10.1.1.

1. $\tilde{\rho}_1(0) = \dfrac{Z_0/Z_1 - 1}{Z_0/Z_1 + 1} = \dfrac{Z_0/3 \cdot 2/Z_0 - 1}{Z_0/3 \cdot 2/Z_0 + 1} = \dfrac{2/3 - 1}{2/3 + 1} = -\dfrac{1}{5}$

2. $\tilde{\rho}_1(-\lambda_1/4) = |-1/5|\, e^{2j(2\pi/\lambda)(-\lambda/4)} = |-1/5|\, e^{-j\pi} = -1/5$

$Z_1(-\lambda_1/4) = Z_1\left(\dfrac{1-\tilde{\rho}_1(-\lambda_1/4)}{1+\tilde{\rho}_1(-\lambda_1/4)}\right) = \dfrac{Z_0}{2}\left(\dfrac{1-(-1/5)}{1+(-1/5)}\right) = \dfrac{3Z_0}{4}$

10.1.2.

1. $\dfrac{Z_1(0)}{Z_1} = Z_0/3 \cdot 2/Z_0 = 2/3 \rightarrow r = 2/3,\ x = 0$

2. $\tilde{\rho}_1(0) \simeq 0.2 = 1/5 \angle 180$ (point a)

3. $\tilde{\rho}_1(-\lambda_1/4) \simeq 1.5 = -1/5 \angle 180$ (point b)

4. $r = 1.5,\ x = 0$

5. $\dfrac{Z_1(-\lambda_1/4)}{Z_0/2} = 1.5 \rightarrow Z_1(-\lambda_1/4) = \dfrac{3}{4} Z_0$

The Complete Smith Chart

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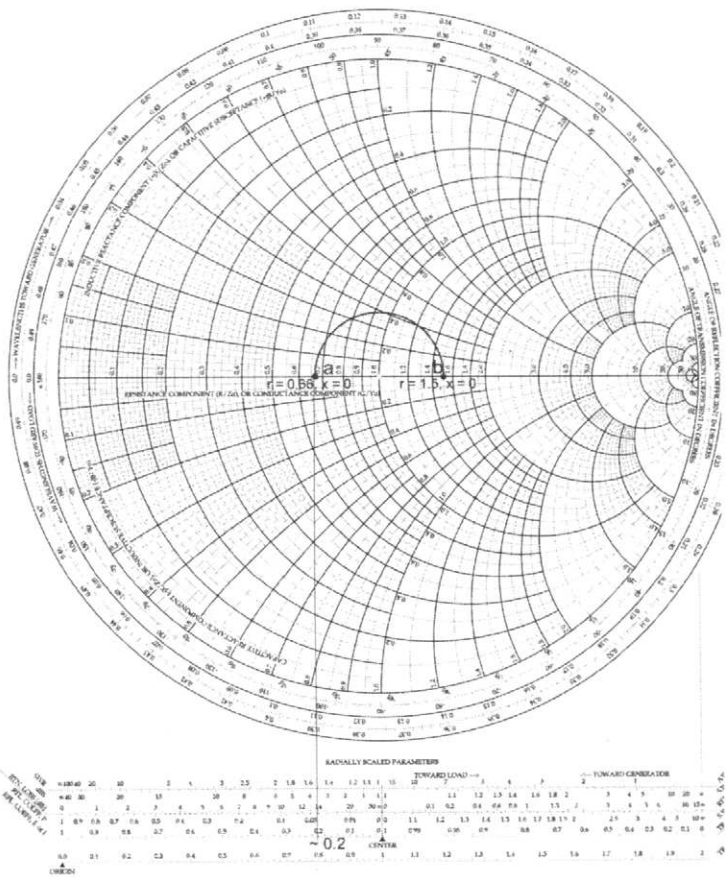

10.2.1.

