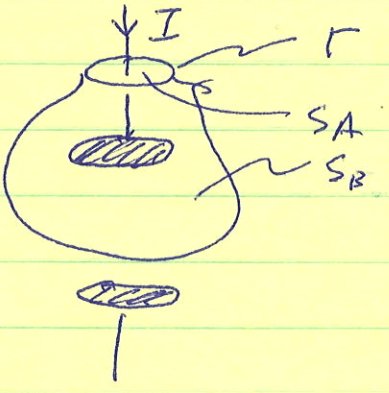
Phy 482 — Exam 2

Solutions and Grading Key

(1)



$$\nabla \times \vec{B} = \mu_0 \vec{J} + \mu_0 \epsilon_0 \frac{\partial \vec{E}}{\partial t}$$

$$\int_{S_A} \nabla \times \vec{B} \cdot d\vec{A} = \mu_0 \int_{S_A} \vec{J} \cdot d\vec{A} + 0$$

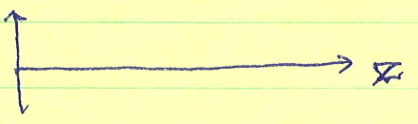
$$= \mu_0 I$$

$$\int_{S_B} \nabla \times \vec{B} \cdot d\vec{A} = 0 + \mu_0 \epsilon_0 \frac{d}{dt} \int_{S_B} \vec{E} \cdot d\vec{A}$$

$$= \mu_0 I \qquad \int_{S_B} \vec{E} \cdot d\vec{A} = Q/\epsilon_0$$

5 points

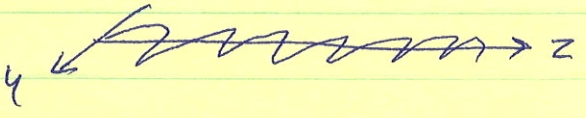
(2)



$$\vec{E} = \hat{i} E_0 \sin(kz - \omega t)$$

$$E_0 = 17 \text{ V/m}$$

(A) $\vec{B} = \hat{j} \frac{E_0}{c} \sin(kz - \omega t)$



$$B_0 = \frac{E_0}{c} = 5.67 \times 10^{-8} \text{ T}$$

5 points

(B) Intensity = $S_{average}$ where $\vec{S} = \vec{E} \times \vec{B} / \mu_0$.

$$\text{Intensity} = \frac{E_0^2}{\mu_0 c} \cdot \frac{1}{2} = 0.385 \text{ W/m}^2$$

5 points