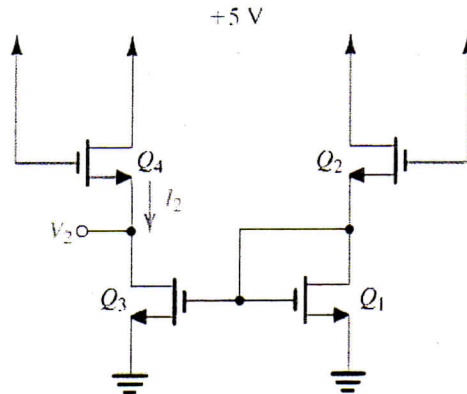


Microelectronic Circuits I (Quiz 2)

date: 2010/12/17 (Fri)

time: 14:20~15:10

1. (50%) For the devices in the circuits of Fig below, $|V_t| = 1\text{V}$, $\lambda = 0$, $\mu_n C_{OX} = 50\mu\text{A}/\text{V}^2$, $L = 1\mu\text{m}$, and $W = 10\mu\text{m}$. Find V_2 and I_2 . How do these values change if Q_3 and Q_4 are made to have $W = 100\mu\text{m}$?



2. (50%) The NMOS transistor in the CS amplifier shown in Fig. below has $V_t = 0.7\text{V}$ and $V_A = 50\text{V}$.
- (1) Neglecting the Early effect, verify that the MOSFET is operating in saturation with $I_D = 0.5\text{mA}$ and $V_{OV} = 0.3\text{V}$. What must the MOSFET's k_n be? What is the dc voltage at the drain?
 - (2) Find R_{in} and G_v .
 - (3) If v_{sig} is a sinusoid with a peak amplitude \hat{v}_{sig} , find the maximum allowable value of \hat{v}_{sig} for which the transistor remains in saturation. What is the corresponding amplitude of the output voltage?
 - (4) What is the value of resistance R_s that needs to be inserted in series with capacitor C_s in order to allow us to double the input signal \hat{v}_{sig} ? What output voltage now results?

