Answer on Question #61809-Physics-Other

You are looking down at a flat coil of 200 turns of wire. It encloses an area of 10.0cm by 10.0cm. This coil is immersed in a uniform magnetic field of 0.500T that penetrates the entire area. The field is pointing up towards you, the observer. The field is then shut off so that it drops to zero in 200.0ms. The resistance in the coil of wire is 25.0Ω.

a) What is the average induced emf?

b) In what direction is the induced magnetic field?

c) What is the direction of the induced current?

d) What is the magnitude of the induced current?

e) What power has been generated in this circuit?

Solution

a)

$$\varepsilon = -NA\frac{\Delta B}{\Delta t} = -200 \cdot 0.1^2 \frac{(0-0.5)}{0.2} = 5.00\ V.$$

b) The field wants to "keep the magnetic field going", so to speak, and thus points towards you.

c) The direction of current which would cause that sort of field in a right-hand-rule coordinate system is anticlockwise.

d)

$$I = \frac{\varepsilon}{R} = \frac{5.00}{25.0} = 0.20\ A.$$

e)

$$P = UI = (5.00)(0.20) = 1.00\ W.$$