1. $\tilde{\rho}_0(0) = \frac{z_1/z_0 - 1}{z_1/z_0 - 1} = \frac{z_{\lambda/2} \cdot 1/z_0 - 1}{z_{\lambda/2} \cdot 1/z_0 + 1} = -1/3$

2. $\tilde{\rho}_1(-\lambda/4) = |-1/3| e^{2j(2\pi/\lambda)(-\lambda/4)} = |-1/3| e^{-j\pi} = -1/3$

$z_0(-\lambda/4) = z_0\left(\frac{1 - \tilde{\rho}_0(-\lambda/4)}{1 + \tilde{\rho}_0(-\lambda/4)}\right) = z_0\left(\frac{1 - (-1/3)}{1 + (-1/3)}\right) = 2z_0$ ✓

10.2.2.

1. $\frac{z_1(0)}{z_0} = \frac{z_0}{2} \cdot \frac{1}{z_0} = \frac{1}{2} \rightarrow r = 1/2,\ x = 0$

2. $\tilde{\rho}_0(0) \simeq 0.333 = 1/3 \ \angle 180°$ (point c)

3. $\tilde{\rho}_0(-\lambda/4) \simeq 2 = -1/3 \ \angle 180°$ (point d)

4. $r = 2,\ x = 0$

5. $\frac{z_0(-\lambda/4)}{z_0} = 2 \rightarrow z(-\lambda/4) = 2z_0$ ✓

The Complete Smith Chart

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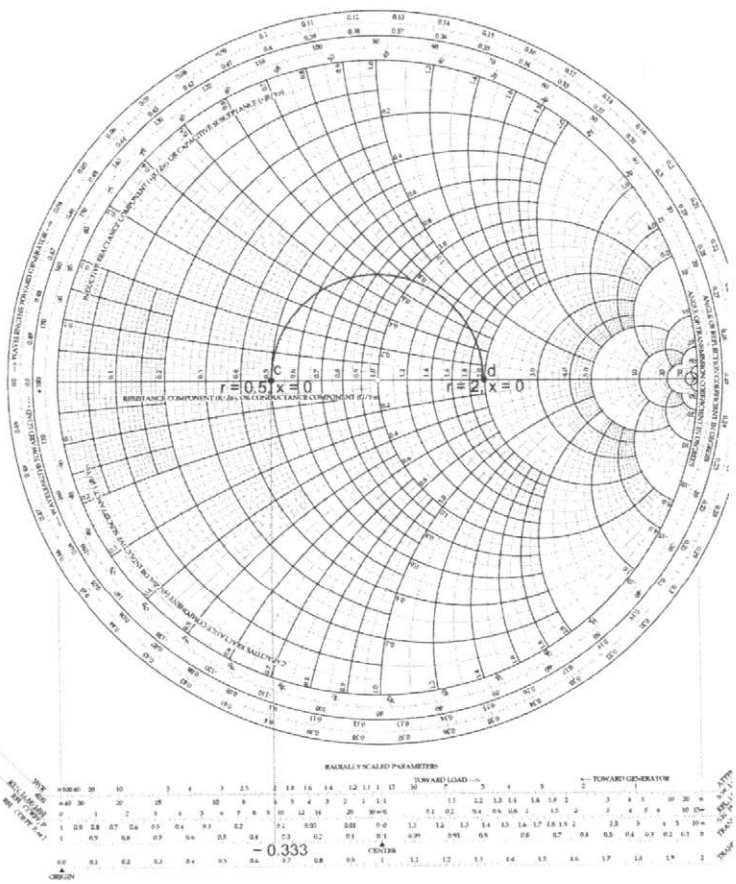

10.3.1

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

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

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

$\tilde{\rho}_0(-\lambda_0/4) = \dfrac{\frac{z_1(-\lambda/8)}{z_0} - 1}{\frac{z_1(-\lambda_1/8)}{z_0} + 1} = \dfrac{z_{0/2} \cdot 1/z_0\left[\frac{1+1/5j}{1-1/5j}\right] - 1}{z_{0/2} \cdot 1/z_0\left[\frac{1+1/5j}{1-1/5j}\right] + 1} = -0.345 + 0.177j$

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

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

10.3.2.

1. $z_{3/z_1} = 2/3 \rightarrow r = 2/3,\ x = 0$
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. $\tilde{\rho}_0(-\lambda/4) = -0.345 + 0.177j$
7. $r = 1.85,\ x = -0.77$ (point h)
8. $z_0(-\lambda_0/4) = z_0\,(1.85 - 0.77j)$

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