0085

AIPMT 2009

5. Power dissipated in an LCR series circuit connected to an a.c. source of emf ε is :-

(1) $\varepsilon^2 R \Big/ \sqrt{R^2 + \left(L\omega - \frac{1}{C\omega}\right)^2}$

(2) $\varepsilon^2 R \Big/ \left[R^2 + \left(L\omega - \frac{1}{C\omega}\right)^2\right]$

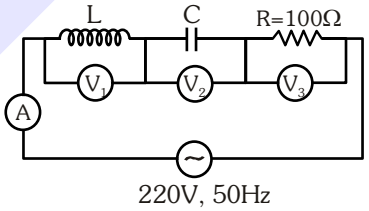
(3) $\varepsilon^2 \sqrt{\left[R^2 + \left(L\omega - \frac{1}{C\omega}\right)^2\right]} \Big/ R$

(4) $\frac{\varepsilon^2\left[R^2 + \left(L\omega - \frac{1}{C\omega}\right)^2\right]}{R}$

AC0086

AIPMT Pre. 2010

6. In the given circuit the reading of voltmeter V_1 and V_2 are 300 volts each. The reading of the voltmeter V_3 and ammeter A are respectively :



(1) 100 V, 2.0 A (2) 150 V, 2.2 A

(3) 220 V, 2.2 A (4) 220 V, 2.0 A

AC0087

AIPMT Mains 2010

7. A condenser of capacity C is charged to a potential difference of V_1. The plates of the condenser are then connected to an ideal inductor of inductance L. The current through the inductor when the potential difference across the condenser reduces to V_2 is ?

(1) $\frac{C(V_1^2 - V_2^2)}{L}$ (2) $\frac{C(V_1^2 + V_2^2)}{L}$

(3) $\left(\frac{C(V_1^2 - V_2^2)}{L}\right)^{1/2}$ (4) $\left(\frac{C(V_1 - V_2)^2}{L}\right)^{1/2}$

AC0088

AIPMT Pre. 2011

8. An ac voltage is applied to a resistance R and an inductor L in series. If R and the inductive reactance are both equal to 3Ω, the phase difference between the applied voltage and the current in the circuit is :-

(1) $\pi/6$ (2) $\pi/4$ (3) $\pi/2$ (4) Zero

AC0089

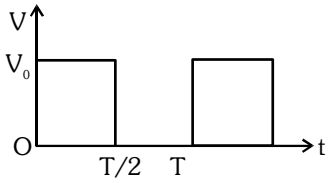
9. In an ac circuit an alternating voltage $e = 200\sqrt{2}\sin 100\,t$ volts is connected to a capacitor of capacity 1μF. The r.m.s. value of the current in the circuit is:-

(1) 10 mA (2) 100 mA (3) 200 mA (4)20 mA

AC0090

AIPMT Mains 2011

10. The r.m.s. value of potential difference V shown in the figure is :-



(1) $\frac{V_0}{\sqrt{3}}$ (2) V_0 (3) $\frac{V_0}{\sqrt{2}}$ (4) $\frac{V_0}{2}$

AC0091

11. A coil has resistance 30 ohm and inductive reactance 20 ohm at 50 Hz frequency. If an ac source , of 200 volt, 100 Hz, is connected across the coil, the current in the coil will be :-

(1) 2.0 A (2) 4.0 A

(3) 8.0 A (4) $\frac{20}{\sqrt{13}}$ A

AC0092

AIPMT Pre. 2012

12. In an electrical circuit R, L, C and an a.c. voltage source are all connected in series. When L is removed from the circuit, the phase difference between the voltage and the current in the circuit is $\pi/3$. If instead, C is removed from the circuit the phase difference is again $\pi/3$. The power factor of the circuit is :

(1) 1 (2) $\sqrt{3}/2$ (3) $\frac{1}{2}$ (4) $\frac{1}{\sqrt{2}}$

AC0093

AIPMT Mains 2012

13. The instantaneous values of alternating current and voltages in a circuit are given as

$i = \frac{1}{\sqrt{2}}\sin(100\,\pi t)$ ampere

$e = \frac{1}{\sqrt{2}}\sin(100\,\pi t + \pi/3)$ volt

The average power in Watts consumed in the circuit is :-

(1) $\frac{1}{2}$ (2) $\frac{1}{8}$ (3) $\frac{1}{4}$ (4) $\frac{\sqrt{3}}{4}$

AC0094

NEET-UG 2013

14. A coil of self-inductance L is connected in series with a bulb B and an AC source. Brightness of the bulb decreases when :

(1) an iron rod is inserted in the coil.

