EE305 Project
Group 9

Project 9: Consider a plane wave (having angular frequency of ω rad/sec and phase constant of β rad/m) propagating along a transmission line and terminated by a load impedance Z_L. The transmission line has a characteristic impedance of Z_o ($=R_o + jX_o$) and length of l. Plot the input impedance Z_i of the transmission line for different values of the load impedance Z_L ($=R_L + jX_L$). Note: the parameter l should be considered as input in terms of λ. The parameter values ω, β, l, R_0, X_0, R_L, X_L will be provided from user-end.

We designed an app using MATLAB through which we can calculate input impedance Z_i of the transmission line for different values of ω, β, l, Z_o, Z_L and α. And can generate plot for range of load impedance between R_{in} Vs Z_L and X_{in} Vs Z_L.

For the calculation of input impedance Z_i :-

By providing β, l, R_o, X_0, R_L, X_L and α we can calculate Z_i

λ = 2* π/ β
Z_L = R_L + 1j* X_L
Z_o = R_0 + 1j* X_0
g = α + 1j* β
Z_i = Z_o *((Z_L + Z_o *tanh(g*l))/(Z_o + Z_L *tanh(g*l)))

Plotting R_{in} Vs Z_L :-

λ = 2* π/ β
Z_o = R_0 + 1j* X_0
g = α + 1j* β
x = [R_start:0.1:R_end]
y = [X_start,0.1:X_end]
[xx,yy] = meshgrid(x,y)
Z_L = (xx) + 1j*(yy)
zzz = Z_o.*((Z_L + Z_o *tanh(g*l))/(Z_o + tanh(g*l).* Z_L))
zz = real(zzz)
mesh(xx,yy,zz)

Plotting X_{in} Vs Z_L :-

λ = 2* π/ β
Z_o = R_0 + 1j* X_0
g = α + 1j* β
x = [R_start:0.1:R_end]
y = [X_start,0.1:X_end]
[xx,yy] = meshgrid(x,y)
Z_L = (xx) + 1j*(yy)
zzz = Z_o.*((Z_L + Z_o *tanh(g*l))/(Z_o + tanh(g*l).* Z_L))
zz = imag(zzz)
mesh(xx,yy,zz)

x = [R_start:0.1:R_end] and y = [X_start,0.1:X_end] :- range of x and y for generating plots.
meshgrid :- used to create rectangular structures from the given arrays which represent the indexing in the matrix.

mesh(X,Y,Z) :- creates a mesh plot, which is a three-dimensional surface that has solid edge colours and no face colours. The function plots the values in matrix Z as heights above a grid in the *x-y* plane defined by X and Y. The edge colours vary according to the heights specified by Z.