EE433-08 Homework 1
Due 9/30/2008

Do problems 2.1, 2.2, 2.6, 2.11, 2.18 in the text as shown:

PROBLEMS

2.1 The current on a transmission line is given as $i(t) = 1.2\cos(1.51 \times 10^{10}t - 80.3z)$ A. Determine (**a**) the frequency, (**b**) the wavelength, (**c**) the phase velocity, and (**d**) the phasor representation of this current.

2.2 A transmission line has the following per unit length parameters: $L = 0.2$ μH/m, $C = 300$ pF/m, $R = 5$ Ω/m, and $G = 0.01$ S/m. Calculate the propagation constant and characteristic impedance of this line at 500 MHz. Recalculate these quantities in the absence of loss ($R = G = 0$).

2.6 RG-402U semi-rigid coaxial cable has an inner conductor diameter of 0.91 mm, and a dielectric diameter (equal to the inner diameter of the outer conductor) of 3.02 mm. Both conductors are copper, and the dielectric material is Teflon. Compute the R, L, G, and C parameters of this line at 1 GHz, and use these results to find the characteristic impedance and attenuation of the line at 1 GHz. Compare your results to the manufacturer's specifications of 50 Ω and 0.43 dB/m, and discuss reasons for the difference.

2.11 A 100 Ω transmission line has an effective dielectric constant of 1.65. Find the shortest open-circuited 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.

2.18 A generator is connected to a transmission line as shown below. Find the voltage as a function of z along the transmission line. Plot the magnitude of this voltage for $-\ell \le z \le 0$.