



CET25P7 ALTERNATING CURRENT

Class 12 - Physics

Time Allowed: 1 hour and 30 minutes

Maximum Marks: 75

1. In which of the following circuit power dissipation is maximum? [1]
 - a) LR or CR circuit
 - b) Pure capacitive circuit
 - c) Pure resistive circuit
 - d) Pure inductive circuit
2. In a LCR-circuit, capacitance is changed from C to $2C$. For the resonant frequency to remain unchanged, the inductance should be changed from L to: [1]
 - a) $L/4$
 - b) $4L$
 - c) $2L$
 - d) $L/2$
3. In an ac circuit, the maximum value of voltage is 423 volts. Its effective voltage is [1]
 - a) 400 volt
 - b) 340 volt
 - c) 323 volt
 - d) 300 volt
4. In an LRC series circuit $R = 300.0 \Omega$, $X_C = 300.0 \Omega$ and $X_L = 500.0 \Omega$. 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
5. The voltage across the terminals of an ac power supply varies with time according to $V \cos \omega t$. The voltage amplitude is $V = 45.0$ V. Average potential difference between the two terminals of the power supply is [1]
 - a) 35.8 V
 - b) 33.8 V
 - c) 37.8 V
 - d) 0 V
6. 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
7. 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
8. An a.c. is represented by $= 220 \sin(100)t$ V and is applied over resistance of 110Ω . 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

9. Inductance of an inductor whose reactance is $120\ \Omega$ at 80.0 Hz is [1]
a) 0.239 H b) 0.209 H
c) 0.199 H d) 0.219 H

10. If an a.c. main supply is given to be 220 V, the average e.m.f. during a positive half cycle will be [1]
a) 240 V b) $220\sqrt{2}$ V
c) 220 V d) 198 V

11. A transformer has 500 primary turns and 10 secondary turns. If the secondary has a resistive load of $15\ \Omega$, 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

12. 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

13. A sinusoidal voltage of peak value 283 V and frequency 50 Hz is applied to a series LCR circuit in which $R = 3\ \Omega$, $L = 25.48$ mH, and $C = 796\ \mu\text{F}$. Power dissipated in the circuit and the power factor are [1]
a) 4800 W, 0.6 b) 4000 W, 0.4
c) 3800 W, 0.6 d) 4400 W, 0.6

14. The best material for the core of a transformer is [1]
a) soft iron b) hard steel
c) mild steel d) stainless steel

15. 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

16. The rms current in a circuit connected to 50 Hz ac source is 15 A. The value of the current in the circuit $\left(\frac{1}{600}\right)$ s after the instant the current is zero, is [1]
a) $\frac{15}{\sqrt{2}}$ A b) $\frac{\sqrt{2}}{15}$ A
c) $15\sqrt{2}$ A d) 8 A

17. A resistor of $100\ \Omega$ and a capacitor of $10\ \mu\text{F}$ 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

18. 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 [1]

value in time:

- a) $\frac{1}{300}$ s b) $\frac{1}{100}$ s
c) $\frac{1}{400}$ s d) $\frac{1}{200}$ s

19. You have a special light bulb with a very delicate wire filament. The wire will break if the current in it ever exceeds 1.50 A, even for an instant. What is the largest root-mean-square current you can run through this bulb? [1]
a) 1.26 A b) 1.46 A
c) 1.06 A d) 1.56 A

20. A circuit has a resistance of 12 ohm and an impedance of 15 ohm. The power factor of the circuit will be [1]
a) 0.8 b) 1.125
c) 0.4 d) 1.25

21. A coil of inductance 8 pH is connected to a capacitor of capacitance $0.02 \mu\text{F}$. To what wavelength is this circuit tuned? [1]
a) $15.90 \times 10^3 \text{ m}$ b) $7.54 \times 10^2 \text{ m}$
c) $7.54 \times 10^3 \text{ m}$ d) $4.12 \times 10^2 \text{ m}$

22. In a series RLC circuit $R = 300 \Omega$, $L = 60 \text{ mH}$, $C = 0.50 \mu\text{F}$ applied voltage $V = 50 \text{ V}$ and $\omega = 10,000 \text{ rad/s}$. Inductive reactance X_L , capacitive reactance X_C and impedance Z are [1]
a) 600Ω , 200Ω and 500Ω b) 450Ω , 200Ω and 450Ω
c) 550Ω , 300Ω and 100Ω d) 500Ω , 250Ω and 500Ω

