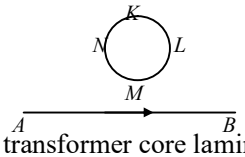
REVISIONAL ASSIGNMENTS FOR CLASS 12 BLOCK TEST 01

Worksheet 1 EMI and AC

One mark questions

1. The magnitude of electric current is increasing from A towards B. If there is any induced current in the loop shown in figure, what will be its direction? (Understanding and Application of Lenz's law)



2. Why is transformer core laminated? (Knowledge and Understanding)
3. In an L-R circuit reactance and resistance are equal. Calculate phase by which voltage differ from current? (Numerical application)
4. For circuits used for transporting electric power, a low power factor implies large power loss in transmission. Explain. (Understanding)
5. Current in a circuit falls from 5 A to 0 A in 0.1s. If an average emf of 200V induced, give an estimate of the self-inductance of the circuit. (Application)

Two marks questions

1. Prove that an ideal capacitor, in an a.c. circuit does not dissipate power.

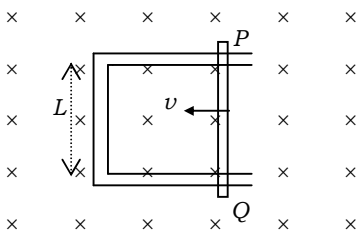
OR

Prove that an ideal inductor, in an a.c. circuit does not dissipate power.

2. Derive an expression for the self-inductance of a long air-cored solenoid of length l and number of turns N.
3. What are eddy currents? Give two applications of eddy currents.

Three marks questions

1. How is the mutual induction of pair of two coils affected when:
   (i) separation between the coils is increased?
   (ii) the number of turns of each coil is increased?
   (iii) a thin iron sheet is placed between the two coils, other factors remaining the same? Explain your answer in each case.
2. A 0.5m long metal rod PQ completes the circuit as shown in the figure. The area of the circuit is perpendicular to the magnetic field of flux density 0.15T. If the resistance of the total circuit is 3 ohm, calculate the force needed to move the rod in the direction as indicated with a constant speed of 2m/s.



3. Derive the expression for the average power dissipation in an a.c. circuit. Hence explain power factor.

OR

Explain the principle and working of an a.c. generator using a suitable labelled diagram. Also deduce the expression for the instantaneous emf.

Five marks question

1. Draw phasor diagram of a series L-C-R circuit. Using it derive an expression for the impedance of the circuit and phase angle between voltage and current when frequency of the source is greater then resonance frequency. Draw the impedance – frequency graph for two different values of resistance of the circuit and interpret it.

OR

What is a transformer. Write the principle of transformer. Draw a sketch diagram and briefly explain its working. Establish the following relation for an ideal transformer.

$$\frac{N_S}{N_P} = \frac{e_S}{e_P}$$

Write about the energy losses in a transformer.

Physics Assignment for class 12

Chapter-9 (Ray Optics)

1. State and derive mirror formula for a concave mirror with the help of suitable ray diagram. State the sign conventions used.

2. A double convex lens is made of glass of refractive index 1.56 has both radii of curvature of magnitude 20cm. If an object is placed at a distance of 10cm from this lens. Find the position of image formed.

3. Explain the phenomenon of total internal reflection. What is the condition for phenomenon? Explain the meaning of critical angle.

4. With the help of a ray diagram , show the formation of image of a point object by refraction of light of a spherical surface separating two media of refractive indices n1 and n2 (n2>n1)respectively. Using this diagram, derive the relation $n2/v - n1/u = (2-n1/R)$.

5. State and prove prism formula.

6. Draw a labelled ray diagram of compound microscope and write an expression for its magnifying power.

7. Describe an astronomical telescope. Derive an expression for its magnifying power when final image is (i) at infinity (ii) at least distance of distant vision.

8. Describe reflecting type telescope. What are its advantage?

Chapter-10 (Wave Optics)

1. Two slits in young's double slit experiment are illuminated by two different sodium lamps emitting light of same wave length. Do you observe any interference pattern on the screen.

2. What is the geometrical shape of the wavefront when a plane wave passes through a convex lens?

3. What type of wavefront will emerge from (i) a point source (ii) distant light source?

4. Prove snell's law of refraction on the basis of Huygen's principle.

5. What is meant by interference of light? Describe briefly young's double slit experiment to demonstrate interference of light.

6. What do you understand by fringe width? Derive an expression for fringe width in interference pattern.

7. What are coherent source of light? Why are coherent sources required to obtain sustained interference pattern.

8. How would resolving power of microscope change on (i) decreasing of wavelength of light (ii) decreasing diameter of objective lens.

9. Distinguish between interference and diffraction of light?

10. What is the phenomenon of polarization? Derive the relation connecting the polarizing angle of a medium and a refractive index.

