ECE 3030: Physical Foundations of Computer Engineering
Fall 2021
Homework 4—Total points 100
Due on Thursday 9/30/2021 at 11.59 am. In case of a late submission, you will
be penalized by 50 points for each day after the submission deadline has passed.
You will receive no score if you submit after the solution has been posted.

Q1 What are the two main differences between an ideal switch and a real
MOSFET based switch? Explain with $I - D$-V_G characteristics. All variables have their usual meaning. [30 pts]

Q2 Draw the 3-D schematic diagram of a MOSFET and the 2-D cross-section
of the same, indicating all the relevant dimensions L_G, t_{ox} and W and the
terminals. All variables have their usual meaning. [30 pts]

Q3 What is the typical range of threshold voltage (V_{th}) for a silicon MOSFET? [20]

Q4 If the gate-source voltage (V_{GS}) of a MOSFET is 3 volts and the threshold
voltage (V_{th}) is 0.8 volts, is the MOSFET in the enhancement or depletion
mode? [20]