```
% Design exercise


clear ; clc ;

rect2polard = @(z) [abs(z) rad2deg(angle(z))] ;
polard2rect = @(z) z(1)*exp(1j*deg2rad(z(2))) ;
get_gamma = @(Z) (Z-50)/(Z+50)
```

```
get_gamma = function_handle with value:
    @(Z)(Z-50)/(Z+50)
```

```
get_Z = @(gamma) 50*(1+gamma)/(1-gamma)
```

```
get_Z = function_handle with value:
    @(gamma)50*(1+gamma)/(1-gamma)
```

```
Z0 = 50 ;


%%% From stability.dds @ 2GHz: RStabCkt..Sopt = 0.490 / 104.992
S_opt = polard2rect([ 0.444 98.626])
```

```
S_opt = -0.0666 + 0.4390i
```

```

f = 2e9 ;
w = 2*pi*f ;


gamma_in = conj(S_opt)
```

```
gamma_in = -0.0666 - 0.4390i
```

```
Zin = get_Z(gamma_in)
```

```
Zin = 30.1756 - 32.9979i
```

```
R_in = real(Zin) ;
X_in = (imag(Zin)) ;


% check lumped elements matching configuration 1
XL = X_in ;
RL = R_in ;

B_Lin = ( XL - sqrt(RL/Z0)*sqrt(RL^2+XL^2-Z0*RL) )/( RL^2+XL^2 )
```

```
B_Lin = -0.0251
```

```
Lin = 1/(w*B_Lin)
```

```
Lin = -3.1691e-09
```

```
X_Cin = 1/B_Lin + XL*Z0/RL - Z0/(B_Lin*RL)
```

```
X_Cin = -28.5129
```

```
Cin = 1/(w*X_Cin)
```

```
Cin = -2.7909e-12
```

```
clear XL RL
```

```
C_in = 2.8e-12 ;
L_in = 3.2e-9 ;

Z0 = 50 ;
Z_Cin = 1/(j*w*C_in) ;
Z_Lin = (j*w*L_in) ;

Z_SM = 1/( 1/(Z0+Z_Cin) + 1/(Z_Lin) )
```

```
Z_SM = 30.6367 + 32.9871i
```

```
gamma_S = get_gamma(Z_SM)
```

```
gamma_S = -0.0623 + 0.4346i
```

```
rect2polard(gamma_S)
```

```
ans = 1×2
    0.4390   98.1641
```

```
S11 = polard2rect([0.571 -124.400]) ;
S12 = polard2rect([0.087 29.260]) ;
S21 = polard2rect([2.871 82.700]) ;
S22 = polard2rect([0.707 -41.920]) ;
% S = [S11 S12 ; S21 S22] ;
% rect2polard(S(:))

% gamma_S = get_gamma(25.727 + j*31.811)
% rect2polard(gamma_S)

gamma_out = S22 + (gamma_S*S21*S12)/(1-gamma_S*S11)
```

```
gamma_out = 0.3962 - 0.5248i
```

```
rect2polard(gamma_out)
```

```
ans = 1×2
```

```
    0.6575  -52.9476
```

```
Z_out = get_Z(gamma_out)
```

```
Z_out = 44.3489 - 82.0009i
```

```
rect2polard(Z_out)
```

```
ans = 1×2
   93.2254  -61.5939
```

```
L_stab = 10e-9 ;
R_stab = 30 ;
Z_stability = R_stab + j*w*L_stab
```

```
Z_stability = 3.0000e+01 + 1.2566e+02i
```

```
Z_out_stab = 1/( (1/Z_out) + (1/Z_stability) )
```

```
Z_out_stab = 1.3464e+02 - 3.7202e+01i
```

```
% rect2polard(Z_out_stab)
gamma_out_stab = get_gamma(Z_out_stab)
```

```
gamma_out_stab = 0.4795 - 0.1049i
```

```
rect2polard(gamma_out_stab)
```

```
ans = 1×2
    0.4909  -12.3346
```

```
% check lumped elements matching configuration 1
XL = imag(Z_out_stab) ;
RL = real(Z_out_stab) ;

B_Lout = ( XL - sqrt(RL/Z0)*sqrt(RL^2+XL^2-Z0*RL) )/( RL^2+XL^2 )
```

```
B_Lout = -0.0114
```

```
Lout = 1/(w*B_Lout)
```

```
Lout = -6.9719e-09
```

```
X_Cout = 1/B_Lout + XL*Z0/RL - Z0/(B_Lout*RL)
```

```
X_Cout = -68.8923
```

```
Cout = 1/(w*X_Cout)
```

```
Cout = -1.1551e-12
```