Universidad de Puerto Rico
Recinto Universitario de Mayagüez
Departamento de Ingeniería Eléctrica y Computadoras

INEL 4151 Problemas sugeridos para el tercer parcial

1. La linea coaxial RG-223/U tiene un conductor interno con radio a = 0.47mm y radio interno de conductor externo b = 1.435 mm. El conductor es cobre y el dielectrico es polietileno. Determina los parametros distribuidos RGLC para una frecuencia de 800 MHz.

2. A manufacturer produces a ferrite material with $\mu = 750\mu_o$, $\varepsilon = 5\varepsilon_o$, and $\sigma = 10^{-6}$ S/m at 10 MHz.
   (a) Would you classify the material as lossless, lossy, or conducting?
   (b) Calculate $\beta$ and $\lambda$.
   (c) Determine the phase difference between two points separated by 2 m.
   (d) Find the intrinsic impedance.

3. The magnetic field component of a plane wave in a lossless dielectric ($\mu_r = 1$) is

$$\mathbf{H} = 30 \sin(2\pi \times 10^8 t - 5x)\mathbf{a}_z \text{ mA/m}$$

   (a) Find $\varepsilon_r$.
   (b) Calculate the wavelength and wave velocity.
   (c) Determine the wave impedance.
   (d) Determine the polarization of the wave.
   (e) Find the corresponding electric field component.
   (f) Find the displacement current density.

4. A uniform plane wave in a lossy medium has a phase constant of 1.6 rad/m at $10^7$ Hz, and its magnitude is reduced by 60% for every 2 m traveled. Find the skin depth and speed of the wave.

5. La impedancia y constante de propagación a 100 MHz para una linea de transmision son $Z_0 = 18.6 - j0.253\ \Omega$ y $\gamma = 0.0638 + j4.68\ m^{-1}$. Determina los parametros distribuidos.

6. Una fuente con impedancia de 50 Ω suple una linea de transmision de 50 Ω que mide 1/8 de largo de onda. Esta termina en una carga ZL = 50 –j25 Ω. Determina $\Gamma_L$, VSWR, y $Z_{in}$, la impedancia de entrada que ve la fuente.

7. A 100 MHz plane wave is incident from air onto a dielectric medium ($\varepsilon = 4\varepsilon_o$) at normal incidence. Find (a) $\Gamma$ and $s$, (b) $\lambda$ in air and in the dielectric, (c) the percentage of the power density that is reflected from the interface.

8. A 100 Ω load is connected to a 50 Ω transmission line. Determine the value of the reactance to put in series at the input to the line and the length in wavelengths of the shortest transmision line to match with a 50 Ω source.

9. A 150 + j300 Ω load is connected to a 75 Ω transmission line. Determine the value of the reactance to put in parallel at the input to the line and the length in wavelengths of the shortest transmission line to match with a 75 Ω source.

10. Redo problem 9 using a short-circuited stub as the equivalent parallel reactance.