

EE6311 Fall 2009 Homework #2; Pozar Chapter 3

- 3.4 Compute the TE_{10} mode attenuation, in dB/m, for K -band waveguide operating at $f = 20$ GHz. The waveguide is made from brass, and is filled with a dielectric material having $\epsilon_r = 2.2$ and $\tan \delta = 0.002$.
- 3.19 Design a stripline transmission line for a 70Ω characteristic impedance. The ground plane separation is 0.316 cm, and the dielectric constant of the filling material is 2.20 . What is the guide wavelength on this transmission line if the frequency is 3.0 GHz?
- 3.20 Design a microstrip transmission line for a 100Ω characteristic impedance. The substrate thickness is 0.158 cm, with $\epsilon_r = 2.20$. What is the guide wavelength on this transmission line if the frequency is 4.0 GHz?
- 3.21 A 100Ω microstrip line is printed on a substrate of thickness 0.0762 cm, with a dielectric constant of 2.2 . Ignoring losses and fringing fields, find the shortest length of this line that appears at its input as a capacitor of 5 pF at 2.5 GHz. Repeat for an inductance of 5 nH. Using a microwave CAD package with a physical model for the microstrip line, compute the actual input impedance seen when losses are included (assume copper conductors and $\tan \delta = 0.001$).
- 3.22 A microwave antenna feed network operating at 5 GHz requires a 50Ω printed transmission line that is 16λ long. Possible choices are (1) copper microstrip, with $d = 0.16$ cm, $\epsilon_r = 2.20$, and $\tan \delta = 0.001$, or (2) copper stripline, with $b = 0.32$ cm, $\epsilon_r = 2.20$, $t = 0.01$ mm, and $\tan \delta = 0.001$. Which line should be used, if attenuation is to be minimized?

Due Wednesday
Sept 6, 2009