3/7/21

Ch-4 Home assignment

1) Field due to ring at O = O

Due to semi infinite coil ab

$$B_{ab} = \frac{\mu_0 I}{4\pi a}(\sin\theta_1 + \sin\theta_2)$$

$$= \frac{\mu_0 I}{4\pi a}(\sin\theta + \sin 90)$$

$$= \frac{\mu_0 I}{4\pi a} = 10^{-7} \times \frac{5A}{5\times10^{-2}m} = 1\times10^{-5}\ T$$

Similarly $B_{cd} = 1\times10^{-5}\ T$

$B_{net} = B_{ab} + B_{cd} = 2\times10^{-5}\ T$

2) B line current $= \frac{\mu_0 I}{2\pi r}$ — (1)

B circular current $= \frac{\mu_0 I}{2r}$

$$B_{net} = \left(\frac{\mu_0 I}{2\pi r} + \frac{\mu_0 I}{2r}\right)$$

$$= \frac{\mu_0 I}{2r}\left(1 + \frac{1}{\pi}\right)$$

3) $B = \frac{\mu_0 I \theta}{4\pi R}$

$B_1 = \left(\frac{\theta}{2\pi}\right)\left(\frac{\mu_0 I}{2a}\right)$

$B_2 = \left(\frac{\theta}{2\pi}\right)\left(\frac{\mu_0 I}{2b}\right)$

$B = B_1 - B_2$

$= \frac{\mu_0 i \theta (b-a)}{4\pi ab}$ coming out of the plane

4) Radius = R

$I_p = I_A$

$I_q = \sqrt{3} A$

$B_p = \frac{\mu_0 N 1}{2R}$

$B_Q = \frac{\mu_0 N 1 \sqrt{3}}{2R}$

$B = \sqrt{B_p^2 + B_Q^2}$

$= \sqrt{\left(\frac{\mu_0 N I}{2R}\right)^2 + \left(\frac{\mu_0 N I \sqrt{3}}{2R}\right)^2} = \frac{\mu_0 N I}{2R}\sqrt{1+3} = \frac{\mu_0 N I}{R}$

5] $B = \frac{\mu_0}{4\pi} \cdot \frac{2\pi I a^2}{(a^2+n^2)^{\frac{3}{2}}}$

$B_1 = B_2 = \frac{\mu_0}{4\pi} \frac{2\pi I a^2}{(a^2+x^2)^{3/2}}$

$B_{net} = \sqrt{B_1^2 + B_2^2}$

$= \frac{\mu_0}{4\pi} \cdot \frac{2\pi \sqrt{2} I a^2}{(a^2+x^2)^{3/2}}$