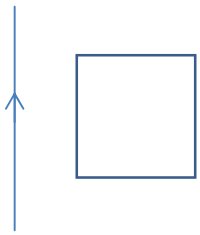
11. How does the angular separation between fringes in single-slit diffraction experiment change when distance of separation between the slit and screen is doubled?

12. How does the fringe width of interference fringes change, when whole apparatus of young's experiment is kept in water (refractive index 4/3)?

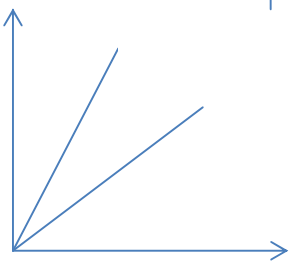
Worksheet 2 EMI and AC

One marks Questions

1. When an alternating current is passed through a moving coil galvanometer, it shows no deflection. Why? (knowledge and understanding)
2. A rectangular loop of wire is pulled to the right, away from the long straight wire through which a steady current I flows upwards. What is the direction of induced current in the loop?



3. A plot of magnetic flux ϕ versus current I is shown in the figure for two inductors A and B. which of the two has larger value of self-inductance?



4. The current flowing through a pure inductor of inductance 4mH is $i = 12 \cos 300t$ ampere. What is the (i) rms (ii) average value of current for a complete cycle?
5. Why are the oscillations of a copper disc in a magnetic field highly damped?

Two marks Questions

1. A solenoid is connected to a battery so that a steady current flows through it. If an iron core is inserted into the solenoid, will the current increase or decrease? Whether the current flowing through the solenoid higher of lower than this value, if instead of a battery, an a.c. source of same effective value would be connected to the solenoid? Also state what type of change in current is observed in this case on insertion of iron core into the solenoid.

2. Define self-inductance of a coil. Show that magnetic energy required to build up the current I in a coil of self-inductance L is given by ½ LI^2.

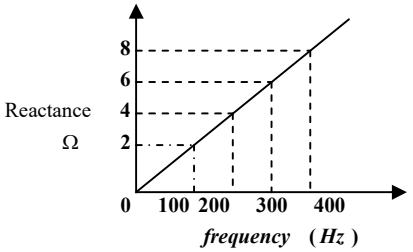
OR

A metallic rod of length 'L' is rotated with angular frequency 'ω' with one end hinged at the centre and the other end at the circumference of a circular metallic ring of radius L, about an axis passing through the centre and perpendicular to the plane of the ring. A constant and uniform magnetic field B parallel to the axis is present everywhere. Deduce an expression for the emf induced between the centre and the metallic ring.

3. An alternating voltage of frequency f is applied across a series LCR circuit. Let f_r be the resonance frequency for the circuit. Will the current in the circuit lag, lead or remain in phase with the applied voltage when (i) $f>f_r$ (ii) $f<f_r$? Explain your answer in each case.

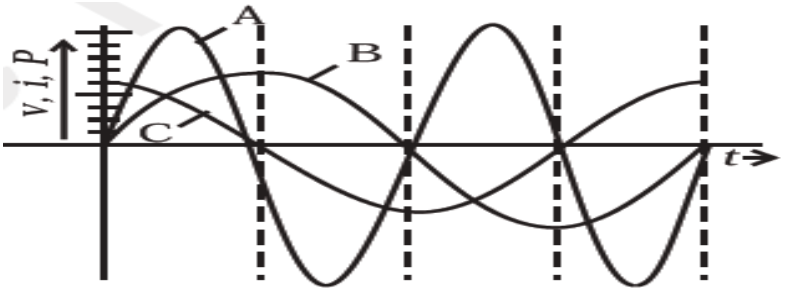
OR

Calculate the inductance of inductor using the following graph.



Three marks questions

1. Using the concept of simple harmonic oscillation obtain expression for the frequency of electromagnetic oscillations in parallel LC circuit. Hence show that the energy remains conserved during these oscillations in an ideal LC circuit.
2. When an inductor L and a resistor R in series are connected across a 12 V, 50 Hz supply, a current of 0.5A flows in the circuit. The current differs in phase from applied voltage by π/3 radian. Calculate the value of R.
3. A device 'X' is connected to an a.c. source. The variation of voltage, current and power in one complete cycle is shown in the figure.
   (a) Which curve shows power consumption over a full cycle?
   (b) What is the average power consumption over a cycle?
   (c) Identify the device 'X'.



OR

When an alternating voltage of 220V is applied across a device X, a current of 0.5A flows through the circuit and in phase with the applied voltage. When the same voltage is applied across another device Y, the same current again flows through the circuit but it leads the applied voltage by $\pi/2$ radians. (i) Name the devices X and Y, (ii) Calculate the current flowing in the circuit when the same voltage is applied across the series combination of X and Y.

