ECE 320 - Homework #8

Schmitt Triggers, MOSFET's, MOSFET Switch. Due Monday, October 17th

Schmitt Trigger:

1) Assume you have a light sensor whose resistance is

$$R = \left(\frac{100,000}{Lux} \right) \ \Omega$$

Design a circuit which is capable of driving a 1k Ohm load where

- The output goes to +10V when the light level drops below 20 Lux and
- The output goes to 0V when the light level goes above 25 Lux.

MOSFET: The VI characteristics for a MOSFET are shown below.

2) Label the off / saturated / and ohmic regions.

3) Determine the turn-on voltage and transconductance gain, gm

4) Draw the load-line for the circuit shown to the right.

5) Determine the Q-point for
- Vg = 0V
- Vg = 2V
- Vg = 3V
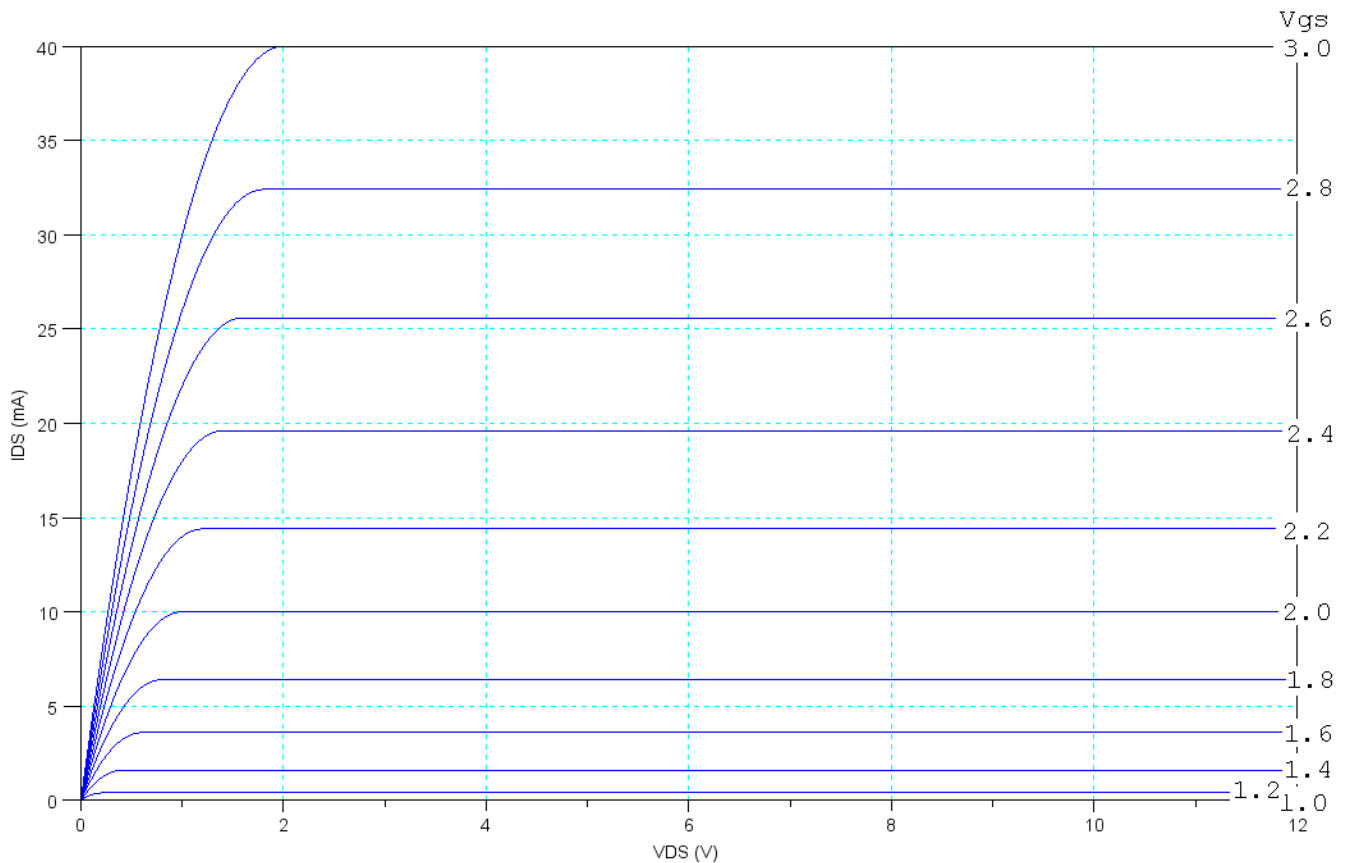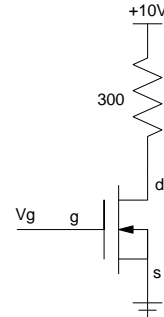
6) Design a circuit to turn on and off a 12V DC motor which draws 3A. Assume the MOSFET characteristics are:

- VDS max = 100V
- ID max = 11A (continuous)
- RDS max = 173 mOhm @ ID = 5A, VGS = 10V
- VT = 2V @ 1mA

Term Project (part 1)

Lab: 7-10) Design, build, and test one part of your term project

7) Requirements: Specify

- Inputs
- Outputs
- How they relate

8) Analysis: Give calculations for resitors, capacitors, etc. for a circuit which meets these requirements.

9) Testing: Simulate your circuit in PartSim (or similar software) to check if you calculations were correct.

10) Validation: Build your circuit and collect data to verify your design meets your requirements.