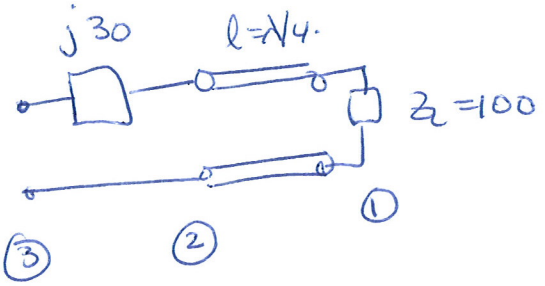
~~Problem #1~~ Question 1
Solution #1

Problem 8
Fields and Transmission Lines

Spring 2013

(1.0) a) $Z_{in} = ?$

① $Z_{in} = 100 \qquad \bar{Z}_L = \frac{Z_L}{50} = 2$



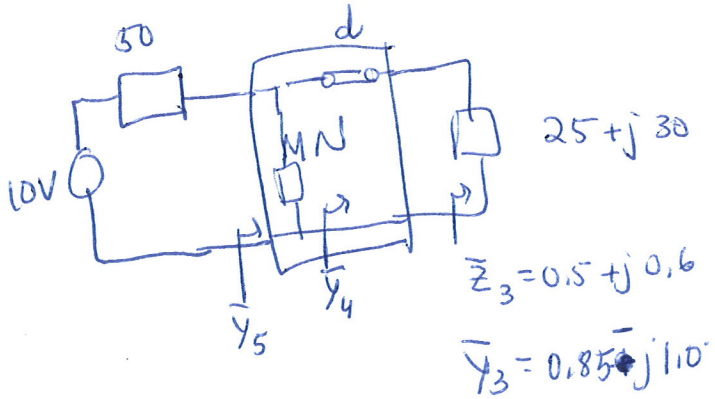
② $\bar{Z}_{②} = 0.5$

③ $j30 \Rightarrow j\frac{30}{50} = j0.6$

$\Rightarrow \bar{Z}_{③} = 0.5 + j0.6$

$Z_3 = \bar{Z}_{③} \times 50 = 25 + j30$

(1.0) b) Design the MN



$d = (0.5 - 0.348)\lambda + 0.1645\lambda = (0.152 + 0.1642)\lambda = 0.3165\lambda$

$\bar{y}_4 = 1 + j1.1$

Select ⑥ $+j1.1$ to offset $+j1.1$ in Y_4.

Stub design:

