Answer on Question 73460, Physics, Electromagnetism

Question:

Coil of 390 turns is wound uniformly over a mica ring. The ring has a mean circumference of $96\,cm$, magnetic field strength of $2535\ A \cdot turns/m$ and a uniform cross-sectional area of $758\,mm^2$. What will be the current through the coil and flux density?

Solution:

a) We can find the current through the coil from the formula:

$$H = \frac{NI}{l},$$

here, H is the magnetic field strength, N is the number of turns, I is the current through the coil and l is the mean circumference of the ring.

Then, from this formula we can calculate the current through the coil:

$$I = \frac{Hl}{N} = \frac{2535\ \frac{A \cdot turns}{m} \cdot 0.96\,m}{390\ turns} = 6.24\ A.$$

b) We can find the magnetic flux density from the formula:

$$B = \mu_0 H,$$

here, B is the magnetic flux density, $\mu_0 = 4\pi \cdot 10^{-7}\ N \cdot A^{-2}$, H is the magnetic field strength.

Then, from this formula we can calculate the magnetic flux density:

$$B = \mu_0 H = 4\pi \cdot 10^{-7}\ N \cdot A^{-2} \cdot 2535\ \frac{A \cdot turns}{m} = 0.003185\ T = 3185\ \mu T.$$

Answer:

a) $I = 6.24\ A$.

b) $B = 3185\ \mu T$.