

# EE381 HW3

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2.47

(a)  $\Gamma = 0.5 \angle 0^\circ$

(b)  $\Gamma = 0.62 \angle -29.74^\circ$

(c)  $\Gamma = 1 \angle -53.13^\circ$

(d)  $\Gamma = 1 \angle 180^\circ$

2.53

(a)  $\Gamma = 0.24 \angle 75^\circ$

(b)  $SWR = 1.65$

(c)  $z(0.35\lambda) = 0.61 - j0.05$

(d)  $y(0.35\lambda) = 1.65 + j0.05$

(e)  $d = 0.105\lambda$

(f)  $d(max) = 0.105\lambda$

2.54

(a)  $\Gamma = 0.24 \angle 76^\circ$

(b)  $SWR = 1.64$

(c)  $z(0.35\lambda) = 0.61 - j0.02$

(d)  $y(0.35\lambda) = 1.64 + j0.06$

(e)  $d = 0.105\lambda$

(f)  $d(max) = 0.105\lambda$

2.58

(a)  $Z_L = j0.95 \cdot Z_0 = 95\Omega$

(b)

•	$z_L = 0.0 + j0.95$
	$\Gamma_L = 1.0 \angle 92.9376^\circ$
•	$z(d) = 0.0 - j0.025641$
	$\Gamma_d = 1.0 \angle -177.0624^\circ$
•	$y(d) = 0.0 + j39.0$
•	$d' = 0.375\lambda$ $d = 0.875\lambda$
	$2\beta d' = 4.712389 \text{ rad} = 270.0^\circ$
•	$0.5\lambda - d' = 0.125\lambda$
	$2\beta(0.5\lambda - d') = 1.570796 \text{ rad} = 90.0^\circ$

2.65

First Solution	
$d_1 = 0.22899\lambda$	$+ 68.6983 \text{ mm}$
$Z(d_1) = 202.6551 \Omega$	
$Z_{02} = 142.357 \Omega$	
Second Solution	
$d_2 = 0.47899\lambda$	$+ 143.6983 \text{ mm}$
$Z(d_2) = 49.3449 \Omega$	
$Z_{02} = 70.2459 \Omega$	
Transformer Length $\lambda_2/4 = 75.0 \text{ mm}$	

2.68

$$Z_L = (75 - j20)\Omega$$

$$Z_0 = 50\Omega$$

$$z_L = (1.5 - j0.4)\Omega$$

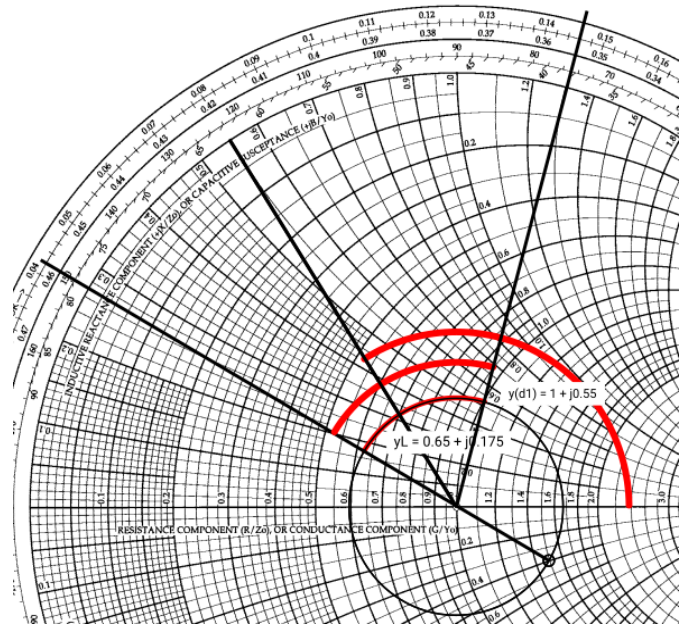
$$y_L = (0.65 + j1.75)\Omega$$

$$d_1 = 0.104\lambda$$

$$y(d_1) = (1 + j0.55)\Omega$$

$$l_1 = 0.25 - 0.08 = 0.17\lambda$$

Work:



