Mechanical Effect of Current And Electro Magnetic Induction

1) A charged particle is released from rest in a region of steady and uniform electric and magnetic fields which are parallel to each other. The particle will move in a

a) Circle b) straight line

c) Helix d) cycloid

2) An electron accelerated through a p.d. of V volts enters into a uniform magnetic field and experience a force of F. f the accelerating potential is increased to 2V ,the electron in the same field will experience a force

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

3) On connecting a battery to the two corners of a diagonal of a square conductor frame of side 'a', the magnetic field at the centre will be

a) zero b) $\frac{\mu_0}{\pi a}$ c) $\frac{2\mu_0}{\pi a}$ d) $\frac{4\mu_0}{a}$

4) Mark the correct option

a) Electric and Magnetic fields are basically independent

b) Electric and Magnetic fields are two aspects of the electromagnetic field

c) Electric and Magnetic fields may be produced by charge at rest

d) Both a and c are correct

5) In a moving coil galvanometer the current I is related to the deflection θ

a) I α θ b) I α θ^2 c) I α $\sin\theta$ d) I α $\tan\theta$

6) Two parallel beam of positrons moving in a same direction will

a) Repeal each other

b) Attract each other

c) will not interact with each other

d) be deflected normal to the plane containing two beams

7) A galvanometer of 50Ω resistance has 25 divisions. A current of $4X10^{-4}$A gives a deflection of one division. To convert this galvanometer to voltmeter having a range of 25 volt, it should connected a resistance of

a) 2500 Ω as a shunt b)2450Ω as a shunt

c) 2550Ω in series d)2450Ω in series

8)A galvanometer has a resistance of G and range of I ampere. The value of resistance used in parallel to convert it into an ammeter of range nI.

a) $\frac{n-1}{G}$ b)nG c) $\frac{G}{n}$ d) $\frac{G}{n-1}$

9) A certain current on passing through a galvanometer produces a deflection of 100 divisions. When a shunt of 1 Ω is connected, the deflection reduces to 1 division then the galvanometer resistance is.

a) 99 Ω b) 990 Ω c) 9.9 Ω d) 0.99 Ω

10) A voltmeter has a resistance G ohm and range of V volt.the value of resistance used in series to convert it into a voltmeter nV volt is

a) nG b) (n+1)G c) (n-1)G d) $\frac{G}{n}$

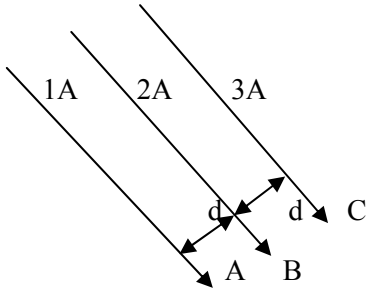
11) Three long straight wires A,B and C are at equidistant 'd' carrying currents as shown in the figure. The resultant force on B is directed

a)Perpendicular to the plane of the paper and directed outward.

b) Perpendicular to the plane of the paper and directed inward.

c) towards A

d) towards C



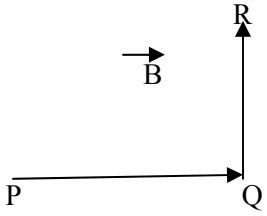
12) A moving coil galvanometer has 150 equal divisions. Its current sensitivity is 10 divisions per milliampere and voltage sensitivity is 2 divisions per millivolt. In order that each division reads 1 volt, the resistance (in ohm) needed to connect in series with the coil will be

a) 99995 b)9995 c)1000 d) 1050

13) A wire PQR bent as shown in the figure and is placed in a region of uniform magnetic field B. The length PQ=QR= L. A current I ampere flows through the wire as shown. The magnitude of force on PQ and QR will be

a)BIL,0 b)2BIL,0

c) 0,BIL d)0,0



14)When deuterium and helium are subjected to an accelerating field simultaneously, then

a) both acquire same energy

b) deuterium accelerate fast

c) helium accelerates faster

d) neither of them accelerate

15) A straight wire of mass 200gm and length 1.5m carries a current of 2A. It is suspended in the midair by uniform magnetic field B. The magnetic of the field(in tesla) ($g = 9.9ms^{-2}$)

a)2 b) 1.5 c) 0.55 d) 0.66

16) Two long parallel straight conductors carries currents I_1 and I_2 ($I_1 > I_2$). When currents are in same direction the magnetic field at the point midway between the wires is 20μT. If the direction of I_2 is reversed, the field becomes 50 μT.The ratio of currents I_1/ I_2 is

