The exam will be in two parts: part 1 will be closed book and notes, and will test knowledge of definitions and derivations; part 2 will be similar to the homework problems and examples in the text. The text covers the reading assignments in chapter 3 and 5, lecture material, and hw 1-4. For part 2, the student will need a calculator, and will be allowed one 8.5x11 sheet of notes. Paper will be provided.

Review for exam 2: EE 324 11/19/03. Passed out, available on web covers chapter 3 material (up to "Static Fields" p.3/3).

Normal-incidence Plane Wave Reflection and Transmission at Plane Boundaries (Chaps 5)

Assumptions: linear, isotropic media; TEM, linear polarization; sinusoidal steady-state

Using phasors

\[
\hat{E}_1(3) = \left(\frac{E_{m1} e^{-j\beta_1 d} + E_{m1} e^{j\beta_2 d}}{j \varepsilon_0 \mu_0}\right) e^{j \omega t} \hat{x}
\]

and

\[
\hat{H}_1(3) = \left(\frac{H_{m1} e^{-j\beta_1 d} - H_{m1} e^{j\beta_2 d}}{j \varepsilon_0 \mu_0}\right) e^{j \omega t} \hat{y}
\]

Note: \(\varepsilon_0\) = \(\mu_0\) = \(\varepsilon_0\) = \(\mu_0\) (complex)

\[
\hat{E}_2(3) = \frac{\varepsilon_2}{\varepsilon_1} \hat{E}_1(3)
\]

Total field impedance

\[
\frac{\hat{E}_i(3)}{\hat{H}_i(3)} = \frac{\varepsilon_1}{\mu_1}
\]

Reflection coefficient at z = \(\beta_1 d\)

\[
\hat{r}_i(3) = \frac{E_{m2} - E_{m1} e^{-j\beta_1 d}}{E_{m1}}
\]

Transmission coefficient

\[
\hat{t}_i(3) = \frac{E_{m2} - E_{m1} e^{j\beta_1 d}}{E_{m1}}
\]

Boundary condition for \(\rho_0 = 0\)

\[
\hat{A}_1(0) = \hat{A}_2(0)
\]

Where \(\rho_0\) is boundary

Special case of one boundary

Transmission coefficient

\[
\hat{t}_1 = \frac{E_{m2}}{E_{m1}} = \frac{\varepsilon_2 - \varepsilon_1}{\varepsilon_2 + \varepsilon_1}
\]

Perfect conductor for \(\rho_0\) and parallel dielectric for \(\rho_1\): \(\varepsilon_0 = \mu_0\), \(\varepsilon_1 = 0\)

\[
\hat{A}_1(0) = 0 \quad \hat{A}_2(0)
\]

Standing wave in \(\rho_0\)

\[
\hat{E}_1(3) = \varepsilon_0 e^{j\beta_1 d} \sin \omega t \hat{x}
\]

\[
\hat{H}_1(3) = \frac{\varepsilon_0 e^{j\beta_1 d} \cos \omega t}{\mu_0} \hat{y}
\]

Where \(\hat{A}_1(0) = 0\) and \(\hat{A}_2(0) = 0\)