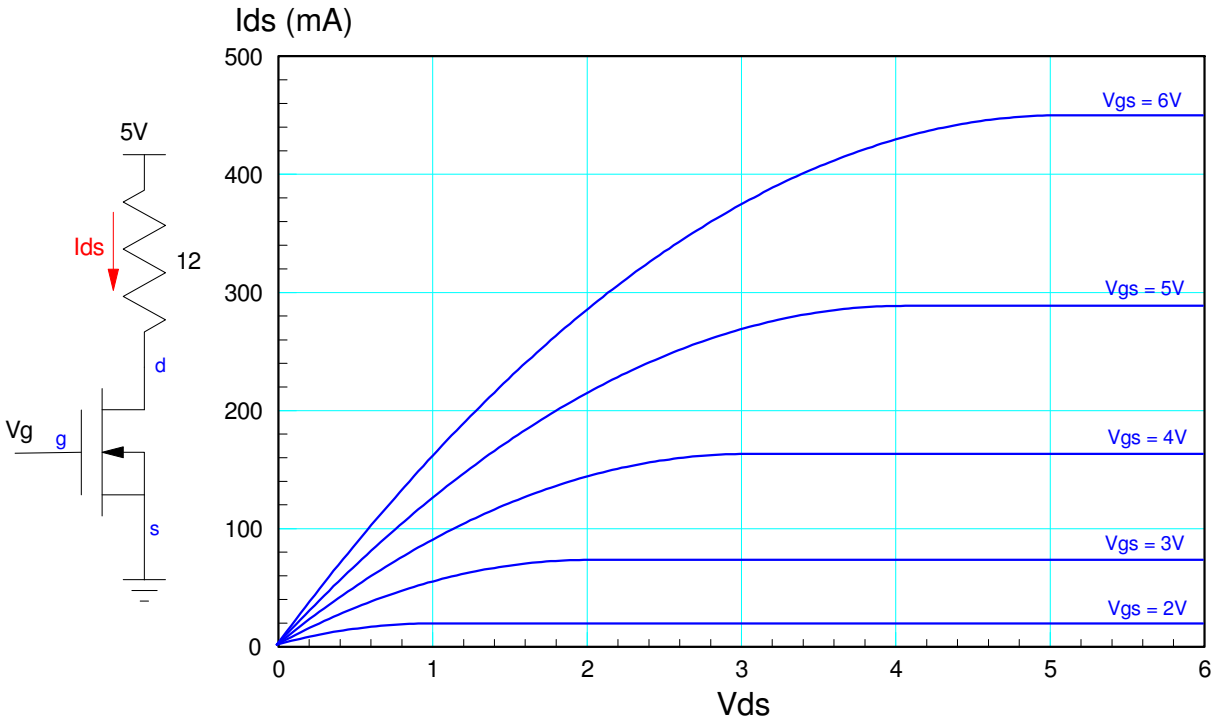
ECE 320 - Homework #9

MOSFET Switches, CMOS logic

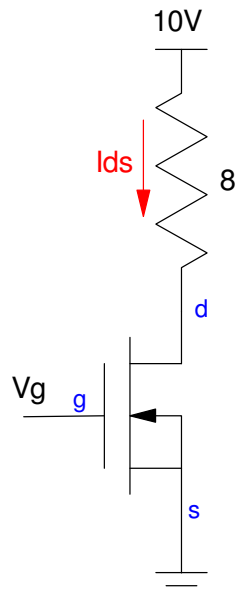
MOSFETs

1) The VI characteristics for an n-channel MOSFET are shown below.
   - Label the off / ohmic / and saturated regions
   - Determine the transconductance gain, kn. Assume Vth = 1.00V

2) Draw the load-line for the circuit below. From the load line, determine the Q-point (Vds, Ids) when
   - Vg = 0V
   - Vg = 4V
   - Vg = 7V



MOSFET Switch



The characteristics for a IRF3205 MOSFET are

- Max Current = 110A continuous
- Rds = 0.008 Ohms @ Vgs = 10V @ Id = 62A
- Vth = 3V (range = 2V to 4V)

3) Determine the transconductance gain, kn

4) The CircuitLab model for an IRF3205 MOSFET is

- $k = 70.0\frac{A}{V^2}$
- $V_{th} = 3.900V$

Using the CircuitLab parameters, determine the voltages for the following circuit for

- Vin = Vg = 0V
- Vin = Vg = 5V
- Vin = Vg = 10V

5) Simulate this circuit in CircuitLab using an IRF3710. Determine the voltages and currents when

- Vin = Vg = 0V
- Vin = Vg = 5V
- Vin = Vg = 10V
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CMOS Logic

6) Design a CMOS gate to implement the function: Y(A, B, C, D)

Y(A,B,C,D)

AB \ CD	00	01	11	10
00	0	1	1	x
01	1	1	1	1
11	0	x	0	0
10	0	1	x	0