(2) frequency of the AC source is decreased.

(3) number of turns in the coil is reduced.

(4) A capacitance of reactance $X_C = X_L$ is included in the same circuit.

AC0098

Re-AIPMT 2015

15. A series R-C circuit is connected to an alternating voltage source. Consider two situations :-

(a) When capacitor is air filled.

(b) When capacitor is mica filled.

Current through resistor is i and voltage across capacitor is V then :-

(1) $V_a = V_b$ (2) $V_a < V_b$

(3) $V_a > V_b$ (4) $i_a > i_b$

AC0103

AIPMT 2015

16. A resistance 'R' draws power 'P' when connected to an AC source. If an inductance is now placed in series with the resistance, such that the impedance of the circuit becomes 'Z', the power drawn will be:

(1) $P\sqrt{\frac{R}{Z}}$ (2) $P\left(\frac{R}{Z}\right)$

(3) P (4) $P\left(\frac{R}{Z}\right)^2$

AC0104

NEET-I 2016

17. An inductor 20 mH, a capacitor 50 μF and a resistor 40Ω are connected in series across a source of emf V = 10 sin 340 t. The power loss in A.C. circuit is:-

(1) 0.51 W (2) 0.67 W

(3) 0.76 W (4) 0.89 W

AC0107

18. A small signal voltage V(t) = V_0 sin ωt is applied across an ideal capacitor C :-

(1) Current I(t), lags voltage V(t) by 90°.

(2) Over a full cycle the capacitor C does not consume any energy from the voltage source.

(3) Current I(t) is in phase with voltage V(t).

(4) Current I(t) leads voltage V(t) by 180°.

AC0108

NEET-II 2016

19. Which of the following combinations should be selected for better tuning of an L-C-R circuit used for communication ?

(1) R = 15 Ω, L = 3.5 H, C = 30 μF

(2) R = 25 Ω, L = 1.5 H, C = 45 μF

(3) R = 20 Ω, L = 1.5 H, C = 35 μF

(4) R = 25 Ω, L = 2.5 H, C = 45 μF

AC0109

20. The potential differences across the resistance, capacitance and inductance are 80 V, 40 V and 100 V respectively in an L-C-R circuit. The power factor of this circuit is :-

(1) 0.8 (2) 1.0

(3) 0.4 (4) 0.5

AC0110

NEET (UG) 2018

21. An inductor 20 mH, a capacitor 100 μF and a resistor 50 Ω are connected in series across a source of emf, V = 10 sin 314 t. The power loss in the circuit is

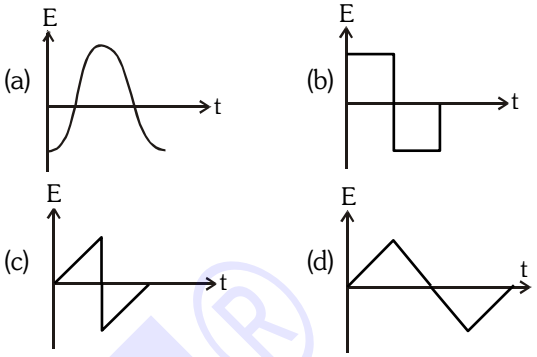
(1) 0.79 W (2) 0.43 W

(3) 2.74 W (4) 1.13 W

AC0119

NEET (UG) 2019 (Odisha)

22. The variation of EMF with time for four types of generators are shown in the figures. Which amongst them can be called AC ?



(1) (a) and (d) (2) (a), (b), (c) and (d)

(3) (a) and (b) (4) only (a)

AC0166

23. A circuit when connected to an AC source of 12 V gives a current of 0.2 A. The same circuit when connected to a DC source of 12 V, gives a current of 0.4 A. The circuit is

(1) series LR (2) series RC

(3) series LC (4) series LCR

AC0167

NEET (UG) 2020

24. A 40 μF capacitor is connected to a 200 V, 50 Hz ac supply. The rms value of the current in the circuit is, nearly :

(1) 25.1 A (2) 1.7 A

(3) 2.05 A (4) 2.5 A

AC0168

25. A series LCR circuit is connected to an ac voltage source. When L is removed from the circuit, the phase difference between current and voltage is $\frac{\pi}{3}$. If instead C is removed from the circuit, the phase difference is again $\frac{\pi}{3}$ between current and voltage. The power factor of the circuit is :

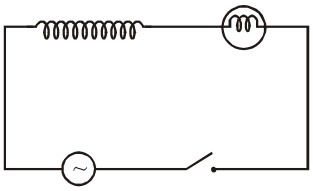
(1) –1.0 (2) zero

(3) 0.5 (4) 1.0

AC0169

NEET (UG) 2020(Covid-19)

