

EEL 3473 HOMEWORK #8  
DUE: FRIDAY, NOVEMBER 13, 2009

Ulaby,      pg 356      -      Q. 8.8 – 8.11  
                 pg 361      -      Q. 8.12 – 8.13  
                 pg 371      -      Problems: 8.35, 8.36, 8.37

Problem: Show that the phasor wave equation

$$\nabla^2 \vec{E} + \omega^2 \mu \epsilon \vec{E} = 0$$

is satisfied by the electric fields of the  $TM_{mn}$  rectangular waveguide modes

$$\text{where } k_x = \frac{m\pi}{a}, k_y = \frac{n\pi}{b}, \beta^2 = \omega^2 \mu \epsilon - k_c^2, k_c^2 = \left(\frac{m\pi}{a}\right)^2 + \left(\frac{n\pi}{b}\right)^2 = k_x^2 + k_y^2,$$

and

$$\vec{E} = \hat{x} E_{x0} \cos k_x x \sin k_y y e^{-j\beta z} + \hat{y} E_{y0} \sin k_x x \cos k_y y e^{-j\beta z} + \hat{z} E_{z0} \sin k_x x \sin k_y y e^{-j\beta z}$$