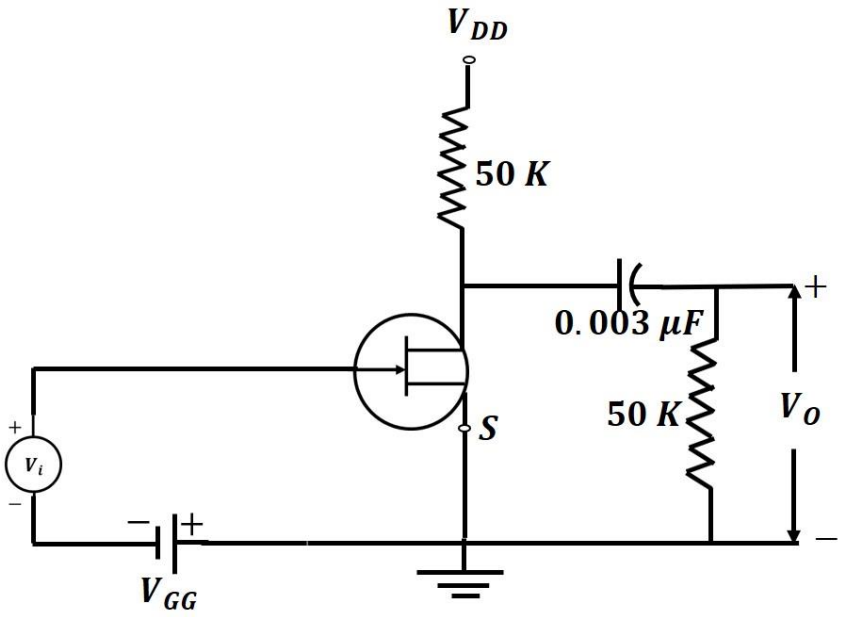
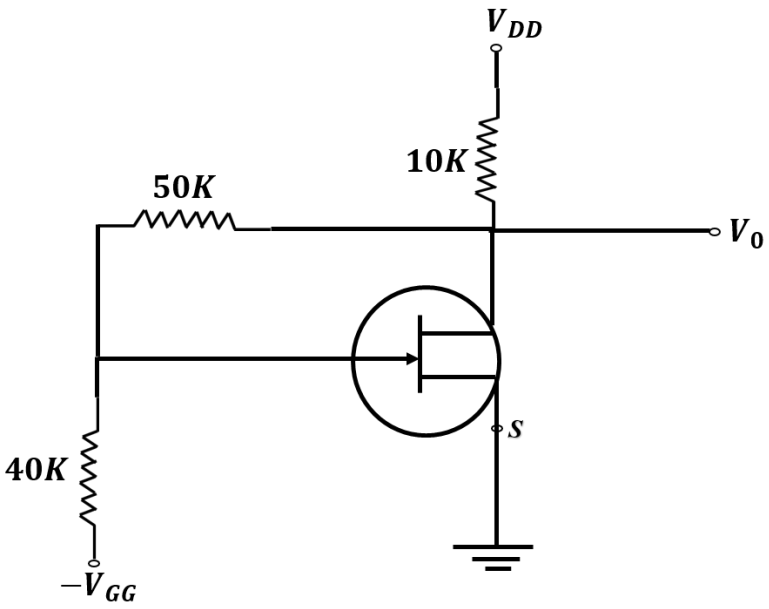
Tutorial -3

1. Calculate the voltage gain $A_v = {}^{V_o}/_{V_i}$, at 1 kHz for the circuit shown below. The FET parameters are $g_m = 2\ mA/V$ and $r_d = 10\ K$. Neglect capacitances.



2. If an input signal V_i is impressed between gate and ground, find the amplification $A_v = V_o/V_i$. Apply Miller's theorem to the 50 K resistor. The FET parameters are $\mu = 30$ and $r_d = 5K$. Neglect capacitances.



