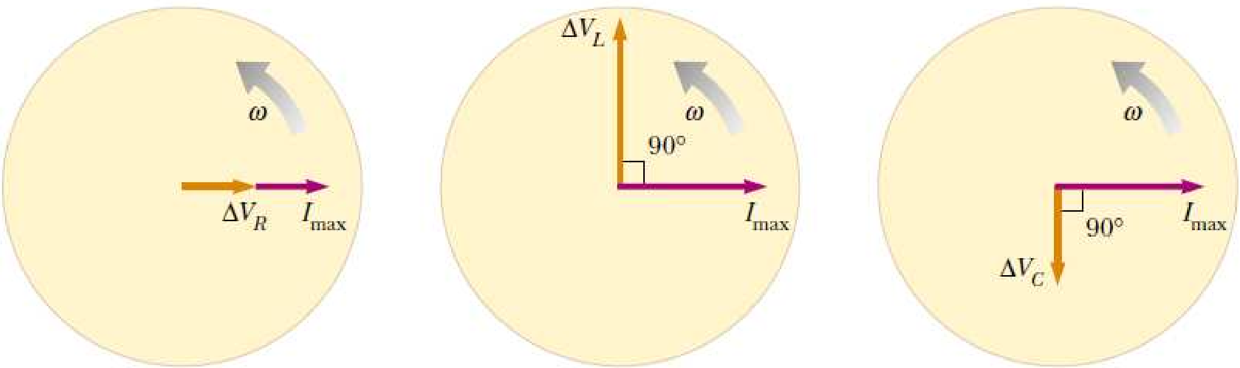
Alternating-Current Circuits

CH (10)

Al Dahma' Secondary School
Alain



(a) Resistor (b) Inductor (c) Capacitor

Circuit Elements	Impedance Z	Phase Angle ϕ
R	R	0°
C	X_C	− 90°
L	X_L	+ 90°
R C	$\sqrt{R^2 + X_C^2}$	Negative, between − 90° and 0°
R L	$\sqrt{R^2 + X_L^2}$	Positive, between 0° and 90°
R L C	$\sqrt{R^2 + (X_L - X_C)^2}$	Negative if $X_C > X_L$ Positive if $X_C < X_L$

1. The power is transmitted from a powerhouse on high voltage AC because:
A) Electric current travels faster at higher volts
B) It is more economical due to less power wastage
C) It is difficult to generate power at low voltage
D) Chances of stealing transmission lines are minimized

2. The potential difference V and the current i flowing through an instrument in an AC circuit of frequency f are given by $\boldsymbol{V = 5.0 cos\omega t}$ volts and $\boldsymbol{i = 2.0\ sin\ wt}$ amperes (where $w = 2\pi f$). The power dissipated in the instrument is:

A) $Zero$

B)10 W

C) 5 W

D) 2.5 W

3. In an AC circuit, V and i are given by $\boldsymbol{V = 100\ sin\ (100\ t)\ volts}$, $\boldsymbol{i = 100 sin(100t + \frac{\pi}{3}) mA}$. The power dissipated in circuit is:

A) 104 $watt$

B) 10 $watt$

C) 2.5 $watt$

D) 5 $watt$

4. The resistance of a coil for DC is in ohms. In AC, the resistance:
A) Will remain same
B) Will increase
C) Will decrease
D) Will be zero

5. If instantaneous current is given by $\boldsymbol{i = 4cos(\omega t + \varphi)\ A}$, then the $r.m.s.$ value of current is:
A) 4 A
B) $2\sqrt{2}\ A$
C) $4\sqrt{2}\ A$
D) $Zero\ A$

6. In an AC circuit $\boldsymbol{i = 100\ sin\ 200\ \pi t}$. The time required for the current to achieve its peak value will be:
A) $\frac{1}{100}\ s$
B) $\frac{1}{200}\ s$
C) $\frac{1}{300} s$
D) $\frac{1}{400} s$

7. A generator produces a voltage that is given by $\boldsymbol{V = 240sin120t}$, where t is in seconds. The $frequency$ and $r.m.s.voltage$ are:
A) $60\ Hz\ and\ 240\ V$
B) $19\ Hz\ and\ 120\ V$
C) $19\ Hz\ and\ 170\ V$
D) $754\ Hz\ and\ 70\ V$

8. If V_0 represents the peak value of the voltage in an AC circuit, the $r.m.s.$ value of the voltage will be:
A) $\frac{V_0}{\pi}$
B) $\frac{V_0}{2}$
C) $\frac{V_0}{\sqrt{\pi}}$
D) $\frac{V_0}{\sqrt{2}}$

9. The peak value of $220\ V$ of AC mains is:
A) $155.6\ V$
B) $220.0\ V$
C) $311.0\ V$
D) $440\ V$

10. A sinusoidal AC current flows through a resistor of resistance R. If the peak current is i_p, then the power dissipated is:
A) $i_p^2 Rcos\theta$
B) $\frac{1}{2} i_p^2 R$
C) $\frac{4}{\pi} i_p^2 R$
D) $\frac{1}{\pi} i_p^2 R$

11. A $40\ W$ electric heater is connected to a $200\ V, 50\ Hz$ mains supply. The peak value of electric current flowing in the circuit is approximately:
A) 2.5 A
B) 5.0 A
C) 7 A
D) 10 A

12. The root mean square value of the alternating current is equal to:
A) $Twice\ the\ peak\ value$
B) $Half\ the\ peak\ value$
C) $\frac{1}{\sqrt{2}}\ times\ the\ peak\ value$
D) $Equal\ to\ the\ peak\ value$

Al Dahma'