a) $\frac{5}{2}$ b) $\frac{7}{3}$ c) $\frac{4}{3}$ d) $\frac{5}{3}$

17)The electrons in the beam of a television tube move horizontally from south to north. The vertical component of earth's magnetic field points down. The electrons deflected towards

a) west b) no deflection c) east d) north to south

18) In a shunted ammeter, only 10% main current passes through the galvanometer of resistance G. The resistance of the shunt is

a) 9G b)10G c) $\frac{G}{9}$ d) $\frac{G}{10}$

19) The resistance of an ideal ammeter is

a) low b) high c) infinite d) zero

20)) The resistance of an ideal voltmeter is

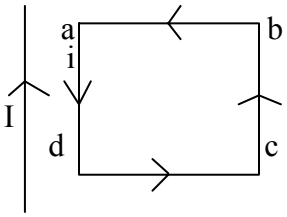
a) low b) high c) infinite d) zero

21) The deflection in a galvanometer falls from 50 division to 20 when a 12 ohm shunt is applied. The galvanometer resistance is

a) 18 ohm b) 36 ohm c) 24 ohm d) 30 ohm

22) A rectangular loop carrying a current i is situated near a long straight wire such that wire is parallel to one of the sides of the loop and is in the plane of loop. If steady current I is established in the wire as shown in the figure. The loop will

a) rotate about an axis parallel to the wire
b) move away from the wire
c) move towards the wire
d) remain stationary



23) An experiment to investigates the variation of the force between two long parallel current carrying conductors a distance 'd' apart. A straight line graph is obtained on plotting

a) F against d b) F against 1/d c) F against d^2 d) log F against d

24) A voltmeter having resistance of $50X10^3$ Ω is used to measure the voltage in a circuit. To increase the range of measurement three times, the additional series resistance required is

a) 10^5 Ω b) 150k Ω c)900k Ω d)$9X10^6$ Ω

25) The electric bulb is designed to operate at 12V DC.It is connected to AC and gives a same brightness as when connected to DC,then peak Ac voltage is

a) 12V b) 24V c) $12\sqrt{2}$ V d) $\frac{12}{\sqrt{2}}$ V

26) The dimensional formula of inductance is

a) $M L^2T^{-2}A^{-2}$ b) $M^0LT^{-3} A^{-2}$ c) $M^2 A^{-2}$ d) $MLT^{-2} A^{-1}$

27) When a current changes from +2A to -2A in 0.05 second, an emf of 8V is induced in a coil. The coefficient of self inductance of the coil is

a)0.1 H b)0.2H c)0.4H d)0.8H

28) If V_{rms} is rms voltage and V_m be the mean value (over half cycle)of an alternating voltage then $\frac{V_{rms}}{V_m}$ is

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

29) The Q- factor of a series resonance circuit can be given by

a) $\frac{\omega_0 L}{R}$ b) $\frac{1}{\omega_0 CR}$ c) $\frac{1}{R}\sqrt{\frac{L}{C}}$ d) all the above

30) The motional emf produced across a conductor moving through a magnetic field does not depend on its

a)speed b) length c) orientation with the field d) thickness

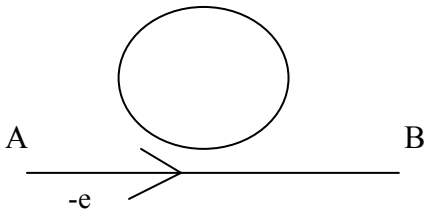
31)an electron moves along the line AB which lies in the same plane as a circular loop of conducting wire as shown in the figure. what will be the direction of current induced if any in the loop ?

