



Lecturer: Dr. Darwish Abd-El-Aziz
T.A. : Eng. Wael Abd Ellatif

Electromagnetics
Course # EC341
Term: 6th

Sheet (7)

1. Find the force of translation on a square conductor current loop when immersed in the B -field of a current carrying filamentary conductor of infinite length along the z -axis, as shown in **(Fig. 1)** $I_1 = 10\text{A}$ and $I_2 = 50\text{A}$.
2. Two infinite conductor sheets carry surface currents J_s in opposite directions parallel to yz -plane. If $J_s = 5 \hat{a}_y \text{ A/m}$ and the separation $d = 1\text{mm}$. Find the force of translation per square meter.
3. An infinite slab of magnetic material fills the space between two infinite and parallel conduct current sheets, with $J_s = 2 \hat{a}_x \text{ A/m}$ at $z = 0.01$ and $J_s = -2 \hat{a}_x \text{ A/m}$ at $z = -0.01$. Find \overline{H} , \overline{B} , \overline{M} and χ_m everywhere when $\mu_r = 3$ for the magnetic material. Assume that $\mu_r = 3$ for the magnetic material. Assume that $\mu_r = 1$ for $|z| > 0.01$.
4. A conductor lies along the z -axis at $-1.5 \leq z \leq 1.5$ and carries a fixed current of 10A in the $-\hat{a}_z$ direction. For a field $B = 3 \times 10^{-4} e^{-0.2x} \hat{a}_y \text{ T}$. Find the work and power required to move the conductor with constant speed to $x = 2\text{m}$, $y = 0$ in $5 \times 10^{-3} \text{ S}$.
5. Find the work required to move the conductor shown in **(Fig. 2)**, one full turn in the positive direction if:
$$B = B_0 \hat{a}_\phi \text{ T, and the length of the conductor is } L.$$
6. In region #1 as shown in **(Fig. 3)**, $B_1 = 1.2 \hat{a}_x + 0.8 \hat{a}_y + 0.4 \hat{a}_z \text{ T}$, Find \overline{H}_2 , θ_1 and θ_2 .
7. A conductor of length L lies along x -axis with current I in the $+x$ direction. Find the work done in turning it at constant speed to be along y axis, as shown in **(Fig. 4)**, if the uniform field is $\overline{B} = B_0 \hat{a}_z \text{ T}$.

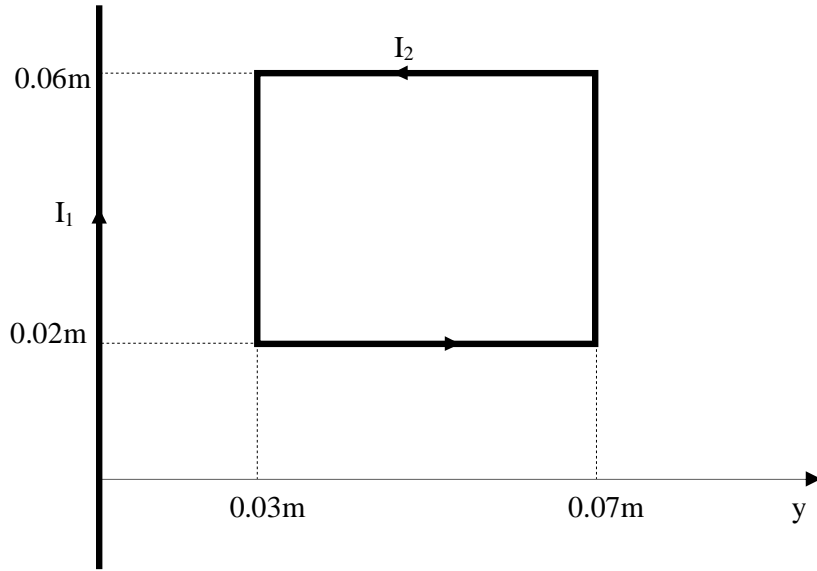


Fig. 1

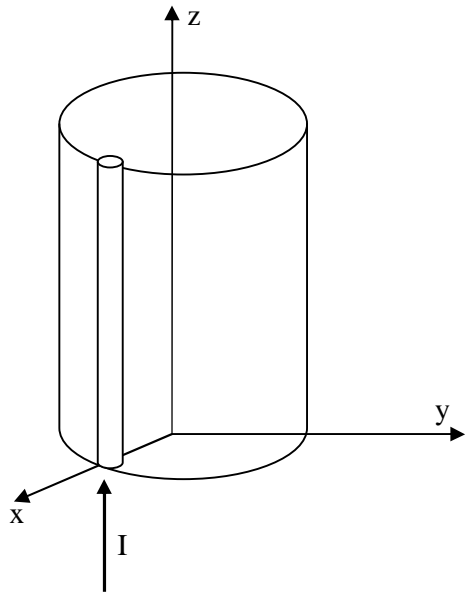


Fig. 2

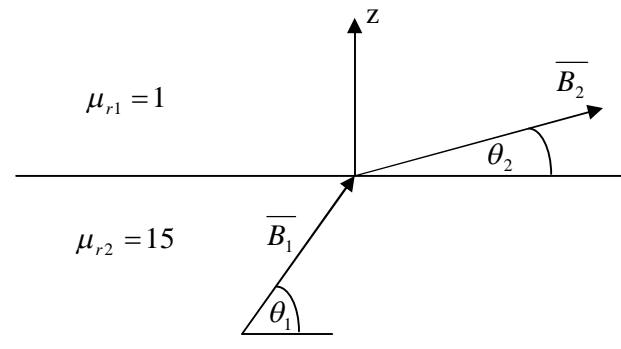


Fig. 3

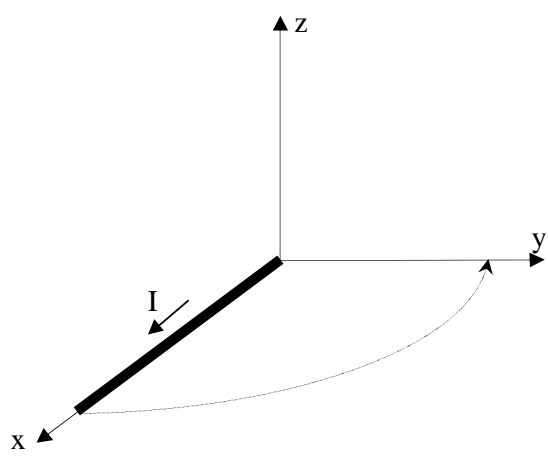


Fig. 4