EE 382 Applied EM Quiz #7 (Spring 2018)

Name Key A

Instructions: Open book. Place answers in indicated spaces and **show all work for credit.**

A uniform plane wave, oscillating at 440 MHz, is propagating through air when it encounters a glass window ($\mu_r = 1$, and $\varepsilon_r = 8$) at normal incidence. Find the intrinsic impedance of the air & glass, reflection coefficient, transmission coefficient, and standing wave ratio in the air.

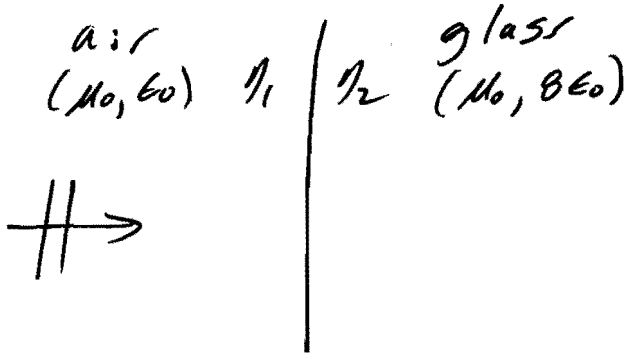
$$\eta_{air} = \eta_0 = \sqrt{\frac{\mu_0}{\epsilon_0}} = \sqrt{\frac{4\pi \times 10^{-7}}{8.8541878 \times 10^{-12}}} = 376.7303\,\Omega = \eta_1$$

$$\eta_{glass} = \sqrt{\frac{\mu_0}{8\epsilon_0}} = \frac{\eta_0}{\sqrt{8}} = \frac{376.7303}{\sqrt{8}} = 133.1943\,\Omega = \eta_2$$

$$\Gamma = \frac{\eta_2 - \eta_1}{\eta_2 + \eta_1} = \frac{133.1943 - 376.7303}{133.1943 + 376.7303} = -0.47759$$

$$\tau = \frac{2\eta_2}{\eta_2 + \eta_1} = \frac{2(133.1943)}{133.1943 + 376.7303} = 0.52241$$

$$S = \frac{1 + |\Gamma|}{1 - |\Gamma|} = \frac{1 + 0.47759}{1 - 0.47759} = 2.8284$$



intrinsic imp.air = 376.7303 Ω intrinsic imp.glass = 133.1943 Ω

reflection coefficient = −0.4776 transmission coefficient = 0.5224

standing wave ratio in the air = 2.8284

EE 382 Applied EM Quiz #7 (Spring 2018)

Name Key B

Instructions: Open book. Place answers in indicated spaces and **show all work for credit.**

A uniform plane wave, oscillating at 640 MHz, is propagating through air when it encounters a glass window ($\mu_r = 1$, and $\varepsilon_r = 6$) at normal incidence. Find the intrinsic impedance of the air & glass, reflection coefficient, transmission coefficient, and standing wave ratio in the air.

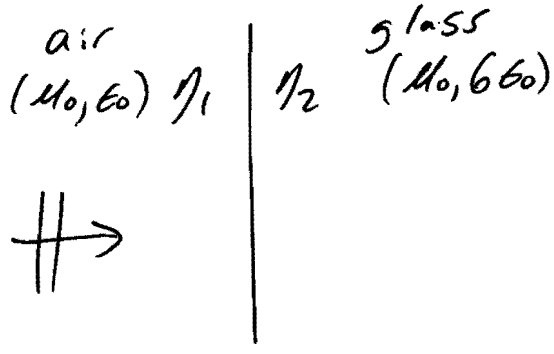
$$\eta_{air} = \eta_0 = \sqrt{\frac{\mu_0}{\varepsilon_0}} = \sqrt{\frac{4\pi \times 10^{-7}}{8.854187878 \times 10^{-12}}} = 376.7303\,\Omega = \eta_1$$

$$\eta_{glass} = \sqrt{\frac{\mu_0}{6\varepsilon_0}} = \frac{\eta_0}{\sqrt{6}} = 153.7995\,\Omega = \eta_2$$

$$\Gamma = \frac{\eta_2 - \eta_1}{\eta_2 + \eta_1} = \frac{153.7995 - 376.7303}{153.7995 + 376.7303} = -0.4202$$

$$\tau = 1 + \Gamma = \frac{2\eta_2}{\eta_2 + \eta_1} = \frac{2(153.7995)}{153.7995 + 376.7303} = 0.5798$$

$$S = \frac{1 + |\Gamma|}{1 - |\Gamma|} = \frac{1 + 0.4202}{1 - 0.4202} = 2.4495$$



intrinsic imp.air = 376.7303 Ω intrinsic imp.glass = 153.7995 Ω

reflection coefficient = −0.4202 transmission coefficient = 0.5798

standing wave ratio in the air = 2.4495