EE5390 Analog Integrated Circuit Design
Assignment 6
Friday 18/04/2014

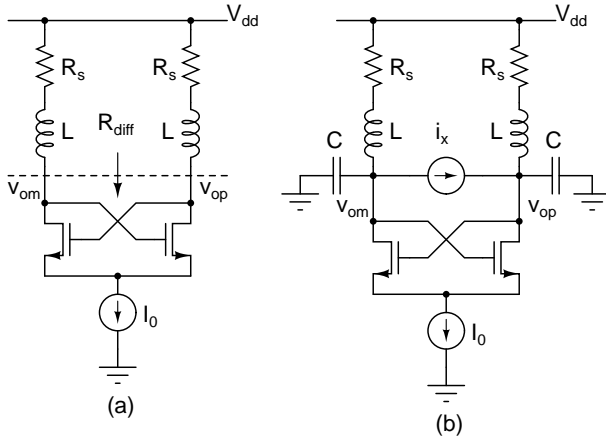

Figure 1:
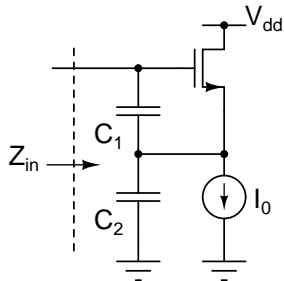

Figure 2:

Figure 3:

Figure 4:

1. Calculate the current flowing in each transistor in Fig. 1(a) in the quiescent condition. Calculate the small signal differential resistance R_{out} looking into the drains of the two transistors.

   In Fig. 1(b), calculate $(v_{op} - v_{om})/i_x$. What is the condition for this to be infinity? What is the frequency at which this happens?

2. Calculate the input impedance Z_{in} in Fig. 2. Is there anything special about it? Model the transistor using only its g_m.
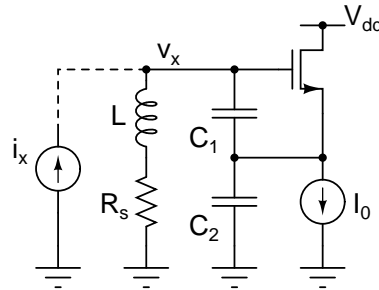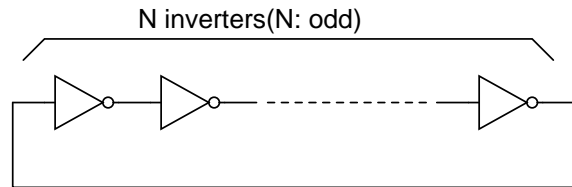
3. Calculate the small signal impedance v_x/i_x. What is the condition for this to be infinity? What is the frequency at which this happens? Model the transistor using only its g_m.

4. In Fig. 4, assume that all nodes are at the self bias voltage of the inverter. Model the small signal gain of each inverter as $A_0/(1 + s/p_1)$ and calculate the condition for instability (i.e. when the loop gain becomes -1). Hint: Among the roots of -1, pick the one which satisfies the above for the lowest value of A_0.