$f = 300\ MHz = 3 \times 10^8\ Hz$ RG 11 A/U : $Z_0 = 75\ \Omega$

$l = \frac{\lambda}{2}$ $c = 3 \times 10^8\ m/s$

$\lambda = \frac{c}{f\sqrt{\varepsilon_r \mu_r}}$

$\varepsilon_r = 2,2$

$Z_L = 73 + j\,42,5\ \Omega$

a. $\Gamma_L = \frac{Z_L - Z_0}{Z_L + Z_0} = \frac{73 + j\,42,5 - 75}{73 + j\,42,5 + 75}$

$= \frac{-2 + j\,42,5}{148 + j\,42,5} \times \frac{148 - j\,42,5}{148 - j\,42,5}$

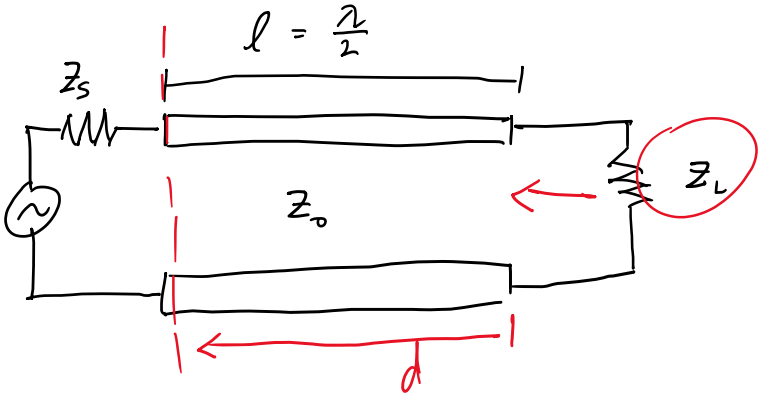
$= 0,06 + j\,0,27$

$\Gamma_L = 0,28 \angle 77,47°$

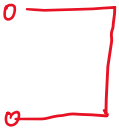
$SWR = \frac{1 + |\Gamma_L|}{1 - |\Gamma_L|} = \frac{1 + 0,28}{1 - 0,28} = \frac{16}{9} = 1,78$

$RL = 20 \log |\Gamma_L| = 20 \log (0,28) = -11,06\ dB$

b.




$Z(d) = \infty$


$Z(d) = 0$

$d = l = \frac{\lambda}{2}$

$\beta = \frac{2\pi}{\lambda}$

$$Z\left(d=\frac{\lambda}{2}\right) = Z_0 \frac{Z_L + j Z_0 \tan(\beta d)}{Z_0 + j Z_L \tan(\beta d)}$$

$$= Z_0 \frac{Z_L + j Z_0 \tan\left(\frac{2\pi}{\lambda} \cdot \frac{\lambda}{2}\right)}{Z_0 + j Z_L \tan\left(\frac{2\pi}{\lambda} \cdot \frac{\lambda}{2}\right)}$$

$$Z\left(d=\frac{\lambda}{2}\right) = Z_0 \cdot \frac{Z_L}{Z_0} = Z_L = 73 + j\,42{,}5$$

$$\Gamma_L = 0{,}06 + j\,0{,}27 = 0{,}28 \angle 77{,}47^\circ$$

SWR = 1,78

RL = −11,06 dB

c. $d = \frac{\lambda}{2}$

$$Z\left(d=\frac{\lambda}{2}\right) = Z_L = 73 + j\,42{,}5\ \Omega$$

$d = \frac{\lambda}{4}$

$$Z\left(d=\frac{\lambda}{4}\right) = Z_0 \frac{Z_L + j Z_0 \tan(\beta \cdot d)}{Z_0 + j Z_L \tan(\beta \cdot d)}$$

$$= Z_0 \cdot \frac{Z_L + j Z_0 \tan\left(\frac{2\pi}{\lambda} \cdot \frac{\lambda}{4}\right)}{Z_0 + j Z_L \tan\left(\frac{2\pi}{\lambda} \cdot \frac{\lambda}{4}\right)}$$

$$= Z_0 \cdot \frac{Z_L + j\,\infty}{Z_0 + j\,\infty} \times \frac{Z_0 - j\,\infty}{Z_0 - j\,\infty}$$

$$= \infty \quad (\text{Open Circuit})$$