13. The peak value of an alternating $e.m.f.\ \boldsymbol{V}$ is given by $\boldsymbol{V = V_0 cos\omega t\ is\ 10\ volts}$ and its frequency is $50\ Hz$. At time $t = 1600s$, the instantaneous $e.m.f.$ is:
A) $10\ V$
B) $5\sqrt{3}\ V$
C) $5\ V$
D) $1\ V$

14. An AC generator produced an output voltage $\boldsymbol{V = 170sin377t\ V}$, where t is in seconds. The $frequency$ of AC voltage is:
A) $50\ Hz$
B) $110\ Hz$
C) $60\ Hz$
D) $230\ Hz$

15. In general, in an alternating current circuit:
A) The average value of current is zero
B) The average value of square of the current is zero
C) Average power dissipation is zero
D) The phase difference between voltage and current is zero

16. The $r.m.s.$ voltage of domestic electricity supply is $220\ V$. Electrical appliances should be designed to withstand an instantaneous voltage of:

A) 220 V
B) 310 V
C) 330 V
D) 440 V

17. The process by which AC is converted into DC is known as:

A) Purification
B) Amplification
C) Rectification
D) Current amplification

18. For an AC circuit $\boldsymbol{V = 15sin\omega t}$ and $\boldsymbol{i = 20cos\omega t}$ the average power consumed in this circuit is:

A) $300\ Watt$
B) $150\ Watt$
C) $75\ Watt$
D) $zero$

19. A bulb is connected first with DC and then AC of same voltage then it will shine brightly with:

A) AC
B) DC
C) $Brightness\ will\ be\ in\ ratio\ 1/1.4$
D) $Equally\ with\ both$

20. The frequency of an alternating voltage is $50\ cycles/sec$ and its amplitude is $120V$. Then the $r.m.s.$ value of voltage is:

A) $101.3V$
B) $84.8V$
C) $70.7V$
D) $56.5V$

21. A resistance of 20 Ω is connected to a source of an alternating potential $\boldsymbol{V = 220sin(100\pi t)}$. The time taken by the current to change from its peak value to $r.m.s$ value is:
A) 0.2 s
B) 0.25 s
C) $25 \times 10^{-3} s$
D) $2.5 \times 10^{-3} s$

22. Voltage and current in an AC circuit are given by $\boldsymbol{V = 5sin(100\pi t - \pi 6)}$ and $\boldsymbol{i = 4sin(100\pi t + \frac{\pi}{6})}$
A) Voltage leads the current by 30^0
B) Current leads the voltage by 30^0
C) Current leads the voltage by 60^0
D) Voltage leads the current by 60^0

23. The ratio of peak value and $r.m.s$ value of an alternating current is:
A) 1
B) $\frac{1}{2}$
C) $\sqrt{2}$
D) $\frac{1}{\sqrt{2}}$

24. If an alternating voltage is represented as $\boldsymbol{V = 141sin(628t)}$, then the rms value of the voltage and the frequency are respective:

A) $141V, 628Hz$
B) $100V, 50Hz$
C) $100V, 100Hz$
D) $141V, 100Hz$

25. Current in the circuit is $\boldsymbol{wattles}$, if:
A) Inductance in the circuit is zero
B) Resistance in the circuit is zero
C) Current is alternating
D) Resistance and inductance both are zero

26. A circuit containing capacitance only. An alternating $e.m.f.$ is applied to purely capacitive circuit. **The phase relation** between $e.m.f.$ and $current\ flowing$ in the circuit is:

A) $e.m.f. is\ leads\ the\ current\ by\ (\frac{\pi}{2})$
B) B) $Current\ is\ leads\ the\ e.m.f. by\ (\frac{\pi}{2})$
C) $Current\ lags\ behind\ e.m.f. by\ (\pi)$
D) $Current\ is\ leads\ the\ e.m.f. by\ (\pi)$

27. An AC source is connected to a resistive circuit. Which of the following is true?

A) Current leads the voltage and both are in same phase
B) Current lags behind the voltage and both are in same phase
C) Current and voltage are in same phase
D) Any of the above may be true depending upon the value of resistance

28. The phase angle between $e.m.f.$ and $current(i)$ in LCR series ac circuit is:

A) $0\ to\ \left(\frac{\pi}{2}\right)$
B) $\left(\frac{\pi}{4}\right)$
C) $\left(\frac{\pi}{2}\right)$
D) π

29. The average power dissipated in a pure inductor of inductance L when an AC current is passing through it, is:
A) $\frac{1}{2}Li^2$
B) $\frac{1}{4}Li^2$
C) $2Li^2$
D) $Zero$

30. An alternating current of frequency $'f'$ is flowing in a circuit containing a resistance R and a choke L in series. The $\boldsymbol{impedance}(Z)$ of this circuit is:
A) $R + 2\pi fL$
B) $\sqrt{R^2 + 4\pi^2 f^2 L^2}$
C) $\sqrt{R^2 + L^2}$
D) $\sqrt{R^2 + 2\pi fL}$

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

A) $10^5 Hz$
B) $10\ Hz$
C) $\frac{10^5}{2\pi} Hz$
D) $\frac{10}{2\pi} Hz$

32. Power delivered by the source of the circuit becomes maximum, when:

A) $\omega L = \omega C$
B) $\omega L = \frac{1}{\omega C}$
C) $\omega L = -(\frac{1}{\omega C})^2$
D) $\omega L = \sqrt{\omega C}$

33. An alternating voltage is connected in series with a resistance R and an inductance L . If the potential drop across the resistance is $200\ V$ and across the inductance is $150\ V$, then the applied voltage is:

A) $350\ V$
B) $250\ V$
C) $500\ V$
D) $300\ V$

34. An inductive circuit contains resistance of $10\ \Omega$ and an inductance of $20\ H$. If an AC voltage of $120\ V$ and frequency $60\ Hz$ is applied to this circuit, the current would be nearly:

