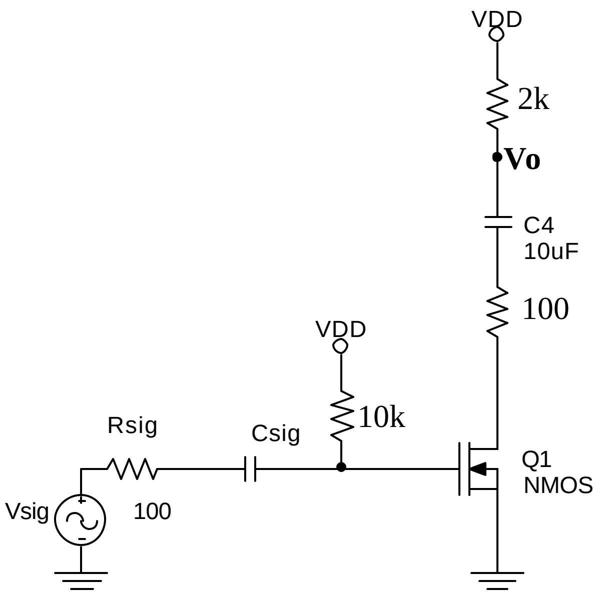
1. Use: $\mathbf{g_m=100mA/V}$ for the circuit below. Vsig is an AC signal source.

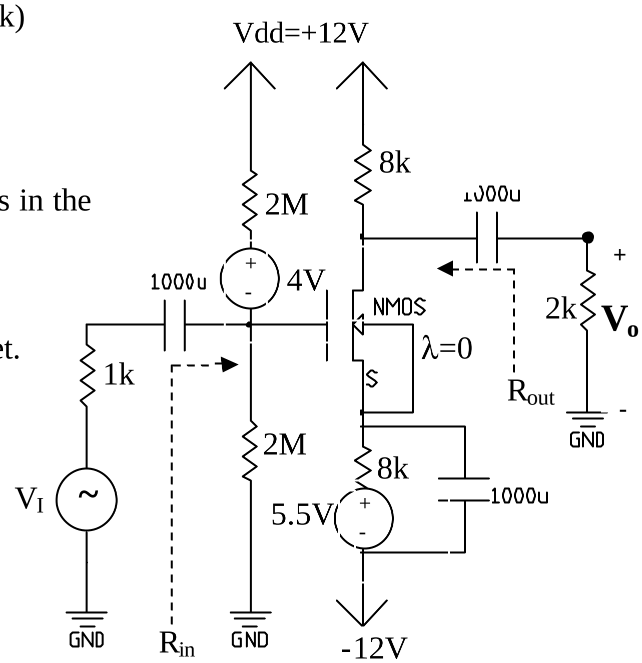
(a) Derive the frequency response transfer function for Vo/Vsig in terms of Csig.
(b) Find the value of Csig where the low 3db frequency value, f_L = 10 Hz (note this is in Hz – not rad/sec).



2. (a) Solve the DC circuit(schematic below)to find I_D and V_{GS}(assume caps open)
   (b) Use Matlab to find the value that Vdd can be reduced and still keep the transistor in saturation.
3. Solve the AC circuit(schematic below):
   (a) Draw the small-signal equivalent circuit (assume caps shorted)
   (b) Find the midband gain $\frac{V_o}{V_I}$ (V_I is an AC source)
   (d) Find Rin (node to right of capacitor, remove V_I and 1k)
   (e) Find Rout (node to left of capacitor, remove 4k)
   Given:
   V_t=2.831V
   $k_n'(W/L)=3.1A/V^2$

4. Solve the circuit(schematic below) by including the capacitors in the AC small-signal equivalent circuit. Solve the frequency transfer function V_o/V_I.

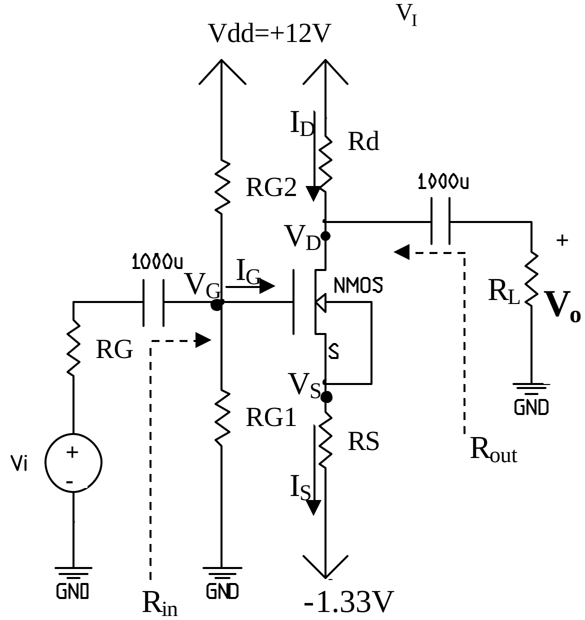
5. Simulate the circuit using PSPICE and IRF150 for the MosFet.
(a) Find and compare the simulated AC bode plot with the theoretical function found in (4).
(b) Find and compare the DC values found in (2). If there are differences describe why.



6. V_I is an AC voltage source. Use $\lambda=0$, $g_m=1mA/V^2$

$R_G=10\Omega$, $R_{G1}=2M\Omega$, $R_{G2}=10M\Omega$, $Rd=10k\Omega$, $RS=1k\Omega$, $R_L=10k\Omega$.

(a) Find the midband gain $A_v=\frac{V_o}{V_I}$ (use small-signal model), R_{in} (remove R_G) and R_{out}(remove R_L)



7. Use $V_t=2V$, $k_n'(W/L)=3mA/V^2$, $\lambda=0$, Vs is an AC voltage source. $g_m=10mA/V^2$

(a) Find the midband gain $A_v=\frac{V_o}{V_s}$ (use small-signal model), R_{in}(remove 10) and R_{out}(remove 10k)