CBSE

ALTERNATING CURRENT WS 1

Class 12 - Physics

1. Mr. Iyer takes a grinder rated 220 V, 50 Hz to the U.S where supply is 110 V, 60 Hz. He needs to use a **[1]**

   a) step-down transformer with turn ratio 2 : 1
   b) step-up transformer with turn ratio 1 : 3
   c) step-up transformer with turn ratio 1 : 2
   d) step-down transformer with turn ratio 5 : 2

2. What is the ratio of inductive and capacitive reactance in an ac citcuit? **[1]**

   a) $\omega^2 LC$
   b) LC^2
   c) $\omega^2 L$
   d) $\frac{LC}{\omega^2}$

3. When an alternating voltage E = E_0 sin ωt is applied to a circuit, a current I = $I_0 \sin\left(\omega t + \frac{\pi}{2}\right)$ flows through it. **[1]**
   The average power dissipated in the circuit is

   a) $E_{rms} \cdot I_{rms}$
   b) $\frac{E_0 I_0}{\sqrt{2}}$
   c) Zero
   d) $E_0 I_0$

4. A 15 Ω resistor, an 80 mH inductor and a capacitor of capacitance C are connected in series with a 50 Hz ac source. If the source voltage and current in the circuit are in phase, then the value of capacitance is **[1]**

   a) 100 μF
   b) 127 μF
   c) 160 μF
   d) 142 μF

5. Alternating current can not be measured by d.c. ammeter, because: **[1]**

   a) average value of current of complete cycle is zero
   b) a.c. cannot pass through a.c. ammeter
   c) a.c. ammeter will get damaged
   d) a.c. changes direction

6. In a LCR-circuit, capacitance is changed from C to 2 C. For the resonant frequency to remain unchanged, the inductance should be changed from L to: **[1]**

   a) L/4
   b) 4 L
   c) 2 L
   d) L/2

7. In a transformer, number of truns in the primary is 140 and that in the secondary is 280. If current in primary is 4 A, then that in the secondary is: **[1]**

   a) 6 A
   b) 10 A
   c) 2 A
   d) 4 A

8. A 100 mH coil carries a current of 1 A. Energy stored in the form of the magnetic field is **[1]**

   a) 1 J
   b) 0.1 J
   c) 0.5 J
   d) 0.05 J

9. The wiring for a refrigerator contains a starter capacitor. A voltage of amplitude 170 V and frequency 60 Hz applied across the capacitor is to produce a current amplitude of 0.850 A through the capacitor. Capacitance required is **[1]**

a) 17.8 μF
b) 13.3 μF
c) 15.3 μF
d) 23.4 μF

10. Quantity that remains unchanged in a transformer is **[1]**

a) voltage
b) Ampere
c) frequency
d) current

11. The current flowing in a step down transformer 220 V to 22 V having impedance 220Ω is **[1]**

a) 0.1 A
b) 0.1 mA
c) 1 A
d) 1 mA

12. In a series LR circuit, $X_L = 3R$. If a capacitor with $X_C = R$ is added in series, the ratio of new to old power factor is: **[1]**

a) $\frac{1}{\sqrt{2}}$
b) 2
c) 1
d) $\sqrt{2}$

13. The best material for the core of a transformer is **[1]**

a) soft iron
b) hard steel
c) mild steel
d) stainless steel

14. The reactance of a capacitance at 50 Hz is 5 Ω. If the frequency is increased to 100 Hz, the new reactance is **[1]**

a) 10 Ω
b) 2.5 Ω
c) 125 Ω
d) 5 Ω

15. A resistor of 100 Ω and a capacitor of $10\mu F$ are connected in series to a 220 V 50 Hz ac source. Voltage across the resistor and capacitance are **[1]**

a) 66 V, 210 V
b) 66 V, 110 V
c) 60 V, 280 V
d) 56 V, 210 V

16. A transformer is used to light a 100 W and 110 V lamp from a 220 V mains. If the main current is 0.5 A, the efficiency of the transformer is approximate: **[1]**

a) 30 %
b) 10 %
c) 90 %
d) 50 %

17. A power transmission line feeds input power at 2300 V to a step-down transformer with its primary windings having 4000 turns. Number of turns in the secondary in order to get output power at 230 V is **[1]**

a) 325
b) 380
c) 425
d) 400

18. In an LCR-series a.c. circuit, the voltage across each of the components. L, C and R is 50 V. The voltage across the LC-combination will be: **[1]**

a) zero
b) 100 V

c) $50\sqrt{2}\ V$ d) 50 V

19. The peak value of an alternating emf ε given by $\varepsilon = \varepsilon_0 \cos \omega t$ is 10 volt and its frequency is 50 Hz. At time t = $\frac{1}{600}$ sec, the instantaneous emf is: **[1]**

