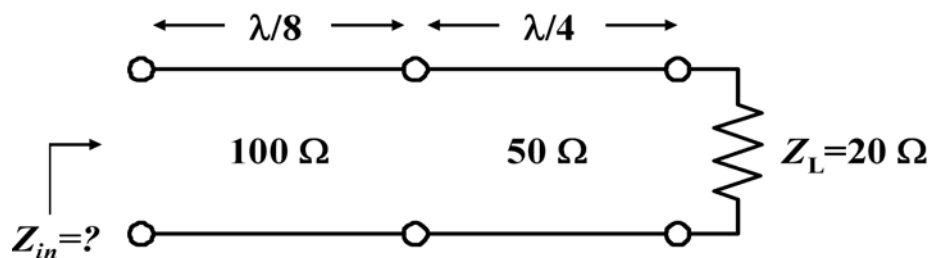


Reading Assignment: Chapter 9 of Cheng

Homework #1

Due: Friday, 20 January 2006

- 1) Calculate the distributed transmission-line parameters R' , L' , G' , and C' for:
 - a) A lossy line with $\alpha = 0.25$ Np/m, $\beta = 4.2$ rad/m, $Z_0 = 100 - j5 \Omega$, and $f = 60$ MHz.
 - b) A lossless line with $\beta = 3$ rad/m, $Z_0 = 50 \Omega$, and $f = 10$ MHz.
 - c) A distortionless line with $\gamma = 0.04 + j1.5$ m⁻¹, $Z_0 = 80 \Omega$, and $f = 500$ MHz.
- 2) Do Problem P.9–20 in Cheng
- 3) Determine the shortest length of a 50Ω coaxial air-line required to produce a reactance of $j50 \Omega$ at 1 GHz if the line is:
 - a) short-circuited.
 - b) open-circuited.
- 4) In class we derived an expression for the input impedance Z_{in} of a terminated transmission-line in terms of the characteristic impedance Z_0 , the load impedance Z_L , and the length l . Show that a similar expression can be derived for the input admittance of the line, Y_{in} , in terms of the characteristic admittance $Y_0 = 1/Z_0$ and the load admittance $Y_L = 1/Z_L$.
- 5) Two transmission-lines with different characteristic impedances are connected together as shown below. At a frequency of 1 GHz, the 50Ω line is exactly a quarter-wavelength long, while the 100Ω line is exactly $\lambda/8$ long. There is a load impedance of 20Ω terminating this combination of lines.



- a) What is the input impedance Z_{in} of the structure?
 - b) Suppose the frequency is doubled to $f=2$ GHz. What is the input impedance at the new frequency?
- 6) Do Problem P.9–42 in Cheng
 - 7) Do Problem P.9–44 in Cheng