

Topic – Series Magnetic Circuits

1. A 200 turns coil is wound on an iron ring whose mean length is 50 cm with a 1 mm long air gap. Considering the permeability of iron to be 300, the flux density established when the coil is supplied with a current of 1 A will be:

Ans.

$$S_i = \frac{l_i}{A_i \mu_0 \mu_r} = \frac{(50 \times 10^{-2}) - (1 \times 10^{-3})}{A \times 4\pi \times 10^{-7} \times 300} = \frac{1323.6386}{A} \text{ AT/Wb}$$

$$S_g = \frac{l_g}{A_g \mu_0 \mu_{rg}} = \frac{(1 \times 10^{-3})}{A \times 4\pi \times 10^{-7} \times 1} = \frac{795.7747}{A} \text{ AT/Wb}$$

$$S_T = S_i + S_g = \frac{2119.4133}{A} \text{ AT/Wb}$$

$$\phi = \frac{\text{mmf}}{\text{Reluctance}} = \frac{NI}{S_T} = \frac{200 \times 1}{2119.4133/A} = 0.0943657 \times A \text{ Wb}$$

$$B = \frac{\phi}{A} = \frac{0.0943657 \times A}{A} = 0.0943657 \frac{\text{Wb}}{\text{m}^2} = 94.3657 \text{ mWb/m}^2$$