a) no current will be induced

b)the current will be clockwise

c) the current will be anticlockwise

d) the current will change the direction as the electron passes by



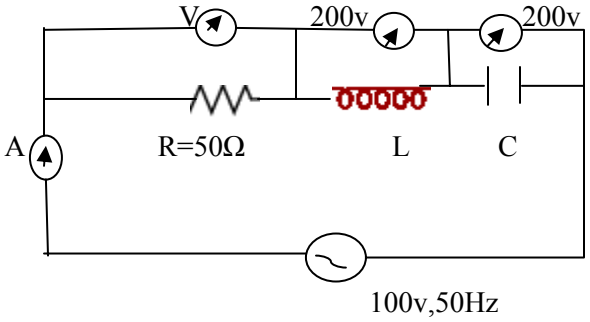
32) In LCR circuit ,the voltmeter and ammeter readings are respectively

a)250 v,4A

b) 200 v,2A

c) 150 v,2A

d) 100v,2A



33) To induce an emf in a coil ,the linking magnetic flux

a) must increase b) must decrease

c) must remain constant d) can either or decrease

34) A coil rotated in a uniform magnetic field about an axis perpendicular to the field. The emf induced in the coil would be maximum, when the plane of the coil is

a) parallel to the field b) perpendicular to the field

c) at 45^0 to the field d) in none of above positions

35) The armature of the a d.c. motor has 20 ohm resistance. It draws a current of 1.5A when run by a 220v dc supply. The value of back emf induced is

a) 150v b) 170v c)190v d)220v

36) In an a.c. circuit, V and I are given by V=100 sin(100t)volt . I=100 sin(100t + π/3)mA. The power dissipated in the circuit is

a) 10^4 watt b) 10 watt c) 2.5 watt d) 5 watt

37) Average power dissipated in a pure capacitor in a complete cycle of a.c. is

a) $\frac{cv2}{2}$ b) cv^2 c) $\frac{cv2}{4}$ d) zero

38) power factor of a series LCR circuit at resonance is

a) 1 b)0.5 c) zero d) none of these

39) The magnetic flux linked with a coil at any instant of time 't' is given by $\varphi=5t^3-100t+300$ Wb.The emf induced in the coil at t = 2 second is

a) 40v b) -40v c)300v d)140v

40) Time taken by AC of 50Hz in reaching from zero to maximum value is

a) $50X10^{-3}$s b) $5X10^{-3}$s c)$1X10^{-2}$s d)$2X10^{-2}$s

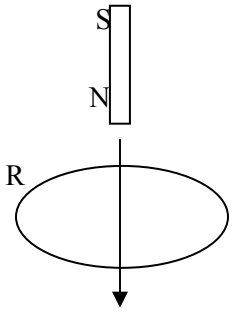
41) A small bar magnet is allowed to fall through a fixed horizontal conducting ring. Let 'g' be the acceleration due to gravity, then the acceleration of the magnet will be

a) >g when it is below R and moving away from R

b) =g when it is below or above R and moving towards or away from R

c) <g when it is above the R and moving towards R

d) >g when it is above R and moving towards R



42) The dimensions of $\sqrt{LC}$ where L inductance and C is capacitance

a) length b) mass c) time d) no dimension

43) An inductance of $\frac{200}{\pi}$ mH ,capacitance of $\frac{10^{-3}}{\pi}$ F and a resistance of 10Ω are connected in series with a AC source of 220v,50Hz. The phase angle of the circuit is

a) $\frac{\pi}{2}$ b) $\frac{\pi}{3}$ c) $\frac{\pi}{6}$ d) $\frac{\pi}{4}$

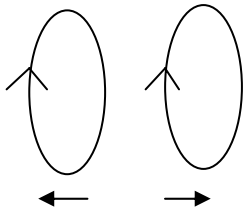
44) Maximum value of current from an AC source of 50 HZ is 5A. The time taken by current to grow from 0 to 2.5A is

a) 0.6ms b) 1.67ms c) 5μs d)0.5 μs

45) Two similar circular loops carry equal currents in the same direction. On moving the coils further apart the electric current will

a) increase in one and decrease in second b) Remain unaltered

c) decrease in both d) increase in both



46) An alternating emf is represented as V=10 sin (314t). The instantaneous emf at t = ($\frac{1}{600}$) s is

a) 10v b) 4v c)5v d)6v

47) A train is moving towards north with a speed of 180km/hr .If the vertical component of earth's magnetic field is $0.2X10^{-4}$ T.The emf induced in the axle 1.5m long is

a)5.4mv b)54mv c) 15mv d)1.5mv

48) In a step up transformer the turns ratio is 1:2 . A dc source of emf 1.5v is connected across the primary. The voltage the secondary is

a) zero b) 1.5v c) 3.0v d) 0.75v

49) A step up transformer operates on a 230v line and a load current of 2A. The ratio of primary and secondary windings is 1:25. The current in the primary is

