PHYSICS

BOOKS - TARGET PHYSICS (HINGLISH)

ELECTROMAGNETIC INDUCTION

Classical Thinking

1. Magnetic flux is

A. total charge per unit area.

B. total current through a surface

C. total number of magnetic field lines passing normally through given area.

D. total e.m.f. in closed circuit.

Answer: C

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2. Which of the following represents correct formula for magnetic flux?

A. $d\phi = \overrightarrow{d}\,s \cdot \overrightarrow{B}$

B. $d\phi = \overrightarrow{v} \cdot \overrightarrow{B}$

C. $d\phi = \overrightarrow{B} \cdot \overrightarrow{d}\,s$

D. $d\phi = \overrightarrow{B} \cdot \overrightarrow{d}\,l$

Answer: C

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3. Ohm is not the unit of

A. reactance

B. inductive reactance

C. impedance

D. magnetic flux

Answer: D

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4. SI unit of magnetic flux is

A. tesla

B. Wb/m^2

C. Wb

D. Wbm

Answer: C

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5. Dimensional formula of magentic flux is

A. $[M^1L^1T^{-2}A^{-1}]$

B. $[M^1L^2T^{-1}A^{-1}]$

C. $[M^1L^2T^{-2}A^{-1}]$

D. $\left[M^{1}L^{2}T^{-2}A^{1}\right]$

Answer: C

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6. A rectangular loop of area $0.2m^{2}$ is lying in a magnetic field of 5×10^{-2} tesla at an angle of 60° with the magnetic field. The magnetic flux passing through this loop will be

A. 5×10^{-4} weber

B. 5×10^{-3} weber

C. 5×10^{-2} weber

D. zero

Answer: B

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7. In electromagnetic induction, the induced charge in a coil is independent of

A. change of flux

B. time

C. resistance of the coil

D. none of these

Answer: C

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8. Whenever the magnet flux linked with a coil changes, then is an induced emf in the circuit. This emf lasts

A. for a short time

B. for a long time

C. so long as the change in flux takes place.

D. forever

Answer: C

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9. Lenz's law provides a relation between

A. current and magnetic flux

B. induced e.m.f and the magnetic flux

C. force on a conductor in magnetic flux

D. current and induced e.m.f

Answer: B

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10. The expression for the induced e.m.f. contains a negative sign $\left[e = -\frac{d\phi}{dt}\right]$. What is the significance of the negative sign?

A. The induced e.m.f is produced only when the magnetic flux decreases.

B. The induced e.m.f opposes the change in the magnetic flux.

C. The induced e.m.f. is opposite to the direction of the flux

D. None of these

Answer: B

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11. A conducting ring is placed in a uniform magnetic field with its plane perpendicular to the field . An emf is induced in the ring if

A. it is translated

B. it is rotated about its axis

C. both (A) and (B)

D. it is rotated about its diameter.

Answer: D

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12. When a conductor is moved in a steady magnetic field or is kept in a changing magnetic field, the currents developed in it are called as

A. Faraday's currents

B. Foucault's currents.

C. Ampere's currents

D. Fleming's currents

Answer: B

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13. If the magnetic field linked with the coil is reduced to half, the e.m.f induced in coil will be_______.

A. half

B. same

C. double

D. four times

Answer: A

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14. A magnet is moved towards a coil (i) quickly (ii) slowly, then the induced e.m.f. is

A. larger in case (i)

B. equal in both cases

C. smaller in case (i)

D. zero

Answer: A

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15. If the flux associated with a coil changes at the rate of 240 weber in every 2 minutes, then the induced e.m.f. is

A. 2 volt

B. 0.20 volt

C. 3 volt

D. 6 volt

Answer: A

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16. Flux passes through coil changes from $2 \times 10^{-3} Wb$ to $3 \times 10^{-3} Wb$ during $25s$. The induced e.m.f. is

A. 0.02 mV`

B. 0.03 m V

C. `0.05 mV

D. 0.04 mV

Answer: D

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17. A straight conductor of length $1.5m$ moves in a uniform magnetic field of induction $5 \times 10^{-3}T$ with a velocity of $5m/s$ in a direction perpendicular to its length and also perpendicular to the field. The e.m.f. induced between the ends of the conductor is

A. $1.5 \times 10^{-3}V$

B. $3.75 \times 10^{-3}V$

C. $37.5 \times 10^{-3}V$

D. $25 \times 10^{-3} V$

Answer: C

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18. The rate of change of magnetic flux density through a circular coil of area $10^{-2} m^2$ and number of turns 100 is $10^3 Wb/m^2 s$. The value of induced e.m.f. will be

A. $10^{-2} V$

B. $10^{-3}V$

C. 10V

D. 10^3 V

Answer: D

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19. The induced e.m.f. in a rod of length l translating at a speed v making an angle θ with length l and perpendicular to magnetic field B is

A. B/v

B. B/v $\cos\theta$

C. B/v $\sin\theta$

D. B/v $\tan\theta$

Answer: C

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20. Eddy currents are also known as __________ currents.

A. alternating

B. focault

C. direct

D. peak

Answer: B

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21. Which one of the following devices is not based on eddy currents?

A. Induction furance

B. Electric brakes

C. Tangent galvanometer

D. Dead beat galvanometer

Answer: C

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22. Eddy currents are produced when

A. a thick metal plate is kept in a steady magnetic field.

B. a circular coil is placed in a magnetic field

C. a steady current is passed through a coil

D. a thick metal plate is kept in a varying magnetic field

Answer: D

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23. If in a galvanometer the coil is wound on a bad conductor, the eddy current will be

A. zero

B. maximum

C. minimum

D. 50% of the actual value

Answer: A

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24. Which of the following is an application of eddy currents?

A. Lux meter

B. Speed meter

C. Exposure meter

D. Galvanometer

Answer: B

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25. Which of the following is not an application of eddy currents?

A. Induction furance

B. Speed meter of automobiles

C. Galvanometer damping

D. X-ray crystallography

Answer: D

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26. Dynamo core is laminated because

A. magnetic field increases.

B. efficiency decreases

C. residual magnetism in core decreases.

D. loss of energy in core due to eddy currents decreases.

Answer: D

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27. Eddy currents do not produce

A. heat

B. a loss of energy

C. spark

D. damping of motion

Answer: C

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28. The pointer of a dead-beat galvanometer gives a steady deflection because

A. self induction

B. eddy currents

C. alternating current

D. mutual induction

Answer: B

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29. Induction furnaces work on the principle of

A. self induction

B. mutual induction

C. eddy currents

D. hysteresis

Answer: C

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30. The self inductance associated with a coil is independent of __________.

A. current

B. induced voltage

C. time

D. resistance of a coil

Answer: D

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31. Whenever current in a coil is changed, an e.m.f. is induced in the same coil. This property of coil is due to _________.

A. eddy currents

B. mutual induction

C. self induction

D. hysteresis

Answer: C

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32. If the magnetic flux linked with a coil through which a current of xA is set up is yWb, then the coeffficent of self inductance of the coil is

A. $(x - y)$ henry

B. $\frac{x}{y}$ henry

C. $\frac{y}{x}$ henry

D. xy henry

Answer: C

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33. The self inductance of a coil is $5mH$. If a current of $2A$ is flowing in it, then the magnetic flux produced in the coil will be

A. 0.01 weber

B. 10 weber

C. zero

D. 1 weber

Answer: A

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34. Magnetic flux of 10 microweber is linked with a coil. When current of $2.5 mA$ flows through it, the slef inductance of the coil is

A. $4 kH$

B. $4 mH$

C. $4 \mu H$

D. $4 H$

Answer: B

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35. The flux linked with a coil of self inductance $2H$, when there is a current of $5.8A$ flowing through it is

A. $11.6Wb$

B. $2.9Wb$

C. $8.7Wb$

D. independent of orientation of coil.

Answer: A

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36. A current through a choke coil of self inductance $2H$ decreases at the rate of $0.5A/s$. The e.m.f. developed across the coil is

A. $1.0V$

B. $0.5V$

C. $2.0V$

D. $3.0V$

Answer: A

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37. The e.m.f. induced in a 1 milli henry inductor, in which the current changes from $5A$ to $3A$ in 10^{-3} second is

A. $2 \times 10^{-6} V$

B. $8 \times 10^{-6} V$

C. $2V$

D. $8V$

Answer: C

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38. In a coil , the e.m.f. induced by a change in current from $4A$ to $8A$ in 0.1 second is $8V$. The inductance of the coil is

A. $0.1H$

B. $0.2H$

C. $0.35H$

D. $0.25h$

Answer: B

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39. The mutual inductance of coil does not depend on

A. number of turns of the coil

B. geometrical properties of the coil

C. permebility of the medium

D. all of the above

Answer: D

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40. Induction coil is an instrument based on the principle of

A. electromagnetic induction

B. mutual induction

C. self induction

D. induction furance

Answer: B

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41. When a current of $5A$ flows in the primary coil, then the flux linked with the secondary coil is 200 weber. The value of coefficient of mutual induction will be

A. $1000H$

B. $40H$

C. $195H$

D. $205H$

Answer: B

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42. With the decrease of current in the primary coil from 2 amperes to zero value in 0.01 s the emf generated in the secondary coil is 1000 volts. The mutual inductance of the two coils is

A. 1.25 henry

B. 2.50 henry

C. 5.00 henry

D. 10.00 henry

Answer: C

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43. The displacement current was first postulated by

A. Ampere

B. Maxwell

C. Faraday

D. Lamy

Answer: A

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44. Displacement current is produced due to

A. when electric field or electric flux varies with time

B. when magnetic field varies with time

C. when electric field and magnetic field both vary with time

D. when D.C source produce high current

Answer: A

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45. Magnitude of displacement current through an amperian circuit is

A. $1 + \varepsilon_0 \frac{d\phi_E}{dt}$

B. $\varepsilon_0 \frac{d\phi_E}{dt}$

C. $1 - \varepsilon_0 \frac{d\phi_E}{dt}$

D. $\mu_0 \varepsilon_0 \frac{d\phi_E}{dt}$

Answer: B

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46. Which of the following represents correct modified formula for Ampere's circuital law?

A. $\oint \vec{B} \cdot \vec{d}\, l = \left[I + \frac{d\phi_E}{dt} \right]$

B. $\oint \vec{B} \cdot \vec{d} \, l = I\left[\mu_0 + \varepsilon_0 \frac{d\phi_E}{dt}\right]$

C. $\oint \vec{B} \times \vec{d} \, l = \mu_0\left[I + \frac{d\phi_E}{dt}\right]$

D. $\oint \vec{B} \cdot \vec{d} \, l = \mu_0\left[I + \varepsilon_0 \frac{d\phi_E}{dt}\right]$

Answer: D

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47. The basic requirment for the operation of a transformer is that its input voltage must be

A. pulsating D.C.

B. rectified

C. alternating

D. amplifed

Answer: C

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48. The main purpose of laminating a transformer core is to reduce its

A. electrical resistance

B. hysteresis loss

C. eddy current loss

D. copper loss

Answer: C

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49. In a step-up transformer, if the voltage in the secondary is increased, then the current in the primary

A. increases

B. decreases

C. does not change

D. becomes zero

Answer: A

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50. In an ideal transformer , the primary and the secondary voltages always have

A. equal magnitude

B. the same phase

C. a phase difference of 90°

D. a phase difference of 180°

Answer: B

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51. When a coil is rotated in a magnetic field, with steady speed , then

A. no e.m.f is induced

B. a periodic e.m.f is induced

C. unidirectional e.m.f is induced

D. multidirectional e.m.f is induced

Answer: B

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52. A current carrying coil is subjected to a uniform magnetic field. The coil will orient so that its plane become

A. inclined at 45° to the magnetic field

B. inclined at any arbitary angle to the magnetic field

C. parallel to the magnetic field

D. perpendicular to the magnetic field

Answer: D

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53. Alternating current can be produced by

A. a transformer

B. a choke coil

C. a dynamo

D. a galvanometer

Answer: C

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54. Alternating current can be measured with the help of

A. suspended coil galvanometer

B. moving coil galvanometer

C. hot wire bolometer

D. hot wire ammeter

Answer: D

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55. Instrument which measures alternating current is based on

A. Joule's effect

B. Focault's effect

C. current directly proportional to delfection

D. current proportional to voltage across the resistance

Answer: A

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56. In a simple A.C. circuit containing resistance, the current

A. lags behind the e.m.f. by $\pi / 2$

B. is in phase with applied e.m.f.

C. leads the applied e.m.f. by $\pi / 2$

D. none of these

Answer: B

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57. The r.m.s value of alternating e.m.f. is

A. twice peak value

B. $\sqrt{2}$ times greater than peak value

C. equal to peak value

D. less than peak value

Answer: D

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58. D.C. ammeter is connected in a circuit through which an A.C. of $50Hz$ is flowing. The ammeter will read

A. maximum current

B. r.m.s value of current

C. zero current

D. cannot be predicted

Answer: C

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59. Which of the following can produce maximum induced emf?

