HW#4

8-5. The following characteristics have been measured on a lossy transmission line at 100 (MHz):

$$Z_0 = 50 + j0 \ (\Omega)$$
$$\alpha = 0.01 \ (\mathrm{dB/m})$$
$$\beta = 0.8\pi \ (\mathrm{rad/m}).$$

Determine *R, L, G,* and *C* for the line.

8-7. Express $V(z)$ and $I(z)$ in terms of the voltage V_i and current I_i at the input end and γ and Z_0 of a transmission line (a) in exponential form, and (b) in hyperbolic form.

8-9. A generator with an open-circuit voltage $v_g(t) = 10\sin 8000\pi t \ (\mathrm{V})$ and internal impedance $Z_g = 40 + j30 \ (\Omega)$ is connected to a 50-(Ω) distortionless line. The line has a resistance of 0.5-(Ω/m), and its lossy dielectric medium has a loss tangent of 0.18%. The line is 50 (m) long and is terminated in a matched load. Find (a) the instantaneous expressions for the voltage and current at an arbitrary location on the line, (b) the instantaneous expressions for the voltage and current at the load, and (c) the average power transmitted to the load.

8-11. A 2-(m) lossless air-spaced transmission line having a characteristic impedance $50 \ (\Omega)$ is terminated with an impedance $40 + j30 \ (\Omega)$ at an operating frequency of 200 (MHz). Find the input impedance.

8-13. Measurements on a 0.6-(m) lossless coaxial cable at 100 (kHz) show a capacitance of 54 (pF) when the cable is open-circuited and an inductance of 0.30 (μH) when it is short-circuited.

a) Determine Z_0 and the dielectric constant of its insulating medium.
b) Calculate the X_{io} and X_{is} at 10 (MHz).

8-15. Consider a lossless transmission line.

a) Determine the line's characteristic resistance so that it will have a minimum possible standing-wave ratio for a load impedance $40 + j30 \ (\Omega)$.
b) Find this minimum standing-wave ratio and the corresponding voltage reflection coefficient.