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

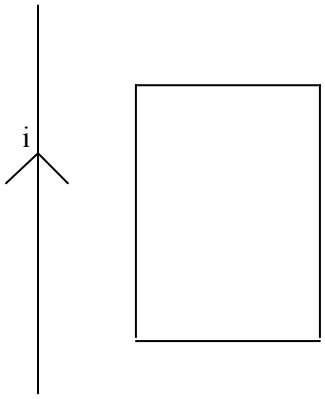
50) a square conducting loop is placed in the neighborhood of a coplanar long straight wire carrying a current of i

a) if $\frac{di}{dt} = 0$,current is induced in the coil.

b) if $\frac{di}{dt} > 0$,current is not induced in the coil

c) if $\frac{di}{dt} > 0$, current in the loop is clockwise

d) if $\frac{di}{dt} > 0$, current in the loop is anticlockwise



51) In an oscillating LC circuit the maximum charge on the capacitor is Q. The charge on the capacitor when the energy stored equally between the electric field and the magnetic field is

a) $\frac{Q}{2}$ b) $\frac{Q}{\sqrt{3}}$ c) $\frac{Q}{\sqrt{2}}$ d) Q

52) If L,C ,R and V respectively represent inductance, capacitance, resistance and potential difference > Then the dimensions of $\frac{L}{RCV}$ is same as that of

a) current b) $\frac{1}{current}$ c) charge d) $\frac{1}{charge}$

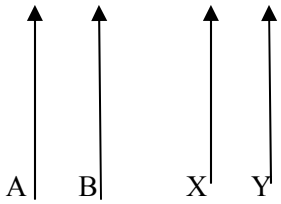
53) A and B are two conductors carrying a current I in same direction. X and Y two electrons beams moving in same direction

a) there will be a repulsion between A and B and attraction between X and Y

b) there will be a attraction between A and B and repulsion between X and Y

c) there will be repulsion between A and B and also between X and Y

d) there will be attraction between A and B and also between X and Y



54) A charged particle of energy 15ev moves through a perpendicular magnetic field . The energy of the particle emerging out of magnetic field is

a) 15ev b) >15ev c) <15ev d) none of these

55) A uniform electric field and uniform magnetic field are acting along the same direction in a certain region. If an electron is projected along the direction of the fields with a certain velocity then

a) it will turn towards left of direction of motion
b) it will turn towards right of direction of motion
c) its velocity will increase
d) its velocity will decrease

56) A proton and a α particle moving with a same velocity enter into a uniform magnetic field along normal to the plane of their direction . The ratio of radii of circular paths described by the proton and α particle is

a) 1:2 b)1:4 c) 1:16 d) 4:1

57) An electron and a proton enter a magnetic field perpendicularly. Both have same kinetic energy. Which of following statement is true ?

a) Trajectory of electron is less curved b) Trajectory of proton is less curved

c) Both trajectories equally curved d) Both move in straight line.

58) Which of the following particle will experience maximum magnetic force (magnitude) when projected with same velocity perpendicular to a uniform magnetic field

a)electron b) proton c) He^{+} d) Li^{++}

59) A milliammeter range of 10mA has a coil of resistance 1Ω. To use it as a voltmeter of range 10v,the resistance must be connected in series with it is

a) 9 Ω b)99 Ω c)999 Ω d) 1000 Ω

60) With a resistance 'R' is connected in series with a galvanometer of resistance 100Ω, it act as voltmeter of range 0-10V. To double the range a resistance of 1000Ω is to be connected in series with R. Then the value of 'R' is (in Ω)

a) 1100 b)1000 c) 900 d)800

61) A moving charge produces

a) electric field only b) magnetic field only

c) both electric and magnetic fields d) none of them.

62) The resistance of an ammeter is 13Ω and its scale is graduated for a current up to 100 mA. After an additional shunt has been connected to this ammeter it becomes possible to measure 750 mA by this ammeter. The value of shunt resistance is

a)2 Ω b) 0.2 Ω c)2k Ω d)20 Ω

63) When a changed particle moving with a velocity $\vec{v}$ is subjected to a magnetic field of $\vec{B}$, the force on it is non zero, it implies that

a) angle between $\vec{v}$ and $\vec{B}$ either zero or 180^0

b) angle between $\vec{v}$ and $\vec{B}$ is necessarily 90^0

c) angle between $\vec{v}$ and $\vec{B}$ is can have any value other than 90^0

d) angle between $\vec{v}$ and $\vec{B}$ is can have any value other than zero and 180^0