a) 10 V b) 5 V

c) $5\sqrt{3}$ V d) 1 V

20. In which of the following circuit power dissipation is maximum? **[1]**

a) LR or CR circuit b) Pure capacitive circuit

c) Pure resistive circuit0 d) Pure inductive circuit

21. In the AC circuit, the current is expressed as I = $100 \sin 200\pi t$. In this circuit the current rises from zero to peak value in time: **[1]**

a) $\frac{1}{300}$ s b) $\frac{1}{100}$ s

c) $\frac{1}{400}$ s d) $\frac{1}{200}$ s

22. The peak voltage of 220 V ac mains is **[1]**

a) 155.6 V b) 440 V

c) 220.0 V d) 311 V

23. An inductor with L = 9.50 mH is connected across an ac source that has voltage amplitude 45.0 V. Phase angle for the source voltage relative to the current is **[1]**

a) 120^o b) 90^o

c) -180^o d) -90^o

24. The phase difference between the current and the voltage in series LCR circuit at resonance is **[1]**

a) $\frac{\pi}{2}$ b) π

c) $\frac{\pi}{3}$ d) zero

25. To manufacture the core of a transformer, the best material is: **[1]**

a) soft iron b) hard steel

c) mild steel d) stainless steel

26. In a series LC circuit connected to an ac source, with the increase in the frequency of the source, the net reactance: **[1]**

a) decreases linearly b) first increases to become maximum and then decreases to zero

c) first decreases to become zero and then increases d) increases linearly

27. The transformer is a device that is used to change the magnitude of: **[1]**

a) A.C. voltage b) D.C. voltage

c) Both A.C. voltage and D.C. voltage d) D.C. current

28. A choke is preferred to resistance for limiting current in ac circuit because **[1]**

a) there is no wastage of power

b) choke is compact in size

c) choke is a good absorber of heat

d) choke is cheap

29. Relation between r.m.s. voltage and instantaneous voltage of an AC **[1]**

a) $V_0 = \frac{V_{rms}}{\sqrt{2}}$

b) $V_{rms} = 0.707\ V_0$

c) Both $V_{rms} = \frac{V_0}{\sqrt{2}}$ and $V_{rms} = 0.707\ V_0$

d) $V_{rms} = \frac{V_0}{\sqrt{2}}$

30. To reduce the reasonant frequency in an LCR series circuit with a generator **[1]**

a) dielectric in the capacitor should be removed

b) the generator frequency should be reduced

c) another capacitor should be added in parallel to the first

d) the iron core of the inductor should be removed

31. The best material for the core of a transformer is: **[1]**

a) soft iron

b) mild steel

c) hard steel

d) stainless steel

32. The primary winding of a transformer has 50 turns and its secondary has 500 turns. If the primary is connected to a.c. supply of 20 V-50 Hz, then secondary will have an **[1]**

a) 200 V - 50 Hz

b) 2 V - 5 Hz

c) 200 V - 500 Hz

d) 2 V - 50 Hz

33. The primary winding of a transformer has 500 turns, whereas its secondary has 5,000 turns. The primary is connected to an a.c. supply 20 V-50 Hz. The secondary will have an output of: **[1]**

a) 200 V - 50 Hz

b) 200 V - 500 Hz

c) 2 V - 50 Hz

d) 2 V - 5 Hz

34. In an LRC series circuit R = 300.0 Ω, X_C = 300.0 Ω and X_L = 500.0 Ω. The average power consumed in the resistor is 60.0 W. Rms voltage of the source is **[1]**

a) 151 V

b) 141 V

c) 161 V

d) 131 V

35. A series circuit consists of an ac source of variable frequency, a 115.0 Ω resistor, a 1.25 μF capacitor, and a 4.50-mH inductor. The impedance of this circuit when the angular frequency of the ac source is adjusted to half the resonant angular frequency is **[1]**

a) 156.0 Ω

b) 166.0 Ω

c) 176.0 Ω

d) 146.0 Ω

36. A 50 mH coil carries a current of 2A. The energy stored in the coil is: **[1]**

a) 0.1 J

b) 10 J

c) 0.5 J

d) 0.05 J

37. The selectivity of a series LCR a.c. circuit is large, when **[1]**

a) L is small and R is small

b) L is large and R is small

c) L is large and R is large

d) L = R

38. Which of the following quantities remain constant in a step down transformer? **[1]**

a) Current

b) Charge

c) Power

d) Voltage

39. A series LCR circuit with R = 20 Ω, L = 1.5 H and C = 35 μF is connected to a variable-frequency 200 V ac supply. When the frequency of the supply equals the natural frequency of the circuit, average power transferred to the circuit in one complete cycle is **[1]**

