UNIVERSITY OF CALIFORNIA AT BERKELEY
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1. Consider the circuit shown in Figure 1..

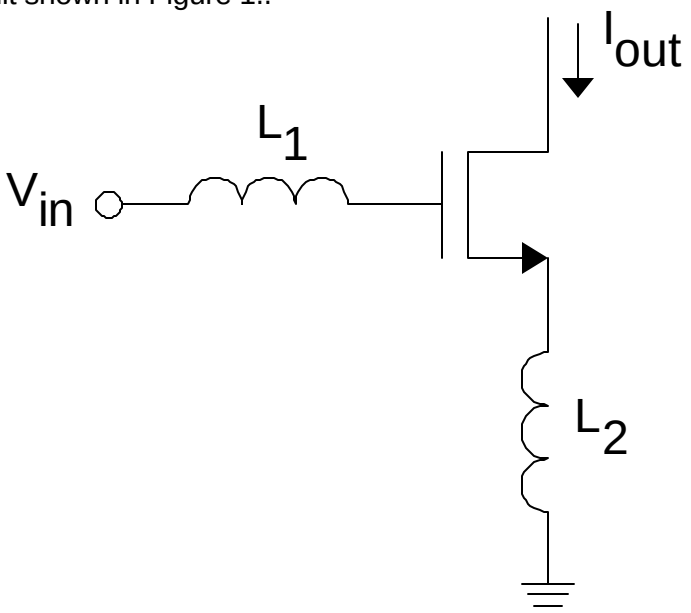

Figure 1

For the transistor above, consider only it's g_m and C_{GS}. (i.e. $r_o \rightarrow$ infinity, C_{GD}=0, etc)

a) Determine the size of L1 and L2 such that the input impedance is purely real and exactly 50ohms at an operating frequency of 5GHz. g_m=10mS, C_{GS}=80fF

b) Calculate the G_M of this circuit for the parameters given and L1, L2 as determined from part (a)

2. Consider the circuit in figure 2

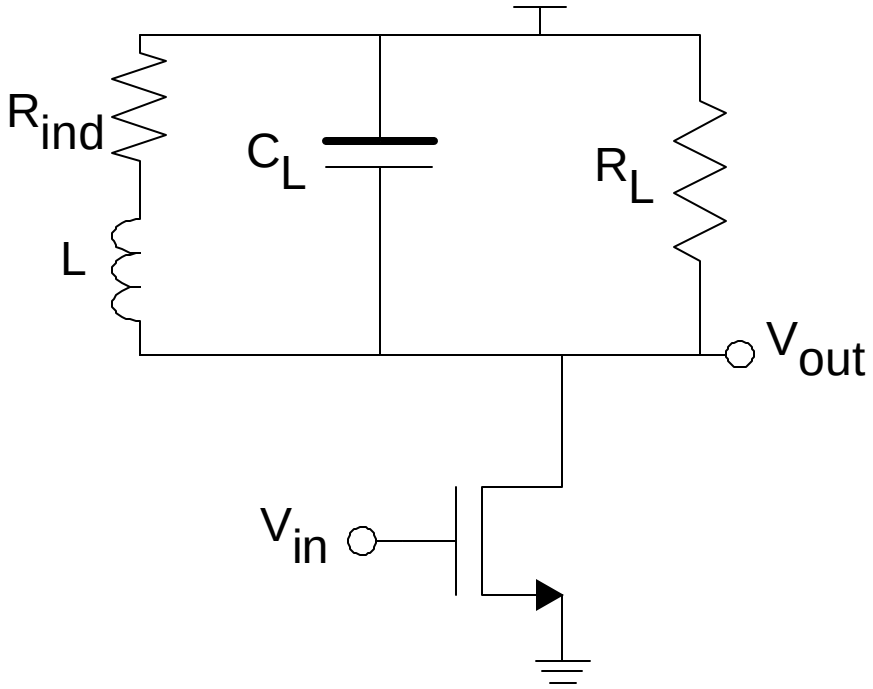

Figure 2

a) At an operating frequency of ω_0, we seek to use an inductor to cancel out the capacitance at the output, C_L. Determine the size of the inductor, L, that is required in terms of C_L, ω_0, Q_{ind}, and R_L. Note that the inductor has a finite Q (=Q_{ind}), so that the relationship between R_{ind} and L is:

$$R_{ind} = \frac{w \cdot L}{Q_{ind}}$$

b) Calculate the expression for the gain at $\omega=\omega_0$ of the circuit with and without the inductor present.

c) Re-do parts (a) and (b) for the following device parameters:

g_m	= 10mS
R_L	= 1kohm
C_L	= 1pF
ω_0	= 2π*5GHz=31.41 Grad/s
Q_{IND}	= 10 (@ 5GHz)

d) Verify the gain calculations from part (b) in spice with the parameters from part (c)