A. 50 ampere D.C.

B. 50 ampere 50 Hz A.C.

C. 50 ampere 500 Hz A.C.

D. 100 ampere D.C.

Answer: C

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60. A certain A.C. voltage is represented by $e = 100\sin(100\pi t + 0.6)$. The peak value of A.C. is

A. 100 volt

B. 50 volt

C. 141 volt

D. 150 volt

Answer: A

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61. An electron lamp is conected to $220V, 50Hz$ supply. Then the peak value of voltage is

A. $210V$

B. $211V$

C. $311V$

D. $320V$

Answer: C

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62. The peak value of Alternating current is 6 amp, then r.m.s. value of current will be

A. $3A$

B. $3\sqrt{3}A$

C. $3\sqrt{2}A$

D. $2\sqrt{3}A$

Answer: C

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63. The opposition offered by capacitance to flow of A.C. current through it is

A. inductive reactance

B. impedance

C. capacitive reactance

D. ohmic resistance

Answer: C

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64. The reactance of a circuit is zero. It is possible that the circuit contains

A. a resistor

B. an inductor and a capacitor

C. a capacitor but no inductor

D. an inductor but no capacitor

Answer: B

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65. With increase in frequency of an AC supply, the inductive reactance:

A. increases

B. remains constant

C. decreases

D. decreases sharply

Answer: A

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66. In a purely capcitive circuit, the e.m.f.

A. leads the current by $\pi/2$

B. is in phase with current

C. lags behind the current by $\pi/2$

D. lags behind the current by π^c.

Answer: C

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67. An inductor may store energy in

A. its electric field

B. its magnetic field

C. its coils

D. both electric and magnetic fields

Answer: B

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68. The angular frequency of $A.C.$ at which 1 mH inductor has a resistance of 1Ω is

A. 1

B. 10

C. 100

D. 1000

Answer: D

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69. The impedance of a $50-$ microfarad capacitor of $50Hz$ A.C. is

A. 2Ω

B. 20Ω

C. 200Ω

D. 63.7Ω

Answer: D

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70. A condenser of $10\mu F$ and an inductor of $1.2H$ are connected in series with an A.C. source of frequency $50Hz$. The impedance of the combination will be

A. zero

B. 0.583Ω

C. 5.83Ω

D. 58.3Ω

Answer: D

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71. The capacitance of a pure capacitance is 1 farad. In DC circuits, its effective resistance will be

A. Zero

B. Infinite

C. 7Ω

D. $\pi\sqrt{2}\Omega$

Answer: B

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72. The reactance of the coil is 10Ω and its resistance is 10Ω. It is connected to an A.C. source of e.m.f. $220V$. The peak value of the current in the circuit is

A. $44A$

B. $22\sqrt{2}A$

C. $22A$

D. $\frac{22}{\sqrt{2}}A$

Answer: C

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73. Electrical oscillations of desired frequency can be obtained by

A. parallel combination of L and C

B. series combination of L and C

C. parallel combination of R and C

D. series combination of R and C

Answer: A

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74. When a capacitor connected with coil is completely discharged , then

A. electric field around the coil is maximum

B. magnetic field around the coil is maximum

C. electric field around the coil is minimum

D. magnetic field around the coil is minimum

Answer: B

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75. In LC oscillation circuit, current flows in reverse direction due to

A. peak e.m.f.

B. r.m.s e.m.f.

C. back e.m.f.

D. induced e.m.f.

Answer: C

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76. The oscillation in LC, circuit is produced due to

A. transfer of energy between L and C

B. transfer of resistance between L and C

C. transfer of energy between diode and transistor

D. transfer of energy between resistance and C

Answer: A

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77. Wattless current is a current flowing through a

A. pure resistor

B. semiconductor

C. circuit containing a resistance and an inductance in series

D. pure inductor

Answer: D

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78. Power factor in series LCR circuit at reasonance is

A. zero

B. 0.5

C. 1

D. 1.5

Answer: C

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79. The e.m.f and the current of an $A.C.$ circuit are $e = 100\sin(100t)V$ and $I = 100\sin(100t)mA$ respectively. The power dissipated in the circuit is

A. $10^4 W$

B. $10W$

C. $2.5W$

D. $5.0W$

Answer: D

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80. In series resonace, LCR circuit, below the resonant frequency, the circuit is

A. inductive

B. capacitive

C. resistive

D. both resistive and inductive

Answer: B

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81. The parallel resonance circuit is called as

A. acceptor circuit

B. transfer circuit

C. rejector circuit

D. ohmic circuit

Answer: C

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82. In parallel resonance, the current will be minimum, when

A. impedance is maximum

B. impedance is less than resistance

C. impedance is equal to resistance

D. impedence is zero

Answer: A

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83. In rejector circuit, above resonant frequency the circuit is

A. both capacitive as well as inductive

B. only capacitive

C. only inductive

D. only ohmic resistance contained

Answer: B

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84. At resonance , the source current is

A. maximum in a series LCR circuit

B. maximum in a parallel LCR circuit

C. maximum in both series and parallel LCR circuit

D. minimum in both series and parallel LCR circuit

Answer: A

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85. 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. $\frac{1}{2\pi}\sqrt{\frac{C}{L}}$

Answer: B

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86. In series resonant circuit, at resonance,

A. $Z=\sqrt{R^{2}+\left(X_{L}-X_{C}\right)^{2}}$

B. $Z=X_{L}-X_{C}$

C. $Z=R$

D. $Z=X_{C}$

Answer: C

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87. If the current in the primary coil is reduced from $3A$ to zero in 10 second, then the induced e.m.f. in the secondary is 15×10^{-3} volt. The mutual inductance of the coil will be

A. $10H$

B. $0.05H$

C. $2.5H$

D. $10mH$

Answer: B

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88. A rectangular loop of area $0.4m^2$ is lying in a magnetic field of 4×10^{-3} tesla. If the plane of the loop is at right angles to the magnetic field, then the magnetic flux passing through the loops will be

A. 1.6×10^{-3} weber

B. 0.6×10^{-3} weber

C. zero

D. 4×10^{-3} weber

Answer: A

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89. In an induction coil, the coefficient of mutual inductance is 4 henry. If a current of 5 ampere in the primary coil is cut-off in $\frac{1}{1500}s$, the e.m.f. at the terminals of the secondary coil will be

A. $15kV$

B. $60kV$

C. $10kV$

D. $30kV$

Answer: D

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Critical Thinking

1. A long solenoid has 1000 turns and its area of cross -section is $10^{-4}m^2$. If a magnetic induction of$10^{-2}T$ is produced in it on passing a current of $1A$ through it , then the magnetic flux linked with it will be

A. 10^{-1}

B. 10^{-2}

C. 10^{-3}

D. 10^{-4}

Answer: C

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2. The current induced in 100Ω coil when the magnetic flux decreases from $1Wb$ to $0.1Wb$ in $0.1s$, is

A. $9A$

B. $0.9A$

C. $0.09A$

D. $90A$

Answer: C

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3. A small loop of area of cross -section $10^{-4} m^2$ is lying concentrically and coplanar inside a bigger loop of radius $0.628 m$. A current of $10 A$ is passed in the bigger loop. The smaller loop is rotated about its diameter with an angular velocity ω. The magnetic flux linked with the smaller loop will be

A. $10^{-7} \sin \omega t$

B. $10^{-7} \cos \omega t$

C. $10^{-9} \sin \omega t$

D. $10^{-9} \cos \omega t$

Answer: D

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4. The instantaneous magnetic flux ϕ in a circuit is $\phi = 4t^2 - 4t + 1$ .The total resistance of circuit is 10Ω. At $t = \frac{1}{2}s$,the induced current in circuit is

A. $0A$

B. $0.6A$

C. $0.4A$

D. $0.2A$

Answer: A

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5. A given wire is bent into a circular loop of radius $7cm$ and is placed perpendicular to a magnetic field of $1.0T$.Within 0.1 second ,the loop is changed to a $100cm$ square and the field increases to $1.8T$ .The induced emf in the coil will be

A. $13mV$

B. $26mV$

C. $39mV$

D. $52mV$

Answer: B

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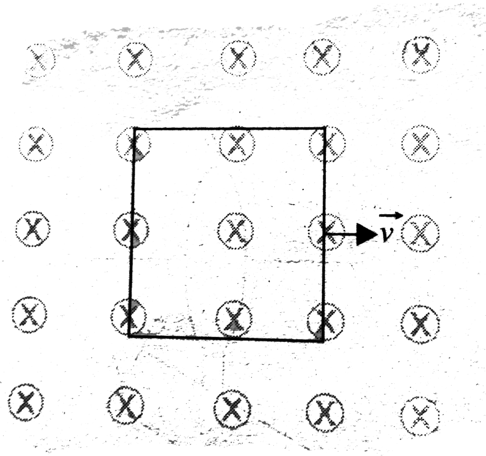
6. Conducting square loop of side L and resistance R moves in its plane with a uniform velocity v perpendicular to one of its sides. A magnetic induction B, constant in time and space, pointing perpendicular and into the plane of the loop exists everywhere.

The current induced in the loop is



A. $\frac{B/v}{R}$ clockwise

B. $\frac{B/v}{R}$ anticlockwise

C. $\frac{2B/v}{R}$ anticlockwise

D. zero

Answer: D

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7. A metal wire of area of cross-section $1.8 \times 10^{-7} m^2$ and specific resistance $9 \times 10^{-6} \Omega - m$ is bent into a square loop and moved with a constant speed in a uniform magnetic field of induction $2Wb/m^2$. What should be the speed of loop so that a current of $3mA$ passes through it ?

A. $7.5m/s$

B. $0.5 \times 10^{-3}m/s$

C. $7.5 \times 10^{-2}m/s$

D. $1.9 \times 10^{-2}m/s$

Answer: C

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8. A coil of radius $1cm$ and 100 turns is placed in a magnetic field of 10^6 gauss such that its plane makes an angle 30° with the field . The magnetic flux through the coil in S.I unit is

A. $0.5\pi Wb$

B. $0.5 Wb$

C. $0.5 \times 10^{-4} Wb$

D. $5 \times 10^{-4} Wb$

Answer: A

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9. The magnetic flux in a closed circuit of resistance 10Ω varies with time according to equation , $\phi = 6t^2 - 5t + 1$. What is the magnitude of the induced current at $t = 0.25s$?