23. A transmitting station transmits radiowaves of wavelength 360 m. Find the inductance of the coil required with a condenser of capacity 1.20 pF in the resonant circuit. [1]
a) $3.07 \times 10^{-8} \text{ H}$ b) $2.25 \times 10^{-8} \text{ H}$
c) $1.25 \times 10^{-8} \text{ H}$ d) $1.9 \times 10^{-8} \text{ H}$

24. The coil of a choke in a circuit [1]
a) has high resistance to d.c. circuit. b) increases the current
c) decreases the current d) does not change the current

25. Reactance of a 3 H inductor at a frequency of 80.0 Hz is [1]
a) 1508Ω b) 1480Ω
c) 1500Ω d) 1490Ω

26. 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

27. An ac voltage $v = v_0 \sin \omega t$ is applied to a series combination of a resistor R and an element X . The instantaneous current in the circuit is $I = I_0 \sin (\omega t + \frac{\pi}{4})$. Then which of the following is correct? [1]
a) X is an inductor and $X_L = \sqrt{2}R$ b) X is an inductor and $X_L = R$

- c) X is a capacitor and $X_C = \sqrt{2} R$ d) X is a capacitor and $X_C = R$
28. An inductor with $L = 9.50 \text{ mH}$ is connected across an ac source that has voltage amplitude 45.0 V . Frequency of the source that results in a current amplitude of 3.90 A is [1]
- a) 180 Hz b) 129 Hz
c) 193 Hz d) 150 Hz
29. Series LCR circuit is connected to a variable frequency 230 V source where $L = 5.0 \text{ H}$, $C = 80 \mu\text{F}$, $R = 40 \Omega$. Impedance of the circuit and the amplitude of current at the resonating frequency are [1]
- a) 50Ω , 8.1 A b) 40Ω , 5.75 A
c) 80Ω , 3.9 A d) 25Ω , 5.4 A
30. An inductor, a capacitor and a resistor are connected in series across an ac source of voltage. If the frequency of the source is decreased gradually, the reactance of: [1]
- a) both the inductor and the capacitor decreases. b) inductor increases and the capacitor decreases.
c) inductor decreases and the capacitor increases. d) both the inductor and the capacitor increases.
31. In an LRC series circuit $R = 300.0 \Omega$, $X_C = 300.0 \Omega$ and $X_L = 500.0 \Omega$. The average power consumed in the resistor is 60.0 W . What is the power factor of the circuit? [1]
- a) 0.881 b) 0.831
c) 0.931 d) 0.911
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. A small signal voltage $V(t) = V_0 \sin t$ is applied across an ideal capacitor C . [1]
- a) Current $I(t)$ lags voltage $V(t)$ by 90° b) Current $I(t)$ leads voltage $V(t)$ by 180° .
c) Over a full cycle the capacitor C does not consume any energy from the voltage source. d) Current $I(t)$ is in phase with voltage $V(t)$
35. The phase difference between the alternating current and emf is $\frac{\pi}{2}$. Which of the following cannot be the constituent of the circuit? [1]
- a) L alone b) C alone
c) L - C d) R , L

36. If C and R denote capacitance and resistance, then dimensions of CR are [1]
 a) $[M^0 L T^0 A^1]$ b) $[MLT^0 A^2]$
 c) $[M^0 L^0 T A^0]$ d) $[ML^0 T A^{-2}]$
37. An inductor 20 mH, a capacitor 100 μF and a resistor 50 Ω are connected in series across a source of emf, $V = 10 \sin 314t$. The power loss in the circuit is: [1]
 a) 1.13 W b) 0.43 W
 c) 0.79 W d) 2.74 W
38. The average power dissipation in a pure capacitor in ac circuit is: [1]
 a) CV^2 b) $2CV^2$
 c) Zero d) $\frac{1}{2} CV^2$
39. Which of the following quantities remain constant in a step down transformer? [1]
 a) Current b) Charge
 c) Power d) Voltage
40. 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
41. 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
42. A series resonant LCR circuit has a quality factor (Q-factor) 0.4. If $R = 2 \text{ k}\Omega$, $C = 0.1 \mu F$, then the value of inductance is [1]
 a) 0.1 H b) 2 H
 c) 5 H d) 0.064 H
43. What are the dimensions of impedance? [1]
 a) $ML^3 T^{-3} I^{-2}$ b) $M^{-1} L^2 T^3 I^2$
 c) $ML^2 T^{-3} I^{-2}$ d) $M^{-1} L^3 T^3 I^2$
44. In a series LCR circuit, the voltage across the resistance, capacitance and inductance is 10 V each. If the capacitance is short-circuited the voltage across the inductance will be [1]
 a) $\frac{10}{\sqrt{2}}$ V b) 20 V
 c) 10 V d) $10\sqrt{2}$ V
45. The power factor of an a.c. circuit having resistance R and inductance L (connected in series) and an angular velocity ω is: [1]
 a) $R / (R^2 + \omega^2 L^2)^{1/2}$ b) $R / \omega L$