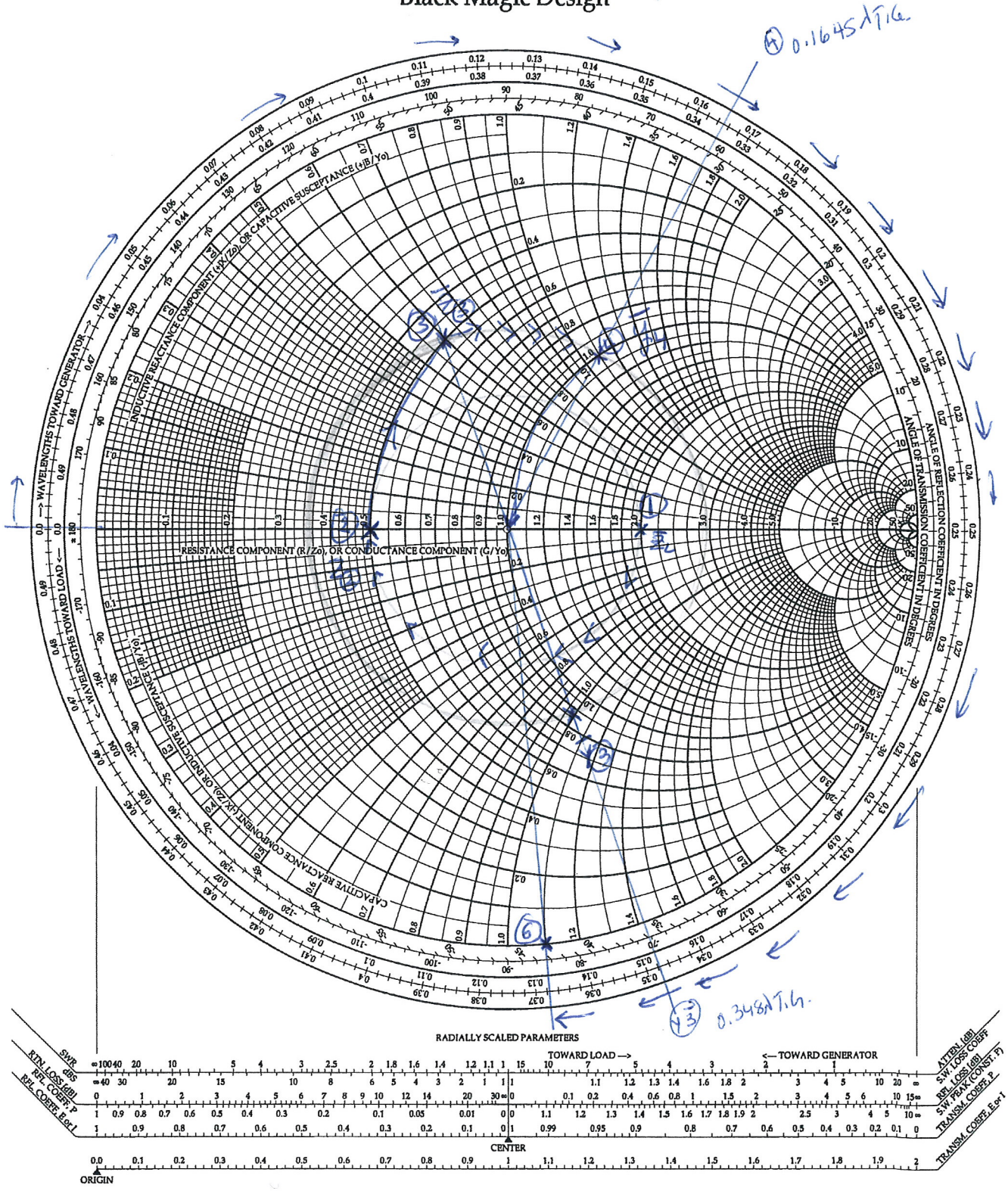
Using an O.C. $\ell_{O.C} = 0.368\lambda$

Using a S.C. $\ell_{S.C} = 0.118\lambda$

~~Problem~~ #1
Question

The Complete Smith Chart

Black Magic Design



Question

~~Problem~~ # 2. - Solution # 2

$$C_T = \frac{1}{L_T (2\pi f_r)^2}$$

$f_r = 800\ MHz$

$L_T = 2 \times 1 \times 10^{-9}\ H.$

$$C_T = \frac{1}{(2\times10^{-9})(2\pi \times 800\times10^{6})^2}$$

$$= \frac{1}{5.05\times10^{10}}$$

(0.5) $C_T = 19.78\ pF$

$$C_1 = \frac{\varepsilon_{r1}\,\varepsilon_0 A_1}{d} \qquad A_1 = w_1 \times l_1$$

$$= (0.2\times10^{-2})(0.1\times10^{-2})$$

$$= \frac{4 \times 8.85\times10^{-12}\ F/m \times (0.2\times10^{-2})(0.1\times10^{-2})}{1\times10^{-3}}$$

(0.5) $= 0.708\ pF.$

(0.5) $C_2 = C_T - C_1 = 9.54\ pF = \frac{\varepsilon_{r2}\,\varepsilon_0 A_2}{d}$; $A_2 = 2w_2 \times l.$

(0.5) $$\varepsilon_{r2} = \frac{C_2\, d}{\varepsilon_0 (2w_2)} = \frac{9.54\times10^{-12} \times (1\times10^{-3})}{8.85\times10^{-12}(2)(0.4\times10^{-2})(1\times10^{-2})} = 13.4.$$

Problem 8
Fields and Transmission Lines

$$\varepsilon_{r2} = \frac{9.54 \times 10^{-12+(-3)} = -15}{0.4 \times 2 \times 8.85 \times 10^{\underline{-12+(-2)+(-2)}}}$$

$$-16$$

$$= \frac{1.34 \times 10^{-15}}{10^{-16}}$$

$$= 1.34 \times 10^{1}$$

$$\varepsilon_{r2} = 13.4.$$