A. $1.2A$

B. $0.8A$

C. $0.6A$

D. $0.2A$

Answer: D

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10. A coil of 50 turns is pulled in $0.02s$ between the poles of a magnet, where its area includes $31 \times 10^{-6} Wb$ to $1 \times 10^{-6} Wb$.The average is

A. $7.5 \times 10^{-2} V$

B. $7.5 \times 10^{-3} V$

C. zero

D. $7.5 \times 10^{-4} V$

Answer: A

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11. A magnetic field of $2 \times 10^{-2} T$ acts at right angles to a coil of area $100 cm^2$ with 50 turns. The average emf induced in the coil is $0.1V$, when it is removed from the field in time t. The value of t is

A. $0.1 s$

B. $0.01 s$

C. $1s$

D. $20s$

Answer: A

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12. A coil of 10 turns and area $4 \times 10^{-2} m^2$ is placed in a unifrom magnetic field of flux dencity $10^{-2} T$ .If it is removed completely in $0.5s$,then the induced in the coil is

A. $2mV$

B. $8mV$

C. $16mV$

D. $20mV$

Answer: B

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13. A rectangular coil of 100 turns and size $0.1m \times 0.05m$ is placed perpendicular to a magnetic field of 0.1 T. If the field drops to 0.05

T in 0.05 s, the magnitude of the emf induced in the coil is

A. $0.005V$

B. $0.05V$

C. $0.5V$

D. $5V$

Answer: C

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14. A coil of area $10cm^2$ and 10 turns is in magnetic field directed perpendicular to the plane and changing at a rate of $10^8 gauss / s$. The resistance of coil is 20Ω. The current in the coil will be

A. 5 ampere

B. 0.5 ampere

C. 0.05ampere

D. 5×10^8 ampere

Answer: A

Watch Video Solution

15. An idduced emf is produced when a magnet is plunged into a coil. The magnitude of the induced emf is independent of

A. the strength of the magnet

B. number of turns of the coil

C. the resistivity of the wire of the coil

D. speed with which the magnet is moved

Answer: C

Watch Video Solution

16. A cylindrical bar amgnet is kept along the axis of a circular coil. If the magnet is rotated about its axis, then

A. only a current will be indcued in the coil

B. only e.m.f will be induced in the coil

C. an e.m.f and a current both will be induced in the coil

D. neither e.m.f nor current will be induced in the coil.

Answer: D

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17. A square loop of side $22cm$ is converted into circular loop in $0.4s$. A uniform magnetic field of $0.2T$ directed normal to the loop, then the induced in the loop is

A. $6.6 \times 10^{-3} V$

B. $6.6 \times 10^{-5} V$

C. $6.6 \times 10^{-4} V$

D. $6.6 \times 10^{-8} V$

Answer: A

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18. A coil is wound as a transformer of rectangular cross section. If all the linear dimension of the transformer are increased by a factor 2 and the number of turns per unit length of the coil remain the same, the self-inductance increased by a factor of

A. 6

B. 12

C. 8

D. 16

Answer: C

Watch Video Solution

19. When the current changes from +2A to -2A in 0.5 second an emf of 8V is induced in a coil. The coefficient of selfinduction of the coil is

A. $0.1H$

B. $0.2H$

C. $0.4H$

D. $0.6H$

Answer: A

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20. The coefficients of self induction of two coils are L_1 and L_2 .To induce an of 2 volt in the coil, a change of current of $1A$ has to be produced in 5 second and $50ms$ respectively. The ratio of their self inductances $L_1 : L_2$ will be

A. $1:5$

B. $200:1$

C. $100:1$

D. $50:1$

Answer: C

Watch Video Solution

21. When the number of turns in a coil is doubled without any change in the length of the coil, its self-inductance becomes

A. becomes 4 times

B. becomes 2 times

C. geta halved

D. remains unchanged

Answer: A

Watch Video Solution

22. A coil of wire of a certain radius has 600 turns and a self-inductance of $108mH$. The self-inductance of a 2^{nd} similar coil of 500 turns will be

A. $74mH$

B. $75mH$

C. $76mH$

D. $77mH$

Answer: B

Watch Video Solution

23. The coefficients of self -induction of two coils are $L_1 = 8mH$ and $L_2 = 2mH$ respectively. The current rises in the two coils at the same rate . The power given to the two coils at any instant is same . The ratio of currents flowing in the coils will be

A. $\frac{I_1}{I_2} = \frac{1}{4}$

B. $\frac{I_1}{I_2} = \frac{4}{1}$

C. $\frac{I_1}{I_2} = \frac{3}{4}$

D. $\frac{I_1}{I_2} = \frac{4}{3}$

Answer: A

Watch Video Solution

24. The coefficient of self-inductance of a solenoid is $0.18mH$. If a crude of soft iron of relative permeability 900 is inserted, then the coeffcient of self-inductance will become nearly

A. $5.4 mH$

B. $162 mH$

C. $0.006 mH$

D. $0.0002 mH$

Answer: B

Watch Video Solution

25. A coil of self-inductance $\left(\frac{1}{\pi}\right)H$ is connected is series with a 300Ω resistance. A voltage of $200V$ at frequency $200Hz$ is applied to this combination. The phase difference between the voltage and the current will be

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

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

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

D. $\tan^{-1}\left(\frac{5}{4}\right)$

Answer: A

Watch Video Solution

26. The coefficient of mutual induction between two coils is $4H$. If the current in the primary reduces from $5A$ to zero in 10^{-3} second, then the induced e.m.f. in the secondary coil will be

A. $10^4 V$

B. $25 \times 10^3 V$

C. $2 \times 10^4 V$

D. $15 \times 10^3 V$

Answer: C

Watch Video Solution

27. In a step up transformer, the input voltage is 300 V and the output voltage is 15 KV. Then the ratio of the number of turns in the primary to that in the secondary is

A. $1 : 20$

B. $1:30$

C. $1:40$

D. $1:50$

Answer: D

Watch Video Solution

28. A transformer has 100 turns in the primary and 500 turns in the secondary. If the primary is connected to 220V DC supply, then the voltage develop across the secondary will be

A. $220V$

B. $1100V$

C. zero

D. $44V$

Answer: B

Watch Video Solution

29. In a transformer 220 ac voltage is increased to 2200 volts. If the number of turns in the secondary are `2000, then the number of turns

in the primary will be

A. 200

B. 100

C. 50

D. 20

Answer: A

Watch Video Solution

30. The primary winding of a transformer has 100 turns and its secondary winding has 200 turns. The primary is connected to an ac supply of $120V$ and the current flowing in it is $10A$. The voltage and the current in the secondary are

A. $240V, 5A$

B. $240V, 10A$

C. $60V, 20A$

D. $120V, 20A$

Answer: A

Watch Video Solution

31. A loss free transformer has 500 turns on its primary winding and 2500 in secondary. The meters of the secondary indicate 200 volts at 8 amperes under these condition. The voltage and current in the primary is

A. $100V, 16A$

B. $40V, 40A$

C. $160V, 10A$

D. $80V, 20A$

Answer: B

Watch Video Solution

32. A step-down transformer is connected to 2400 volts line and 80 amperes of current is found to flow in output load. The ratio of the turns in primary and secondary coil is $20:1$. if transformer efficiency is 100%, then the current flowing in primary coil will be

A. $1600A$

B. $20A$

C. $4A$

D. $1.5A$

Answer: C

Watch Video Solution

33. A $100\,\%$ efficient transformer has 100 turns in the primary and 25 turns in its secondary coil. Of the current in the secondary coil is 4 amp, then the current in the primary coil is

A. $1A$

B. $4A$

C. $8A$

D. $16A$

Answer: A

Watch Video Solution

34. The ratio of secondary to the primary turns in a transformer is $3:2$. If the power output be P, then the input power neglecting all loses must be equal to

A. $5P$

B. $1.5P$

C. P

D. $\frac{2}{5}P$

Answer: C

Watch Video Solution

35. The number of turns in the primary coil of a transformer is $1000A$. A power of $2kW$ is fed to it by a current of $0.1A$. The number of turns in the secondary coil in order to produce a voltage of $200V$ in it, will be

A. 10

B. 20

C. 30

D. 40

Answer: A

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36. In an A.C. generator, when the plane of the armature is perpendicular to the magnetic field

A. both magnetic flux and e.m.f. are maximum

B. both magnetic flux and e.m.f. are zero

C. both magnetic flux and e.m.f. are half of their respective maximum values

D. magnetic flux is maximum and e.m.f is zero

Answer: D

Watch Video Solution

37. A coil of effective area $2m^2$ is rotated so as to cut a magnetic field of induction $7 \times 10^{-5} Wb/m^2$. If the coil makes 100 revolutions/s, then the maximum e.m.f. induced in the coil is

A. $44mV$

B. $88mV$

C. $22mV$

D. $200mV$

Answer: B

Watch Video Solution

38. A coil of copper having 1000 turns is placed in a magnetic field $B = 4 \times 10^{-3}T$ perpendicular to its plane. The cross-sectional area of the coil is $0.05m^2$. If it turns through 180° in $0.01s$, then the e.m.f induced in the coil is

A. $0.4V$

B. $40V$

C. $0.2V$

D. $4V$

Answer: B

Watch Video Solution

39. A coil of area $80cm^2$ and number of turns 50 is rotating about an axis perpendicular to magneitc field of $0.05T$ at 200 rotations per minute. The maximum value of e.m.f. induced in it will be

A. 200π volt

B. $\frac{10\pi}{3}$ volt

C. $\frac{4\pi}{30}$ volt

D. $\frac{2}{3}$ volt

Answer: C

Watch Video Solution

40. The peak value of induced e.m.f. in a coil of 5000 turns each and of area 50 sq.cm rotating at 600 r.p.m. about an axis at right angles to the field of $8 \times 10^{-4} Wb/m^2$ is

A. $1.256 mV$

B. $1.256 V$

C. $12.56 mV$

D. $12.56 V$

Answer: B

Watch Video Solution

41. The number of turns in the coil of an ac genrator is 5000 and the area of the coil is $0.25 m^2$. The coil is rotate at the rate of

$100 \text{cycles} / \sec$ in a magnetic field of $0.2 W / m^2$. The peak value of the emf generated is nearly

A. $786 kV$

B. $440 kV$

C. $220 kV$

D. $157 kV$

Answer: D

Watch Video Solution

42. In a region of a uniform magnetic induction $B = 10^{-3}T$, a circular coil of raidus $40cm$ and resistance $\pi^3\Omega$ is rotated about an axis which is perpendicular to the direction of $\vec{B}$ and which forms a diameter of the coil. If the coil rotates at 400 r.p.m., the amplitude of the alternating current induced in the coil is

A. $4mA$

B. $0.68mA$

C. $5mA$

D. $200mA$

Answer: B

Watch Video Solution

43. The general equation for the instantenous e.m.f. of a generator (frequency 50 cycles/s), whose peak voltage is $200V$ will be

A. $e = 200\sqrt{2}\sin(50\pi t)$

B. $e = 200\sin(50\pi t)$

C. $e = 200\sin(100\pi t)$

D. $e = 200\sqrt{2}\sin(100\pi t)$

Answer: C

Watch Video Solution

44. The instantaneous current in a circuit is, $I = \sin(\omega t + \phi)$ ampere. What is the r.m.s., value of the current?

A. $2A$

B. $\sqrt{2}A$

C. $1A$

D. $1/\sqrt{2}A$

Answer: D

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45. An alternating voltage of $e = 100\sqrt{2}\sin(100t)$ volt is connected to a condenser of $0.5\mu F$ through an A.C. ammeter. The reading of the ammeter will be

A. $5mA$

B. $10mA$

C. $0.5mA$

D. $20mA$

Answer: A

Watch Video Solution

46. A hot wire ammeter reads $10A$ in A.C. circuit. The peak value of the current is

A. $10\sqrt{2}A$

B. $\frac{10}{\sqrt{2}}A$

C. $5\pi A$

D. $\dfrac{20}{\pi}A$

Answer: A

Watch Video Solution

47. A 40Ω electric heater is connected to a $200V, 50Hz$ main supply. The peak value of electric current flowing in the circuit is approx.

A. $2.5A$

B. $5.0A$

C. $7.1A$

D. $10A$

Answer: C

Watch Video Solution

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

A. 16 volt

B. 10 volt

C. 8 volt

D. 6 volt

Answer: A

Watch Video Solution

49. Instantaneous values of current and e.m.f in an AC circuit are $I = I / \sqrt{2} \sin 314$ tamp and $E = \sqrt{2}\sin(314t - \pi/6)V$ respectively.

