INDIAN SCHOOL MUSCAT

DEPARTMENT OF PHYSICS

STUDY MATERIAL FOR NEET AND JEE EXAMS

ELECTROMAGNETIC INDUCTION&ALTERNATING CURRENT

1 A metal road moves at a constant velocity in a direction perpendicular to its length & a constant uniform magnetic field too. Select the correct statement (s) from the following.

(a) The entire rod is at the same electrical potential

(b) There is an electric field in the rod

(c) The electric potential is highest at the centre of the rod.

(d) The electric potential is lowest at the centre of the rod.

2 Two co-axial solenoids are made by a pipe of cross sectional area 10 cm^2 and length 20 cm If one of the solenoid has 300 turns and the other 400 turns, their mutual inductance is.....

(a) $4.8\pi\times10^{-4}$H (b) $4.8\pi\times10^{-5}$H

(c) $2.4\pi\times10^{-4}$H (d) $4.8\pi\times10^{4}$H

3 The self inductance of a straight conductor is...

(a) zero (b) very large (c) very small (d) infinity

4 In circular coil. when no. of turns is doubled & resistance becomes half of the initial then inductance becomes....

(a) 4 times (b) 2 times (c) 8 times (d) No change

5 Two coils of self inductances 2 mH & 8 mH are placed so close together that the effective flux in one coil is completely half with the other. The mutual inductance between these coils is.....

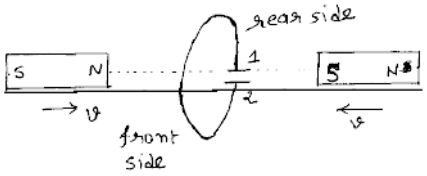
(a) 4 mH (b) 6 mH (c) 2 mH (d) 16 mH

6 Two identical circular loops of metal wire are lying on a table near to each other without touching. Loop A carries a current which increasing with time. In response the loop B.....

(a) Is repelled by loop A (b) Is attracted by loop A

(c) rotates about its centre of mass (d) remains stationary

7 Two identical magnets moving towards a coil, connecting a condenser at rear side shown in fig., with equal speed from opposite sides Then



(a) Both plate will be positive

(b) There is no charging of condenser

(c) Plate 1 will be positive and 2 negative

(d) Plate 2 will be positive and 1 negative

8 A metal rod of length 2 m rotates vertically about one of its end with frequency 2 Hz. The horizontal component of earth's magnetic field is 3.14×10^{-5} T then emf developed between two ends of road is.....

(a) 78.87×10^{-4}V (b) 7.887×10^{-4}V (c) 78.87×10^{-6}V (d) 0V

9 The self inductance of a coil is 5H, a current of 1A changes to 2A within 5 sec. through the coil. The value of induced emf will be.....

(a) 10 V (b) 0.1 V (c) 1 V (d) 100 V

10 If rotational velocity of a dynamo armature is doubled, then induced emf will become...

What is increased in step down transformer?

(a) Half (b) Two times (c) Four times (d) unchanged

11 The core of a transformer is laminated so that.....

(a) Ratio of I/p & O/p voltage increases

(b) Rusting of core may be stopped

(c) Energy loss due to eddy current may be reduced

(d) Change in flux is increased

12 In transformer, core is made of soft iron to reduce.....

(a) Hysterlsis losses (b) Eddy current losses

(c) Force opposing current (d) the weight

13 A step down transformer is connected to main supply 200 V to operate a 6V, 30 w bulb. The current in primary is.....

(a) 3A (b) 1.5 A (c) 0.3 A (d) 0.15 A

14 A primary winding of transformer has 500 turns whereas its secondary has 5000 turns. Primary is connected to ac supply of 20V, 50Hz The secondary output of....

(a) 200V, 25 Hz (b) 200 V, 50Hz (c) 2 V, 100 Hz (d) 2V, 50 Hz

15 An ideal transformer has 1:25 turn ratio. The peak value of the ac is 28 V. The rms secondary voltage is nearest to.....

(a) 50 V (b) 70 V (c) 100 V (d) 40 V

16 A coil of inductance 8.4 mH and resistance 6 ohm is connected to a 12 V battery. The current in the coil is 1A in the time.....

