ENEL 476 – Assignment #3

Due on Thurs April 6 at 4 pm

Drop boxes on 2nd floor of ICT

An antenna with impedance Z_L=72-j43 Ω is connected to a lossless transmission line with impedance Z_o=75Ω. Use the Smith Chart to solve the following problems.

a) Plot the normalized impedance, z_L
b) Find the reflection coefficient, Γ.
c) Find the standing wave ratio (VSWR, SWR or s).
d) Find the shortest distances from the antenna to the location of the voltage maximum (V_{max}) and voltage minimum (V_{min}) on the transmission line.
e) Indicate the locations of the short and open on the Smith Chart.
f) The antenna is connected to transmission line of length of 0.625λ. What is Z_{in} at this location?
g) A generator supplies 20 V and has internal impedance of Z_g= 75 Ω. How much power is absorbed by the load connected to the generator and the 0.625λ line?

a) $z_L = \frac{72-j43}{75}$

$= 0.96 - j0.573$

b) $|\Gamma| = 0.28$

$\angle = -76°$

c) $S = 1.75 - 1.8$

d) V_{max} is located at 0.25λ

V_{min} is located at 0.5λ

z_L is located at 0.356λ.

$z_L \rightarrow V_{max} = [(0.5 - 0.356) + 0.25]\lambda$

$= 0.394\lambda$

$z_L \rightarrow V_{min} = 0.144\lambda$

f) $0.625\lambda = (0.5 + 0.125)\lambda$ ← rotation

$z_L \rightarrow z_{in} \Rightarrow 0.356\lambda$

$+ 0.125\lambda$

0.481λ

$z_{in} = 0.575 - j0.08$

$Z_{in} = 75 z_{in}$

$\boxed{Z_{in} = 43.125 - j6\ \Omega}$

g) $P_L = \frac{1}{2}|I_{in}|^2 R\{Z_{in}\}$

$I_{in} = \frac{10}{75 + 43.125 - j6}$

$= 0.168 + j0.0086$

$P_L = \frac{1}{2}(0.0283)(43)$

$\boxed{P_L = 0.610\ W}$

Normalized Impedance Smith Chart

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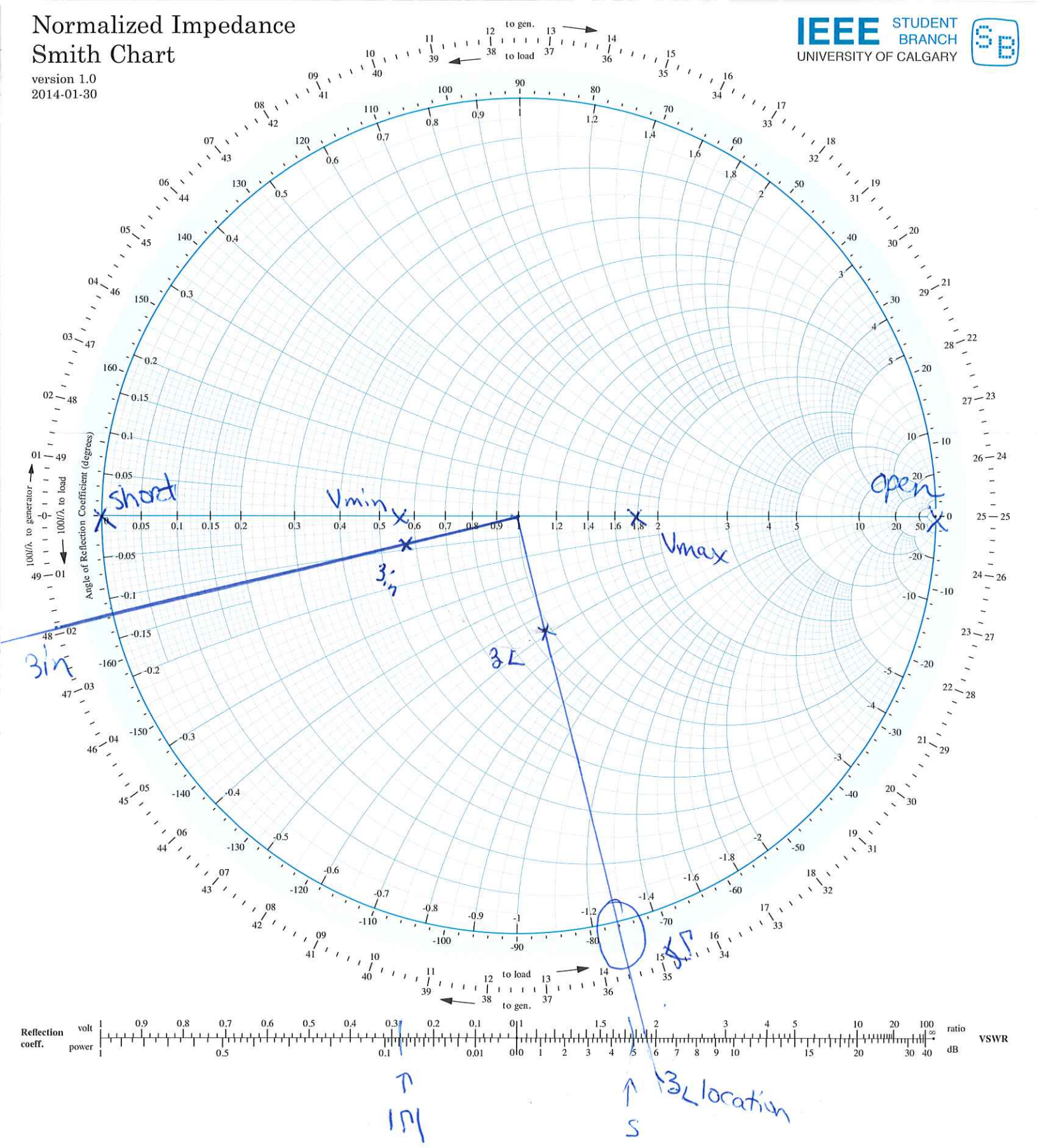
IEEE STUDENT BRANCH
UNIVERSITY OF CALGARY



IN

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3L location

SCHULICH School of Engineering
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makeda press