Ch—06 Electromagnetic Induction

Daily Practice Problem 01

Q1. A rectangular loop of area $20\ cm \times 30\ cm$ is placed in a magnetic field of $0.3\ T$ with its plane

(a) normal to the field

(b) inclined 30° to the field and

(c) parallel to the field.

Find the flux linked with the coil in each case.

Q2. A 10Ω resistance coil has 1000 turns and at a time $5.5 \times 10^4\ Wb$ of flux passes through it. If the flux falls to $0.5 \times 10^4 Wb$ in 0.1 second, find the emf generated in volts and the charge flown through the coil in coulombs.

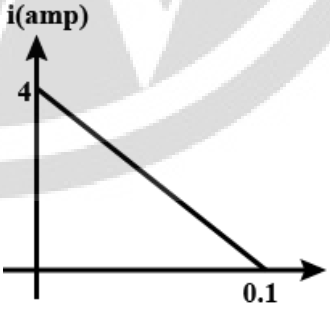
Q3. A magnetic field of flux density $10\ T$ acts normal to a $50\ turns$ coil of $100\ cm^2$ area. Find the emf induced in it if the coil is removed from the field in $1/20\ s$.

Q4. A coil of area $0.04\ m^2$ having 1000 turns is suspended perpendicular to a magnetic field of $5.0 \times 10^{-5}\ Wbm^{-2}$. It is rotated through 90° in $0.2\ s$. Calculate the average emf induced in it.

Q5. A closed coil consists of $500\ turns$ on a rectangular frame of area $4.0\ cm^2$ and has a resistance of 50Ω. It is kept with its plane perpendicular to a uniform magnetic field of $0.2\ Wb\ m^{-2}$. Calculate the amount of charge flowing through the coil when it is turned over (rotated through 180°). Will this answer depend on the speed with which the coil is rotated?

Q6. A coil is placed in a constant and uniform magnetic field of induction $10^{-3}\ Wb/m^2$ acting normal to the plane of the coil. If the radius of a coil decreases steadily at the rate of $10^{-2}\ m/s$, what will be the radius of the coil when the induced e.m.f. in the $1\ \mu V$.

Q7. Some magnetic flux is changed from a coil of resistance $10\ ohm$. As a result an induced current is developed in it, which varies with time as shown in figure. The magnitude of change in flux through the coil in webers is



(a) 2

(b) 4

(c) 6

(d) None of these

Q8. An air-cored solenoid of length $50\,cm$ and area of cross-section $28\,cm^2$ has 200 turns and carries a current of $5.0\,A$. On switching off, the current decreases to zero within a time interval of $1.0\,ms$. Find the average emf induced across the ends of the open switch in the circuit.

Q9. A hundred turns of insulated copper wire are wrapped around an iron cylinder of area $1 \times 10^{-3}\,m^2$ and are connected to a resistor. The total resistance in the circuit is $10\,ohms$. If the longitudinal magnetic induction in the iron changes from $1\,weber\,m^{-2}$, in one direction to $1\,weber\,m^{-2}$ in the opposite direction, how much charge flows through the circuit.

(a) $2 \times 10^{-2}\,C$

(b) $2 \times 10^{-3}\,C$

(c) $2 \times 10^{-4}\,C$

(d) $2 \times 10^{-5}\,C$

Q10. A closed coil having $20\,turns$, area of cross-section $1\,cm^2$ and resistance $2\,ohms$ are connected to a ballistic galvanometer of resistance $30\,ohms$. If the normal of the coil is inclined at $60°$ to the direction of a magnetic field of intensity $1.5\,Wb/m^2$, the coil is quickly pulled out of the field to a region of zero magnetic field, calculate the charge passed through the galvanometer.

ANSWERS

1.(i) $1.8 \times 10^{-2}\ Wb$

(ii) $0.9 \times 10^{-2}\ Wb$

(iii) $zero$

2. $5V;\quad 0.05\ C$

3. $100\ V$

4. $0.01\ V$

5. $1.6 \times 10^{-3}\ C, No$

6. $r = \frac{5}{\pi}\ cm$

7. a

8. $1.4\ V$

9. a

10. $5.0 \times 10^{-5}\ C$