

**2.73** Repeat Problem 2.72 for the case where all three transmission lines are  $3\lambda/4$  in length.

**Solution:** Since the transmission lines are in parallel, it is advantageous to express loads in terms of admittances. A  $3\lambda/4$  line behaves the same as a  $\lambda/4$  line. In the upper branch, which is a quarter wave line,

$$Y_{1\text{ in}} = \frac{Y_0^2}{Y_1} = \frac{Z_1}{Z_0^2},$$

and similarly for the lower branch,

$$Y_{2\text{ in}} = \frac{Y_0^2}{Y_2} = \frac{Z_2}{Z_0^2}.$$

Thus, the total load at the junction is

$$Y_{\text{JCT}} = Y_{1\text{ in}} + Y_{2\text{ in}} = \frac{Z_1 + Z_2}{Z_0^2}.$$

Therefore, since the common transmission line is also quarter-wave,

$$Z_{\text{in}} = Z_0^2 / Z_{\text{JCT}} = Z_0^2 Y_{\text{JCT}} = Z_1 + Z_2 = (50 + j50) \, \Omega + (50 - j50) \, \Omega = 100 \, \Omega.$$

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