The phase difference between E and I will be

A. $-\frac{\pi}{6}$ rad

B. $-\frac{\pi}{3}$ rad

C. $\frac{\pi}{6}$ rad

D. $\frac{\pi}{3}$ rad

Answer: A

Watch Video Solution

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

A. $2 \times 10^{-2} s$ and $14.14 A$

B. $1 \times 10^{-2} s$ and $7.07 A$

C. $5 \times 10^{-3} s$ and $7.07 A$

D. $5 \times 10^{-3} s$ and $14.14 A$

Answer: D

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51. The r.m.s value of induced voltage in a coil of 50 turns each of area 30 sq.cm. rotating at 1000 r.p.m. about an axis at right angles to magnetic field is $\left(B = 5 \times 10^{-4} Wb/m^2\right)$

A. $555 mV$

B. $55.5 mV$

C. $5.55 mV$

D. $55 mV$

Answer: C

Watch Video Solution

52. An alternating e.m.f. of $100V$ (rms) is applied to a series LCR circuit. At resonance, the potential difference across the inductance and across the capacitance is $400V$ each. The potential difference across the resistance will be

A. $100V$

B. $400V$

C. $800V$

D. zero

Answer: A

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53. A $10\mu F$ capacitor is connected across a $200V$, $50Hz$ A.C. supply. The peak current through the circuit is

A. $0.6A$

B. $0.6 \times \sqrt{2}A$

C. $\frac{0.6}{\sqrt{2}}A$

D. $0.6\frac{\pi}{2}A$

Answer: B

Watch Video Solution

54. The reactance of capacitor at $50Hz$ is 10Ω.

What will be its reactance at $200Hz$?

A. 10Ω

B. 40Ω

C. 2.5Ω

D. 20Ω

Answer: C

Watch Video Solution

55. The reactance of a capacitor in an A.C. circuit is 10Ω. If the frequency of A.C. is doubled, its reactance will become

A. 5Ω

B. 10Ω

C. 15Ω

D. 20Ω

Answer: A

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56. A resistance of 10Ω, an inductance of $\left(\frac{2}{\pi}\right)$ henry and a capacitor of $\left(\frac{1}{\pi}\right)\mu F$ are connected in series with mains line of $110V$ and $50Hz$. The phase difference between the voltage and current will be

A. $\approx -90^{\circ}$

B. $\approx +90^{\circ}$

C. 0°

D. 180°

Answer: A

Watch Video Solution

57. The inductive reactance of a coil is 1000Ω. If its inductance and the frequency of A.C. supply are both doubled, then the reactance will become

A. 2000Ω

B. 4000Ω

C. 8000Ω

D. $16, 000\Omega$

Answer: B

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58. In a series A.C. circuit , $R = 100\Omega$, $X_L = 300\Omega$ and $X_C = 200\Omega$. The phase difference between the applied e.m.f. and the current will be

A. 0

B. 37°

C. 45°

D. 90°

Answer: C

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59. An inductive coil has resistance of 100Ω. When an ac signal of frequency $1000Hz$ is fed to the coil. The applied voltage leads the current by 45°. What is the inductance of the coil?

A. $10mH$

B. $12mH$

C. $16mH$

D. $8 mH$

Answer: C

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60. A series RLC circuit has the following values $R = 20\Omega, X_L = 10\Omega. E = 50V$(rms) at $\omega = 400$ rad/s. Current $2A$ leads the applied voltage. The value of the capacitative reactance X_C is

A. 5Ω

B. 25Ω

C. 10Ω

D. 15Ω

Answer: B

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61. When $100V$ DC is applied across a solenoid, a current of $1.0A$ flows in it. When $100V$ AC is applied across the same coil. The current drops to $0.5A$. If the frequency of the ac source is $50Hz$, the impedance and inductance of the solenoid are

A. $200\Omega, 0.55H$

B. $100\Omega, 0.86H$

C. $200\Omega, 1.0H$

D. $100\Omega, 0.93H$

Answer: A

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62. It is found that the current in the circuit is $0.50A$ with D.C. source and $0.40A$ with A.C. sources. The voltage E for D.C. is $120V$ and for A.C. is $120V$. The frequency of A.C. source is $60Hz$. The inductance of the circuit is

A. $0.28H$

B. $0.80H$

C. $0.60H$

D. $0.48H$

Answer: D

Watch Video Solution

63. A variable capacitor and an inductive coil with negligible resistance are connected in series to an A.C. voltage of value $100V$. The current in the circuit is $5A$. When the capacitor decreases to half its value, the current becomes $10A$. The voltage across the capacitor, in first case, is

A. $40V$

B. $50V$

C. $60V$

D. $150V$

Answer: B

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64. The e.m.f. and the current of an A.C. circuit are $e = 5\cos\omega t$ volt and $I = 2\sin\omega t$ ampere respectively. The power consumed in the circuit is

A. zero

B. $10W$

C. $5W$

D. $2.5W$

Answer: A

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65. Average power lost per cycle of A.C. is given by

A. $\frac{1}{2}e_0 I_0 \sin\theta$

B. $\frac{1}{2}e_0 I_0 \cos\theta$

C. $\frac{1}{2}e_0 I_0 \tan\theta$

D. $\frac{1}{2}e_0 I_0 \times \theta$

Answer: B

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66. In an A.C. circuit, the current flowing in inductance is $I = 5\sin(100t - \pi/2)$ amperes and the potential difference is

$V = 200\sin(100t)$ volts. The power consumption is equal to

A. $100W$

B. $40W$

C. $20W$

D. $0W$

Answer: D

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67. When a coil is connected to a D.C. source of e.m.f. 12 volt, then a current of 4 ampere flows in it. If the same coil is connected to a 12 volt, 50 cycle/s A.C. source, then the current flowing in it is $2.4A$. The self inductance of the coil will be

A. $48H$

B. $4H$

C. $12.5H$

D. $8 \times 10^{-2}H$

Answer: D

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68. The equations of voltage and current in an A.C. circuit are $e = 100 \sin(100t)$ volt and $I = 100 \sin\left[100t + \frac{\pi}{2}\right] mA$ respectively. The average power lost in the circuit will be

A. $5W$

B. $10W$

C. $0W$

D. $10^4 W$

Answer: C

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69. The r.m.s current in an AC circuit is $2A$. If the wattless current be $\sqrt{3}A$, what is the power factor?

A. $\frac{1}{\sqrt{3}}$

B. $\frac{1}{\sqrt{2}}$

C. $\frac{1}{2}$

D. $\frac{1}{3}$

Answer: C

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70. If power factor is $1/2$ in a series RL, circuit $R = 100\Omega$. AC mains is used then L is

A. $\frac{\sqrt{3}}{\pi}H$

B. πH

C. $\frac{\pi}{\sqrt{3}}H$

D. $\sqrt{3}\pi H$

Answer: A

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71. $\frac{2.5}{\pi}\mu F$ capacitor and $3000-$ ohm resistance are joined in series to an AC source of 200volts and $50\sec^{-1}$ frequency. The power factor of the circuit and the power dissipated in it will respectively

A. $0.6, 0.06W$

B. $0.06, 0.6W$

C. $0.6, 4.8W$

D. $4.8, 0.6W$

Answer: C

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72. A resistor R, an inductor L and a capacitor C are connected in series to an oscillator of frequency n. If the resonant frequency is n_r, then the current lags behind voltage, when

A. $n = 0$

B. $n < n_r$

C. $n = n_r$

D. $n > n_r$

Answer: D

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73. A coil of $4mH$ and a capacitor of $10\mu F$ are in series with an A.C. source along with 5Ω resistances. If inductive reactance, then the angular frequency (in rad/s) of source is

A. 5×10^3

B. 5×10^4

C. 500

D. 50

Answer: A

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Watch Video Solution

74. The frequency at which the inductive reactance of $2H$ inductance will be equal to the capactive reactance of $2\mu F$ capactiance (nearly)

A. $80Hz$

B. $40Hz$

C. $60Hz$

D. $20Hz$

Answer: A

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75. An A.C. voltage of r.m.s. value $0.1V$ is applied to an LCR series circuit in which $L = 100\mu H$ and $C = 4 \times 10^{-8} F$ and $R = 2\Omega$. The resonant frequency will be

A. $\dfrac{10^6}{\pi} Hz$

B. $\dfrac{10^4}{\pi} Hz$

C. $\dfrac{5}{\pi} \times 10^4 Hz$

D. $\frac{25}{\pi} \times 10^4 Hz$

Answer: D

Watch Video Solution

76. The frequency at which $9.0mh$ inductor and $10\mu F$ capacitor will have same reactance is

A. $0.53kHz$

B. 50 kHz

C. $0.33kHz$

D. $5.3kHz$

Answer: A

Watch Video Solution

77. A group of electric lamps having a total power rating of 1000 watt is supplied by an AC voltage $E = 200\sin(310t + 60^\circ)$. Then the r.m.s value of the circuit current is

A. $10A$

B. $10\sqrt{2}A$

C. $20A$

D. $20\sqrt{2}A$

Answer: B

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78. A coil has a inductance of 0.7H and is joined in series with a resistance of 220Ω. When an alternating emf of 220V at 50 cps is applied to it, then the wattless component of the current in the circuit is

A. $7A$

B. $5A$

C. $0.7A$

D. $0.5A$

Answer: C

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79. 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?

A. $6A$

B. $2A$

C. $3.46A$

D. $0.66A$

Answer: C

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80. A horizontal straight conductor when placed along south-north direction falls under gravity, there is

A. an induced current from south to north direction.

B. an induced current from north to south direction

C. no induced e.m.f. along the length of the conductor.

D. an induced e.m.f. along the length of the conductor.

Answer: C

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81. A square coil of side $25cm$ having 1000 turns is rotated with a uniform speed in a magnetic field about axis perpendicular to the direction of the field. At an instant t, the e.m.f. induced in the coil is $e = 200 \sin 100\pi t$. The magnetic induction is

A. $0.50T$

B. $0.01T$

C. $10^{-3}T$

D. $0.1T$

Answer: B

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82. Which of the following curves represents the variation of impedence (Z) with frequency f in series LCR circuit?

A.

B.

C.

D.

Answer: C

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83. A $0.1m$ long conductor carrying a current of $50A$ is perpendicular to a magentic field of $1.25mT$. The mechanical power to move the conductor with a speed of $1ms^{-1}$ is

A. $62.5mW$

B. $625mW$

C. $6.25mW$

D. $12.5mW$

Answer: C

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84. A very small circular loop of radius a is initially (at t = 0) coplanar and concentric with a much larger fixed circular loop of radius b. A constant current I flows in the larger loop. The smaller loop is rotated with a constant angular speed ω about the common diameter. The emf induced in the smaller loop as a function of time t is

A. $\frac{\pi a^2 \mu_0 I}{2b} \omega \cos(\omega t)$

B. $\frac{\pi a^2 \mu_0 I}{2b} \omega \sin(\omega^2 t^2)$

C. $\frac{\pi a^2 \mu_0 I}{2b} \omega \sin(\omega t)$

D. $\frac{\pi a^2 \mu_0 I}{2b} \omega \sin^2(\omega t)$

Answer: C

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Competitive Thinking

1. Lenz's law is consequence of the law of conservation of

A. charge

B. momentum

C. mass

D. energy

Answer: D

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2. Two identical circular loops of metal wire are lying on a table without touching each other.

Loop-A carries a current which increases with time. In response, the loop-B

A. remains stationery

B. is attracted by the loop-A

C. is repelled by the loop-A

D. rotates about its CM, with CM fixed (CM is the centre of mass)

Answer: C

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3. A solenoid carrying a current supplied by a DC source with a constant emf contains an iron core inside it. How will the current change when the core is pulled out of the solenoid: will it increase, decrease, or remain the same?

A. remain same

B. decreases

C. inrease

D. modulate

Answer: B

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4. A square coil of $10^{-2}m^2$ area is placed perpenducular to a uniform magnetic field of $10^3 Wb/m^2$. What is magnetic flux through the coil?

