

**Problem 2.24** A  $50\text{-}\Omega$  lossless line terminated in a purely resistive load has a voltage standing-wave ratio of 3. Find all possible values of  $Z_L$ .

**Solution:**

$$|\Gamma| = \frac{S-1}{S+1} = \frac{3-1}{3+1} = 0.5.$$

For a purely resistive load,  $\theta_r = 0$  or  $\pi$ . For  $\theta_r = 0$ ,

$$Z_L = Z_0 \left[ \frac{1+\Gamma}{1-\Gamma} \right] = 50 \left[ \frac{1+0.5}{1-0.5} \right] = 150\ \Omega.$$

For  $\theta_r = \pi$ ,  $\Gamma = -0.5$  and

$$Z_L = 50 \left[ \frac{1-0.5}{1+0.5} \right] = 15\ \Omega.$$

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