TUTORIAL 7

Ques 1. (a) For the boundary between two magnetic media, show that the boundary conditions on the magnetization vector are,

$$\frac{M_{1t}}{\chi_{m1}} - \frac{M_{2t}}{\chi_{m2}} = K \qquad \text{and} \qquad \frac{\mu_1}{\chi_{m1}} m_{1n} = \frac{\mu_2}{\chi_{m2}} M_{2n}$$

(b) If the boundary is not current free, show that, we obtain

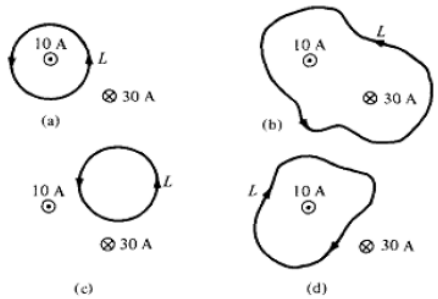
$$\frac{\tan\theta_1}{\tan\theta_2} = \frac{\mu_1}{\mu_2}\left[1 + \frac{K\mu_2}{B_2 \sin\theta_2}\right]$$

Ques 2. If $\mu_1 = 2\ \mu_o$ for region 1($0 < \phi < \Pi$) and $\mu_2 = 5\mu_o$ for region 2 ($0 < \phi < 2\ \Pi$) and $B_2 = 10a_\rho + 15a_\phi - 20a_z$ mWb/m^2. Calculate: (a) B_1 (b) the energy densities in the two media.

Ques 3. A unit normal vector from region 2 ($\mu = 2\ \mu_o$) to region 1($\mu = \mu_o$) is $a_{n21} = (6a_x + 2a_y - 3a_z)/7$. If $H_1 = 10a_x + a_y + 12a_z$ A/m and $H_2 = H_{2x}a_x - 5a_y + 4a_z$ A/m, determine
(a) H_{2x}
(b)The surface current density K on the interface
(c)The angles $B_1$and B_2 make with the normal to the interface.

Ques 4. If $H = y\,a_x - x\,a_y$ A/m on plane z = 0,
(a) determine the current density and
(b) verify Ampere's law by taking the circulation of H around the edge of the rectangle Z=0, $0 < x < 3, -1 < y < 4$.

Ques 5. For the currents and closed paths of Figure, calculate the value of $\oint_L H.dl$



Ques 6. A conductor of radius a carries a uniform current with $J = Jo\ a_z$. Show that the magnetic vector potential for $\rho > a$ is

$$\mathbf{A} = -\frac{1}{4}\mu_o J_o \rho^2 \mathbf{a}_z$$