

- 11.48** (a) Calculate the reflection coefficient corresponding to $Z_L = (0.5 - j)Z_0$.
 (b) Determine the load impedance corresponding to the reflection coefficient $0.4 \angle 25^\circ$.
 ➤ Use Smith chart. Also, find SWR.

a)

- Normalize $Z_L \Rightarrow z_{L,a} = Z_L / Z_0 = (0.5 - j1)Z_0 / Z_0 = 0.5 - j1 \Omega/\Omega$.
- Plot $z_{L,a} = 0.5 - j1 \Omega/\Omega$ by finding intersection between $r = 0.5$ circle and $x = -1$ arc on Smith chart.
- Set compass to distance between center of Smith chart and z_L .
- Draw radial line from center of Smith chart through z_L to outer edge.
- Use the “ANGLE OF REFLECTION COEFFICIENT IN DEGREES” scale to read $\angle \Gamma_{L,a} = -83^\circ$.
- Next, use compass to mark the “REFL. COEFF. V or I” scale below Smith chart on right side to find $|\Gamma_{L,a}| = 0.62$.
- Put magnitude & angle of the load reflection coefficient together $\Gamma_{L,a} = 0.62 \angle -83^\circ$.
- Next, use compass to mark the “SWR (VSWR)” scale below Smith chart on left side to find $\text{SWR}_a = 4.25$.

b)

- Plot $\Gamma_L = 0.4 \angle 25^\circ$ point on Smith chart by: 1) drawing radial line from center of Smith chart through $\angle \Gamma_{L,b} = 25^\circ$ on the “ANGLE OF REFLECTION COEFFICIENT IN DEGREES” scale (on perimeter), 2) set compass to $|\Gamma_{L,b}| = 0.4$ on the “REFL. COEFF. V or I” scale below Smith chart on right side, and 3) drawing arc through radial line with compass.
- Use normalized resistance circles on Smith chart to read $r = 1.93$.
- Use normalized reactance arcs on Smith chart to read $x = 0.78$.
- Put together to get $z_{L,b} = 1.93 + j0.78 \Omega/\Omega$.
- Un-normalize $z_{L,b}$ to get $Z_{L,b} = (z_L) Z_0 \Rightarrow Z_{L,b} = (1.93 + j0.78) Z_0$.
- Use compass to mark SWR (VSWR) scale below Smith chart on left side and read standing wave ratio to be $\text{SWR}_b = 2.33$.

11.48**Simple Smith Chart**