26. A light bulb and an inductor coil are connected to an ac source through a key as shown in the figure below. The key is closed and after sometime an iron rod is inserted into the interior of the inductor. The glow of the light bulb



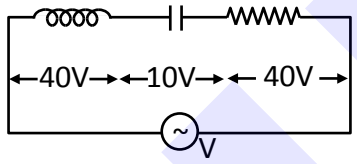
(1) decreases
(2) remains unchanged
(3) will fluctuate
(4) increases

AC0170

NEET (UG) 2021

27. An inductor of inductance L, a capacitor of capacitance C and a resistor of resistance 'R' are connected in series to an ac source of potential difference 'V' volts as shown in figure.

Potential difference across L, C and R is 40 V, 10 V and 40 V, respectively. The amplitude of current flowing through LCR series circuit is $10\sqrt{2}$ A. The impedance of the circuit is :-



(1) $4\sqrt{2}\,\Omega$
(2) $5/\sqrt{2}\,\Omega$
(3) $4\,\Omega$
(4) $5\,\Omega$

AC0171

28. A series LCR circuit containing 5.0 H inductor, 80 μF capacitor and 40 Ω resistor is connected to 230 V variable frequency ac source. The angular frequencies of the source at which power transferred to the circuit is half the power at the resonant angular frequency are likely to be :

(1) 25 rad/s and 75 rad/s
(2) 50 rad/s and 25 rad/s
(3) 46 rad/s and 54 rad/s
(4) 42 rad/s and 58 rad/s

AC0172

NEET (UG) 2021(Paper-2)

29. When a d.c. voltage of 100 V is applied to a coil of self-inductance $(\sqrt{3}/\pi)$H, a current of 1 A flows through it, when an a.c. source of 100 V is applied across the coil, the current in the coil becomes 0.5A. The frequency of a.c. supply is

(1) 30 Hz (2) 50 Hz
(3) 60 Hz (4) 100 Hz

AC0173

NEET (UG) 2022

30. The peak voltage of the ac source is equal to:

(1) the rms value of the ac source
(2) $\sqrt{2}$ times the rms value of the ac source
(3) $1/\sqrt{2}$ time the rms value of the ac source
(4) the value of voltage supplied to the circuit.

AC0174

31. A series LCR circuit with inductance 10 H, capacitance 10 μF, resistance 50 Ω is connected to an ac source of voltage, V = 200 sin (100 t) volt. If the resonant frequency of the LCR circuit is ν_o and the frequency of the ac source is ν, then

(1) $\nu_o = \nu = \frac{50}{\pi}$Hz

(2) $\nu_o = \frac{50}{\pi}$Hz, $\nu = 50$Hz

(3) $\nu = 100$ Hz ; $\nu_o = \frac{100}{\pi}$Hz

(4) $\nu_o = \nu = 50$ Hz

AC0175

NEET (UG) 2022 (Overseas)

32. An a.c. source given by $V = V_m \sin \omega t$ is connected to a pure inductor L in a circuit and I_m is the peak value of the ac current. The instantaneous power supplied to the inductor is:

(1) $-\frac{V_m I_m}{2}\sin(2\omega t)$ (2) $V_m I_m \sin^2(\omega t)$

(3) $-V_m I_m \sin^2(\omega t)$ (4) $\frac{V_m I_m}{2}\sin(2\omega t)$

AC0176

Re-NEET (UG) 2022

33. Given below are two statements :

Statement-I :

In an ac circuit, the current through a capacitor leads the voltage across it.

Statement-II :

In a.c. circuits containing pure capacitance only, the phase difference between the current and the voltage is π:-

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **statement-I** and **statement-II** are correct

(2) Both **statement-I** and **statement-II** are incorrect

(3) **Statement-I** is correct but **statement-II** is incorrect

(4) **Statement-I** is incorrect but **statement-II** is correct

AC0177

34. An inductor of inductance 2 mH is connected to a 220 V, 50 Hz a.c. source. Let the inductive reactance in the circuit is X_1. If a 220 V dc source replaces the ac source in the circuit, then the inductive reactance in the circuit is X_2. X_1 and X_2 respectively are :

(1) 6.28 Ω, zero (2) 6.28 Ω, infinity

(3) 0.628 Ω, zero (4) 0.628 Ω, infinity

AC0178

35. A standard filament lamp consumes 100 W when connected to 200 V ac mains supply. The peak current through the bulb will be :