(a) 500 sec (b) 20 sec (c) 35 ms (d) 1 ms

17 Alternating current can not be measured by dc ammeter because,

(a) ac can not pass through dc ammeter

(b) Average value of complete cycle is zero

(c) ac is virtual

(d) ac changes its direction

18 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

19 An alternating current of rms valuve 10 A is passed through a $12\,\Omega$ resistance. The maximum potential difference across the resistor is,

(a) 20 V (b) 90 V (c) 169. 68 V (d) None of these

20 220 V,50 Hz, ac is applied to a resistor. The instantancous value of voltage is

(a) $220\sqrt{2}\sin 100\pi t$ (b) $220\sin 100\pi t$

(c) $220\sqrt{2}\sin 50\pi t$ (d) $220\sin 50\pi t$

21 The rms value of an ac of 50 Hz is 10 amp. The time taken by the alternating current in reaching from zero to maximum value and the peak value of current will be,

(a) 2×10^{-2} sec and 14.14 amp (b) 1×10^{-2} sec and 7.07 amp

(c) 5×10^{-3} sec and 7.07 amp (d) 5×10^{-3} sec and 14.14 amp

22 If a current I given by $I_o \sin\left(\omega t - \frac{\pi}{2}\right)$ flows in an ac circuit across which an ac potential of $E = E_o \sin \omega t$ has been applied, then the power consumption p in the circuit will be,

(a) $P = \frac{E_0 I_0}{\sqrt{2}}$ (b) $P = \sqrt{2} E_0 I_0$

(c) $P = \frac{E_0 I_0}{2}$ (d) $P = 0$

23 In general in an alternating current circuit.

(a) The average value of current is 20A.

(b) The average value of square of current is zero.

(c) Average power dissipation is zero.

(d) The phase difference between voltage and current is zero.

24 In an ac circuit, the current is given by $I = 5\sin\left[100 \quad t - \frac{\pi}{2}\right]$ and the ac potential is $V = 200 \sin 100t$. Then the power consumption is,

(a) 20 watts (b) 40 watts

(c) 1000 watts (d) 0 watts

25 In ac circuit with voltage V and current I, the power dissipated is.

(a) VI (b) $\frac{1}{2}$VI

(c) $\frac{1}{\sqrt{2}}$VI (d) Depends on the phase between V and I

26 In the transmission of a.c. power through transmission lines, when the voltage is stepped up n times,

the power loss in transmission,

(a) increase n times (b) Decrease n times

(c) Increase n^2 times (d) Decrease n^2 times

27 An alternating voltage is represented as E = 20 sin 300t. The average value of voltage over one cycle will be.

(a) zero (b) 10 volt

(c) $20\sqrt{2}$ volt (d) $\frac{20}{\sqrt{2}}$ volt

28 A lamp consumes only 50% of peak power in an ac circuit. What is the phase difference between the applied voltage and the circuit current.

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{3}$

(c) $\frac{\pi}{4}$ (d) $\frac{\pi}{2}$

29 An ac source is rated at 220V, 50 Hz. The time taken for voltage to change from its peak value to zero is,

(a) 50 sec (b) 0.02 sec

(c) 5 sec (d) 5×10^{-3} sec

30 The instantaneous voltage through a device of impedance 20Ω is $\varepsilon = 80\sin 100\pi\, t$. The effective value of the current is,

(a) 3A (b) 2.828 A

(c) 1.732 A (d) 4A

31 A resistor and a capacitor are connected in series with an ac source. If the potential drop across the capacitor is 5 V and that across resistor is 12 V, the applied voltage is,

(a) 13 V (b) 17 V (c) 5 V (d) 12 V

32 A choke coil has.

(a) High inductance and low resistance (b) Low inductance and high resistance

(c) High inductance and high resistance (d) Low inductance and low resistance

33 In an ac circuit the emf (e) and the current (i) at any instant core given respectively by $e = E_o \sin \omega t$, $I = I_0 \sin(\omega t - \varphi)$ The average power in the circuit over one cycle of ac is.

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

(c) $\frac{E_0 I_0}{2}$ (d) $\frac{E_0 I_0}{2} \sin\phi$

34 The resistance of an R-L circuit is $10\,\Omega$. An emf E_o applied across the circuit at $\omega = 20$ rad/s. If the current in the ckt is $\frac{I_0}{\sqrt{2}}$ what is the value of L.

(a) 1 H (b) 2 H (c) 3 H (d) 0.5 H

35 Same current is flowing in two alternating circuits. The first circuits contains only inductance and the other contains only a capacitor. If the frequency of the emf of ac is increased the effect on the value of the current will be.