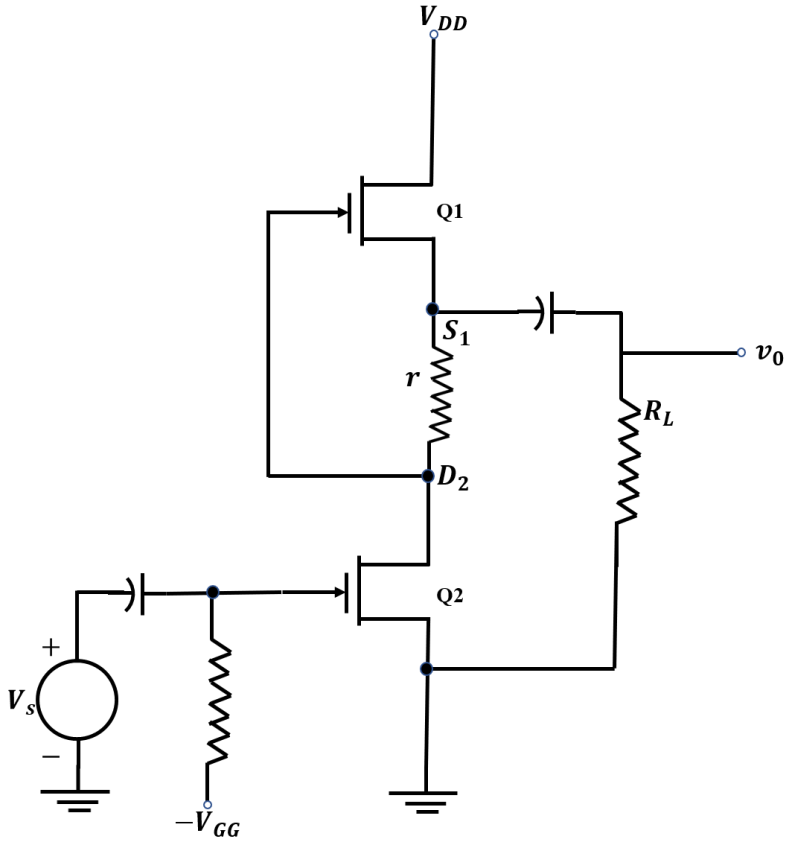
3. (a) Prove that the magnitude of the signal current is the same in both FETs provided that

$$r = \frac{1}{g_m} + \frac{2R_L}{\mu}$$

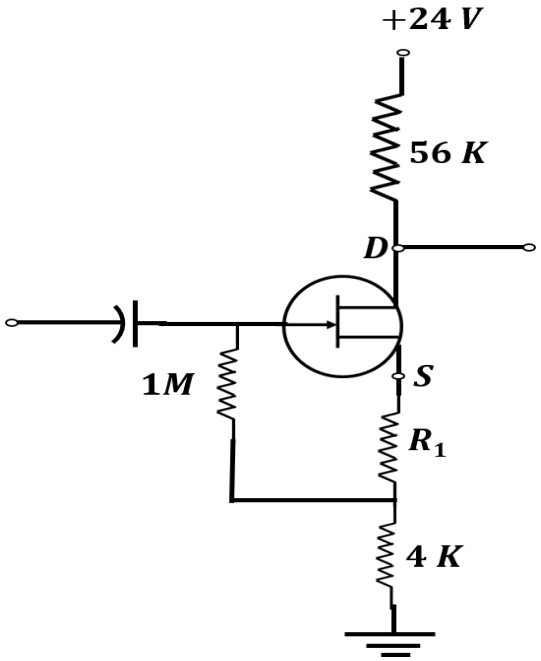
Neglect the reactance of the capacitors.

(b) If r is chosen as part a, prove that the voltage gain is given by

$$A = \frac{-\mu^2}{\mu + 1} \frac{R_L}{R_L + r_d/2}$$



4. The amplifier stage shown uses an n-channel FET having $I_{DSS} = 1\ mA, V_p = -1V$. If the quiescent drain to ground voltage is 10 V, find R_1.



5. The FET shown has the following parameters, $I_{DSS} = 5.6\,mA, V_p = -4V$.
   (a) If $v_i = 0$, find v_o;
   (b) If $v_i = 10\,V$, find v_0;
   (c) If $v_0 = 0\,V$, find v_i;
   Note: v_0 and $v_i$are constant voltages (and not small signal voltages).