

Model Question Paper
ElectroMagnetic Induction and Alternating Current - Part IV

12th Standard

Physics

Reg.No. :

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I. Answer all the Questions.

II. Use blue pen only.

Time : 02:00:00 Hrs

Total Marks : 75

5 x 1 = 5

Section-A

- 1) The maximum value of emf induced by changing the orientation of the coil with the magnetic field
(a) $E_0 = NBA\omega\tau$ (b) $E_0 = NBA.2\pi\omega$ (c) $E_0 = NBA\omega \sin \omega\tau$ (d) $E_0 = NBA \cos \omega\tau$
- 2) When the plane of the coil is parallel to magnetic the emf induced in it is.
(a) $e = 0$ (b) $e = NBA\omega$ (c) $e = E_0 \sin \omega\tau$ (d) $e = NBA \cos \omega\tau$
- 3) The soft iron core in the a.c generator is used to
(a) a) support the coil (b) b) increase the magnetic flux (c) c) both(a) and (b) are wrong (d) d) both(a) and (b) are correct
- 4) The unit of magnetic flux
(a) Weber (b) Telsa.m² (c) N m/A (d) All the above
- 5) The energy stored in an inductor of self inductance ' L '
(a) $\frac{1}{2}L^2I$ (b) $\frac{1}{2}LI_0^2$ (c) $\frac{1}{2}LI_0$ (d) $\frac{1}{2}L^2I_0^2$

Section-B

3 x 3 = 9

- 6) Magnetic field through a coil having 200 turns and cross sectional area 0.04 m^2 changes from 0.1 wb m^{-2} to 0.04 wb m^{-2} in 0.02 s Find the induced emf.
- 7) An aircraft having a wingspan of 20.48 m flies due north at a speed of 40 m s^{-1} . If the vertical component of earth's magnetic field at the place is $2 \times 10^{-5} \text{ T}$, Calculate the emf induced between the ends of the wings.
- 8) A solenoid of length 1m and 0.05 m diameter has 500 turns. If a current of 2A passes through the coil, calculate (i) the coefficient of self induction of the coil.

Section-C

6 x 5 = 30

- 9) A coil is connected across 250 V, 50 Hz power supply and it draws a current of 2.5 A and consumes power of 400 W. Find the self inductance and power factor.
- 10) A bulb connected to 50 V, DC consumes 20 w power. Then the bulb is connected to a capacitor in an a.c. power supply of 250 V, 50 Hz. Find the value of the capacitor required so that the bulb draws the same amount of current.
- 11) An AC voltage represented by $e = 310 \sin 314 t$ is connected in series to a 24Ω resistor, 0.1 H inductor and a $25\mu\text{F}$ capacitor. Find the value of the peak voltage, rms voltage, frequency, reactance of the circuit, impedance of the circuit and phase angle of the current.
- 12) A coil of 100 turns and resistance 100Ω is connected in series with a galvanometer of resistance 100Ω and the coil is placed in a magnetic field. If the magnetic flux linked with the coil changes from 10^{-3} Wb to $2 \times 10^{-4} \text{ Wb}$ in a time of 0.1 s, calculate the induced emf and current.
- 13) Air core solenoid having a diameter of 4 cm and length 60 cm is wound with 4000 turns. If a current of 5A flows in the solenoid, calculate the energy stored in the solenoid.
- 14) a) Calculate the mutual inductance between two coils when a current of 4 A changing to 8 A in 0.5 s in one coil, induces an emf of 50 mV in the other coil.
b) Write the equation of a 25 cycle current sine wave having rms value of 30A.

Section-D

3 x 10 = 30

- 15) Obtain the phase relation between current and voltage in an ac circuit with an inductor only.(Graph not necessary)
- 16) Explain the principle of transformer. Discuss its construction and working.
- 17) Obtain the phase relation between current and voltage in an a.c. circuit with a capacitor only