A) $0.32\ A$
B) $0.016\ A$
C) $0.48\ A$
D) $0.80\ A$

35. Same current is flowing in two alternating circuits. The first circuit contains only inductance and the other contains only a capacitor. If the frequency of the $e.m.f.$ of AC is increased, the effect on the value of the current will be:

A) Increases in the first circuit and decreases in the other
B) Increases in both the circuits
C) Decreases in both the circuits
D) Decreases in the first circuit and increases in the other

36. A capacitor is a perfect insulator for:

A) Alternating currents
B) Direct currents
C) Both AC and DC
D) None of these

37. In a circuit containing an inductance of zero resistance, the $e.m.f.$ of the applied AC voltage leads the current by:

A) 90^{o}
B) 45^{o}
C) 30^{o}
D) 0.0^{o}

38. In a pure inductive circuit or in an AC circuit containing inductance only, the current:

A) $Leads\ the\ e.m.f.by\ 90^{0}$
B) $Lags\ behind\ the\ e.m.f.by\ 90^{0}$
C) $Sometimes\ leads\ and\ sometime\ lags\ behind\ the\ e.m.f.$
D) $Is\ in\ phase\ with\ the\ e.m.f.$

39. A $20\ volts\ AC$ is applied to a circuit consisting of a resistance and a coil with negligible resistance. If the voltage across the resistance is $12\ V$, the voltage across the coil is:

A) $16\ V$
B) $10\ V$
C) $8.0\ V$
D) $6.0\ V$

40. A resistance of 300 Ω and an inductance of $1\pi\ H$ are connected in series to a AC voltage of 20 V and 200 Hz frequency. The phase angle between the voltage and current is:
A) $\tan^{-1}(\frac{4}{3})$
B) $\tan^{-1}(\frac{3}{4})$
C) $\tan^{-1}(\frac{3}{2})$
D) $\tan^{-1}(\frac{2}{5})$

41. The power factor of LCR circuit at resonance is:
A) 0.707
B) 1
C) $Zero$
D) 0.5
42. The natural frequency of a $L - C$ circuit is equal to:
A) $\frac{1}{2\pi}\sqrt{LC}$
B) $\frac{1}{2\pi\sqrt{LC}}$
C) $\frac{1}{2\pi}\sqrt{\frac{L}{C}}$
D) $\frac{1}{2\pi}\sqrt{\frac{C}{L}}$

43. An alternating voltage $\boldsymbol{V = 200\sqrt{2}\ sin(100t)}$ is connected to a $1\mu F$ capacitor through an AC ammeter. The reading of the ammeter shall be:
A) 10 mA
B) 20 mA
C) 40 mA
D) 80 mA

44. An inductive circuit contains a resistance of 10 $\Omega$and an inductance of 2.0 H. If an AC voltage of 120 V and frequency of 60 Hz is applied to this circuit, the current in the circuit would be nearly:
A) 0.32 A
B) 0.16 A
C) 0.48 A
D) 0.80 A

45. In a LCR circuit having $L = 8.0\ H$, $C = 0.5\ mF$ and $R = 100\ \Omega$in series. The resonance frequency in radian/second is:
A) 600
B) 400
C) 500
D) 300

46. In LCR circuit, the capacitance is changed from C to $4C$. For the same resonant frequency, the inductance should be changed from L to:
A) $2L$
B) L / 2
C) L / 4
D) 4 L

47. A $120\ volt\ AC$ source is connected across a pure inductor of inductance $0.70\ H$. If the frequency of the source is $60\ Hz$, the current passing through the inductor is:
A) $4.55\ A$
B) $0.355\ A$
C) $0.455\ A$
D) $3.55\ A$

48. The impedance of a circuit consists of $3.0\ \Omega$resistance and $4.0\ \Omega$ reactance. The power factor of the circuit is:
A) 0.4
B) 0.6
C) 0.8
D) 1.0

49. L, C and R denote inductance, capacitance and resistance respectively. Pick out the combination which does not have the dimensions of frequency:
A) $\frac{1}{RC}$
B) $\frac{R}{L}$
C) $\frac{1}{\sqrt{LC}}$
D) $\frac{C}{L}$

50. The power factor of a good choke coil is:
A) Nearly zero
B) Exactly zero
C) Nearly one
D) Exactly one

51. If resistance of $100\ \Omega$, inductance $of\ 0.5\ H$ and capacitance of $10 \times 10^{-6} F$ are connected in series through $50\ Hz\ AC$ supply, then impedance is:
A) 1.876 Ω
B) 18.76 Ω
C) 189.7 Ω
D) 101.3 Ω

52. A $10\ \Omega$ resistance, $5\ mH$ coil and $10\ mF$ capacitor are joined in series. When a suitable frequency alternating current source is joined to this combination, the circuit resonates. If the resistance is halved, the resonance frequency:

A) Is halved
B) Is doubled
C) Remains unchanged
D) In quadrupled

53. In a series circuit $R = 300\ \Omega$, $L = 0.9\ H$, $C = 2.0\ mF$ and $\omega = 1000\ rad/sec$. The impedance of the circuit is:
A) 1300 Ω
B) 900 Ω
C) 500 Ω
D) 400 Ω

54. In a $L - R$ circuit, the value of L is $(\frac{0.4}{\pi})\ H$ and the value of R is 30 Ω. If in the circuit, an alternating $e.m.f.$ of $200\ V$ at $50\ cycles\ per\ sec$ is connected, the impedance of the circuit and current will be:
A) $11.4\Omega,\ 17.5A$
B) $30.7\Omega,\ 6.5A$
C) $40.4\Omega,\ 5.0A$
D) $50\Omega,\ 4.0A$