a) 2800 W

b) 2000 W

c) 1000 W

d) 1800 W

40. The voltage across a resistor, an inductor, and a capacitor connected in series to an ac source are 20 V, 15 V and 30 V respectively. The resultant voltage in the circuit is **[1]**

a) 5 V

b) 25 V

c) 20 V

d) 65 V

41. The primary of step-down transformer used for ringing doorbell has 2000 turns of fine wire and the secondary has 100 turns. This transformer when connected to a 110 V A.C. source will deliver at its secondary a potential difference of: **[1]**

a) 220 V

b) 11 V

c) 5.5 V

d) 55 V

42. Reciprocal of impedance is **[1]**

a) admittance

b) susceptance

c) conductance

d) transconductance

43. An alternating current generator has an internal resistance Rg and an internal reactance Xg. It is used to supply power to a passive load consisting of a resistance Rg and a reactance X_L. For maximum power to be delivered from the generator to the load, the value of X_L is equal to **[1]**

a) zero

b) $-X_g$

c) X_g

d) R_g

44. Turn ratio in a set-up transformer is 1 : 2. If a Leclanche cell of 1.5 V is connected across the input, what is the voltage across the output? **[1]**

a) 3 V

b) 0.75 V

c) 1.5 V

d) 0 V

45. If the resistance of 100 Ω, the inductance of 0.5 H, and capacitance of 10×10^{-6} F are connected in series through 50 Hertz AC supply, the impedance will be: **[1]**

a) 18.7 Ω

b) 189.7 Ω

c) 101.3 Ω

d) 1.87 Ω

46. A step down transformer is used on a 1000 V line to deliver 20 A at 120 V at the secondary coil. If the efficiency of the transformer is 80%, the current drawn from the line is **[1]**

a) 3 A

b) 30 A

c) 2.4 A

d) 0.3 A

47. A voltage signal is described by: **[1]**

v = V_0 for $0 \leq t \leq \frac{T}{2}$

= 0 for $\frac{T}{2} \leq t \leq T$

for a cycle. Its rms value is:

a) $\frac{V_0}{2}$

b) $\frac{V_0}{\sqrt{2}}$

c) V_0

d) $\sqrt{2}\, V_0$

48. With increase in frequency of an A.C. supply, the impedance of a series L-C-R circuit **[1]**

a) remains constant

b) decreases at first, becomes minimum and then increases

c) increases

d) decreases

49. A transformer of 100% efficiency has 200 turns in the primary coil and 40000 turns in the secondary coil. It is connected to a 220 V main supply and secondary feeds to a 100 kΩ resistance. The potential difference per turn is **[1]**

a) 11 V

b) 18 V

c) 25 V

d) 1.1 V

50. Parameter that remains unchanged in a transformer is **[1]**

a) frequency

b) voltage

c) efficiency

d) current

51. An a.c. is represented by = 220sin(100)t V and is applied over resistance of 110 Ω. The heat produced in 7 min is: **[1]**

a) 11×10^3 cal

b) 25×10^3 cal

c) 33×10^3 cal

d) 22×10^3 cal

52. A 220 volt input is supplied to a transformer. The output circuit draws a current of 2.0 ampere at 440 volts. If the efficiency of the transformer is 80 %, the current drawn by the primary windings of the transformer is: **[1]**

a) 2.5 ampere

b) 5.0 ampere

c) 2.8 ampere

d) 3.6 ampere

53. The core of a transformer is laminated to reduce the effect of **[1]**

a) flux leakage

b) hysteresis loss

c) eddy current

d) copper loss

54. A capacitor of capacity C has reactance X. If capacitance and frequency are doubled, the reactance would be: **[1]**

a) 4X

b) 2X

c) $\frac{X}{2}$

d) $\frac{X}{4}$

55. The impedance of a series LCR circuit is **[1]**

a) $R + X_L + X_C$

b) $\sqrt{\frac{1}{X_C^2} + \frac{1}{X_L^2} + R^2}$

c) $\sqrt{X_L^3 - X_C^2 + R^2}$

d) $\sqrt{R^2 + (X_L - X_C)^2}$

56. A transformer has 500 primary turns and 10 secondary turns. If the secondary has a resistive load of 15 Ω, the currents in the primary and secondary respectively, are **[1]**

a) 3.2×10^{-3} A, 3.2×10^{-3} A

b) 3.2×10^{-3} A, 0.16 A

c) 0.16 A, 3.2×10^{-3} A

d) 0.16 A, 0.16 A

57. The primary and secondary coils of a transformer have 50 and 1500 turns respectively. If the magnetic flux ϕ linked with the primary coil is given by $\phi = \phi_0 + 4t$, where ϕ is in weber, t is time in second and ϕ_0 is a constant, the output voltage across the secondary coil is: **[1]**

