ECE166 Problem

Design an LC matching network at 5 GHz for maximum power transfer between a generator with an impedance of $Z_g=10-j60 \, \Omega$ and a load with an impedance of $Z_L=50 \, \Omega$. Use a single Smith Chart. Write your name on the Smith Chart.

- Calculate the values of $L$ and $C$ in nH and pF.
- Calculate the voltage on the load for a generator voltage of 2 V.
- Determine the input and output reflection coefficient at 4 GHz. You need to assume that the reactance of the LC components change with frequency but that the generator impedance stays the same.
ECE265A Problem

1) Analyze the circuits below based on a long-channel NFET transistor biased in saturation (note that the biasing is not shown). Assume the maximum supply is 1 V and the voltage threshold is 0.5 V. Assume $L = 400\text{nm}$, the oxide thickness is 2 nm, the oxide permittivity is 3.9, and $\mu_n = 1000\frac{\text{cm}^2}{\text{V} \cdot \text{s}}$.

a. Ignore the effect of $L_s$. If the transistor is 40um wide, determine the transconductance (15).

b. Ignore the effect of $L_s$. Find the gate-source capacitance of the transistor. (5)

c. Ignore the effect of $L_s$. Find the $f_T$ the transistor. (10)

d. If $L_s$ is arbitrarily chosen, find the maximum $f_T$ the transistor. (15)

e. If $L_s$ is 80pH, what is the real part of the input impedance? (10)