A. 10 weber

B. 10^{-5} wber

C. 10^5 weber

D. 100 weber

Answer: A

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5. Magnetic flux ϕ (in weber) linked with a closed circuit of resistance $10 ohm$ varies with time t (in seconds) as

$\phi = 5t^2 - 4t + 1$

The induced electromotive force in the circuit at $t = 0.2$ sec. is

A. 0.4 volt

B. -0.4 volt

C. -2.0 volt

D. 2.0 volt

Answer: D

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6. The magnetic flux linked with coil, in weber is given by the equation, $\phi = 5t^2 + 3t + 16.$ The induced emf in the coil in the fourth second is

A. $10V$

B. $30V$

C. $45V$

D. $90V$

Answer: A

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7. The magnetic flux linked with a coil varies with time as $\phi = 3t^2 + 4t + 9$ webers. The induced emf at $t = 2s$ is

A. $10V$

B. $1V$

C. $6V$

D. $16V$

Answer: D

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8. A coil of resistance 400Ω is placed in a magnetic field. If the magnetic flux ϕ (wb) linked with the coil varies with time t (sec) as

$f = 50t^2 + 4$, the current in the coil at $t = 2$ sec is

A. $0.5A$

B. $0.1A$

C. $2A$

D. $1A$

Answer: A

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9. A coil having effective area A, is held with its plane normal to a magnetic field of induction B. The magnetic induction is quickly reduced to $25\,\%$ of its initial value in $2s$. Then e.m.f. induced across the coil will be

A. $\dfrac{3AB}{8}$

B. $\dfrac{3AB}{4}$

C. $\dfrac{AB}{4}$

D. $\dfrac{AB}{2}$

Answer: A

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10. Magnetic flux passing through a coil is initially 4×10^{-4} Wb. It reduces to 10% of its original value in t second. If the emf induced is 0.72 mV then t in second is

A. 0.3

B. 0.4

C. 0.5

D. 0.6

Answer: C

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11. A coil having 200 turns has a surface area of $0.15m^2$. A magnetic field of strength $0.2T$ applied perpendicular to this changes to $0.6T$ in $0.4s$, then the induced emf in the coil is __________V.

A. 45

B. 30

C. 15

D. 60

Answer: B

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12. For a coil of unit area, induction is doubled in $0.2s$. Then, the induced e.m.f. is

A. $5B$

B. $10B$

C. $8B$

D. $4B$

Answer: A

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13. A coil having 'n' turns and resistance $ROm \geq a$ is connected with a galvanometer of resistance $4R\Omega$. This combination is moved in time 't' seconds from a magnetic flux ϕ_1.

Weber to ϕ_2 Weber. The induced current in the circuit is

A. $\frac{\phi_2 - \phi_1}{5Rnt}$

B. $-\frac{n(\phi_2 - \phi_1)}{5Rt}$

C. $\frac{\phi_2 - \phi_1}{Rnt}$

D. $-\frac{n(\phi_2 - \phi_1)}{Rt}$

Answer: B

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14. A wire of length 50 cm moves with a velocity of 300 m/min, perpendicular to a magnetic field. If the emf induced in the wire is 2 V, then the magnitude of the field in tesla is

A. 2

B. 5

C. 0.8

D. 2.5

Answer: C

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15. If rotational velocity of a dynamo armature is doubled, then induced e.m.f. will become

A. half

B. two times

C. four times

D. unchanged

Answer: B

Watch Video Solution

16. A straight conductor 0.1 m long moves in a uniform magnetic field 0.1 T. The velocity of the conductor is 15 m/s and is directed perpendicular to the field. The emf induced between the two ends of the conductor is

A. $0.10V$

B. $0.15V$

C. $1.50V$

D. $15.00V$

Answer: B

Watch Video Solution

17. A rod of 10 cm length is moving perpendicular to uniform magnetic field of intensity $5 \times 10^{-4} \text{Wbm}^{-2}$. If the acceleration of the rod is $5ms^{-2}$, then the rate of increase of induced emf is

A. $2.5 \times 10^{-4} Vs^{-1}$

B. $25 \times 10^{-4} Vs$

C. $20 \times 10^{-4} V s$

D. $20 \times 10^{-4} V s^{-1}$

Answer: A

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18. A boat is moving due east in a region where the earth's magnetic field is $5.0 \times 10^{-5} NA^{-1} m^{-1}$ due north and horizontal. The boat carries a vertical aerial 2 m long. If the speed of the boat is $1.50 ms^{-1}$, the magnitude of the induced emf in the wire of aerial is

A. $1mV$

B. $0.75mV$

C. $0.50mV$

D. $0.15mV$

Answer: D

Watch Video Solution

19. Consider a metal ball of radius 'r' moving at a constant velocity 'v' in a unifrom magnetic field of induction $\vec{B}$. Assuming that the direction of velocity forms an angle 'a' with the direction of $\vec{B}$, the maximum potentail difference between points on the ball is

A. $r\left|\vec{B}\right|\left|\vec{v}\right|\sin\alpha$

B. $\left|\vec{B}\right|\left|\vec{v}\right|\sin\alpha$

C. $2r\left|\vec{B}\right|\left|\vec{v}\right|\sin\alpha$

D. $2r\left|\vec{B}\right|\left|\vec{v}\right|\cos\alpha$

Answer: C

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20. An aircraft with a wingspan of 40 m flies a speed of 1080 km hr_1 in the eastward direction at a constant altitude in the northern hemisphere, where the vertical component of earth's magnetic fieldis 1.75×10^{-5} T. Find the e.m.f. that develops between the tips of the wings.

A. $0.21V$

B. $0.5V$

C. $2.1V$

D. $0.34V$

Answer: A

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21. A circular wire of radius r rotates about its own axis with angular speed w in a magnetic field B perpendicular to its plane, then the induced e.m.f. is

A. $\frac{1}{2}Br\omega^2$

B. $Br\omega^2$

C. $2Br\omega^2$

D. zero

Answer: D

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22. A six pole generotar with fixed field excitation developes an e.m.f. of $100V$ when operating at 1500 r.p.m. At what speed must it rotate to develop $120V$?

A. 1200 r.p.m.

B. 1800 r.p.m.

C. 1500 r.p.m.

D. 400 r.p.m.

Answer: B

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23. A wheel with 10 spokes each of length 'L' m is rotated with a unifrom angular velocity ω in a plane normal to the magnetic field 'B' . The emf induced between the axle and the rim of the wheel.

A. $\frac{1}{2}N\omega BL^2$

B. $\frac{1}{2}\omega BL^2$

C. ωBL^2

D. $N\omega BL^2$

Answer: B

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24. Eddy currents are produced in a matterial when it is

A. heated

B. placed in a time varying magnetic field

C. placed in an electric field

D. placed in a uniform magnetic field

Answer: B

Watch Video Solution

25. The pointer of a dead-beat galvanometer gives a steady deflection because

A. eddy currents are produced in the conducting frame over which the coil is wound

B. its magnet is very strong

C. its pointer is very light

D. its frame is made of ebonite

Answer: A

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26. A coil is suspended in a uniform magnetic field, with the plane of the coil parallel to the magnetic lines of force. When a current is passed through the coil it starts oscillating, It is very difficult to stop. But if an aluminium plate is placed near to the coil, it stops. This is due to :

A. development of air current when the plate is placed

B. induction of electrical charge on the plate

C. shielding of magnetic lines of force as aluminimum is a paramagnetic material

D. electromagnetic induction in the aluminimum plate giving rise to electromagnetic damping.

Answer: D

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27. Choke coil works on the principle of

A. transient current

B. self induction

C. mutual inductance

D. wattless current

Answer: B

Watch Video Solution

28. The unit of inductance is

A. volt/ampere

B. joule/ampere

C. volt-s/ampere

D. volt-apmere/s

Answer: C

Watch Video Solution

29. An e.m.f. of $5\mathrm{volt}$ is produced by a self-inductance, when the current changes at a steady rate from $3A$ to $2A$ 1millisecond. The value of self-inductance is

A. zero

B. $5H$

C. $5000H$

D. $5mH$

Answer: D

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30. A varying current in a coil change from $10A$ to $0A$ in $0.5\,\text{sec.}$ If the average emf induced in the coil is $220V$, the self inductance of the coil is

A. $5H$

B. $10H$

C. $11H$

D. $22H$

Answer: C

Watch Video Solution

31. In a coil, $L = 5H$, current changes at the rate of 2 ampere per second. The induced

A. $-10V$

B. $10V$

C. $5V$

D. $-5V$

Answer: A

Watch Video Solution

32. the inductance of a closed-packed coil of 400 turns is $8mH. A$ current of $5mA$ is passed through it. The magnetic flux through each turn of the coil is

A. $\frac{1}{4\pi}\mu_0 Wb$

B. $\frac{1}{2\pi}\mu_0 Wb$

C. $\frac{1}{3\pi}\mu_0 Wb$

D. $0.4\mu_0 Wb$

Answer: A

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33. A long solenoid has 500 turns. When a current of $2A$ is passed through it, the resulting magnetic flux linked with each turn of the solenoid is $4 \times 10^{-3} Wb$. The self-inductance of the solenoid is

A. 1.0 henry

B. 4.0 henry

C. 2.5 henry

D. 2.0 henry

Answer: A

Watch Video Solution

34. A long solenoid has 1000 turns. When a current of $4A$ flows through it, the magnetic flux linked with each turn of the solenoid is $4 \times 10^{-3} Wb$. The self-inductance of the solenoid is

A. $2H$

B. $1H$

C. $4H$

D. $3H$

Answer: B

Watch Video Solution

35. The current passing through a choke coil of 5 hery is decreasing at the rate of $2ampere/\sec$. The e.mf. Devlopeing across the coil is

A. $10V$

B. $-10V$

C. $2.5V$

D. $-2.5V$

Answer: A

Watch Video Solution

36. If a current of $10A$ flows in one second through a coil and the induced e.m.f. is $10V$, then the self-inductance of the coil is

A. $\frac{2}{5}H$

B. $\frac{4}{5}H$

C. $\frac{5}{4}H$

D. $1H$

Answer: D

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37. An average induced e.m.f. of $1V$ appears in a coil when the current in it is changed from $10\ A$ in one direction to $10A$ in opposite direction in 0.5 sec. self-inductance of the coil is

A. $25mH$

B. $50mH$

C. $75mH$

D. $100mH$

Answer: A

Watch Video Solution

38. Two coils have a mutual inductance of $0.005H$. the current changes in the first coil according to equation $I = I_0 \sin \omega t$, where $I_0 = 10A$ and $\omega = 100\pi rad/s$. The maximum value of emf (in volt) in the second coil is

A. π

B. 2π

C. 4π

D. 5π

Answer: D

Watch Video Solution

39. Two coils P and Q are kept near each other. When no current flows through coil P and current increases in coil Q at the rate $10A/s$, the emf in coil P is 15 mV. When coil Q carries no current and current of $1.8A$ flows through coil P, the magnetic flux linked with the coil Q is

A. $1.4mWb$

B. $2.2mWb$

C. $2.7mWb$

D. $2.9mwb$

Answer: C

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40. A 100Ω resistance and a capacitor of 100Ω reactance are connected in series across a 220 V source. When the capacitor is $50\ \%$ charged, the peak value of the displacement current is

A. $11\sqrt{2}A$

B. $2.2A$

C. $11A$

D. $4.4A$

Answer: B

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41. The output power in step-up transformer used in practice is

A. greater than the input power

B. equal to the input power

C. less than the input power

D. none of these

Answer: C

Watch Video Solution

42. What is increase in step-down transformer?

A. Voltage

B. Current

C. Power

D. Current density

Answer: B

Watch Video Solution

43. A transformer is used to light a $100W$ and $110V$ lamp from a $220V$ mains. If the main current is $0.5A$, the Efficiency of the transformer is approximately:

A. $96\ \%$

B. $90\ \%$

C. $99\ \%$

D. $95\ \%$

Answer: B

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44. An ideal transformer converts $220V$ a.c. to $3.3kV$ a.c. to transmit a power of $4.4kW$. If primary coil has 600 turns, then alternating current in secondary coil is

A. $\frac{1}{3}A$

B. $\frac{4}{3}A$

C. $\frac{5}{3}A$

D. $\frac{7}{3}A$

Answer: B

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45. A transformer connected to 220 volt line shows an output of $2A$ at 11000 volt. The efficiency is 1005. The current drawn from the line is

A. $100A$

B. $200A$

C. $22A$

D. $11A$

Answer: A

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46. A $220V$ input is supplied to a transformer. The output circuit draws a current of $2.0A$ at $440V$. If the efficiency of the transformer is 80%, the current drawn by the primery winding of the transformer is

A. 5.0 ampere

B. 3.6 ampere

C. 2.8 ampere

D. 2.5 ampere

Answer: A

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47. A transformer has an efficiency of 80%. It works at 4 kW and 100 V. If secondary voltage is 240 V, the current in primary coil is

A. $1.333A$

B. $4A$

C. $13.33A$

D. $40A$

Answer: C

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48. Assertion : A transformer cannot work on dc supply.