- c) $R / (R^2 - \omega^2 L^2)^{1/2}$ d) $\omega L / R$
46. If the current in a series LCR circuit is maximum, then ω will be: [1]
 a) as large as possible b) \sqrt{LC}
 c) \sqrt{LCR} d) equal to natural frequency of LCR system
47. 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
48. A transformer works on the principle of [1]
 a) inverter b) converter
 c) self induction d) mutual induction
49. The best material for the core of a transformer is: [1]
 a) soft iron b) mild steel
 c) hard steel d) stainless steel
50. Quantity that remains unchanged in a transformer is [1]
 a) voltage b) Ampere
 c) frequency d) current
51. 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 %
52. You have a 200.0Ω resistor, a 0.400-H inductor, $5.0 \mu F$ a capacitor, and a variable frequency ac source with an amplitude of 3.00 V. You connect all four elements together to form a series circuit. Current amplitude at an angular frequency of 400 rad/s is [1]
 a) 7.61mA b) 8.61mA
 c) 8.91mA d) 7.91mA
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 200 ohm resistor is connected in series with a $5 \mu F$ capacitor. The voltage across the resistor is $V_R = 1.20 \cos(2500t)$. Capacitive reactance is [1]
 a) 70Ω b) 80Ω
 c) 60Ω d) 90Ω
55. 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

56. A circuit containing a 80 mH inductor and a 60 μF capacitor in series is connected to a 230 V, 50 Hz supply. The resistance of the circuit is negligible. Average powers transferred to the inductor and to the capacitor are respectively [1]
a) 10 W, 10 W
b) 0 W, 0 W
c) 10 W, 20 W
d) 20 W, 10 W

57. 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

58. A circuit is connected to an ac source of variable frequency. As the frequency of the source is increased, the current first increases and then decreases. Which of the following combinations of elements is likely to comprise the circuit? [1]
a) L and R
b) L, C and R
c) L and C
d) R and C

59. 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. Impedance of this circuit when the angular frequency of the ac source is adjusted to the resonant angular frequency is [1]
a) 135.0 Ω
b) 115.0 Ω
c) 145.0 Ω
d) 125.0 Ω

60. Which quantity is increased in a step-down transformer? [1]
a) Current
b) Power
c) Frequency
d) Voltage

61. In a pure inductive circuit with a.c. source, the current lags behind emf by phase angle of [1]
a) $\frac{\pi}{2}$
b) $\frac{\pi}{4}$
c) 2π
d) π

62. 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

63. A condenser of 250 μF is connected in parallel to a coil of inductance 0.16 mH, while its effective resistance is 20 Ω . Determine the resonant frequency. [1]
a) 8×10^5 Hz
b) 9×10 Hz
c) 16×10^7 Hz
d) 9×10^4 Hz

64. 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

65. At resonance, in a series LCR circuit, which relation does not hold? [1]
a) $X_L = X_C$
b) $L\omega = \frac{1}{C\omega}$
c) $\omega = \frac{1}{LC}$
d) $\omega = \frac{1}{\sqrt{LC}}$

66. An inductive circuit have zero resistance. When ac voltage is applied across this circuit, then the current lags behind the applied voltage by an angle [1]
a) 90°
b) 0°
c) 45°
d) 30°

67. 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

68. 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%

69. A current $I = I_0 \sin(\omega t + \pi/2)$ flows in a circuit across which an alternating potential $E = E_0 \sin \omega t$ is applied. The power consumed in the circuit is [1]
a) $E_0 I_0 / 2$
b) $E_0 I_0$
c) E
d) zero

70. 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

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

72. 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

73. 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) $\frac{1}{4}$

74. 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

75. An LRC series circuit has phase angle 31.5° . The voltage amplitude of the source is 90.0 V. Voltage amplitude across the resistor is [1]

a) 68.7 V

b) 76.7 V

c) 74.7 V

d) 70.7 V

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