Practice Questions for ECE 351

1) A 25 Ω lossless transmission line is terminated with a load impedance of $Z_L = 25 + j25$ and the wavelength on the line is 2 cm, compute:

a) Γ_L

b) the input impedance of the transmission line if the length is .8λ.

2) A 125 Ω lossless transmission line is terminated with a load impedance of $Z_L = 250 - j75$ and the wavelength on the line is 10 cm, compute:

a) the distance to the nearest minimum on the transmission line (Note: $\beta = \frac{2\pi}{\lambda}$)

b) the input impedance of the transmission line if the length is .8λ.

3) Use the Smith chart and repeat problem 2.

a) the distance to the nearest minimum on the transmission line

b) the input impedance of the transmission line if the length is .8λ.

4) Use the smith chart to determine the input impedance for the following transmission lines:

a)

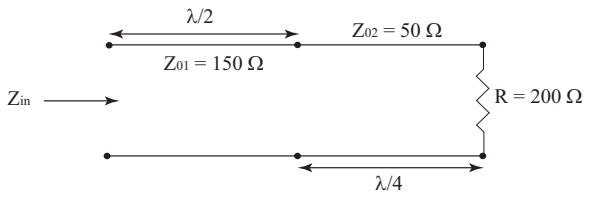

Figure 1. TL for problem 4 a)

b)

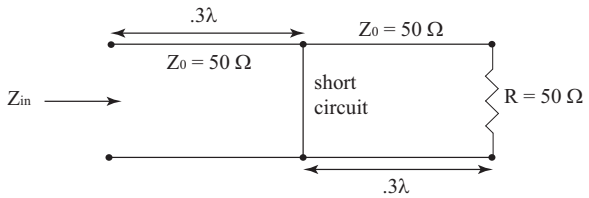

Figure 2. TL for problem 4 b)

5) Use Laplace's equation and **clearly** compute the capacitance between the two parallel plates in the Figure below. Assume that the area of each plate is S (m^2). Note: $\nabla^2 V = 0$.

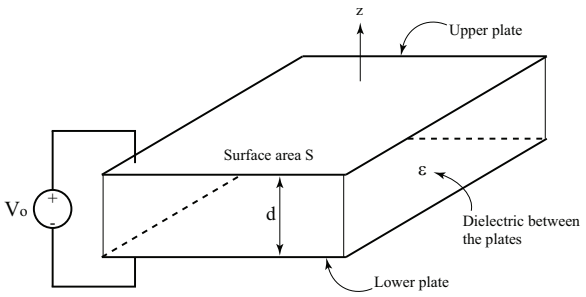

Figure 3. Capacitance between two parallel plates.

6) Using the notation in the Figure below, find $\bar{E}_1$ if $\bar{E}_2 = 2\hat{a}_x - 3\hat{a}_y + 3\hat{a}_z$ (V/m), $\varepsilon_1 = 2\varepsilon_0$ and $\varepsilon_2 = 8\varepsilon_0$. Assume the boundary to be free of charge and is in the x-y plane.

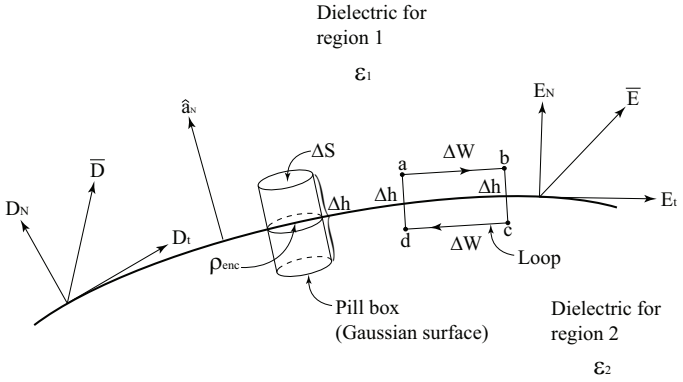

Figure 4. Boundary conditions between dielectric regions.

7) Use Ampere's law to determine $\bar{H}$ everywhere from the infinitely long conductor with radius a carrying the current $I(\rho) = 10\rho$A.

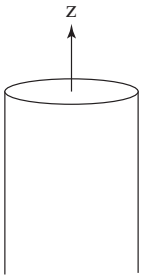

Figure 5. Diagram for problem 7.