Reason : dc changes neither in magnitude nor in direction.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but the reason is not the correct explanation of the assertion.

C. If asserction is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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49. A step-down transformer has 50 turns on secondary and 1000 turns on primary winding. If a transformer is connected to 220 V, 1A C AC source, then what is output current of the transformer ?

A. $1A$

B. $20A$

C. $100A$

D. $2A$

Answer: B

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50. A step up transformer operates on a $230V$ line and a load current of 2 ampere. The ratio of the primary and secondary windings is $1:25$. What is the current in the primary?

A. $25A$

B. $50A$

C. $15A$

D. $12.5A$

Answer: B

Watch Video Solution

51. A transformer having efficiency of 90% is working on $200V$ and $3kW$ power supply. If the current in the secondary coil is $6A$, the voltage across the secondary coil and current in the primary coil respectively are

A. $300V, 15A$

B. $450V, 15A$

C. $450V, 13.5A$

D. $600V, 15A$

Answer: B

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52. The output of a step down transformer is measured to be $48V$ when connected to a $12W$ bulb. The value of peak current is

A. $\frac{1}{\sqrt{2}}A$

B. $\sqrt{2}A$

C. $\frac{1}{2\sqrt{2}}A$

D. $\frac{1}{4}A$

Answer: C

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53. A coil has 2000 turns and area of $70 cm^2$. The magnetic field perpendicular to the plane of the coil is $0.3 Wb/m^2$ and takes 0.1 sec to rotate through 180^0. The value of the induced e.m.f. will be

A. $8.4V$

B. $84V$

C. $42V$

D. $4.2V$

Answer: B

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

A. $4\pi^2 mA$

B. $30mA$

C. $6mA$

D. $200mA$

Answer: C

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55. Alternating current can not be measured by D.C. Ammeter because

A. A.C. cannot pass through D.C. ammeter

B. average value of complete cycle is zero

C. A.C. is virtual

D. A.C. changes its direction

Answer: B

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56. If E_0 represents the peak value of the voltage in an ac circuit, the r.m.s. value of the voltage will be

A. $\frac{e_0}{\pi}$

B. $\frac{e_0}{2}$

C. $\frac{e_0}{\sqrt{\pi}}$

D. $\frac{e_0}{\sqrt{2}}$

Answer: D

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57. The rms value of current in a $50Hz$ AC circuit is $6A$. The average value of AC current over a cycle a

A. $6\sqrt{2}$

B. $\frac{3}{\pi\sqrt{2}}$

C. zero

D. $\frac{6}{\pi\sqrt{2}}$

Answer: C

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58. An alternating voltage $E = 200\sqrt{2}\sin(100t)V$ is connected to a $1\mu F$ capacitor through an ac ammeter (it reads rms value). What will be the reading of he ammeter?

A. $5mA$

B. $10mA$

C. $15mA$

D. $20mA$

Answer: D

Watch Video Solution

59. A capacitor of capacitance $10\mu F$ is connected to an AC source and an AC Ammeter. If the source voltage varies as $V = 50\sqrt{2}\sin 100t$, the reading of the ammeter is

A. $50mA$

B. $70.7mA$

C. $5.0mA$

D. $7.07mA$

Answer: A

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60. The frequency of ac mains in India is

A. $30c/s$ or Hz

B. $50c/s$ or Hz

C. $60c/s$ or Hz

D. $120c/s$ or Hz

Answer: B

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61. 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. $\frac{1}{\sqrt{2}}$

Answer: C

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62. An alternating e.m.f. given by e=200 sin 50 t is applied to a circuit containing only a resistance of 50Ω. What is the value of r.m.s. current in the circuit?

A. 0.02828

B. 0.2828

C. 2.828

D. 28.28

Answer: C

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63. If instantaneous current is given by $i = 4\cos(\omega t + \varphi)$ amperes, then the $r.m.s.$ value of current is

A. 4 ampere

B. $2\sqrt{2}$ ampere

C. $4\sqrt{2}$ ampere

D. zero ampere

Answer: B

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64. For an A.C. given by $I = 50\cos(100t + 45^{\circ})A$. The value of I_{rms} = ________A.

A. zero

B. $50\sqrt{2}$

C. 25

D. $25\sqrt{2}$

Answer: D

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65. A multimeter reads a voltage of a certain A.C. source as $100V$. What is the peak value of voltage of A.C. source?

A. $200V$

B. $100V$

C. $141.4V$

D. $440v$

Answer: C

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66. The number of turns in the coil of an A.C. generator is 100 and its cross-sectional area is $2.5m^2$. The coil is revolving in a uniform magnetic field of strength $0.3T$ with the uniform field of strength $0.3T$ with the uniform angular velocity of $60rad/s$. The value of maximum value produced is ________kV.

A. 1.25

B. 4.50

C. 6.75

D. 2.25

Answer: B

Watch Video Solution

67. In an AC circuit, peak value of voltage is 423 volts. Its effective voltage is

A. 400 volt

B. 323 volt

C. 300 volt

D. 340 volt

Answer: C

Watch Video Solution

68. A generator produces a time varying voltage given by $V = 240 \sin 120t$, where t is in second. The rms voltage and frequency are

A. $60Hz$ and $240V$

B. $19Hz$ and $120V$

C. $19Hz$ and $170V$

D. $754Hz$ and $70V$

Answer: C

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69. An e.m.f. $E = 4\cos(1000t)$volt is applied to an LR circuit of inductance $3mH$ and resistance $4 ohm$. The amplitude of current in the circuit is

A. 0.8

B. 1.0

C. $\frac{5}{7}$

D. $\frac{5}{\sqrt{7}}$

Answer: B

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70. An AC generator produced an output voltage $E = 170 \sin 377t$ volts , where t is in seconds. The frequnecy of AC voltage is

A. $50Hz$

B. $110Hz$

C. $60Hz$

D. $230Hz$

Answer: C

Watch Video Solution

71. A.C. voltmeter is connected to a source of $e_0 = 141.4$ volt, then it will read

A. $10V$

B. $100V$

C. $1000V$

D. $1V$

Answer: B

Watch Video Solution

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

A. $10mA$

B. $20mA$

C. $40mA$

D. $80mA$

Answer: B

Watch Video Solution

73. What is the reactance of a capacitor connected to a constant DC source?

A. zero

B. high

C. low

D. infinite

Answer: D

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74. A small signal voltage $V(t) = V_0 \sin \omega t$ is applied across an ideal capacitor C:

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

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

C. Current $I(t)$ lags voltage $V(t)$by 90°

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

Answer: D

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75. For series LCR circuit, the 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 $\frac{\pi}{2}$

.

C. Potential difference at capacitor and inductor have phase difference of $\frac{\pi}{2}$.

D. Potential difference across resistacne and capacitor have phase difference of $\frac{\pi}{2}$.

Answer: C

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76. In the series LCR circuit, the power dissipation is through

A. R

B. L

C. C

D. Both L and C

Answer: A

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77. An alternating current of frequency $'f'$ is flowing in a circuit containing a resistance R and a choke L in series. The impedence of this circuit is

A. $R+2\pi fL$

B. $\sqrt{R^2+4\pi^2f^2L^2}$

C. $\sqrt{R^2+L^2}$

D. $\sqrt{R^2+2\pi fL}$

Answer: B

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78. In a circuit L, C and R are connected in series with an alternating voltage source of frequency f. The current lead the voltages by 45°. The value of C is :

A. $\frac{1}{2\pi f(2\pi fL+R)}$

B. $\frac{1}{2\pi f(2\pi fR+L)}$

C. $\frac{1}{2\pi f(R+L)}$

D. $\frac{1}{2\pi f\left(R+\frac{1}{L}\right)}$

Answer: A

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79. Two coils A and B have mutual inductance 2×10^{-2} Henry if the current in he primary coil is i=5 sin $(10\pi t)$ then the maximum value of emf induced in coil B is

A. π volt

B. $\frac{\pi}{2}$ volt

C. $\frac{\pi}{3}$ volt

D. $\frac{\pi}{4}$ volt

Answer: A

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80. Reactance of a capacitor of capacitance $C\mu F$ for ac frequency $\frac{400}{\pi}Hz$ is 25Ω . The value C is

A. $50\mu F$

B. $25\mu F$

C. $100\mu F$

D. $75\mu F$

Answer: A

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

A. $\pi/3$

B. $\pi/2$

C. $\pi/4$

D. $\pi / 6$

Answer: A

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82. An AC voltage is applied to a resistance R and an inductance 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

A. zero

B. $\pi/6$

C. $\pi/4$

D. $\pi/2$

Answer: C

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83. A capacitance of $\left(\frac{10^{-3}}{2\pi}\right)F$ and an inductance of $\left[\frac{100}{\pi}\right]mH$ and a resistance of 10Ω are connected in series with an AC voltage source connected in series with an AC voltage source of $220V$, $50Hz$. The phase angle of the circuit is

A. 60°

B. 30°

C. 45°

D. 90°

Answer: C

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84. An are lamp requires a direct current of 10A at 80V to function. If it is connected to a 220V(rms), 50 Hz AC supply, the series inductor needed for it to work is close to:

A. $0.08H$

B. $0.044H$

C. $0.065H$

D. $80H$

Answer: C

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85. In a series L.C.R. circuit, the potential drop across L, C and R respectively are $40V$, $120V$ and $60V$. Them the source voltage is

A. $220V$

B. $160V$

C. $180V$

D. $100V$

Answer: D

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86. An L-C-R series circuit with $R = 100\Omega$ is connected to a $200V, 50Hz$ a.c. source .When only the capacitance is removed, the voltage leads the current by 60° and when only the inductance is removed, the current leads the voltage by 60°. The current in the circuit is

A. $\frac{2}{\sqrt{3}}A$

B. $\frac{\sqrt{3}}{2}A$

C. $1A$

D. $2A$

Answer: D

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87. An AC generator producing $10V$(rms) at 200 rad/s is connected in series with a 50Ω resistor, a $400mH$ inductor and a $200\mu F$ capacitor. The rms voltage across the inductor is

A. $2.5V$

B. $3.4V$

C. $6.7V$

D. $10.8V$

Answer: D

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88. In AC series circuit, the resistace , inductive reactance and capacitive are 3Ω, 10Ω and 14Ω respectively. The impedance of the circuit is

A. 5Ω

B. 4Ω

C. 7Ω

D. 10Ω

Answer: A

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89. In a series circuit $R = 300\Omega, L = 0.9H, C = 2.0\mu F$ and

$\omega = 1000 rad/\sec$. The impedence of the circuit is

A. 1300Ω

B. 900Ω

C. 500Ω

D. 400Ω

Answer: C

Watch Video Solution

90. An inductor of 1 henry is connected across a $220v, 50Hz$ supply. The peak value of the current is approximately.

A. $0.1A$

B. $0.9A$

C. $1A$

D. $9A$

Answer: B

Watch Video Solution

91. The value of the current through an inductance of $1H$ and of negligible resistance, when connected through an AC source of $200V$ and $50Hz$ is

A. $10A$

B. $5A$

C. $33.3A$

D. $3.33A$

Answer: D

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92. Which of the following graphs represent the correct variation of inductive reactance X_L with frequency v?

