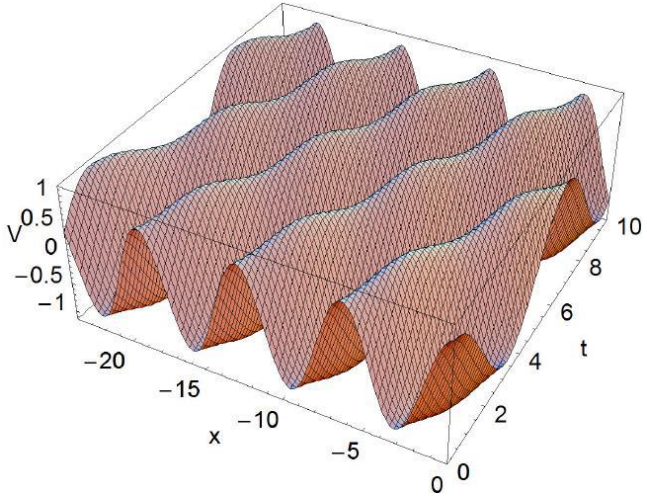
ASSIGNMENT [30% weightage in the final grading]
INSTRUCTION: Submit in detail report form with all the supporting code/ simulation steup file attached
Submission deadline: April 25, 2019 at 09:00 p.m.
Submit to: **subasit.ece@gmail.com**

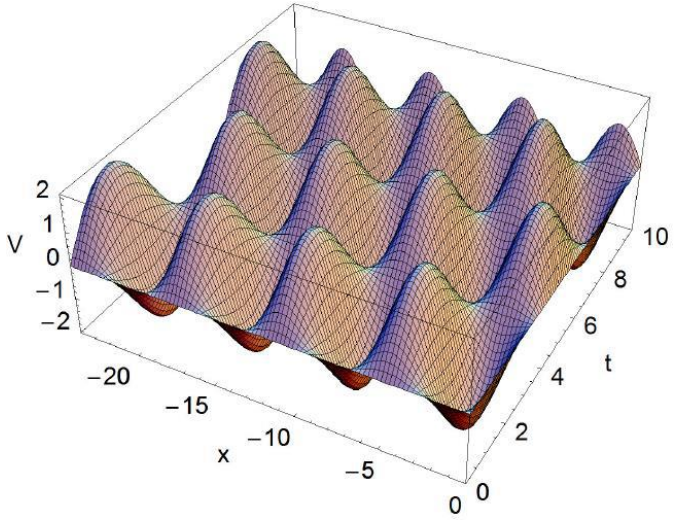
Q.1: Consider a load resistance $\boldsymbol{RL}=\mathbf{100}\boldsymbol{\Omega}$ to be matched to a $\mathbf{50}\boldsymbol{\Omega}$ line with a quarter wave transformer. Find the characteristic impedance of the matching section and plot the magnitude of the reflection coefficient versus normalized frequency, $\boldsymbol{f}/\boldsymbol{f_0}$, where $\boldsymbol{f_0}$ is the frequency at which the line is $\lambda/4$ long.

[N.B.: First solve theoretically. Use MATLAB for coding the plot. The frequencies have to be different for every student.]

Q.2: Demonstrate the following curves using MATLAB: (You are free to make suitable assumptions if needed)



Standing Wave Pattern at Γ_0=0.1

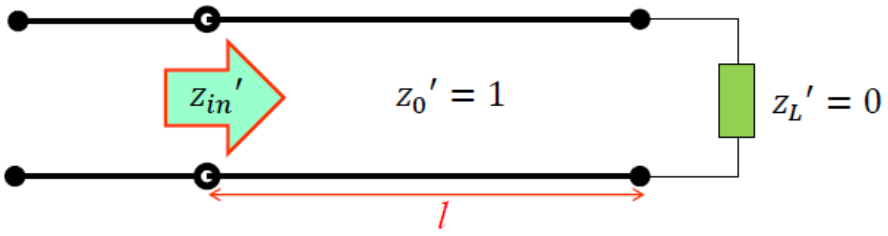


Standing Wave Pattern at Γ_0=1.0

Q.3: Write MATLAB code to determine the input impedance of a transmission line that is terminated in a **short circuit**, and whose length is:

a) $l = \lambda 8 = 0.125\lambda \Rightarrow 2\beta l = 90°$

b) $l = 3\lambda 8 = 0.375\lambda \Rightarrow 2\beta l = 270°$



Q.4: **Assignment Scope:** Design a coupled-line coupler with the following specifications:

Number of sections: 5
Center Frequency: 3 GHz
Coupling: 12 dB
Port Impedance: 50Ω
Frequency Response: Maximally Flat

Assignment Tasks

1) Plot $|S_{11}|^2$, $|S_{21}|^2$, $|S_{31}|^2$, and $|S_{41}|^2$ in dB from 0 to 6 GHz, using a vertical scale from -50dB to 0dB. Use help of HFSS Manual to export S- matrix data, represent the matrix form in the report and then plot it using MATLAB or any other graph plotting tool.

2) Draw an **exact** signal flow graph of **this** (4-port) directional coupler. In other words, a signal flow graph of the form below, where ***c*** is the specific **coupling coefficient** of **this** coupler at the design frequency.