Sheet 2

Problem1

2.1 A 75 Ω coaxial line has a current $i(t, z) = 1.8\cos(3.77 \times 10^9\, t - 18.13z)$ mA. Determine (a) the frequency, (b) the phase velocity, (c) the wavelength, (d) the relative permittivity of the line, (e) the phasor form of the current, and (f) the time domain voltage on the line.

Problem2

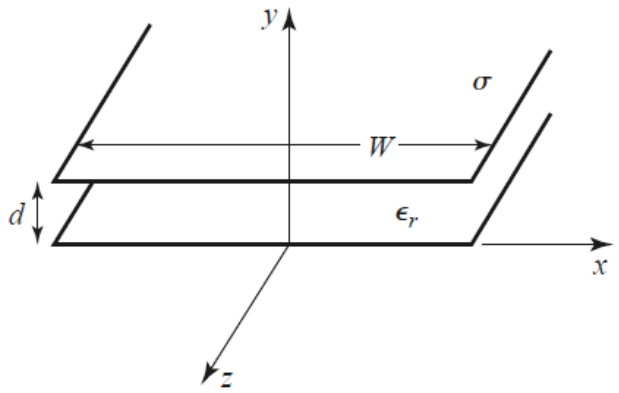
2.2 A transmission line has the following per-unit-length parameters: $L = 0.5\ \mu$H/m, $C = 200$ pF/m, $R = 4.0\ \Omega$/m, and $G = 0.02$ S/m. Calculate the propagation constant and characteristic impedance of this line at 800 MHz. If the line is 30 cm long, what is the attenuation in dB? Recalculate these quantities in the absence of loss ($R = G = 0$).

Problem3

2.3 RG-402U semirigid 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.

Problem4

2.5 For the parallel plate line shown in the accompanying figure, derive the R, L, G, and C parameters. Assume $W \gg d$.



Problem5

2.7 Show that the T-model of a transmission line shown in the accompanying figure also yields the telegrapher equations derived in Section 2.1.