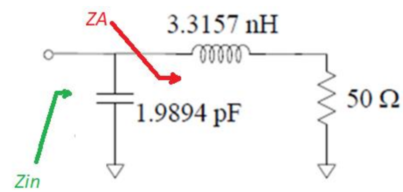
Benha University
Faculty of Engineering at Shoubra
Electrical Engineering Department

Microwave fundamentals
3rd Year Communications
(2018-2019)

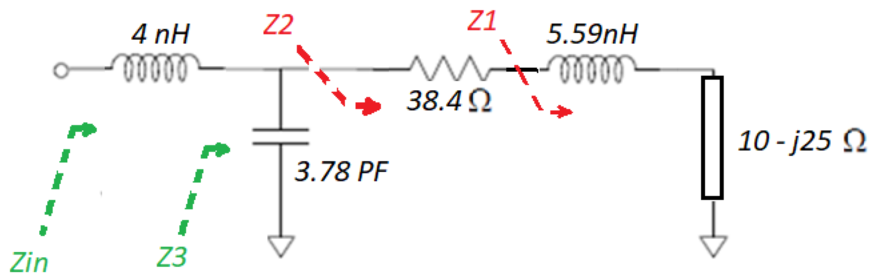
Sheet 5

---

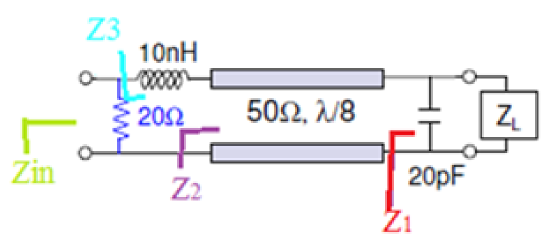
1. Using smith chart find Zin, Γin, VSWR for 50 Ω transmission line connected to the circuit below
   f=2.4GHz



2. Using smith chart locate Z1,Z2,Z3 and Zin, find Γin, VSWR for 50 Ω transmission line connected to the circuit below
   f=1GHz



3. Compute the normalized impedance/admittance points (ZL,Z1,Z2,Z3 and Zin) in figure below; locate these points on impedance/admittance Smith chart and show the solution track on smith. find Zin, Γin, VSWR.
   f=159MHz



Good Luck

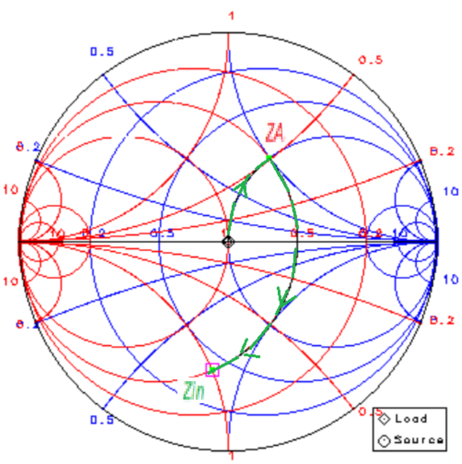
Dr. Gehan Sami

Final solutions :

Note: all impedances/admittances are normalized, convert to un-normalized values by yourself.

Q1:

Solution track

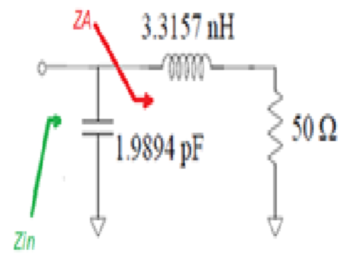


ZA=1+j1

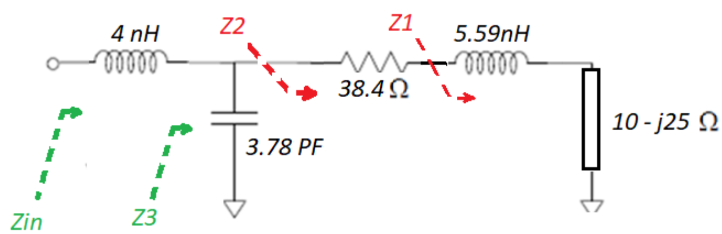
Zin=0.4-j0.8   *Yin=0.5+j1*

input reflection coefficient 0.62∠-97.

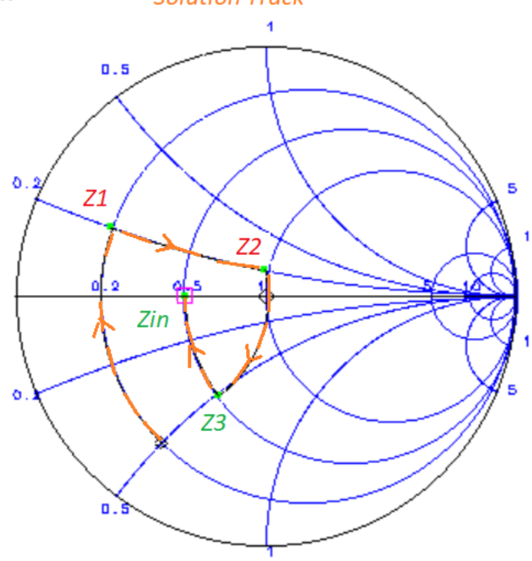
VSWR=4.27



Q2:



Solution Track



ZLn=0.2-j0.5

Z1=0.2+j0.2

Z2=0.97+j0.2   *Y2=1-0.2j*

Y3=1+j1   *Z3=0.5-j0.5*

Zin=0.5

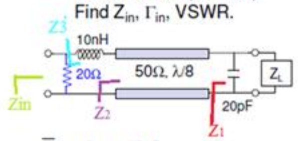
input reflection coefficient=0.324 ∠180

VSWR=1.96

Get from smith

Q3:

e.g. $Z_L = 20 - j25\ \Omega$
$f = 159$ MHz $(\omega = 10^9)$
Find Z_{in}, Γ_{in}, VSWR.



$\overline{Z}_L = 0.4 - j0.5$

Y1=0.98+j2.2 Z1=0.166-j0.378

Z2=0.172+j0.43

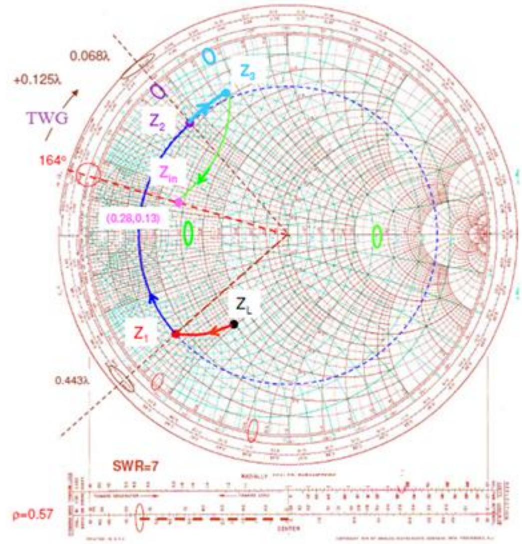
Z3=0.172+j0.63 Y3=0.4-j1.48

Yin=2.9-j1.48 Zin=0.27+j0.139

$Z_{in} = 50(0.28+j0.13) = 14 + j7\ \Omega$

$\Gamma_{in} = 0.57\ (164^o)$

Solution Track



$\overline{B} = \omega C/Y_o = 0.02Z_o = 1$

$\overline{X} = \omega L/Z_o = 10/Z_o = 0.2$

$\overline{G} = G/Y_o = Z_o/R = 50/20 = 2.5$