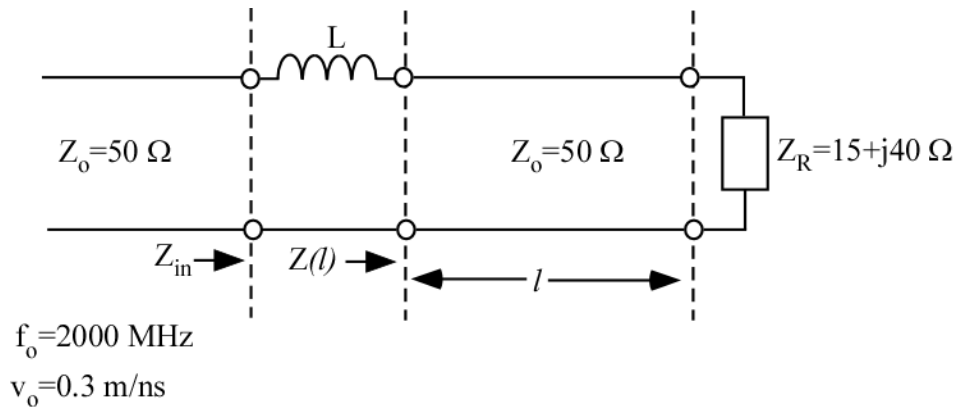


1. Given the lossless transmission line shown above,
  - (a) Find the reflection coefficient  $\Gamma_R$  and the standing wave ratio (SWR) for this loaded transmission line.
  - (b) Sketch the standing wave patterns for the magnitude of the voltage along this transmission line in terms of  $V_R$ .
  - (c) Determine the impedance at the input of this loaded transmission line.
  - (d) If a sinusoidal generator  $10 \angle 0^\circ$  V, which has a source impedance of  $100 \Omega$  is connected to this loaded transmission line, what is the time average power delivered to the  $75\text{-}\Omega$  load.
  
2. A transmission line of length  $0.625\lambda$  and characteristic impedance  $50 \Omega$  is connected to an unknown load impedance  $Z_R$ . The input admittance is measured to be  $Y_{in} = 0.004 - j0.008 \Omega^{-1}$ . Using the Smith chart find:
  - (a) the normalized and the actual load admittance
  - (b) the normalized and the actual load impedance
  - (c) the load reflection coefficient
  - (d) the voltage standing wave ratio (VSWR)
  - (e) the distance, in wavelengths, of the first voltage maximum and minimum, with reference to the load.

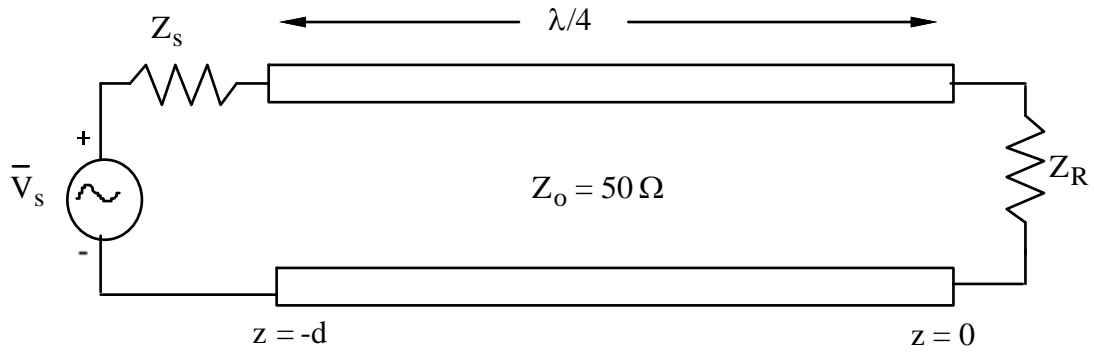
3. Consider the lossless transmission line network shown below. The operating frequency is 2000 MHz and the propagation velocity on the transmission line is 0.3 m/ns.



- Using the Smith chart, determine the SWR on the section of line of length  $l$ .
- Using the Smith chart find two values for the length  $l$  such that  $Z(l)$  is equal to  $Z_0 \pm jX$ .
- Determine the value of series inductance  $L$  and the proper length of the transmission line section ( $l_1$  or  $l_2$ ) that insures  $Z_{in} = Z_0$

4. Answer the following questions using the Smith chart. Clearly identify significant features on the chart. A transmission line with characteristic impedance  $50 \Omega$  is terminated by a load of impedance  $Z_r = 40 + j50 \Omega$ .

- What is the SWR?
- What is the phase of  $\Gamma_r$ ?
- What is the normalized admittance at the load?
- What is the normalized admittance at  $d = 12.2\lambda$  toward the generator from the load?
- What is the phase of  $\Gamma$  at  $d = 12.2\lambda$  toward the generator from the load?
- What is the shortest distance from the load at which a short-circuited stub could be attached to achieve an impedance match?
- What would the normalized input admittance of the stub be?



5. For the above figure, let  $\bar{V}_s = 1$  volt,  $Z_s = 30 \Omega$ , and  $Z_R = 40 \Omega$ .

- What is the impedance at the input of the line ( $z = -d$ ) ?
- What is the phasor current through  $Z_s$ ?
- What is the phasor current through  $Z_R$  ?
- What is the time-average power delivered to the load ?