ECE 321 - Quiz 4: Name _____

MOSFET Amplifiers - December 10, 2015
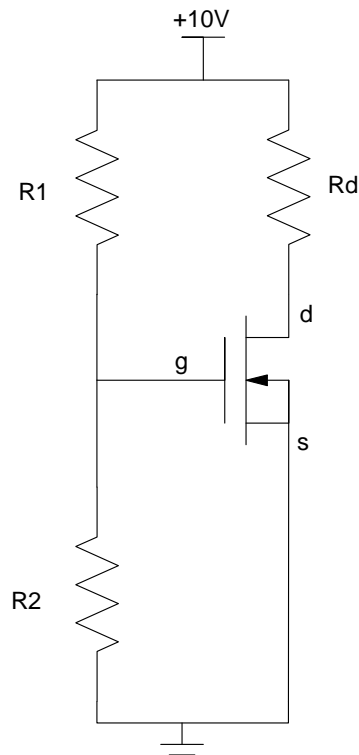
1) MOSFET DC Analysis: Find Rd, R1, and R2 so that the Q-point for the following circuit is

- Vds = 5V
- Ids = 1mA

Assume

- Vth = 2.0V
- $k_n = 1mA/V^2$
- $I_{ds} = \frac{k_n}{2}(V_{gs} - V_{th})^2$ *saturated region*
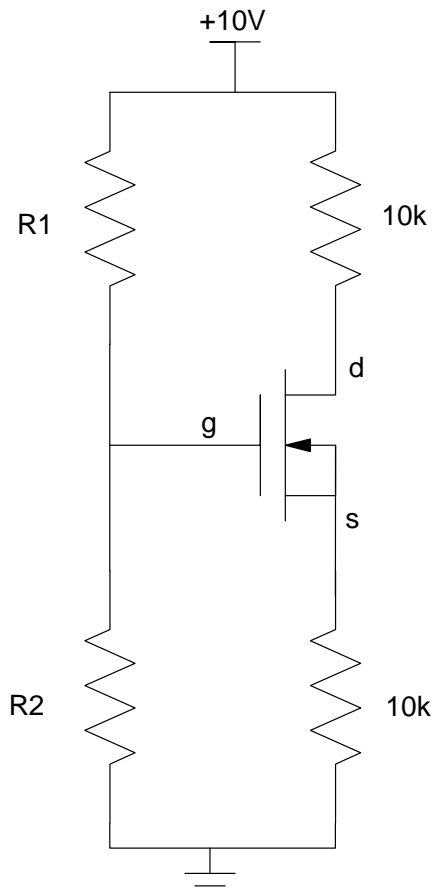
R1	R2	Rd

2) To stabilize the Q-point for variations in the turn-on voltage, Rs is added. Find R1 and R2 so that the Q-point is
   - Vds = 5V

Assume
   - Vth = 2.0V
   - $k_n = 1mA/V^2$
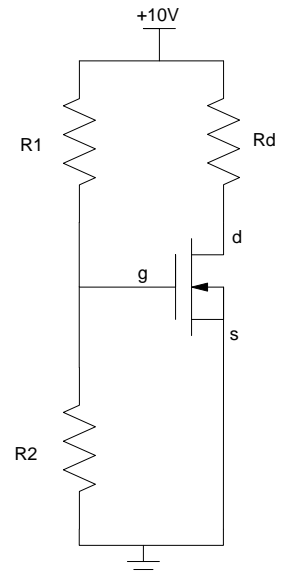   - $I_{ds} = \frac{k_n}{2}(V_{gs} - V_{th})^2$ *saturated model*
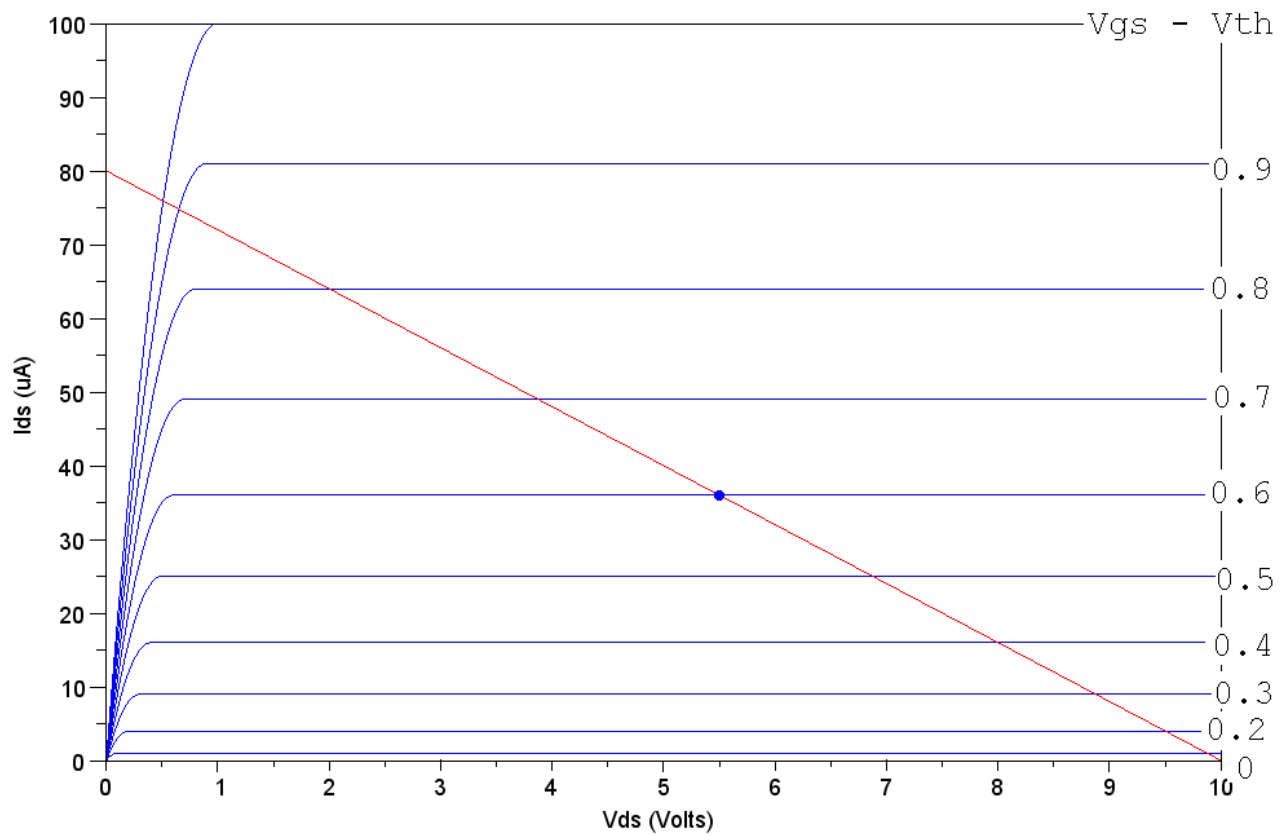
Ids	R1	R2

