Tut Sheet - 02

Q-1 $N = 500$ $R = 4\Omega$ $d_m = 0.25\,m$ $a = 700\,mm^2$

$= 700 \times 10^{-6}\,m^2$

$\phi = ?$

$V = 6V$ $\mu_r = 550$

$\phi = \frac{NI}{S}$

$I = \frac{V}{R} = \frac{6}{4} = \frac{3}{2}$ $S = \frac{l_m}{\mu_0 \mu_r a}$ $l_m = \pi d_m$

$= 0.785$

$S = \frac{0.785}{4\pi \times 10^{-7}(0.785) \times 7 \times 10^{-8}\,m^2}$ $= \frac{0.785}{12.56 \times 10^{-7}(0.785)(550) \times 7 \times 10^{-8}}$

$= \frac{0.785}{48356 \times 10^{-7} \times 10^{-8}} = 0.0000162$ 1.62×10^{-5}

OR

$B = \mu H$

$\frac{\phi}{a} = \frac{\mu_0 \mu_r NI}{l}$ $\phi = \frac{\mu_0 \mu_r NIa}{l}$

$\frac{4 \times 3.14 \times 10^{-7}(550)(500)\frac{3}{2} \times 7 \times 10^{-8}}{0.785} = \frac{362670000 \times 10^{1}}{0.785}$

462×10^{6} $= 462,000,000$

Q2- $l_m = 30\,cm$ $N = 200$ $I = 2A$ $a = 12\,cm^2$ $= 12 \times 10^{-4}\,m^2$

$\mu_r = 1000$ ϕ

$$\phi = \frac{\mu_0 \mu_r N I a}{l} = \frac{4\pi \times 10^{-7} \times 1000 \times 200 \times 2 \times 12 \times 10^{-4}}{94.2}$$

$$= \frac{60,288,000 \times 10^{-3}}{94.2}$$

$$= 640,000 \times 10^{-3}$$

$$= 64 \times 10^{7}$$

Q3- $a = 15 \times 20\ mm^2$

$= 300 \times 10^{-6}\ m^2$

$l_m = 18\,cm$

$= 18 \times 10^{-2}\,m$

$N = 300$ $\mu_r = 940.$

$I = .7\,A$

(i) $H = ?$ (ii) $B = ?$ (iii) $S = ?$ (iv) $\phi = ?$

$$H = \frac{NI}{l} = \frac{300 \times 0.7}{18 \times 10^{-2}} = \frac{270}{18 \times 10^{-2}} = 11.66 \times 10^{2}\ A/m$$

$$B = \mu H = 940 \times 11.66 = 10960.4 \times 10^{-2}\ T$$

$$1.37$$

$$S = \frac{l}{\mu a} = \frac{l}{\mu_0 \mu_r a} = \frac{18 \times 10^{-2}}{4 \times 3.14 \times 10^{-7} (940) \times 300 \times 10^{-6}}$$

$$\frac{18 \times 10^{-2}}{3541920 \times 10^{1}} = .508$$

$$0.000005 \times 10^{1}$$

$$.508 \times 10^{-6}$$

(iv) $\phi = B \cdot a$ $\quad 1 \times 0960.4 \times 10^{-2} \cdot 300 \times 10^{-6}$

$= 3285.90$

330×10^{-6} $\quad 911 \times 10^{-4}$ wb

84- $d_m = 10cm$

$= 10 \times 10^{-2}$ m

$N = 2000$

$I = 0.25$ A

$B = 0.4$ T

(i) $H = ?$

(ii) $\mu_r = ?$

$l = \pi d_m$

$= 31.4 \times 10^{-2}$

(i) $H = \frac{NI}{l} = \frac{2000 \times 0.25}{31.4 \times 10^{-2}} = \frac{500}{31.4 \times 10^{-2}}$

$= 15.92 \times 10^{-2}$

(ii) $B = \mu H$

$= \mu_0 \mu_r H$

$\mu_r = \frac{B}{\mu_0 H} = \frac{0.4}{4 \times 3.14 \times 10^{-7} \times 15.92 \times 10^{-2}} = \frac{0.4}{200.2069 \times 10^{5}}$

$= 0.00199 \times 10^{5}$

1.99×10^{8}