Second Midterm Make Up Exam

PHY 5347

April 15, 2004

SHOW ALL WORK TO GET FULL CREDIT!

Problem 1: Consider a resonant cavity made of material of very high conductivity with dimensions a, b, and c in the x, y and z directions.

a) What are the resonant frequencies of this system in the TE and TM modes? (35 points)

b) What are the respective longitudinal fields for these resonances in the TE and TM modes(35 points)

c) Find the transverse fields for the lowest TM mode. (30 points)

Hint: For the TM mode:

$$\vec{E}_t = \frac{1}{\gamma^2}\vec{\nabla}_t \frac{dE_z}{dz},$$

$$\vec{H}_t = \frac{i\epsilon\omega}{\gamma^2}\hat{z} \times \vec{\nabla}_t E_z.$$