2.72

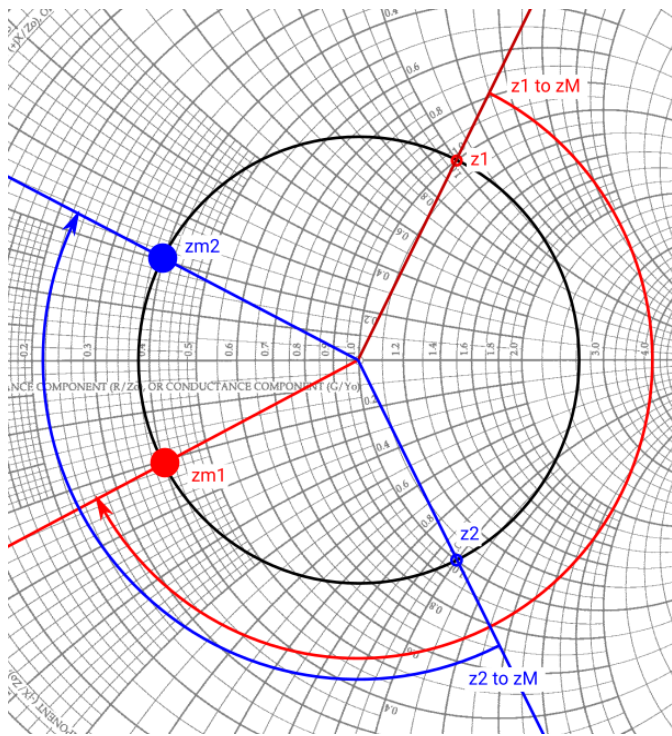
Find  $z_m$

$$z_{m1} = 0.4 - j0.2$$

$$z_{m2} = 0.4 + j0.2$$

$$z_m = z_{m1} \parallel z_{m2} = 0.25 + j0$$

Work:

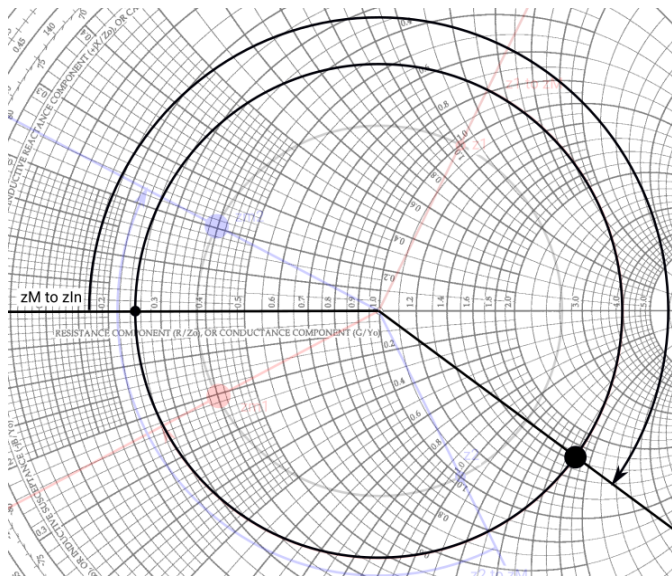


Find  $Z_{in}$

$$z_{in} = 1.65 - j1.8$$

$$Z_{in} = (82.5 - j90)\Omega$$

Work:



2.74

$$z_L = 25/75 = 0.33\Omega$$

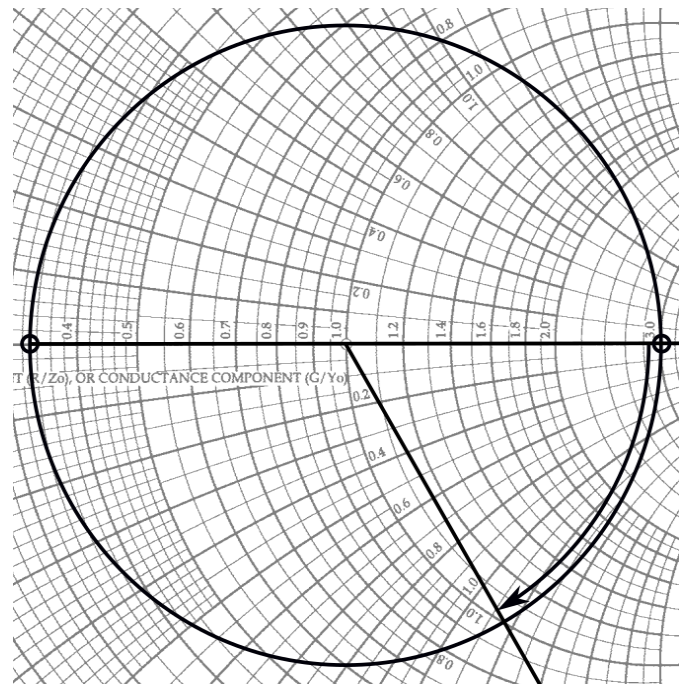
$$y_B = (1.0 - j1.15)\Omega$$

$$l = 0.3325\lambda - 0.25\lambda = \boxed{0.0825\lambda}$$

$$z_B = 1/y_B = (0.43 + j0.5)\Omega$$

$$Z = Z_B = z_B Z_0 = \boxed{(32.25 + j37.5)\Omega}$$

Work:



2.75

$$T = \frac{1m}{2c/3} = 5ns$$

$$\Gamma_L = \frac{R_L - Z_0}{R_L + Z_0} = \frac{25 - 50}{25 + 50} = -\frac{1}{3}$$

$$\Gamma_g = \frac{R_g - Z_0}{R_g + Z_0} = \frac{100 - 50}{100 + 50} = \frac{1}{3}$$

$$V_1^+ = V_g \cdot \frac{Z_0}{Z_0 + R_g} = 60 \cdot \frac{50}{50 + 100} = 20V$$

$$V_1^- = V_1^+ \cdot \Gamma_L = 20 \cdot -\frac{1}{3} = -6.67V$$

$$V_2^+ = V_1^- \cdot \Gamma_g = 6.67 \cdot \frac{1}{3} = 2.22V$$

$$V_2^- = -0.74V$$

$$V_3^+ = 0.25V$$

$$V_3^- = -0.083V$$

