Spring 2012 : Transmission Lines, Fields & Waves

Solution

(a) VSWR $\quad \Gamma_L = \dfrac{z_L - 1}{z_L + 1} = \dfrac{0.8 - j0.6 - 1}{0.8 + j0.6 + 1} = -j0.333$

$z_L = \dfrac{40 - j30}{50} = 0.8 - j0.6$

$S = \dfrac{1 + |\Gamma|}{1 - |\Gamma|} = \underline{\underline{2}}$ (0.5 pts)

$f\lambda = v, \quad \lambda = \dfrac{1 \times 10^8}{1 \times 10^8} = 1m$

(b). $z_L = 0.8 - j0.6$ & $y_L = \dfrac{1}{z_L} = 0.8 + j0.6$.

From Smith Chart. line length to intersect with admittance $1 + jb$ circle is $\cong 0.025\lambda$

& $= \underline{\underline{0.025\ m.}}$

$y_L' = 1.0 + j0.7$

Use short circuit stub length $-j0.7$ at 50 Ω to $= 0.1525\lambda$

$= \underline{\underline{0.1525m}}$

(c) Use the Smith Chart again

$\lambda = \dfrac{9 \times 10^8}{9 \times 10^7} = 1.111\ m$

$z_L = 0.8 - j0.666, \quad y_L = 0.74 + j0.62$

Rotate towards generater by $\dfrac{0.025}{1.111}\lambda$

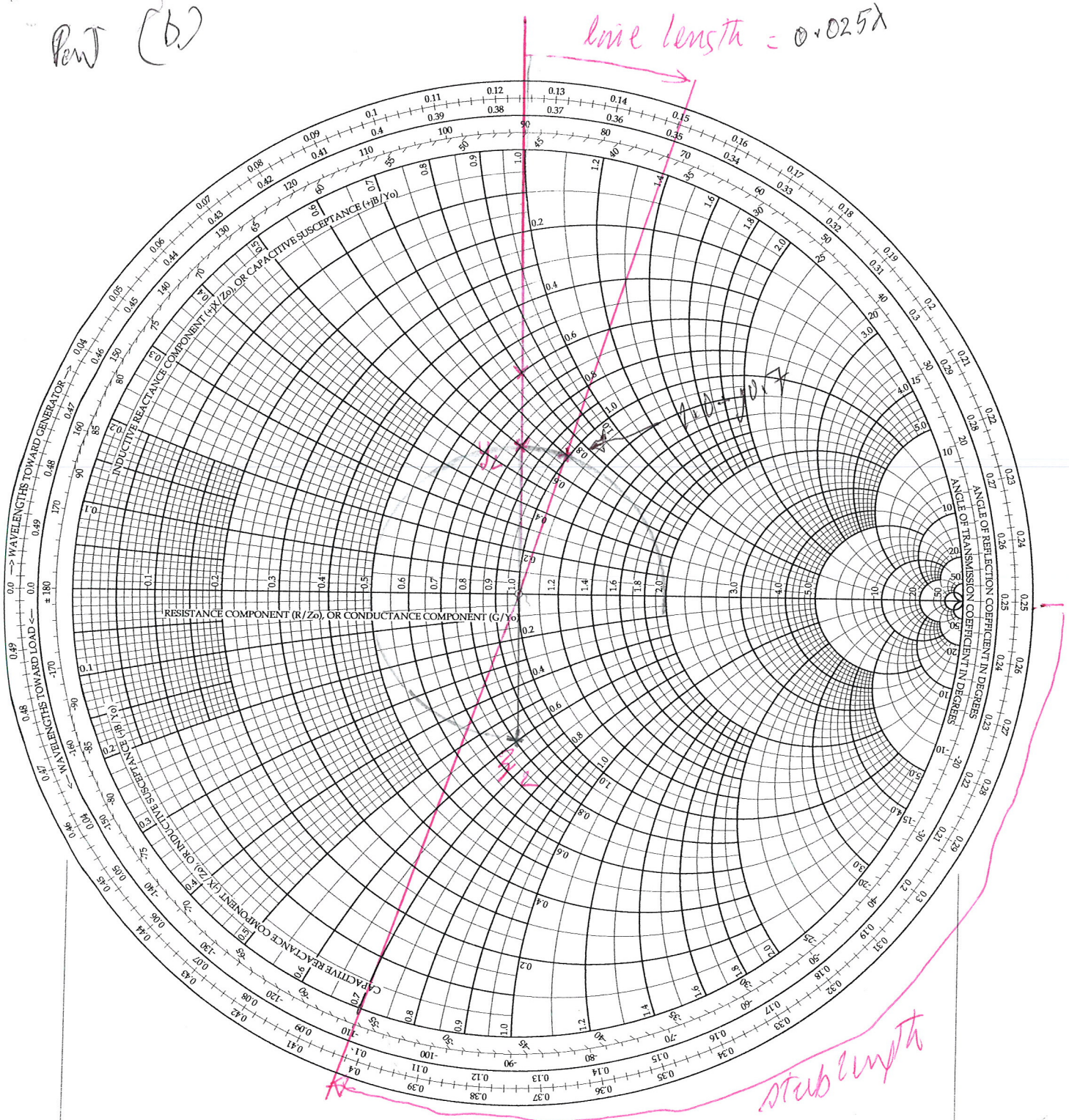
give $y_{L2} = 0.88 + j0.85$ $\quad y_{in} = 0.88$, $z_{in} = \underline{\underline{58.8\Omega}}$