3) The V/I characteristics for a MOSFET are shown below along with a desired load-line.

- Find Rd to give this load line
- Find R1 and R2 so that the Q-point is (Vds = 5.5V, Ids = 36uA) and
- R1 || R2 = 100k

Assume Vth = 2V

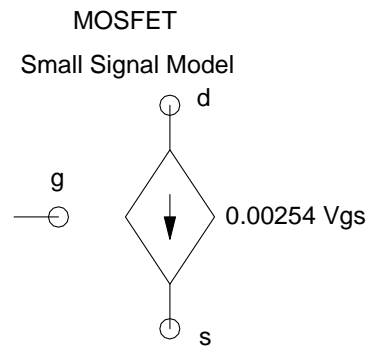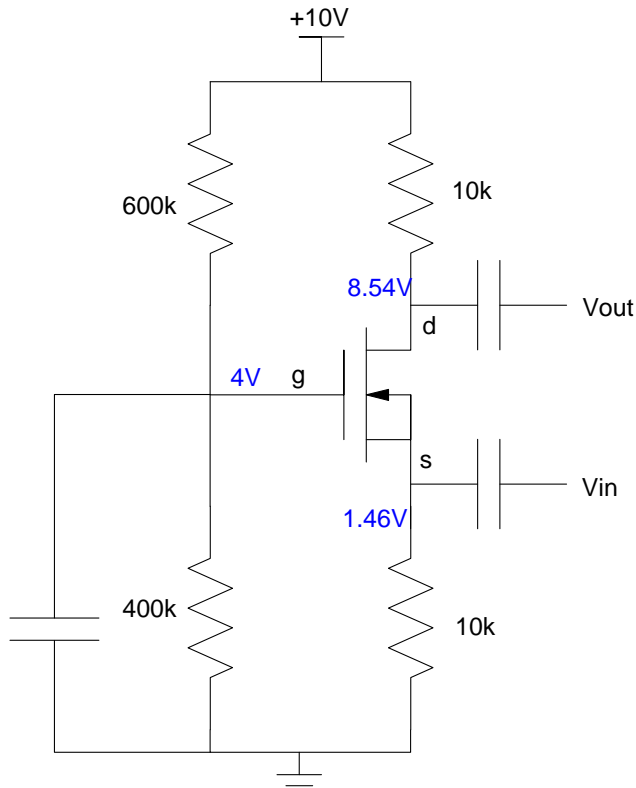| Rd	R1	R2

4) Draw the small-signal model for the following amplifier. Assume the small-signal model for the MOSFET is

- $k_n = 1mA/V^2$
- $g_m = 0.002.54\frac{A}{V^2}$

5) Find the 2-port model for the following MOSFET amplifier

Rin	Ai	Rout	Ao

Vin   Vg   Vd   Vout

400k   600k   10k

Vs

0.00254 Vgs

Rin   Rout

Vin   Ai Vout   Ao Vin   Vout