a) 90 V

b) 220 V

c) 120 V

d) 30 V

58. In a series LCR circuit, the capacitance is changed from C to $\frac{C}{4}$. For the resonant frequency to remain unchanged, the inductance should be changed from L to nL, where n is: **[1]**

a) 2

b) $\frac{1}{2}$

c) 4

d) $\frac{1}{4}$

59. In a circuit, the current lags behind the voltage by a phase difference of $\pi/2$. The circuit contains which of the following? **[1]**

a) R and C

b) only C

c) only L

d) only R

60. An electric bulb marked 40 W and 200 V is used in a circuit of supply voltage 100 V. Its power would be: **[1]**

a) 20 W

b) 100 W

c) 10 W

d) 40 W

61. In a pure inductive circuit, the current **[1]**

a) lags behind the applied emf by an angle π

b) and applied emf are in same phase

c) lags behind the applied emf by an angle $\frac{\pi}{2}$

d) leads the applied emf by an angle $\frac{\pi}{2}$

62. Which quantity is increased in a step-down transformer? **[1]**

a) Current

b) Power

c) Frequency

d) Voltage

63. An ideal inductor is connected across an AC source of voltage. The current in the circuit **[1]**

a) lags voltage in phase by π.

b) lags voltage in phase by $\frac{\pi}{2}$.

c) is ahead of voltage in phase by $\frac{\pi}{2}$.

d) is ahead of the voltage in phase by π.

64. A transformer is used to light a 100 watt and 110 volt lamp from a 220 volt mains. If the main current is 0.5 ampere, the efficiency of the transformer is approximately **[1]**

a) 90%

b) 30%

c) 20%

d) 10%

65. A step up transformer operates on a 230 volt line and a load current of 2 ampere. The ratio of the primary and secondary windings is 1 : 25. The current in the primary is: **[1]**

a) 15 amp
b) 25 amp
c) 12.5 amp
d) 50 amp

66. A transformer works on the principle of **[1]**

a) inverter
b) converter
c) self induction
d) mutual induction

67. The frequency of an alternating voltage is 50 cycles/sec and its amplitude is 120 V. Then its rms value will be: **[1]**

a) 84.8 V
b) 42.4 V
c) 75.5 V
d) 56.5 V

68. The output of a step-down transformer is measured to be 24 V when connected to a 12 watt light bulb. The value of the peak current is **[1]**

a) 2A
b) $2\sqrt{2}$A
c) $\frac{1}{\sqrt{2}}$A
d) $\sqrt{2}$A

69. In an LRC series circuit, the rms voltage across the resistor is 30.0 V, across the capacitor it is 90.0 V, and across the inductor it is 50.0 V. Rms voltage of the source is **[1]**

a) 55.0 V
b) 50.0 V
c) 60.0 V
d) 65.0 V

70. When a voltage measuring device is connected to AC mains, the meter shows the steady input voltage of 220V. This means **[1]**

a) the pointer of the meter is stuck by some mechanical defect
b) input voltage cannot be AC voltage, but a DC voltage.
c) maximum input voltage is 220V
d) the meter reads not v but <v^2> and is calibrated to read $\sqrt{< v^2 >}$

71. A hair dryer meant for 110V, 60Hz is to be used in India. If 220 V is the supply voltage in India, the turns ratio for a transformer would be **[1]**

a) step-down transformer with turn ratio 3 : 1
b) step-up transformer with turn ratio 1 : 2
c) step-down transformer with turn ratio 2 : 1
d) step-down transformer with turn ratio 2.5 : 1

72. A coil has a resistance of 48.0 Ω. At a frequency of 80.0 Hz, the voltage across the coil leads the current in it by 53°. Inductance of the coil is **[1]**

a) 0.114 H
b) 0.84 H
c) 0.94 H
d) 0.124 H

73. If the rms current in a 50 Hz ac circuit is 5 A, the value of the current $\frac{1}{300}$ seconds after its value becomes zero is **[1]**

a) $\frac{5}{6}$A
b) $5\sqrt{\frac{3}{2}}$ A
c) $\frac{5}{\sqrt{2}}$A
d) $5\sqrt{2}$A

74. A series circuit consists of an ac source of variable frequency, a 115.0 Ω resistor, a 1.25 μF capacitor, and a **[1]**

4.50-mH inductor. Impedance of this circuit when the angular frequency of the ac source is adjusted to twice the resonant angular frequency is

a) 146 Ω

b) 176 Ω

c) 166 Ω

d) 156 Ω

75. Domestic power supply in India is **[1]**

a) 110 V, 60 Hz

b) 220 V, 50 Hz

c) 416 V, 60 Hz

d) 24 V DC