(1) 0.707 A (2) 1 A

(3) 1.414 A (4) 2 A

AC0179

EXERCISE-II (Previous Year Questions) ANSWER KEY

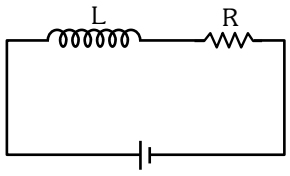
Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**3**	**3**	**2**	**1**	**2**	**3**	**3**	**2**	**4**	**3**	**2**	**1**	**2**	**1**	**3**
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	**4**	**1**	**2**	**1**	**1**	**1**	**2**	**1**	**4**	**4**	**1**	**4**	**3**	**2**	**2**
Que.	31	32	33	34	35										
Ans.	**1**	**1**	**3**	**3**	**1**										

EXERCISE-III (Analytical Questions) Master Your Understanding

1. When 100 volts d.c. is applied across a solenoid a current of 1.0 amp. flows in it. When 100 volt a.c. is applied across the same coil, the current drops to 0.5 amp. If the frequency of the a.c. source is 50 Hz the impedance and inductance of the solenoid are :–
(1) 200 ohm and 0.55 H
(2) 100 ohm and 0.86 H
(3) 200 ohm and 1.0 H
(4) 100 ohm and 0.93 H

AC0123

2. Time constant of the given circuit is τ. If the battery is replaced by an ac source having voltage $V = V_0 \cos \omega t$, power factor of the circuit will be :-



(1) $\omega\tau$ (2) $\frac{1}{\sqrt{1+(\omega\tau)^2}}$
(3) $\sqrt{1+(\omega\tau)^2}$ (4) None

AC0124

3. An alternating emf of angular frequency ω is applied across an inductance. The instantaneous power developed in the circuit has an angular frequency:
(1) $\omega/4$ (2) $\omega/2$
(3) ω (4) 2ω

AC0128

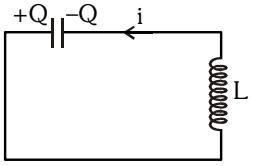
4. The self inductance of a choke coil is 10 mH. when it is connected with a 10 V D.C. source, then the loss of power is 20 watt. When it is connected with 10 volt A.C. source loss of power is 10 watt. The frequency of A.C. source will be :
(1) 50 Hz (2) 60 Hz
(3) 80 Hz (4)100 Hz

AC0129

5. An inductance L, a capacitance C and resistance R may be connected to an AC source of angular frequency ω, in three different combinations of RC, RL and RLC in series. Assume that $\omega L = \frac{1}{\omega C}$. The power drawn by the three combinations are P_1, P_2, P_3 respectively. Then :-
(1) $P_1 > P_2 > P_3$ (2) $P_1 = P_2 < P_3$
(3) $P_1 = P_2 > P_3$ (4) $P_1 = P_2 = P_3$

AC0130

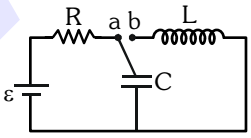
6. In the L-C circuit shown in figure, the current is in direction shown in the figure and charges on the capacitor plates have sign shown in the figure. At this time :-



(1) i as well as Q increasing
(2) i as well as Q decreasing
(3) i is increasing but Q is decreasing
(4) i is decreasing but Q is increasing

AC0131

7. The switch in the circuit pictured is in position a for a long time. At t = 0 the switch is moved from a to b. The current through the inductor will reach its first maximum after moving the switch in a time:-



(1) $2\pi\sqrt{LC}$ (2) $\frac{1}{4}\sqrt{LC}$
(3) $\frac{\pi}{2}\sqrt{LC}$ (4) $\pi\sqrt{LC}$

AC0132

8. The inductance of the oscillatory circuit of a radio station is 10 milli henry and its capacitance is 0.25μF. Taking the effect of the resistance negligible, wavelength of the broadcasted waves will be

(velocity of light = 3.0×10^8 m/s, π = 3.14):

(1) 9.42×10^4 m
(2) 18.8×10^4 m
(3) 4.5×10^4 m
(4) none of these

AC0133

9. A coil has an inductance of 0.7 henry and is joined in series with a resistance of 220 Ω. When the alternating emf of 220 V at 50 Hz is applied to it then the phase through which current lags behind the applied emf and the wattless component of current in the circuit will be respectively

(1) 30°, 1 A

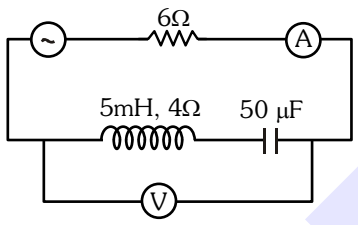
(2) 45°, 0.5 A

(3) 60°, 1.5 A

(4) none of these

AC0134

10. In the circuit shown in the figure, the A.C. source gives a voltage V = 20 cos (2000 t) volt neglecting source resistance, the voltmeter and ammeter readings will be :



