Answer on Question #71866, Physics / Electromagnetism

Question. A steel ring, having a mean circumference of $750\ mm$ and a cross-sectional area of $500\ mm^2$, is wound with a magnetizing coil of 120 turns. Using the following data, calculate the current required to set up a magnetic flux of $630\ \mu Wb$ in the ring.

Flux density (T)	0.9	1.1	1.2	1.3
Magnetic field strength (A/m)	260	450	600	820

Given.

$l = 750\ mm = 0.75\ m;$

$S = 500\ mm^2 = 500 \cdot 10^{-6}\ m^2;$

$N = 120;$

$\Phi = 630\ \mu Wb = 630 \cdot 10^{-6}\ Wb.$

Find.

$I - ?.$

Solution.

Flux density

$$B = \frac{\Phi}{S} = \frac{630 \cdot 10^{-6}}{500 \cdot 10^{-6}} = 1.26\ T$$

From the given table, when $B = 1.26\ T$, $H \approx 730\ A/m$

Magnetomotive force, $m.m.f. = H \cdot l = N \cdot I$

From which, current,

$$I = \frac{H \cdot l}{N} = \frac{730 \cdot 0.75}{120} = 4.56\ A$$

Answer. $I = 4.56\ A.$