A.

B.

C.

D.

Answer: A

Watch Video Solution

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

A. $I_p^2 R \cos \theta$

B. $\frac{1}{2} I_p^2 R$

C. $\frac{4}{\pi} I_p^2 R$

D. $\frac{1}{\pi} I_p^2 R$

Answer: B

View Text Solution

94. 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

A. $P\left(\frac{R}{Z}\right)^2$

B. $P\sqrt{\frac{R}{Z}}$

C. $P\left(\frac{R}{Z}\right)$

D. P

Answer: A

View Text Solution

95. A $100W$ bulb is connected to an AC source of $220V$, $50Hz$. Then the current flowing through the bulb is

A. $\frac{5}{11}A$

B. $\frac{1}{2}A$

C. $2A$

D. $\frac{3}{4}A$

Answer: A

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96. In series LCR circuit $R = 18\Omega$ and impedance is 33Ω . An r.m.s. voltage $220V$ is applied across the circuit.The true power consumed in a.c. circuit is

A. $220W$

B. $400W$

C. $600W$

D. $800W$

Answer: D

Watch Video Solution

97. In an AC circuit , current is $3A$ and voltage $210V$ and power is $63W$. The power factor is

A. 0.11

B. 0.09

C. 0.08

D. 0.10

Answer: D

Watch Video Solution

98. A sinusoidal A.C. current flows through a resistor of resistance 10Ω. If the peak current is $2A$ flowing through the resistor, then the power dissipated is________W.

A. 30

B. 20

C. 10

D. 40

Answer: B

Watch Video Solution

99. In an A.C. circuit , e and I are given by, $e = 100\sin(100t)$ volt, $I = 100\sin\left(100t + \frac{\pi}{3}\right) mA.$ The power dissipated in circuit is

A. 10^4 watt

B. 10 watt

C. 2.5 watt

D. 5 watt

Answer: C

Watch Video Solution

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100. In an a.c. Circuit the voltage applied is $E = E_0 \sin(\omega)t$. The resulting current in the circuit is $I = I_0 \sin\left((\omega)t - \left(\frac{\pi}{2}\right)\right)$. The power consumption in the circuit is given by

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. $P = 0$

Answer: D

Watch Video Solution

101. In a series L.C.R. circuit alternating emf (v) and current (i) are given by the equation $v = v_0 \sin \omega t$, $i = i_0 \sin\left(\omega t + \frac{\pi}{3}\right)$ The average power dissipated in the circuit over a cycle of AC is

A. $\frac{v_0 I_0}{2}$

B. $\frac{v_0 I_0}{4}$

C. $\frac{\sqrt{3}}{2}v_0I_0$

D. zero

Answer: B

Watch Video Solution

102. A lamp consumers only 50% of maximum power applied in an A.C. Circuit. What will be the phase difference between applied voltage and circuit current?

A. $\frac{\pi}{6}$ rad

B. $\frac{\pi}{3}$ rad

C. $\frac{\pi}{4}$ rad

D. $\frac{\pi}{2}$ rad

Answer: B

Watch Video Solution

103. The average power dissipated in A.C. circuit is 2 watt. If a current flowing through a circuit is $2A$ and impedance is 1Ω, what is the power factor of the A.C. circuit?

A. 0.5

B. 1

C. 0

D. $\frac{1}{\sqrt{2}}$

Answer: B

Watch Video Solution

104. In an AC circuit, the instantaneous values of e.m.f and current are $e = 200 \sin 314t$ volt and $i = \sin\left(314t + \frac{\pi}{3}\right)$ ampere. The average power consumed in watt is

A. 200

B. 100

C. 50

D. 25

Answer: C

Watch Video Solution

Watch Video Solution

105. In LCR series circuit, an alternating e.m.f. 'e' and current 'I' are given by the equations $e = 100 \sin(100t)$ volt and $I = 100 \sin\left(100t + \frac{\pi}{3}\right) mA$

The average power dissipated in the circuit will be

A. $100W$

B. $10W$

C. $5W$

D. $2.5W$

Answer: D

Watch Video Solution

106. An inductor $20mH$, a capacitor $50\mu F$ and a resistor 40Ω connected in series across a source of emf $V = 10\sin 340t$. The power loss in A.C. circuit is

A. $0.76W$

B. $0.89W$

C. $0.45W$

D. $0.67W$

Answer: C

Watch Video Solution

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

A. $0.79W$

B. $0.43W$

C. $2.74W$

D. $1.13W$

Answer: A

Watch Video Solution

108. A coil of inductive reactance 31Ω has a resistance of $8 ohm$. It is placed in series with a condenser of capacitive reactance 25Ω. The combination is connected to an ac source of $110V$. The power factor of the circuit is

A. 0.80

B. 0.33

C. 0.56

D. 0.64

Answer: A

Watch Video Solution

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

A. 1.0

B. 0.4

C. 0.5

D. 0.8

Answer: D

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110. The power factor of a CR circuit is $\frac{1}{\sqrt{2}}$. If the frequency of ac signal is halved, then the power factor of the circuit becomes

A. $\frac{1}{\sqrt{5}}$

B. $\frac{1}{\sqrt{7}}$

C. $\frac{1}{\sqrt{3}}$

D. $\frac{1}{\sqrt{11}}$

Answer: A

Watch Video Solution

111. In an a.c. circuit, the instantaneous e.m.f. and current are given by $e = 100 \sin 30t$

$I = 20 \sin\left(30t - \frac{\pi}{4}\right)$

In one cycle of a.c., the average power consumed by the circuit and the wattless current are, respectively.

A. $\frac{50}{\sqrt{2}}, 0$

B. $50, 0$

C. $50, 10$

D. $\frac{1000}{\sqrt{2}}, 10$

Answer: D

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112. The L-C parallel resonant circuit

A. has a very high impedence

B. has a very high current

C. acts as resistance of very low value

D. has zero impedance

Answer: A

Watch Video Solution

113. In an LCR circuit, at resonance

A. the current is minimum

B. the current and voltage are in phase

C. the current leads the voltage by $\pi / 2$

D. the impedence is maximum

Answer: B

Watch Video Solution

114. in a LCR circuit capacitance is chagned from C to 2C. For the resomat frequency to remain unchaged, the inductance should be chagned from L to

A. $4L$

B. $L/4$

C. $L/2$

D. $2L$

Answer: C

Watch Video Solution

115. An LCR circuit contains $R = 50\Omega, L = 1mH$ and $C = 0.1\mu F$. The impedence 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. $2\pi \times 10^{6} s^{-1}$

Answer: A

Watch Video Solution

116. A series LCR circuit contains inductance $5mH$, capacitance $2\mu F$ and resistance 10Ω. If the frequency of A.C. source is varied, what is the frequency at which maximum power is dissipated?

A. $\frac{10^{5}}{\pi} Hz$

B. $\dfrac{10^{-5}}{\pi} Hz$

C. $\dfrac{2}{\pi} \times 10^{5} Hz$

D. $\dfrac{5}{\pi} \times 10^{3} Hz$

Answer: D

Watch Video Solution

117. If the potential difference across the inductor $(3mH)$ is same as that across the condenser $(30\mu F)$ in a series R-L-C circuit, then the frequency of the applied e.m.f. is

A. $180Hz$

B. $530Hz$

C. $890Hz$

D. $5kHz$

Answer: B

Watch Video Solution

118. An alternating current is flowing through a series LCR circuit. IT is found that the current reaches a value of 1mA at both 200 Hz and

800Hz frequency. What is the resonance frequency of the circuit?

A. $600Hz$

B. $300Hz$

C. $500Hz$

D. $400Hz$

Answer: D

Watch Video Solution

119. An oscillator circuit consists of an inductance of $0.5 mH$ and a capacitor of $20 \mu F$. The resonant frequency of the circuit is nearly

A. $15.92 Hz$

B. $159.2 Hz$

C. $1592 Hz$

D. $15910 Hz$

Answer: C

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

A. $f/2\sqrt{2}$

B. $f/2$

C. $f/4$

D. $8f$

Answer: A

Watch Video Solution

121. Out of the following graphs, which grpahs shows the correct relation (graphical representation) for LC parallel resonant circuit ?

A.

B.

C.

D.

Answer: D

Watch Video Solution

122. In Karnataka, the normal domestic power supply AC is $220V$. $50Hz$. Here $220V$ and $50Hz$ refer to

A. peak value of voltage and frequency

B. rms value of voltage and frequency

C. mean value of voltage and frequency

D. peak value of voltage and angular frequency

Answer: B

Watch Video Solution

123. An dielectric current has both DC and AC components . DC component of BA and AC component is given as I = $6 \sin omega t. So$ underset(rms)(I)` value of resulatant current is

A. $8.05A$

B. $9.05A$

C. $11.58A$

D. $13.58A$

Answer: B

Watch Video Solution

124. The peak value of an alternating emf E given by

$E = (E_0)\cos\omega t$

is 10V and frequency is 50 Hz. At time $t = (1/600)s$ the instantaneous value of emf is

A. $10V$

B. $5\sqrt{3}A$

C. $5V$

D. $1V$

Answer: B

Watch Video Solution

125. In an AC circuit $I = 100\sin 200\pi t$. The time required for the current to achieve its peak value of will be

A. $1/100s$

B. $1/200s$

C. $1/300s$

D. $1/400s$

Answer: D

Watch Video Solution

126. A conducting circular loop is placed in a uniform magnetic field $0.04T$ with its plane perpendicular to the magnetic field. The radius of the loop starts shrinking at $2mm / \sec$. The induced emf in the loop when the radius is $2cm$ is

A. $3.2\pi\mu V$

B. $4.8\pi\mu v$

C. $0.8\pi\mu V$

D. $1.6\pi\mu V$

Answer: A

Watch Video Solution

127. The magnetic flux across a loop of resistance 10Ω is given by $\phi = 5t^2 - 4t^2 + 1Wb$. How much current is induced in the loop after 0.2 s?

A. $0.4A$

B. $0.2A$

C. $0.04A$

D. $0.02A$

Answer: B

Watch Video Solution

128. A square loop of wire with side length 10 cm is placed at angle of 45° with a magnetic field that changes uniformly from 0.1 T to zero in 0.7s. The induced current in the loop (its resistance is 1Ω) is

A. $1.0mA$

B. $2.5mA$

C. $3.5mA$

D. $4.0mA$

Answer: A

Watch Video Solution

129. If in a coil rate of change of area is $5m^2 / milli\sec ond$ and current become $1amp$ from $2amp$ in 2×10^{-3} sec. magnitude of field id $1 teslsa$ then self-inductance of the coil

is

A. $2H$

B. $5H$

C. $20H$

D. $10H$

Answer: D

Watch Video Solution

130. The primary and secondary coils of a transmformer 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

A. 90 volt

B. 120 volt

C. 220 volt

D. 30 volt

Answer: B

Watch Video Solution

131. Alternating current of peak value $\left(\frac{2}{\pi}\right)$ ampere flows through the primary coil of the transformer. The coefficient of mutual inductance between primary and secondary coil is 1 henry. The peak e.m.f. induced in secondary coil is (Frequency of a.c.=$50Hz$)

A. $100V$

B. $200V$

C. $300V$

D. $400V$

Answer: B

View Text Solution

132. A conducting circular loop is placed in a uniform magnetic field, $B = 0.025T$ with its plane perpendicular to the loop. The radius of the loop is made to shrink at a constant rate of $1mms^{-1}$. The induced emf when the radius is $2cm$ is