(1) 0V, 1.4A

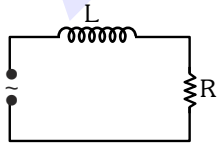
(2) 5.6V, 1.4A

(3) 0V, 0.47 A

(4) 1.68 V, 0.47 A

AC0136

11. An inductor and a resistor in series are connected to an A.C. supply of variable frequency. As the frequency of the source is increased, the phase angle between current and the potential difference across source will be :



(1) First increase and then decrease

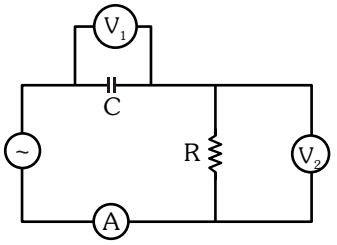
(2) First decrease and then increase

(3) Go on decreasing

(4) Go on increasing

AC0137

12. The diagram shows a capacitor C and a resistor R connected in series to an AC source, V_1 and V_2 are voltmeters and A is an ammeter. Consider now the following statements :



(I) Readings in A and V_2 are always in phase

(II) Reading in V_1 is ahead with reading in V_2

(III) Readings in A and V_1 are always in phase

Which of these statements are is correct :

(1) I only (2) II only

(3) I and II only (4) II and III only

AC0138

13. A capacitor of capacitance 2 μF is connected in the tank circuit of an oscillator oscillating with a frequency of 1 kHz. If the current flowing in the circuit is 2 mA, the voltage across the capacitor will be:–

(1) 0.16 V (2) 0.32 V

(3) 79.5 V (4) 159 V

AC0139

14. If an alternating current $i = i_m \sin \omega t$ is flowing through a capacitor then voltage drop ΔV_C across capacitor C will be ?

(1) $-\frac{i_m}{\omega C}\sin \omega t$ (2) $-\frac{i_m}{\omega C}\cos \omega t$

(3) $-\frac{i_m}{\omega C}\left(\sin \omega t + \frac{\pi}{4}\right)$ (4) $\frac{i_m}{\omega C}\left(\sin \omega t - \frac{\pi}{4}\right)$

AC0141

15. If an alternating current $i = i_m \sin \omega t$ is flowing through an inductor then voltage drop ΔV_L across inductor L will be :-

(1) $i_m \omega L \sin \omega t$

(2) $i_m \omega L \cos \omega t$

(3) $i_m \omega L \sin \left(\omega t + \frac{\pi}{4}\right)$

(4) $i_m \omega L \cos \left(\omega t - \frac{\pi}{4}\right)$

AC0142

16. If frequency of alternating source is made zero then which of the following statement is true :

(1) Current through capacitor will be zero

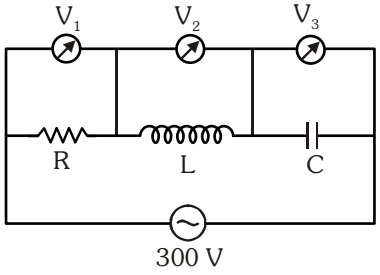
(2) Current through resistance will be zero

(3) Current through inductance will be zero

(4) All

AC0143

17. The figure shows a LCR network connected to 300 V a.c. supply. The circuit elements are such that $R = X_L = X_C = 10\Omega$. V_1, V_2 and V_3 are three a.c. voltmeters connected as shown in the figure. Which of the following represents the correct set of readings of the voltmeters ?



(1) $V_1 = 100$ V, $V_2 = 100$ V, $V_3 = 100$ V

(2) $V_1 = 150$ V, $V_2 = 0$ V, $V_3 = 150$ V

(3) $V_1 = 300$ V, $V_2 = 100$ V, $V_3 = 100$ V

(4) $V_1 = 300$ V, $V_2 = 300$ V, $V_3 = 300$ V

AC0144

18. A 1.5 μF capacitor is charged of 60 V. The charging battery is then disconnected and a 15 mH coil is connected in series with the capacitor so that LC oscillations occurs. Assuming that the circuit contains no resistance. The maximum current in this coil shall be close to

(1) 1.4 A (2) 1.2 A

(3) 0.8 A (4) 0.6 A

AC0146

EXERCISE-III (Analytical Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**1**	**2**	**4**	**3**	**2**	**3**	**3**	**1**	**2**	**2**	**4**	**1**	**1**	**2**	**2**
Que.	16	17	18												
Ans.	**1**	**4**	**4**												