10.3.1

1. $\tilde{\rho}_1(0) = \dfrac{z_2/z_1 - 1}{z_2/z_1 + 1} = \dfrac{z_0/3 \cdot 2/z_0 - 1}{z_0/3 \cdot 2/z_0 + 1} = \dfrac{2/3 - 1}{2/3 + 1} = -1/5$

2. $\tilde{\rho}_1(-\lambda_1/8) = -1/5\, e^{2j(2\pi/\lambda)(-\lambda/8)} = -1/5\, e^{-j\pi/2} = \frac{1}{5} j$

$z_1(-\lambda_1/8) = \dfrac{1 + \tilde{\rho}_1(-\lambda/8)}{1 - \tilde{\rho}_1(-\lambda_1/8)} \cdot z_1 = \dfrac{z_0}{2}\left(\dfrac{1 + 1/5\, j}{1 - 1/5\, j}\right) = (0.46 + 0.19j) z_0$

$\tilde{\rho}_0(-\lambda_0/4) = \dfrac{\frac{\tilde{z}_1(-\lambda_1/8) - 1}{z_0}}{\frac{\tilde{z}_1(-\lambda_1/8)}{z_0} + 1} = \dfrac{z_0/2 \cdot 1/z_0 \left[\frac{1+1/5j}{1-1/5j}\right] - 1}{z_0/2 \cdot 1/z_0 \left[\frac{1+1/5j}{1-1/5j}\right] + 1} = -0.345 + 0.177j$

$= (-0.345 + 0.177j) e^{2j(2\pi/\lambda)(-\lambda/4)} = 0.345 - 0.177j$

$z_0(-\lambda_0/4) = \dfrac{1 + \tilde{\rho}_0(-\lambda_0/4)}{1 - \tilde{\rho}_0(-\lambda_0/4)} \cdot z_0 = z_0\left(\dfrac{1 + (0.345 - 0.177j)}{1 - (0.345 - 0.177j)}\right) = 1.85 - 0.77j$

10.3.2.

1. $z_2/z_1 = 2/3 \rightarrow r = 2/3,\ x = 0$
2. $\tilde{\rho}_1(0) \simeq 0.2 = 1/5 \angle 180$ (point e)
3. $\tilde{\rho}_1(-\lambda_1/8) = 0.2j = 1/5\, j \angle 90$ (point f)
4. $r = 0.91,\ x = 0.38$
5. $z_1(-\lambda/8) = z_0/2\,(0.91 + 0.38j) = (0.46 + 0.19j) z_0$
6. $\tilde{\rho}_0(-\lambda_0/4) = -0.345 + 0.177j$
7. $r = 1.85,\ x = -0.77$ (point h)
8. $z_0(-\lambda_0/4) = z_0(1.85 - 0.77j)$

The Complete Smith Chart

Black Magic Design