ENEE 381 Spring 2004. Solutions to Second Examination

(1) For the transmission line given

$$Z = j\cdot\omega\cdot L_1 + \frac{1}{j\cdot\omega\cdot C_1} = \frac{1-\omega^2\cdot L_1\cdot C_1}{j\cdot\omega\cdot C_1}$$

Write $\omega_1 = \frac{1}{\sqrt{L_1\cdot C_1}}$

$$Z = \frac{1-\frac{\omega^2}{\omega_1^2}}{j\cdot\omega\cdot C_1}$$

$$Y = \frac{1}{j\cdot\omega\cdot L_2 + \frac{1}{j\cdot\omega\cdot C_2}} = \frac{j\cdot\omega\cdot C_2}{1-\frac{\omega^2}{\omega_2^2}}$$

$$\sqrt{Z\cdot Y} = \frac{\sqrt{C_2}}{\sqrt{C_1}}\cdot\sqrt{\frac{1-\frac{\omega^2}{\omega_1^2}}{1-\frac{\omega^2}{\omega_2^2}}}$$

For $\omega<\omega_1,\omega_2$ there is a STOP BAND since for these frequencies γ is real $=\alpha$

For $\omega_1<\omega<\omega_2$ there is a PASS BAND since in this range γ is imaginary $= j\beta$

To draw the graphs I will choose some values

$L_1 := 10^{-8}$ $C_1 := 10^{-8}$ $L_2 := 5\cdot 10^{-9}$ $C_2 := 5\cdot 10^{-9}$

$\omega_1 := \frac{1}{\sqrt{L_1\cdot C_1}}$ $\omega_2 := \frac{1}{\sqrt{L_2\cdot C_2}}$

$\omega_1 = 1\times 10^8$ $\omega_2 = 2\times 10^8$

$i := 1,2..1000$

$\omega_i := (i-1)\cdot\frac{4\cdot 10^8}{999}$