A. $2\mu V$

B. $2\pi\mu V$

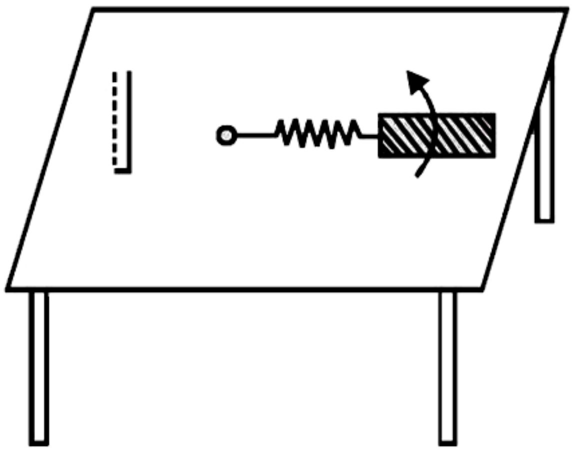
C. $\pi\mu V$

D. $\frac{\pi}{2}\mu V$

Answer: C

Watch Video Solution

133. A metallic rod of length 'l' is tied to a string of length 2l and made to rotate with angular speed w on a horizontal table with one end of the string fixed. If there is a vertical magnetic field 'B' in the region, the e.m.f. Induced across the ends of the rod is



A. $\frac{2B\omega l^2}{2}$

B. $\dfrac{3B\omega l^2}{2}$

C. $\dfrac{4B\omega l^2}{2}$

D. $\dfrac{5B\omega l^2}{2}$

Answer: D

Watch Video Solution

134. A rod of 10 cm length is moving perpendicular to uniform magnetic field of intensity $5 \times 10^{-4}\mathrm{Wbm}^{-2}$. If the acceleration of the rod is $5ms^{-2}$, then the rate of increase of induced emf is

A. $2.5 \times 10^{-4} Vs^{-1}$

B. $2.5 \times 10^{-4} Vs$

C. $20 \times 10^{-4} Vs$

D. $20 \times 10^{-4} Vs^{-1}$

Answer: A

Watch Video Solution

135. A wire loop is rotated in magneitc field. The frequency of change of direction of the induced e.m.f. is.

A. once per revolution

B. twice per revolution

C. four times per revolution

D. six times per revolution

Answer: B

Watch Video Solution

136. A small square loop of wire of side l is placed inside a large square loop of wire of side $L(L > > l)$. The loops are co-planer and their centres coincide. The mutual inductance of the system is proportional to

A. l / L

B. l^2 / L

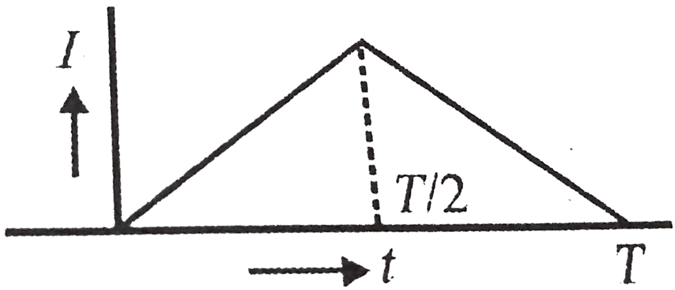
C. L / l

D. L^2 / l

Answer: B

Watch Video Solution

137. The current (I) in the inductance is varying with time according to the plot shown in figure.



Which one of the following is the correct variation of voltage with time in the coil?

A.

B.

C.

D.

Answer: C

Watch Video Solution

138. When the frequency of the ac voltage applied to a series LCR circuit is gradually increased from a low value , the impedance of the circuit.

A. monotonically increases

B. first increases and then decreases

C. first decreases and then increases

D. monotonically decreases

Answer: C

Watch Video Solution

139. Assertion : An emf $\overrightarrow{E}$ is induced in a closed loop where magnetic flux is varied. The induced $\overrightarrow{E}$ is not a conservative field.

Reason : The line intergral $\vec{E} \cdot \vec{dl}$ around the closed loop is non-zero.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If asserction is true but reason is false.

D. If asserction is false but reason is true.

Answer: A

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140. In an AC circuit containing only capacitance the current

A. lags behind the voltage by $\pi/2$ in phase

B. leads the voltage by $\pi/2$ in phase

C. leads the voltage by π in phase

D. lags behind the voltage by π in phase

Answer: B

Watch Video Solution

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

A. $\frac{20}{\sqrt{13}} A$

B. $2.0 A$

C. $4.0 A$

D. $8.0A$

Answer: C

Watch Video Solution

142. A resistor 20Ω, inductive reactance 15Ω and capacitive reactance 15Ω are connected in series to an AC voltage source $V = 200\sqrt{2}\sin\omega t$. Then the maximum current in the circuit is

A. $20\sqrt{2}A$

B. $10\sqrt{2}A$

C. $10A$

D. $20A$

Answer: B

Watch Video Solution

143. Same current is flowing in two alternating circuits. The first circuit contains only inductances 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. increase in first circuit and decrease in second

B. increase in both circuits

C. decrease in both circuits

D. decreases in first circuit and increases in second

Answer: D

Watch Video Solution

144. An electric heater consumes 1 kilowatt power when connected across a 100 volt. D.C. supply. If this heater is to be used with $200V$, $50Hz$ A.C. supply, the value of inductance to be connected in series with it is

A. $5.5H$

B. $0.55H$

C. $0.055H$

D. $1.1H$

Answer: C

Watch Video Solution

145. An ac ammeter is used to measure currnet in a circuit. When a given direct current passes through the circuit. The ac ammeter reads 3 A. When another alternating current passes through the circuit, the ac ammeter reads 4A. Then find the reading of this ammeter (inA), if dc and ac flow through the circuit simultaneously.

A. $3A$

B. $4A$

C. $7A$

D. $5A$

Answer: D

Watch Video Solution

146. A transmitter transmits at a wavelength of $300m$. A condenser of capacitance $2.4\mu F$ is being used. The value of the inductance for the resonant circuit is approximately

A. $10^{-4}H$

B. $10^{-6}H$

C. $10^{-8}H$

D. $10^{-10}H$

Answer: C

Watch Video Solution

147. In an electrical circuit R, L, C and an AC 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, difference the phase difference is again $\pi/3$. The power factor of the circuit is

A. $1/2$

B. $1/\sqrt{2}$

C. 1

D. $\sqrt{3}/2$

Answer: C

Watch Video Solution

148. An AC voltage source of variable angular frequency (ω) and fixed amplitude V_0 is connected in series with a capacitance C and an electric bulb of resistance R (inductance zero). When (ω) is increased

A. the bulb glows dimmer

B. the bulb glows brighter

C. total impedence of the circuit is unchanged

D. total impedance of the circuit increase

Answer: B

Watch Video Solution

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

A. A.C.

B. D.C.

C. both A.C. and D.C. equally

D. neither A.C. nor D.C.

Answer: C

Watch Video Solution

150. The average power is dissipated in a pure inductor is

A. $\frac{VI^2}{4}$

B. $\frac{1}{2}VI$

C. zero

D. VI^2

Answer: C

Watch Video Solution

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

A. frequency of the AC source is decresed

B. number of turns in the coil is reduced

C. a capacitance of reactance $X_C = X_L$ is included in the same circuit

D. an iron rod is inserted in the coil

Answer: D

Watch Video Solution

152. A current of $25/\pi Hz$ frequency is passing through an A.C. circuit having series combination of $R = 100\Omega$ and $L = 2H$, the phase difference between voltage and current is ________.

A. 90°

B. 60°

C. 30°

D. 45°

Answer: D

Watch Video Solution

153. A coil of inductive reactance $1/\sqrt{3}\Omega$ and resistance 1Ω is connected to a $200V, 50Hz$ A.C. supply. The time lag between maximum voltage and current is

A. $\frac{1}{200}s$

B. $\frac{1}{300}s$

C. $\frac{1}{500}s$

D. $\frac{1}{600}s$

Answer: D

Watch Video Solution

154. 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

A. $V_a = V_b$

B. $V_a < V_b$

C. $V_a > V_b$

D. $i_a > i_b$

Answer: C

Watch Video Solution

155. The frequency of the ouput signal becomes ________ times by doubling the value of the capacitance in the LC oscillator circuit.

A. $\frac{1}{\sqrt{2}}$

B. $\sqrt{2}$

C. $\frac{1}{2}$

D. 2

Answer: A

Watch Video Solution

156. A $16\mu F$ capacitor is charged to 20 volts. The battery is then disconnected and a pure $40mH$ coil is connected across the capacitor so that LC oscillations are set up. The maximum current in the coil is

A. $0.2A$

B. $40mA$

C. $2A$

D. $0.4A$

Answer: D

Watch Video Solution

157. The natural frequency of an LC circuit is $125 kHz$. When the capacitor is totally filled with a dielectric material, the natural frequency decreases by $25 kHz$. Dielectric constant of the material is nearly.

A. 3.33

B. 2.12

C. 1.56

D. 1.91

Answer: C

Watch Video Solution

158. An alternating EMF of frequency $\frac{1}{2\pi\sqrt{LC}}$ is applied to a series LCR circuit. For this frequency of the applied EMF,

A. the circuit is at resonace and its impedence 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 e.m.f.

C. the sum of the potential differences 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 ω / LR and is a measure of the voltage magnification produced by the circuit at resonance.

Answer: B

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Evaluation Test

1. Assertion : There can be induced e.m.f. in an inductor even if the current through it is zero.

Reason : Induced e.m.f. depends upon the rate of change of current rather than the current itself.

A. Assertion is true and Reason is correct explanation of Assertion

B. Assertion is true and Reason is false

C. Assertion and Reason both are false

D. Assertion is false but Reason is true

Answer: A

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2. In a car spark coil an e.m.f. of 40000 volts is induced in a secondary when the primary current changes from $4A$ to 0 in $10\mu s$. The mutual inductance between the primary and secondary winding of this spark coil is $\left(n \times \frac{1}{10}\right)$ henry, then $n =$

A. 1

B. 100

C. 1000

D. 10000

Answer: A

Watch Video Solution

3. A superconducting loop of radius R has self inductance $L.A$ uniform & constant magnetic field B is applied perpendicular to the plane of the loop.Initially current in this loop is zer.The loop is rotated about its diameter by 180° .Find the current in the loop after rotation.

A. zero

B. $\dfrac{B\pi R^2}{L}$

C. $\dfrac{2B\pi R^2}{L}$

D. $\dfrac{B\pi R^2}{2L}$

Answer: C

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4. Let B and E denote induction of magnetic field and energy density at mid-point of a long solenoid carrying a current i. The graph between E and B will be

A.

B.

C.

D.

Answer: B

View Text Solution

5. A square frame with side 'a' and a straight conductor carrying a constant current I are located in the same plane. The resistance of the frame is equal to R. The frame was turned through 180° about the axis OO' separated from the current-carrying conductor by a distance $b = 2a$. If the electric charge that flowed through the frame be expressed as a function of a, I, R it takes the form $q =$ constant $\times a^m \times I^n \times R^p$. Find $m + n + p$.

A. 1

B. 2

C. 3

D. 4

Answer: A

Watch Video Solution

6. A ring of mass m, radius r with charge per unit length λ. Encloses a magnetic field such that $B = -B_0\hat{k}$, when $r \leq a$, $B = 0$ when $r > a$ when the magnetic field is switched off. The rings starts to rotate due to induced electric field with varying flux. Find angular velocity (in $10^{-2} rad/s$) with which ring rotates after the magnetic field has been compeletely turned off. $B_0 = 1$ Tesla, $a = 1cm, r = 2cm, m = 0.5kg, \lambda = \frac{4}{\pi} C/m.$

A. 2

B. 4

C. 5

D. 8

Answer: B

View Text Solution

7. Two vertical rails are connected at the ends with a capacitor. There is a magnetic field $\vec{B}$ directed horizontally. A wire of mass 'm' slides down the rails. Find the acceleration of wire given that mass $'m' = 1kg,\ g = 10ms^{-2}$, $B = 1T$ length of wire $= 1m$ capacitance $C = 1$ farad. (The wire and the rails offer zero electrical resistacne)

A. $4ms^{-2}$

B. $6ms^{-2}$

C. $5ms^{-2}$

D. $7ms^{-2}$

Answer: C

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8. The current in coil changes from $0.5A$ to $2A$ in $0.03s$ inducing a voltage of $8V$ across it. Find initial energy stored in the coil.

A. `0.02 J

B. 0.25J

C. 0.4 J`

D. 2 J

Answer: A

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