ENEE 381 Problem Set #4

4/1/04 due 4/13/04

(1) A length of loss-less transmission line is first short-circuited at one end and then open-circuited. The impedance measured at the other end in the first case is Z_1 and Z_2 in the second. Prove that $Z_1 Z_2 = Z_0^2$. This is a convenient way for measuring the characteristic impedance of an unknown line.

(2) A 50 ohm transmission line is terminated with an impedance of 20-j30. What is the magnitude and phase of the reflection coefficient?

(3) Repeat question (4) using the Smith chart

(4) A 75 ohm transmission line is terminated with a load of $150 + j50$ ohm. Compute ρ in terms of both amplitude $|\rho|$ and ϕ. What fraction of incident power is absorbed in the load?

(5) Cheng problem 9.27

(6) Cheng problem 9.30

(7) Use Smith chart. A line with $Z_0 = 100\Omega$ is terminated with an unknown load. The SWR is found to be 3. A current maximum is observed 0.1λ from the load. What are:
(a) the load?
(b) the reflection coefficient ρ, magnitude and angle?
(c) how would you match the line without changing the load at the end of the line?

(8) Use Smith chart. A transmission line of characteristic impedance 75 ohm is terminated with an impedance 50+j125 ohm. 0.1λ from the load a 150ohm shorted stub 0.2λ long is connected in shunt to the main line. What are:
(a) The reflection coefficient in magnitude and phase at this point?
(b) The standing wave ratio?
(c) Where is the nearest current minimum that is greater than 0.1λ from the load?
(d) Where is the nearest point greater than 0.1λ from the load where the line can be matched with an open 75 ohm stub?

(9) Use Smith chart. Cheng problem 9.48

(10) Use Smith chart. Cheng problem 9-49.

(11) Use Smith chart. Cheng problem 9-50.

(12) Use Smith chart. Cheng problem 9-51.