Problem 2.58 A lossless 100-Ω transmission line $3\lambda/8$ in length is terminated in an unknown impedance. If the input impedance is $Z_{in} = -j2.5\ \Omega$,

(a) Use the Smith chart to find Z_L.

(b) Verify your results using CD Module 2.6.

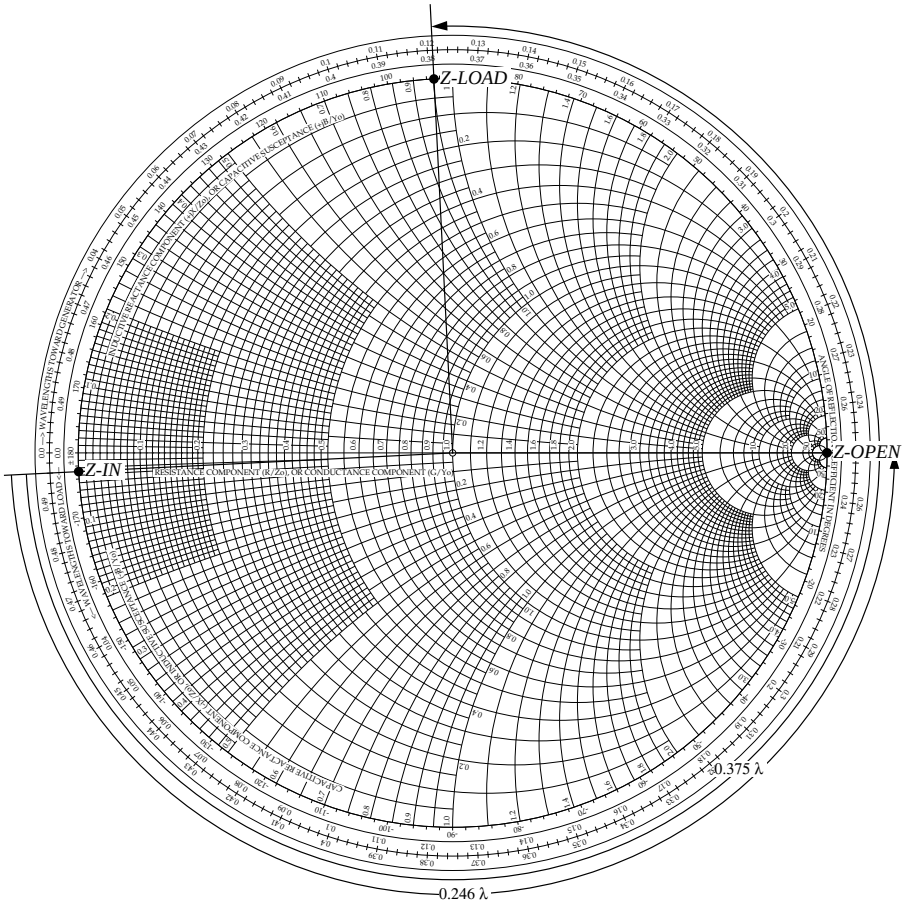

Figure P2.58: Solution of Problem 2.58.

Solution: Refer to Fig. P2.58. $z_{in} = Z_{in}/Z_0 = -j2.5\ \Omega/100\ \Omega = 0.0 - j0.025$ which is at point *Z-IN* and is at 0.004λ on the wavelengths to load scale.

(a) Point *Z-LOAD* is 0.375λ toward the load from the end of the line. Thus, on the wavelength to load scale, it is at $0.004\lambda + 0.375\lambda = 0.379\lambda$.

$$Z_L = z_L Z_0 = (0 + j0.95) \times 100\ \Omega = j95\ \Omega.$$

(b) After setting $d = 0.375\lambda$ in Module 2.6, the load point was moved over the circle to realize a value of $z(d) \simeq 0 - j0.025$. The corresponding value of z_{L} is:

$$z_{\mathrm{L}} = 0 + j0.95064,$$

which gives

$$Z_{\mathrm{L}} = (0 + j95)\ \Omega.$$