64)The p.d V and current I flowing through an instrument in an AC circuit are given by

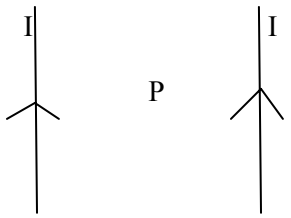
V=5cosωt and I = 2sinωt. Then the power dissipated in the instrument is

a) 0 Watt b) 2.5 Watt c) 5 Watt d) 10 Watt

65) P is a point mid way between two infinite thin straight wires carrying same current as shown in the figure. Field at a point 'P' due to either wire is B. The net field at P due to both the wires is

a) B b) 2B

c) Zero d) B/2



66) A rectangular coil of 300 turns has a average area of 25 cm X 10 cm. The coil rotates with a speed of 50 cps in uniform magnetic field strength of $4X10^{-2}$ T about an axis perpendicular to field. The peak value of the induced emf is (in volt)

a) 300π b) 3000π c) 3π d) 30π

67) When a low flying air craft passes overhead, we sometimes notice a slight shaking of the picture on our TV screen. This is due to

a) diffraction of signal received from the antenna

b) interference of direct signal received by the antenna with the weak signal reflected by the passing air craft

c) change of magnetic flux occurring due to the passage of air craft

d) vibrations created by the passage of air craft

68) The ratio of secondary to the primary turns in a transformer is 3:2 and output power is P. Neglecting the all power losses the input power must be

a) P b) $\frac{P}{2}$ c) $\frac{2p}{3}$ d) $\frac{3p}{2}$

69) The case of a transformer is laminated so as to

a) make it robust and strong
b) increase the secondary voltage
c) reduce the energy loss due to eddy currents
d) make it light weight

70) A hot wire ammeter reads 10 A in an A.C. circuit. The peak value of current is

a) 5π A
b) $10\sqrt{2}$ A
c) $\frac{10}{\sqrt{2}}$ A
d) $\frac{2}{\pi}A$

71) In an A.C circuit the reactance of the coil is $\sqrt{3}$ times its resistance, the phase difference between the voltage across the coil to the current through the coil is

a) $\frac{\pi}{4}$
b) $\frac{\pi}{6}$
c) $\frac{\pi}{2}$
d) $\frac{\pi}{3}$

72) A transformer changes

a) voltage
b) power
c) frequency
d) none of these

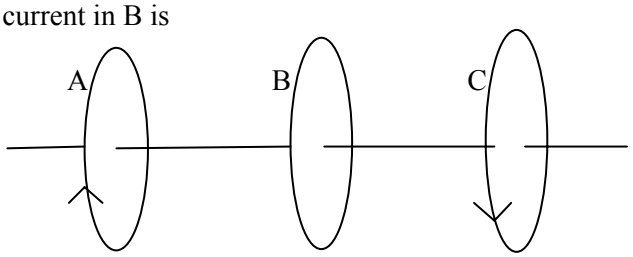
73) The role of self inductance in a circuit is equivalent to

a) Momentum
b) force
c) energy
d) inertia

74) A copper ring having a cut. A bar magnet is dropped through the ring with its length along the axis of the ring. Then the acceleration of the falling magnet is

a) g
b) less than g
c) more than g
d) zero

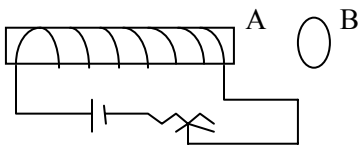
75) Three identical coils A, B and C are placed with their planes parallel to one another. Coils A & C carry currents as shown in the figure. Coils B & C are fixed and A is moved towards B. Then induced current in B is



a) no current induced in B
b) clockwise current induced in B
c) anticlockwise current induced in B
d) current induced only when both the coils move

76) An aluminum ring B faces an electromagnet A. The current 'I' through A can be altered

a) whether I increases or decreases B will not experiences any force
b) if I decrease A will repel B
c) if I increases A will attract B
d) if I increases A will repel B



