Assignment #2

ENEL 476

Due at 4 pm on February 28th in the dropbox on the 2nd floor of ICT

Question 1:

A transmission line operating at 2 GHz has the following distributed element terms: $R = 4\ \Omega/m$, $L = 0.4\ \mu H/m$, $C = 200\ pF/m$ and $G = 0.02\ S/m$. Find:

(a) The propagation constant (γ)

(b) The attenuation constant (α)

(c) The phase constant (β)

(d) The wavelength (λ)

(e) The characteristic impedance (Z_0)

(f) The phase velocity (v_p)

(g) Is the line distortionless?

Question 2:

A lossless transmission line with a characteristic impedance of $Z_0 = 50\ \Omega$ and wavelength of $\lambda = 3$ cm is terminated with a $Z_L = 100 - j25\ \Omega$ load. Find:

(a) The phase constant (β)

(b) The reflection coefficient at the load ($\Gamma(l = 0)$)

(c) The standing wave ratio (SWR)

(d) The reflection coefficient at 0.25λ from the load ($\Gamma(l = 0.25\lambda)$)

(e) The reflection coefficient at 0.5λ from the load ($\Gamma(l = 0.5\lambda)$)

(f) The reflection coefficient at 0.6λ from the load ($\Gamma(l = 0.6\lambda)$)

Reflection coefficient values should be in polar form.

Question 3:

A lossless transmission line ($Z_0 = 100\ \Omega$) is terminated with a *purely resistive* load. If we know that the standing wave ratio is 2, what are the possible impedance values for the resistive load?

Question 4:

A lossless transmission line ($Z_0 = 70\ \Omega$) is operating at 3 GHz. If the velocity along the line is 2.2×10^8 m/s, find:

(a) The distributed element term C in terms of pF/m

(b) The distributed element term L in terms of μH/m

Question 5:

A lossless transmission line ($Z_0 = 50\Omega$) is terminated by a $Z_L = 30 + j100\ \Omega$ load. What is the input impedance at 0.3λ from the load? Answer in A + jB form.