EEC 130A: Homework 3

Due: 3:30 pm, Jan. 29, 2013

1. (4 points) (FAE P2.20) A 300-Ω lossless air transmission line is connected to a complex load composed of a resistor in series with an inductor, as shown in Fig. 1. At 5 MHz, determine: (a) Γ, (b) S, (c) location of voltage maximum nearest to the load, and (d) location of current maximum nearest to the load.

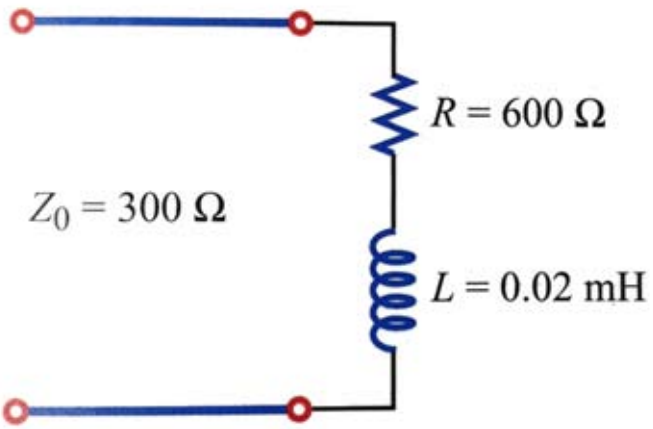

Figure 1: Circuit for Problem 1.

2. (4 points) (FAE P2.30) Show that at the position where the magnitude of the voltage on the line is a maximum, the input impedance is purely real.

3. (4 points) (FAE P2.33) Two half-wave dipole antennas, each with an impedance of 75 Ω, are connected in parallel through a pair of transmission lines, and the combination is connected to a feed transmission line, as shown in Fig. 2. All lines are 50 Ω and lossless.

(a) Calculate Z_{in1}, the input impedance of the antenna-terminated line, at the parallel juncture.

(b) Combine Z_{in1} and Z_{in2} in parallel to obtain Z'_L, the effective load impedance of the feedline.

(c) Calculate Z_{in} of the feedline.

4. (4 points) (FAE P2.50) Use the Smith chart to determine the input impedance Z_{in} of the two-line configuration shown in Fig. 3.

5. (4 points) (FAE P2.53) A lossless 50-Ω transmission line is terminated in a load with $Z_L = (50 + j25)$ Ω. Use the Smith chart to find the following:

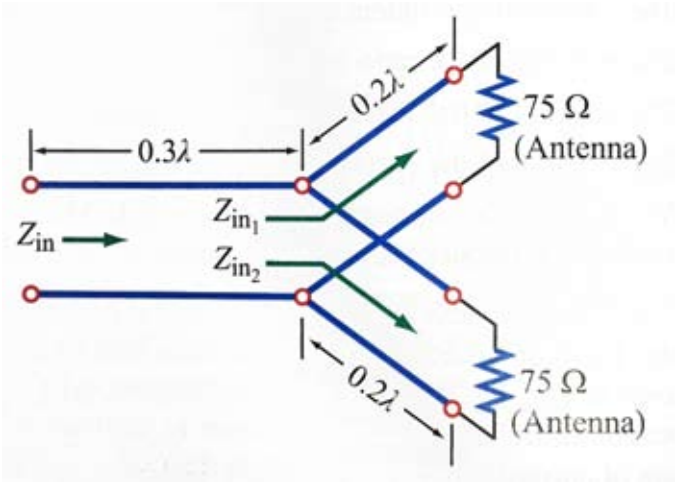

Figure 2: Circuit for Problem 3.

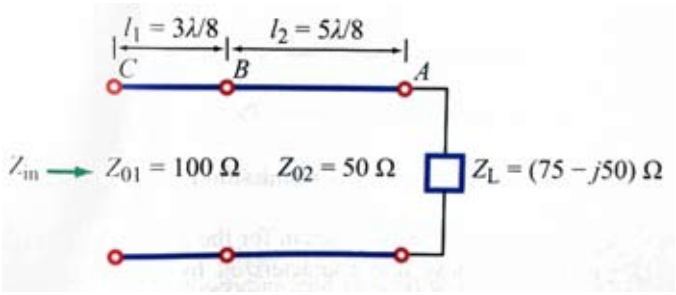

Figure 3: Circuit for Problem 4.

(a) The reflection coefficient Γ.

(b) The standing-wave ratio.

(c) The input impedance at 0.35λ from the load.

(d) The input admittance at 0.35λ from the load.

(e) The shortest line length for which the input impedance is purely resistive.

(f) The position of the first voltage maximum from the load.