55. The reactance of a coil when used in the domestic AC power supply ($220\ volt, 50\ Hz$) is $100\ \Omega$. The self inductance of the coil is nearly:
A) 3.2 H

B) 0.32 H

C) 2.2 H

D) 0.22 H

56. The reactance of a $25\mu F$ capacitor at the ac frequency of $4000\ Hz$ is:
A) $\frac{5}{\pi}\Omega$
B) $\sqrt{\frac{5}{\pi}}\Omega$
C) 10.0Ω
D) $\sqrt{10.0}\ \Omega$

57. The frequency for which a $5\mu F$ capacitor has a reactance of $\frac{1}{1000}\ \Omega$ is given by:
A) $\frac{100}{\pi}MHz$
B) $\frac{1000}{\pi}Hz$
C) $\frac{1}{1000}Hz$
D) $1000\ Hz$

58. An $e.m.f.\ \boldsymbol{V = 4.0cos(1000t)\ volt}$ is applied to an $LR - circuit$ of inductance $3\ mH$ and resistance $4\ \Omega$. The amplitude of current in the circuit is:

A) $\frac{4}{\sqrt{7}}\ A$
B) $1.0\ A$
C) $\frac{4}{7}\ A$
D) $0.8\ A$

59. In an ac circuit, a resistance of R ohm is connected in series with an inductance L. If phase angle between voltage and current be 45°, the value of inductive reactance will be:
    A) $\frac{R}{4}$
    B) $\frac{R}{2} Hz$
    C) R
    D) $Cannot\ be\ found\ with\ the\ given\ data$

60. The phase difference between the current and voltage of LCR circuit in series combination at resonance is:
    A) 0
    B) π/2
    C) π
    D) −π

61. In a series resonant circuit, the AC voltage across resistance R, inductance L and capacitance C are 5 V, 10 V and 10 V respectively. The AC voltage applied to the circuit will be:
    A) 20 V
    B) 10 V
    C) 5 V
    D) 25 V

62. When 100 $volt\ DC$ is applied across a coil, a current of 1.0 A flows through it. When 100 $volt\ AC$ at 50 Hz is applied to the same coil, only 0.5 A current flows. The impedance of the coil is:
    A) 100Ω
    B) 200Ω
    C) 300Ω
    D) 400Ω

63. For series LCR circuit, wrong statement is:
    A) Applied $e.m.f.$ and potential difference across resistance are in same phase
    B) Applied $e.m.f.$ and potential difference at inductor coil have phase difference of π/2
    C) Potential difference at capacitor and inductor have phase difference of π/2
    D) Potential difference across resistance and capacitor have phase difference of π/2

64. In a purely resistive ac circuit, the current:
    A) Lags behind the $e.m.f.$ in phase
    B) Is in phase with the $e.m.f.$
    C) Leads the $e.m.f.$ in phase
    D) Leads the $e.m.f.$ in half the cycle and lags behind it in the other half

65. A 12 Ω resistor and a 0.21 H inductor are connected in series to an ac source operating at 20 V, 50 $cycle/second$. The phase angle between the current and the source voltage is:
    A) 30°
    B) 40°
    C) 80°
    D) 90°

66. The resonant frequency of a circuit is f. If the capacitance is made 4 times the initial values, then the resonant frequency will become:

A) $f\ /\ 2$
B) $2f$
C) f
D) $f\ /\ 4$

67. In the non-resonant circuit, what will be the nature of the circuit for frequencies higher than the resonant frequency:

A) Resistive
B) Capacitive
C) Inductive
D) None of the above

68. In an AC circuit, the potential difference across an inductance and resistance joined in series are respectively $16\ V$ and $20\ V$. The total potential difference across the circuit is:

A) 20.0 V
B) 25.6 V
C) 31.9 V
D) 53.5 V

69. An LCR circuit contains $\mathrm{R} = 50\ \Omega$, $\mathrm{L} = 1$ mH and $\mathrm{C} = 0.1$ mF. The impedance of the circuit will be minimum for a frequency of:

A) $\frac{10^5}{2\pi} s^{-1}$
B) $\frac{10^6}{2\pi} s^{-1}$
C) $2\pi \times 10^5 s^{-1}$
D) $2\pi \times 10^6 s^{-1}$

70. In a series LCR circuit, resistance $R = 10\Omega$ and the impedance $Z = 20\Omega$. The phase difference between the current and the voltage is:

A) 30°
B) 45°
C) 60°
D) 90°

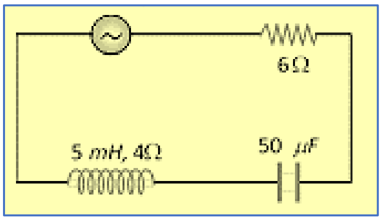
71. A series ac circuit consist of an inductor and a capacitor. The inductance and capacitance are respectively $1\ H$ and $25\mu F$. If the current is maximum in circuit, then angular frequency will be:

A) 200
B) 100
C) 50
D) 200/2π

72. An alternating $e.m.f.$ of frequency ($f = \frac{1}{2\pi\sqrt{LC}}$) is applied to a series LCR circuit. For this frequency of the applied $e.m.f.$:
   A) The circuit is at resonance and its impedance is made up only of a reactive part
   B) The current in the circuit is in phase with the applied $e.m.f.$ and the voltage across R equals this applied emf
   C) The sum of the potential difference across the inductance and capacitance equals the applied $e.m.f.$ which is 180° ahead of phase of the current in the circuit

