Answer on Question #82351, Physics / Electromagnetism

Question:

A solenoid coil.has 10^4 turns of fine insulated conducting wire. The main cross sectional area of the coil is 4000m^2. The magnetic field through the coil changes at a uniform rate of 0.8T to -0.4T in a time of 3s. If the circuit resistance of the coil is 12ohms. Calculate (1).the charge made to pass a cross section of the circuit. (2).the average current (3).the instantaneous current when the magnetic field is zero

Solution:

In accordance with Faraday's law $\mathrm{E} = \frac{d\Phi}{dt}$ and the current $I = \frac{E}{R}$. Then

$q = \int Idt = \int \frac{d\Phi}{Rdt}dt = \frac{\Delta\Phi}{R} = \frac{(B_1 - B_2)SN}{R}$, respectively $q = \frac{1.2 \cdot 4000 * 10^4}{12} = 4MC$.

Again the current $I = \frac{E}{R} = \frac{\Delta BSN}{\tau R} = \frac{1.2 \cdot 4000 \cdot 10^4}{36} = 1.33MA$, this value is the average and the instantaneous current, simultaneously.

The answer:

The charge $q = \frac{1.2 \cdot 4000 * 10^4}{12} = 4MC$

The current $I = \frac{E}{R} = \frac{\Delta BSN}{\tau R} = \frac{1.2 \cdot 4000 \cdot 10^4}{36} = 1.33MA$