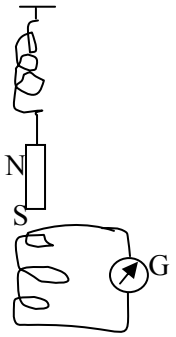
77) A magnet NS is suspended from a spring and while it oscillates, the magnet moves in and out of the coil C. The coil is connected to a galvanometer G. Then as the magnet oscillates

a) G shows no deflection

b) G shows deflection to the left and right but the amplitude steadily decreases

c) G s shows deflection on the left and right with a constant amplitude

d) G shows deflection on one side

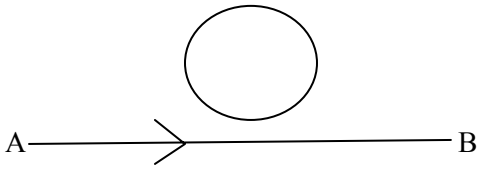


78) A charged particle moves along the line AB which lies in the same plane of a circular loop of conducting wire as shown in the figure, then

a) the current induced will be anticlockwise

b) the current induced will be clockwise

c) no current will be induced in the loop



d) the current induced in the loop will change its directions as the charged particle passes by

79) Two coils have mutual inductance 0.005 H. The current changes in the first coil according to the equation $I=I_0 \sin\omega t$, where $I_0=10$ A and $\omega=100\pi$ rad s^{-1}. The maximum value of emf in the secondary coil (in volt) is

a)2π b) 5π c) π d)4π

80) The resonant frequency of the circuit is f. If the capacitance is made four times of the initial value, then the resonant frequency becomes

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

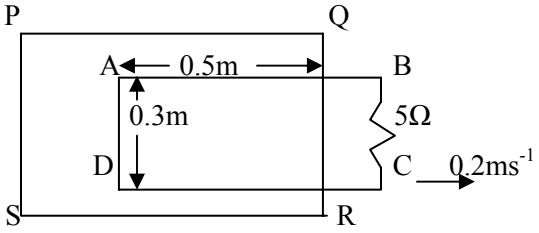
81) A magnet is move towards a coil at rest with a speed v. Due to this there is a induced emf, induced current and induced charge in the coil. If the speed v is doubled, the incorrect statement is

a) emf increases b) current increases c) charge remains same d) charge increases

82) A circuit ABCD is held perpendicular to uniform magnetic field $5X10^{-2}T$ extending over the region PQRS and directed into the plane of the paper. The circuit is pulled out of the field at a uniform speed of 0.2 ms^{-1} in 1.5s. During this time current in 5Ω resistor is

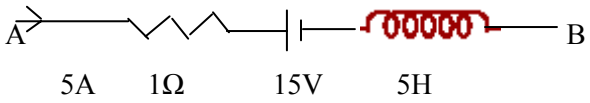
a) 0.6mA from B to C b) 0.9mA from B to C

c) 0.9mA from C to B d)0.6mA from C to B



83) The network shown is a part of a closed circuit in which the current is changing. At an instant, current in it is 5A. Find the potential difference between the points A & B when the current is increasing at $1As^{-1}$

a) 25V b)15V c) 10V d) 20V



84) In the above question when the current is decreasing at the rate of $1As^{-1}$, then p.d. between the points A & B is

a) 25V b)15V c) 10V d) 20V

85) A choke is preferred to resistance for limiting current in AC circuit because

a) choke is compact in size b)choke is good absorber of heat

c) choke is cheap d) there is no wastage of power

86) A transformer is used to light 100W and 110V lamp from 220V mains. If the main current is 0.5A. The efficiency of the transformer is

a)11% b)50% c)80% d)91%

87) A straight line conductor of length 0.4m is moved with a speed of $7ms^{-1}$ perpendicular to magnetic field of 0.9T. The emf induced across the conductor is

a) 5.04V b)1.26V c)2.52V d)25.2V

88) If power factor changes from 0.5 to 0.25,then increase in impedance in AC circuit is

a) 20 % b)50% c) 25% d)100%

89) In an AC circuit, a resistance of R ohm is connected in series with an inductance L. If the phase angle between voltage and current is 45^0,the value of inductive reactance is

a) $\frac{R}{4}$ b) $\frac{R}{2}$ c) R d)can't be found with given data

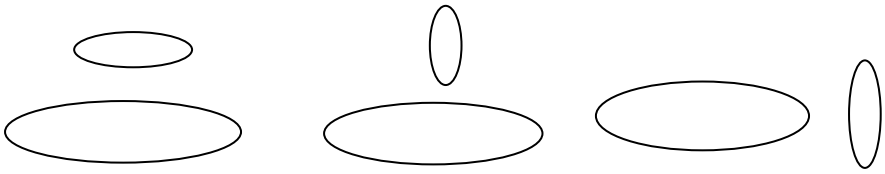
90)Two circular coils can be arranged in any one of the three situations shown in the figure. There mutual inductance will be

