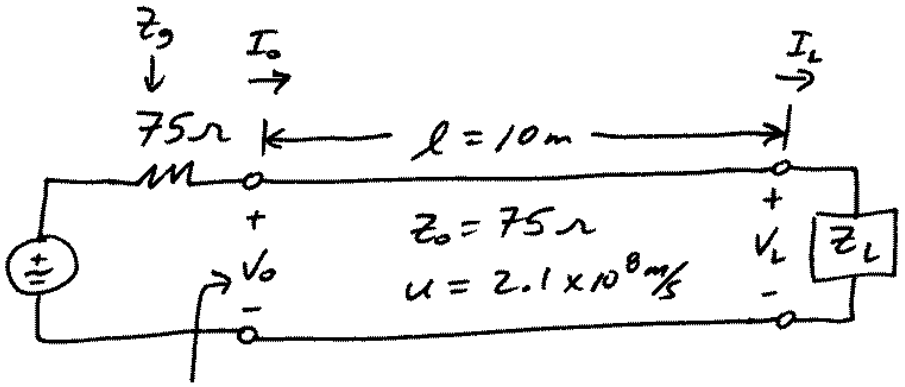
ex.



Find Γ_{in}, Γ_L, V_0, I_0, I_L, V_L, and VSWR (S).

$$\Gamma(0) = \Gamma_{in} = \frac{Z_{in} - Z_0}{Z_{in} + Z_0} = \frac{(60+j30) - 75}{(60+j30) + 75} = \underline{0.2425\angle 104.04°}$$

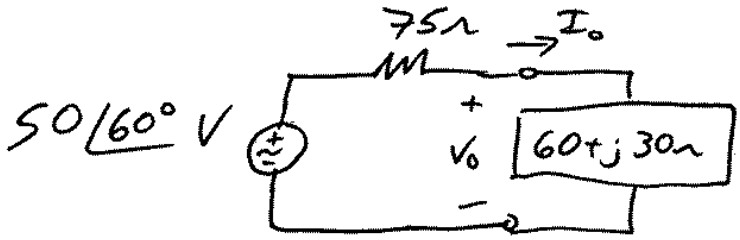
$$\beta = \omega/u = \frac{2\pi f}{u} = \frac{2\pi(890\times10^6)}{2.1\times10^8}$$

$$\underline{\beta = 26.6287\ rad/m}$$

$$\Gamma_L = \Gamma(0)\, e^{+j2\beta\ell} \quad \text{from } \Gamma(z=0) = \Gamma_L\, e^{-j2\beta(\ell - \not{z})}$$

$$\Gamma_L = (0.2425\angle 104.04°)\, e^{j\,2(26.6287)10} = \underline{0.2425\angle 18.322°}$$

To find V_0 & I_0, draw equivalent circuit.



$$V_0 = V_g \frac{Z_{in}}{Z_g + Z_{in}} = (50\angle 60°\ V)\ \frac{60+j30}{75+(60+j30)} = \underline{24.254\angle 74.04°\ V}$$

$$I_0 = \frac{V_g}{Z_g + Z_{in}} = \frac{50\angle 60°}{75+(60+j30)} = \underline{0.3616\angle 47.471°\ A}$$

ex. cont.

To find Z_L, we can NOT use (circular argument)

$$Z_L = Z_{in}(z=\ell) = Z_0\left[\frac{Z_L + j Z_0 \tan(\beta\ell)}{Z_0 + j Z_L \tan(\beta\ell)}\right] = Z_L$$ ← since $\ell' = \ell - \ell = 0$, $\tan(\beta\ell') = 0$

So, we use

$$Z_L = Z_{in}(z=\ell) = Z_0\,\frac{1+\Gamma(\ell)}{1-\Gamma(\ell)} = Z_0\,\frac{1+\Gamma_L}{1-\Gamma_L}$$

$$Z_L = (75)\,\frac{1+0.2425\angle 18.322^\circ}{1-0.2425\angle 18.322^\circ} = \underline{117.97 + j\,19.113\ \Omega}$$

$$VSWR = \frac{1+|\Gamma|}{1-|\Gamma|} = \frac{1+0.2425}{1-0.2425} = \underline{1.64}$$

To find V_L and I_L, we will need V_0^+

$$V_0^+ = \frac{V_0}{1+\Gamma(0)} \quad \text{from} \quad V_s(z) = V_0^+ e^{-j\beta z}(1+\Gamma(z)) \text{ w/ } z=0$$

$$= \tfrac{1}{2}(V_0 + I_0 Z_0)$$ ← easiest

$$V_0^+ = \frac{24.254\angle 74.04^\circ}{1+0.2425\angle 104.04^\circ} = \underline{25\angle 60^\circ\ V}$$ ← same as $\frac{V_s}{2}$! (because $Z_0 = Z_g$)

$$V(z=\ell) = V_L = V_0^+ e^{-j\beta\ell}(1+\Gamma_L) = 25\angle 60^\circ\, e^{-j26.63(10)}(1+0.2425\angle 18.32^\circ)$$

$$\underline{V_L = 30.815\angle -73.597^\circ\ V}$$

$$\underline{I_L = V_L / Z_L = 0.2578\angle -82.8^\circ\ A}$$