(a) Increase in the first circuit and decrease in other

(b) Increase in both the circuit

(c) Decrease in both the circuit

(d) Decrease in the first and increase in other

36 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 volts (b) 10 volts (c) 8 volts (d) 6 volts

37 An alternating voltage $E=200\sqrt{2} \sin(100t)$ is connected to 1 microfarad capacitor through an ac ammeter. The reading of the ammeter shall be.

(a) 10 mA (b) 20 mA (c) 40 mA (d) 80 mA

38 In a region of uniform magnetic induction $B = 10^{-2}$ tesla, a circular coil of radius 30 cm and resistance π^2 ohm is rotated about an axis which is perpendicular to the direction of B and which forms a diameter of the coil. If the coil rotates at 200 rpm the amplitude of the alternating current induced in the coil is,

(a) $4\pi^2$ mA (b) 30 mA (c) 6 mA (d) 200 mA

39 An LCR series circuit with R = 100Ω is connected to a 200 V, 50 Hz a.c source when only the capacitance is removed the current lies the voltage by 60^0 when only the inductance is removed, the current leads the voltage by 60^0. The current in the circuit is,

(a) 2A (b) 1A (c) $\frac{\sqrt{3}}{2}$ A (d) $\frac{2}{\sqrt{3}}$ A

40 The impedance of a circuit consists of 3ohm resistance and 4ohm reactance. The power factor of the circuit is.

(a) 0.4 (b) 0.6 (c) 0.8 (d) 1.0

41 The power factor of a good choke coil is

(a) Nearly zero (b) Exactly zero (c) Nearly one (d) Exactly one

42 When 100 volt dc is applied across a coil, a current of 1A flows through it. When 100 volt ac at 50 cycle s^{-1} is applied to the same coil, only 0.5 A current flows. The impedance of the coil is,

(a) 100 ohm (b) 200 ohm (c) 300 ohm (d) 400 ohm

43 For high frequency, a capacitor offers

(a) More reactance (b) Less reactance (c) Zero reactance (d) Infinite reactance

44 The coil of a choke in a circuit

(a) increase the current (b) Decrease the current

(c) Does not change the current (d) Has high resistance to bc circuit

45 The power factor of an ac circuit having resistance (R) and inductance (L) connected in series and an angular velocity w is,

(a) $R/\omega L$ (b) $R/\left(R^2+\omega^2L^2\right)^{\frac{1}{2}}$

(c) $\omega L/R$ (d) $R/\left(R^2-\omega^2L^2\right)^{\frac{1}{2}}$

46 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,

(a) $\frac{\left(R^2+\omega^2L^2\right)}{V}$ (b) $\frac{V^2R}{\left(R^2+\omega^2L^2\right)}$ (c) $\frac{V}{\left(R^2+\omega^2L^2\right)}$ (d) $\frac{\sqrt{R^2+\omega^2L^2}}{V^2}$

47 In a LCR circuit capacitance is changed from C to 2C. For the resonant fequency to remain unchanged, the inductance should be change from L to

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

48 In an LCR series ac circuit the voltage across each of the components L, C and R is 50 V. The voltage across the LC combination will be

(a) 50 V (b) $50\sqrt{2}$ V (c) 100 V (d) 0 V (zero)

49 In a series resonant LCR circuit, the voltage across R is 100 V and R= 1kΩ with C =2 μF. The resonant frequency ω is 200 rad/s. At resonance the voltage across L is.

(a) 40V (b) 250 V (c) 4×10^{-3} V (d) 2.5×10^{-2} V

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

(a) 0.80 (b) 0.33 (c) 0.56 (d) 0.64

ANSWER KEY

1(B)	11(C)	21(D)	31(A)	41(A)
2(C)	12(A)	22(D)	32(A)	42(B)
3(A)	13(B)	23(A)	33(A)	43(B)
4(A)	14(A)	24(D)	34(D)	44(B)
5(C)	15(A)	25(D)	35(D)	45(B)
6(A)	16(D)	26(D)	36(A)	46(B)
7(C)	17(B)	27(A)	37(B)	47(C)
8(B)	18(B)	28(B)	38(C)	48(D)
9(C)	19(C)	29(D)	39(A)	49(B)
10(B)	20(A)	30(B)	40(B)	50(A)