Five marks questions

1. (a) Show analytically, that Lenz's law is a consequence of the law of conservation of energy.
   (b) A horizontal straight wire of length L extending from east to west is falling with speed v at right angles to the horizontal component of Earth's magnetic field B.
   (i) Write the expression for the instantaneous value of the e.m.f. induced in the wire.
   (ii) What is the direction of the e.m.f.?
   (iii) Which end of the wire is at the higher potential?

OR

A town is situated 15 km away from a power plant generating power at 440V, requires 800 kW of electric power at 220V. The resistance of the two wire line carrying power is 0.5 ohm per km. The town gets power from the line through a 4000-220V step down transformer at a substation in the town.

(i). Find the line power losses in the form of heat.

(ii). How much power must the plant supply, assuming there is negligible power loss due to leakage?

(iii). Characterize the step up transformer at the plant.

Worksheet 3 EMI and AC

General Instruction:-

1. **Questions 1 to 5 carry 1 mark each.**
2. **Questions 6 to 8 carry 2 marks each.**
3. **Questions 9 to 11 carry 3 marks each.**
4. **Question 12 carries 5 marks.**

1. When is Magnetic Flux linked with surface: (i) maximum (ii) minimum.
2. State Faraday's Laws of EMI and express it mathematically.
3. How does Self Inductance of a coil change when an iron rod is introduced in it?
4. What is the phase angle between current and voltage in AC circuit containing R only?
5. Why does the metallic piece become very hot when it is surrounded by a coil carrying high frequency ac?
6. What is eddy current? Give some of its Application.
7. The turns ratio of a transformer is 12.5. If its primary is connected with ac mains of 220V, determine the voltage obtained across the secondary.
8. How does the self inductance of an air core coil changes when –
   (i) no. of lines in the coil is decreased
   (ii) an iron rod is introduced in the coil
9. A sinusoidal emf E=200 sin 314t is applied to a resistor of 10 Ω resistance, calculate
   (i) RMS value of voltage
   (ii) RMS value of current
   (iii) Power dissipated as heat in watt.
10. Discuss the phenomenon of resonance in LCR series circuit. A capacitor of 15 Ω and 101.5mH inductor are placed in series with a 50 Hz AC source. Calculate the capacity of capacitor if the current is observed in phase with voltage.
11. The area of a coil of 25 turns is 1.6 cm^2. This coil is inserted in 0.3 sec in a magnetic field of 1.8 Wb/m^2 such that its plane is perpendicular to the flux line of the field. Calculate the emf induced in the coil. Also calculate the total charge that passes through the wire, if its resistance is 10Ω.
12. Explain the term 'inductive reactance'. Show graphically the variation of inductive reactance with frequency of the applied alternating voltage. An a.c. voltage $E = E_0 \sin \omega t$ is applied across a pure inductor of inductance L. Show mathematically that the current flowing through it lags behind the applied voltage by a phase angle of $\pi/2$.

OR

Explain the term 'capacitive reactance'. Show graphically the variation of capacitive reactance with frequency of the applied alternating voltage. An a.c. $E = E_0 \sin \omega t$ voltage is applied across a pure capacitor of

capacitance C. Show mathematically that the current flowing through it leads the applied voltage by a phase angle of $\pi/2$.

MAGNETIC EFFECT AND MAGNETISM

Q1.A charged particle moving in a uniform magnetic field penetrates a layer of lead and thereby loses one half of its kinetic energy. How does the radius of curvature of its path change?
Q2. Why diamagnetism is almost independent of temperature?
Q3. Three identical specimens of magnetic materials nickel, antimony and aluminium are kept in a uniform magnetic field. Draw the modification of field lines in each case. Justify your answer.
Q4. How can a moving coil galvanometer be converted into an ammeter? To increase current sensitivity of a moving coil galvanometer by 50% its resistance is increased so that the new resistance becomes twice its initial resistance. By what factor does its voltage sensitivity change?

Q5.Two protons P and Q moving with the same speed enter magnetic fields B1 and B2 respectively at right angles to the field directions. If B2 is greater than B1, for which of the protons P and Q, the circular path in the magnetic field will have a smaller radius?
Q6. a) With the help of a diagram, explain the principle and working a moving coil galvanometer.
b) What is the importance of radial magnetic field and how is it produced.
c) While using moving coil galvanometer as a voltmeter a high resistance in series is required whereas in an ammeter a shunt is used. Why?
Q7. Derive an expression for the magnetic field along the axis of air cored solenoid, using Ampere's circuital law. Sketch the magnetic field lines for a finite solenoid. Explain why the field at exterior is weak while at the interior it is uniform and strong.