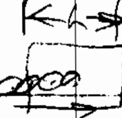
EE 333 . Sample Test 3

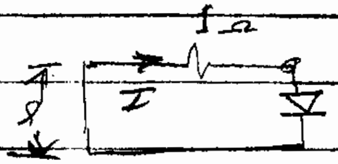


1. $\frac{B}{z} = \mu_0 J_s$; $W_m = \pi a^2 L\left(\frac{\mu_0 J_s^2}{2}\right)$ for length L ; $H_z L = J_s L$

$$F_\rho = \frac{\partial W_m}{\partial a} = \pi a L \mu_0 J_s^2 \; ; \; \therefore \; F_\rho/m^2 = \frac{\pi a L \mu_0 J_s^2}{2\pi a L} = \boxed{\frac{\mu_0 J_s^2}{2}}$$

for length L

2. a)



b) $V = \int \bar{E}\cdot d\bar{l} = \int \bar{u}\times\bar{B}\cdot d\bar{l}$

$V = uB\ell$ ∴ $\boxed{I = \frac{uB\ell}{1}}$

3. must be multiple of $\lambda/2$

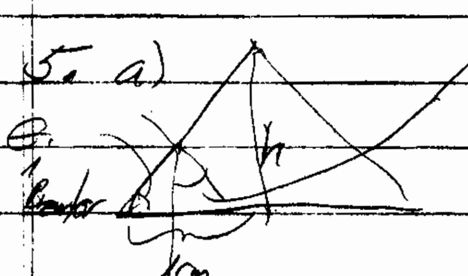
$$\beta\lambda = 2\pi = \lambda\omega\sqrt{\mu\epsilon} = \omega\frac{\sqrt{\epsilon_r}\,\lambda}{3\times10^8} \; ; \; \lambda = \frac{3\times10^8\times2\pi}{\omega\sqrt{\epsilon_r}}$$

$$\lambda = \frac{3\times10^8}{f\sqrt{\epsilon_r}} = \frac{3\times10^8}{10^9\sqrt{9}} = 10^{-1}\,m = 10\,cm$$

∴ radome thickness = 5 cm would work

4. Tangential $\bar{E}$ and $\bar{H}$ are continuous

5. a)



θ_i = Brewster angle

$$\frac{h}{1\,cm} = \tan\theta_{Brewster} = \sqrt{\frac{\epsilon_0}{\epsilon}} = \sqrt{\frac{1}{2}}$$

so $\boxed{h = 1\times\sqrt{\frac{1}{2}} = 0.707\,cm}$

b) $\bar{E}$ perpendicular to paper!

Answers not guaranteed! done in a hurry