   D) The quality factor of the circuit is $(\frac{\omega L}{R})$ or $(\frac{1}{\omega CR})$ and this is a measure of the voltage magnification (produced by the circuit at resonance) as well as the sharpness of resonance of the circuit

73. In the circuit shown below, the AC source has voltage $\boldsymbol{V = 20cos(\omega t)\ volts}$ with $\omega = 2000\ rad/sec$. the amplitude of the current will be nearest to:
   A) 2.0 A
   B) 3.3 A
   C) $\frac{2}{\sqrt{5}}$
   D) $\sqrt{5}\ A$



74. The quality factor of LCR circuit having resistance (R) and inductance (L) at resonance frequency (ω) is given by:
   A) $\frac{\omega L}{R}$
   B) $\frac{R}{\omega L}$
   C) $(\frac{\omega L}{R})^{1/2}$
   D) $(\frac{\omega L}{R})^{2}$

75. Power factor is maximum in an LCR circuit when:
   A) $X_L = X_C$
   B) R=0
   C) $X_L = 0$
   D) $X_C = 0$

76. In an AC circuit the reactance of a coil is $\sqrt{3}$ times its resistance, the phase difference between the voltage across the coil to the current through the coil will be:

   A) π/3
   B) π/2
   C) π/4
   D) π/6

77. The capacity of a pure capacitor is 1 farad. In dc circuits, its effective resistance will be:
    A) $Zero$

    B) $Infinite$

    C) 1.0 Ω

    D) 0.5 Ω

78. In an AC circuit, the current lags behind the voltage by $\pi/3$. The components in the circuit are:
    A) R and L

    B) R and C

    C) L and C

    D) Only R

79. In an AC circuit, the power factor:
    A) Is zero when the circuit contains an ideal resistance only

    B) Is unity when the circuit contains an ideal resistance only

    C) Is zero when the circuit contains an ideal inductance only

    D) Is unity when the circuit contains an ideal inductance only

80. For high frequency, a capacitor offers:
    A) More reactance

    B) Less reactance

    C) Zero reactance

    D) Infinite reactance

81. The coil in a circuit:
    A) Increases the current

    B) Decreases the current

    C) Does not change the current

    D) Has high resistance to dc circuit

82. In a circuit, the current lags behind the voltage by a phase difference of $\pi/2$. The circuit contains which of the following:
    A) Only R

    B) Only L

    C) Only C

    D) R and C

83. The inductive reactance of an inductor of 1π henry at 50 Hz frequency is:
    A) $\frac{50}{\pi}\Omega$

    B) $\frac{\pi}{50}\Omega$

    C) $100\ \Omega$

    D) $50\ \Omega$

84. An oscillator circuit consists of an inductance of $0.5mH$ and a capacitor of $20\mu F$. The resonant frequency of the circuit is nearly:
    A) $15.92\ Hz$

    B) $159.2\ Hz$

    C) $1592\ Hz$

    E) $15910\ Hz$

85. Reactance of a capacitor of capacitance $C\mu F$ for AC frequency $\frac{400}{\pi}\ Hz$ is 25Ω. The value C is:
    A) 50μF

    B) 25μF

    C) 100μF

    D) 75μF

86. There is a 5.0Ω resistance in an AC, circuit. Inductance of $0.1H$ is connected with it in series. If equation of ac $e.m.f.$ is $5.0sin50t$ then the phase difference between current and $e.m.f.$ is:
    A) $\frac{\pi}{2}$

    B) $\frac{\pi}{6}$

    C) $\frac{\pi}{4}$

    D) 0.0

87. In a AC circuit of capacitance the current from potential is:
    A) Forward

    B) Backward

    C) Both are in the same phase

    D) None of these

88. In an LCR circuit capacitance is changed from C to 2C. For the resonant frequency to remain unchanged, the inductance should be change from L to:

A) 4L

B) 2L

C) L/2

D) L/4

89. The current in series LCR circuit will be maximum when ω is:

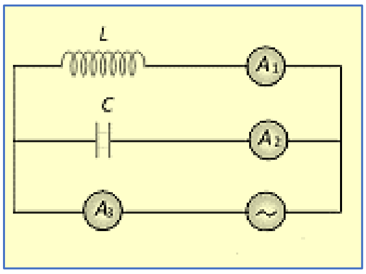
A) As large as possible

B) Equal of natural frequency of LCR system

C) $\sqrt{LC}$

D) $\sqrt{1/LC}$

90. An inductor L and a capacitor C are connected in the circuit as shown in the figure. The frequency of the power supply is equal to the resonant frequency of the circuit. Which ammeter will read zero ampere?



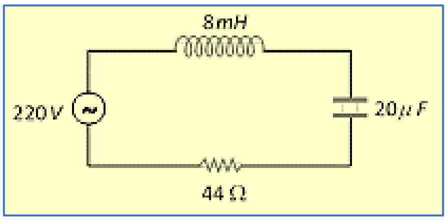
A) A_1

B) A_2

C) A_3

D) *None of these*

91. For the series LCR circuit shown in the figure, what is the resonance frequency and the amplitude of the current at the resonating frequency:



A) $2500\ rad\ s^{-1}\ \ and\ 5\sqrt{2}\ A$

B) $2500\ rad\ s^{-1}\ and\ 5A$

C) $2500\ rad\ s^{-1}\ and\ \frac{5}{\sqrt{2}}\ A$

D) $25\ rad\ s^{-1}\ and\ 5\sqrt{2}\ A$

92. In an A.C. circuit the current:

A) Always leads the voltage

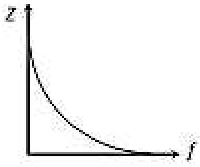
B) Always lags behind the voltage

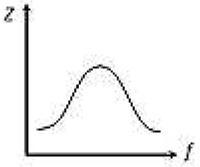
C) Is always in phase with the voltage

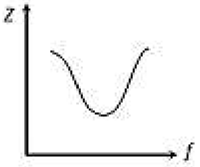
D) May lead or lag behind or be in phase with the voltage

