

CLASS XII
PHYSICS ASSIGNMENT – 5
ELECTROMAGNETIC INDUCTION

1. When current in a coil changes with time, how is the back e.m.f. induced in the coil related to it?
2. Two identical loops one of copper and the other of aluminium are rotated with the same angular speed in some magnetic field. Compare (a) induced e.m.f and (b) the current produced in the two loops.
3. A jet plane is traveling west at 450 ms^{-1} . If the horizontal component of earth's magnetic field at that place $4 \times 10^{-4} \text{ Tesla}$ and the angle of dip is 30° , find the e.m.f. induced between the ends of wings having a span of 30m.
4. A bar magnet is falling under gravity through an air cored coil C. Plot a graph between induced e.m.f E and time t . What does the area enclosed by curve depict?
5. An a.c. generator consists of a coil of 50 turns and area 2.5 m^2 rotating at an angular speed of 60 rad/s in a uniform magnetic field $B = 0.30 \text{ T}$ between two fixed pole pieces. The resistance of the circuit including that of the coil is 500Ω .
 - (a) What is the maximum current drawn from the generator?
 - (b) What is the flux through the coil when the current is zero? What is the flux when the current is maximum?
 - (c) Would the generator work if the coil were stationary and instead the pole pieces rotated together with the same speed as above?
6. A circular coil of radius 8.0 cm and 20 turns is rotated about its vertical diameter with an angular speed of 50 rad/s in a uniform horizontal magnetic field of magnitude $3.0 \times 10^{-2} \text{ T}$. Obtain the maximum and average e.m.f induced in the coil. If the coil forms a closed loop of resistance 10Ω , calculate the maximum value of current in the coil. Calculate the average power loss due to joule heating. Where does the power come from?
7. An air cored solenoid is of length 0.3m, area of cross section $1.2 \times 10^{-3} \text{ m}^2$ and has 2500 turns. Around its central section, a coil of 350 turns is wound. The solenoid and the coil are electrically insulated from each other. Calculate the e.m.f induced in the coil if the initial current of 3A in the solenoid is reversed in 0.25s.