EE338L Spring 2007 Homework 2,  
due 2/22

Use the following parameters
NFET: $V_t=0.67V$, $k_p=150\mu A/V^2$, $\lambda=55e-6 \ 1/V$
PFET: $V_t=-0.95V$, $k_p=60\mu A/V^2$, $\lambda=25e-6 \ 1/V$

2.1 Calculate the required resistance such that a 1pF capacitor can be charged to 99% of vin in 1us. $0.99=1-e^{-(t/RC)}$
Size the transmission gate for this resistance as a maximum. L=Lmin=0.5um, Vdd=3V.
Worst case is at Vin=VDD-Vtp and Vin=Vtn, where only one device has to do all the conducting

2.2 Design a common source amplifier for a gain of 10. VDD=3Vm, use the models above.
   a) choose a load to use – current source, resistor, p-device, diode connected device.
   b) Design the small signal requirements
   c) Calculate the operating point
   d) There is a 1pF load capacitor on the output – what is the bandwidth?
   e) What is the input referred noise in the band from 20Hz-20kHz? (thermal noise only)?

2.3 What is the transconductance of the following circuit