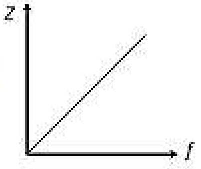
93. Which of the following components of a LCR circuit, with ac supply, dissipates energy:
    A) L
    B) R
    C) C
    D) All of these

94. Which one of the following curves represents the variation of impedance (Z) with frequency f in series LCR circuit?

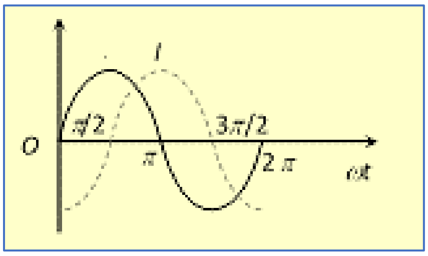
A) 

B) 

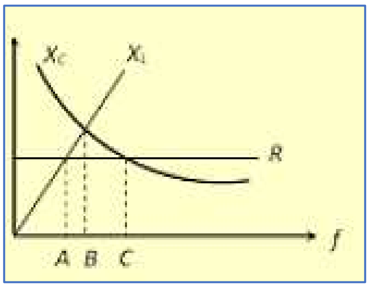
C) 

D) 

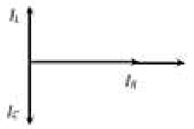
95. The variation of the instantaneous current (i) and the instantaneous emf in a circuit is as shown in fig. Which of the following statements is correct?
    A) The voltage lags behind the current by π / 2
    B) The voltage leads the current by π / 2
    C) The voltage and the current are in phase
    D) The voltage leads the current by π

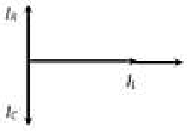


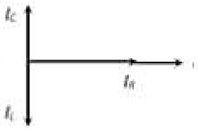
96. The figure shows variation of R, X_L and X_C with frequency f in a series L, C, R circuit. Then for what frequency point, the circuit is inductive:
    A) A
    B) B
    C) C
    D) All points

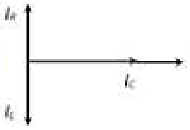


97. An alternating emf is applied across a parallel combination of a resistance R, capacitance C and an inductance L. If i_R, i_L, i_C are the currents through R, L and C respectively, then the diagram which correctly represents, the phase relationship among i_R, i_L, i_C and source emf , is given by:

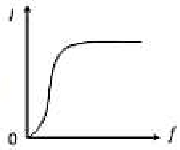
A) 

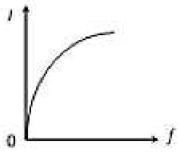
B) 

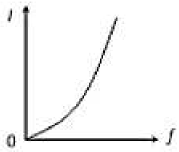
C) 

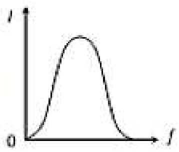
D) 

98. An ac source of variable frequency f is connected to an LCR series circuit. Which one of the graphs in figure. represents the variation of current of current $\boldsymbol{i}$ in the circuit with frequency $\boldsymbol{f}$:

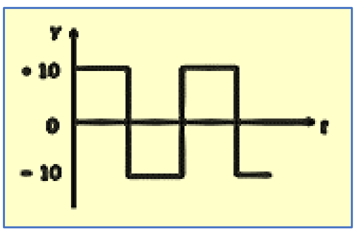
A) 

B) 

C) 

D) 

99. The $r.m.s.$ voltage of the wave form shown is:



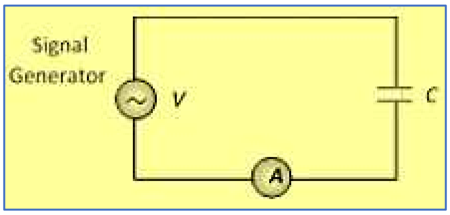
A) 10 V

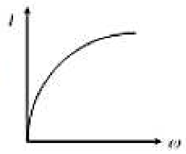
B) 7 V

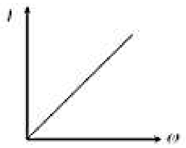
C) 6.37 V

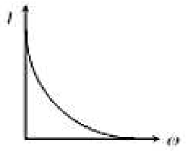
D) None of these

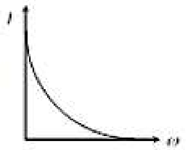
100. A constant voltage at different frequencies is applied across a capacitance C as shown in the figure. Which of the following graphs Correctly depicts the variation of current with frequency?



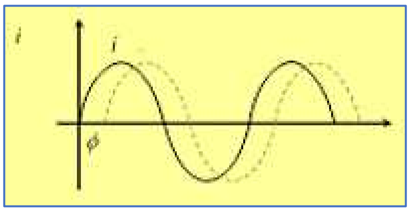
A) 

B) 

C) 

D) 

101. When an AC source of $e.m.f.\boldsymbol{V} = \boldsymbol{V_0 sin(100t)}$ is connected across a circuit, the phase difference between the $e.m.f.\boldsymbol{V}$ and the current $\boldsymbol{i}$ in the circuit is observed to be $\pi/4$, as shown in the diagram. If the circuit consists possibly only of RC or LC in series, find the relationship between the two elements:



A) $R = 1.0k\ \Omega,\quad C = 10.0\mu F$

B) $R = 1.0k\ \Omega,\quad C = 1.0\mu F$

C) $R = 1.0k\ \Omega,\quad L = 10.0H$

D) $R = 1.0k\ \Omega,\quad L = 1.0H$

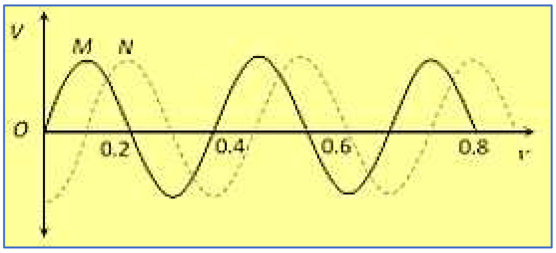
102. Two sinusoidal voltages of the same frequency are shown in the diagram. What is the frequency in Hz, and the phase relationship? If Frequency Phase M lead of N.