a) maximum in (i)

b) maximum in (ii)

c) maximum in (iii)

d) same in all situations



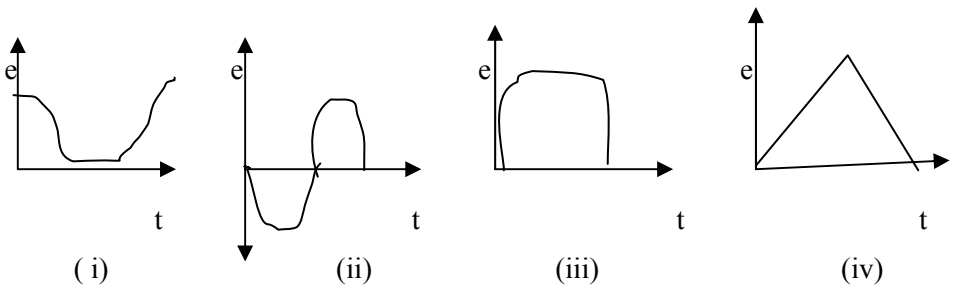
91) The variation of induced emf(e) with time (t) in a coil,if a short bar magnet is moved along its axis with a constant velocity is best represented in

a) i

b) ii

c)iii

d)iv



92) working of a transformer is based on the principle of

a) self inductance b) mutual inductance c) heating effect of current d) chemical effect of current

93) If a current is passed through a spring, then the spring will

a) expand b) compress c) remain same d) none of these

94) An induced emf is produced when a magnet is plunged into a coil. The strength of the induced emf is independent of

a) the strength of the magnet b)number of terms in the coil

c) the resistivity of the wire of the coil d) speed with which the magnet is moved

95) A straight conductor falling vertically downwards with its ends pointing north-south direction, there is

a) an induced current from south to north direction

b) an induced current from north to south direction

c) no induced emf along the length of the conductor

d) an induced emf along the length of the conductor

96) In a step – up transformer

a) $n_s < n_p$ and $V_s > V_p$ b) $n_s > n_p$ and $V_s < V_p$

c) $n_s < n_p$ and $V_s < V_p$ d) $n_s > n_p$ and $V_s > V_p$

97) A current flow in a conductor form east to west. The direction of the magnetic field at a point above the conductor is.

a) towards north b) towards south

c) towards east d) towards west

98) consider the following statements

(A) An emf can be induced by moving a conductor in a magnetic field

(B) An emf can be induced by changing the magnetic field

a) Both A and B are correct b) A is true but B is false

c) A is false but B is true d) Both A and B are false

99) Ferromagnetic material used in transformer must have

a) low permeability and low hysteresis loss b) low permeability and high hysteresis loss

c) high permeability and low hysteresis loss d) high permeability and high hysteresis loss

100) Lenz's is based on the principle of

a) conservation of energy b) conservation of linear momentum

c) conservation of charge d) conservation of angular momentum

101) The materials suitable for making electromagnets should have

a) high retentivity and high coercitity b) low retentivity and low coercitity

c) high retentivity and low coercitity d) low retentivity and high coercitity

102) Which of the following statements is correct ?

a) The core of a transformer is laminated so that the ratio of voltage in the primary and secondary may be increased

b) Power on high voltage is generally transmitted over a long distances using smaller currents

c) In a transformer a large alternating current at low voltage can be transmitted into a small current alternating at high voltage

d) Hot wire ammeter can be used to measure both AC and DC

103) A galvanometer is connected to the secondary coil. The galvanometer shows an instantaneous deflection of 7 divisions when current is started in the primary coil. Now if the primary coil is suddenly rotated through 180^0 , then new instantaneous deflection in galvanometer will be

a) 7 units b) 14 units c) 0 units d) 21 units

104) A charged particle moves through a magnetic field perpendicular to its direction . Then

a) both kinetic energy and momentum of the particle are not constant
b) both kinetic energy and momentum of the particle are constant
c) kinetic energy changes but momentum is constant
d) kinetic energy is constant but momentum changes

105) In an LCR series AC circuit voltage across each of the component is 50volt. Voltage across the combination of LC will be

a) zero b) 50 volt c) 100 volt d) 25 volt