

11.44 A transmission line is terminated by a load with admittance $Y_L = (0.6 + j0.8)/Z_0$. Find the normalized input impedance at $\lambda/6$ from the load.

- Use Smith chart. Also, find Γ_L , y_{in} , and SWR.
- 1) Calculate normalized load admittance $y_L = Y_L/Y_0 = Y_L Z_0 = [(0.6 + j0.8)/Z_0] Z_0 \Rightarrow y_L = 0.6 + j0.8 \text{ S/S}$. Plot y_L on Smith chart.
 - 2) Use compass to draw a circle through y_L , centered on Smith chart. Use a straight edge to draw radial line through center of Smith chart and y_L to outer rings of Smith chart on both sides.
 - 3) Use compass (same setting) to mark the “SWR (VSWR)” and “REFL. COEFF, V or I” scales. Read off $|\Gamma| = 0.5$ and $\Rightarrow \boxed{\text{SWR} = 3}$.
 - 4) At intersection of circle of constant $|\Gamma|$ and radial line opposite to y_L , read normalized load impedance to be $z_L = 0.6 - j0.8 \ \Omega/\Omega$. Use the “ANGLE OF REFLECTION COEFFICIENT IN DEGREES” scale to read $\angle \Gamma_L = -90^\circ$. Put the magnitude and angle of the load reflection coefficient together to get $\Rightarrow \boxed{\Gamma = \Gamma_L = 0.5 \angle -90^\circ}$.
 - 5) Next, move $\lambda/6$ “WAVELENGTHS TOWARD GENERATOR” on circle of constant $|\Gamma|$ from z_L point (0.125) to z_{in} point (0.1667 - 0.125 = 0.04167). Draw a radial line from center of Smith chart through 0.04167 on the “WAVELENGTHS TOWARD GENERATOR” scale. Read normalized input impedance at intersection of circle and radial line $\Rightarrow \boxed{z_{in} = 0.355 + j0.238 \ \Omega/\Omega}$.
 - 6) To find y_{in} , use a straight edge to extend radial line to far side of Smith chart. Read the normalized input admittance at intersection of circle of constant $|\Gamma|$ and the radial line opposite to $z_{in} \Rightarrow \boxed{y_{in} = 1.95 - j1.3 \text{ S/S}}$.

Simple Smith Chart

Z_0 unspecified
 λ unspecified