A) 0.4, $-\pi/4$

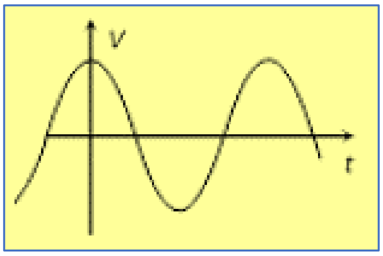
B) 2.5, $-\pi/2$

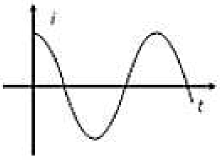
C) 2.5, $+\pi/2$

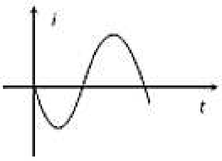
D) 2.5 , $-\pi/4$

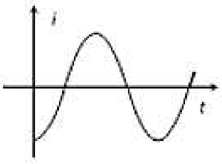


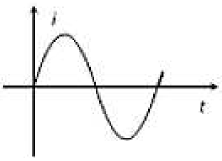
103. The voltage across a pure inductor is represented by the following diagram. Which one of the following diagrams will represent the current?



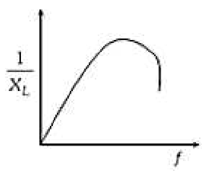
A) 

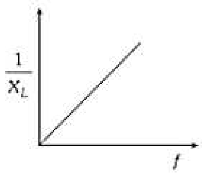
B) 

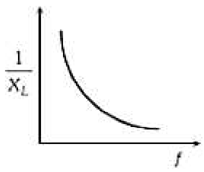
C) 

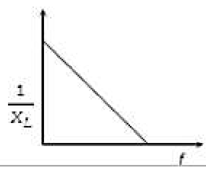
D) 

104. In pure inductive circuit, the curves between frequency f and reciprocal of inductive reactance $(\frac{1}{XL})$ is:

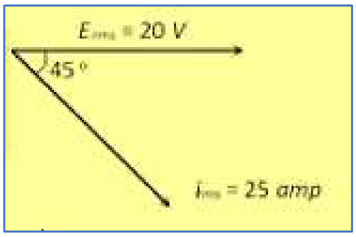
A) 

B) 

C) 

D) 

105. The vector diagram of current and voltage for a circuit is as shown. The components of the circuit will be



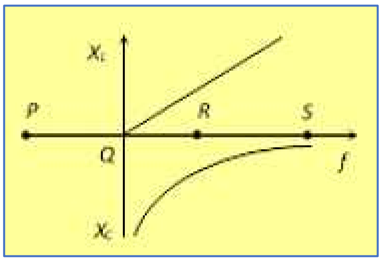
A) LCR

B) LR

C) LCR or LR

D) None of these

106. The resonance point in $(XL - f)$ and $(XC - f)$ curves is



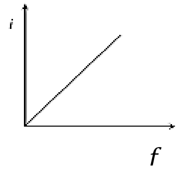
A) P

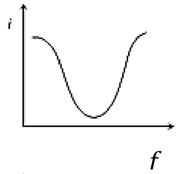
B) Q

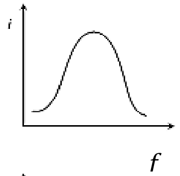
C) R

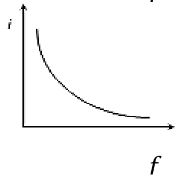
D) S

107. The $(i - f)$ curve for anti-resonant circuit is:

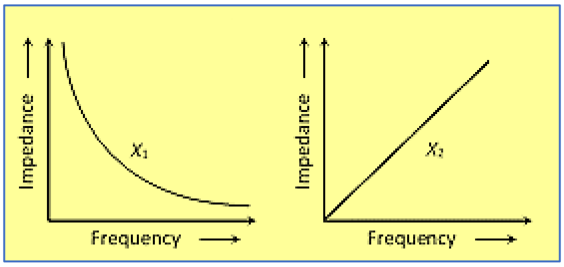
A)


B)


C)


D)


108. 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:



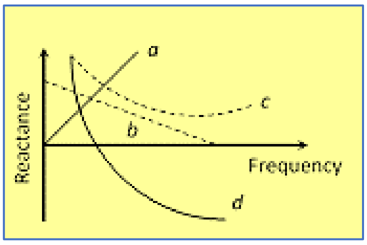
A) X_1 is an inductor and X_2 is a capacitor

