LE 325 Assignment #5

1. It is found that the attenuation on a 50-Ω *distortionless* transmission line is 0.01 (dB/m). The line has a capacitance of 0.1 (pF/m).

a) Find the resistance, inductance, and conductance per meter of the line.
b) Find the velocity of wave propagation.
c) Determine the percentage to which the amplitude of a voltage traveling wave decreases in 1 km and in 5 km.

2. Given a coaxial cable with (inner,outer) radii of (16,60) mils (1000 mils = 1 inch) and filled with polyethylene (ε_r = 2.26) (this is the RG-58/U cable). Assume that the wire conductors are *perfect*. Determine the characteristic impedance, attenuation constant and phase constant at 10 MHz if the loss tangent of polyethylene at 10 MHz is approximately 10^{-3}. Compare with the values computed if polyethylene is considered *lossless*.

3. A lossless transmission line is 80 cm long and operates at a frequency of 600 MHz. The line parameters are L = 0.25 μH/m and C = 100 pF/m. The voltage source V_g = 10 V and the generator impedance Z_g = 50 Ω. Find

(a) the characteristic impedance

(b) the phase constant

(c) the velocity on the line

(d) the input impedance for Z_L = 100 Ω

(e) the current at the load

(f) the power delivered to the load

4. A lossless transmission line is 100 m long and operates at a frequency of 100 MHz. The line parameters are L = 5 μH/m and C = 2 nF/m. The voltage source V_g = 30 V with the generator impedance Z_g = 50 Ω is connected to a 100-Ω load via this transmission line. Find

(a) the input impedance

(b) the current at the load

(c) the power delivered to the line

(d) the power delivered to the load