

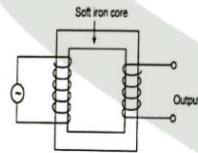
10. a. What is self-inductance of an inductor. Why self-induced emf is called back emf?
 b. Why self-induction is called electrical inertia?
 c. The current in an inductor of self-inductance 40mH is to be increased uniformly from 1A to 11A in 4 millisenconds . What is the emf produced in the inductor during this process? **[100V]**

d. An air-cored solenoid having a diameter of 4cm and a length of 60cm is wound with 4000 turns . Find the inductance of the solenoid. What will be the inductance of the solenoid if it has an iron core of relative permeability 400 ?

f. A plane circular coil has 200 turns and its radius is 0.10m . It is connected to a battery. After switching on the circuit a current of 2A is set up in the coil. Calculate the energy stored in the coil. **[Ans: $1.6 \times 10^{-5}\text{J}$]**

11. Two plane coils having number of turns 1000 and 2000 and radii 5cm and 10cm respectively are placed co-axially in the same plane. Calculate their mutual inductance. **[Ans: 0.099H]**

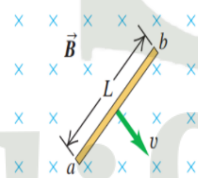
12. The schematic diagram of a transformer is shown in figure. It consists of 500 turns in the primary coil and 100 turns in the secondary coil.



a. What is the output voltage if the input voltage is 4000V ?
 b. A step down transformer transforms a supply line voltage 220V into 100V . Primary coil has 500 turns . The efficiency and power transmitted by the transformer are 80% and 80KW . Find the number of turns in secondary coil and power supplied. **[Ans: $227, 100\text{KW}$]**

13. What are the different power losses in transformer? What measures do you take to minimize these losses?

14. In Fig. alongside a conducting rod of length L moves in a magnetic field of magnitude 0.450 T directed into the plane of the figure. The rod moves with speed 5.00m/sec in the direction shown.



- a. What is the potential difference between the ends of the rod?
 b. Which point, a or b, is at higher potential?
 c. When the charges in the rod are in equilibrium, what are the magnitude and direction of the electric field within the rod?
 d. When the charges in the rod are in equilibrium, which point, a or b, has an excess of positive charge?

e. What is the potential difference across the rod if it moves directly out of the page? **[a. 0.675V , b. end at high p.d. c. $2.25 \frac{\text{V}}{\text{m}}$, d. b point e. 0]**

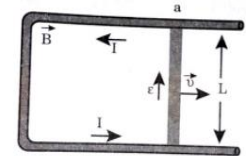
15. A coil of 100 turns each of area $2 \times 10^{-3}\text{ m}^2$ has a resistance of 12Ω . It lies in a horizontal plane in a vertical magnetic flux density $3 \times 10^{-3}\text{ wb/m}^2$. What charge circulates through the coil if its ends are short-circuited and the coil is rotated through 180° about a diametrical axis? **[10^{-4}C]**

16. An aircraft with a wing span of 40m flies with a speed of 1080 Km/hr . in the eastward direction at the constant altitude in northern hemisphere, Find the emf that develops between the tips of wings in following cases:

- a. where the vertical component of earth's magnetic field is $1.75 \times 10^{-5}\text{ T}$. **[0.21V]**
 b. where the horizontal component of earth's magnetic field is $1.6 \times 10^{-5}\text{ T}$ and the angle of dip is 41° . **[0.167V]**

17. In figure, a rod with length 85cm moves in a magnetic field 0.850T the emf induced in the moving rod is 0.620V .

- a. What is the speed of the rod?
 b. If the total circuit resistance is 0.750Ω . What is the induced current?
 c. What force (magnitude and direction) does the field exert on the rod as a result of this current?



18. Predict the direction of induced current in the situations described by the following Figs.