B) X_1 is a resistor and X_2 is a capacitor

C) X_1 is a capacitor and X_2 is an inductor

D) X_1 is an inductor and X_2 is a resistor

109. Which of the following plots may represent the reactance of a series LC combination:



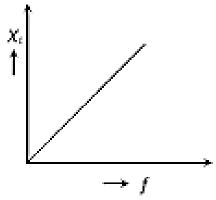
A) a

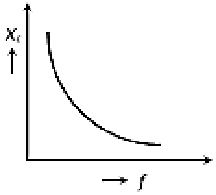
B) b

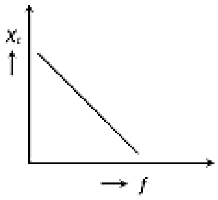
C) c

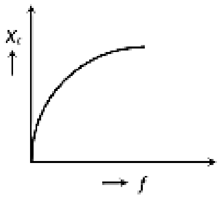
D) d

110. Which of the following curves correctly represents the variation of capacitive reactance X_C with frequency f:

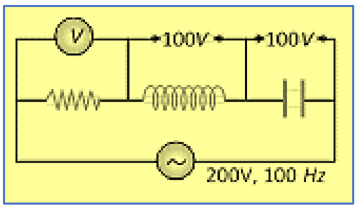
A) 

B) 

C) 

D) 

111. In the circuit given below, what will be the reading of the voltmeter:



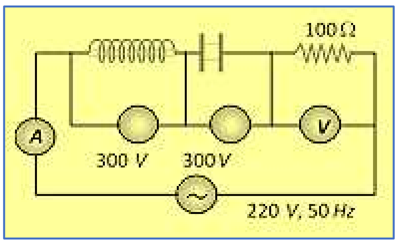
A) 300 V

B) 900 V

C) 200 V

D) 400 V

112. In the circuit shown below, what will be the readings of the voltmeter and ammeter:



A) 800 V, 2A

B) 300 V, 2A

C) 220 V, 2.2 A

D) 100 V, 2A

113. 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:

A) Bulb will give more intense light

B) Bulb will give less intense light

C) Bulb will give light of same intensity as before

D) Bulb will stop radiating light

114. The voltage of an AC source varies with time according to the equation $\boldsymbol{V = 100 sin\ 100\pi t cos 100\pi t}$ where t is in seconds and V is in volts. Then:

A) $The\ peak\ voltage\ of\ the\ source\ is\ 100\ V$

B) $The\ peak\ voltage\ of\ the\ source\ is\ 50\ V$

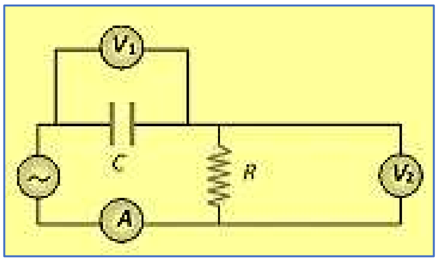
C) $The\ peak\ voltage\ of\ the\ source\ is \frac{100}{\sqrt{2}}\ V$

D) $The\ frequency\ of\ the\ source\ is\ 50\ Hz$

115. 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 in phase with reading in V_2
III. Readings in A and V_1 are always in phase

which of these statements are/is correct?



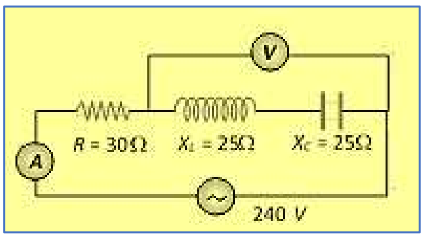
A) I only

B) II only

C) I and II only

D) II and III only

116. In the circuit shown in figure neglecting source resistance the voltmeter and ammeter reading will respectively, will be:



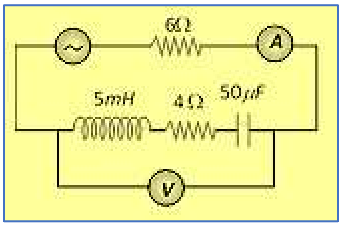
A) 0V, 3A

B) 150V, 3A

C) 150V, 6A

D) 0V, 8A

117. In the circuit shown in the figure, the AC source gives a voltage $\boldsymbol{V = 20cos(2000t)}$. Neglecting source resistance, the voltmeter and ammeter reading will be:



A) 0V, 0.47A

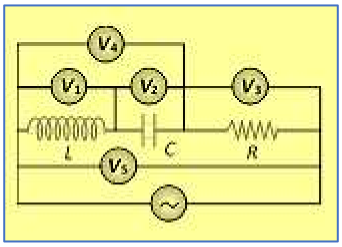
B) 1.68V, 0.47A

C) 0V, 1.4 A

D) 5.6V, 1.4 A

118. In the adjoining AC circuit the voltmeter whose reading will be zero at resonance is:

A) V1



B) V2

C) V3

D) V4

119. For a series RLC circuit $R = X_L = 2X_C$. The impedance of the circuit and phase difference (between) V and i will be:

A) $\frac{\sqrt{5}\ R}{2}$, $\tan^{-1}(2)$

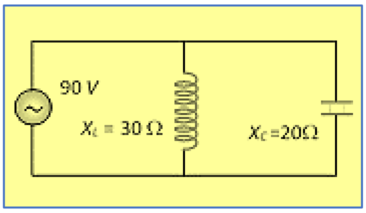
B) $\frac{\sqrt{5}\ R}{2}$, $\tan^{-1}(\frac{1}{2})$

C) $\sqrt{5}\ X_C$, $\tan^{-1}(2)$

D) $\sqrt{5}\ R$, $\tan^{-1}(\frac{1}{2})$

120. In the adjoining figure the impedance of the circuit will be

A) 120 Ω



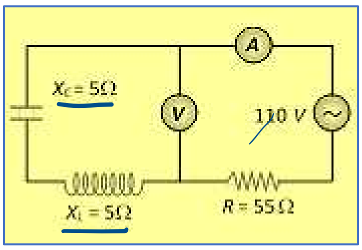
B) 50 Ω

C) 60 Ω

D) 90 Ω

121. The reading of ammeter in the circuit shown will be

A) 2A



B) 2.4 A

C) Zero

D) 1.7 A