Self Assessment Quiz Transformers

Question 1_1

Question:

- A mild-steel ring having a cross-sectional area of 400 mm2 and a mean circumference of 400 mm has a coil of 200 turns wound uniformly around it. Calculate: the current required to produce a flux of 600 µWb in the ring. [The relative permeability of mild-steel is 400]

Solution:

- A mild-steel ring having a cross-sectional area of 400 mm2 and a mean circumference of 400 mm has a coil of 200 turns wound uniformly around it. Calculate: the current required to produce a flux of 600 µWb in the ring. [The relative permeability of mild-steel is 400]

1. Calculate the permeability

$$\mu = \mu_0 \mu_r = 4\pi \times 10^{-7} \times 400 = 5 \times 10^{-4} H/m$$

2. Find the Reluctance (S)

$$S = \frac{\text{path length}}{\mu \times \text{Area}} = \frac{400 \times 10^{-3}}{5 \times 10^{-4} \times 400 \times 10^{-6}} = 2 \times 10^6 \text{ AT/Wb}$$

3. We can now find the MMF (F)

$$\text{Flux } (\Phi) = \frac{F}{S}$$

So: $F = 600 \times 10^{-6} \times 200 \times 10^6 = 1200$ AT (Ampere Turns)

4. Now we can find I:

$$I = \frac{F}{N} = \frac{1200}{200} = 6 \text{ A}$$