Stub length $= \dfrac{0.1525}{1.111} = 0.137\lambda$

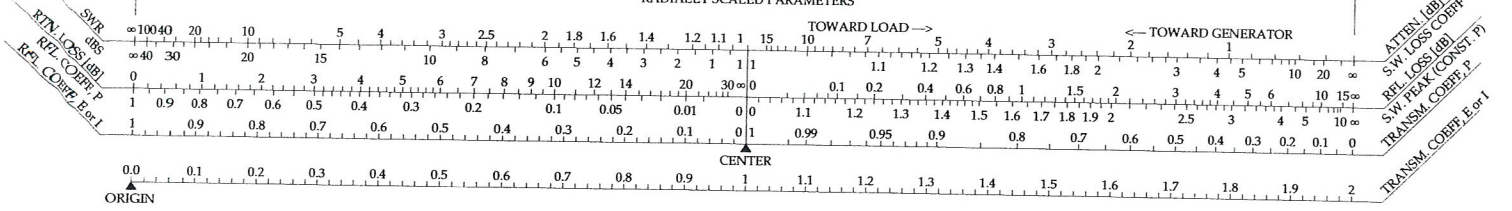
Short circuit stub of this length $jb_{stub} = -j0.85$

Part (b)

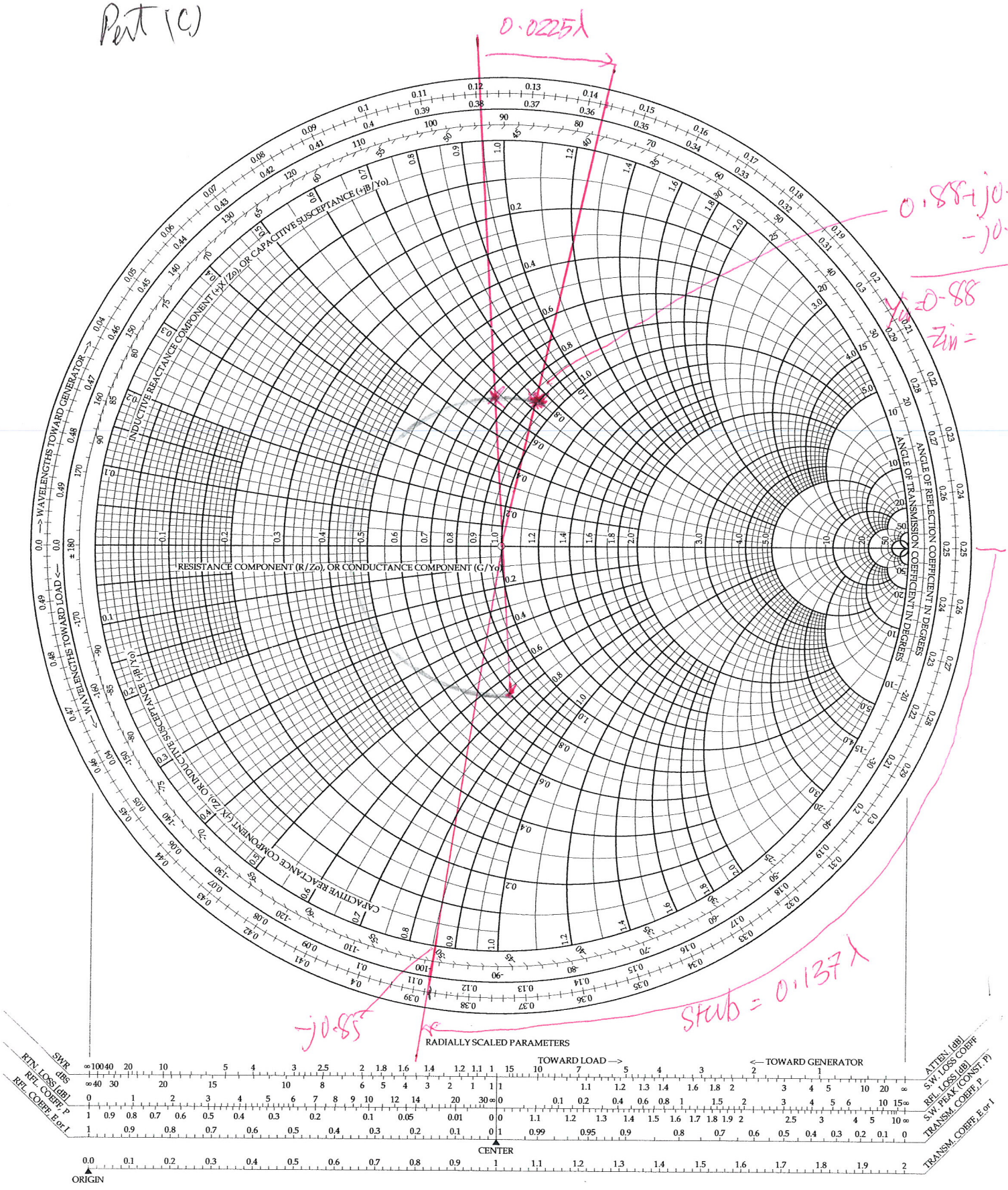
line length = 0.025λ



RADIALLY SCALED PARAMETERS



Part (c)


0.0225λ
0.88+j0.85
-j0.85
Zin =
-j0.85
STUB = 0.137λ
RESISTANCE COMPONENT (R/Zo), OR CONDUCTANCE COMPONENT (G/Yo)
INDUCTIVE REACTANCE COMPONENT (+jX/Zo), OR CAPACITIVE SUSCEPTANCE (+jB/Yo)
CAPACITIVE REACTANCE COMPONENT (-jX/Zo), OR INDUCTIVE SUSCEPTANCE (-jB/Yo)
ANGLE OF REFLECTION COEFFICIENT IN DEGREES
ANGLE OF TRANSMISSION COEFFICIENT IN DEGREES
WAVELENGTHS TOWARD GENERATOR
WAVELENGTHS TOWARD LOAD
RADIALLY SCALED PARAMETERS
TOWARD LOAD
TOWARD GENERATOR
SWR
RTN. LOSS [dB]
RFL. COEFF. P
RFL. COEFF. E or I
ATTEN. [dB]
S.W. LOSS COEFF
RFL. LOSS [dB]
S.W. PEAK (CONST. P)
TRANSM. COEFF. P
TRANSM. COEFF. E or I
CENTER
ORIGIN