EE6311 Fall 2008 Homework #1

2.2 A transmission line has the following per unit length parameters: $L = 0.2\ \mu$H/m, $C = 300$ pF/m, $R = 5\ \Omega$/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 ($R = G = 0$).

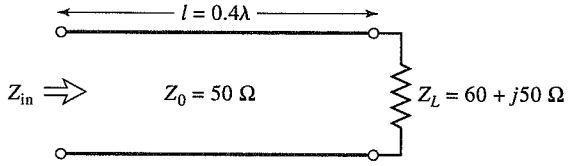
2.13 A 75 Ω coaxial transmission line has a length of 2.0 cm and is terminated with a load impedance $37.5 + j75\ \Omega$. If the dielectric constant of the line is 2.56 and the frequency is 3.0 GHz, find the input impedance to the line, the reflection coefficient at the load, the reflection coefficient at the input, and the SWR on the line.

2.14 Calculate SWR, reflection coefficient magnitude, and return loss values to complete the entries in the following table:

SWR	$\lvert\Gamma\rvert$	*RL* (dB)
1.00	0.00	∞
1.01	—	—
—	0.01	—
1.05	—	—
—	—	30.0
1.10	—	—
1.20	—	—
—	0.10	—
1.50	—	—
—	—	10.0
2.00	—	—
2.50	—	—

2.19 Use the Smith chart to find the following quantities for the transmission line circuit below:

(a) The SWR on the line.
(b) The reflection coefficient at the load.
(c) The load admittance.
(d) The input impedance of the line.
(e) The distance from the load to the first voltage minimum.
(f) The distance from the load to the first voltage maximum.



2.20 Repeat problem 2.19 for $Z_L = 40 - j30\ \Omega$.

2.22 Use the Smith chart to find the shortest lengths of a short-circuited 75 Ω line to give the following input impedance:

(a) $Z_{in} = 0$.
(b) $Z_{in} = \infty$.
(c) $Z_{in} = j75\ \Omega$.
(d) $Z_{in} = -j50\ \Omega$.
(e) $Z_{in} = j10\ \Omega$.

2.23 Repeat Problem 2.22 for an open-circuited length of 75 Ω line.

Due Sept 8, 2008