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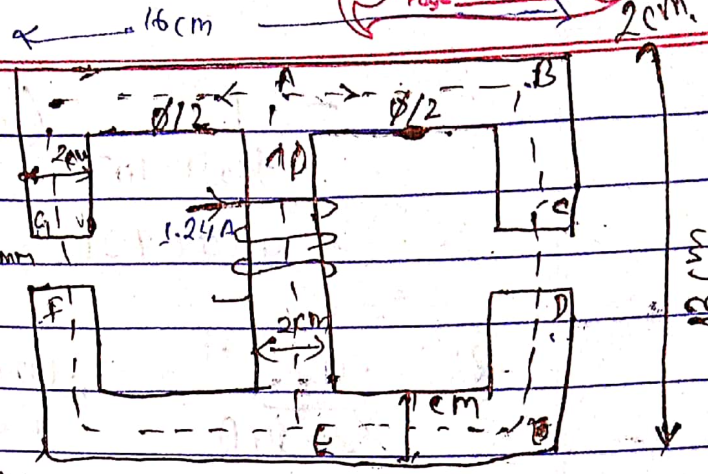

Q5

In the magnetic ckt. shown, fig.
(i) total reluctance of the magnetic ckt
(ii) value of flux linking the coil.
Assume that the relative permeability of the magnetic material is 800.
The exciting coil has 1000 turn & carries a current of 1.25 A.

⇒ Solⁿ.

Step 1

$$l_1 = l_2 = l_{AH} + l_{HG} +$$
$$= 7 + 4.9 + 4.9 + 7$$
$$= 23.8 \text{ cm}$$

$$l_3 = l_{AE}$$
$$= (12-1-1) = 10 \text{ cm}$$

$$A = 2\text{cm} \times 2\text{cm}$$
$$= 4\text{cm}^2$$

Step 2

$$\text{mmf} = NI$$
$$= 1000 \times 1.25$$
$$= 1250 \text{ AT}$$

Step 3

$$R_2 = R_1 = R_{metal} + R_{air}$$
$$= \frac{l_1}{\mu_0\mu_r A} + \frac{l_g}{\mu_0 A}$$
$$= \frac{1}{\mu_0 A}\left(\frac{23.8\times10^{-2}}{800} + 2\times10^{-3}\right)$$

$$= \frac{1}{\mu_0 \, 4\times10^{-4}} \left(\frac{23.8\times10^{-2}}{800} + 2\times10^{-2} \right)$$

$$= 457073\,1.0.22 \text{ AT/wb}$$

$$R_3 = \frac{l_3}{\mu_0 \mu_r A} = \frac{10\times10^{-2}}{\mu_0 \times 800\times4\times10^{-4}}$$

$$= 248679.59 \text{ AT/wb}$$

again

$$mmf = \phi R$$

$$R = \frac{125.0}{2.48\times10^{-3}}$$

$$=$$

Total reluctance is

$$R_T = R_1 \parallel R_2 + R_3$$

$$= \frac{R_1 \times R_2}{R_1 + R_2} + R_3$$

$$= \frac{R_1}{2} + R_3$$

$$= 2534045.11 \text{ AT}$$

Similarities

Magnetic circuit	Electric circuit.
(i) The close path for the magnetic flux is called magnetic circuit.	(i) The ~~e~~close path for the electric current is called electric circuit.
ii) flux (ϕ) = mmf / reluctance.	(ii) Current (I) = emf / Resistance
iii) The no. of magnetic lines of force decide the magnetic flux	iii) Flow of electron decide the current passing through the conductor.
iv) MMF measured in Amp. Turns (AT).	iv) EMF measured in volts (V).
(v) Flux density (B) = ϕ/A (wb/m^2)	(v) Current density (J) = I / A (A/m^2)
(vi) Magnetic Intensity (H) = NI/l (AT/m)	(vi) Electric Intensity (E) = V/d (V/m).

Dissimilarities

Magnetic circuit	Electric Circuit
(i) There is no magnetic insulator as flux can pass through all the materials even through the air as well. For magnetic flux there is no perfect insulator.	(i) There are many materials which used as insulators from which current cannot pass ie. air, PVC, glass etc.
(ii) Magnetic flux does not flow but it set up in the magnetic circuit	(ii) The electric current actually flow in an electric circuit.
(iii) At constant temp., the reluctance (S) of a magnetic circuit is not constant but is not constant but varies with (μ_r).	(iii) At constant temp., the resistance of an electric circuit is constant are its value depends on resistivity which is almost constant.
(iv) Once magnetic flux is setup in a magnetic circuit, no energy needed	(iv) Energy needed as long as current flows through electric circuit