ECE 342: Electronic Circuits **Summer 2026**
Problem Set #4 **Due Date: 5pm, Fri, July 3, 2026**

1. A MOSFET is used in a common-source configuration with a drain resistance of $R_D = 8$ kΩ. If the drain-to-source resistance is $r_{ds} = 70$ kΩ, what must the value of g_m be to result in a midband voltage gain of -18 V/V? If the quiescent drain current is 1 mA, what is the value of $\mu C_{ox} W / 2L$?

2. A device with $\mu C_{ox} W / 2L = 0.4$ mA/V^2, λ. = 0.025/V, and $V_T = 0.8$ V is used in a common-source amplifier stage with $V_{GS} = 2.5$ V. If the power supply is 8 V and $R_D = 4$ kΩ, calculate the voltage gain from gate to drain. Compare this result to that found by assuming λ = 0.

3. For the amplifier of Problem 6.16, calculate the minimum and maximum possible output voltages before serious distortion is encountered (triode region and cutoff).

4. For the amplifier shown, assume that $\mu C_{ox} W / 2L = 0.2$ mA/V^2, λ = 0/V, and $V_T = 1$ V. The quiescent·drain voltage is to be in the range of 4 V to 9 V, and the quiescent drain current should be in the range of 0.1 mA to 4 mA. Select R_D to achieve the maximum possible midband voltage gain magnitude. Calculate A_{MB}.